



EASTERN NILE SUBSIDIARY ACTION PROGRAM (ENSAP)

EASTERN NILE TECHNICAL REGIONAL OFFICE (ENTRO)

## WATERSHED MANAGEMENT PROJECT

Project Implementation Plan  
Volume 2 – Annexes A - E



**Halcrow Group Limited**  
in association with  
**Metaferia Consulting Engineers**

**Halcrow**

**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Project  
Detailed Project Preparation

Project Implementation Plan  
Volume 2 – Annexes A - E

December 2007

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This report is presented in four volumes as listed below:

## **Volume 1: Project Implementation Plan**

## **Volume 2: Annexes A-E**

- A. *Project area description*
- B. *Unit cost guidelines*
- C. *Project cost estimates*
- D. *Economic and financial analysis tables*
- E. *Guidelines for community action planning and implementation*

## **Volume 3: Annex F**

- F. *Social and environmental assessment*

## **Volume 4: Annexes G-K**

- G. *Training plan*
- H. *Terms of Reference for project staff*
- I. *Monitoring and evaluation indicators*
- J. *Financial management plan*
- K. *Action plan for the first 18 months*

# Acronyms

ACSI	Amhara Credit and Savings Institute
AfDB	African Development Bank
AIMO	Industrial Association of Mozambique
AMAREW	Amhara Micro Enterprise, Agricultural Research, Extension and Watershed Management Project
ANRS	Amhara National regional state
ARARI	Amhara Regional Agricultural Research Institute
BoARD	Regional State Bureau of Agriculture and Rural Development
BoFED	Bureau of Finance and Economic Development
BoWRD	Bureau of Water Resources Development
BP	Bank Policy (of the World Bank)
CAD	Computer Aided Design
CAP	Community Action Plan
CIT	Catchment Implementation Team
COOPI	Cooperazione Internazionale
CPCO	Catchment Project Coordination Office
CPSC	Catchment Project Steering Committee
DA	Development Agent
DAP	Dia ammonium phosphate (chemical fertilizer)
EA	Environmental assessment
EIA	Environmental impact assessment
EMP	Environmental management plan
ENSAP	Eastern Nile SAP
ENTRO	Eastern Nile Technical Regional Office
EPA	Environmental Protection Authority
EPLAUA	Environmental Protection, Land Administration and Use Authority
ETB	Ethiopian Birr
FAO	Food and Agriculture Organisation
FTC	Farmer training centre
GEF	Global Environment Fund
GIS	Geographic Information System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HH	Household
IDEN	Integrated Development of the Eastern Nile
IFAD	International Fund for Agricultural Development
ILRI	International Livestock Research Institute
IWMP	Integrated watershed management project
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
KWC	Kebele watershed committee
LFA	Logical Framework Approach
LFM	Logical Framework Matrix
M&E	Monitoring and Evaluation
MCA	Multi-Criteria Assessment

MERET	Managing Environmental Rehabilitation in Transition to Sustainable Livelihoods
MoARD	(Federal) Ministry of Agriculture and Rural Development (in Ethiopia)
MOV	Means of Verification
MoWR	(Federal) Ministry of Water Resources (in Ethiopia)
MSC	Multi-Selection Criteria
MSF	Medecin sans Frontieres
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes SAP
NGO	Non-Government Organization
NILE-COM	Nile Council of Ministers
NPV	Net present value
NRM	Natural Resources Management
NTFPs	Non-Timber Forest Products
O&M	Operation and maintenance
O&M	Operations and Maintenance
OARD	Offices of Agriculture and Rural Development
OP	Operational Policy (of the World Bank)
ORDA	Organisation for Rehabilitation and Development in Amhara
OVI	Objectively Verifiable Indicators
P&IWMD	Participatory and Integrated Watershed Management and Development
PC	Project Coordinator
PCU	Project Coordination Unit
PDO	Project Development Objective
PIPs	Project Implementation Plans
PLUP	Participatory Land Use Plan
PRA	Participatory Rural Appraisal or Participant Response Analysis
PSC	Project Steering Committee
PWS	Public water supply
SAP	Subsidiary Action Plan
SIDA	Swedish International Development Agency
SMS	Subject matter specialist
SWC	Soil and water conservation
SWHISA	Sustainable Water Harvesting and Institutional Strengthening in Amhara
TBIWRDP	Tana Beles Integrated Water Resources Development Project
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WB	World Bank
WBISPP	Woody Biomass Inventory and Strategic Planning Project
WFO	World Football Organisation
WFP	World Food Programme
WSS	Water supply and sanitation

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Watershed Project, Fast-Track Projects  
Detailed Project Preparation

**Project Implementation Plan**

Annex A: Project area description

December 2007

**Halcrow Group Limited**

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## Preface

In common with many projects of this nature, there is sometimes confusion over what “project area” actually refers to. In this report (the Project Implementation Plan main report and its annexes) the following terminology is used:

- The **gross study area** refers to the overall area identified in the three **watersheds** (sometimes referred to in the ToR as **catchments** or **sub-watersheds**) within which the Water Management Project is to be taken up.
- The **detailed study area** is the five **study sites** within **micro-watersheds** selected during the course of project preparation for detailed assessment and which are proposed to be the nucleus for the project’s development.
- **Micro-watersheds** are discrete hydrological units typically of about 1,000ha, themselves made of **mini-watersheds**, typically of 100-500ha, as represented by the **study sites**.
- The **Project area** refers to the area to be developed under the investment project within the gross study area. As defined, the project area is made up of five **development clusters** around **development nuclei**. The **development nuclei** are the same as the **study sites** where community action planning is already well advanced during the project preparation phase.

# 1. Sub-catchments of the gross study area

The *gross study area* comprises three river sub-catchments within the Amhara Regional State, namely the Ribb, Gumera and Jema all of which drain into Lake Tana. The Ribb and Gumera catchments are contiguous and are located to the east of Lake Tana centred on Debre Tabor. The Jema drains into the Gilgel Abbay river and thence into Lake Tana and is located to the south of the lake.

The physical characteristics of the three sub-catchments are described below.

## 1.1 Ribb catchment

The Upper Ribb catchment covers an area of some 94,540ha and lies to the north of Debre Tabor. The catchment ranges in altitude from around 1,800m at its base to over 3,000m in the upper catchment. Physiographically the area is one of a dissected basin with high level plateau remnants separated by deeply incised rivers with steep and very steep slopes. Rainfall ranges from about 1,200 to over 1,600mm per year and is unimodal with a single secure cropping season. Most of the catchment falls into the moist weyna dega to moist dega agro-ecological zones although the higher upper catchment falls under the wet wurch and upper wurch zones.

In terms of land cover the vast majority of the catchment has been mapped as Dominantly Cultivated and Moderately Cultivated with some small areas of grassland in the lower basin and afro-alpine vegetation in the higher areas. A few small areas of natural woodland and some (mainly eucalyptus) plantations have also been noted. Areas mapped as Dominantly Cultivated tend to correspond to less steep middle slopes whilst those areas mapped as Moderately Cultivated are associated with steeper slopes and include a greater area of grassland and bare ground. Farming systems range from teff-wheat-maize in the lower elevations of the lower catchment, through a wheat-barley-pulses system in the higher middle catchment to one dominated by barley in the upper catchment above about 2,900m. Draught oxen, cows, sheep and goats are the dominant livestock in all the farming systems.

The soils of the Ribb catchment are primarily moderately deep to deep chromic and haplic luvisols which are soils characterised by an accumulation of high activity clay minerals at some depth in the soil horizon. They are, in general, fertile soils because of their mixed mineralogy, relatively high nutrient content and the presence of weatherable minerals. Their physical characteristics are also favourable. They are well drained (unless a dense clay accumulation layer develops over time), porous and well aerated and have a moderate to high moisture storage capacity. Other soils include eutric leptosols (shallow soils) in places and alluvial eutric fluvisols in the valley bottoms. It has been noted that upper steep slopes were often shallow and stony with deeper soils more associated with the less steep middle

and lower slopes. Small areas of highly fertile but difficult to manage vertisols and nitisols were also noted.

In terms of soil erosion the most visible evidence of soil erosion in the Ribb catchment is that of gullies which often appear to be associated with areas of communal grazing and of sheet erosion with exposure of rock and stones on previously cultivated steep upper slopes. Given the relatively high rainfall, the safe disposal of excess runoff in the rainy season is the main priority with in-field drainage furrows down the slope regularly being observed in the teff fields causing soil rilling. Soil erosion and declining soil fertility were highlighted as issues in discussions with community members during the studies of the project mini-catchments. In a few areas soil conservation structures, mainly stone bunds, were noted, most notably around Tsagure Yesus, west of Debre Tabor, although many fields also had earth bunds marking their boundary. Tree planting around homesteads is relatively common but it is not common along field boundaries.

## **1.2 Gumera catchment**

The Upper Gumera catchment covers an area of some 98,386ha and lies immediately to the south of the Ribb catchment. The catchment ranges in altitude from around 1800m at its base to just under 3500m in the upper catchment. Physiographically the area is similar to the Ribb but is less dissected with larger areas of gently sloping high level plateau remnants. As with the Ribb, rainfall ranges from about 1,200 to >1,600mm per year and is unimodal with a single secure cropping season. Most of the catchment falls into the moist weyna dega to moist dega agro-ecological zones.

In terms of land cover the vast majority of the catchment has been mapped as Dominantly Cultivated (primarily the west and centre) and Moderately Cultivated (the centre and east) with some small areas of grassland in valley bottoms and associated with shallow and stony plateau crests and afro-alpine vegetation in the higher areas. Areas of natural woodland are not as extensive as in Ribb, nor are the areas of eucalyptus plantation. As with the Ribb, farming systems range from teff-wheat-maize in the lower elevations of the lower catchment to a wheat-barley-pulses system in the higher middle catchment. Draught oxen, cows, sheep and goats are the dominant livestock in all the farming systems.

The soils of the Gumera catchment have been mapped as primarily moderately deep to deep haplic luvisols although large areas of very stony soils have been observed in the lower to middle catchment during the study period. Other soils include eutric leptosols (shallow soils) in places and alluvial eutric fluvisols in the valley bottoms. As with the Ribb it was noted that upper steep slopes were often shallow and stony with deeper soils more associated with the less steep middle and lower slopes.

In terms of soil erosion the most visible evidence of soil erosion in the Gumera catchment is that of gullies which are often associated with areas of communal grazing and of sheet

erosion with exposure of rock and stones on previously cultivated steep upper slopes. Given the relatively high rainfall, the safe disposal of excess runoff in the rainy season is the main priority with in-field drainage furrows noted during the reconnaissance but incorrectly aligned down the prevailing land slope. Soil erosion and declining soil fertility were highlighted as issues in discussions with community members during the study period. Fewer areas of soil conservation structures were noted compared to the Ribb catchment although some recently constructed earth bunds had been observed. Tree planting around homesteads appears to be less common than in the Ribb catchment and is also not as common along field boundaries.

### **1.3 Jema catchment**

The Jema catchment is appreciably smaller in size than the Ribb and Gumera catchments with an area of around 48,000ha. It lies immediately to the south of the Koga catchment and the Koga dam and irrigation development project which has an on-going watershed management programme in its upper catchment. The Jema catchment lies some 15km to the south of Merawi but access within the catchment is extremely poor.

The catchment ranges in altitude from around 2,000m where it joins the Gilgel Abay to 3,500m in the upper catchment. The physiography of the area can be divided in two with the northern part of the catchment being relatively flat with most slopes less than 10% and the southern or upper catchment being more typical of Highland Ethiopia with rolling to steep topography and slopes of 15-30%. Rainfall is slightly higher than the Ribb and Gumera catchments at around 1,700mm per year and is unimodal with a single secure cropping season. The northern catchment falls into the wet weyna dega traditional agro-ecological zone whilst the southern upper catchment is wet dega agro-ecological zone.

In terms of land cover there is also a split with the northern catchment mapped as Dominantly Cultivated and the upper catchment as Moderately Cultivated with eucalyptus forests occurring on steeper slopes. In the northern area, patches of natural woodland were noted on hill crests and eucalyptus plantation is common around homesteads, in gullies and watercourses and occasionally as field boundaries. In general the catchment is more wooded than the Ribb and Gumera catchments.

As with the Gumera catchment, farming systems range from teff-wheat-maize in the lower elevations to a wheat-barley-pulses system in the higher catchment. Small areas of vegetable production from small-scale irrigation were also noted. Draught oxen, cows, sheep and goats are the dominant livestock in all the farming systems.

The soils of the Jema catchment have been mapped as primarily haplic alisols with a smaller extent of haplic luvisols in the lower catchment. Alisols are generally deep friable soils but are not as fertile as luvisols, being more acidic, often with high amounts of aluminium in the subsoil. They are also more prone to erosion than the luvisols since the friable topsoil has low

structural stability. Smaller areas of more fertile eutric nitisols and eutric vertisols have also been mapped and were noted in the field. Also it was also noted that many hill crests and upper slopes were extremely stony and/or shallow with bare rock exposed.

In terms of soil erosion the most visible evidence of soil erosion in the small area of the Jema catchment visited, is that of gullies associated with areas of communal grazing and of sheet erosion with exposure of rock and stones on previously cultivated steep upper slopes. Given the relatively high rainfall, the safe disposal of excess runoff in the rainy season is the main priority with in-field drainage furrows being noted. Low yields and a lack of fertilizer rather than soil erosion *per se* were highlighted as issues in discussions with community members during the study of the project mini-catchments at Engule. Fewer areas of soil conservation structures were noted compared to the Ribb and Gumera catchment although most fields were bounded by earth bunds and many were also planted with eucalyptus. Wood and charcoal are exported by donkey to the market at Merawi but dung usage as fuel is high suggesting that the returns to fuelwood are greater than those obtainable from selling crop surpluses which could be produced by using dung as manure.

## 2. Physical description of the five study sites

Within the three sub-catchments, five sites (two each in Ribb and Gumera and one in Jema) were selected for detailed study. Their physical characteristics are described below.

### 2.1 Ribb sub-catchment

#### 2.1.1 *Baskura*

The Baskura micro-watershed in Farta wereda covers some 137ha to the west of Debre Tabor and abutting the treated Tsagure Yesus area. It has an altitude of around 2,300m and is in the moist weyna dega to dega agro-ecological zones with a wheat-barley-pulses farming system.

To the south of the main road the land is steep (>30% slope) with evidence of sheet erosion and was previously arable land but is now mainly used for grazing. There is evidence of former bench terracing on the upper-middle slopes where the soils are deeper but the upper slopes have shallow, stony soils with grass and shrub vegetation and very few trees. Two gullies that are the headwaters of the Baskura stream have been treated with a variety of interventions such as gabions, stone and brushwood checkdams. A borrow pit for road construction has been created between these two gullies during the time of study.

Immediately to the north of the road the area is dominated by an area of communal grazing land through which the Baskura stream flows. The soils on the grazing land are shallow with bare rock exposed in places, to moderately deep. There is evidence of headward gully erosion to the north of the Baskura. The slopes of the grazing land are not steep at around 8-16%.

To the northwest of the grazing land, close to the church, the northern boundary is a steep slope of over 30% which is covered in regrowth vegetation and fenced at its lower slope boundary. In contrast to the southern steep slopes, runoff onto arable land below is not a problem, due to the high density of vegetative cover.

To the east of the grazing land are areas of arable land and homesteads, most of which are surrounded by eucalyptus. These lands have deep well drained soils, often with earth bunds and also live hedges and eucalyptus along field boundaries. Very steep (>60%) slopes then lead down to the stream in the valley bottom. These slopes may be used by goats for grazing but there are also some eucalyptus planted.

### 2.1.2 *Kantai*

The Kantai micro-watershed as selected covers some 384ha immediately to the west of Gasay, east of Debre Tabor and is in Farta wereda. It has a mean altitude of just under 2,800m and is in the moist dega agro-ecological zone with a wheat-barley-pulses farming system.

The area lies largely to the north of the main Debre Tabor-Gasay road and is bisected by the Kantai river. Crests and upper slopes are often highly degraded with sheet erosion and active headward gully erosion. Soils are shallow, rocky and stony and these areas are now being used as grazing land although they were cultivated 30 years ago with evidence of old stone bunds.

Flatter upper-middle and middle slopes (from 5-15%) have deeper soil, though often still stony, and are used for arable cropping with many fields banded by stones. Gullies have often developed at the break of slope, often associated with degraded steeper grazing land upslope. Eucalyptus are common around homesteads but are generally not planted at field boundaries.

Lower slopes are narrow and steep leading to streams in valley bottoms. These are often used for grazing and show evidence of sheet erosion and degradation.

## 2.2 **Gumera sub-catchment**

### 2.2.1 *Zefie*

The Zefie micro--watershed is also in Farta wereda and covers some 229ha on the road between Gasay and Este. It is situated at an altitude of around 2,850m and is in the moist dega agro-ecological zone with a wheat-barley-pulses farming system.

The micro-watershed is characterised by a series of steep basalt ridges which cut across the area interspersed by intensively cultivated flatter areas. The micro-watershed's northern boundary is the ridge separating it from surrounding micro-watersheds but the western and eastern boundaries are social boundaries demarcated by streams. The southern boundary is the Gumera river.

At the crest of the micro-watershed the upper slopes show evidence of sheet erosion and land degradation with former rock bunds evident. This rocky, stony and shallow area was formerly used for cultivation but, due to the erosion and degradation, is now used as private grazing land and some forestry. Down slope of this, the slope lessens, soils are deeper though still stony and the area is intensively cultivated. These arable lands are often banded by stone bunds and the community have constructed a cut-off drain to channel excess runoff from upper slopes to an adjacent watercourse. Evidence of gullying was noted where road drainage was directed into unprotected watercourses which are planted with eucalyptus and some bamboo.



The middle of the micro-watershed is cut by three basalt escarpments about 200m apart with cultivation or grazing land between them, dependent on the slope. The middle to lower slopes have an undulating topography with slopes of 8-15% and are cultivated while close to the Gumera river the slopes are flatter (5-8%) and the land is also cultivated.

### 2.2.2 *Enkulal*

The Enkulal micro-watershed covers some 350ha on the road between Ambasene and Este and is located to the west of Gelawdros village in Dera wereda. It is situated at an altitude of around 2,400m and is in the moist dega agro-ecological zone with a wheat-barley-pulses farming system.

The micro-watershed is characterised by a stand of dense natural forest forming the border of the upper catchment. Upper slopes are not as steep as other micro-watersheds and the soils in general are deeper although they are also often very stony. The land use of these upper slopes is arable, grazing or natural woodland.

A major feature of the eastern slopes is a large area of severely eroded 'badlands' where the topsoil has been stripped down to the bedrock. This area corresponds to areas of communal grazing lands although it was cultivated in the recent past (10-15 years ago) and was forested up to 1975. Other areas of erosion with active gullies also occur on the eastern slopes.

Both up and downslope of the 'badland' areas the land is cultivated, with long planar slopes which have been recently bunded with soil and stone bunds. On the western side of the micro-watershed the land is primarily cultivated on slopes of 5-8% but often with deep gullies.

## 2.3 **Jema Sub-catchment**

### 2.3.1 *Engule*

The Engule micro-watershed covers an area of some 319ha in Merawi wereda. It is situated at an altitude of about 2,050m in the moist weyna dega agro-ecological zone with a teff-wheat-maize farming system.

The micro-watershed is characterised by wooded, rocky and stony hills forming the upper slopes of the eastern boundary, a large area of arable land on gently undulating terrain towards the Jema river and severe gully erosion associated with areas of communal grazing in the northeast of the area. The area is bounded by the Engule river and the hills to the east and the Jema river to the west and south.

The upper slopes are steep (>30%) with land uses of natural open woodland and grazing with evidence of sheet soil erosion which is concentrated into gullies in places. To the north of the wooded hills there is some cultivation on extremely stony soils indicating the extent of land pressure.

The lower slopes of the hills are used for grazing and areas of communal grazing land are located in the northeast. The upslope communal grazing area has been eroded to such an extent that bedrock is exposed in many places and this then feeds gullies that are eroding the downslope communal grazing area. This area of grassland is being seriously eroded by gullies which are eroding headwards and sideways by undercutting and slumping.

The rest of the area is intensively cultivated on deeper and less stony soils. Most fields have soil boundary bunds and some are planted with eucalyptus. Eucalyptus has also been planted in gullies in places, as a preventative measure.

The arable agriculture extends to the Jema river where small-scale irrigation is practiced in places but where river bank erosion is also evident.

### 3. Study site land classifications

The following tables give details of the different land development categories identified during the participatory land use planning (PLUP) exercise undertaken within the five detailed study sites. The problems associated with each land class are listed and the suggested interventions to be introduced for improved land management described.

#### 3.1 Baskura study site

Land Development Category	Suitable Interventions
<b>C1</b>	
<u>Description</u>	<u>Possible solutions</u>
Arable land with homesteads in east of micro-watershed. Cultivated land (wheat, barley, teff, maize, noug) without bunding on slopes of 0-8%. Eucalyptus and hedgerows planted around homesteads only. LCC III	To retain moisture on arable areas – soil bunds at field boundaries  To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting
<u>Current Problems</u>	
Sheetwash on arable land. Declining soil fertility and yields	
<u>Area</u> 22.6ha	
<u>Costing Category</u> 1c	
<b>C2</b>	
<u>Description</u>	<u>Possible solutions</u>
Arable land with homesteads in east of micro-watershed. Cultivated land (wheat, barley, teff, maize, noug) without bunding on slopes of 8-15%. Eucalyptus and hedgerows planted around homesteads only. LCC III	To retain moisture on arable areas – soil bunds at field boundaries  To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting
<u>Current Problems</u>	
Sheetwash on arable land. Declining soil fertility and yields	<u>Note</u>
<u>Area</u> 23.5ha	Potential for small-scale irrigation should be investigated
<u>Costing Category</u> 2c	

Land Development Category	Suitable Interventions
<p><b>C3</b></p> <p><u>Description</u></p> <p>Arable land and homesteads in east of micro-watershed. Cultivated land (wheat, barley, teff, maize, noug) with terracing/bunding on slopes of 15-30%. Eucalyptus and hedgerows planted in homestead area. LCC IVI</p> <p><u>Current Problems</u></p> <p>Steep slopes and moderately deep soils only. Declining soil fertility.</p> <p><u>Area</u> 31.2ha</p> <p><u>Costing Category</u> 3c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas – rehabilitation/improvement of stone (or stone-faced) bunds</p> <p>To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p>
<p><b>C4.</b></p> <p><u>Description</u></p> <p>Downslope of G4. Cultivated land (wheat, barley) with terracing on slopes of 30-60%. Gullying in watercourses. LCC VII</p> <p><u>Current Problems</u></p> <p>Steep slopes and moderately deep soils only. Declining soil fertility and yields, sheetwash</p> <p><u>Area</u> 5.5ha</p> <p><u>Costing Category</u> 4c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas – rehabilitation/improvement of bench terraces with vetiver hedgerows</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p> <p><u>Notes</u></p> <p>Check dams and some re-vegetation already undertaken in small gullies. Costs of terracing will be lower since rehabilitation rather than overall construction required</p>
<p><b>G2</b></p> <p><u>Description</u></p> <p>Communal grazing land, bisected by Baskura stream, in centre of area. Shallow (with rock outcrops) to moderately deep soils. Slopes 0-15%. Gully/streambank erosion on main stream and incipient gullying. LCC IVd</p> <p><u>Current Problems</u></p> <p>Sheetwash into stream, gullying, declining soil fertility lowering carrying capacity</p> <p><u>Area</u> 16.6ha</p> <p><u>Costing Category</u> 2g &amp; 2e</p>	<p><u>Possible solutions</u></p> <p>To improve soil fertility and carrying capacity whilst retaining moisture – grass strips initially with improved pasture between grass strips. Once established grass strips can be converted to hedgerows with fodder crops.</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p> <p><u>Note</u></p> <p>Shallow fragile soils, therefore no soil bunding. Small stone bunds may help grass strip establishment. Rotating area closure may be needed to establish grass strips and improved pasture.</p>

Land Development Category	Suitable Interventions
<p><b>G3</b></p> <p><u>Description</u></p> <p>Communal grazing land upslope of G1. Shallow (with rock outcrops) to moderately deep soils. Slopes 15-30%. LCC VII</p> <p><u>Current Problems</u></p> <p>Sheetwash and declining soil fertility lowering carrying capacity</p> <p><u>Area</u> 18.5ha</p> <p><u>Costing Category</u> 3g &amp; 3e</p>	<p><u>Possible solutions</u></p> <p>To improve soil fertility and carrying capacity whilst retaining moisture – rotating area closure, establishment of grass strips initially with improved pasture between grass strips. Once established grass strips can be converted to hedgerows with fodder crops.</p> <p><u>Note</u></p> <p>Shallow fragile soils, therefore no soil bunding. Small stone bunds may help grass strip establishment. Rotating area closure may be needed to establish grass strips and improved pasture.</p>
<p><b>G4.</b></p> <p><u>Description</u></p> <p>Southern boundary. Steep degraded slopes. Generally shallow and stony soils. Shrub and grassland vegetation. Slopes 30-60%. LCC VIIId</p> <p><u>Current Problems</u></p> <p>Low infiltration and sheet erosion. Runoff is concentrated into gullies and washes over downslope arable lands.</p> <p><u>Area</u> 3.8ha</p> <p><u>Costing Category</u> 4g &amp; 4e</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on slopes – area closure and forestry</p> <p>To protect sheetwash onto arable land – cut-off drains</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p> <p><u>Notes</u></p> <p>Check dams and some re-vegetation already undertaken in small gullies</p> <p>Cut-off drains constructed in places</p>
<p><b>F4.</b></p> <p><u>Description</u></p> <p>Northwestern boundary. Replanted formerly deforested area. Fenced and closed for revegetation. Slopes 30-60% LCC IVe</p> <p><u>Current Problems</u></p> <p>Moderately eroded when stripped of forest cover in past. Now replanted and fenced for protection.</p> <p><u>Area</u> 2.5ha</p> <p><u>Costing Category</u> 4f</p>	<p><u>Possible solutions</u></p> <p>None required – area is closed and replanted to indigenous vegetation according to local knowledge.</p>

Land Development Category	Suitable Interventions
Community development.  Investigate possibilities of such interventions as roof water harvesting, spring development, conservation tillage etc	Soil Fertility management & Biological Soil Conservation  Bund stabilisation using grasses and legumes; contour ploughing and composting, cash crops along bunds; control grazing in banded areas.

### 3.2 Kantai study site

Land Development Category	Suitable Interventions
<p><b>C1 &amp; C2</b></p> <p><u>Description</u></p> <p>Arable land (wheat, barley, teff, maize, noug) on shallow to moderate slopes (0-15%) south of Kantai river. Moderately deep to deep soils with some stones. Stone bunds constructed in last 5 years in north of area. Eucalyptus and hedgerows planted around homesteads only. LCC IIII</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land. Declining soil fertility and yields</p> <p><u>Area</u> 95.7ha</p> <p><u>Costing Category</u> 1c &amp; 2c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas and reduce sheetwash – leguminous hedgerows on top of soil bunds along contour possibly alternating with grass strips</p> <p>To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, shrub and grass planting along bunds</p> <p><u>Note</u></p> <p>Community have suggested a study of the area's soils to improve appropriate fertiliser use. Main fertilisers used are DAP and Urea which may not be the most suitable.</p>
<p><b>C3</b></p> <p><u>Description</u></p> <p>Arable land (wheat, barley, teff, maize, noug) on steeper slopes (15-30%) north of Kantai river. Shallow to moderately deep and deep soils with some stones. Stone bunds constructed but need rehabilitation. Eucalyptus and hedgerows planted around homesteads only. LCC IVI</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land. Declining soil fertility and yields</p> <p><u>Area</u> 70ha</p> <p><u>Costing Category</u> 3c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas and reduce sheetwash – stone bunds along contour possibly alternating with grass strips in areas of lower slope</p> <p>To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, shrub and grass planting along bunds</p>

Land Development Category	Suitable Interventions
<p><b>G1</b></p> <p><u>Description</u></p> <p>Grazing land close to watercourses. Moderately deep to deep soils, waterlogged in rainy season. Slopes 0-8%. LCC IVw</p> <p><u>Current Problems</u></p> <p>Overgrazing, declining soil fertility lowering carrying capacity</p> <p><u>Area</u> 21ha</p> <p><u>Costing Category</u> 1g</p>	<p><u>Possible solutions</u></p> <p>Establishment of improved pasture – rotating area closure to enable pasture to establish</p>
<p><b>G2</b></p> <p><u>Description</u></p> <p>Areas formerly used as arable land but now eroded and converted to grazing land. Shallow to moderately deep but often stony soils. Evidence of former stone bunding. Slopes 8-15%. LCC VIIe</p> <p><u>Current Problems</u></p> <p>Overgrazing and sheet erosion.</p> <p><u>Area</u> 25ha</p> <p><u>Costing Category</u> 2g</p>	<p><u>Possible solutions</u></p> <p>Area closure and conversion to cut and carry feeding or establishment of silvi-pasture (fodder crops/trees) and/or forestry.</p> <p>May need to rotate areas closed during establishment to provide some grazing land. Old stone bunds may be used as boundary markers.</p>
<p><b>G3</b></p> <p><u>Description</u></p> <p>Steep (15-30%) slopes to river. Shallow to stony soils. LCC VIId</p> <p><u>Current Problems</u></p> <p>Overgrazing and sheet erosion.</p> <p><u>Area</u> 19ha</p> <p><u>Costing Category</u> 3g</p>	<p><u>Possible solutions</u></p> <p>Area closure with leguminous hedgerows and possible conversion to forestry and/or silvi-pasture (fodder crops/trees). May need micro-basins to establish trees.</p>

Land Development Category	Suitable Interventions
<p><b>G4</b></p> <p><u>Description</u></p> <p>Steep (30-60%) slopes to river. Shallow to stony soils. LCC VIIId</p> <p><u>Current Problems</u></p> <p>Overgrazing and sheet erosion.</p> <p><u>Area</u> 2ha</p> <p><u>Costing Category</u> 4g</p>	<p><u>Possible solutions</u></p> <p>Area closure and conversion to forestry and/or silvi-pasture (fodder crops/trees). With cut-off drain. May need micro-basins to establish trees.</p>
<p><b>E2</b></p> <p><u>Description</u></p> <p>Severely eroded area within arable land. Shallow to moderately deep stony soils.</p> <p>LCC VIIe</p> <p><u>Current Problems</u></p> <p>Severe sheet erosion with runoff onto arable land.</p> <p><u>Area</u> 41ha</p> <p><u>Costing Category</u> 2e</p>	<p><u>Possible solutions</u></p> <p>Area closure and conversion to forestry and/or silvi-pasture (fodder crops/trees).</p> <p><u>Notes</u></p> <p>Community gully stabilisation measures ineffective. Cut-off drain exacerbates gully erosion.</p>
<p><b>E3</b></p> <p><u>Description</u></p> <p>Severely eroded crests and upper slopes. Shallow to moderately deep stony soils, extremely hard and cemented when dry but which disassociate on contact with water. Active gully erosion into these soils. Area was arable land 30 years ago but converted to grazing land due to erosion.</p> <p>LCC VIIIe</p> <p><u>Current Problems</u></p> <p>Severe sheet and gully erosion</p> <p><u>Area</u> 13ha</p> <p><u>Costing Category</u> 3e</p>	<p><u>Possible solutions</u></p> <p>Area closure with cut and carry and conversion to forestry and/or silvi-pasture (fodder crops/trees). Community suggest rotation of area closure to retain some land for grazing.</p> <p>To protect sheetwash onto arable land and to channel runoff to suitable channel – cut-off drains</p> <p>To prevent further gully erosion – brushwood check-dams and gully revegetation. Stone check-dams not recommended due to soil characteristics.</p>



Land Development Category	Suitable Interventions
<p><b>F4</b></p> <p><u>Description</u></p> <p>Eucalyptus plantation. Shallow to moderately deep stony soils.</p> <p>LCC IVI</p> <p><u>Current Problems</u></p> <p>Euclyptus monoculture</p> <p><u>Area</u> 16ha</p> <p><u>Costing Category</u> 4f</p>	<p><u>Possible solutions</u></p> <p>Land closure and enrichment planting with indigenous tree species</p>
<p>Community development.</p> <p>Investigate possibilities of such interventions as roofwater harvesting, spring development, conservation tillage etc</p> <p>Soil testing to improve appropriate fertiliser use and to enable suitable gully revegetation and stabilisation.</p>	<p>Soil Fertility management &amp; Biological Soil Conservation</p> <p>Bund stabilisation using grasses and legumes; contour ploughing and composting, cash crops along bunds; control grazing in banded areas.</p>

### 3.3 Zefie study site

Land Development Category	Suitable Interventions
<p><b>C1</b></p> <p><u>Description</u></p> <p>Cultivated land between basalt escarpments. Moderately deep stony soils with some stone bunds. Most fertile soils in area according to community</p> <p>LCC IVd</p> <p><u>Current Problems</u></p> <p>Declining soil fertility, some sheet erosion.</p> <p><u>Area</u> 24.3ha</p> <p><u>Costing Category</u> 1c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas – grass strips along the top of soil bunds</p> <p>To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting, replacement of eucalyptus with multi-purpose hedgerow species</p>

Land Development Category	Suitable Interventions
<p><b>C2</b></p> <p><u>Description</u></p> <p>Arable land with homesteads in upper watershed. Cultivated land (wheat, barley, teff, maize, noug) with some stone bunding on slopes of 8-15%. Deep to moderately deep soils. Eucalyptus and hedgerows planted around homesteads only. LCC III</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land from degraded grazing land upslope. Declining soil fertility and yields</p> <p><u>Area</u> 49ha</p> <p><u>Costing Category</u> 2c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas – grass strips and soil bunds</p> <p>To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting</p> <p>To protect sheetwash onto arable land – cut-off drains at base of G3 upslope</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully re-vegetation</p>
<p><b>C3</b></p> <p><u>Description</u></p> <p>Arable land (wheat, barley, teff, maize, noug) on steeper slopes (15-30%) in lower watershed. Moderately deep to deep soils with some stones. Stone bunds constructed but need rehabilitation. Eucalyptus and hedgerows planted around homesteads only. LCC IV</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land. Declining soil fertility and yields</p> <p><u>Area</u> 56ha</p> <p><u>Costing Category</u> 3c</p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas and reduce sheetwash – stone bunds along contour possibly alternating with grass strips in areas of lower slope</p> <p>To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, shrub and grass planting along bunds</p>
<p><b>C4</b></p> <p><u>Description</u></p> <p>Former arable land on steeper slopes (30-60%) in middle watershed, now degraded and used as arable and grazing land. Shallow to deep soils with some stones. Stone bunds constructed but need rehabilitation. No hedgerows. LCC VII</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land. Declining soil fertility and yields</p> <p><u>Area</u> 17ha</p> <p><u>Costing Category</u> 4c</p>	<p><u>Possible solutions</u></p> <p>Areas with deep soils and steep slopes (&gt;30%) will require bench terracing with vetiver strips along the edges and upslope cut-off drain for cultivation. In areas of shallower soils and steeper slopes – area closure and conversion to forestry</p>

Land Development Category	Suitable Interventions
<p><b>G3</b></p> <p><u>Description</u></p> <p>Former arable land on shallow to moderately steep slopes (8-30%) in upper watershed, now degraded and used as private grazing land. Shallow to moderately deep soils with some stones. Stone bunds constructed previously by GTZ project but destroyed. Some private eucalyptus plantations. No hedgerows. LCC VII</p> <p><u>Current Problems</u></p> <p>Sheetwash onto arable land below exacerbating gullying in watercourses. Declining soil fertility and yields</p> <p><u>Area</u> 52ha</p> <p><u>Costing Category</u> 2g &amp; 3g</p>	<p><u>Possible solutions</u></p> <p>To improve soil fertility and carrying capacity whilst retaining moisture – rotating area closure, establishment of grass strips initially with improved pasture between grass strips. Once established grass strips can be converted to hedgerows with fodder crops.</p> <p>Area closure with cut and carry and conversion to forestry and/or silvi-pasture (fodder crops/trees). Community suggest rotation of area closure to retain some land for grazing.</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p>
<p><b>G4</b></p> <p><u>Description</u></p> <p>Steep (slopes 30-60%) escarpment in upper watershed upslope of G3a. Shallow to moderately deep soils with some stones. No bunding, some eucalyptus planted. LCC VII</p> <p><u>Current Problems</u></p> <p>Sheetwash onto grazing and then arable land below exacerbating gullying in watercourses.</p> <p><u>Area</u> 14ha</p> <p><u>Costing Category</u> 4g</p>	<p><u>Possible solutions</u></p> <p>To protect sheetwash onto arable land and to channel runoff to suitable channel – cut-off drains in association with interventions proposed for G3a</p> <p>Rotating area closure with cut and carry and conversion to forestry and/or silvi-pasture (fodder crops/trees).</p> <p>May need micro-basins to establish trees</p>
<p><b>G5</b></p> <p><u>Description</u></p> <p>Very steep (&gt;60%) rocky escarpments. LCC VIIIId</p> <p><u>Current Problems</u></p> <p>Few trees</p> <p><u>Area</u> 3ha</p> <p><u>Costing Category</u> 5</p>	<p><u>Possible solutions</u></p> <p>Land closure with establishment of suitable forestry where possible. Upstream cut-off drain leading to protected watercourse with stone check dams</p>

Land Development Category	Suitable Interventions
<b>F4</b>	
<u>Description</u>	<u>Possible solutions</u>
Eucalyptus plantation. Shallow to moderately deep stony soils.	Land closure and enrichment planting with indigenous tree species
LCC IVI	
<u>Current Problems</u>	
Euclyptus monoculture	
<u>Area</u> 10ha	
<u>Costing Category</u> 4f	
Community development.	
Investigate possibilities of such interventions as roofwater harvesting, spring development, conservation tillage etc	Soil Fertility management & Biological Soil Conservation
	Bund stabilisation using grasses and legumes; contour ploughing and composting, cash crops along bunds; control grazing in banded areas.

### 3.4 Enkulal study site

Land Development Category	Suitable Interventions
<b>C1</b>	
<u>Description</u>	<u>Possible solutions</u>
Large areas of arable land on middle and lower slopes (slopes of 0-8%) in centre of watershed and small areas of arable land on crests. Cultivated land (wheat, barley, noug, maize, teff) with stone bunds but no hedgerows. Deep to moderately deep soils with some stones. Cut by incised watercourses and gullies in places. LCC II d	To retain moisture on arable areas – leguminous hedgerows along the top of soil bunds.
<u>Current Problems</u>	To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting with multipurpose fodder crops and trees
Sheetwash on arable land. Gullies	To prevent further gully erosion – stone and brushwood check-dams, gully revegetation
<u>Area</u> 56.7ha	
<u>Costing Category</u> 1c	

Land Development Category	Suitable Interventions
<p><b>C2</b></p> <p><u>Description</u></p> <p>Large areas of arable land on upper, middle and lower slopes (slopes of 8-15%) in upper watershed. Cultivated land (wheat, barley, noug, maize, teff) with stone bunds constructed in past 2-3 years. No hedgerows. Deep to moderately deep soils with some stones. Cut by incised watercourses and gullies in places and bounded by severely eroded land of E3. LCC III</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land. Gullies</p> <p><u>Area</u> 81ha</p> <p><u>Costing Category 2c</u></p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas and reduce sheetwash – leguminous hedgerows along contour in conjunction with soil bunds</p> <p>To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, hedgerow and grass planting along bunds</p> <p>To protect sheetwash onto arable land from E3 and to channel runoff to suitable channel – cut-off drains</p> <p>To prevent further gully erosion – stone and brushwood check-dams, gully revegetation</p>
<p><b>C3</b></p> <p><u>Description</u></p> <p>Arable land (wheat, barley, teff, maize, noug) on steeper slopes (15-30%) in upper watershed. Moderately deep to deep soils with some stones. Stone bunds constructed along contour LCC IVI</p> <p><u>Current Problems</u></p> <p>Sheetwash on arable land.</p> <p><u>Area</u> 76ha</p> <p><u>Costing Category 3c</u></p>	<p><u>Possible solutions</u></p> <p>To retain moisture on arable areas and reduce sheetwash – maintenance of stone bunds alternate grass strips along contour with stone bunds in areas of lower slope</p> <p>To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, shrub and grass planting along bunds</p>
<p><b>G2</b></p> <p><u>Description</u></p> <p>Private grazing land in upper watershed and area of communal grazing land downslope of severely eroded communal grazing area E3. Shallow stony soils. Slopes 8-15%. No bunds or hedgerows. LCC VI d</p> <p><u>Current Problems</u></p> <p>Sheetwash, overgrazing, lowering carrying capacity</p> <p><u>Area</u> 21ha</p> <p><u>Costing Category 2g</u></p>	<p><u>Possible solutions</u></p> <p>To improve soil fertility and carrying capacity whilst retaining moisture – alternate grass strips with improved pasture between. Once established grass strips can be converted to hedgerows with fodder crops.</p> <p>To stabilise steeply sloping area and to reduce runoff onto severely eroded areas– conversion to silvi-pasture (fodder crops/trees) and/or forestry. Area closure and establishment of suitable tree crops.</p> <p><u>Note</u></p> <p>Rotating area closure may be needed to establish grass strips and improved pasture.</p>

Land Development Category	Suitable Interventions
<p><b>G3</b></p> <p><u>Description</u></p> <p>Area of communal grazing land upslope of severely eroded communal grazing area E3. Shallow stony soils. Slopes 15-30%. No bunds or hedgerows. LCC VI d</p> <p><u>Current Problems</u></p> <p>Sheetwash, overgrazing, lowering carrying capacity</p> <p><u>Area</u> 20ha</p> <p><u>Costing Category</u> 3g</p>	<p><u>Possible solutions</u></p> <p>To stabilise steeply sloping area and to reduce runoff onto severely eroded areas– conversion to silvi-pasture (fodder crops/trees) and/or forestry. Area closure and establishment of suitable tree crops.</p>
<p><b>G4</b></p> <p><u>Description</u></p> <p>Area of communal grazing land along road in upper watershed. Shallow stony soils. Slopes 30-60%. No bunds or hedgerows. LCC VI d</p> <p><u>Current Problems</u></p> <p>Sheetwash, overgrazing, lowering carrying capacity</p> <p><u>Area</u> 2ha</p> <p><u>Costing Category</u> 4g</p>	<p><u>Possible solutions</u></p> <p>To stabilise steeply sloping area and to reduce runoff onto severely eroded areas– conversion to silvi-pasture (fodder crops/trees) and/or forestry. Area closure and establishment of suitable tree crops.</p>
<p><b>E2</b></p> <p><u>Description</u></p> <p>Severely eroded lower slopes (8-15%) with active gullies. Moderately deep to deep soils. Area was forested and acacia woodland 30 years ago but converted to arable and grazing land due to erosion.</p> <p>LCC VII e</p> <p><u>Current Problems</u></p> <p>Severe sheet and gully erosion</p> <p><u>Area</u> 36ha</p> <p><u>Costing Category</u> 2e</p>	<p><u>Possible solutions</u></p> <p>To prevent further gully erosion – stone and brushwood check-dams and gully revegetation.</p> <p>Area closure and conversion to forestry and/or silvi-pasture (fodder crops/trees).</p>

Land Development Category	Suitable Interventions
<p><b>E3</b></p> <p><u>Description</u></p> <p>Very severely eroded communal grazing area with bedrock exposed. Slopes (15-30%) with some active gullies. Shallow to deep soils with rock outcrops in many areas. Area was forested 30 years ago but converted to arable land and then grazing land due to erosion.</p> <p>LCC VIIIe</p> <p><u>Current Problems</u></p> <p>Severe sheet and gully erosion</p> <p><u>Area</u> 14ha</p> <p><u>Costing Category</u> 3e</p>	<p><u>Possible solutions</u></p> <p>To prevent further gully erosion – stone and brushwood check-dams and gully revegetation.</p> <p>Area closure and conversion to forestry and/or silvi-pasture (fodder crops/trees).</p> <p>To protect sheetwash onto arable land downslope and to channel runoff to suitable channel – cut-off drains</p>
<p><b>F4.</b></p> <p><u>Description</u></p> <p>Areas of natural forest at upper watershed boundary, around church and upstream of spring. Community recognise importance and the forest is guarded and managed by the community. Slopes 15-60% LCC IVI</p> <p><u>Current Problems</u></p> <p>Livestock encroachment, shortage of funds for guards, shortage of seeds for enrichment planting, shortage of land for nursery.</p> <p><u>Area</u> 17ha</p> <p><u>Costing Category</u> 4f</p>	<p><u>Possible solutions</u></p> <p>Raise funds for guards and for nursery establishment both for forestry enrichment and for rehabilitation of severely eroded areas (see F3a below).</p>
<p>Community development.</p> <p>Investigate possibilities of such interventions as roofwater harvesting, spring development, conservation tillage etc</p>	<p>Soil Fertility management &amp; Biological Soil Conservation including</p> <p>bund stabilisation using grasses and legumes; contour ploughing and composting, cash crops along bunds; control grazing in banded areas.</p>

### 3.5 Engule study site

Land Development Category	Suitable Interventions
<b>C1 &amp; C2</b>	
<u>Description</u>	<u>Possible solutions</u>
Majority of micro-watershed is arable land growing maize, teff, wheat, barley, chickpeas and noug on deep to very deep soils on slopes of 0-15%. Field boundaries often planted with eucalyptus. No bunding. LCC III	To retain moisture on arable areas – leguminous hedgerows at field boundaries, with soil bunds on the steeper slopes
<u>Current Problems</u>	To improve soil fertility and provide bund stability - soil fertility management and hedgerow planting with multi-purpose fodder, tree and fruit crops.
Gully erosion in places, flooding of lower slopes, river bank erosion	Investigate potential for small-scale irrigation development
<u>Area</u> 60.8ha	<u>Note</u>
<u>Costing Category</u> 1c	It is unlikely to be economically justifiable to prevent river bank erosion
<b>C3 &amp; C4</b>	
<u>Description</u>	<u>Possible solutions</u>
Arable land on moderate to steep slopes (8-60%) with moderately deep stony soils. No bunds or hedgerows. LCC IVd	To retain moisture on arable areas and reduce sheetwash – stone bunds along contour possibly alternating with leguminous hedgerows and vetiver hedgerows on the steeper slopes
<u>Current Problems</u>	To improve soil fertility and provide bund stability - soil fertility management (compost promotion) and multipurpose tree, shrub and grass planting along bunds
Sheetwash on arable land. Declining soil fertility and yields	
<u>Area</u> 134ha	
<u>Costing Category</u> 3c & 4c	
<b>G1</b>	
<u>Description</u>	<u>Possible solutions</u>
Communal grazing land on lower slopes in areas of unstable heavy clay soils. Very deep to deep soils. Slopes 0-8%. Very active headward and side slumping gully erosion of E1. LCC IIIe	Gully expansion of E1 needs to be treated before improvements can be recommended.
<u>Current Problems</u>	To improve soil fertility and carrying capacity whilst retaining moisture – grass strips initially with improved pasture between grass strips. Once established grass strips can be converted to hedgerows with fodder crops.
Severe expansion of E1 gullies into G1. Sheetwash into gullies and surrounding arable land.	
<u>Area</u> 2ha	
<u>Costing Category</u> 1g	



Land Development Category	Suitable Interventions
<p><b>G2</b></p> <p><u>Description</u></p> <p>Crest and upper slopes with shrub vegetation. Shallow stony soils. Slopes 8-15%. LCC VIId</p> <p><u>Current Problems</u></p> <p>Overgrazing and sheet erosion.</p> <p><u>Area</u> 25ha</p> <p><u>Costing Category</u> 2g</p>	<p><u>Possible solutions</u></p> <p>Area closure and conversion to cut and carry feeding or establishment of silvi-pasture (fodder crops/trees) and/or forestry.</p> <p>To protect sheetwash onto arable land downslope and to control runoff – plant leguminous hedgerows</p>
<p><b>G3</b></p> <p><u>Description</u></p> <p>Crest and upper slopes of southern boundary. Shrubland in west and woodland in east. Shallow stony soils. Slopes 15-30%. LCC VIId</p> <p><u>Current Problems</u></p> <p>Overgrazing and sheet erosion.</p> <p><u>Area</u> 62ha</p> <p><u>Costing Category</u> 3g</p>	<p><u>Possible solutions</u></p> <p>Area closure and conversion to cut and carry feeding or establishment of silvi-pasture (fodder crops/trees) in shrubland area and enhancement forestry in east.</p> <p>To protect sheetwash onto arable land downslope and to control runoff – rotational closure and plant leguminous hedgerows with upslope cut-off drain</p>
<p><b>E2</b></p> <p><u>Description</u></p> <p>Severe active gully erosion in communal grazing land and severely eroded area downslope of wooded hill crest. Soils are very deep to deep but unstable. Gullies initiated by runoff from upslope (G3) and are extending headward and laterally by undercutting and slumping. Slopes 0-15%. LCC VIIIe</p> <p><u>Current Problems</u></p> <p>Severe gully erosion.</p> <p><u>Area</u> 8ha</p> <p><u>Costing Category</u> 2e</p>	<p><u>Possible solutions</u></p> <p>Need to stabilise gullies to prevent further gully erosion – gully reshaping and revegetation plus brushwood check-dams.</p> <p>To prevent further gully erosion – stone and brushwood check-dams and gully revegetation.</p> <p>Area closure and conversion to forestry and/or silvi-pasture (fodder crops/trees).</p> <p>To channel runoff to suitable channel – cut-off drains</p>

Land Development Category	Suitable Interventions
<p><b>F4</b></p> <p><u>Description</u></p> <p>Natural woodland in church compound. LCC IVI</p> <p><u>Current Problems</u></p> <p>None reported</p> <p><u>Area</u> 9ha</p> <p><u>Costing Category</u> 4f</p>	<p><u>Possible solutions</u></p> <p>Maintain existing closure with enrichment planting with indigenous tree species</p>
<p>Community development.</p> <p>Investigate possibilities of such interventions as roofwater harvesting, spring development, conservation tillage etc</p>	<p>Soil Fertility management &amp; Biological Soil Conservation</p> <p>Bund stabilisation using grasses and legumes; contour ploughing and composting, cash crops along bunds; control grazing in banded areas.</p>

## 4. Comparison of gross study area data with study site data

The kebele statistics were collected through the Wereda Office of Agriculture and Rural Development (WOARD) by the Project Team in July and August 2007. As such it is raw data, and may not be exactly as reported by the regional bureau of statistics. Table 1 shows the area and population statistics<sup>1</sup> as provided by the Wereda offices

**Table 1: Area and population statistics**

	ha	villages	hh	population	hh size	pop/ha
Gumera	210,332	1,220	103,167	467,319	4.53	2.17
Ribb	184,530	1,012	70,339	360,606	5.13	1.95
Jema	48,797	191	24,785	127,374	5.14	2.61
Upper slopes	62,252	282	39,594	154,044	3.89	2.47
Middle slopes	322,501	1,832	137,917	688,166	4.99	2.13
Lower slopes	58,906	309	20,780	113,089	5.44	1.92
<b>Total</b>	<b>443,659</b>	<b>2,423</b>	<b>198,291</b>	<b>955,299</b>	<b>4.82</b>	<b>2.15</b>

The total catchment (project) area is about 445,000 ha (Gumera 47%, Ribb 42% and Jema 11%)<sup>2</sup>. The population of the project area was about 0.95 million (Gumera 49%, Ribb 38%, and Jema 13%). Jema is therefore the most densely populated of the three catchments, 2.61 persons per ha.

Classifying kebeles by altitude in three classes, about 14% is highland, 73% is midland and 13% lowland. About 16% of the population is in the highland, 72% in the midland and 12% in the lowland. The highland is therefore most densely populated, possibly reflecting more recent settlement of the midland and later the lowland with progressive reduction of and availability of treatment for serious diseases. Land use at catchment level is shown in Table 2.

<sup>1</sup> The data as provided by the Wereda offices categorise the catchments into "highland", "midland" and "lowland", which are terms used in a different context by MoWR and others in categorising topography country-wide. To avoid confusion, the terms expressed in the Wereda-provided data have been renamed here as "upper slopes", "middle slopes" and "lower slopes", recognising that the distinction remains useful here to characterise the broad shape of the individual catchments.

<sup>2</sup> The TOR give the area of Gumera as 150,000 ha not 210,000 ha and some of the kebeles must fall partially outside the catchment but it is not known which. The area of the other two catchments is more or less correctly estimated by the kebele data, and the kebele lists by catchment contain no duplicates.

**Table 2: Land use**

	Cultivable	Grazing	Forest	Waste	Houses & Roads	Other	Total	Persons/ cultivable ha
Gumera	160,673	18,924	5,281	1,371	13,010	11,072	210,332	2.9
Ribb	119,176	18,183	4,524	4,210	12,773	25,663	184,530	3.0
Jema	37,143	5,034	2,760	284	1,471	2,105	48,797	3.4
Upper slopes	42,810	7,122	2,183	1,897	3,905	4,336	62,252	3.6
Middle slopes	226,107	29,744	8,154	3,817	20,349	34,331	322,501	3.0
Lower slopes	48,076	5,275	2,228	151	3,001	173	58,906	2.4
<b>Total</b>	<b>316,993</b>	<b>42,141</b>	<b>12,564</b>	<b>5,866</b>	<b>27,255</b>	<b>38,840</b>	<b>443,659</b>	<b>3.0</b>

Cultivable (not cultivated) land is about 71% of the total catchment area, with 9% grazing, 3% forest, 1% waste, 6% infrastructure and 9% other land use. Ribb has a lower proportion of cultivable land than the other two, the balance is taken up by “other” land in Ribb, which may be montane upland. The highland and midland have less than 70% cultivable, but 82% of lowland is cultivable. “Waste” is greater at higher elevations, 3%, and barely occurs in midland and lowland areas. The proportion of Infrastructure is similar in all three altitude zones, 6%. “Other” land occurs in both midland and highland zones, and is probably bare rock (volcanic plugs?) or montane areas.

Persons per cultivable ha is greatest in Jema (3.4 persons per ha) and about 3 persons per ha in Ribb and Gumera. Persons per cultivable ha tends to decline with elevation, it is highest in the highland, 3.6 and lowest in the lowland, 2.4.

The total area of irrigation is about 22,000 ha (about 7% of cultivable land), and divided between Gumera 48%, Ribb 47% and Jema 6%). Of the three catchments Ribb has the highest proportion of irrigated area to cultivable land, 9%. The lowest is Jema, 4%.

Nearly all the irrigated area falls in midland, 88%. The schemes are very small here, less than 0.75 ha, and only about two irrigators per scheme. Schemes in the lowland and highland are larger, with more irrigators per scheme.

The irrigated area per irrigator is surprisingly large (when one considers farm size), about 0.28 ha per irrigator. The irrigated area per irrigator is larger in the midlands (despite the smaller scheme size), 0.31 ha per irrigator.

The characteristics of irrigation in the project area are shown in Table 3.

**Table 3: Irrigation characteristics**

	Total ha	schemes	irrigators	Irrigators per scheme	ha per scheme	irrigated ha per irrigator
Gumera	10,054	18,921	36,905	2	0.53	0.27
Ribb	10,251	7,740	32,847	4	1.32	0.31
Jema	1,386	862	6,926	8	1.61	0.20
Upper slopes	1,898	938	12,252	13	2.02	0.15
Middle slopes	18,981	26,020	60,642	2	0.73	0.31
Lower slopes	813	565	3,785	7	1.44	0.21
<b>Total</b>	<b>21,691</b>	<b>27,523</b>	<b>76,678</b>	<b>3</b>	<b>0.79</b>	<b>0.28</b>

Table 4 shows the development agents reported to be operational in the project area.

**Table 4: Numbers of development agents**

	Development Agents	DA/hh	Veterinary DA	Forest Guard
Gumera	156	816	8	60
Ribb	123	614	5	19
Jema	42	615	2	2
Upper slopes	54	708	3	34
Middle slopes	238	678	9	38
Lower slopes	29	883	3	9
<b>Total</b>	<b>321</b>	<b>618</b>	<b>15</b>	<b>81</b>

The total number of DA reported in the project area is only 321, or 612 households per DA. The hh:DA ratio is better in Gumera and in the midland areas. The lowlands are much more poorly served.

The total number of veterinary DA in the whole project area is only 15, and there are 81 Forest Guards.

Table 5 shows the livestock characteristics of the project area. Numbers have been converted into livestock units using stand conversion factors, and the proportion accounted for by each stock type has then been calculated.

**Table 5: Livestock**

	Total LU	LU per ha	cattle	sheep	goats	equines	chickens
Gumera	253,101	1.17	75%	7%	7%	10%	2%
Ribb	199,714	1.08	72%	6%	10%	10%	2%
Jema	77,203	1.58	67%	13%	8%	10%	2%
Upper slopes	84,183	1.35	59%	14%	7%	18%	2%
Middle slopes	380,373	1.18	75%	5%	9%	8%	3%
Lower slopes	65,462	1.11	74%	10%	6%	9%	1%
<b>Total</b>	<b>530,018</b>	<b>1.19</b>	<b>73%</b>	<b>7%</b>	<b>8%</b>	<b>10%</b>	<b>2%</b>

The livestock density in Jema, at 1.58 units per ha is greater than the other two target catchments. However, the proportion of cattle contributing to the total is lower, but with a higher proportion of sheep. Livestock density is higher in the highland zone, and decreases with elevation. As expected, the proportion of sheep, chickens and equines in the highland is greater than in the lowland.

In summary, the kebele statistics for the project area indicate that:

- Jema has the highest population density, at 2.61 persons per ha, Ribb and Gumera have population densities of about 2 persons per ha
- Higher population densities are expected in highland (2.5 persons per ha) than lowland (1.9 persons per ha)
- About 70% of the project area lies in midland, with equal percentages of the remainder in highland and lowland
- The overall cultivable area is about 70%, with a lower proportion in Ribb, and an increasing proportion as elevation declines, this is explained by higher proportions of montaine and waste in the highland
- Grazing is about 10% and forest about 3%
- Infrastructure occupies about 6%
- The proportion of irrigated to cultivable land is about 7%, and is highest in Ribb 9% and lowest in Jema 4%
- Irrigation is concentrated in midland, 88% of the total
- The irrigated area per irrigator can be high, 0.3 ha in the midland
- There are about 620 households to one development agent, with a higher proportion in Gumera

- Livestock density is greatest in Jema 1.58 LUs per ha, declines from highland to lowland, and changes in composition with a greater proportion of sheep and equines in highland, and a greater proportion of cattle in the lowland.

It is useful to compare the characteristics of the sampled micro watersheds with the general description of the project area, to see how representative they are. Population characteristics of micro watersheds are given in Table 6.

Five micro-watersheds were sampled which cover about 2,100 ha, of which 24% may be considered highland, 67% midland and 10% lowland. The elevation distribution therefore roughly conforms to the distribution in the total catchment.

**Table 6: Study site population characteristics**

Micro watershed	Catchment	Elevation class	Villages	Area ha	Population	Households	HH size	Pop/ha	Average holding ha	Area in holdings ha
Engule	Jema	L	7	200	426	76	5.60	2.13	1.4	106
Baskura	Ribb	M	5	750	701	113	6.20	0.93	1.5	170
Kantai	Ribb	M	6	450	682	110	6.20	1.52	0.7	77
Zefie	Gumera	H	15	500	871	130	6.70	1.74	2.1	273
Enkulal	Gumera	M	3	200	150	25	6.00	0.75	2.1	53
<b>Total</b>			<b>36</b>	<b>2,100</b>	<b>2,829</b>	<b>454</b>	<b>6.23</b>	<b>1.35</b>		<b>678</b>

The population density varies from 2.13 per ha in Engule (Jema, the Jema kebele statistics suggest the population density is 2.17 per ha) to 1.15 per ha in the micro watersheds in Ribb (Ribb kebele statistics suggest 1.95), and 1.46 in Gumera (Gumera kebele statistics suggest 2.17 per ha). In all cases the sample population density is rather less than the total population density, but the broad relationship remains similar, that is high in Jema and lower in Ribb. In several of the micro watersheds one should add the population outside which has customary rights inside; this would tend to increase the overall population density.

Household size (6.2 persons) appears larger in the sampled micro watersheds than reported from the catchment (4.82 persons).

Unfortunately no comparable data is available on land use and irrigation, but multiplying average holding area per household by the number of households and assuming a cropping intensity of 100% suggests that only 32% of the sampled micro watershed area is cultivated (not cultivable). To this should be added the area of land cultivated by households living outside the micro watershed. However, in general it seems that the sampled micro watersheds have much less than the catchment proportion of cultivable land.

Another result is that the density of livestock owned by households resident in the sampled micro watersheds (0.66 LU/ha) is substantially less than the catchment density (1.18 LU per ha). See Table 7 overleaf.

In general then, the data suggest that the micro-watersheds have rather lower population density, larger household size, lower cultivated area and lower density of livestock than the overall catchment statistics. A hypothesis to explain this apparently low level of land use in the sampled micro watersheds compared with the catchment is that the sampling process resulted in the selection of areas of greater than average erosion, and as a result lower population, cultivation and livestock density. It would be natural for wereda and kebele officials to select what were perceived as the areas of greatest erosion for attention by a future SWC project

**Table 7: Study site livestock characteristics**

Study site	Cattle	Sheep	Goats	Equines	Poultry	LU	LU per ha
Engule	82%	8%	1%	6%	3%	234	1.17
Baskura	67%	16%	5%	11%	1%	376	0.50
Kantai	59%	20%	0%	19%	2%	311	0.69
Zefie	49%	29%	2%	18%	2%	424	0.85
Enkulal	81%	7%	3%	7%	3%	46	0.23
						<b>1,391</b>	<b>0.66</b>

One can speculate why the selected areas have a lower intensity of land use. Perhaps it is because these areas had been partly abandoned as a result of past erosion, leaving a relatively poor population, or possibly because the land capability in the selected micro watersheds is inherently lower than average for the catchment, with a relatively poor population having occupied them in recent times due to population pressure elsewhere.

It is known that the proportion of communal grazing land within the selected micro watersheds is very small, usually less than 10%. If the cultivated area is truly proportionally less than the catchment cultivated area then the difference must be uncultivable land (waste) in private lands. The apparent lower intensity of cultivation and livestock within the micro watershed compared with the catchment must then be explained by lower land capability.

If indeed the selected micro watersheds are “worse” (in terms of the intensity of erosion) than the overall catchment conditions, then this is “good”, as the TOR for this project specifically require that “the geographical coverage of this project will be (in) “..areas where the rate of (soil) degradation is highest...” (TOR p7).

The implications for project design are:



- Costs of SWC works will be high in the selected study sites compared with the costs of SWC in micro watersheds more typical of overall catchment conditions
- However, the TOR envisage project activities in “the most degradable watershed area” of 25,000 ha in each catchment over a period of 5 years. This is equivalent to 16% of the total catchment area. It would not be inconceivable that the selected micro watersheds are representative of the worst 16%. In this case we should bulk up estimated costs from the five selected micro catchments (22,000 ha) to a total of 75,000 ha, or whatever is affordable within budget.
- It may be that since Jema is so much smaller (only 11% of the total) that proportionally more work will be done in Ribb and Gumera.
- The population of selected study sites may be more disadvantaged in cultivable land and livestock than the catchment average.

## 5. The project area

### 5.1 Administrative areas

The boundaries of the administrative areas within the Project Area have been collected and examined in order to determine the extent of the project within each wereda and kebele. Unfortunately the available mapping of administrative boundaries is quite old (c.1980's) and is not available in correctly geo-referenced form.

Nevertheless an attempt has been made to digitise and rationalise these boundaries, but the resultant maps indicate considerable uncertainty over the precise location of the boundaries, rendering any detailed estimate of coverage very unreliable. Thus, the approach adopted has been to classify the kebeles as wholly, mainly or partly overlapping the proposed project area.

From this assessment it is apparent that some 57 kebele and 5 wereda overlap the proposed project area (in total 80,600ha). Taking a weighted average for costing purposes, it is concluded that 35 kebele will be actively engaged in the project. Details of this assessment are given overleaf and summarised below.

**Table 8: Summary of kebele overlapping project area**

	overlapping project area	Kebele equivalents for costing purposes
Kebeles completely within Project area	11	11
Kebeles mostly within Project area	26	22
Kebeles partly within Project area	20	2
	<b>57</b>	<b>35</b>
<b>By catchment</b>		
Ribb	24	12
Gumera	22	14
Jema	11	9
	<b>57</b>	<b>35</b>
<b>By Wereda</b>		
Farta	33	20
Estie	7	4
Dera	6	2
Mecha	7	6
Sekela	4	3
	<b>57</b>	<b>35</b>
<b>By development cluster</b>		
Baskura	11	4
Kantai	13	8
Zefie	12	8
Enkulal	10	6
Engule	11	9
	<b>57</b>	<b>35</b>

**Table 9: Kebeles within project area and estimated equivalent number for costing purposes**

Ref	Watershed	Wereda	Project area	Kebele	Coverage	Assumed proportion	
1	Ribb	Farta	Baskura	Tararoch	A	100%	
2			Baskura	Ivaniva	M	85%	
3			Baskura	Kolay	M	85%	
4			Baskura	Tsegur Michael	M	85%	
5			Baskura	Adeko Gebreal	P	10%	
6			Baskura	Buro	P	10%	
7			Baskura	Dangores	P	10%	
8			Baskura	Gubeda	P	10%	
9			Baskura	Kaletone Glawdewos	P	10%	
10			Baskura	Medebe	P	10%	
11			Baskura	Wabela	P	10%	
12		Kantai	Gumera	Farta	Awezat	A	100%
13		Kantai			Azwer	A	100%
14		Kantai			Gasay	A	100%
15		Kantai			Jura	A	100%
16		Kantai			Wawama Where	A	100%
17		Kantai			Magra	M	85%
18		Kantai			Mokoshe	M	85%
19		Kantai			Shama Mariam	M	85%
20		Kantai			Ata Sifa Tra	P	10%
21		Kantai			Dedem Meganta	P	10%
22		Kantai			Enidrego	P	10%
23		Kantai			Farta Kuskuum	P	10%
24		Kantai			Heruy Gayra	P	10%
1	Zefie	Estie	Farta	Asikoma	A	100%	
2	Zefie			Mendago Abo	A	100%	
3	Zefie			Mienet	A	100%	
4	Zefie			Ayre	M	85%	
5	Zefie			Daremona Dangal	M	85%	
6	Zefie			Gedayat Kirkos	M	85%	
7	Zefie			Kisnate	M	85%	
8	Zefie			Semen Marian	M	85%	
9	Zefie			Siras	M	85%	
10	Zefie			Ashema Kirkos	P	10%	
11	Zefie	Lieyeyna Tejebat	P	10%			
	Zefie	Semen Georgis	P	10%			
1	Enkulal	Dera	Farta	Areda Mariam	M	85%	
2				Debre Sina	M	85%	
3				Galwedewose	M	85%	
4				Gebe Asera	M	85%	
5				Shemagella Giorgis	M	85%	
6				Zegora Medehanialem	M	85%	
7				Dagon Michael	P	10%	
8				Genda Tememem	P	10%	
9				Licha Meskele	P	10%	
10				Shema Mariam	P	10%	
1	Jema	Mecha	Engule	Gosh Meda	A	100%	
2				Hateta Abejeme	A	100%	
3				Abe Kerse	M	85%	
4				Abero Menor	M	85%	
5				Abeyot Chora	M	85%	
6				Anorayita	M	85%	
7				Dago Mada / Lehulum Selam	M	85%	
8		Sekela		Leje Ambera	M	85%	
9				Tera Meda	M	85%	
10				Zememe Berhan	M	85%	
11				Gulie	P	10%	
					<b>57</b>	<b>35</b>	

## 5.2 Project area demographic data

An estimate has been made of demographic data for the Project Area in comparison to that given for the gross study area. The results are given in Table 10 below.

**Table 10: Basic demographic data for Project Area**

	Gross area ha	No. of villages	No. of households	Total population	Household size	Population per ha
<b>Gross study area</b>						
Gumera	210,332	1,220	103,167	467,319	4.53	2.17
Ribb	184,530	1,012	70,339	360,606	5.13	1.95
Jema	48,797	191	24,785	127,374	5.14	2.61
<b>Total</b>	<b>443,659</b>	<b>2,423</b>	<b>198,291</b>	<b>955,299</b>	<b>4.82</b>	<b>2.15</b>
<b>Project area</b>						
Gumera	22,560	131	11,065	50,126	4.53	2.22
Ribb	32,763	180	12,489	64,066	5.13	1.96
Jema	25,279	99	12,840	65,996	5.14	2.61
<b>Total</b>	<b>80,602</b>	<b>409</b>	<b>36,394</b>	<b>180,189</b>	<b>14.80</b>	<b>6.79</b>

## 5.3 Land resource data

Land resource data has been estimated on the basis of spatial analysis using GIS. The results are given in Table 11 overleaf.

## 5.4 Detailed data sets

Much detailed data have been collected for the project area. These include:

- a) **For overall study areas:**
  - Assembly of available social, environmental and physical data
  - Digital elevation model (Jema 90m, Ribb-Gumera 30m resolution)
  - Ortho rectified images for four time periods since mid 70's (15m resolution)
  - Soil mapping and land cover/use mapping
  - Kebele and wereda boundaries and latest road mapping available
- b) **For proposed project areas:**
  - High resolution satellite imagery suitable micro-catchment evaluation (2.5m and 1.0m resolution)
- c) **Processed data:**
  - Erosion potential for the whole area
  - Suitability of over 30 watershed management interventions
  - Maps of access to roads and markets

Full lists of these data are provided in Appendix 4 of the Main Report (Volume 1) and the data themselves have been handed over to ENTRO in electronic format.

**Table 11: Land resource data for Project Area**

RIVER CATCHMENT				RIBB				GUMERA				JEMA		TOTAL AREAS			
Total project area (ha)				22,558				32,643				25,402		80,602			
Project Development Area				Baskura		Kantai		Zefie		Enkulal		Engule		Study area		Project Area	
Development area (ha)				10,865		11,693		12,893		19,750		25,402		80,602		80,602	
Land Slope	Land class	Land use	Unit	Study area ha	Project Area ha	Study area ha	Project Area ha	Study area ha	Project Area ha	Study area ha	Project Area ha	Study area ha	Project Area ha	Study area ha	%	Project Area ha	%
<8%	1c	Cultivated	ha	23	3,418	75	4,732	24	3,573	57	8,954	8	5,702	186	13%	26,379	33%
	1g	Grazing	ha	12	1,785	21	1,299	6	912	15	2,306	4	2,997	57	4%	9,298	12%
>8% and <15%	2c	Cultivated	ha	24	1,898	89	1,938	49	2,447	81	3,136	53	4,003	295	21%	13,422	17%
	2g	Grazing	ha	13	1,026	25	533	12	626	21	811	25	1,929	96	7%	4,925	6%
>15% and <30%	2e	Badlands	ha	4	315	41	896	18	908	36	1,394	6	479	106	7%	3,992	5%
	3c	Cultivated	ha	31	1,231	70	1,251	56	2,278	76	1,818	107	4,319	340	24%	10,898	14%
	3g	Grazing	ha	16	640	19	343	14	582	20	469	56	2,246	125	9%	4,280	5%
	3e	Badlands	ha	2	91	13	233	8	340	14	329	6	258	44	3%	1,251	2%
>30% and <60%	4c	Cultivated	ha	6	176	7	91	17	519	7	88	27	1,713	64	4%	2,586	3%
	4g	Grazing	ha	3	93	2	25	4	133	2	23	14	891	25	2%	1,164	1%
>60%	4e	Badlands	ha	1	29	3	42	4	109	3	39	3	207	14	1%	426	1%
	4f	Forestry	ha	3	80	16	215	10	311	17	213	6	402	52	4%	1,220	2%
>60%	5	Cultivated/Grazing/Degraded	ha		4		3	3	45		1		256	3	0%	309	0%
		Gullies Gully Reshaping	ha	1	80	3	90	2	113	3	169	2	0	11	1%	452	1%
				<b>137</b>	<b>10,865</b>	<b>384</b>	<b>11,693</b>	<b>228</b>	<b>12,893</b>	<b>350</b>	<b>19,750</b>	<b>319</b>	<b>25,402</b>	<b>1,418</b>	<b>100%</b>	<b>80,602</b>	<b>100%</b>
<b>Land use sub-totals:</b>																	
		Cultivated	ha	83	6,724	241	8,013	146	8,816	220	13,996	195	15,737	885	62%	53,285	66%
		Grazing	ha	44	3,543	66	2,200	37	2,252	57	3,608	100	8,064	303	21%	19,667	24%
		Forestry	ha	3	80	16	215	10	311	17	213	6	402	52	4%	1,220	2%
		Cultivated/Grazing/Degraded	ha	0	4	0	3	3	45	0	1	0	256	3	0%	309	0%
		Badlands	ha	7	435	58	1,172	30	1,357	53	1,763	16	943	163	12%	5,669	7%
		Gullies	ha	1	80	3	90	2	113	3	169	2	0	11	1%	452	1%
		<b>Totals</b>	ha	<b>137</b>	<b>10,865</b>	<b>384</b>	<b>11,693</b>	<b>228</b>	<b>12,893</b>	<b>350</b>	<b>19,750</b>	<b>319</b>	<b>25,402</b>	<b>1,418</b>	<b>100%</b>	<b>80,602</b>	<b>100%</b>
<b>Slope category sub-totals</b>																	
		<8%	ha	34	5,203	95	6,031	31	4,484	71	11,260	12	8,699	243	17%	35,677	44%
		>8% and <15%	ha	40	3,239	155	3,367	79	3,980	138	5,341	84	6,411	497	35%	22,339	28%
		>15% and <30%	ha	50	1,961	103	1,828	78	3,200	109	2,617	170	6,823	509	36%	16,429	20%
		>30% and <60%	ha	12	377	28	373	36	1,070	29	363	51	3,213	155	11%	5,395	7%
		>60%	ha	1	84	3	93	5	158	3	170	2	256	14	1%	761	1%
		<b>Totals</b>	ha	<b>137</b>	<b>10,865</b>	<b>384</b>	<b>11,693</b>	<b>228</b>	<b>12,893</b>	<b>350</b>	<b>19,750</b>	<b>319</b>	<b>25,402</b>	<b>1,418</b>	<b>100%</b>	<b>80,602</b>	<b>100%</b>
		No. of microcatchments			10		11		14		20		27				82
		Average microcatchment area	ha		<b>1,087</b>		<b>1,063</b>		<b>921</b>		<b>987</b>		<b>941</b>				<b>983</b>

# Appendices

## Appendix 1

### Rural Land Administration And Land Use: Proclamation No. 456/2005

Security of tenure is a key factor influencing farm investment and so plays a critical role in the development of a land holding and the conservation of natural resources. Lack of security of tenure was also considered a major constraint to farmers' willingness to implement soil and water conservation (SWC) measures. In July 2005, the Government of Ethiopia promulgated Proclamation Number 456/2005, entitled Rural Land Administration and Land Use, which attempts to address these concerns by providing farmers with land use certificates.

Land degradation in rural areas is a major concern and the Government of Ethiopia is now actively promoting the sustainable use of natural resources through legislative and development initiatives. The recent land use proclamation is fundamental to the proposed SWC program. In addition to providing for the issuing of land use certificates, the Proclamation also requires farmers to adopt improved and use practices designed to reduce soil erosion and the land degradation. The section of the Proclamation dealing with land use planning and proper use of slopes, gullies and wet lands, which is relevant to the watershed management, is quoted below.

- A guiding land use master plan which takes into account soil type, land form, weather conditions, plant cover, and socio-economic conditions and which is based on watershed approach, shall be developed by the competent authority and implemented.
- Equitable water use system between upper and lower watershed communities shall be affected.
- In any type of rural land where SWC works have been undertaken a system of free grazing shall be prohibited and a system of cut and carry feeding shall be introduced step by step.
- The management of rural lands, where the slopes is less than 30%, shall follow the strategy of soil conservation and water harvesting.
- Development of annual crops on rural lands that have slopes between 31% and 60% may be allowed only through making bench terraces.
- Rural lands, the slope which is more than 60% shall not be used for farming and free grazing; they shall be used for development of trees, perennial plants and forage production development of trees.
- Rural lands of any slope which is highly degraded shall be closed from human and animal interference for a given period of time to let it recover, and shall be put to use when ascertained that it has recovered. Unless the degradation is caused by the negligence of the peasant farmers, semi pastoralists and pastoralists, the users shall be given compensation or other alternatives for the interim period.
- Rural lands that have gullies shall be rehabilitated by private and neighboring holders and, as appropriate, by works of the local community, using biological and physical works.
- Rural lands that have gullies and are located on hilly areas shall be rehabilitated and developed communally and, as appropriate, by private individuals.
- The biodiversity in rural wetland shall be conserved and utilized, as necessary in accordance with a suitable land use strategy.

## **Appendix 2**

### **Multi Criteria Assessment used in project definition**

Investments were first identified for the entire project area based on the requirements of the communities expressed within the five study sites through the consultation process augmented by measures to stabilise the landscape beyond the communities' proposals. These were extrapolated across the entire investment area using spatial analysis of physical and socio-economic data. The initial investment package was then subjected to a multi-criteria assessment (MCA) and ranked in terms of overall score per investment cost. This then provided a basis for identifying those investments which should be included within a first phase of an overall programme. Further details of the criteria used in the multi criteria assessment are set out in the following tables.



## Criteria for ranking impacts of individual interventions

Criteria	Score >>>	0	1	2	3	4	5
<b>Environment</b>	Reduces erosion	No direct impact on erosion	Minimal direct impact on erosion	Slightly degraded or low value landscape restored and/or protected	Valuable land at risk protected	Moderately degraded landscape restored	Highly degraded landscape restored
	Energy balance	No direct impact on energy resource	Minimal positive impact on energy balance	Indirect but tangible improvement of energy balance	Direct and slight improvement of energy balance	Direct and moderate improvement of energy balance	Direct and substantial improvement of energy balance
<b>Social</b>	People directly benefitted *	< 25	> 25	> 125	> 200	> 500	> 1,000
	Increases h/h income	No impact	Creates moderate short-term employment opportunities	Creates substantial short-term employment opportunities	Improves access to markets and/or some sustainable employment	Creates moderate sustainable employment opportunities	Creates substantial sustainable employment opportunities
	Increases labour availability **	No impact on labour availability	-	Slight improvement of labour availability	Moderate improvement of labour availability	-	Major improvement of labour availability
<b>Economic</b>	Economic Benefit	No benefit	Low benefits	Medium direct benefits	Medium and early direct benefits	High and early direct benefit + multiplier effect	High and early direct benefits + high multiplier effect
	Economic Cost	Unsupportable O&M cost	Very high capital and high O&M cost	High capital and medium O&M costs	Medium capital and medium O&M costs	Medium capital and low O&M costs	Low capital & low O&M cost
	Sustainability	Unsustainable	Very Low	Low	Medium	High	Very High

\* within one micro-catchment

\*\* arising from increased efficiency of labour performance and/or greater number of potential working days per year

## Summary of relative impacts

Based on MCA

PROJECT COMPONENTS	Full development				Proposed project investments				Change in proportion
	Env	Social	Econ	Overall	Env	Social	Econ	Overall	
	<i>Factored to 100 score total</i>				<i>Factored to 100 score total</i>				
<b>SWC, WSS and IRRIGATION</b>									
<b>A. Soil and Water Conservation Works</b>									
Land Class 1 (< 8% slope)	5.3	6.6	10.2	7.7	5.7	7.1	11.1	8.3	0.6%
Land Class 2 (8% - 15% slope)	4.1	5.3	13.4	8.2	4.4	5.7	14.5	8.9	0.7%
Land Class 3 (15% - 30% slope)	5.1	4.0	21.2	11.2	5.5	4.3	23.0	12.1	0.9%
Land Class 4 (30% - 60% slope)	4.3	1.6	11.2	6.3	1.5	0.6	1.7	1.3	-5.0%
Land Class 5 (> 60% slope)	0.8	0.2	0.3	0.4	0.3	0.1	0.1	0.2	-0.3%
Other Works	4.7	2.8	2.6	3.3	5.1	3.0	2.8	3.6	0.3%
Sub-total Soil and Water Conservation Works	24.3	20.5	59.0	37.1	22.5	20.8	53.2	34.3	-2.8%
<b>B. Water Supply and Sanitation</b>	1.5	6.5	9.7	6.3	1.6	7.1	10.5	6.8	0.5%
<b>C. Irrigation</b>	0.9	0.7	4.5	2.3	1.0	0.8	4.9	2.5	0.2%
<b>Sub-totals</b>	<b>26.6</b>	<b>27.8</b>	<b>73.3</b>	<b>45.6</b>	<b>25.0</b>	<b>28.7</b>	<b>68.6</b>	<b>43.6</b>	<b>-2.1%</b>
<b>COMMUNITY ENTRY POINTS</b>									
<b>A. Access and Communications</b>	5.4	14.1	22.1	14.7	5.8	15.2	23.9	15.9	1.2%
<b>B. Renovation of public buildings</b>		1.1	0.3	0.5		1.2	0.3	0.5	0.0%
<b>C. Not used</b>									
<b>Sub-totals</b>	<b>5.4</b>	<b>15.2</b>	<b>22.4</b>	<b>15.1</b>	<b>5.8</b>	<b>16.4</b>	<b>24.2</b>	<b>16.4</b>	<b>1.2%</b>
<b>CROP PRODUCTION</b>									
A. Farmer Training Centres	2.9	3.4	0.6	2.1	3.2	3.7	0.6	2.3	0.2%
B. Demonstrations	2.9	3.4	1.6	2.5	3.2	3.7	1.7	2.8	0.2%
C. DA Crop production	4.4	5.1	0.9	3.2	4.8	5.5	1.0	3.5	0.3%
<b>Sub-totals</b>	<b>10.3</b>	<b>11.9</b>	<b>3.1</b>	<b>7.9</b>	<b>11.1</b>	<b>12.9</b>	<b>3.3</b>	<b>8.5</b>	<b>0.6%</b>
<b>LIVESTOCK PRODUCTION</b>									
A. Animal Health Posts	3.7	7.8	1.1	3.9	4.0	8.4	1.2	4.2	0.3%
B. Feed supply	5.6	5.6	1.0	3.7	6.0	6.1	1.0	4.0	0.3%
C. Dairy Production	0.3	2.5	0.5	1.0	0.3	2.7	0.5	1.1	0.1%
D. Dairy processing		2.8	0.2	0.9		3.0	0.3	1.0	0.1%
E. Sheep Demonstrations	0.6	2.5	0.3	1.1	0.6	2.7	0.4	1.1	0.1%
F. Poultry		2.5	0.7	1.0		2.7	0.8	1.1	0.1%
G. Animal Fattening	0.9	4.7	0.8	2.0	1.0	5.0	0.9	2.2	0.2%
H. DA Livestock	2.2	4.7	0.7	2.3	2.4	5.0	0.8	2.5	0.2%
<b>Sub-totals</b>	<b>13.2</b>	<b>32.8</b>	<b>5.4</b>	<b>16.0</b>	<b>14.3</b>	<b>35.5</b>	<b>5.8</b>	<b>17.3</b>	<b>1.3%</b>
<b>FORESTRY AND AGRO-FORESTRY</b>									
A. Agroforestry Demonstrations and Nurseries	1.7	0.8	7.8	3.9	1.3	0.6	3.1	1.8	-2.1%
B. DA Natural Resources	1.6	0.8	0.6	0.9	1.7	0.8	0.6	1.0	0.1%
<b>Sub-totals</b>	<b>3.3</b>	<b>1.5</b>	<b>8.4</b>	<b>4.8</b>	<b>3.0</b>	<b>1.4</b>	<b>3.7</b>	<b>2.8</b>	<b>-2.0%</b>
<b>NON-FARM INCOME GENERATION</b>									
A. Community flour mills		7.3	0.6	2.4		7.9	0.6	2.6	0.2%
B. Technology and innovation fund	2.7	4.4	0.7	2.4	2.9	4.8	0.8	2.6	0.2%
C. Micro-credit facility	1.2	4.3	10.2	5.7	1.3	4.6	11.0	6.2	0.5%
<b>Sub-totals</b>	<b>3.9</b>	<b>16.1</b>	<b>11.5</b>	<b>10.6</b>	<b>4.2</b>	<b>17.4</b>	<b>12.4</b>	<b>11.4</b>	<b>0.9%</b>
<b>Overall totals</b>	<b>62.6</b>	<b>105.3</b>	<b>124.1</b>	<b>100.0</b>	<b>63.4</b>	<b>112.3</b>	<b>118.2</b>	<b>100.0</b>	
					1.3%	6.7%	-4.8%		

**Summary of relative impacts**  
Based on MCA

PROJECT COMPONENTS	Full development				Proposed project investments				Change in proportion
	Env	Social	Econ	Overall	Env	Social	Econ	Overall	
	Factored to 100 score total				Factored to 100 score total				
<b>SWC, WSS and IRRIGATION</b>									
<b>A. Soil and Water Conservation Works</b>									
Land Class 1 (< 8% slope)	5.5	6.9	11.9	8.5	6.0	7.5	13.0	9.3	0.8%
Land Class 2 (8% - 15% slope)	4.3	5.5	15.5	9.2	4.7	6.1	17.0	10.0	0.9%
Land Class 3 (15% - 30% slope)	5.3	4.1	24.6	12.7	5.8	4.5	27.0	13.9	1.2%
Land Class 4 (30% - 60% slope)	4.5	1.8	13.0	7.1	1.6	0.6	2.0	1.5	-5.6%
Land Class 5 (> 60% slope)	0.9	0.3	0.4	0.5	0.3	0.1	0.1	0.2	-0.3%
Other Works	4.9	2.9	3.0	3.6	5.3	3.2	3.3	3.9	0.3%
Sub-total Soil and Water Conservation Works	25.3	21.6	68.5	41.5	23.7	22.0	62.5	38.7	-2.8%
<b>B. Water Supply and Sanitation</b>	1.5	6.2	9.4	6.1	1.7	6.8	10.2	6.7	0.6%
<b>C. Irrigation</b>	0.9	0.7	5.3	2.6	1.0	0.8	5.8	2.8	0.2%
<b>Sub-totals</b>	<b>27.8</b>	<b>28.6</b>	<b>83.1</b>	<b>50.2</b>	<b>26.4</b>	<b>29.7</b>	<b>78.5</b>	<b>48.2</b>	<b>-1.9%</b>
<b>SOCIAL SERVICES</b>									
<b>A. Access and Communications</b>	5.6	14.6	25.7	16.4	6.1	16.0	28.2	17.9	1.6%
<b>B. Health</b>		1.2	0.1	0.4		1.3	0.1	0.4	0.0%
<b>C. Education</b>	0.5	0.8	0.1	0.4	0.6	0.8	0.2	0.5	0.0%
<b>Sub-totals</b>	<b>6.1</b>	<b>16.6</b>	<b>26.0</b>	<b>17.2</b>	<b>6.7</b>	<b>18.1</b>	<b>28.4</b>	<b>18.8</b>	<b>1.6%</b>
<b>CROP PRODUCTION</b>									
A. Farmer Training Centres	3.1	3.5	0.7	2.3	3.3	3.9	0.8	2.5	0.2%
B. Demonstrations	3.1	3.5	1.1	2.4	3.3	3.9	1.3	2.7	0.2%
C. DA Crop production	4.6	5.3	0.3	3.1	5.0	5.8	0.4	3.4	0.3%
<b>Sub-totals</b>	<b>10.7</b>	<b>12.4</b>	<b>2.2</b>	<b>7.8</b>	<b>11.7</b>	<b>13.6</b>	<b>2.4</b>	<b>8.5</b>	<b>0.7%</b>
<b>LIVESTOCK PRODUCTION</b>									
A. Animal Health Posts	3.8	8.1	1.3	4.1	4.2	8.9	1.4	4.5	0.4%
B. Feed supply	5.8	5.9	1.1	3.9	6.3	6.4	1.2	4.3	0.4%
C. Dairy Production	0.3	2.6	0.6	1.1	0.3	2.8	0.6	1.2	0.1%
D. Dairy processing		2.9	0.3	1.0		3.1	0.3	1.1	0.1%
E. Sheep Demonstrations	0.6	2.6	0.4	1.1	0.7	2.8	0.4	1.2	0.1%
F. Poultry		2.6	0.6	1.0		2.8	0.7	1.1	0.1%
G. Animal Fattening	0.9	4.9	1.0	2.1	1.0	5.3	1.1	2.3	0.2%
H. DA Livestock	2.3	4.9	0.3	2.2	2.5	5.3	0.3	2.5	0.2%
<b>Sub-totals</b>	<b>13.7</b>	<b>34.2</b>	<b>5.6</b>	<b>16.6</b>	<b>15.0</b>	<b>37.4</b>	<b>6.1</b>	<b>18.2</b>	<b>1.6%</b>
<b>FORESTRY AND AGRO-FORESTRY</b>									
A. Agroforestry Demonstrations and Nurseries	1.8	0.8	9.1	4.4	1.3	0.6	3.6	2.0	-2.4%
B. DA Natural Resources	1.7	0.8	0.2	0.8	1.8	0.9	0.2	0.9	0.1%
<b>Sub-totals</b>	<b>3.5</b>	<b>1.6</b>	<b>9.3</b>	<b>5.2</b>	<b>3.2</b>	<b>1.5</b>	<b>3.8</b>	<b>2.9</b>	<b>-2.3%</b>
<b>NON-FARM INCOME GENERATION</b>									
A. Grinding Mills		7.6	0.7	2.6		8.4	0.7	2.8	0.2%
B. Cooking Stoves	0.8	0.8	0.0	0.5	0.9	0.8	0.0	0.5	0.0%
C. Not used									
<b>Sub-totals</b>	<b>0.8</b>	<b>8.4</b>	<b>0.7</b>	<b>3.0</b>	<b>0.9</b>	<b>9.2</b>	<b>0.8</b>	<b>3.3</b>	<b>0.3%</b>
<b>Overall totals</b>	<b>62.5</b>	<b>101.7</b>	<b>126.9</b>	<b>100.0</b>	<b>63.9</b>	<b>109.5</b>	<b>120.0</b>	<b>100.0</b>	
					2.1%	7.7%	-5.4%		

Individual scores for each intervention were assessed for environment, social and economic criteria and then weighted as shown overleaf. The aggregate score for each intervention under full development was then further weighted, for environment and social, by people benefited as a surrogate for the spatial extent of the intervention and by the proportion of total investment for the economic score. The scores for the proposed development were then calculated as those for full development factored by the proposed reductions in investment (where relevant).

The table above then summarises these scores after adjusting each to a total score of 100. The overall scores above thus reflect the relative importance of each component and demonstrate the impact that the reduction of investment will have on the development focus. As may be seen, the reduction in costs creates a mix of interventions that is more pro-environment and more pro-social, but with slightly lower economic attraction.



PROJECT COMPONENTS	75%	25%	100%	25%	65%	10%	100%	55%	25%	20%	100%	30%	30%	40%	100%	30%	30%	40%	100%
	Environmental Assessment			Social Assessment				Economic Assessment				Full development				Proposed project investments			
	Reduces erosion (0-5)	Energy balance (0-5)	Overall (0-5)	People benefited (0-5)	Household income (0-5)	Labour availability (0-5)	Overall (0-5)	Economic Benefits (0-5)	Capital/O&M Costs (0-5)	Sustainability /Risk (0-5)	Overall (0-5)	Env	Social	Econ	Overall	Env	Social	Econ	Overall
<b>CROP PRODUCTION</b>																			
<b>A. Farmer Training Centres</b>																			
Classroom Furniture and Equipment	2	4	2.5	3	5		2.9	4	4	4	4.0	1.4	1.7	0.2	1.0	1.5	1.8	0.2	1.1
FTC Audio Visual Equipment	2	4	2.5	3	5		2.9	4	4	4	4.0	1.4	1.7	0.4	1.1	1.5	1.8	0.4	1.2
<b>B. Demonstrations</b>																			
Demonstrations Crop Production & Profitability	2	4	2.5	3	5		2.9	5	5	4	4.8	1.4	1.7	1.2	1.4	1.5	1.8	1.3	1.5
Demonstrations High Value Crops	2	4	2.5	3	5		2.9	5	5	4	4.8	1.4	1.7	0.4	1.1	1.5	1.8	0.4	1.2
<b>C. DA Crop production</b>																			
DA Crops Office Furniture and Equipment	2	4	2.5	3	5		2.9	4	4	4	4.0	1.4	1.7	0.1	1.0	1.5	1.8	0.1	1.0
DA Crops Tools and Field Equipment	2	4	2.5	3	5		2.9	4	4	4	4.0	1.4	1.7	0.1	1.0	1.5	1.8	0.1	1.0
DA Crops Transport	2	4	2.5	3	5		2.9	4	4	4	4.0	1.4	1.7	0.7	1.2	1.5	1.8	0.7	1.3
<b>LIVESTOCK PRODUCTION</b>																			
<b>A. Animal Health Posts</b>																			
AHP Building and Kraal Construction	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.5	0.8	0.8	1.6	0.5	0.9
AHP Office Furniture	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.0	0.7	0.8	1.6	0.0	0.7
AHP Tools and Equipment	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.1	0.7	0.8	1.6	0.1	0.8
AHP Demonstration Equipment	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.1	0.7	0.8	1.6	0.1	0.8
AHP Training Courses for Farmers	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.4	0.8	0.8	1.6	0.5	0.9
<b>B. Feed supply</b>																			
Improvement of communal pasture	3	5	3.5	3	3		2.4	4	4	3	3.8	2.0	1.4	0.0	1.0	2.2	1.5	0.0	1.1
Forage Nursery Establishment	1	5	2.0	3	3		2.4	3	4	3	3.3	1.1	1.4	0.2	0.8	1.2	1.5	0.2	0.9
Forage Nursery Equipment	1	5	2.0	3	3		2.4	3	4	3	3.3	1.1	1.4	0.0	0.8	1.2	1.5	0.0	0.8
Forage demonstrations	1	5	2.0	3	3		2.4	3	4	3	3.3	1.1	1.4	0.7	1.0	1.2	1.5	0.7	1.1
<b>C. Dairy Production</b>																			
AI Delivery System		1	0.3	2	4		2.1	4	4	3	3.8	0.1	0.8	0.2	0.3	0.1	0.9	0.2	0.4
Liquid nitrogen, semen and equipment		1	0.3	2	4		2.1	4	4	3	3.8	0.1	0.8	0.1	0.3	0.1	0.9	0.1	0.3
Dairy production demonstrations		1	0.3	2	4		2.1	4	4	3	3.8	0.1	0.8	0.2	0.4	0.1	0.9	0.3	0.4
<b>D. Dairy processing</b>																			
Dairy processing Centre				2	5		2.4	3	4	3	3.3		0.9	0.1	0.3		1.0	0.1	0.3
Dairy processing equipment				2	5		2.4	3	4	3	3.3		0.9	0.1	0.3		1.0	0.1	0.3
Dairy Processing Demonstrations				2	5		2.4	3	4	3	3.3		0.9	0.1	0.3		1.0	0.1	0.3
<b>E. Sheep Demonstrations</b>																			
Sheep breeding stock		1	0.3	2	4		2.1	4	4	4	4.0	0.1	0.8	0.0	0.3	0.1	0.9	0.0	0.3
Sheep demonstration equipment		1	0.3	2	4		2.1	3	4	3	3.3	0.1	0.8	0.2	0.3	0.1	0.9	0.2	0.4
Sheep demonstrations	1	1	1.0	2	4		2.1	3	4	3	3.3	0.4	0.8	0.1	0.4	0.4	0.9	0.1	0.4
<b>F. Poultry and honey</b>																			
Poultry demonstration breeding stock				2	4		2.1	4	4	4	4.0		0.8	0.1	0.3		0.9	0.1	0.3
Poultry demonstration housing				2	4		2.1	3	4	3	3.3		0.8	0.3	0.4		0.9	0.3	0.4
Poultry & honey demonstrations				2	4		2.1	3	4	3	3.3		0.8	0.3	0.3		0.9	0.3	0.4
<b>G. Animal Fattening</b>																			
Breeding Stock Large ruminants A		2	0.5	3	4		2.7	4	4	4	4.0	0.3	1.5	0.6	0.8	0.3	1.6	0.6	0.8
Breeding stock small ruminants		2	0.5	3	4		2.7	4	4	4	4.0	0.3	1.5	0.1	0.6	0.3	1.6	0.1	0.6
Fattening demonstrations		2	0.5	3	4		2.7	3	4	3	3.3	0.3	1.5	0.1	0.6	0.3	1.6	0.1	0.6
<b>H. DA Livestock</b>																			
DA Livestock Office Furniture and Equipment Am	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.1	0.7	0.8	1.6	0.1	0.8
DA Livestock Tools and Field Equipment	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.1	0.7	0.8	1.6	0.1	0.7
DA Livestock Transport	1	2	1.3	3	4		2.7	3	4	3	3.3	0.7	1.5	0.5	0.9	0.8	1.6	0.6	1.0

PROJECT COMPONENTS	75%	25%	100%	25%	65%	10%	100%	55%	25%	20%	100%	30%	30%	40%	100%	30%	30%	40%	100%
	Environmental Assessment			Social Assessment				Economic Assessment				Full development				Proposed project investments			
	Reduces erosion (0-5)	Energy balance (0-5)	Overall (0-5)	People benefitted (0-5)	Household income (0-5)	Labour availability (0-5)	Overall (0-5)	Economic Benefits (0-5)	Capital/O&M Costs (0-5)	Sustainability/Risk (0-5)	Overall (0-5)	Env	Social	Econ	Overall	Env	Social	Econ	Overall
<b>FORESTRY AND AGRO-FORESTRY</b>																			
<b>A. Agroforestry Demonstrations and Nurseries</b>																			
Protection and Harvesting R&D Units	2	5	2.8	1	3		1.3	2	4	3	2.7	0.5	0.2	0.7	0.5	0.6	0.3	0.8	0.6
System and Subsystem demonstrations	2	5	2.8	1	3		1.3	2	4	3	2.7	0.5	0.2	1.0	0.6	0.6	0.3	1.1	0.7
Tree Nurseries	3	4	3.3	1	3		1.3	2	4	3	2.7	0.6	0.2	5.8	2.6	0.1	0.0	1.0	0.5
<b>B. DA Natural Resources</b>																			
DA NR Office Furniture and Equipment	2	5	2.8	1	3		1.3	2	4	3	2.7	0.5	0.2	0.1	0.3	0.6	0.3	0.1	0.3
DA NR Tools and Field Equipment	2	5	2.8	1	3		1.3	2	4	3	2.7	0.5	0.2	0.1	0.3	0.6	0.3	0.1	0.3
DA NR Transport	2	5	2.8	1	3		1.3	2	4	3	2.7	0.5	0.2	0.5	0.4	0.6	0.3	0.5	0.4
<b>NON-FARM INCOME GENERATION</b>																			
<b>A. Grinding Mills</b>																			
Grinding Mill and housing				5	4		3.8	2	4	3	2.7		3.6	0.5	1.2		3.8	0.5	1.3
Grinding Mill engine				5	4		3.8	2	4	3	2.7		3.6	0.1	1.1		3.8	0.1	1.2
<b>B. Technology and innovation fund</b>	2	5	2.8	5	4	4	4.6	5	4	4	4.6	2.6	4.3	0.7	2.4	2.8	4.7	0.7	2.5
<b>C. Micro-credit facility</b>	1	2	1.3	5	5	2	4.4	5	5	3	4.6	1.2	4.2	9.9	5.6	1.3	4.5	10.7	6.0

**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Projects  
Detailed Project Preparation

**Project Implementation Plan**

Annex B Unit Cost Guidelines

December 2007

**Halcrow Group Limited**

in association with  
Metaferia Consulting Engineers

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# 1 Unit Cost Guidelines

The unit costs are based on the following sources:

- (i) Person day work norms provided in the MoARD Community Based Participatory Watershed Development Guidelines (2005), formulated as part of the WFP/MERET watershed development programme
- (ii) Quotations from Regional and Wereda level organisations and suppliers
- (iii) Current market prices for products and labour in the Amhara Region
- (iv) The consultants own cost data compilation from on-going complimentary projects in Ethiopia

## **2 Soil and Water Conservation Works**

The soil and water conservation unit costs were derived for each land class based on the mix of proposed interventions needed to protect the natural environment. The MoARD Community Based Participatory Watershed Development Guidelines provided the work norms for each intervention in person days per unit of work and this was then multiplied by an assumed labour rate. The labour rate was taken as Birr12/day being representative of the present expectations from the community in the rural areas of the project. The rate build up for the physical and biological intervention measures are presented in Table 1

## Rate build-up physical and biological soil and water conservation measures

TABLE B1

LAND CLASS	LAND SLOPE	LAND USE	INTERVENTION	UNIT	WORK NORM	COST Birr	UNIT	NOTES
5	>60%	Grazing/Cultivated/Degraded	Closure	p-d/ha/yr	4	48	ha	Guards
			Vegetative Fencing	p-d/ha	16	192	ha	40p-d/km and 0.4km/ha
			Forestry	p-d/ha	250	3,000	ha	Planting
			D/S Cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Waterway	p-d/km	1,440	17,280	km	Stone - 20% slope W12.0m xD1.5m x L1m at 1.0cum/PD
4c	>30% to <60%	Cultivated	U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Bench Terracing	p-d/ha	1,000	12,000	ha	20 terraces 100m long at 500p-d/km
			Vetiver Hedgerows	p-d/ha	20	240	ha	20 rows 100m long at 10 p-d/km
4g	Grazing		U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Rotational closure	p-d/ha/yr	4	48	ha	Guards
			Leguminous Hedgrows	p-d/ha	20	240	ha	20 rows 100m long at 10 p-d/km
4e & 4f	Badlands/Forestry		U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Closure	p-d/ha/yr	4	48	ha	Guards
			Agroforestry in micro-basins	p-d/ha	250	3,000	ha	Planting
3c	>15% to <30%	Cultivated	Stone Faced Bunds	p-d/ha	300	3,600	ha	12 bunds 100m long at 250p-d/km
			Leguminous Hedgrows	p-d/ha	12	144	ha	12 rows 100m long at 10 p-d/km
3g	Grazing		Rotational closure	p-d/ha/yr	4	48	ha	Guards
			Leguminous Hedgrows	p-d/ha	12	144	ha	12 rows 100m long at 10 p-d/km
3e	Badlands/Forestry		U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Closure	p-d/ha/yr	4	48	ha	Guards
			Agroforestry in micro-basins	p-d/ha	250	3,000	ha	Planting
2c	>8% to <15%	Cultivated	Soil Bunds	p-d/ha	90	1,080	ha	6 bunds 100m long at 150p-d/km
			Leguminous Hedgrows	p-d/ha	6	72	ha	6 rows 100m long at 10 p-d/km
2g	Grazing		Leguminous Hedgrows	p-d/ha	6	72	ha	6 rows 100m long at 10 p-d/km
2e			U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Closure	p-d/ha/yr	4	48	ha	Guards
			Agroforestry	p-d/ha	250	3,000	ha	Planting
1c	0% to <8%	Cultivated	Soil Bunds	p-d/ha	60	720	ha	4 bunds 100m long at 150p-d/km
		Badlands	Leguminous Hedgrows	p-d/ha	4	48	ha	4 rows 100m long at 10 p-d/km
1g	Grazing		Leguminous Hedgrows	p-d/ha	4	48	ha	4 rows 100m long at 10 p-d/km
GULLIES	5% to 30%	Stream Bed	Stone Checkdams	p-d/km	1,440	17,280	km	Stone - 20% slope W12.0m xD1.5m x L1m at 1.0cum/PD
		Cultivated/Grazing/Badlands	U/S cut-off Drain	p-d/km	1,071	12,852	km	750cum/km at 0.7cum/PD
			Closure	p-d/ha/yr	4	48	ha	Guards
			Gully Reshaping	p-d/ha	400	4,800	ha	

ASSUMPTIONS	
Labour Rate	12 Birr/day
Improved Cooking Stove	100 Birr/Unit
Nursery Establishment	2000 Birr/ha

Using the rates derived in Table 1 the unit rate per hectare for the proposed mix of interventions relating to each land use class was computed as presented in Table 2. For the gully control in existing watercourses a linear measure per kilometre was more appropriate. As the unit rates were labour-based, this Table also indicates the labour requirement needed for undertaking the particular intervention works. This assumed that after taking into account the time required for farming activities, rest days and religious observances only 100 days in a year would be free for soil and conservation works. This therefore showed that for the more work intensive interventions required on the steeper cultivated and degraded lands it would take some 3 to 4 years to be completed by an able bodied farmer. For the Class 4c and gully control works in stream watercourses the work requirement is so large that the proposed intervention works would only be feasibly undertaken under an external contract.

## Soil and water conservation costs per interventions and land class

TABLE B2

INTERVENTIONS	SLOPE	>60%	>30% and <60%					>15% and <30%			>8% and <15%			<8%			GULLIES	
	LAND USE	Degraded & Forestry	Cultivation	Grazing	Badlands	Forestry	Cultivation	Grazing	Badlands	Cultivation	Grazing	Badlands	Cultivation	Grazing	Badlands	Land	Stream	
	CLASS	5	4c	4g	4e	4f	3c	3g	3e	2c	2g	2e	1c	1g	1e		(Per km)	
Land Closure		48			48	48			48						48			
Vegetative Fencing		192			192	192			192									
Forestry in micro-basins		3,000																
Cut-off Drain		257	257	257	257	257			257							257		
Waterway with Stone Checks		864																
Bench Terracing			12,000															
Vetiver Hedgerows			240															
Rotational closure				48					48									
Leguminous Hedgrows				240			144	144	72	72		48	48	48				
Agroforestry in micro-basins					3,000	3,000			3,000			3,000						
Stone Faced Bunds							3,600											
Soil Bunds									1,080				720			720		
Stone Checkdams																	17,280	
Gully Reshaping															4,800			
<b>TOTAL COST PER ha</b>	Birr	<b>4,361</b>	<b>12,497</b>	<b>545</b>	<b>3,497</b>	<b>3,497</b>	<b>3,744</b>	<b>192</b>	<b>3,497</b>	<b>1,152</b>	<b>72</b>	<b>3,048</b>	<b>768</b>	<b>48</b>	<b>768</b>	<b>5,105</b>	<b>17,280</b>	
																	(Per km)	
p-d/ha required for construction	p-d	<b>363</b>	<b>1,041</b>	<b>45</b>	<b>291</b>	<b>291</b>	<b>312</b>	<b>16</b>	<b>291</b>	<b>96</b>	<b>6</b>	<b>254</b>	<b>64</b>	<b>4</b>	<b>64</b>	<b>425</b>	<b>1,440</b>	
Assumed available p-d/year	100																	
Required labour construction time	P-year/ha	<b>4</b>	<b>10</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>14</b>	
O&M Cost /ha	Birr	<b>218</b>	<b>1,250</b>	<b>27</b>	<b>175</b>	<b>175</b>	<b>187</b>	<b>6</b>	<b>175</b>	<b>35</b>	<b>2</b>	<b>152</b>	<b>23</b>	<b>1</b>	<b>23</b>	<b>511</b>	<b>1,728</b>	
	%	<b>5</b>	<b>10</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>10</b>	<b>10</b>	
																	(Per km)	

Labour rate Birr/day 12.0

To further analyse the incentive for farmers to implement the soil and water conservation works the incremental net income per day as a return on the O&M costs relating to the interventions for each land class was computed as shown in Table 2. In this analysis it was assumed that the incremental returns from increased crop production varied from Birr 500/ha to Birr 1500/ha depending on the benefit from the conservation measures applied. Based on the premise that there would be not enough incentive for farmers to maintain works that yielded a net incremental income of less than Birr 30/Ha it is concluded that the soil conservation works relating to Class 5e (degraded land on slopes >60%) and Class 4e (cultivated land on slopes >30% and <60%) are intrinsically less sustainable than the works on the other land classes.

The unit rates derived in Table 2 for each land class were applied to the areas identified during the land classification undertaken for the PLUP on each of the five project pilot micro-catchments. The same unit rates were then applied to the areas computed during the scaling up of the project pilot micro-catchment areas corresponding with the total areas defined for the five project micro-watersheds as shown in Table 3.

Soil and water conservation costs for each study area and development area

TABLE B3

RIVER CATCHMENT					RIBB							
Project Development Area					Baskura				Kantai			
Land Slope	Land class	Land use	Unit	Rate Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr
<8%	1c	Cultivated	ha	768	23	17,357	3,418	2,625,355	75	57,370	4,732	3,634,519
	1g	Grazing	ha	48	12	566	1,785	85,673	21	984	1,299	62,339
>8% and <15%	2c	Cultivated	ha	1,152	24	27,072	1,898	2,186,894	89	102,643	1,938	2,232,748
	2g	Grazing	ha	72	13	914	1,026	73,866	25	1,764	533	38,371
>15% and <30%	2e	Badlands	ha	3,048	4	11,887	315	960,256	41	125,578	896	2,731,629
	3c	Cultivated	ha	3,744	31	116,813	1,231	4,608,696	70	263,203	1,251	4,684,460
>30% and <60%	3g	Grazing	ha	192	16	3,110	640	122,820	19	3,706	343	65,952
	3e	Badlands	ha	3,497	2	8,043	91	317,600	13	45,811	233	815,343
>60%	4c	Cultivated	ha	12,497	6	68,734	176	2,197,024	7	86,230	91	1,135,925
	4g	Grazing	ha	545	3	1,581	93	50,523	2	1,036	25	13,642
>60%	4e	Badlands	ha	3,497	1	3,147	29	100,602	3	11,191	42	147,416
	4f	Forestry	ha	3,497	3	8,743	80	279,451	16	57,002	215	750,899
>60%	5	Cultivated/Grazing/Degraded	ha	4,361	0	0	4	15,313	0	0	3	13,147
	Gullies	Gully Reshaping	ha	5,105	1	5,105	80	410,389	3	15,315	90	461,687
		Stone Checkdams	km	17,280	2	34,560	80	1,382,400	2	34,560	30	518,400
<b>Totals</b>					<b>137</b>	<b>307,633</b>	<b>10,865</b>	<b>15,416,863</b>	<b>384</b>	<b>806,391</b>	<b>11,693</b>	<b>17,306,479</b>
						<i>Cost/ha</i>		<i>2,245</i>		<i>2,100</i>		<i>1,480</i>

RIVER CATCHMENT					GUMERA							
Project Development Area					Zefie				Enkulal			
Land Slope	Land class	Land use	Unit	Rate Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr
<8%	1c	Cultivated	ha	768	24	18,662	3,573	2,743,784	57	43,546	8,954	6,876,698
	1g	Grazing	ha	48	6	298	912	43,754	15	701	2,306	110,670
>8% and <15%	2c	Cultivated	ha	1,152	49	55,872	2,447	2,818,566	81	93,542	3,136	3,612,398
	2g	Grazing	ha	72	12	893	626	45,039	21	1,512	811	58,390
>15% and <30%	2e	Badlands	ha	3,048	18	54,864	908	2,767,715	36	110,033	1,394	4,249,222
	3c	Cultivated	ha	3,744	56	208,166	2,278	8,530,513	76	283,046	1,818	6,807,315
>30% and <60%	3g	Grazing	ha	192	14	2,726	592	111,726	20	3,744	469	90,044
	3e	Badlands	ha	3,497	8	29,025	340	1,169,442	14	47,909	329	1,152,231
>60%	4c	Cultivated	ha	12,497	17	214,949	519	6,479,821	7	86,230	88	1,093,713
	4g	Grazing	ha	545	4	2,398	133	72,295	2	981	23	12,444
>60%	4e	Badlands	ha	3,497	4	12,589	109	379,516	3	10,841	39	137,502
	4f	Forestry	ha	3,497	10	36,020	311	1,085,838	17	58,750	213	745,173
>60%	5	Cultivated/Grazing/Degraded	ha	4,361	3	13,083	45	197,201	0	0	1	4,382
	Gullies	Gully Reshaping	ha	5,105	2	10,210	113	574,544	3	15,315	169	861,816
		Stone Checkdams	km	17,280	5	86,400	140	2,419,200	5	86,400	140	2,419,200
<b>Totals</b>					<b>228</b>	<b>746,156</b>	<b>12,893</b>	<b>29,458,955</b>	<b>350</b>	<b>842,550</b>	<b>19,750</b>	<b>28,231,198</b>
						<i>Cost/ha</i>		<i>2,285</i>		<i>2,407</i>		<i>1,429</i>

RIVER CATCHMENT					JEMA			
Project Development Area					Engule			
Land Slope	Land class	Land use	Unit	Rate Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr
<8%	1c	Cultivated	ha	768	8	5,990	5,702	4,378,995
	1g	Grazing	ha	48	4	197	2,997	143,861
>8% and <15%	2c	Cultivated	ha	1,152	53	60,710	4,003	4,611,556
	2g	Grazing	ha	72	25	1,829	1,929	138,915
>15% and <30%	2e	Badlands	ha	3,048	6	19,202	479	1,458,612
	3c	Cultivated	ha	3,744	107	401,731	4,319	16,171,182
>30% and <60%	3g	Grazing	ha	192	56	10,714	2,246	431,262
	3e	Badlands	ha	3,497	6	22,381	258	900,921
>60%	4c	Cultivated	ha	12,497	27	341,169	1,713	21,406,645
	4g	Grazing	ha	545	14	7,740	891	465,619
>60%	4e	Badlands	ha	3,497	3	11,540	207	724,091
	4f	Forestry	ha	3,497	6	22,381	402	1,404,298
>60%	5	Cultivated/Grazing/Degraded	ha	4,361	0	0	256	1,117,471
	Gullies	Gully Reshaping	ha	5,105	2	10,210	0	0
		Stone Checkdams	km	17,280	4	69,120	0	0
<b>Totals</b>					<b>319</b>	<b>984,915</b>	<b>25,402</b>	<b>53,373,430</b>
						<i>Cost/ha</i>		<i>2,101</i>

RIVER CATCHMENT					TOTAL AREAS			
Project Development Area					Study area		Project Area	
Land Slope	Land class	Land use	Unit	Rate Birr	Study area ha	Cost Birr	Project Area ha	Cost Birr
<8%	1c	Cultivated	ha	768	186	142,925	26,379	20,259,352
	1g	Grazing	ha	48	57	2,746	9,298	446,297
>8% and <15%	2c	Cultivated	ha	1,152	295	339,840	13,422	15,462,163
	2g	Grazing	ha	72	96	6,912	4,925	354,582
>15% and <30%	2e	Badlands	ha	3,048	106	321,564	3,992	12,167,435
	3c	Cultivated	ha	3,744	340	1,272,960	10,898	40,802,166
>30% and <60%	3g	Grazing	ha	192	125	24,000	4,280	821,804
	3e	Badlands	ha	3,497	44	153,170	1,251	4,375,536
>60%	4c	Cultivated	ha	12,497	64	797,311	2,586	32,313,129
	4g	Grazing	ha	545	25	13,735	1,164	634,523
>60%	4e	Badlands	ha	3,497	14	49,308	426	1,489,128
	4f	Forestry	ha	3,497	52	182,895	1,220	4,265,680
>60%	5	Cultivated/Grazing/Degraded	ha	4,361	3	13,083	309	1,347,514
	Gullies	Gully Reshaping	ha	5,105	11	56,155	452	2,308,436
		Stone Checkdams	km	17,280	18	311,040	390	6,739,200
<b>Totals</b>					<b>1,418</b>	<b>3,687,645</b>	<b>80,602</b>	<b>143,786,924</b>
						<i>Cost/ha</i>		<i>1,784</i>

### **3 Water Harvesting and Irrigation Components**

Rates were derived for the water harvesting intervention through supply and labour costs associated with constructing a new metal roof to a house with associated guttering and pipe work to enable water to be collected in plastic tanks for both domestic use and for kitchen garden watering. For collecting runoff water from the land in micro-ponds and for the small scale run of river works for diverting and conveying water for irrigation to the fields, labour only is envisaged for constructing the works. Work norms in person days per unit of work were taken and multiplied by an assumed labour rate of Birr12/day. Pumped irrigation rates were based on the commercial cost of buying and installing the pump and associated suction and delivery pipe-work. The derivations of the rates adopted are given in Table 4. Table 5 gives the total costs after scaling up for the total project area.



## Rate build-up for water harvesting and irrigation components

TABLE B4

INTERVENTION	COMPONENT	UNIT	QUANTITY	UNIT RATE Birr	COST Birr	NOTES
<b>Roof water harvesting</b>	Roofing Sheets	No	60	100	6,000	<i>2sqm/metal sheet</i>
	Gutter	m	20	10	200	
	Pipework	m	10	20	200	<i>5cm dia. Plastic</i>
	Plastic Tank	No	3	650	1,950	<i>300 litre capacity</i>
	Labour	p-d	10	12	120	
	Transportation Costs	km	50	10	500	
	<b>Total per site</b>					<b>8,970</b>
<b>Low cost microponds</b>	Labour Excavation	p-d	200	12	2,400	<i>100cum pond at 2PD/cum</i>
	Labour Stone	p-d	40	12	480	<i>20cum stone lining at 2PD/cum</i>
	<b>Total per pond</b>				<b>2,880</b>	
<b>Small scale irrigation (5ha)</b>	Check Dam Excavation	p-d	60	12	720	<i>W30mxD1mxL4m at 2.0cum/PD</i>
	Check Dam Stone	p-d	1,440	12	17,280	<i>W30mxD3mxL4m at 1.0cum/PD</i>
	Stone Lined Canal	p-d	250	12	3,000	<i>Channel W0.3mxD0.3mxL1000m at 250p-d/site</i>
	<b>Total per site</b>				<b>21,000</b>	
<b>Pumped irrigation (2ha)</b>	Small Diesel Portable Pump	No	1	16,000	16,000	<i>5HP Pump</i>
	Pipework	m	50	70	3,500	<i>15cm dia. Hose</i>
	Transportation Costs	km	50	10	500	
	<b>Total per pump</b>				<b>20,000</b>	

Assumed labour rate : 12 Birr/day

Water harvesting and irrigation component costs

TABLE B5

RIVER SUB-CATCHMENT				RIBB				GUMERA				JEMA		TOTALS			RIBB	GUMERA	JEMA				
				Baskura		Kantai		Zefie		Enkulal		Engule											
Project development area				ha	10,893	11,666	12,969	19,794	25,279	<b>80,602</b>			22,560	32,763	25,279								
Project development area				no.	10	11	14	20	27	<b>82</b>			21	34	27								
No. of micro-catchments				ha	1,087	1,063	921	987	941	<b>4,999</b>			2,149	1,908	941								
Average micro-catchment area				ha	137	384	228	350	319	<b>1,418</b>			521	578	319								
Study site area				no.	4	8	8	6	9	<b>35</b>			12	14	9								
				Unit	Unit rate	Quantities		Total cost		Quantities		Total cost		Quantities		Total cost		Cost	Cost	Cost			
				Unit	Birr '000	Study site	Project Area	Birr '000	Study site	Project Area	Birr '000	Study site	Project Area	Birr '000	Study site	Project Area	Birr '000	Birr '000	Birr '000	Birr '000			
<b>Water supply, sanitation and irrigation</b>																							
<b>Water harvesting</b>																							
Roof water harvesting	Site	8.97	1	80	718	3	90	807	2	114	1,023	2	114	1,023	2	158	1,417	10	<b>556</b>	<b>4,987</b>	1,525	2,045	1,417
Low cost micro-ponds	Site	2.88	1	80	230	3	90	259	2	114	328	2	114	328	2	158	455	10	<b>556</b>	<b>1,601</b>	490	657	455
<b>Sub-total</b>					<b>948</b>			<b>1,067</b>			<b>1,351</b>			<b>1,351</b>			<b>1,872</b>			<b>6,589</b>	2,015	2,702	1,872
<b>Irrigation</b>																							
Small scale irrigation	Site	21.00	1	72	1,512	1	23	483	0	5	105	1	51	1,071	1	72	1,512	4	<b>223</b>	<b>4,683</b>	1,995	1,176	1,512
Pumped irrigation	Site	20.00	1	51	1,020	0	15	300	1	37	740	0	10	200	1	66	1,320	3	<b>179</b>	<b>3,580</b>	1,320	940	1,320
<b>Sub-total</b>					<b>2,532</b>			<b>783</b>			<b>845</b>			<b>1,271</b>			<b>2,832</b>			<b>8,263</b>	3,315	2,116	2,832
<b>Estimated total costs</b>					<b>3,480</b>			<b>1,850</b>			<b>2,196</b>			<b>2,622</b>			<b>4,704</b>			<b>14,852</b>	<b>5,330</b>	<b>4,818</b>	<b>4,704</b>

## 4 Livelihood Components

New hand dug well and the associated pump mechanism costs and the construction of new communal toilet facilities were taken from the rates given by the Finnish water supply and sanitation project. New external feeder road rates, upgrading community footpaths and provision of access paths came from the rural roads section within the Wereda Agriculture and Rural Development office and the MoARD Community Based Participatory Watershed Development Guidelines for the work norms for labour costs. All other livelihood rates were taken from information supplied from Regional offices in Bahir Dar. A summary of the rates adopted is given in Table 6. Table 7 gives the total costs after scaling up for the total project area.

## Rate build-up for livelihoods components

TABLE B6

INTERVENTION	COMPONENT	UNIT	QUANTITY	UNIT RATE Birr	COST Birr	NOTES	
<b>Public water supply</b>	New hand Pump Well	No	1	30,000	<b>30,000</b>	10m deep dug well with covered stand	
	Spring Development						
	Source Development	p-d	10	12	120	20cum at 2.0cum/PD	
	Spring Box Excavation	p-d	2	12	24	4cum at 2.0cum/PD	
	Spring Box Stone	p-d	32	12	384	W2mxD2mxL2m at 1.0cum/PD	
	Night Storage Reservoir	p-d	16	12	192	1cum storage capacity 4cum stone at 1.0cum/PD	
	Cattle Trough	p-d	4	12	48	1cum stone at 1.0cum/PD	
	Spring Protection	p-d	50	12	600	0.20ha at 250p-d/ha	
	Sub-total labour					1,368	
	Cement	Bag	10	200	2,000	100kg/bag	
	Pipework	m	50	60	3,000	Outlets, overflow, connectors, taps	
	Reinforced Tank Covers	cum	5	800	4,000		
	Transportation Costs	km	50	10	500		
		<b>Total per spring</b>				<b>10,868</b>	
<b>Improved sanitation</b>	New Communal Toilet	No	1	45,000	<b>45,000</b>	At Health Centre and School	
<b>Upgrade internal access paths</b>	Village Access Track	km	4,000	12	<b>48,000</b>	4m wide at 4000p-d/km	
<b>Foot bridge over stream/river</b>	Footbridge	No	1	36,000	<b>36,000</b>	1.2m wide 20m span at Birr2000/sqm	
<b>External feeder access road</b>	Road upgrade	km	1	240,000	<b>240,000</b>	8m wide gravel surfaced track with surface drainage	
<b>Telephone post</b>	Solar Powered Telephone	No	1	10,000	<b>10,000</b>	Solar Panel, Aerial, Battery, Phone	
<b>Community flour mill</b>	Engine	No	1	15,000	15,000		
	Mill	No	1	10,000	10,000		
	Housing	No	1	15,000	15,000		
		<b>Total per grinding mill</b>				<b>40,000</b>	
<b>Cooking stove</b>	Improved Stove Mold	No	1	1,200	<b>1,200</b>		
<b>Health post</b>	Improved Facilities	No	1	10,000	<b>10,000</b>	Furniture, Equipment, Mosquito Nets, Redecoration	
<b>Local school</b>	Improved Facilities	No	1	15,000	<b>15,000</b>	Furniture, Equipment, Books, Redecoration	

Assumed labour rate : 12 Birr/day

Livelihood component costs

TABLE B7

RIVER SUB-CATCHMENT				RIBB			GUMERA			JEMA			TOTALS		RIBB	GUMERA	JEMA						
				Baskura		Kantai		Zefie		Enkulal		Engule											
				Study site	Project Area	Study site	Project Area	Study site	Project Area	Study site	Project Area	Study site	Project Area	Study site	Project Area	Cost	Cost	Cost					
				Quantities	Total cost	Quantities	Total cost	Quantities	Total cost	Quantities	Total cost	Quantities	Total cost	Quantities	Total cost	Cost	Cost	Cost					
				Unit	Unit rate	Unit	Unit rate	Unit	Unit rate	Unit	Unit rate	Unit	Unit rate	Unit	Unit rate	Birr '000	Birr '000	Birr '000					
				Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000	Birr '000				
<b>Project development area</b>				10,893		11,666		12,969		19,794		25,279		<b>80,602</b>		22,560	32,763	25,279					
<b>Project development area</b>				10	ha	11	ha	14	ha	20	ha	27	ha	<b>82</b>	21	34	27						
<b>No. of micro-catchments</b>				1,087	ha	1,063	ha	921	ha	987	ha	941	ha	<b>4,999</b>	2,149	1,908	941						
<b>Average micro-catchment area</b>				137	ha	384	ha	228	ha	350	ha	319	ha	<b>1,418</b>	521	578	319						
<b>Study site area</b>				4	no.	8	no.	8	no.	6	no.	9	no.	<b>35</b>	12	14	9						
<b>No. of kebeles significantly involved</b>																							
<b>Community Entry Points</b>																							
<b>Access and communications</b>																							
External all weather feeder access road	km	240.0	-	12	2,880	-	28	6,720	-	32	7,680	-	37	8,880	-	135	32,400	9,600	16,560	6,240			
Upgrade internal access paths	km	48.00	1	39	1,872	2	30	1,440	1	28	1,344	2	56	2,688	1	39	1,872	7	192	9,216	3,312	4,032	1,872
Foot bridge over stream/river	No	36.00	1	37	1,332	1	14	504	3	81	2,916	1	26	936	2	74	2,664	8	232	8,352	1,836	3,852	2,664
Telephone post	No	10.00	-	4	43	-	8	81	-	8	84	-	6	55	-	9	89	-	35	351	123	139	89
<b>Sub-total</b>					6,127		8,745		12,024		12,559		10,865		50,319		14,871	24,583		10,865			
<b>Community infrastructure improvements</b>																							
Health post	No	10.00	-	4	43	-	8	81	-	8	84	-	6	55	-	9	89	-	35	351	123	139	89
Local school	No	15.00	-	4	64	-	8	121	-	8	126	-	6	83	-	9	134	-	35	527	185	209	134
<b>Sub-total</b>					106		201		210		138		223		878		308	348		223			
<b>Non-farm income generation</b>																							
Community flour mill	No	40.00	-	4	170	-	8	322	-	8	336	-	6	220	-	9	356	-	35	1,404	492	556	356
<b>Water supply and sanitation</b>																							
<b>Water supply and sanitation</b>																							
Public water supply: New hand-pump well	Site	30.00	0	0	0	0	0	0	1	57	1,710	0	0	0	1	79	2,370	2	136	4,080	0	1,710	2,370
Spring development	Site	10.87	2	150	1,630	3	87	946	2	108	1,174	3	162	1,761	2	150	1,630	12	657	7,140	2,576	2,934	1,630
Improved sanitation	No	45.00	0	0	0	1	30	1,350	0	0	0	1	57	2,565	1	79	3,555	3	166	7,470	1,350	2,565	3,555
<b>Sub-total</b>					1,630		2,296		2,884		4,326		7,555		18,690		3,926	7,209		7,555			
<b>Estimated total costs</b>					<b>8,033</b>		<b>11,563</b>		<b>15,454</b>		<b>17,242</b>		<b>18,999</b>		<b>71,291</b>		<b>19,596</b>	<b>32,696</b>		<b>18,999</b>			

## **5 Institutional Strengthening Components**

### **5.1 Office Establishment**

Costs for establishment of the Project Co-ordination Office assume that office space will be provided by Government but will need to be fully equipped with appropriate new furniture, office equipment and transport. For the Wereda watershed teams provision is made for renting suitable accommodation at the Wereda centre, again each office to be fully equipped with appropriate new furniture, office equipment and transport. At the Kebele level unit costs have been presented for improving the present DA and FTC offices through provision of new furniture, training and field equipment and associated transport provision. All cost estimates are based on current market prices for purchasing new equipment and the annual operating costs on present rates being experienced from existing NGOs in the region.

### **5.2 Training and Staff Salaries**

Training costs have been based on information collected from on-going training programmes organised by SWISHA and ORDA in the Amhara region. Staff salaries use rates currently applicable in order to employ appropriately qualified consultant and specialist staff both at the Regional and Wereda levels.

The unit rates applied and corresponding total costs for the institutional strengthening components are presented on the following Tables 8 to 20.

**Table 8: Establishment of PCU Office and Transportation**

Item	Unit	Quantity	Unit Price (Birr)	Total Cost (Birr)
<b>Office Furniture</b>				
Office desk	pcs	20	500	10,000
Office chair	pcs	20	200	4,000
Table (1.5mx0.75m)	pcs	10	2,000	20,000
Arm chair	pcs	25	200	5,000
Filing cabinet	pcs	10	1,200	12,000
Shelving	pcs	10	750	7,500
<b>Sub-Total</b>				<b>58,500</b>
<b>Office Equipment</b>				
Computer with accessories	pcs	10	13,000	130,000
Printers and scanners	pcs	10	7,000	70,000
Stabiliser	pcs	10	500	5,000
Photocopier	pcs	1	20,000	20,000
Digital camera	pcs	3	3,000	9,000
Telephone	pcs	5	1,000	5,000
Calculator	pcs	5	120	600
Basic office equipment (eg. stapler)	lumpsum	10	500	5,000
Notice board	pcs	3	500	1,500
White board	pcs	6	500	3,000
<b>Sub-Total</b>				<b>249,100</b>
<b>Transportation</b>				
4WD car (saloon)	pcs	1	800,000	800,000
4WD car (double cab pick-up)	pcs	3	450,000	1,350,000
<b>Sub-Total</b>				<b>2,150,000</b>
<b>Grand Total</b>				<b>2,457,600</b>

**Table 9: Project Coordination Unit staff costs**

Staff	Unit rate (US\$)	No. of staff	Months per staff	Total p-m	Total Costs (US\$)
<b>Long-term national staff</b>					
Project coordinator	2,500	1	60	60	150,000
Training Manager	2,000	1	60	60	120,000
M&E expert	1,500	1	60	60	90,000
Agricultural specialist	1,500	1	60	60	90,000
SWC specialist	1,500	1	60	60	90,000
GIS and database applications	1,500	1	60	60	90,000
Senior administrator	1,000	1	60	60	60,000
Administrative support staff	500	2	60	120	60,000
<b>Short-term national staff</b>					
M&E specialist	1,500	1	18	18	27,000
Forestry specialist	1,500	1	24	24	36,000
Contracts/procurement specialist	2,000	1	10	10	20,000
Financial specialist / auditor	2,000	1	10	10	20,000
Micro-credit specialist	1,500	1	10	10	15,000
Physical planner	1,500	1	6	6	9,000
Appropriate technology specialist	1,500	1	12	12	18,000
Subject matter specialists	1,500	5	12	60	90,000
<b>Short-term international staff</b>					
Subject matter specialists	25,000	2	2	4	100,000
<b>Totals</b>		<b>23</b>		<b>694</b>	<b>1,085,000</b>
<b>Summary</b>					
Long-term national staff	1,389	9		540	750,000
Short-term national staff	1,567	12		150	235,000
Short-term international staff	25,000	2		4	100,000
<b>Grand Total</b>					<b>1,085,000</b>

**Table 10: Government salaries and allowances**

Item	Unit	Unit rate Birr'000	Number	Months per staff	Total quantity	Total cost Birr'000
SMS Subsistence	days	0.070	-	-	3,600	252.0
DA Subsistence	days	0.050	-	-	7,875	393.8
Ministry staff expenses and per diems	days	0.860	-	-	350	301.0
<b>Total</b>						<b>946.8</b>



**Table 11: Training costs**

Course / item	Unit	No. of trainees	No. of events	Days per event	Trainee days	Per diems/ trainee day Birr	Other charges per event (Birr)	Trainer costs per event Birr	Total cost Birr
<b>Training of kebele staff</b>		<i>Training of nebele staff and cooperatives in 35 kebeles using DA and someines external traineers</i>							
DA Office Training Budget	Birr		1,225	-				200	245,000
Kebele watershed committee	Birr	20	350	1	7,000		100		35,000
Cooperative	Birr	15	700	1	10,500		100		70,000
Kebele Council	Birr	10	175	1	1,750		100		17,500
<b>Total</b>		<b>45</b>	<b>1,225</b>		<b>19,250</b>				<b>367,500</b>
<b>Training of subject matter specialist staff</b>		<i>Training of SMS staff at Wereda level using external trainers</i>							
SMS staff in Wereda	Birr	125	18	2	4,500	50	1,000	10,000	423,000
SMS staff in Baher Dar	Birr	125	18	2	4,500	100	2,000	10,000	666,000
<b>Total</b>		<b>125</b>	<b>36</b>		<b>9,000</b>				<b>1,089,000</b>
<b>Training of development agents</b>		<i>Training of 3no. District Agents per kebele in 35 kebeles using trained SMS staff and sometimes external trainers</i>							
Batch 1	Birr	33	42	4	5,544	60	180	1,000	382,200
Batch 2	Birr	36	35	5	6,048	60	180	1,000	404,180
Batch 3	Birr	36	28	6	6,048	60	180	1,000	395,920
<b>Total</b>		<b>105</b>	<b>105</b>		<b>17,640</b>				<b>1,182,300</b>
<b>Other training</b>		<i>Training of local contractors, 350 user groups and extension workers in 35 kebeles by DA and external providers</i>							
Training of local contractors	Birr	20	12		480	100	2,000	10,000	192,000
Training of user groups	Birr	7,000	1,750	1	35,000		200	500	1,225,000
Training of health extension workers	Birr	105	25	2	525	60	200	500	49,000
<b>Total</b>		<b>7,125</b>	<b>1,787</b>		<b>36,005</b>				<b>1,466,000</b>
<b>Total</b>		<b>7,400</b>	<b>3,153</b>		<b>81,895</b>				<b>4,104,800</b>
			Birr/event		Birr/Trainee-day				
			1,302		50				

**Table 12: Monitoring and Evaluation**

Item	Unit	Unit rate Birr'000	Total quantity	Total cost Birr'000
Baseline socio-economic surveys	Survey	100	3	300.0
Annual monitoring surveys	Survey	25	15	375.0
Ad hoc surveys	Survey	50	4	200.0
Establish gauging stations	Station	50	20	1,000.0
Sediment measurements and analysis	Survey	15	100	1,500.0
Impact evaluation survey	Survey	75	3	225.0
Annual financial audit	Audit	30	5	150.0
<b>Total</b>				<b>3,750.0</b>

**Table 13: Catchment Implementation Team office establishment costs**

Item	Unit	Quantity	Unit Price (Birr)	Total Cost per Wereda (Birr)	Number of WWTs	Total Costs (Birr)
<b>Office Furniture</b>						
Office desk	pcs	20	500	10,000		
Office chair	pcs	40	200	8,000		
Table (1.5mx0.75m)	pcs	2	2,000	4,000		
Arm chair	pcs	10	200	2,000		
Filing cabinet	pcs	8	1,200	9,600		
Shelve	pcs	18	750	13,500		
<b>Sub-Total</b>				<b>47,100</b>	<b>3</b>	<b>141,300</b>
<b>Office Equipment</b>						
Computer with accessories	pcs	12	13,000	156,000		
Printer	pcs	5	7,000	35,000		
Stabiliser	pcs	6	500	3,000		
Photocopier	pcs	1	10,000	10,000		
Digital camera	pcs	3	3,000	9,000		
Generator	pcs	1	13,000	13,000		
Telephone	pcs	2	1,000	2,000		
Calculator	pcs	20	120	2,400		
Basic office equipment	lumpsum	5	500	2,500		
Notice board	pcs	5	500	2,500		
White board	pcs	5	500	2,500		
<b>Sub-Total</b>				<b>237,900</b>	<b>3</b>	<b>713,700</b>
<b>Transportation</b>						
4WD car	pcs	2	450,000	900,000		
Motorbike	pcs	11	40,000	440,000		
<b>Sub-Total</b>				<b>1,340,000</b>	<b>3</b>	<b>4,020,000</b>
<b>Office building</b>						
Four-room building (200m <sup>2</sup> )	lumpsum	1	400,000	400,000		
<b>Sub-Total</b>				<b>300,000</b>	<b>3</b>	<b>900,000</b>
<b>Grand Total</b>				<b>1,925,000</b>	<b>3</b>	<b>5,775,000</b>

**Table 14: Catchment Implementation Team staffing costs**

<b>Staff</b>	<b>Unit rate (US\$)</b>	<b>No. of staff</b>	<b>Months per staff</b>	<b>Total p-m</b>
<b>Project management staff</b>				
Catchment Project Coordinator	1,500	3	60	180
Finance officer	1,500	3	60	180
Accountant	1,000	2	60	120
Office Manager	800	3	60	180
Office support staff	500	5	60	300
<b>Key technical staff</b>				
Soil and Water Specialist	1,000	6	60	360
Water Harvesting and Irrigation Expert	1,000	3	60	180
Crop production specialist	1,000	3	60	180
Livestock Expert	1,000	3	60	180
Socio economics and Gender Specialist	1,000	3	60	180
Community Mobilisers	900	18	60	1,080
<b>Grand Total</b>		<b>52</b>		<b>3,120</b>

**Table 15: Catchment Implementation Team establishment**

Watershed	Wereda	Kebeles	Coordinator	Finance officer	Accountant	Office Manager	Office support staff	Soil and Water Specialist	Agronomist	Livestock Expert	Water Harvesting and Irrigation Expert	Socio economics and Gender Specialist	Community Mobilisers	Office	car	Motorbikes	Guesthouse
<b>Ribb</b>	Farta	12	1	1	1	2	2	1	1	1	1	6	1	2	11	1	
<b>Gumera</b>	Farta	8			1	2						4					incl. above
	Estie	4			1	1						2					1
	Dera	2			1	1						1					1
	Sub-total	14	1	1	1	1	2	1	1	1	1	7	1	2	12	2	
<b>Jema</b>	Mecha	6			1	2						3					1
	Sekele	3			1	1						2					1
	Sub-total	9	1	1	2	1	3	2	1	1	1	5	1	2	10	2	
<b>Totals</b>		<b>35</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>18</b>	<b>3</b>	<b>6</b>	<b>33</b>	<b>5</b>	
Inputs per person			60	60	60	60	60	60	60	60	60	60					
<b>Total inputs</b>		<b>3,120</b>	<b>180</b>	<b>180</b>	<b>120</b>	<b>180</b>	<b>300</b>	<b>360</b>	<b>180</b>	<b>180</b>	<b>180</b>	<b>1,080</b>					

**Table 16: DA Office**

Item	Unit	Quantity	Unit Price (Birr)	Total Cost per Kebele (Birr)	Number of Kebeles	Total Costs (Birr)
<b>Office Furniture and Equipment</b>						
Office desk	pcs	3	500	1,500		
Office chair	pcs	3	200	600		
Filing cabinet	pcs	1	1,200	1,200		
Calculator	pcs	1	120	120		
Shelve	pcs	1	750	750		
Reference book	pcs	10	200	2,000		
Basic office equipment	lumpsum	1	350	350		
<b>Sub-Total</b>				<b>6,520</b>	<b>35</b>	<b>228,200</b>
<b>Tools and Field Equipment</b>						
Knapsack sprayer (20 litres)	pcs	1	250	250		
Thermometer	pcs	1	10	10		
Tape meter (50 metres)	pcs	1	100	100		
Shovel/spade	pcs	2	20	40		
Bucket	pcs	3	50	150		
Axe	pcs	1	50	50		
Sickle	pcs	1	15	15		
Hoe	pcs	1	20	20		
Rake	pcs	1	20	20		
Wheel barrow	pcs	1	250	250		
Rope	pcs	10	2	20		
Seive for sand aggregate (2mx3m)	pcs	1	100	100		
Weighing scale (100 kgs)	pcs	1	2,500	2,500		
Prunning knife	pcs	1	150	150		
Rain jacket	pcs	3	200	600		
Pair of rubber boots	pcs	3	100	300		
<b>Sub-Total</b>				<b>4,575</b>	<b>35</b>	<b>160,125</b>
<b>Transportation</b>						
Pedal bicycle / mule	pcs	2	2,500	5,000		
<b>Sub-Total</b>				<b>5,000</b>	<b>35</b>	<b>175,000</b>
<b>Grand Total</b>				<b>16,095</b>	<b>35</b>	<b>563,325</b>

**Table 17: Farmer training centres**

Item	Unit	Quantity	Unit Price (Birr)	Total Cost per Kebele (Birr)	Number of Kebeles	Total Costs (Birr)
<b>Classroom Furniture and Equipment</b>						
Arm chair	pcs	40	200	8,000		
Table (1.5mx0.75m)	pcs	2	2,000	4,000		
Chalkboard (1.2mx4m)	pcs	1	200	200		
Notice/white board	pcs	2	500	1,000		
Fixed pencil sharpner	pcs	1	40	40		
Waste paper basket	pcs	5	20	100		
<b>Sub-Total</b>				<b>13,340</b>	<b>35</b>	<b>466,900</b>
<b>Audio-Visual Equipment</b>						
Television	pcs	1	2,400	2,400		
VHS video player	pcs	1	3,000	3,000		
Tape recorder & CD player	pcs	1	1,000	1,000		
Generator	pcs	1	13,000	13,000		
Photo camera	pcs	1	2,000	2,000		
<b>Sub-Total</b>				<b>21,400</b>	<b>35</b>	<b>749,000</b>
<b>Grand Total</b>				<b>34,740</b>	<b>35</b>	<b>1,215,900</b>

**Table 18: Operating costs of DA Office and FTC**

Item	Unit Cost (Birr)	Quantity	Total Annual Cost per Kebele (Birr)	Number of Kebeles	Total Annual Costs (Birr)	Total Costs for 5 Years
DA Office	1,000	1	2,400			
Feeding and guarding mule	600	2	1,200			
Trials and demonstrations	30,000	1	30,000			
<b>Total</b>			<b>33,600</b>	<b>35</b>	<b>1,176,000</b>	<b>5,880,000</b>

**Table 19: Operating costs of Catchment Implementation Team office**

Item	Unit Cost (Birr)	Quantity	Total Annual Cost per Wereda (Birr)	Number of Weredas	Total Costs (Birr)	Total Costs for 5 Years
CWMT Office	30,000	1	30,000			
4WD cars	45,000	2	90,000			
Motorbikes	2,500	11	27,500			
<b>Total</b>			<b>147,500</b>	<b>3</b>	<b>442,500</b>	<b>2,212,500</b>

**Table 20: Operating costs of PCU Office**

Item	Unit Cost (Birr)	Quantity	Total Annual Cost per Wereda (Birr)	Total Costs for 5 Years
PCU Office	50,000	1	50,000	350,000
4WD cars	45,000	5	225,000	1,575,000
Monthly Office Rent (200sqm)	15,000	12	180,000	1,260,000
<b>Total</b>			<b>455,000</b>	<b>2,275,000</b>

## 6 Overall base costs and assumptions

Given in the following pages is the make-up of the overall project base cost, data from which has been entered into COSTAB (see Annex C).

The tables show, inter alia:

- The individual cost components
- A Costing Code as cross referenced with the implementation plan diagram
- Units and unit rates
- Cost category as used for determining share of finance
- Assumed beneficiary contribution
- Estimated quantities
- Estimated costs
- Share of costs expected from beneficiaries
- Share of costs expected from Government (inclusive on donor funding)

**Summary of estimated base costs**  
(Birr '000)

PROJECT COMPONENTS	Proposed project investments			
	Total Cost (Birr '000)		Community Contribution (Birr '000)	Government + Donor cost (Birr '000)
<b>SWC, WSS and IRRIGATION</b>				
<b>A. Soil and Water Conservation Works</b>				
Land Class 1 (< 8% slope)	20,777	7%	17,660	3,117
Land Class 2 (8% - 15% slope)	27,956	9%	13,413	14,543
Land Class 3 (15% - 30% slope)	45,950	15%	691	45,259
Land Class 4 (30% - 60% slope)	5,207	2%	544	4,663
Land Class 5 (> 60% slope)	436	0%		436
Other Works	9,049	3%		9,049
Sub-total Soil and Water Conservation Works	<b>109,375</b>	<b>36%</b>	<b>32,309</b>	<b>77,066</b>
<b>B. Water Supply and Sanitation</b>	25,280	8%	7,745	17,535
<b>C. Irrigation</b>	8,259	3%	6,195	2,065
<b>Sub-totals</b>	<b>142,914</b>	<b>48%</b>	<b>46,248</b>	<b>96,666</b>
<b>COMMUNITY ENTRY POINTS</b>				
<b>A. Access and Communications</b>	50,318	17%	2,635	47,683
<b>B. Renovation of public buildings</b>	875	0%	70	805
<b>C. Not used</b>				
<b>Sub-totals</b>	<b>51,193</b>	<b>17%</b>	<b>2,705</b>	<b>48,488</b>
<b>CROP PRODUCTION</b>				
A. Farmer Training Centres	1,216	0%		1,216
B. Demonstrations	2,730	1%	546	2,184
C. DA Crop production	1,789	1%		1,789
<b>Sub-totals</b>	<b>5,734</b>	<b>2%</b>	<b>546</b>	<b>5,188</b>
<b>LIVESTOCK PRODUCTION</b>				
A. Animal Health Posts	2,806	1%	221	2,585
B. Feed supply	2,379	1%	476	1,903
C. Dairy Production	1,021	0%	104	917
D. Dairy processing	578	0%	55	523
E. Sheep Demonstrations	842	0%	69	772
F. Poultry	1,692	1%	138	1,554
G. Animal Fattening	1,786	1%	69	1,717
H. DA Livestock	1,789	1%		1,789
<b>Sub-totals</b>	<b>12,893</b>	<b>4%</b>	<b>1,133</b>	<b>11,760</b>
<b>FORESTRY AND AGRO-FORESTRY</b>				
A. Agroforestry Demonstrations and Nurseries	8,500	3%	1,700	6,800
B. DA Natural Resources	1,789	1%		1,789
<b>Sub-totals</b>	<b>10,289</b>	<b>3%</b>	<b>1,700</b>	<b>8,589</b>
<b>NON-FARM INCOME GENERATION</b>				
A. Community flour mills	1,750	1%	438	1,313
B. Technology and innovation fund	1,250	0%	313	938
C. Micro-credit facility	18,000	6%		18,000
<b>Sub-totals</b>	<b>21,000</b>	<b>7%</b>	<b>750</b>	<b>20,250</b>
<b>CAPACITY DEVELOPMENT AND PROJECT MANAGEMENT</b>				
A. PCU Office	2,458	1%		2,458
B. PCU staff and consultants	10,024	3%		10,024
C. Government Salaries and Allowances	947	0%		947
D. Training	4,105	1%		4,105
E. Monitoring and Evaluation	3,500	1%		3,500
F. Wereda Offices	7,175	2%		7,175
G. Community Watershed Management Teams	27,775	9%		27,775
<b>Sub-totals</b>	<b>55,984</b>	<b>19%</b>		<b>55,984</b>
<b>Overall total base costs</b>	<b>300,008</b>	<b>100%</b>	<b>53,083</b>	<b>246,925</b>
	100.0%		17.7%	82.3%



**Breakdown of base costs**  
(Birr '000)

PROJECT COMPONENTS	Cost reference	Unit	Unit cost (Birr '000)	Component Category (1-7)	Community Contribution (%)	Proposed project investments			
						Quantity	Total Cost (Birr '000)	Community Contribution (Birr '000)	Government Contribution (Birr '000)
<b>SWC, WSS and IRRIGATION</b>	<b>1000</b>								
<b>A. Soil and Water Conservation Works</b>									
Land Class 1 (< 8% slope)	<b>1100</b>								
Cultivated (1c)	1101	ha	0.77	1	85%	26,379	<b>20,312</b>	17,265	3,047
Grazing (1g)	1102	ha	0.05	1	85%	9,298	<b>465</b>	395	70
Land Class 2 (8% - 15% slope)	<b>1200</b>								
Cultivated (2c)	1201	ha	1.15	1	85%	13,422	<b>15,435</b>	13,120	2,315
Grazing (2g)	1202	ha	0.07	1	85%	4,925	<b>345</b>	293	52
Badlands (2e)	1203	ha	3.05	2		3,992	<b>12,176</b>		12,176
Land Class 3 (15% - 30% slope)	<b>1300</b>								
Cultivated (3c)	1301	ha	3.74	2		10,898	<b>40,759</b>		40,759
Grazing (3g)	1302	ha	0.19	1	85%	4,280	<b>813</b>	691	122
Badlands (3e)	1303	ha	3.50	2		1,251	<b>4,379</b>		4,379
Land Class 4 (30% - 60% slope)	<b>1400</b>								
Cultivated (4c)	1401	ha	12.50	3		250	<b>3,125</b>		3,125
Grazing (4g)	1402	ha	0.55	1	85%	1,164	<b>640</b>	544	96
Badlands (4e)	1403	ha	3.50	2		107	<b>375</b>		375
Forestry (4f)	1404	ha	3.50	2		305	<b>1,068</b>		1,068
Land Class 5 (> 60% slope)	<b>1500</b>								
Cultivated/Grazing/Degraded	1501	ha	4.36	3		100	<b>436</b>		436
Other Works	<b>1600</b>								
Gully Reshaping	1601	ha	5.11	2		452	<b>2,310</b>		2,310
Stone Checkdams	1602	km	17.28	2		390	<b>6,739</b>		6,739
<b>B. Water Supply and Sanitation</b>	<b>1700</b>								
Roof Water Harvesting	1701	units	8.97	4	75%	556	<b>4,987</b>	3,740	1,247
Low cost microponds	1702	units	2.88	4	75%	556	<b>1,601</b>	1,201	400
Hand pumping wells	1703	units	30.00	4	15%	136	<b>4,080</b>	612	3,468
Spring Development	1704	unit	10.87	4	15%	657	<b>7,142</b>	1,071	6,070
Improved sanitation	1705	unit	45.00	4	15%	166	<b>7,470</b>	1,121	6,350
<b>C. Irrigation</b>	<b>1800</b>								
Small scale irrigation	1801	unit for 2 ha	20.96	1	75%	223	<b>4,674</b>	3,506	1,169
Pumped irrigation	1802	unit for 5 ha	20.03	1	75%	179	<b>3,585</b>	2,689	896
<b>COMMUNITY ENTRY POINTS</b>	<b>2000</b>								
<b>A. Access and Communications</b>	<b>2100</b>								
Rural Access Roads	2101	km	240.00	4		135	<b>32,400</b>		32,400
Internal access paths	2102	km	48.00	4	15%	192	<b>9,216</b>	1,382	7,834
Footbridges	2103	unit	36.00	4	15%	232	<b>8,352</b>	1,253	7,099
Telephone Post	2104	unit	10.00	4		35	<b>350</b>		350
<b>B. Renovation of public buildings</b>	<b>2200</b>	Kebele	25.00	4	8%	35	<b>875</b>	70	805
<b>C. Not used</b>	<b>2300</b>	-							

PROJECT COMPONENTS	Cost reference	Unit	Unit cost (Birr '000)	Component Category (1-7)	Community Contribution (%)	Proposed project investments			
						Quantity	Total Cost	Community Contribution	Government Contribution
							(Birr '000)	(Birr '000)	(Birr '000)
<b>CROP PRODUCTION</b>	<b>3000</b>								
<b>A. Farmer Training Centres</b>	<b>3100</b>								
Classroom Furniture and Equipment	3101	per FTC	13.34	1		35	<b>467</b>		467
FTC Audio Visual Equipment	3102	per FTC	21.40	1		35	<b>749</b>		749
<b>B. Demonstrations</b>	<b>3200</b>								
Demonstrations Crop Production & Profitability	3201	demos	5.00	1	20%	420	<b>2,100</b>	420	1,680
Demonstrations High Value Crops	3202	demos	6.00	1	20%	105	<b>630</b>	126	504
<b>C. DA Crop production</b>	<b>3300</b>								
DA Crops Office Furniture and Equipment	3301	per kebele	6.52	1		35	<b>228</b>		228
DA Crops Tools and Field Equipment	3302	per kebele	4.58	1		35	<b>160</b>		160
DA Crops Transport	3303	per kebele	40.00	1		35	<b>1,400</b>		1,400
<b>LIVESTOCK PRODUCTION</b>	<b>4000</b>								
<b>A. Animal Health Posts</b>	<b>4100</b>								
AHP Building and Kraal Construction	4101	unit	106.20	1		11	<b>1,168</b>		1,168
AHP Office Furniture	4102	unit	1.13	1		11	<b>12</b>		12
AHP Tools and Equipment	4103	unit	27.11	1		11	<b>298</b>		298
AHP Demonstration Equipment	4104	unit	20.00	1		11	<b>220</b>		220
AHP Training Courses for Farmers	4105	event	8.65	1	20%	128	<b>1,107</b>	221	886
<b>B. Feed supply</b>	<b>4200</b>								
Improvement of communal pasture	4201	2 ha units	2.75	1	20%	19	<b>52</b>	10	42
Forage Nursery Establishment	4202	unit	31.07	1	20%	19	<b>590</b>	118	472
Forage Nursery Equipment	4203	unit	2.75	1	20%	15	<b>41</b>	8	33
Pasture and forage demonstrations	4204	event	8.65	1	20%	196	<b>1,695</b>	339	1,356
<b>C. Dairy Production</b>	<b>4300</b>								
AI Delivery System	4301	unit	30.00	1		12	<b>360</b>		360
Liquid nitrogen, semen and equipment	4302	unit	11.84	1		12	<b>142</b>		142
Dairy production demonstrations	4303	event	8.65	1	20%	60	<b>519</b>	104	415
<b>D. Dairy processing</b>	<b>4400</b>								
Dairy processing Centre	4401	unit	48.00	1		3	<b>144</b>		144
Dairy processing equipment	4402	unit	52.52	1		3	<b>158</b>		158
Dairy Processing Demonstrations	4403	courses pa	8.65	1	20%	32	<b>277</b>	55	221
<b>E. Sheep Demonstrations</b>	<b>4500</b>								
Sheep breeding stock	4501	unit	7.00	1		12	<b>84</b>		84
Sheep demonstration equipment	4502	unit	34.30	1		12	<b>412</b>		412
Sheep demonstrations	4503	event	8.65	1	20%	40	<b>346</b>	69	277
<b>F. Poultry and honey</b>	<b>4600</b>								
Poultry demonstration breeding stock	4601	unit	10.00	1		20	<b>200</b>		200
Poultry demonstration housing	4602	unit	40.00	1		20	<b>800</b>		800
Poultry & honey demonstrations	4603	event	8.65	1	20%	80	<b>692</b>	138	554
<b>G. Animal Fattening</b>	<b>4700</b>								
Breeding Stock Large ruminants /l	4701	per demo	60.00	1		20	<b>1,200</b>		1,200
Breeding stock small ruminants	4702	per demo	12.00	1		20	<b>240</b>		240
Fattening demonstrations	4703	event	8.65	1	20%	40	<b>346</b>	69	277
<b>H. DA Livestock</b>	<b>4800</b>								
DA Livestock Office Furniture and Equipment /m	4801	per kebele	6.52	1		35	<b>228</b>		228
DA Livestock Tools and Field Equipment	4802	per kebele	4.58	1		35	<b>160</b>		160
DA Livestock Transport	4803	per kebele	40.00	1		35	<b>1,400</b>		1,400

PROJECT COMPONENTS	Cost reference	Proposed project investments							
		Unit	Unit cost (Birr '000)	Component Category (1-7)	Community Contribution (%)	Quantity	Total Cost (Birr '000)	Community Contribution (Birr '000)	Government Contribution (Birr '000)
<b>FORESTRY AND AGRO-FORESTRY</b>	<b>5000</b>								
<b>A. Agroforestry Demonstrations and Nurseries</b>	<b>5100</b>								
Protection and Harvesting R&D Units	5101	demos	20.00	1	20%	115	<b>2,300</b>	460	1,840
System and Subsystem demonstrations	5102	demos	20.00	1	20%	160	<b>3,200</b>	640	2,560
Tree Nurseries	5103	nurseries	150.00	1	20%	20	<b>3,000</b>	600	2,400
<b>B. DA Natural Resources</b>	<b>5200</b>								
DA NR Office Furniture and Equipment	5201	per kebele	6.52	1		35	<b>228</b>		228
DA NR Tools and Field Equipment	5202	per kebele	4.58	1		35	<b>160</b>		160
DA NR Transport	5203	per kebele	40.00	1		35	<b>1,400</b>		1,400
<b>NON-FARM INCOME GENERATION</b>	<b>6000</b>								
<b>A. Community flour mills</b>	<b>6100</b>								
Grinding Mill and housing	6101	unit	40.00	5	25%	35	<b>1,400</b>	350	1,050
Grinding Mill engine	6102	unit	10.00	5	25%	35	<b>350</b>	88	263
<b>B. Technology and innovation fund</b>	<b>6200</b>	Lumpsum	1,250.00	5	0.25	1	<b>1,250</b>	313	938
<b>C. Micro-credit facility</b>	<b>6300</b>	Lumpsum	18,000.00	5		1	<b>18,000</b>		18,000

PROJECT COMPONENTS	Cost reference						Proposed project investments			
		Unit	Unit cost (Birr '000)	Component Category (1-7)	Community Contribution (%)	Donor Contribution (%)	Quantity	Total Cost (Birr '000)	Community Contribution (Birr '000)	Government Contribution (Birr '000)
<b>CAPACITY DEVELOPMENT AND PROJECT MA</b>	<b>7000</b>									
<b>A. PCU Office</b>	<b>7100</b>									
PCU Office Furniture	7101	lump sum	58.50	6		1	59		59	
PCU Office Equipment	7102	lump sum	249.10	6		1	249		249	
PCU 4WD saloon	7103	unit	800.00	6		1	800		800	
PCU Double cab pick up	7104	unit	450.00	6		3	1,350		1,350	
<b>B. PCU staff and consultants</b>	<b>7200</b>									
National long term staff	7201	p-m	12.83	6		540	6,928		6,928	
National consultancy (short term)	7202	p-m	14.48	6		150	2,172		2,172	
Not used	7203	p-m	231.00	6						
International consultancy (short term)	7204	p-m	231.00	6		4	924		924	
<b>C. Government Salaries and Allowances</b>	<b>7300</b>									
Not used	7301	months	4.00	6						
Not used	7302	months	3.00	6						
SMS Subsistence	7303	days	0.07	6		3,600	252		252	
DA Subsistence	7304	days	0.05	6		7,875	394		394	
Ministry staff expenses and per diems	7305	days	0.86	6		350	301		301	
<b>D. Training</b>	<b>7400</b>									
Training of kebele staff	7401	lump sum	367.50	6		1	368		368	
Training of CIT and SMS	7402	lump sum	1,089.00	6		1	1,089		1,089	
Training of DA	7403	lump sum	1,182.30	6		1	1,182		1,182	
Training of local contractors	7404	lump sum	192.00	6		1	192		192	
Training of user groups	7405	lump sum	1,225.00	6		1	1,225		1,225	
Training of Health Extension Workers	7406	lump sum	49.00	6		1	49		49	
<b>E. Monitoring and Evaluation</b>	<b>7500</b>									
lump sum			3,500.00	7		1	3,500		3,500	
<b>F. Wereda Offices</b>	<b>7600</b>									
Wereda Office	7601	offices	400.00	6		3	1,200		1,200	
Wereda Office Furniture	7602	per office	47.10	6		3	141		141	
Wereda Office Equipment	7603	per office	237.90	6		3	714		714	
Wereda 4WD Vehicle	7604	vehicles	450.00	6		6	2,700		2,700	
Wereda Motorbikes	7605	motorbikes	40.00	6		33	1,320		1,320	
Wereda Guesthouse	7606	guesthouse:	220.00	6		5	1,100		1,100	
<b>G. Community Watershed Management Teams</b>	<b>7700</b>									
Catchment Project Coordinator	7701	p-m	13.86	6		180	2,495		2,495	
Finance officer	7702	p-m	13.86	6		180	2,495		2,495	
Accountant	7703	p-m	9.24	6		120	1,109		1,109	
Office Manager	7704	p-m	7.39	6		180	1,331		1,331	
Office support staff	7705	p-m	4.62	6		300	1,386		1,386	
Soil and Water Specialist	7706	p-m	9.24	6		360	3,326		3,326	
Water Harvesting and Irrigation Expert	7707	p-m	9.24	6		180	1,663		1,663	
Crop production specialist	7708	p-m	9.24	6		180	1,663		1,663	
Livestock Expert	7709	p-m	9.24	6		180	1,663		1,663	
Socio economics and Gender Specialist	7710	p-m	9.24	6		180	1,663		1,663	
Community Mobilisers	7711	p-m	8.32	6		1,080	8,981		8,981	
<b>Total Investment Costs</b>							<b>300,007</b>	<b>53,083</b>	<b>246,924</b>	

**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Projects  
Detailed Project Preparation

**Project Implementation Plan**

**Annex C: Project Cost Estimates**

December 2007

**Halcrow Group Limited**

in association with  
Metaferia Consulting Engineers

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# 1 Project Cost Structure

## 1.1 Basic Information

COSTAB has been used to summarise, order and present project costs. This section describes the cost structure of the project as entered into the COSTAB programme. The project is scheduled to begin in the year 2008/09 with a five year implementation period. An exchange rate of US\$ 1=Birr 9.24 was used throughout the implementation period. Annual inflation in Ethiopia is assumed to be 8%. International price inflation is assumed to be 2% per annum. Taxes were estimated where possible, including VAT at 15% on locally purchased final goods and services and 100% on imported vehicles and computer equipment. Taxes are included in the project base costs.

The physical contingency used on all expenditure accounts is 10%.

Quantities and unit costs used in the cost estimation for each project component were prepared by the specialists responsible. The detailed cost tables are presented in Appendix C3.

## 1.2 Expenditure Accounts

The expenditure accounts for investment costs are as follows:

- works (i.e. soil and water conservation works, rural infrastructure and office buildings);
- vehicles (including DA motorcycles);
- equipment;
- training;
- agricultural inputs, extension services and materials;
- agro-forestry inputs, extension services and materials;
- livestock inputs, extension services and materials;
- consulting services;
- monitoring and evaluation; and
- incremental government staff salaries required to implement the project;

The expenditure accounts for recurrent costs are:

- management, operation and maintenance costs (for project works); and
- project implementation costs (costs incurred in managing the project).

### 1.3 Project Costs

Summaries of project costs by component are given in Appendix C1. Baseline costs are estimated at Birr 330.2 million (or US\$ 35.7 million), with a foreign exchange component of 7%. If physical and price contingencies are included, the total costs of the project are estimated at Birr 446.8 million (or US\$ 48.4).

The soil and water management component accounts for 46% of baseline cost, followed by the capacity development and project management component at 19%. Crops, livestock, agro-forestry and non-farm income generation components together account for 18% of baseline costs. The costs of community entry points (including access, communications and renovation of schools and health posts) account for 16% of baseline costs.

With respect to expenditure accounts, works accounts for the greatest proportion of investment costs (68%) and this includes the soil and water conservation works, water supply/sanitation, irrigation and the public infrastructure. Consultancy and project vehicles together account for a further 15% of project base costs.

Project base costs per hectare (over the project area of 80,600 ha) are US\$ 443 per ha, and per person (assuming a population in the project area of about 170,000 people) about US\$ 210 per capita.

### 1.4 Disbursement Accounts

The disbursement accounts in COSTAB have been identified on the basis of the project's financing plan and the project financiers are Government/Donor and Community. The disbursement accounts for each financier are shown in Appendix C1 and it can be seen that the Communities will contribute 18.3% toward investment costs and over 45% towards recurrent costs in the form of labour (overall community contribution being 20.8%). The balance of total investment and recurrent costs (i.e. 79.2%) will be funded by either the government or donors. The assumptions with respect to the financing rules for investment costs used in COSTAB are given in Appendix C2.



## 2 Project Components

### 2.1 Soil and Water Management

Soil and water management accounts for 46% of investment costs and this cost will be shared between the government/donor and the community. According to *Community Based Participatory Watershed Development: A Guideline (2005)*, the Community Action Plan will specify the number of labour days the community will make available for the works, and the rate at which they will be remunerated, taking into account intra-community subsidies between more and less resourced households, the degree of food insecurity and the proportion of communal and private land in each micro watershed.

The derivation of the investment costs for soil and water conservation for various land types and slope categories is described in detail in Annex B: Unit Cost Guidelines. In addition, maintenance costs during implementation (3% pa of investment cost of implementation) have been included under recurrent costs and it is assumed that these costs will be met entirely by the communities within each micro-watershed.

With regard to the different types of water supply and sanitation interventions, as well as irrigation development, it is assumed that labour accounts for 75% of the unit costs for each intervention and equipment/materials for the balance. Labour costs are divided into private labour costs (labour required for private investment), community labour (the community subsidises its labour on local work by 20%), and commercial labour which is paid at the rural wage rate. Private labour would be used for rainwater harvesting and irrigation, while community labour is required for spring development, hand pump wells and public toilets.

The detailed COSTAB table for this component is given in Appendix C.3 where the investment costs are clearly specified.

### 2.2 Crop Production

The Crop Production investment costs include the cost of furnishing and equipping Farmer Training Centres (one per kebele within the project area). It should be noted that the buildings are expected to be constructed under another regional programme. The component costs also include crop demonstrations and the office, equipment and transport costs of the DA (Crops). The DA (Crops) is assumed to share an office with DA (Livestock) and DA (Natural Resources) so office costs are divided by one third, but each DA has their particular set of equipment and transport (i.e. motorcycle).

Demonstration investment and recurrent costs are assumed to have a 10% foreign exchange component to cover any imported equipment and inputs.

The expenditure account specified is crop extension for all investment costs except for vehicles (DA (Crops) transport). Demonstration operational costs are debited to MOM expenditure and DA (Crops) operational costs are debited to project implementation.

The detailed COSTAB table for the Crop Production component is given in Appendix C.3.

### **2.3 Livestock Production**

The component investment costs include the cost of building, furnishing and equipping Animal Health Posts (11 are assumed). The component costs also include various types of livestock demonstrations associated with the AHP, as well as the office, equipment and transport costs of the DA (Livestock). Demonstration investment and recurrent costs are assumed to have a 20% foreign exchange component to cover any imported equipment and inputs.

The expenditure account specified is livestock extension for all investment costs except for vehicles (DA (Livestock) transport). Demonstration operational costs are debited to MOM expenditure and DA (Livestock) operational costs are debited to project implementation.

The detailed COSTAB table for the Livestock Production component is given in Appendix C3.

### **2.4 Forestry and Agro-forestry**

The component investment costs include the cost of demonstrations, forestry nurseries and the office, equipment and transport costs of the DA (Natural Resources). Investment and recurrent DA (Natural Resources) office furniture, equipment and transport costs are expected to be funded by Government.

Due to the large demand for seedlings, forestry nurseries are expected to be financed and operated by the community. There are already a large number of small private nurseries existing within the project area, so only a small number of community nurseries have been include in the cost estimates. A 20% subsidy for nursery start up costs is assumed.

Demonstration investment and recurrent costs are assumed to have a 10% foreign exchange component to cover any imported equipment and inputs.

The expenditure account specified is agro-forestry for all investment costs except for vehicles (DA (Natural Resources) transport). Demonstration operational costs are debited to MOM expenditure and DA (Natural Resources) operational costs are debited to project implementation.

The detailed COSTAB table for the Forestry and Agro-forestry component is given in Appendix C.3.

### **2.5 Community Entry Points**

The community entry points component includes the proposed interventions related to access, communications, health and education. Investment costs are debited to the works expenditure account, and annual MOM to the MOM expenditure account.

It is assumed that labour accounts for 75% of the unit costs for each intervention (except telephone posts, health posts and schools at 40%), and equipment for the balance. Labour

costs are divided into private labour costs (labour required for private investment), community labour (the community subsidises its labour on local work by 20%), and commercial labour which is paid at the rural wage rate.

Private labour would be used for local paths and commercial labour would be for roads and bridges. Community labour is therefore the sum of private labour and community labour at the wage rate less the subsidy given by the community, assumed to be 20%. Government payment for labour is the sum of labour employed at the commercial rate and the (reduced) labour bill for community works.

Only rural roads and telephone posts have been allocated a foreign exchange component of 10% and 20% respectively.

The detailed COSTAB Table for the Community Entry Points is given in Appendix C.3.

## **2.6 Non-farm Income Generation**

The non-farm income generation component includes proposed interventions for the establishment of grain mills. Investment costs are debited to the works and equipment expenditure accounts, and annual MOM to the MOM expenditure account. All maintenance costs are attributed to the community. Foreign exchange costs are assumed to be 0% for the mill, 50% for the engine. Taxes are assumed to be 15% on the mill components.

A Technology and Innovation Fund (amounting to ETB 1.25 million) has also been included in this component in order to procure and demonstrate a range of appropriate technologies in order to encourage their uptake by project households. In addition, a micro-facility has been included in the component costs (amounting to ETB 18 million over the first two years) for a revolving fund to be managed by a micro-finance institution such as the Amhara Credit and Savings Institute (ACSI). The fund will be primarily used to finance both farm and no-farm enterprises as well as the purchase of new technologies and innovations.

The detailed COSTAB table for the Non-farm Income Generation is given in Appendix C.3.

## **2.7 Capacity Development and Project Management**

The Capacity Development and Project Management component includes all the investment and recurrent costs related to the Project Coordination Unit (PCU) and the three Community Watershed Management Offices at wereda level. In addition, staff training, consultancy and M&E costs, as well as incremental government salaries are also included under this component.

Vehicle unit costs are inclusive of taxes, and divided into 50% foreign exchange and 50% tax. The unit cost of 4WD vehicle operation is Birr 20,000 per month but increases over the 5 year implementation period to allow for increased O&M with age of the vehicle.

The detailed COSTAB Table for the Capacity Development and Project Management component is given in Appendix C.3.

# Appendices

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## Appendix C.1: Summary COSTAB Tables

Ethiopia

Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme

**Components Project Cost Summary**

	<b>(Birr '000)</b>			<b>(US\$ '000)</b>			<b>%</b>	<b>% Total</b>
	<b>Local</b>	<b>Foreign</b>	<b>Total</b>	<b>Local</b>	<b>Foreign</b>	<b>Total</b>	<b>Foreign Exchange</b>	<b>Base Costs</b>
1. Community Entry Points	51,123.0	3,313.2	54,436.2	5,532.8	358.6	5,891.4	6	16
2. Crop Production	4,724.8	2,539.4	7,264.2	511.3	274.8	786.2	35	2
3. Livestock Production	14,862.7	3,542.5	18,405.2	1,608.5	383.4	1,991.9	19	6
4. Non Farm Income Generation	19,914.8	1,150.0	21,064.8	2,155.3	124.5	2,279.7	5	6
5. Soil and Water Management	153,348.7	-	153,348.7	16,596.2	-	16,596.2	-	46
6. Forestry and Agroforestry	11,315.8	2,206.0	13,521.8	1,224.7	238.7	1,463.4	16	4
7. Capacity Development and Project Management	53,327.4	8,819.2	62,146.5	5,771.4	954.5	6,725.8	14	19
<b>Total BASELINE COSTS</b>	<b>308,617.2</b>	<b>21,570.3</b>	<b>330,187.5</b>	<b>33,400.1</b>	<b>2,334.4</b>	<b>35,734.6</b>	<b>7</b>	<b>100</b>
Physical Contingencies	30,861.7	2,157.0	33,018.7	3,340.0	233.4	3,573.5	7	10
Price Contingencies	82,478.5	1,074.8	83,553.4	8,926.2	116.3	9,042.6	1	25
<b>Total PROJECT COSTS</b>	<b>421,957.5</b>	<b>24,802.1</b>	<b>446,759.6</b>	<b>45,666.4</b>	<b>2,684.2</b>	<b>48,350.6</b>	<b>6</b>	<b>135</b>

Ethiopia

Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme

**Expenditure Accounts by Components**  
(US\$ '000)

	Community Entry Points	Crop Production	Livestock Production	Non Farm Income Generation	Soil and Water Management	Forestry and Agroforestry	Capacity Development and Project Management	Total	Physical Contingencies	
									%	Amount
<b>I. Investment Costs</b>										
A. Works	5,540.4	-	126.4	151.5	15,467.1	-	248.9	21,534.3	10.0	2,153.4
B. Vehicles	-	151.5	151.5	-	-	151.5	667.7	1,122.3	10.0	112.2
C. Equipment	-	-	-	173.2	-	-	125.8	299.0	10.0	29.9
D. Training and Development	-	-	-	-	-	-	444.2	444.2	10.0	44.4
E. Agricultural Extension and Materials	-	469.1	42.0	-	-	-	-	511.1	10.0	51.1
F. Agroforestry Extension and Materials	-	-	-	-	-	961.9	-	961.9	10.0	96.2
G. Livestock Production and Extension	-	-	1,075.3	-	-	-	-	1,075.3	10.0	107.5
H. Consulting Services	-	-	-	-	-	-	4,090.9	4,090.9	10.0	409.1
I. Monitoring and Evaluation	-	-	-	-	-	-	378.8	378.8	10.0	37.9
J. Government Salaries	-	-	-	-	-	-	102.5	102.5	10.0	10.2
K. Alternative Livelihood Microcredit	-	-	-	1,948.1	-	-	-	1,948.1	10.0	194.8
<b>Total Investment Costs</b>	<b>5,540.4</b>	<b>620.6</b>	<b>1,395.3</b>	<b>2,272.7</b>	<b>15,467.1</b>	<b>1,113.5</b>	<b>6,058.9</b>	<b>32,468.4</b>	<b>10.0</b>	<b>3,246.8</b>
<b>II. Recurrent Costs</b>										
A. Management and Operation Costs	351.0	67.5	498.5	7.0	1,129.1	251.9	-	2,305.1	10.0	230.5
B. Project Implementation	-	98.1	98.1	-	-	98.1	667.0	961.1	10.0	96.1
<b>Total Recurrent Costs</b>	<b>351.0</b>	<b>165.6</b>	<b>596.6</b>	<b>7.0</b>	<b>1,129.1</b>	<b>349.9</b>	<b>667.0</b>	<b>3,266.2</b>	<b>10.0</b>	<b>326.6</b>
<b>Total BASELINE COSTS</b>	<b>5,891.4</b>	<b>786.2</b>	<b>1,991.9</b>	<b>2,279.7</b>	<b>16,596.2</b>	<b>1,463.4</b>	<b>6,725.8</b>	<b>35,734.6</b>	<b>10.0</b>	<b>3,573.5</b>
Physical Contingencies	589.1	78.6	199.2	228.0	1,659.6	146.3	672.6	3,573.5	-	-
Price Contingencies	1,481.5	105.2	437.7	208.1	5,169.4	347.2	1,293.4	9,042.6	9.1	822.1
<b>Total PROJECT COSTS</b>	<b>7,962.0</b>	<b>969.9</b>	<b>2,628.8</b>	<b>2,715.8</b>	<b>23,425.2</b>	<b>1,957.0</b>	<b>8,691.8</b>	<b>48,350.6</b>	<b>9.1</b>	<b>4,395.5</b>
Taxes	-	102.1	85.3	62.6	-	85.3	1,339.2	1,674.6	9.1	152.2
Foreign Exchange	414.6	313.6	445.8	145.0	-	276.2	1,089.0	2,684.2	9.1	244.0

Ethiopia  
Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme  
**Project Components by Year -- Base Costs**  
(US\$ '000)

	<b>Base Cost</b>					<b>Total</b>
	<b>08/09</b>	<b>09/10</b>	<b>10/11</b>	<b>11/12</b>	<b>12/13</b>	
1. Community Entry Points	288.1	1,296.1	1,779.7	1,841.4	686.1	5,891.4
2. Crop Production	151.5	334.3	119.8	128.2	52.3	786.2
3. Livestock Production	261.8	402.7	426.1	466.4	434.9	1,991.9
4. Non Farm Income Generation	1,323.1	714.5	71.5	84.7	85.9	2,279.7
5. Soil and Water Management	549.2	2,541.3	3,644.0	4,805.4	5,056.3	16,596.2
6. Forestry and Agroforestry	149.1	327.7	286.1	344.7	355.7	1,463.4
7. Capacity Development and Project Management	1,907.0	1,404.3	1,176.1	1,130.6	1,107.8	6,725.8
<b>Total BASELINE COSTS</b>	<b>4,629.8</b>	<b>7,021.0</b>	<b>7,503.3</b>	<b>8,801.5</b>	<b>7,779.0</b>	<b>35,734.6</b>
Physical Contingencies	463.0	702.1	750.3	880.2	777.9	3,573.5
Price Contingencies	172.6	862.5	1,689.7	2,888.5	3,431.1	9,044.4
<b>Total PROJECT COSTS</b>	<b>5,265.4</b>	<b>8,585.6</b>	<b>9,943.3</b>	<b>12,570.2</b>	<b>11,988.0</b>	<b>48,352.4</b>
Taxes	606.0	461.2	191.8	202.0	213.8	1,674.9
Foreign Exchange	623.4	716.7	440.2	505.4	398.6	2,684.2



Ethiopia  
Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme  
**Disbursement Accounts by Financiers**  
(US\$ '000)

	Community		Government & Donor		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes
	Amount	%	Amount	%	Amount	%			
<b>A. Investment</b>									
1. Kebele Council Works	7,031.92	32.3	14,720.65	67.7	21,752.57	45.0	-	21,752.57	-
3. PCO Vehicle Procurement	-	-	745.28	100.0	745.28	1.5	372.64	-	372.64
4. PCO Training Procurement	-	-	156.74	100.0	156.74	0.3	-	133.23	23.51
5. PCO Consultancy Procurement	-	-	5,488.70	100.0	5,488.70	11.4	112.21	4,570.01	806.47
6. PCO Office and Transport	-	-	37.19	100.0	37.19	0.1	14.98	6.16	16.06
7. PCO WMT Office and Transport	-	-	392.43	100.0	392.43	0.8	42.91	260.62	88.90
8. PCO Monitoring and Evaluation	-	-	629.40	100.0	629.40	1.3	109.50	519.90	-
10. WPC Training	-	-	410.68	100.0	410.68	0.8	-	379.03	31.66
11. WPC DA Support	-	-	759.15	100.0	759.15	1.6	351.04	144.54	263.57
12. WPC Works Account	-	-	380.56	100.0	380.56	0.8	104.03	267.39	9.15
13. WPC Demonstrations	496.14	16.5	2,508.14	83.5	3,004.27	6.2	249.88	2,754.39	-
14. WPC Services	504.77	5.0	9,644.33	95.0	10,149.10	21.0	559.20	9,527.28	62.63
<b>Subtotal Investment</b>	<b>8,032.83</b>	<b>18.3</b>	<b>35,873.26</b>	<b>81.7</b>	<b>43,906.09</b>	<b>90.8</b>	<b>1,916.38</b>	<b>40,315.12</b>	<b>1,674.59</b>
<b>B. Recurrent</b>									
1. Kabele Council Works	1,411.71	100.0	-	-	1,411.71	2.9	-	1,411.71	-
6. PCO Office and Transport	-	-	321.35	100.0	321.35	0.7	98.50	222.84	-
7. PCO WMT Office and Transport	-	-	510.06	100.0	510.06	1.1	338.30	171.76	-
11. WPC DA Support	-	-	257.50	100.0	257.50	0.5	190.15	67.35	-
12. WPC Works Account	-	-	136.81	100.0	136.81	0.3	22.08	114.74	-
13. WPC Demonstrations	146.97	14.4	870.49	85.6	1,017.45	2.1	118.39	899.06	-
14. WPC Services	464.93	58.9	324.71	41.1	789.64	1.6	0.42	789.22	-
<b>Subtotal Recurrent</b>	<b>2,023.60</b>	<b>45.5</b>	<b>2,420.91</b>	<b>54.5</b>	<b>4,444.52</b>	<b>9.2</b>	<b>767.83</b>	<b>3,676.69</b>	<b>-</b>
<b>Total PROJECT COSTS</b>	<b>10,056.43</b>	<b>20.8</b>	<b>38,294.17</b>	<b>79.2</b>	<b>48,350.61</b>	<b>100.0</b>	<b>2,684.22</b>	<b>43,991.80</b>	<b>1,674.59</b>

## Appendix C.2: Financing Rules Assumed in COSTAB

## FINANCING RULES FOR INVESTMENT COSTS ASSUMED IN COSTAB CALCULATIONS

Project Component	Financing Rule	Notes
<b>1. SWC, WSS and Irrigation</b>		
SWC works (community)	85% Community 15% Govt/Donor.	Govt/Donor funds material costs estimated at 15%. Labour provided by community.
SWC works (contract)	0% Community 100% Govt/Donor	Govt/Donor funds material and labour costs.
Roof water harvesting, micro-ponds and irrigation	75% Community 25% Govt/Donor	Govt/Donor funds part of material & equipment costs (i.e. 25% of total cost). Community provides labour and finances balance of material & equipment costs.
Hand pump wells, spring development and low cost toilets	15% Community 75% Govt/Donor	Govt/Donor funds material & equipment costs (i.e. 15% of total cost). Community provides labour.
<b>2. Community Entry Points</b>		
Rural access roads and telephone posts	0% Community 100% Govt/Donor	Govt/Donor funds materials, equipment and labour costs.
Internal access paths and footbridges	15% Community 85% Govt/Donor	Community provides part of labour costs. Govt/Donor finances balance of labour and material costs.
Health and education	8% Community 92% Govt/Donor	Community provides part of labour costs. Govt/Donor finances balance of labour and material costs.
<b>3. Crop Production</b>		
FTC and DA Offices: furniture, tools and transport	100% Govt/Donor	Govt/Donor finances all material, equipment and transport costs.
FTC audio visual equipment	100% Govt/Donor	Govt/Donor finances all equipment costs.
Crop demonstrations	20% Community 80% Govt/Donor	Govt/Donor funds material and equipment costs. Community provides labour.
<b>4. Livestock Production</b>		
AHP buildings and furniture; AI Delivery System; Dairy processing centre; DA Offices – furniture, equipment and transport.	100% Govt/Donor	Govt/Donor finances all material, equipment and transport costs.
AHP tools & equipment, AI materials & equipment; Dairy processing equipment; Sheep demo equipment; Breeding stock: sheep & poultry plus fattening demos;	100% Govt/Donor	Govt/Donor funds all material and equipment costs as well as breeding stock.
AHP farmer training; Forage nurseries;	20% Community 80% Govt/Donor	Govt/Donor funds material and equipment costs. Community provides labour.

<b>Project Component</b>	<b>Financing Rule</b>	<b>Notes</b>
Demonstrations: Dairy, sheep, poultry and fattening.		
<b>5. Forestry</b>		
Agro-forestry demos and nurseries.	20% Community 80% Govt/Donor	Govt/Donor funds material and equipment costs. Community provides labour.
DA Offices: furniture, equipment and transport.	100% Govt/Donor	Govt/Donor finances all material, equipment and transport costs.
<b>6. Non-farm Income</b>		
Flour mills and engines	25% Community 75% Govt/Donor	Govt/Donor funds material and equipment cost. Community provides labour.
Technologies and Interventions	25% Community 75% Govt/Donor	Govt/Donor funds equipment and material costs. Community provide labour
Micro-credit	100% Govt/Donor	Govt/Donor funds micro-credit facility administered by MFI.
<b>7. Community Development and Project Management</b>		
PCO office furniture, equipment and vehicles, Consultancy; Govt staff salaries and allowances; Government staff Staff training; Community Watershed Management offices, equipment and vehicles; Community watershed management staff.	100% Govt/Donor	Govt/Donor funds all materials, equipment, vehicles and staff costs including consultancy.

## Appendix C.3: Detailed COSTAB Tables

Integrated Watershed Management (Ethiopia) Watershed Project,  
Fast-Track Projects - Detailed Project Preparation  
Project Implementation Plan

Ethiopia  
Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme  
Table 2. Soil and Water Conservation Works  
Detailed Costs

Unit	Quantities						Unit Cost (Birr '000)	Base Cost (Birr '000)						
	08/09	09/10	10/11	11/12	12/13	Total		08/09	09/10	10/11	11/12	12/13	Total	
<b>I. Investment Costs</b>														
<b>A. Soil and Water Conservation Works</b>														
1. Land Class 1, < 8% slope, Cultivated	ha	788	3,938	5,775	7,939	7,939	26,379	0.77	606.76	3,032.26	4,446.75	6,113.03	6,113.03	20,311.83
2. Land Class 1, < 8% slope, Grazing	ha	278	1,388	2,036	2,798	2,798	9,298	0.05	13.90	69.40	101.80	139.90	139.90	464.90
3. Land Class 2, 8%-15% slope, Cultivated	ha	400	2,006	2,939	4,038	4,039	13,422	1.15	460.00	2,306.90	3,379.85	4,643.70	4,644.85	15,435.30
4. Land Class 2, 8%-15% slope, Grazing	ha	147	735	1,078	1,492	1,493	4,945	0.07	10.29	51.45	75.46	104.44	104.51	346.15
5. Land Class 2, 8%-15% slope, Badlands	ha	119	596	874	1,201	1,202	3,992	3.05	362.95	1,817.80	2,665.70	3,663.05	3,666.10	12,175.60
6. Land Class 3, 15%-30% slope, Cultivated	ha	325	1,627	2,386	3,280	3,280	10,898	3.74	1,215.50	6,084.98	8,923.64	12,267.20	12,267.20	40,758.52
7. Land Class 3, 15%-30% slope, Grazing	ha	128	639	937	1,288	1,288	4,280	0.19	24.32	121.41	178.03	244.72	244.72	813.20
8. Land Class 3, 15%-30% slope, Badlands	ha	37	187	274	376	377	1,251	3.50	129.50	654.50	959.00	1,316.00	1,319.50	4,378.50
9. Land Class 4, 30%-60% slope, Cultivated	ha	-	45	55	75	75	250	12.50	-	562.50	687.50	937.50	937.50	3,125.00
10. Land Class 4, 30%-60% slope, Grazing	ha	35	174	255	350	350	1,164	0.55	19.25	95.70	140.25	192.50	192.50	640.20
11. Land Class 4, 30%-60% slope, Badlands	ha	-	19	23	32	33	107	3.50	-	66.50	80.50	112.00	115.50	374.50
12. Land Class 4, 30%-60% slope, Forestry	ha	-	55	67	91	92	305	3.50	-	192.50	234.50	318.50	322.00	1,067.50
13. Land Class 5, > 60% slope, Cultivated/Grazing/Degraded	ha	-	18	22	30	30	100	4.36	-	78.48	95.92	130.80	130.80	436.00
14. Other Works - Gully Reshaping	ha	14	68	99	135	136	452	5.11	71.54	347.48	505.89	689.85	694.96	2,309.72
15. Other Works - Stone Checkdams	ha	12	59	86	116	117	390	17.28	207.36	1,019.52	1,486.08	2,004.48	2,021.76	6,739.20
<b>Subtotal Soil and Water Conservation Works</b>									3,121.37	16,501.38	23,960.87	32,877.67	32,914.83	109,376.12
<b>B. Water Supply and Sanitation</b>														
Roof Water Harvesting	units	29	112	138	138	139	556	8.97	260.13	1,004.64	1,237.86	1,237.86	1,246.83	4,987.32
Low cost microponds	units	29	112	138	138	139	556	2.88	83.52	322.56	397.44	397.44	400.32	1,601.28
Hand pumping wells	units	7	27	34	34	34	136	30.00	210.00	810.00	1,020.00	1,020.00	1,020.00	4,080.00
Spring Development	unit	33	132	164	164	164	657	10.87	358.71	1,434.84	1,782.68	1,782.68	1,782.68	7,141.59
Improved Sanitation	unit	14	33	39	40	40	166	45.00	630.00	1,485.00	1,755.00	1,800.00	1,800.00	7,470.00
<b>Subtotal Water Supply and Sanitation</b>									1,542.36	5,057.04	6,192.98	6,237.98	6,249.83	25,280.19
<b>C. Irrigation</b>														
Small scale irrigation	unit for 5 ha	11	45	55	56	56	223	20.96	230.56	943.20	1,152.80	1,173.76	1,173.76	4,674.08
Pumped irrigation	unit for 2 ha	9	36	44	45	45	179	20.03	180.27	721.08	881.32	901.35	901.35	3,585.37
<b>Subtotal Irrigation</b>									410.83	1,664.28	2,034.12	2,075.11	2,075.11	8,259.45
<b>Total Investment Costs</b>									5,074.56	23,222.70	32,187.97	41,190.76	41,239.77	142,915.76
<b>II. Recurrent Costs</b>														
<b>A. MOM Costs Soil and Water Conservation</b>														
1. Land Class 1, < 8% slope, Cultivated	ha	-	788	4,726	10,501	18,440	34,455	0.02	-	18.20	109.17	242.57	425.96	795.91
2. Land Class 1, < 8% slope, Grazing	ha	-	278	1,666	3,702	6,500	12,146	-	-	0.42	2.50	5.55	9.75	18.22
3. Land Class 2, 8%-15% slope, Cultivated	ha	-	400	2,406	5,345	9,383	17,534	0.03	-	13.80	83.01	184.40	323.71	604.92
4. Land Class 2, 8%-15% slope, Grazing	ha	-	147	882	1,960	3,452	6,441	-	-	0.31	1.85	4.12	7.25	13.53
5. Land Class 2, 8%-15% slope, Badlands	ha	-	119	715	1,589	2,790	5,213	0.92	-	108.89	654.23	1,453.94	2,552.85	4,769.90
6. Land Class 3, 15%-30% slope, Cultivated	ha	-	325	1,952	4,338	7,618	14,233	0.11	-	36.47	219.01	486.72	854.74	1,596.94
7. Land Class 3, 15%-30% slope, Grazing	ha	-	128	767	1,704	2,992	5,591	0.01	-	0.73	4.37	9.71	17.05	31.87
8. Class 3, 15%-30% slope, Badlands	ha	-	37	224	498	874	1,633	0.11	-	3.89	23.52	52.29	91.77	171.47
9. Land Class 4, 30%-60% slope, Cultivated	ha	-	-	45	100	175	320	0.38	-	-	16.88	37.50	65.63	120.00
10. Land Class 4, 30%-60% slope, Grazing	ha	-	35	209	464	814	1,522	0.02	-	0.58	3.45	7.66	13.43	25.11
11. Land Class 4, 30%-60% slope, Badlands	ha	-	-	19	42	74	135	0.11	-	-	2.00	4.41	7.77	14.18
12. Land Class 4, 30%-60% slope, Forestry	ha	-	-	55	122	213	390	0.11	-	-	5.78	12.81	22.37	40.95
13. Land Class 5, > 60% slope, Cultivated/Grazing/Degraded	ha	-	-	18	40	70	128	0.13	-	-	2.35	5.23	9.16	16.74
14. Other Works - Gully Reshaping	ha	-	14	82	181	316	593	0.15	-	2.15	12.57	27.75	48.44	90.91
15. Other Works - Stone Checkdams	km	-	12	71	157	273	513	0.52	-	6.22	36.81	81.39	141.52	265.94
<b>Subtotal MOM Costs Soil and Water Conservation</b>									-	191.64	1,177.49	2,616.05	4,591.40	8,576.58
<b>B. Water Supply and Sanitation</b>														
Roof Water Harvesting O&M	unit pa	-	29	141	279	417	866	0.27	-	7.70	37.44	74.07	110.71	229.92
Low cost micropond O&M	unit pa	-	29	141	279	417	866	0.09	-	2.51	12.18	24.11	36.03	74.82
Hand pump well O&M	unit pa	-	7	34	68	102	211	0.90	-	6.30	30.60	61.20	91.80	189.90
Spring Development O&M	unit pa	-	33	165	329	493	1,020	0.33	-	10.76	53.81	107.29	160.77	332.62
Improved Sanitation O&M	unit pa	-	14	47	86	126	273	1.35	-	18.90	63.45	116.10	170.10	368.55
<b>Subtotal Water Supply and Sanitation</b>									-	46.17	197.47	382.77	569.41	1,195.82
<b>C. Irrigation O&amp;M</b>														
Small scale irrigation O&M	unit pa	-	11	56	111	167	345	0.63	-	6.93	35.28	69.93	105.21	217.35
Pumped Irrigation O&M	unit pa	-	9	45	89	134	277	1.60	-	14.40	72.00	142.40	214.40	443.20
<b>Total Recurrent Costs</b>									-	259.13	1,482.24	3,211.15	5,480.42	10,432.94
<b>Total</b>									5,074.56	23,481.83	33,670.21	44,401.91	46,720.19	153,348.70

Integrated Watershed Management (Ethiopia) Watershed Project,  
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Ethiopia  
Integrated Watershed Management (Ethiopia)  
Sub-Watershed Project of Fast Track Projects  
of Eastern Nile Subsidiary Action Programme  
Table 3. Crop Production  
Detailed Costs

Unit	Quantities						Unit Cost (Birr '000)	Base Cost (Birr '000)						
	08/09	09/10	10/11	11/12	12/13	Total		08/09	09/10	10/11	11/12	12/13	Total	
<b>I. Investment Costs</b>														
<b>A. Farmer Training Centres</b>														
Classroom Furniture and Equipment	per FTC	11	24	-	-	-	35	13.34	146.74	320.16	-	-	-	466.90
FTC Audio Visual Equipment	per FTC	11	24	-	-	-	35	21.40	235.40	513.60	-	-	-	749.00
<b>Subtotal Farmer Training Centres</b>									382.14	833.76	-	-	-	1,215.90
<b>B. Demonstrations</b>														
Demonstrations Crop Production and Profitability	per demo	60	120	120	120	-	420	5.00	300.00	600.00	600.00	600.00	-	2,100.00
Demonstrations High Value Crops	per demo	15	30	30	30	-	105	6.00	90.00	180.00	180.00	180.00	-	630.00
<b>Subtotal Demonstrations</b>									390.00	780.00	780.00	780.00	-	2,730.00
<b>C. DA Crop production</b>														
DA Crops Office Furniture and Equipment /d	per kebele	11	24	-	-	-	35	6.52	71.72	156.48	-	-	-	228.20
DA Crops Tools and Field Equipment	per kebele	11	24	-	-	-	35	4.58	50.33	109.80	-	-	-	160.13
DA Crops Transport	per kebele	11	24	-	-	-	35	40.00	440.00	960.00	-	-	-	1,400.00
<b>Subtotal DA Crop production</b>									562.05	1,226.28	-	-	-	1,788.33
<b>Total Investment Costs</b>									1,334.19	2,840.04	780.00	780.00	-	5,734.23
<b>II. Recurrent Costs</b>														
<b>A. Demonstrations</b>														
Demonstrations: Crop Production and Profitability O&M	per demo	-	60	180	300	420	960	0.50	-	30.00	90.00	150.00	210.00	480.00
Demonstrations: High Value Crops O&M	per demo	-	15	45	75	105	240	0.60	-	9.00	27.00	45.00	63.00	144.00
<b>Subtotal Demonstrations</b>									-	39.00	117.00	195.00	273.00	624.00
<b>B. DA Crops</b>														
DA Crops Office Running Costs	per kebele	11	35	35	35	35	151	1.00	11.00	35.00	35.00	35.00	35.00	151.00
DA Crops Transport O&M	per kebele	11	35	35	35	35	151	5.00	55.00	175.00	175.00	175.00	175.00	755.00
<b>Total Recurrent Costs</b>									66.00	249.00	327.00	405.00	483.00	1,530.00
<b>Total</b>									1,400.19	3,089.04	1,107.00	1,185.00	483.00	7,264.23

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Table 4. Livestock Production

Detailed Costs

	Unit	Quantities					Total	Unit Cost (Birr '000)	Base Cost (Birr '000)					Total
		08/09	09/10	10/11	11/12	12/13			08/09	09/10	10/11	11/12	12/13	
<b>I. Investment Costs</b>														
<b>A. Animal Health Posts</b>														
AHP Building and Kraal Construction	unit	5	1	4	1	-	11	106.20	531.00	106.20	424.80	106.20	-	1,168.20
AHP Office Furniture	unit	5	1	4	1	-	11	1.13	5.65	1.13	4.52	1.13	-	12.43
AHP Tools and Equipment	unit	5	1	4	1	-	11	27.11	135.57	27.11	108.45	27.11	-	298.24
AHP Demonstration Equipment	unit	5	1	4	1	-	11	20.00	100.00	20.00	80.00	20.00	-	220.00
AHP Training Courses for Farmers	event	-	20	24	40	44	128	8.65	-	173.00	207.60	346.00	380.60	1,107.20
<b>Subtotal Animal Health Posts</b>									772.22	327.44	825.37	500.44	380.60	2,806.07
<b>B. Feed Supply</b>														
Improvement of communal pasture	2 ha pasture units	5	5	5	4	-	19	2.75	13.75	13.75	13.75	11.00	-	52.25
Forage Nursery Establishment	unit	5	5	5	4	-	19	31.07	155.35	155.35	155.35	124.28	-	590.33
Forage Nursery Equipment	unit	5	5	4	1	-	15	2.75	13.75	13.75	11.00	2.75	-	41.25
Pasture and forage demonstrations	event	-	20	40	60	76	196	8.65	-	173.00	346.00	519.00	657.40	1,695.40
<b>Subtotal Feed Supply</b>									182.85	355.85	526.10	657.03	657.40	2,379.23
<b>C. Dairy Production</b>														
AI Delivery System	unit	3	3	3	3	-	12	30.00	90.00	90.00	90.00	90.00	-	360.00
Liquid nitrogen, semen and equipment	unit	3	3	3	3	-	12	11.84	35.52	35.52	35.52	35.52	-	142.08
Dairy production demonstrations	event	-	6	12	18	24	60	8.65	-	51.90	103.80	155.70	207.60	519.00
<b>Subtotal Dairy Production</b>									125.52	177.42	229.32	281.22	207.60	1,021.08
<b>D. Dairy processing</b>														
Dairy processing Centre	unit	1	-	2	-	-	3	48.00	48.00	-	96.00	-	-	144.00
Dairy processing equipment	unit	1	-	2	-	-	3	52.52	52.52	-	105.04	-	-	157.56
Dairy Processing Demonstrations	event	-	4	4	12	12	32	8.65	-	34.60	34.60	103.80	103.80	276.80
<b>Subtotal Dairy processing</b>									100.52	34.60	235.64	103.80	103.80	578.36
<b>E. Sheep Demonstrations</b>														
Sheep breeding stock	unit	-	3	3	3	3	12	7.00	-	21.00	21.00	21.00	21.00	84.00
Sheep demonstration equipment	unit	-	3	3	3	3	12	34.30	-	102.90	102.90	102.90	102.90	411.60
Sheep demonstrations	event	-	4	8	12	16	40	8.65	-	34.60	69.20	103.80	138.40	346.00
<b>Subtotal Sheep Demonstrations</b>									-	158.50	193.10	227.70	262.30	841.60
<b>F. Poultry and Beekeeping</b>														
Poultry demonstration breeding stock	unit	5	5	5	5	-	20	10.00	50.00	50.00	50.00	50.00	-	200.00
Poultry demonstration housing	unit	5	5	5	5	-	20	40.00	200.00	200.00	200.00	200.00	-	800.00
Poultry and beekeeping demonstrations	event	-	8	16	24	32	80	8.65	-	69.20	138.40	207.60	276.80	692.00
<b>Subtotal Poultry and Beekeeping</b>									250.00	319.20	388.40	457.60	276.80	1,692.00
<b>G. Animal Fattening</b>														
Breeding Stock Large ruminants	per demo	5	5	5	5	-	20	60.00	300.00	300.00	300.00	300.00	-	1,200.00
Breeding stock small ruminants	per demo	5	5	5	5	-	20	12.00	60.00	60.00	60.00	60.00	-	240.00
Fattening demonstrations	event	-	4	8	12	16	40	8.65	-	34.60	69.20	103.80	138.40	346.00
<b>Subtotal Animal Fattening</b>									360.00	394.60	429.20	463.80	138.40	1,786.00
<b>H. DA Livestock</b>														
DA Livestock Office Furniture and Equipment /m	per kebele	11	24	-	-	-	35	6.52	71.72	156.48	-	-	-	228.20
DA Livestock Tools and Field Equipment /n	per kebele	11	24	-	-	-	35	4.58	50.33	109.80	-	-	-	160.13
DA Livestock Transport /o	per kebele	11	24	-	-	-	35	40.00	440.00	960.00	-	-	-	1,400.00
<b>Subtotal DA Livestock</b>									582.05	1,226.28	-	-	-	1,788.33
<b>Total Investment Costs</b>									2,353.15	2,993.89	2,827.13	2,691.59	2,026.90	12,892.67
<b>II. Recurrent Costs</b>														
<b>A. Animal Health Centre</b>														
Drugs and Chemicals	per AHP	-	5	6	10	11	32	27.11	-	135.57	162.68	271.13	298.24	867.62
AHP Office Running Costs	per AHP	-	5	6	10	11	32	1.50	-	7.50	9.00	15.00	16.50	48.00
<b>Subtotal Animal Health Centre</b>									-	143.07	171.68	286.13	314.74	915.62
<b>B. Feed Supply</b>														
Communal Pasture Maintenance	2 ha pasture units	-	5	10	15	19	49	0.28	-	1.38	2.75	4.13	5.23	13.48
Forage Nursery Running Costs	per nursery	-	5	10	15	19	49	4.60	-	23.00	46.00	69.00	87.40	225.40
Forage Cultivation O&M	per nursery	-	5	10	15	19	49	4.60	-	23.00	46.00	69.00	87.40	225.40
<b>Subtotal Feed Supply</b>									-	47.38	94.75	142.13	180.03	464.28
<b>C. Dairy Production</b>														
Dairy Production administration	unit	-	3	6	9	12	30	0.92	-	2.75	5.50	8.24	10.99	27.48
<b>D. Dairy Processing</b>														
Dairy Processing Administration	unit	-	1	1	3	3	8	1.29	-	1.29	1.29	3.87	3.87	10.32
Dairy Processing Skilled Labour	unit	-	1	1	3	3	8	18.60	-	18.60	18.60	55.80	55.80	148.80
<b>Subtotal Dairy Processing</b>									-	19.89	19.89	59.67	59.67	159.12
<b>E. Poultry</b>														
Feed and Medicines	demo	-	5	10	15	20	50	60.80	-	304.00	608.00	912.00	1,216.00	3,040.00
<b>F. DA Livestock</b>														
DA Livestock Office Running Costs	per kebele	11	35	35	35	35	151	1.00	11.00	35.00	35.00	35.00	35.00	151.00
DA Livestock Transport O&M	per kebele	11	35	35	35	35	151	5.00	55.00	175.00	175.00	175.00	175.00	755.00
<b>Total Recurrent Costs</b>									66.00	727.08	1,109.81	1,618.17	1,991.43	5,512.49
<b>Total</b>									2,419.15	3,720.97	3,936.95	4,309.76	4,018.33	18,405.16



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Table 5. Forestry and Agroforestry  
Detailed Costs

Unit	Quantities					Total	Unit Cost (Birr '000)	Base Cost (Birr '000)					Total		
	08/09	09/10	10/11	11/12	12/13			08/09	09/10	10/11	11/12	12/13			
<b>I. Investment Costs</b>															
<b>A. Agroforestry Demonstrations and Nurseries</b>															
Protection and Harvesting R&D UNits	demos	-	15	25	35	40	115	20.00	-	300.00	500.00	700.00	800.00	2,300.00	
System and Subsystem demonstrations	demos	-	20	40	40	60	160	20.00	-	400.00	800.00	800.00	1,200.00	3,200.00	
Tree Nurseries	nurseries	5	5	5	5	-	20	150.00	750.00	750.00	750.00	750.00	-	3,000.00	
<b>Subtotal Agroforestry Demonstrations and Nurseries</b>										750.00	1,450.00	2,050.00	2,250.00	2,000.00	8,500.00
<b>B. DA Natural Resources</b>															
DA NR Office Furniture and Equipment	per kebele	11	24	-	-	-	35	6.52	71.72	156.48	-	-	-	228.20	
DA NR Tools and Field Equipment	per kebele	11	24	-	-	-	35	4.58	50.33	109.80	-	-	-	160.13	
DA NR Transport	per kebele	11	24	-	-	-	35	40.00	440.00	960.00	-	-	-	1,400.00	
<b>Subtotal DA Natural Resources</b>										562.05	1,226.28	-	-	-	1,788.33
<b>Total Investment Costs</b>										1,312.05	2,676.28	2,050.00	2,250.00	2,000.00	10,288.33
<b>II. Recurrent Costs</b>															
<b>A. Agroforestry Demonstrations and Nurseries</b>															
Protection and Harvesting R&D Units	demo	-	15	40	75	115	245	2.00	-	30.00	80.00	150.00	230.00	490.00	
System and Subsystem Demonstration Units	demo	-	20	60	120	180	380	4.00	-	80.00	240.00	480.00	720.00	1,520.00	
Tree Nurseries O&M	nursery	-	5	10	15	20	50	6.35	-	31.75	63.50	95.25	127.00	317.50	
<b>Subtotal Agroforestry Demonstrations and Nurseries</b>										-	141.75	383.50	725.25	1,077.00	2,327.50
<b>B. DA Natural Resources</b>															
DA NR Office Running Costs	per kebele	11	35	35	35	35	151	1.00	11.00	35.00	35.00	35.00	35.00	151.00	
DA NR Transport O&M	per kebele	11	35	35	35	35	151	5.00	55.00	175.00	175.00	175.00	175.00	755.00	
<b>Total Recurrent Costs</b>										66.00	351.75	593.50	935.25	1,287.00	3,233.50
<b>Total</b>										1,378.05	3,028.03	2,643.50	3,185.25	3,287.00	13,521.83

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Table 6. Community Entry Points: All Catchments

Detailed Costs	Unit	Quantities					Total	Unit Cost	Base Cost (Birr '000)					
		08/09	09/10	10/11	11/12	12/13		(Birr '000)	08/09	09/10	10/11	11/12	12/13	Total
<b>I. Investment Costs</b>														
<b>A. Access and Communications</b>														
Rural Access Roads	km	7	34	47	47	-	135	240.00	1,680.00	8,160.00	11,280.00	11,280.00	-	32,400.00
Internal access paths	km	10	38	48	48	48	192	48.00	480.00	1,824.00	2,304.00	2,304.00	2,304.00	9,216.00
Footbridges	unit	12	46	58	58	58	232	36.00	432.00	1,656.00	2,088.00	2,088.00	2,088.00	8,352.00
Telephone Post	unit	2	7	8	9	9	35	10.00	20.00	70.00	80.00	90.00	90.00	350.00
<b>Subtotal Access and Communications</b>									<b>2,612.00</b>	<b>11,710.00</b>	<b>15,752.00</b>	<b>15,762.00</b>	<b>4,482.00</b>	<b>50,318.00</b>
B. Renovation of Public Buildings	kebele	2	7	8	9	9	35	25.00	50.00	175.00	200.00	225.00	225.00	875.00
<b>Total Investment Costs</b>									<b>2,662.00</b>	<b>11,885.00</b>	<b>15,952.00</b>	<b>15,987.00</b>	<b>4,707.00</b>	<b>51,193.00</b>
<b>II. Recurrent Costs</b>														
<b>A. Access and Communications</b>														
Internal access paths O&M	km pa	-	10	48	96	192	346	1.44	-	14.40	69.12	138.24	276.48	498.24
Footbridges O&M	unit pa	-	12	58	116	174	360	2.16	-	25.92	125.28	250.56	375.84	777.60
External feeder access roads O&M	km pa	-	7	41	88	135	271	7.20	-	50.40	295.20	633.60	972.00	1,951.20
Telephone post O&M	unit pa	-	2	9	17	26	54	0.30	-	0.60	2.70	5.10	7.80	16.20
<b>Total Recurrent Costs</b>									<b>-</b>	<b>91.32</b>	<b>492.30</b>	<b>1,027.50</b>	<b>1,632.12</b>	<b>3,243.24</b>
<b>Total</b>									<b>2,662.00</b>	<b>11,976.32</b>	<b>16,444.30</b>	<b>17,014.50</b>	<b>6,339.12</b>	<b>54,436.24</b>

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Table 7. Non Farm Income Generation All Catchme  
**Detailed Costs**

	Unit	Quantities					Total	Unit Cost (Birr '000)	Base Cost (Birr '000)					Total
		08/09	09/10	10/11	11/12	12/13			08/09	09/10	10/11	11/12	12/13	
<b>I. Investment Costs</b>														
<b>A. Flour Mills</b>														
Flour mills and housing	unit	2	7	8	9	9	35	40.00	80.00	280.00	320.00	360.00	360.00	1,400.00
Flour mill engine	unit	2	7	8	9	9	35	10.00	20.00	70.00	80.00	90.00	90.00	350.00
<b>Subtotal Flour Mills</b>									100.00	350.00	400.00	450.00	450.00	1,750.00
B. Technology and Innovation Fund	unit	0.1	0.2	0.2	0.25	0.25	1	1,250.00	125.00	250.00	250.00	312.50	312.50	1,250.00
C. Micro-credit Facility	lump sum	1	0.5	-	-	-	1.5	12,000.00	12,000.00	6,000.00	-	-	-	18,000.00
<b>Total Investment Costs</b>									12,225.00	6,600.00	650.00	762.50	762.50	21,000.00
<b>II. Recurrent Costs</b>														
A. Grinding Mill O&M	per mill	-	2	9	17	26	54	1.20	-	2.40	10.80	20.40	31.20	64.80
<b>Total Recurrent Costs</b>									-	2.40	10.80	20.40	31.20	64.80
<b>Total</b>									12,225.00	6,602.40	660.80	782.90	793.70	21,064.80

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Table 1. Capacity Development and Project Management  
**Detailed Costs**

	Unit	Quantities					Total	Unit Cost (Birr '000)	Base Cost (Birr '000)					Total
		08/09	09/10	10/11	11/12	12/13			08/09	09/10	10/11	11/12	12/13	
<b>I. Investment Costs</b>														
<b>A. PCO Office</b>														
PCO Office Furniture	lump sum	1	-	-	-	-	1	58.50	58.50	-	-	-	-	58.50
PCO Office Equipment	lump sum	1	-	-	-	-	1	249.10	249.10	-	-	-	-	249.10
PCO 4WD saloon	unit	1	-	-	-	-	1	800.00	800.00	-	-	-	-	800.00
PCO Double cab pick up	unit	3	-	-	-	-	3	450.00	1,350.00	-	-	-	-	1,350.00
<b>Subtotal PCO Office</b>									2,457.60					2,457.60
<b>B. Consultancy</b>														
National long term staff	staff months	108	108	108	108	108	540	12.83	1,385.64	1,385.64	1,385.64	1,385.64	1,385.64	6,928.20
National consultancy (short term)	staff months	30	30	30	30	30	150	14.48	434.40	434.40	434.40	434.40	434.40	2,172.00
International consultancy (short term)	staff months	2	2	-	-	-	4	231.00	462.00	462.00	-	-	-	924.00
<b>Subtotal Consultancy</b>									2,282.04	2,282.04	1,820.04	1,820.04	1,820.04	10,024.20
<b>C. Government Salaries and Allowances</b>														
SMS Subsistence	days	450	450	900	900	900	3,600	0.07	31.50	31.50	63.00	63.00	63.00	252.00
DA Subsistence	days	1,575	1,575	1,575	1,575	1,575	7,875	0.05	78.75	78.75	78.75	78.75	78.75	393.75
Ministry staff expenses and per diems	days	70	70	70	70	70	350	0.86	60.20	60.20	60.20	60.20	60.20	301.00
<b>Subtotal Government Salaries and Allowances</b>									170.45	170.45	201.95	201.95	201.95	946.75
<b>D. Training</b>														
Training of kebele staff	lump sum	0.3	0.3	0.3	0.1	-	1	367.50	110.25	110.25	110.25	36.75	-	367.50
Training of WWT and SMS	lump sum	0.25	0.1875	0.1875	0.1875	0.1875	1	1,089.00	272.25	204.19	204.19	204.19	204.19	1,089.00
Training of DA	lump sum	0.3	0.3	0.3	0.1	-	1	1,182.30	354.69	354.69	354.69	118.23	-	1,182.30
Training of Local Contractors	lump sum	0.3	0.3	0.3	0.1	-	1	192.00	57.60	57.60	57.60	19.20	-	192.00
Training of User Groups	lump sum	0.3	0.3	0.3	0.1	-	1	1,225.00	367.50	367.50	367.50	122.50	-	1,225.00
Training of Health Extension Workers	lump sum	0.3	0.3	0.3	0.1	-	1	49.00	14.70	14.70	14.70	4.90	-	49.00
<b>Subtotal Training</b>									1,176.99	1,108.93	1,108.93	505.77	204.19	4,104.80
E. Monitoring and Evaluation	lump sum	0.2	0.2	0.2	0.2	0.2	1	3,500.00	700.00	700.00	700.00	700.00	700.00	3,500.00
<b>F. Woreda Offices</b>														
Woreda Office	offices	3	-	-	-	-	3	400.00	1,200.00	-	-	-	-	1,200.00
Woreda Office Furniture	per office	3	-	-	-	-	3	47.10	141.30	-	-	-	-	141.30
Woreda Office Equipment	per office	3	-	-	-	-	3	237.90	713.70	-	-	-	-	713.70
Woreda 4WD Vehicle	vehicles	4	2	-	-	-	6	450.00	1,800.00	900.00	-	-	-	2,700.00
Woreda Motorbikes	motorbikes	20	13	-	-	-	33	40.00	800.00	520.00	-	-	-	1,320.00
Woreda Guesthouse	guesthouses	3	2	-	-	-	5	220.00	660.00	440.00	-	-	-	1,100.00
<b>Subtotal Woreda Offices</b>									5,315.00	1,860.00	-	-	-	7,175.00
<b>G. Woreda Watershed Planning Staff</b>														
Woreda Project Coordinator	staff months	36	36	36	36	36	180	13.86	498.96	498.96	498.96	498.96	498.96	2,494.80
Finance Officer	staff months	36	36	36	36	36	180	13.86	498.96	498.96	498.96	498.96	498.96	2,494.80
Accountant	staff months	24	24	24	24	24	120	9.24	221.76	221.76	221.76	221.76	221.76	1,108.80
Office Manager	staff months	36	36	36	36	36	180	7.39	266.11	266.11	266.11	266.11	266.11	1,330.56
Office Support Staff	staff months	60	60	60	60	60	300	4.62	277.20	277.20	277.20	277.20	277.20	1,386.00
Soil and Water Specialist	staff months	72	72	72	72	72	360	9.24	665.28	665.28	665.28	665.28	665.28	3,326.40
Agronomist	staff months	36	36	36	36	36	180	9.24	332.64	332.64	332.64	332.64	332.64	1,663.20
Livestock Expert	staff months	36	36	36	36	36	180	9.24	332.64	332.64	332.64	332.64	332.64	1,663.20
Water Harvesting and Irrigation Expert	staff months	36	36	36	36	36	180	9.24	332.64	332.64	332.64	332.64	332.64	1,663.20
Socio economics and Gender Specialist	staff months	36	36	36	36	36	180	9.24	332.64	332.64	332.64	332.64	332.64	1,663.20
Community Mobilisers	staff months	120	240	240	240	240	1,080	8.32	997.92	1,995.84	1,995.84	1,995.84	1,995.84	8,981.28
<b>Subtotal Woreda Watershed Planning Staff</b>									4,756.75	5,754.67	5,754.67	5,754.67	5,754.67	27,775.44
<b>Total Investment Costs</b>									16,858.83	11,876.09	9,585.59	8,982.43	8,680.85	55,983.79
<b>II. Recurrent Costs</b>														
<b>A. PCO Office</b>														
PCO support staff	months	96	96	96	96	96	480	0.80	76.80	76.80	76.80	76.80	76.80	384.00
PCO Office Running Cost	per annum	1	1	1	1	1	5	50.00	50.00	50.00	50.00	50.00	50.00	250.00
PCO Office Rent	per annum	1	1	1	1	1	5	180.00	180.00	180.00	180.00	180.00	180.00	900.00
PCO Office Transport	per annum	4	6	8	10	11	39	20.00	80.00	120.00	160.00	200.00	220.00	780.00
<b>Subtotal PCO Office</b>									386.80	426.80	466.80	506.80	526.80	2,314.00
<b>B. Woreda Offices</b>														
1. Woreda Guesthouse Running Costs	per annum	3	5	5	5	5	23	25.00	75.00	125.00	125.00	125.00	125.00	575.00
2. Woreda 4WD O&M	per annum	4	9	12	15	16.5	56.5	20.00	80.00	180.00	240.00	300.00	330.00	1,130.00
3. Woreda Motorbikes O&M	per annum	20	49.5	66	82.5	90.75	308.75	5.00	100.00	247.50	330.00	412.50	453.75	1,543.75
4. Woreda Office Running Cost	per annum	4	4	4	4	4	20	30.00	120.00	120.00	120.00	120.00	120.00	600.00
<b>Subtotal Woreda Offices</b>									375.00	672.50	815.00	957.50	1,028.75	3,843.75
<b>Total Recurrent Costs</b>									761.80	1,099.30	1,281.80	1,464.30	1,555.55	6,162.75
<b>Total</b>									17,620.63	12,975.39	10,867.39	10,446.73	10,236.40	62,146.54

**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Projects  
Detailed Project Preparation

**Project Implementation Plan**

Annex D: Financial and Economic Analysis

December 2007

**Halcrow Group Limited**

in association with  
Metaferia Consulting Engineers

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# 1 Project Benefits

The main economic benefits of the proposed integrated watershed management project are expected to be: (i) increased crop production and improved livestock productivity, (ii) expansion of agricultural surpluses and higher farm household incomes; (iii) enhanced sustainability of future agricultural development due to mitigation of land degradation and improved soil fertility; (iv) greater fuel wood production; (v) increased off-farm income primarily due to the expansion of agricultural processing and marketing, and (vi) enhanced capital resources resulting from improved economic and social infrastructure (e.g. rural access roads/paths, water supply and sanitation as well as health and education facilities).

Increased crop production will be primarily derived from improved crop productivity as cultivated land within the project area, which is currently estimated at approximately 43,525 hectares (or 54% of the total project area), is not expected to expand in the future. However, a small increase in the cropping intensity from 100% to 105% (due to the expansion of irrigated land for horticultural crops) is envisaged. However, under the proposed project (i.e. with limited hillside terracing and forestry on very steep slopes), the cultivated area is expected to decline by 0.25% per annum in the future with project situation and by 0.5% per annum in the future without project situation.

In the future with project situation, it is anticipated that the cropping patterns will still be dominated by the production of cereal crops (e.g. teff, wheat, barley, maize and millet) which currently account for 78% of the cultivated area. However, significant increases in the yields of these staple foods will be critical to meeting household food requirements as well as growing market demand. Furthermore, under the crop diversification programme, the project will promote the production of potatoes, vegetables and temperate fruits. An expansion of the area of pulses (as part of the crop rotation) will also play an important role in enhancing soil fertility.

As a consequence of project interventions, the annual production of cereal, pulse and oilseed crops is expected to increase by 42% from 58,316 tons to 82,589 tons. In addition, there will also be substantial increases in the production of potatoes, vegetables and fruit crops. The expected increases in the level of production for the various crops grown in the watershed are summarised in Table 1.1.

Livestock productivity is also expected to increase significantly. At present, livestock productivity is extremely low with average milk yields of about 400 litres/cow/annum and egg production at around 60 eggs/hen/annum. Similarly, the rates of live weight gain for beef and sheep/goats are also low. In the future with project situation, increases in livestock productivity will principally arise from the adoption of better livestock husbandry, particularly with respect to nutrition and animal health. In the analysis, it has been assumed that the annual milk yield will increase by 800 litres/cow (from 400 to 1,200 litres/cow) as a result of the adoption of improved husbandry practices by about 50% of 36,000 beneficiary households. Similarly, egg production is also expected to rise by 140 eggs/hen/annum (from 60 to 200 eggs/hen/annum) for about 50% of the households. The live weight gain of beef cattle and sheep/goats reared for fattening purposes will also increase with better nutrition.

**Table 1.1: Annual Crop Production in the Project Area**

Crop	Annual Crop Production (tons)		
	Present	Future With Project	Increment
Teff	11,102	16,059	4,957
Wheat	9,814	14,071	4,257
Barley	6,237	9,121	2,884
Maize	18,424	25,149	6,725
Millet	8,011	6,821	-1,190
Pulses	2,285	6,604	4,319
Oilseeds	2,443	4,764	2,321
Potatoes	16,935	27,832	10,897
Vegetables	2,612	11,458	8,846
Temperate Fruit	0	3,183	3,183
<b>Total</b>	<b>77,862</b>	<b>125,062</b>	<b>47,199</b>

Source: Consultant's estimates.

An assessment of the economic benefits of the forestry component has also been made which primarily comprises the additional value of fuel wood and poles for construction resulting from agro-forestry (homestead plantations) as well as from conservation forestry interventions implemented under the project.

It should also be noted that the increase in income and employment opportunities resulting from an expansion of processing, transport, storage and marketing of crop and livestock products has not been included in the analysis. However, these secondary benefits will make a notable contribution to the economic development of the project area.

With respect to public infrastructure, the benefits of improved rural access roads, footpaths and footbridges, as well as water supply/sanitation (WSS), health and education facilities, have not been quantified. It is, however, implicit in the analysis that these improvements to rural infrastructure are critical to achieving the direct economic benefits generated by the sustainable development of crop, livestock and forestry production within the project area. For example, improved access roads will be essential for the marketing of the additional agricultural surpluses generated by the project, while improved WSS facilities will significantly enhance human health and labour availability.



## 2 Financial Analysis

Financial analysis was undertaken to determine the likely impact of project interventions on net household income as well as to assess whether the financial benefits are sufficiently attractive to encourage the full participation of farmers in project interventions and subsequent maintenance activities.

### 2.1 Crop Gross Margins

Crop budgets were prepared for ten crops, namely: teff, wheat, barley, maize, millet, pulses, oilseeds, potatoes, vegetables and temperate fruits. Information on present crop yields, input use (i.e. seeds, manure, chemical fertilisers and pesticides), as well as output and input prices were collected for farmers during the PRA surveys. Information was also collected from local agricultural offices and other secondary sources. The average crop yields used in the analysis for the present, future without (FWO) and the future with (FW) project situations are given in Table 2.1 and it can be seen that the current yields of major crops are low.

**Table 2.1: Crop Yields in Present, Future Without and With Project (tons/ha)**

Crop	Present	Future Without Project	Future With Project
Teff	1.00	0.90	1.50
Wheat	1.70	1.60	2.50
Barley	1.50	1.40	2.25
Maize	2.50	2.30	3.50
Millet	1.50	1.40	2.25
Pulses	0.80	0.70	1.20
Oilseeds	0.60	0.50	1.20
Potatoes	7.00	7.00	10.00
Vegetables	6.00	6.00	9.00
Temperate Fruit	5.00	5.00	7.50

Source: Field survey (May/June 2007) and consultant's estimates.

In the future with project situation, increases in crop productivity will principally arise from the implementation of appropriate soil/water conservation measures and the adoption of improved agronomic practices. Improved practices would include better land preparation, adoption of improved seed varieties, use of compost/organic manure, introduction of crop rotations, improved weed control, and application of integrated pest management (IPM) techniques.

To achieve higher levels of crop productivity, fertiliser use (both organic and chemical) is expected to rise and there will also be an increase in the application of pesticides. Furthermore, enhanced land preparation techniques, improved weed, disease and pest control, as well as

increased harvesting and post-harvesting activities, would require a notable increase in labour requirements per hectare.

It is envisaged that future yields levels would be fully attained 5 years after project completion. There is, however, still considerable scope for further increases in productivity in the long term and it has therefore been assumed that average crop yields will steadily increase by about 1% per annum due the adoption of new seed varieties and improved cropping practices.

In the FWO project situation, it is anticipated that crop yields will slowly decline as a result of increased land degradation and lower soil fertility. The average crop yields in the FWO project situation, presented in Table 2.1, reflects the expected levels of productivity after 10 years and further gradual falls in crop yield are also anticipated in the long term.

The crop yields, input use and labour requirements were then valued at 2007 farm gate prices in order to derive financial gross margins per hectare for each crop. In the financial analysis, farm gate prices for cereals, pulses, oilseeds, potatoes, vegetables and fruits and were based on the actual prices received by farmers for these commodities within the project area. Fertilizers prices are currently controlled by the government so the present government prices were used in the financial analysis.

The financial crop budgets for the present, FWO and FW project situations are detailed in Appendix D.1: Financial and Economic Crop Budgets, and the gross margins are summarised in Table 2.2. It is evident from this analysis that, at the present levels of crop productivity, average gross margins per hectare for cereals, pulses and oilseeds are low. It is also apparent that the net returns per hectare from potatoes, vegetables and fruit are substantially higher than the returns from other crops. However, it is important to note that the attractive returns from horticultural crops are moderated by the risks associated with large seasonal price fluctuations.

**Table 2.2: Financial Crop Gross Margins (ETB/hectare)**

<b>Crop</b>	<b>Present</b>	<b>Future Without Project</b>	<b>Future With Project</b>
Teff	3,096	2,696	4,515
Wheat	3,367	3,100	4,791
Barley	2,801	2,551	3,745
Maize	3,395	2,742	4,266
Millet	2,389	2,189	3,161
Pulses	1,402	1,102	1,712
Oilseeds	2,665	2,165	3,444
Potatoes	5,163	5,163	8,656
Vegetables	9,521	9,521	13,860
Temperate Fruit	9,229	9,229	14,149

Source: Consultant's estimates based on field survey (May/June 2007)

In the FW project situation, the significant improvements in the net returns for all types of crop reflect the higher levels of productivity which generate incremental returns in excess of the additional production costs.

## 2.2 Cropping Patterns

Cereal crops dominate the present cropping patterns and the cropping intensity is estimated at 100%. In the FW project situation, it is anticipated that the cropping patterns will become more diversified with the expansion of pulses, vegetables and temperate fruits in all the sub-catchments. This will increase the overall cropping intensity to around 105%. Cropping intensity could increase further if more short cycle vegetables are grown, but local market demand places a constraint on the expansion of horticultural crops in the short to medium term, so only modest increases can reasonably be expected. For each sub-catchment, the cropping patterns used in the financial and economic analysis for the present, FWO and FW project situations are presented in Table 2.3.

**Table 2.3: Cropping Patterns: Present, Future Without and Future With Project**

Crop	Present and Future Without Project (% Cultivated Area)			Future With Project (% Cultivated Area)		
	Jema	Gumera	Ribb	Jema	Gumera	Ribb
Teff	13%	30%	33%	13%	30%	32%
Wheat	5%	15%	20%	5%	15%	20%
Barley	8%	7%	15%	8%	7%	15%
Maize	30%	13%	8%	30%	13%	8%
Millet	20%	12%	4%	15%	6%	0%
Pulses	9%	3%	9%	15%	10%	15%
Oilseeds	12%	11%	4%	12%	11%	4%
Potatoes	2%	8%	6%	3%	9%	7%
Vegetables	1%	1%	1%	3%	3%	3%
Temperate Fruit	0%	0%	0%	1%	1%	1%
<b>Cropping Intensity</b>	100%	100%	100%	105%	105%	105%

Source: Field survey (May/June 2007) and Consultant's estimates.

## 2.3 Livestock Gross Margins

The livestock component of the project is expected to improve the productivity of different types of livestock enterprises. In the financial analysis, budgets were therefore prepared for four livestock enterprises, namely dairy production, beef fattening, sheep/goat fattening, and poultry (egg) production. In the FW project situation, it was assumed that increases in livestock productivity will result from the adoption of improved nutrition and animal health practices being promoted by the project. It is envisaged that the levels of livestock productivity in the FW project situation would be fully attained 5 years after project completion.

The livestock outputs and inputs were then valued in 2007 farm gate prices in order to derive financial gross margins for each of the enterprises. The financial livestock budgets for the present, FWO and FW project situations are detailed in Appendix D.2: Financial and Economic Livestock Budgets, and the livestock gross margins are summarised in Table 2.4. In the FW project situation, the significant improvements in net returns for all types of livestock reflect the notably higher levels of productivity which generated incremental returns in excess of the additional production costs.

**Table 2.4: Financial Livestock Gross Margins (ETB/enterprise)**

Livestock Enterprise	Present and Future Without Project	Future With Project
Dairy Production (1 cow)	506	1,711
Beef Fattening (1 bullock)	299	426
Sheep/Goat Fattening (3 sheep/goats)	113	170
Egg Production (5 hens)	135	365

Source: Consultant's estimates based on field survey (August/Sept 2007)

During the 5 year project period, it is anticipated that approximately 18,000 households would adopt improved systems of dairy husbandry. In addition, 9,000 households would introduce better beef, sheep and goat fattening practices, and 18,000 households would take up improved poultry management techniques.

## 2.4 Farm Household Budgets and Net Farm Returns

Based on the cropping patterns given in Table 2.3, the crop areas for each farm model were calculated and then applied to the respective financial crop gross margins in order to derive the likely net returns to farmers in the present, FWO and FW project situations. The net returns from the various livestock enterprises were then added to the net crop returns. Following the deduction of fixed costs (e.g. land tax, farm tools and building repairs), net farm returns for each sub-catchment were obtained and these estimates provided an indication of the financial viability of project interventions from the farmers' perspective.

The detailed farm budgets are presented in Appendix D.3: Farm Budgets, and a summary of the net farm returns in the present, FWO and FW project situations is given in Table 2.5 and it is evident that there are likely to be significant increases in net farm returns in all the sub-catchments.

Based on a typical farm with a cropped area of 1.0 hectare, the overall net farm returns are estimated to rise by about ETB 3,255 (from ETB 4,005 to around ETB 7,260 per annum). This increase is very important because the overwhelming majority of rural households depend upon crop and livestock production for their food security as well as household income. Furthermore, the incremental net farm returns far exceed the costs of maintaining the SWC works and other rural infrastructure (estimated at about ETB 200/hectare), so farm households and local communities will have a strong incentive to ensure that the physical works are maintained in a satisfactory manner.

**Table 2.5: Annual Net Farm Returns by Sub-catchment (ETB per farm)**

<b>Sub-catchment</b>	<b>Present</b>	<b>Future Without Project</b>	<b>Future With Project</b>
Jema	3,859	3,450	6,689
Gumera	4,125	3,774	7,287
Ribb	4,043	3,713	7,185
<b>Overall Project</b>	4,005	3,642	7,137

Source: Consultant's estimates

## 3 Economic Analysis

The main objective of the economic analysis was to establish whether proposed investments are justified for the economy as a whole. The need for economic analysis arises principally from the existence of distortions within an economy, which can lead to a divergence between market prices and real resource costs of the economy. In terms of efficient allocation of resources, the prices applied in an economic analysis should therefore reflect the next best alternative use (or opportunity cost) of those resources.

### 3.1 Economic Prices

*Traded Goods:* Economic prices for internationally traded goods (i.e. wheat, maize, pulses, oilseeds and fertilizers) were derived from World Bank commodity price projections for 2010. Prices were converted to 2007 constant prices using the manufactures unit value (MUV) index and were adjusted for insurance, freight, processing, transport and handling to determine economic farm gate prices. Economic prices for pulses and oilseeds were derived on an export parity basis, while the economic prices for wheat and fertilizers were calculated on an import parity basis. The economic price of maize was based on a combination of import and export parity pricing to reflect the current levels of self sufficiency and low level of imports in a normal year (See Appendix D.4: Derivation of Economic Farmgate Prices).

*Non-traded Goods:* Prices for non-internationally traded agricultural goods (e.g. vegetables, fruit, straw etc) and transport costs were based on 2007 prices prevailing in the project area. Financial prices for these goods and services were then converted to economic prices by applying the standard conversion factor (SCF) of 0.90.

*Labour:* Labour on small farms is almost exclusively provided by either family members or exchange labour and, in the economic analysis, the value of farm labour was based on the prevailing wage rates. Labour costs varied according to the type of farm activity but averaged around ETB 10 per day for most farm operations and ETB 12 per day for construction activities. However, given the high levels of unemployment and underemployment in the project area, a shadow wage rate factor of 0.63 was used to determine the economic value of labour.

### 3.2 Capital and Recurrent Costs

The capital costs of the various project components were distributed over a 5 year period in accordance with the proposed implementation schedule. In the derivation of economic costs of the project, import duties and taxes were first omitted from the financial costs, as these are transfer payments within the economy and so are not real resource costs. The standard conversion factor of 0.90 was then applied to the financial costs of local materials, machinery/equipment and skilled labour. The cost of unskilled construction labour was also reduced by applying a shadow wage rate factor of 0.63. The financial cost of foreign goods and services remained unchanged.

These economic conversion factors were then applied to the financial costs (as given in the project cost tables) in order to determine the economic costs. In total, the economic cost of the project (including 10% physical contingencies) was estimated at ETB 266 million. The financial and economic capital costs are detailed in Appendix D.5 and summarised in Table 3.1.

**Table 3.1: Project Economic Costs (ETB '000)**

<b>Project Component</b>	<b>Financial Cost</b>	<b>Economic Cost</b>
Community Entry Points	54,436	42,760
Crop Production	7,264	5,781
Livestock Production	18,405	15,156
Non-farm Income Generation	21,065	2,681
Soil and Water Management	153,349	113,260
Forestry and Agro-forestry	13,522	11,112
Capacity Development and Project Management	62,147	51,240
<b>Base Cost</b>	<b>330,188</b>	<b>241,989</b>
Physical Contingencies (@ 10%)	33,019	24,199
<b>Total Cost</b>	<b>363,207</b>	<b>266,188</b>

The annual recurrent costs for each component were also included in the economic analysis as these costs will have to be incurred if the future benefits of the capital investment are to be sustained. The financial recurrent costs were estimated at ETB 14.6 million per annum. These were converted to economic prices by omitting taxes/duties and other transfer payments and then applying the standard conversion factor (0.90) and the shadow wage rate factor (0.63) to the local costs. In total, economic recurrent costs were estimated at ETB 11.1 million per annum.

### 3.3 Agricultural Benefits

In the estimation of the crop production benefits, economic crop gross margins per hectare were calculated by valuing the physical input and output quantities in terms of their respective economic prices. The economic gross margins for each crop grown are summarised in Table 3.2, and their derivation with respect to crop yields, crop inputs and labour requirements, as well as economic input and output prices, are presented in detail in Appendix D.1: Financial and Economic Crop Budgets.

The economic gross margins per hectare were then multiplied by the crop areas to determine the net crop benefits in the present, FWO and FW project situations (see Appendix D.6: Agricultural Benefits). Similarly, the net livestock benefits were estimated by multiplying the economic gross margins for each enterprise by the number of improved livestock enterprises which will be adopted by farmers during the project period.

The differences between the net crop and livestock benefits in the present, FWO and FW project situations were then calculated in order to determine the economic impact of the project interventions. As a result of improved productivity, net agricultural benefits are estimated to rise by ETB 79.7 million per annum (from ETB 119.0 million to ETB 198.7 million per annum).

Furthermore, the net economic benefits from forestry and agro-forestry development were also added to the economic benefit stream.

**Table 3.2: Economic Crop Gross Margins (ETB/hectare)**

<b>Crop</b>	<b>Present</b>	<b>Future Without Project</b>	<b>Future With Project</b>
Teff	2,398	2,051	3,576
Wheat	3,020	2,772	4,391
Barley	2,457	2,220	3,353
Maize	3,106	2,486	3,998
Millet	1,745	1,578	2,319
Pulses	1,355	1,041	1,704
Oilseeds	2,557	2,053	3,364
Potatoes	3,457	3,457	6,353
Vegetables	6,373	6,373	10,025
Temperate Fruit	6,921	6,921	10,840

Source: Field survey (May/June 2007) and Consultant's estimates.

It is envisaged that FW project agricultural benefit would be fully attained 5 years after project implementation. After achieving the levels of productivity envisaged, it was then assumed that net benefits would increase by 1.0% per year. The potential for intensifying and diversifying agricultural production will be clearly demonstrated by the crop and livestock extension activities. Gradual adoption of these improved methods, supported by expanding domestic markets, will therefore lead to increases in agricultural production and farm income.

### **3.4 Economic Viability**

By deducting the economic capital and recurrent costs from the net benefit stream, an incremental net benefit stream for the project was determined over a 30 year period (in constant 2007 economic prices). The incremental net benefit stream was then used to estimate the economic internal rate of return (EIRR), net present value (NPV) and benefit:cost ratio (B:C ratio). NPVs and B:C ratios were calculated at a discount rate of 10%, which corresponds to the opportunity cost of capital in Ethiopia.

The results of the economic analysis indicate that the EIRR of the project is 20.5% with a net present value (NPV) of ETB 314 million and a B:C ratio of 2.24:1. These results clearly show that the proposed project investment is fully justified on economic grounds.

The detailed tables showing the economic benefit and cost streams used to calculate the EIRRs and NPVs are presented in Appendix D7: Economic Benefit and Cost Streams.



### 3.5 Sensitivity Analysis

Sensitivity analysis was also undertaken to test the economic viability of the proposed interventions to various changes in the cost and benefit streams. In addition to testing the economic viability for variations in input and output prices, the effect on the EIRR from changes to key assumptions (such as crop yields in FW project situation and increases in project costs) were also assessed. The results of the sensitivity analysis, which are shown in Table 3.3, indicate that the project's economic viability is fairly robust to adverse changes in key variables.

**Table 3.3: Sensitivity Analysis**

Scenario		EIRR (%)	NPV (ETB Million)	B:C Ratio
<b>Base Case</b>		<b>20.5</b>	<b>314</b>	<b>2.24</b>
Capital Costs	+20%	18.1	276	1.95
Recurrent Costs	+20%	20.1	302	2.14
Capital and Recurrent Costs	+20%	17.8	264	1.87
Incremental Benefits	-20%	17.2	201	1.79
Costs +20%, Incremental Benefits -20%		14.8	150	1.49
Incremental Benefits delayed by 2 years		16.0	200	1.78
Crop Output Prices	-20%	16.3	175	1.69
With Project Crop Yields	-20%	8.5	-43	0.83

Source: Consultants' estimates.

The project is particularly robust to adverse changes in project costs and still remains viable with increases in capital and recurrent costs of up to 124%. Similarly, with respect to changes in project benefits, incremental benefits would have to reduce by 56% for the project to become uneconomic. The analysis also considered the possibility of a 20% benefit reduction being combined with a 20% increase in costs but, even under this scenario, the project still maintains economic viability.

It should, however, be noted that the project's economic viability is sensitive to not achieving the expected crop yields. For example, a reduction in FW project crop yields of 20% (e.g. wheat yield of 2.0 t/ha rather than the anticipated 2.5 t/ha) reduces the EIRR to 8.5%. This clearly underlines the critical importance of integrating the SWC and rural infrastructure interventions with an extension and training programme to ensure that potential agricultural benefits are fully realised. The project's economic viability is also fairly sensitive to changes in crop prices with a 20% reduction resulting in the EIRR falling to 16.3%.

## 4 Poverty Analysis and Employment Impact

### 4.1 Benefit Distribution and Poverty Impact

A distribution analysis of the costs and benefits was undertaken for the project. Firstly, the present value (PV) of the incremental benefits and project costs were estimated over a 30 year period at a discount rate of 10% (PVs were calculated in both financial and economic prices). The benefits expected to be generated by the project were then distributed between the three main categories of stakeholders, namely farmers, hired labour, and the government/economy. In addition, the differences between the economic and financial present values for the various benefits and costs were also distributed between these stakeholders to reflect the effects of shadow pricing. By adding the net financial gains/losses to the differences between the financial and economic PVs, the net benefits for each stakeholder category were determined. The detailed analysis for each sub-project is given in Appendix D8: Benefit Distribution and Poverty Impact, and summarised in Table 4.1.

With respect to the financial benefits, it can be seen from Table 4.1 that the main beneficiaries of the project interventions will be farmers, but labour used during the construction of soil conservation measures and rural infrastructure will also obtain significant economic benefits. This analysis also shows a significant financial transfer between government and farmers.

The net benefits of the project being gained by poor households were then estimated by applying the percentage of poor living below the poverty line to the overall net benefits within the different stakeholder categories. The results of this poverty analysis indicate that poor farm households will substantially benefit from the project interventions. It can therefore be concluded that the project will make a major contribution to poverty reduction in the project area.

**Table 4.1: Distribution Analysis and Poverty Impact**

Benefit/Cost	Distribution of Project Effects ('000 ETB)			
	Farmers	Hired Labour	Government/Economy	Total
PV Economic – PV Financial	46,153		-131,460	-46,561
Financial Gain/Loss	569,454	38,746	-112,438	457,016
<b>Net Benefits</b>	615,607	38,746	-243,898	410,455
Proportion of Poor (%)	65%	85%	39%	
<b>Net Benefits to Poor</b>	400,144	32,934	-95,120	337,959

### 4.2 Employment Impact

As a consequence of project interventions, farm employment is also expected to increase by 1.82 million days per annum (from 4.44 million days to 6.26 million days). This is equivalent to

7,583 additional full time jobs (at 240 person days per year). The expected increases in the level of farm employment for the various crops and livestock enterprises in the project area are summarized in Table 4.2.

Furthermore, substantial levels of employment will also be generated through the processing, transport and marketing of the incremental agricultural produce from the project area. This secondary employment impact could provide an additional 2,500 full time jobs. In addition, labour will also be required during the construction of the SWC measures and rural infrastructure and this is estimated at a total of approximately 14.0 million days over the 5 year implementation period or 2.8 million days per year (or the equivalent of about 11,665 full time jobs per annum).

**Table 4.2: Farm Employment in the Project Area**

Farm Enterprise	Annual Farm Employment (days)		
	Present	Future With Project	Increment
<b><i>Crop Production</i></b>			
Teff	727,205	922,057	194,852
Wheat	428,630	547,369	118,739
Barley	290,007	377,010	87,002
Maize	694,602	874,839	180,237
Millet	372,501	281,922	-90,578
Pulses	126,365	346,691	220,326
Oilseeds	163,879	226,276	62,396
Potatoes	598,784	821,049	222,265
Vegetables	132,751	448,771	316,019
Temperate Fruit	0	139,511	139,511
<b><i>Sub-total</i></b>	<b>3,534,724</b>	<b>4,985,494</b>	<b>1,450,770</b>
<b><i>Livestock Production</i></b>			
Dairy Cows	666,000	1,026,000	360,000
Beef Cattle	112,500	121,500	9,000
Sheep/Goat	38,250	42,750	4,500
Poultry	90,000	90,000	0
<b><i>Sub-total</i></b>	<b>906,750</b>	<b>1,280,250</b>	<b>373,500</b>
<b>Total</b>	<b>4,441,474</b>	<b>6,265,744</b>	<b>1,824,270</b>

# Appendices

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## **Appendix D.1: Financial and Economic Crop Budgets**

**Financial Crop Budget: TEFF (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Teff <sup>1/</sup>	tonne	1.00	4,000	4,000	0.90	4,000	3,600	1.50	4,000	6,000
Straw <sup>2/</sup>	tonne	1.0	400	400	1.0	400	400	1.25	400	500
<b>Gross Returns</b>				<b>4,400</b>			<b>4,000</b>			<b>6,500</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	50	5.0	250	50	5.0	250	50	8.0	400
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	50	4.0	200
DAP	kg	100	4.3	430	100	4.3	430	100	4.3	430
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				900			900			1,385
<b>Labour <sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	25	0.0	0	25	0.0	0	30	0.0	0
other field tasks	day	8	0.0	0	8	0.0	0	15	0.0	0
harvesting	day	15	0.0	0	14	0.0	0	18	0.0	0
post-harvest tasks	day	10	0.0	0	9	0.0	0	15	0.0	0
sub-total		63		0	61		0	83		0
<b>Draft Oxen</b>										
land preparation	day	10	30.0	300	10	30.0	300	15	30.0	450
transport	quintal	10	3.0	30	10	3.0	30	13	3.0	38
sub-total				330			330			488
Interest on s/t credit	%		6%	74		6%	74		6%	112
<b>Total Variable Costs</b>				<b>1,304</b>			<b>1,304</b>			<b>1,985</b>
<b>GROSS MARGIN</b>				<b>3,096</b>			<b>2,696</b>			<b>4,515</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: WHEAT (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Wheat <sup>1/</sup>	tonne	1.70	2,700	4,590	1.6	2,700	4,320	2.50	2,700	6,750
Straw <sup>2/</sup>	tonne	1.5	250	375	1.5	250	375	2.0	250	500
<b>Gross Returns</b>				<b>4,965</b>			<b>4,695</b>			<b>7,250</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	150	3.4	506	150	3.4	506	150	5.4	810
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	50	4.0	200
DAP	kg	100	4.3	430	100	4.3	430	100	4.3	430
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				1,156			1,156			1,795
<b>Labour<sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	25	0.0	0	25	0.0	0	30	0.0	0
other field tasks	day	8	0.0	0	8	0.0	0	15	0.0	0
harvesting	day	20	0.0	0	19	0.0	0	24	0.0	0
post-harvest tasks	day	12	0.0	0	10	0.0	0	17	0.0	0
sub-total		70		0	67		0	91		0
<b>Draft Oxen</b>										
land preparation	day	10	30.0	300	10	30.0	300	15	30.0	450
transport	quintal	17	3.0	51	16	3.0	48	25	3.0	75
sub-total				351			348			525
Interest on s/t credit	%		6%	90		6%	90		6%	139
<b>Total Variable Costs</b>				<b>1,598</b>			<b>1,595</b>			<b>2,459</b>
<b>GROSS MARGIN</b>				<b>3,367</b>			<b>3,100</b>			<b>4,791</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: BARLEY (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Barley <sup>1/</sup>	tonne	1.5	2,500	3,750	1.40	2,500	3,500	2.25	2,500	5,625
Straw <sup>2/</sup>	tonne	1.5	250	375	1.5	250	375	2.0	250	500
<b>Gross Returns</b>				<b>4,125</b>	<b>3,875</b>			<b>6,125</b>		
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	150	3.1	469	150	3.1	469	150	5.0	750
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	50	4.0	200
DAP	kg	50	4.3	215	50	4.3	215	100	4.3	430
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				904	904			1,735		
<b>Labour <sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	25	0.0	0	25	0.0	0	30	0.0	0
other field tasks	day	8	0.0	0	8	0.0	0	15	0.0	0
harvesting	day	18	0.0	0	17	0.0	0	23	0.0	0
post-harvest tasks	day	10	0.0	0	9	0.0	0	15	0.0	0
sub-total				66	64			88		
<b>Draft Oxen</b>										
land preparation	day	10	30.0	300	10	30.0	300	15	30.0	450
transport	quintal	15	3.0	45	15	3.0	45	20	3.0	60
sub-total				345	345			510		
Interest on s/t credit	%		6%	75		6%	75		6%	135
<b>Total Variable Costs</b>				<b>1,324</b>	<b>1,324</b>			<b>2,380</b>		
<b>GROSS MARGIN</b>				<b>2,801</b>	<b>2,551</b>			<b>3,745</b>		

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of staw for fodder.

<sup>3/</sup> Family and exchange labour.



**Financial Crop Budget: MAIZE (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Maize <sup>1/</sup>	tonne	2.5	1,700	4,250	2.3	1,700	3,910	3.5	1,700	5,950
Stalks <sup>2/</sup>	tonne	2.0	250	500	1.8	100	180	2.5	100	250
<b>Gross Returns</b>				<b>4,750</b>			<b>4,090</b>			<b>6,200</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	25	2.1	53	25	2.1	53	25	3.4	85
Fertiliser										
urea	kg	100	4.0	400	100	4.0	400	100	4.0	400
DAP	kg	100	4.3	430	100	4.3	430	100	4.3	430
manure	tonne	0.0	50.0	0	0.0	50.0	0	5.0	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				903			903			1,270
<b>Labour<sup>3/</sup></b>										
planting	day	5	0.0	0.00	5	0.0	0.00	5	0.0	0.00
weeding	day	30	0.0	0.00	30	0.0	0.00	35	0.0	0.00
other field tasks	day	8	0.0	0.00	8	0.0	0.00	15	0.0	0.00
harvesting	day	25	0.0	0.00	24	0.0	0.00	30	0.0	0.00
post-harvest tasks	day	20	0.0	0.00	18	0.0	0.00	28	0.0	0.00
sub-total		88		0	85		0	113		0
<b>Draft Oxen</b>										
land preparation	day	10	30.0	300	10	30.0	300	15	30.0	450
transport	quintal	25	3.0	75	23	3.0	69	35	3.0	105
sub-total				375			369			555
Interest on s/t credit	%		6%	77		6%	76		6%	110
<b>Total Variable Costs</b>				<b>1,355</b>			<b>1,348</b>			<b>1,935</b>
<b>GROSS MARGIN</b>				<b>3,395</b>			<b>2,742</b>			<b>4,266</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of stalks for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: FINGER MILLET (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Finger Millet <sup>1/</sup>	tonne	1.5	2,000	3,000	1.40	2,000	2,800	2.25	2,000	4,500
Straw <sup>2/</sup>	tonne	1.5	250	375	1.5	250	375	2.0	250	500
<b>Gross Returns</b>				<b>3,375</b>			<b>3,175</b>			<b>5,000</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	60	2.5	150	60	2.5	150	60	4.0	240
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	50	4.0	200
DAP	kg	50	4.3	215	50	4.3	215	100	4.3	430
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				585			585			1,225
<b>Labour <sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	25	0.0	0	25	0.0	0	30	0.0	0
other field tasks	day	8	0.0	0	8	0.0	0	15	0.0	0
harvesting	day	18	0.0	0	17	0.0	0	23	0.0	0
post-harvest tasks	day	10	0.0	0	9	0.0	0	15	0.0	0
sub-total		66		0	64		0	88		0
<b>Draft Oxen</b>										
land preparation	day	10	30.0	300	10	30.0	300	15	30.0	450
transport	quintal	15	3.0	45	15	3.0	45	20	3.0	60
sub-total				345			345			510
Interest on s/t credit	%		6%	56		6%	56		6%	104
<b>Total Variable Costs</b>				<b>986</b>			<b>986</b>			<b>1,839</b>
<b>GROSS MARGIN</b>				<b>2,389</b>			<b>2,189</b>			<b>3,161</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of staw for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: PULSES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Pulses <sup>1/</sup>	tonne	0.8	3,000	2,400	0.7	3,000	2,100	1.2	3,000	3,600
Crop residue <sup>2/</sup>	tonne	0.5	50	25	0.5	50	25	0.8	50	40
<b>Gross Returns</b>				<b>2,425</b>			<b>2,125</b>			<b>3,640</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	200	3.8	750	200	3.8	750	200	6.0	1,200
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.3	0	0	4.3	0	0	4.3	0
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				770			770			1,525
<b>Labour <sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	15	0.0	0	15	0.0	0	20	0.0	0
other field tasks	day	3	0.0	0	3	0.0	0	8	0.0	0
harvesting	day	12	0.0	0	11	0.0	0	16	0.0	0
post-harvest tasks	day	8	0.0	0	7	0.0	0	12	0.0	0
sub-total		43		0	41		0	61		0
<b>Draft Oxen</b>										
land preparation	day	6	30.0	180	6	30.0	180	9	30.0	270
transport	quintal	5	3.0	15	5	3.0	15	8	3.0	24
sub-total				195			195			294
Interest on s/t credit	%		6%	58		6%	58		6%	109
<b>Total Variable Costs</b>				<b>1,023</b>			<b>1,023</b>			<b>1,928</b>
<b>GROSS MARGIN</b>				<b>1,402</b>			<b>1,102</b>			<b>1,712</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: OILSEEDS (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Oilseeds <sup>1/</sup>	tonne	0.6	5,000	3,000	0.50	5,000	2,500	0.9	5,000	4,500
Crop residue <sup>2/</sup>	tonne	0.5	50	25	0.5	50	25	0.8	50	40
<b>Gross Returns</b>				<b>3,025</b>			<b>2,525</b>			<b>4,540</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	20	6.3	125	20	6.3	125	20	10.0	200
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.3	0	0	4.3	0	50	4.3	215
manure	tonne	0	50.0	0	0	50.0	0	5	50.0	250
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
Other inputs	LS	1.0	20.0	20	1.0	20.0	20	1.0	30.0	30
sub-total				145			145			740
<b>Labour <sup>3/</sup></b>										
planting	day	5	0.0	0	5	0.0	0	5	0.0	0
weeding	day	15	0.0	0	15	0.0	0	20	0.0	0
other field tasks	day	3	0.0	0	3	0.0	0	8	0.0	0
harvesting	day	10	0.0	0	9	0.0	0	13	0.0	0
post-harvest tasks	day	6	0.0	0	5	0.0	0	9	0.0	0
sub-total		39		0	37		0	55		0
<b>Draft Oxen</b>										
land preparation	day	6	30.0	180	6	30.0	180	9	30.0	270
transport	quintal	5	3.0	15	5	3.0	15	8	3.0	24
sub-total				195			195			294
Interest on s/t credit	%		6%	20		6%	20		6%	62
<b>Total Variable Costs</b>				<b>360</b>			<b>360</b>			<b>1,096</b>
<b>GROSS MARGIN</b>				<b>2,665</b>			<b>2,165</b>			<b>3,444</b>

<sup>1/</sup> All produce valued at farmgate market price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family and exchange labour.

**Financial Crop Budget: POTATOES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Potatoes <sup>1/</sup>	tonne	7.0	1,500	10,500	7.0	1,500	10,500	10.0	1,500	15,000
Crop residue <sup>2/</sup>	tonne	0.0	50	0	0.0	50	0	0.0	50	0
<b>Gross Returns</b>				<b>10,500</b>			<b>10,500</b>			<b>15,000</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	2,000	1.9	3,750	2,000	1.9	3,750	2,000	1.9	3,750
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	100	4.0	400
DAP	kg	50	4.3	215	50	4.3	215	100	4.3	430
manure	tonne	5	50.0	250	5	50.0	250	10	50.0	500
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	50.0	50	1.0	50.0	50	1.0	80.0	80
sub-total				4,465			4,465			5,235
<b>Labour <sup>3/</sup></b>										
planting	day	60	0.0	0	60	0.0	0	60	0.0	0
weeding	day	60	0.0	0	60	0.0	0	60	0.0	0
other field tasks	day	20	0.0	0	20	0.0	0	25	0.0	0
harvesting	day	60	0.0	0	60	0.0	0	80	0.0	0
post-harvest tasks	day	30	0.0	0	30	0.0	0	45	0.0	0
sub-total		230		0	230		0	270		0
<b>Draft Oxen</b>										
land preparation	day	12	30.0	360	12	30.0	360	15	30.0	450
transport	quintal	70.0	3.0	210	70.0	3.0	210	100.0	3.0	300
sub-total				570			570			750
Interest on s/t credit	%		6%	302		6%	302		6%	359
<b>Total Variable Costs</b>				<b>5,337</b>			<b>5,337</b>			<b>6,344</b>
<b>GROSS MARGIN</b>				<b>5,163</b>			<b>5,163</b>			<b>8,656</b>

<sup>1/</sup> All produce valued at farmgate market price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family labour.

**Financial Crop Budget: VEGETABLES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Vegetables <sup>1/</sup>	tonne	6.0	1,750	10,500	6.0	1,750	10,500	9.0	1,750	15,750
Crop residue	tonne	1.0	500	500	1.0	500	500	1.0	500	500
<b>Gross Returns</b>				<b>11,000</b>			<b>11,000</b>			<b>16,250</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	10.0	50.0	500	10.0	50.0	500	10.0	50.0	500
Fertiliser										
urea	kg	50	4.0	200	50	4.0	200	100	4.0	400
DAP	kg	50	4.3	215	50	4.3	215	100	4.3	430
manure	tonne	5	50.0	250	5	50.0	250	10	50.0	500
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	No.	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	50.0	50	1.0	50.0	50	1.0	80.0	80
sub-total				1,215			1,215			1,985
<b>Labour</b> <sup>2/</sup>										
land preparation	day	60	0.0	0	60	0.0	0	60	0.0	0
planting	day	60	0.0	0	60	0.0	0	60	0.0	0
weeding	day	60	0.0	0	60	0.0	0	60	0.0	0
other field tasks	day	20	0.0	0	20	0.0	0	25	0.0	0
harvesting	day	60	0.0	0	60	0.0	0	80	0.0	0
post-harvest tasks	day	30	0.0	0	30	0.0	0	45	0.0	0
sub-total		290		0	290		0	330		0
<b>Transport</b>										
transport to roadside	quintal	60.0	3.0	180	60.0	3.0	180	90.0	3.0	270
sub-total				180			180			270
Interest on s/t credit	%		6%	84		6%	84		6%	135
<b>Total Variable Costs</b>				<b>1,479</b>			<b>1,479</b>			<b>2,390</b>
<b>GROSS MARGIN</b>				<b>9,521</b>			<b>9,521</b>			<b>13,860</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family labour.

**Financial Crop Budget: TEMPERATE FRUIT (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (Birr)	Value (Birr)	Units/ha	Price (Birr)	Value (Birr)	Units/ha	Price (Birr)	Value (Birr)
<b>RETURNS</b>										
Apple	tonne	5.0	2,000	10,000	5.0	2,000	10,000	7.5	2,000	15,000
Crop residue	tonne	0.0	0	0	0.0	0	0	0.0	0	0
<b>Gross Returns</b>				<b>10,000</b>			<b>10,000</b>			<b>15,000</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seedlings <sup>2/</sup>	no.	55	0.5	28	55	0.5	28	55	0.5	28
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.3	0	0	4.3	0	0	4.3	0
manure	tonne	10	50.0	500	10	50.0	500	10	50.0	500
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.0	75.0	0
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.0	75.0	0
Other inputs	LS	1.0	50.0	50	1.0	50.0	50	1.0	50.0	50
sub-total				578			578			578
<b>Labour</b> <sup>3/</sup>										
crop establishment <sup>2/</sup>	day	10.0	0.0	0	10.0	0.0	0	10.0	0.0	0
weeding	day	50.0	0.0	0	50.0	0.0	0	60.0	0.0	0
other field tasks	day	50.0	0.0	0	50.0	0.0	0	60.0	0.0	0
harvesting	day	80.0	0.0	0	80.0	0.0	0	120.0	0.0	0
post-harvest tasks	day	40.0	0.0	0	40.0	0.0	0	60.0	0.0	0
sub-total		230		0	230		0	310		0
<b>Transport</b>										
transport to roadside	quintal	50.0	3.0	150	50.0	3.0	150	75.0	3.0	225
sub-total				150			150			225
Interest on s/t credit	%		6%	44		6%	44		6%	48
<b>Total Variable Costs</b>				<b>771</b>			<b>771</b>			<b>851</b>
<b>GROSS MARGIN</b>				<b>9,229</b>			<b>9,229</b>			<b>14,149</b>

<sup>1/</sup> All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Planting material, labour and ox power for a twenty five year production cycle.

<sup>3/</sup> Family labour.

**Economic Crop Budget: TEFF (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Teff <sup>1/</sup>	tonne	1.0	3,600	3,600	0.9	3,600	3,240	1.5	3,600	5,400
Straw <sup>2/</sup>	tonne	1.0	360	360	1.0	360	360	1.3	360	450
<b>Gross Returns</b>				<b>3,960</b>			<b>3,600</b>			<b>5,850</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	50	4.5	225	50	4.5	225	50	7.2	360
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	50	4.0	201
DAP	kg	100	4.2	424	100	4.2	424	100	4.2	424
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				868			868			1,312
<b>Labour</b> <sup>3/</sup>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	25	6.3	158	25	6.3	158	30	6.3	189
other field tasks	day	8	6.3	50	8	6.3	50	15	6.3	95
harvesting	day	15	6.3	95	14	6.3	88	18	6.3	113
post-harvest tasks	day	10	6.3	63	9	6.3	57	15	6.3	95
sub-total		63		397	61		384	83		523
<b>Draft Oxen</b>										
land preparation	day	10	27.0	270	10	27.0	270	15	27.0	405
transport to local market	quintal	10	2.7	27	10	2.7	27	13	2.7	34
sub-total				297			297			439
<b>Total Variable Costs</b>				<b>1,562</b>			<b>1,549</b>			<b>2,274</b>
<b>GROSS MARGIN</b>				<b>2,398</b>			<b>2,051</b>			<b>3,576</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.



**Economic Crop Budget: WHEAT (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Wheat <sup>1/</sup>	tonne	1.7	2,699	4,589	1.6	2,699	4,319	2.5	2,699	6,748
Straw <sup>2/</sup>	tonne	1.5	225	338	1.5	225	338	2.0	225	450
<b>Gross Returns</b>				<b>4,926</b>			<b>4,656</b>			<b>7,198</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	150	3.4	506	150	3.4	506	150	5.4	810
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	50	4.0	201
DAP	kg	100	4.2	424	100	4.2	424	100	4.2	424
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				1,149			1,149			1,762
<b>Labour</b> <sup>3/</sup>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	25	6.3	158	25	6.3	158	30	6.3	189
other field tasks	day	8	6.3	50	8	6.3	50	15	6.3	95
harvesting	day	20	6.3	126	19	6.3	120	24	6.3	151
post-harvest tasks	day	12	6.3	76	10	6.3	63	17	6.3	107
sub-total				441			422			573
<b>Draft Oxen</b>										
land preparation	day	10	27.0	270	10	27.0	270	15	27.0	405
transport to local market	quintal	17	2.7	46	16	2.7	43	25	2.7	68
sub-total				316			313			473
<b>Total Variable Costs</b>				<b>1,906</b>			<b>1,884</b>			<b>2,807</b>
<b>GROSS MARGIN</b>				<b>3,020</b>			<b>2,772</b>			<b>4,391</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: BARLEY (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Barley <sup>1/</sup>	tonne	1.5	2,497	3,745	1.4	2,497	3,495	2.3	2,497	5,618
Straw <sup>2/</sup>	tonne	1.5	225	338	1.5	225	338	2.0	225	450
<b>Gross Benefits</b>				<b>4,083</b>	<b>3,833</b>			<b>6,068</b>		
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	150	3.1	468	150	3.1	468	150	5.0	749
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	50	4.0	201
DAP	kg	50	4.2	212	50	4.2	212	100	4.2	424
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				899	899			1,701		
<b>Labour <sup>3/</sup></b>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	25	6.3	158	25	6.3	158	30	6.3	189
other field tasks	day	8	6.3	50	8	6.3	50	15	6.3	95
harvesting	day	18	6.3	113	17	6.3	107	23	6.3	145
post-harvest tasks	day	10	6.3	63	9	6.3	57	15	6.3	95
sub-total				66	64			88		
<b>Draft Oxen</b>										
land preparation	day	10	27.0	270	10	27.0	270	15	27.0	405
transport to local market	quintal	15	2.7	41	15	2.7	41	20	2.7	54
sub-total				311	311			459		
<b>Total Variable Costs</b>				<b>1,625</b>	<b>1,613</b>			<b>2,714</b>		
<b>GROSS MARGIN</b>				<b>2,457</b>	<b>2,220</b>			<b>3,353</b>		

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: MAIZE (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>RETURNS</b>										
Maize <sup>1/</sup>	tonne	2.5	1,779	4,447	2.30	1,779	4,091	3.5	1,779	6,226
Stalks <sup>2/</sup>	tonne	2.0	225	450	1.8	90	162	2.5	90	225
<b>Gross Returns</b>				<b>4,897</b>			<b>4,253</b>			<b>6,451</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	25	2.2	56	25	2.2	56	25	3.6	89
Fertiliser										
urea	kg	100	4.0	402	100	4.0	402	100	4.0	402
DAP	kg	100	4.2	424	100	4.2	424	100	4.2	424
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
	sub-total			899			899			1,242
<b>Labour <sup>3/</sup></b>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	30	6.3	189	30	6.3	189	35	6.3	221
other field tasks	day	8	6.3	50	8	6.3	50	15	6.3	95
harvesting	day	25	6.3	158	24	6.3	151	30	6.3	189
post-harvest tasks	day	20	6.3	126	18	6.3	113	28	6.3	176
	sub-total			554			536			712
<b>Draft Oxen</b>										
land preparation	day	10	27.0	270	10	27.0	270	15	27.0	405
transport	quintal	25	2.7	68	23	2.7	62	35	2.7	95
	sub-total			338			332			500
<b>Total Variable Costs</b>				<b>1,791</b>			<b>1,767</b>			<b>2,453</b>
<b>GROSS MARGIN</b>				<b>3,106</b>			<b>2,486</b>			<b>3,998</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of stalks for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: FINGER MILLET (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Barley <sup>1/</sup>	tonne	1.5	1,800	2,700	1.4	1,800	2,520	2.3	1,800	4,050
Straw <sup>2/</sup>	tonne	1.5	225	338	1.5	225	338	2.0	225	450
<b>Gross Benefits</b>				<b>3,038</b>			<b>2,858</b>			<b>4,500</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	60	2.3	135	60	2.3	135	60	3.6	216
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	50	4.0	201
DAP	kg	50	4.2	212	50	4.2	212	100	4.2	424
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				566			566			1,168
<b>Labour <sup>3/</sup></b>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	25	6.3	158	25	6.3	158	30	6.3	189
other field tasks	day	8	6.3	50	8	6.3	50	15	6.3	95
harvesting	day	18	6.3	113	17	6.3	107	23	6.3	145
post-harvest tasks	day	10	6.3	63	9	6.3	57	15	6.3	95
sub-total		66		416	64		403	88		554
<b>Draft Oxen</b>										
land preparation	day	10	27.0	270	10	27.0	270	15	27.0	405
transport to local market	quintal	15	2.7	41	15	2.7	41	20	2.7	54
sub-total				311			311			459
<b>Total Variable Costs</b>				<b>1,292</b>			<b>1,280</b>			<b>2,181</b>
<b>GROSS MARGIN</b>				<b>1,745</b>			<b>1,578</b>			<b>2,319</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of straw for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: POTATOES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Potatoes <sup>1/</sup>	tonne	7.0	1350	9,450	7.0	1350	9,450	10.0	1350	13,500
Crop residue <sup>2/</sup>	tonne	0.0	45	0	0.0	45	0	0.0	45	0
<b>Gross Benefits</b>				<b>9,450</b>			<b>9,450</b>			<b>13,500</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	2,000	1.7	3,375	2,000	1.7	3,375	2,000	1.7	3,375
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	100	4.0	402
DAP	kg	50	4.2	212	50	4.2	212	100	4.2	424
manure	tonne	5	45.0	225	5	45.0	225	10	45.0	450
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	45.0	45	1.0	45.0	45	1.0	72.0	72
sub-total				4,058			4,058			4,798
<b>Labour</b> <sup>3/</sup>										
planting	day	60	6.3	378	60	6.3	378	60	6.3	378
weeding	day	60	6.3	378	60	6.3	378	60	6.3	378
other field tasks	day	20	6.3	126	20	6.3	126	25	6.3	158
harvesting	day	60	6.3	378	60	6.3	378	80	6.3	504
post-harvest tasks	day	30	6.3	189	30	6.3	189	45	6.3	284
sub-total		230		1,449	230		1,449	270		1,701
<b>Draft Oxen</b>										
land preparation	day	12	27.0	324	12	27.0	324	15	27.0	405
transport	quintal	60.0	2.7	162	60.0	2.7	162	90.0	2.7	243
sub-total				486			486			648
<b>Total Variable Costs</b>				<b>5,993</b>			<b>5,993</b>			<b>7,147</b>
<b>GROSS MARGIN</b>				<b>3,457</b>			<b>3,457</b>			<b>6,353</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family labour valued at shadow agricultural wage rate.

**Economic Crop Budget: PULSES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Pulses <sup>1/</sup>	tonne	0.8	3,267	2,614	0.7	3,267	2,287	1.2	3,267	3,921
Crop residue <sup>2/</sup>	tonne	0.5	45	23	0.5	45	23	0.8	45	36
<b>Gross Benefits</b>				<b>2,636</b>			<b>2,310</b>			<b>3,957</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	200	4.1	817	200	4.1	817	200	6.5	1,307
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.2	0	0	4.2	0	0	4.2	0
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				835			835			1,604
<b>Labour <sup>3/</sup></b>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	15	6.3	95	15	6.3	95	20	6.3	126
other field tasks	day	3	6.3	19	3	6.3	19	8	6.3	50
harvesting	day	12	6.3	76	11	6.3	69	16	6.3	101
post-harvest tasks	day	8	6.3	50	7	6.3	44	12	6.3	76
sub-total		43		271	41		258	61		384
<b>Draft Oxen</b>										
land preparation	day	6	27.0	162	6	27.0	162	9	27.0	243
transport to local market	quintal	5	2.7	14	5	2.7	14	8	2.7	22
sub-total				176			176			265
<b>Total Variable Costs</b>				<b>1,281</b>			<b>1,269</b>			<b>2,253</b>
<b>GROSS MARGIN</b>				<b>1,355</b>			<b>1,041</b>			<b>1,704</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: OILSEEDS (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Oilseeds <sup>1/</sup>	tonne	0.6	5,172	3,103	0.5	5,172	2,586	0.9	5,172	4,655
Crop residue <sup>2/</sup>	tonne	0.5	45	23	0.5	45	23	0.8	45	36
<b>Gross Benefits</b>				<b>3,126</b>			<b>2,609</b>			<b>4,691</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	20	6.5	129	20	6.5	129	20	10.3	207
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.2	0	0	4.2	0	50	4.2	212
manure	tonne	0	45.0	0	0	45.0	0	5	45.0	225
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.3	75.0	23
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				147			147			716
<b>Labour <sup>3/</sup></b>										
planting	day	5	6.3	32	5	6.3	32	5	6.3	32
weeding	day	15	6.3	95	15	6.3	95	20	6.3	126
other field tasks	day	3	6.3	19	3	6.3	19	8	6.3	50
harvesting	day	10	6.3	63	9	6.3	57	13	6.3	82
post-harvest tasks	day	6	6.3	38	5	6.3	32	9	6.3	57
sub-total		39		246	37		233	55		347
<b>Draft Oxen</b>										
land preparation	day	6	27.0	162	6	27.0	162	9	27.0	243
transport to local market	quintal	5	2.7	14	5	2.7	14	8	2.7	22
sub-total				176			176			265
<b>Total Variable Costs</b>				<b>569</b>			<b>556</b>			<b>1,327</b>
<b>GROSS MARGIN</b>				<b>2,557</b>			<b>2,053</b>			<b>3,364</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family and exchange labour valued at shadow agricultural wage rate.

**Economic Crop Budget: VEGETABLES (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)	Units/ha	Price (birr)	Value (birr)
<b>BENEFITS</b>										
Vegetables <sup>1/</sup>	tonne	6.0	1575	9,450	6.0	1575	9,450	9.0	1575	14,175
Crop residue	tonne	1.0	45	45	1.0	45	45	1.0	45	45
<b>Gross Benefits</b>				<b>9,495</b>			<b>9,495</b>			<b>14,220</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seed	kg	10	45	450	10	45	450	10	45	450
Fertiliser										
urea	kg	50	4.0	201	50	4.0	201	100	4.0	402
DAP	kg	50	4.2	212	50	4.2	212	100	4.2	424
manure	tonne	5	45.0	225	5	45.0	225	10	45.0	450
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.5	75.0	38
Other inputs	LS	1.0	45.0	45	1.0	45.0	45	1.0	72.0	72
sub-total				1,133			1,133			1,873
<b>Labour <sup>2/</sup></b>										
land preparation	day	60	6.3	378	60	6.3	378	60	6.3	378
planting	day	60	6.3	378	60	6.3	378	60	6.3	378
weeding	day	60	6.3	378	60	6.3	378	60	6.3	378
other field tasks	day	20	6.3	126	20	6.3	126	25	6.3	158
harvesting	day	60	6.3	378	60	6.3	378	80	6.3	504
post-harvest tasks	day	30	6.3	189	30	6.3	189	45	6.3	284
sub-total		290		1,827	290		1,827	330		2,079
<b>Transport</b>										
transport to local market	quintal	60.0	2.7	162	60.0	2.7	162	90.0	2.7	243
sub-total				162			162			243
<b>Total Variable Costs</b>				<b>3,122</b>			<b>3,122</b>			<b>4,195</b>
<b>GROSS MARGIN</b>				<b>6,373</b>			<b>6,373</b>			<b>10,025</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Imputed value of crop residue for fodder.

<sup>3/</sup> Family labour valued at shadow agricultural wage rate.



**Economic Crop Budget: TEMPERATE FRUIT (Birr per hectare)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ha	Price (Birr)	Value (Birr)	Units/ha	Price (Birr)	Value (Birr)	Units/ha	Price (Birr)	Value (Birr)
<b>BENEFITS</b>										
Apple <sup>1/</sup>	tonne	5.0	1,800	9,000	5.0	1,800	9,000	7.5	1,800	13,500
Crop residue	tonne	0.0	0	0	0.0	0	0	0.0	0	0
<b>Gross Returns</b>				<b>9,000</b>			<b>9,000</b>			<b>13,500</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Seedlings <sup>2/</sup>	no.	55	0.5	28	55	0.5	28	55	0.5	28
Fertiliser										
urea	kg	0	4.0	0	0	4.0	0	0	4.0	0
DAP	kg	0	4.2	0	0	4.2	0	0	4.2	0
manure	tonne	10	45.0	450	10	45.0	450	10	45.0	450
Pesticides										
insecticides	litre	0.0	75.0	0	0.0	75.0	0	0.0	75.0	0
fungicide	litre	0.0	75.0	0	0.0	75.0	0	0.0	75.0	0
Other inputs	LS	1.0	18.0	18	1.0	18.0	18	1.0	27.0	27
sub-total				496			496			505
<b>Labour <sup>3/</sup></b>										
crop establishment <sup>2/</sup>	day	10	6.3	63	10	6.3	63	10	6.3	63
weeding	day	50	6.3	315	50	6.3	315	60	6.3	378
other field tasks	day	50	6.3	315	50	6.3	315	60	6.3	378
harvesting	day	80	6.3	504	80	6.3	504	120	6.3	756
post-harvest tasks	day	40	6.3	252	40	6.3	252	60	6.3	378
sub-total		230		1,449	230		1,449	310		1,953
<b>Transport</b>										
transport to local market	quintal	50.0	2.7	135	50.0	2.7	135	75.0	2.7	203
sub-total				135			135			203
<b>Total Variable Costs</b>				<b>2,080</b>			<b>2,080</b>			<b>2,660</b>
<b>GROSS MARGIN</b>				<b>6,921</b>			<b>6,921</b>			<b>10,840</b>

<sup>1/</sup> All produce valued at economic farmgate price including proportion consumed by household.

<sup>2/</sup> Planting material, labour and ox power for a twenty five year production cycle.

<sup>3/</sup> Family labour valued at shadow agricultural wage rate.

## **Appendix D.2: Financial and Economic Livestock Budgets**

**Financial Livestock Budget: Milk Production (Birr per head per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Milk production <sup>1/</sup>	litres	400	2.5	1,000	400	2.5	1,000	1,200	2.5	3,000
Calf sales <sup>2/</sup>	head	0.7	175	117	0.7	175	117	0.7	175	117
less Replacement <sup>3/</sup>	head	0.1	550	-55	0.1	550	-55	0.1	550	-55
<b>Gross Returns</b>				<b>1,062</b>			<b>1,062</b>			<b>3,062</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>4/</sup>	kg	1,500	0.3	450	1,500	0.3	450	2,500	0.3	750
Concentrated feed	kg	0	2.0	0	0	2.0	0	200	2.0	400
Veterinary/medicine	LS	1.0	50.0	50	1.0	50.0	50	1.0	100.0	100
Miscellaneous expenses	LS	1.0	25.0	25	1.0	25.0	25	1.0	25.0	25
sub-total				525			525			1,275
<b>Labour <sup>5/</sup></b>										
Milking	day	15.0	0.0	0	15.0	0.0	0	30.0	0.0	0
Feeding (cut and carry)	day	15.0	0.0	0	15.0	0.0	0	20.0	0.0	0
Other livestock tasks	day	5.0	0.0	0	5.0	0.0	0	5.0	0.0	0
Marketing	day	2.0	0.0	0	2.0	0.0	0	2.0	0.0	0
sub-total		37		0	37		0	57		0
Interest on s/t credit	%		6%	32		6%	32		6%	77
<b>Total Variable Costs</b>				<b>557</b>			<b>557</b>			<b>1,352</b>
<b>GROSS MARGIN</b>				<b>506</b>			<b>506</b>			<b>1,711</b>

<sup>1/</sup> Production from 1 cow. All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Sale of calf every 18 months.

<sup>3/</sup> Cost of replacement (at 600 Birr/head) less sale of cull cow (at 100 Birr/head) after 10 years.

<sup>4/</sup> Cut grass and crop residues carried and fed to cows in stalls.

<sup>5/</sup> Labour provided by family members.

**Financial Livestock Budget: Beef Fattening (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Cattle sales <sup>1/</sup>	kg	275	5.0	1,375	275	5.0	1,375	310	5.0	1,550
less cattle purchase <sup>2/</sup>	kg	200	4.0	-800	200	4.0	-800	200	4.0	-800
<b>Gross Returns</b>				<b>575</b>			<b>575</b>			<b>750</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>3/</sup>	kg	1,800	0.1	180	1,800	0.1	180	2,000	0.1	200
Concentrated feed	kg	0	1.5	0	0	1.5	0	0	1.5	0
Veterinary/medicine	LS	1.0	25.0	25	1.0	25.0	25	1.0	50.0	50
Miscellaneous expenses	LS	1.0	10.0	10	1.0	10.0	10	1.0	10.0	10
sub-total				215			215			260
<b>Labour <sup>4/</sup></b>										
Feeding (cut and carry)	day	18.0	0.0	0	18.0	0.0	0	20.0	0.0	0
Other livestock tasks	day	5.0	0.0	0	5.0	0.0	0	5.0	0.0	0
Marketing	day	2.0	0.0	0	2.0	0.0	0	2.0	0.0	0
sub-total		25		0	25		0	27		0
Interest on s/t credit	%		6%	61		6%	61		6%	64
<b>Total Variable Costs</b>				<b>276</b>			<b>276</b>			<b>324</b>
<b>GROSS MARGIN</b>				<b>299</b>			<b>299</b>			<b>426</b>

<sup>1/</sup> Cattle are sold at 275 kg liveweight in present and future without project, and 310 kg liveweight in future with project situation.

<sup>2/</sup> Cattle are purchased at 200 kg livewieght.

<sup>3/</sup> Cut grass and crop residues carried and fed to cattle in stalls.

<sup>4/</sup> Labour provided by family members.

**Financial Livestock Budget: Sheep/Goat Fattening (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Sheep/goat sales <sup>1/</sup>	kg	90	5.0	450	90	5.0	450	105	5.0	525
less sheep/goat purchase <sup>2/</sup>	kg	60	4.0	-240	60	4.0	-240	60	4.0	-240
<b>Gross Returns</b>				<b>210</b>			<b>210</b>			<b>285</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>3/</sup>	kg	650	0.1	65	650	0.1	65	750	0.1	75
Concentrated feed	kg	0	1.5	0	0	1.5	0	0	1.5	0
Veterinary/medicine	LS	1.5	5.0	8	1.5	5.0	8	1.5	10.0	15
Miscellaneous expenses	LS	1.0	5.0	5	1.0	5.0	5	1.0	5.0	5
sub-total				78			78			95
<b>Labour <sup>4/</sup></b>										
Feeding (cut and carry)	day	5.0	0.0	0	5.0	0.0	0	6.0	0.0	0
Other livestock tasks	day	2.5	0.0	0	2.5	0.0	0	2.5	0.0	0
Marketing	day	1.0	0.0	0	1.0	0.0	0	1.0	0.0	0
sub-total		9		0	9		0	10		0
Interest on s/t credit	%		6%	19		6%	19		6%	20
<b>Total Variable Costs</b>				<b>97</b>			<b>97</b>			<b>115</b>
<b>GROSS MARGIN</b>				<b>113</b>			<b>113</b>			<b>170</b>

<sup>1/</sup> 3 sheep/goats are sold per annum at 30 kg liveweight in present and FWO project, and 35 kg liveweight in FW project situation.

<sup>2/</sup> Sheep/goats are purchased per annum at 20 kg liveweight.

<sup>3/</sup> Cut grass and crop residues carried and fed to sheep/goats in stalls.

<sup>4/</sup> Labour provided by family members.

**Financial Livestock Budget: Household Egg Production (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/	Price	Value	Units/	Price	Value	Units/	Price	Value
<b>RETURNS</b>										
Egg production <sup>1/</sup>	no.	300	0.5	150	300	0.5	150	1,000	0.5	500
less Replacement <sup>2/</sup>	head	1.0	10	-10	1.0	10	-10	2.0	20	-40
<b>Gross Returns</b>				<b>140</b>			<b>140</b>			<b>460</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Concentrated feed	kg	0	1.5	0	0	1.5	0	50	1.5	75
Veterinary/medicine	LS	1.0	0.0	0	1.0	0.0	0	1.0	10.0	10
Miscellaneous expenses	LS	1.0	5.0	5	1.0	5.0	5	1.0	5.0	5
sub-total				5			5			90
<b>Labour <sup>4/</sup></b>										
Feeding	day	2.0	0.0	0	2.0	0.0	0	2.0	0.0	0
Other livestock tasks	day	2.0	0.0	0	2.0	0.0	0	2.0	0.0	0
Marketing	day	1.0	0.0	0	1.0	0.0	0	1.0	0.0	0
sub-total		5		0	5		0	5		0
Interest on s/t credit	%		6%	0		6%	0		6%	5
<b>Total Variable Costs</b>				<b>5</b>			<b>5</b>			<b>95</b>
<b>GROSS MARGIN</b>				<b>135</b>			<b>135</b>			<b>365</b>

<sup>1/</sup> Production from 5 hens. All produce valued at current farmgate price including proportion consumed by household.

<sup>2/</sup> Cost of replacement: 1 hens/annum (at 15 Birr/hen for local and 25/hen for improved) less sale of cull hens (at 5 Birr/head).

<sup>3/</sup> Labour provided by family members.

**Economic Livestock Budget: Milk Production (Birr per head per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Milk production <sup>1/</sup>	litres	400	2.3	900	400	2.3	900	1,200	2.3	2,700
Calf sales <sup>2/</sup>	head	0.7	158	106	0.7	158	106	0.7	158	106
less Replacement <sup>3/</sup>	head	0.1	495	-50	0.1	495	-50	0.1	495	-50
<b>Gross Returns</b>				<b>956</b>			<b>956</b>			<b>2,756</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>4/</sup>	kg	1,500	0.3	405	1,500	0.3	405	2,500	0.3	675
Concentrated feed	kg	0	2.0	0	0	2.0	0	200	2.0	400
Veterinary/medicine	LS	1.0	50.0	50	1.0	50.0	50	1.0	100.0	100
Miscellaneous expenses	LS	1.0	22.5	23	1.0	22.5	23	1.0	22.5	23
sub-total				478			478			1,198
<b>Labour <sup>5/</sup></b>										
Milking	day	15.0	6.3	95	15.0	6.3	95	30.0	6.3	189
Feeding (cut and carry)	day	15.0	6.3	95	15.0	6.3	95	20.0	6.3	126
Other livestock tasks	day	5.0	6.3	32	5.0	6.3	32	5.0	6.3	32
Marketing	day	2.0	6.3	13	2.0	6.3	13	2.0	6.3	13
sub-total		37		233	37		233	57		359
<b>Total Variable Costs</b>				<b>711</b>			<b>711</b>			<b>1,557</b>
<b>GROSS MARGIN</b>				<b>245</b>			<b>245</b>			<b>1,199</b>

<sup>1/</sup> Production from 1 cow. Valued at current farmgate price including proportion consumed by household. Adjusted by SCF of 0.9.

<sup>2/</sup> Sale of calf every 18 months.

<sup>3/</sup> Cost of replacement (at 1,000 Birr/head) less sale of cull cow (at 500 Birr/head) after 10 years. Adjusted by SCF of 0.9.

<sup>4/</sup> Cut grass and crop residues carried and fed to cows in stalls.

<sup>5/</sup> Labour provided by family members.

**Economic Livestock Budget: Beef Fattening (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Cattle sales <sup>1/</sup>	kg	275	5	1,238	275	5	1,238	310	5	1,395
less cattle purchase <sup>2/</sup>	kg	200	4	-720	200	4	-720	200	4	-720
<b>Gross Returns</b>				<b>518</b>			<b>518</b>			<b>675</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>3/</sup>	kg	1,800	0.1	162	1,800	0.1	162	2,000	0.1	180
Concentrated feed	kg	0	1.5	0	0	1.5	0	0	1.5	0
Veterinary/medicine	LS	1.0	25.0	25	1.0	25.0	25	1.0	50.0	50
Miscellaneous expenses	LS	1.0	9.0	9	1.0	9.0	9	1.0	9.0	9
sub-total				196			196			239
<b>Labour <sup>4/</sup></b>										
Feeding (cut and carry)	day	18.0	6.3	113	18.0	6.3	113	20.0	6.3	126
Other livestock tasks	day	5.0	6.3	32	5.0	6.3	32	5.0	6.3	32
Marketing	day	2.0	6.3	13	2.0	6.3	13	2.0	6.3	13
sub-total		25		158	25		158	27		170
<b>Total Variable Costs</b>				<b>354</b>			<b>354</b>			<b>409</b>
<b>GROSS MARGIN</b>				<b>164</b>			<b>164</b>			<b>266</b>

<sup>1/</sup> Cattle are sold at 275 kg liveweight in present and future without project, and 310 kg liveweight in future with project situation.

<sup>2/</sup> Cattle are purchased at 200 kg livewieght.

<sup>3/</sup> Cut grass and crop residues carried and fed to cattle in stalls.

<sup>4/</sup> Labour provided by family members.



**Economic Livestock Budget: Sheep/Goat Fattening (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)	Units/ head	Price (birr)	Value (birr)
<b>RETURNS</b>										
Sheep/goat sales <sup>1/</sup>	kg	90	5	405	90	5	405	105	5	473
less sheep/goat purchase <sup>2/</sup>	kg	60	4	-216	60	4	-216	60	4	-216
<b>Gross Returns</b>				<b>189</b>			<b>189</b>			<b>257</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Fodder <sup>3/</sup>	kg	650	0.1	59	650	0.1	59	750	0.1	68
Concentrated feed	kg	0	1.5	0	0	1.5	0	0	1.5	0
Veterinary/medicine	LS	1.5	5.0	8	1.5	5.0	8	1.5	10.0	15
Miscellaneous expenses	LS	1.0	4.5	5	1.0	4.5	5	1.0	4.5	5
sub-total				71			71			87
<b>Labour <sup>4/</sup></b>										
Feeding (cut and carry)	day	5.0	6.3	32	5.0	6.3	32	6.0	6.3	38
Other livestock tasks	day	2.5	6.3	16	2.5	6.3	16	2.5	6.3	16
Marketing	day	1.0	6.3	6	1.0	6.3	6	1.0	6.3	6
sub-total		9		54	9		54	10		60
<b>Total Variable Costs</b>				<b>124</b>			<b>124</b>			<b>147</b>
<b>GROSS MARGIN</b>				<b>65</b>			<b>65</b>			<b>110</b>

<sup>1/</sup> 7 sheep/goats are sold per annum at 27 kg liveweight in present and FWO project, and 30 kg liveweight in FW project situation.

<sup>2/</sup> Sheep/goats are purchased per annum at 20 kg liveweight.

<sup>3/</sup> Cut grass and crop residues carried and fed to sheep/goats in stalls.

<sup>4/</sup> Labour provided by family members.

**Economic Livestock Budget: Household Egg Production (Birr per annum)**

Item	Unit	Present Situation			Without Project			With Project		
		Units/	Price	Value	Units/	Price	Value	Units/	Price	Value
<b>RETURNS</b>										
Egg production <sup>1/</sup>	no.	300	0.5	135	300	0.5	135	1,000	0.5	450
less Replacement <sup>2/</sup>	head	1	9	-9	1	9	-9	2	18	-36
<b>Gross Returns</b>				<b>126</b>			<b>126</b>			<b>414</b>
<b>VARIABLE COSTS</b>										
<b>Materials</b>										
Concentrated feed	kg	0	1.5	0	0	1.5	0	50	1.5	75
Veterinary/medicine	LS	1.0	0.0	0	1.0	0.0	0	1.0	10.0	10
Miscellaneous expenses	LS	1.0	4.5	5	1.0	4.5	5	1.0	4.5	5
sub-total				5			5			90
<b>Labour <sup>4/</sup></b>										
Feeding	day	2.0	6.3	13	2.0	6.3	13	2.0	6.3	13
Other livestock tasks	day	2.0	6.3	13	2.0	6.3	13	2.0	6.3	13
Marketing	day	1.0	6.3	6	1.0	6.3	6	1.0	6.3	6
sub-total				5			5			32
<b>Total Variable Costs</b>				<b>36</b>			<b>36</b>			<b>121</b>
<b>GROSS MARGIN</b>				<b>90</b>			<b>90</b>			<b>293</b>

<sup>1/</sup> Production from 5 hens. Valued at current farmgate price including proportion consumed by household. Adjusted by SCF of 0.9.

<sup>2/</sup> Cost of replacement: 1 hens/annum (at 10 Birr/hen for local and 20/Birr/hen for improved) less sale of cull hens (at 5 Birr/head). Adjusted by

<sup>3/</sup> Labour provided by family members.

## **Appendix D.3: Farm Budgets**

**Incremental Net Farm Returns, 2007 Financial Prices (Birr per annum)**

a) Jema

**Cropped Area: 1.00 hectare**

Season/Crop	Present			Future Without Project			Future With Project		
	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (acre)	Gross Margin per ha	Financial Gross Margin
<b>Annual Crops</b>									
Teff	0.13	3,096	403	0.13	2,696	351	0.13	4,515	587
Wheat	0.05	3,367	168	0.05	3,100	155	0.05	4,791	240
Barley	0.08	2,801	224	0.08	2,551	204	0.08	3,745	300
Maize	0.30	3,395	1,019	0.30	2,742	822	0.30	4,266	1,280
Finger Millet	0.20	2,389	478	0.20	2,189	438	0.15	3,161	474
Pulses	0.09	1,402	126	0.09	1,102	99	0.15	1,712	257
Oilseeds	0.12	2,665	320	0.12	2,165	260	0.12	3,444	413
Vegetables	0.01	9,521	95	0.01	9,521	95	0.03	13,860	416
Potatoes	0.02	5,163	103	0.02	5,163	103	0.03	8,656	260
<b>Perennial Crops</b>									
Temperate Fruit	0.00	9,229	0	0.00	9,229	0	0.01	14,149	141
<b>Net Crop Returns</b>	1.00		2,936	1.00		2,527	1.05		4,367
<b>Livestock</b>	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM
Dairy Cows (1 cow unit)	1.00	506	506	1.00	506	506	1.00	1,711	1,711
Beef Cattle (1 bullock unit)	1.00	299	299	1.00	299	299	1.00	426	426
Sheep/Goat (3 sheep/goat unit)	1.00	113	113	1.00	113	113	1.00	170	170
Poultry (5 hen unit)	1.00	135	135	1.00	135	135	1.00	365	365
<b>Net Livestock Returns</b>			1,053			1,053			2,672
<u>Less Fixed Costs:</u>									
Land tax	1.00	30	30	1.00	30	30	1.00	30	30
Farm tools and other expenses <sup>1/</sup>	1.00	100	100	1.00	100	100	1.00	120	120
sub-total			130			130			150
<b>Net Farm Household Returns</b>			3,859			3,450			6,889
<b>Maintenance Fees <sup>2/</sup></b>							1.00	200	200
<b>Net Farm Household Returns (after maintenance fees)</b>									6,689
<b>Incremental Net Farm Returns (after maintenance fees)</b>									3,238
<b>Maintenance Fees as % Incremental Net Farm Returns (after fees)</b>									6%

1/ Farm tools, building repairs and miscellaneous expenses

2/ Fees to recover costs of maintaining SWC measures and rural infrastructure.

**Incremental Net Farm Returns, 2007 Financial Prices (Birr per annum)**

**b) Gumera**

**Cropped Area: 1.00 hectare**

Season/Crop	Present			Future Without Project			Future With Project		
	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (acre)	Gross Margin per ha	Financial Gross Margin
<b>Annual Crops</b>									
Teff	0.30	3,096	929	0.30	2,696	809	0.30	4,515	1,355
Wheat	0.15	3,367	505	0.15	3,100	465	0.15	4,791	719
Barley	0.07	2,801	196	0.07	2,551	179	0.07	3,745	262
Maize	0.13	3,395	441	0.13	2,742	356	0.13	4,266	555
Finger Millet	0.12	2,389	287	0.12	2,189	263	0.06	3,161	190
Pulses	0.03	1,402	42	0.03	1,102	33	0.10	1,712	171
Oilseeds	0.11	2,665	293	0.11	2,165	238	0.11	3,444	379
Vegetables	0.01	9,521	95	0.01	9,521	95	0.03	13,860	416
Potatoes	0.08	5,163	413	0.08	5,163	413	0.09	8,656	779
<b>Perennial Crops</b>									
Temperate Fruit	0.00	9,229	0	0.00	9,229	0	0.01	14,149	141
<b>Net Crop Returns</b>	1.00		3,202	1.00		2,851	1.05		4,966
<b>Livestock</b>	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM
Dairy Cows (1 cow unit)	1.00	506	506	1.00	506	506	1.00	1,711	1,711
Beef Cattle (1 bullock unit)	1.00	299	299	1.00	299	299	1.00	426	426
Sheep/Goat (3 sheep/goat unit)	1.00	113	113	1.00	113	113	1.00	170	170
Poultry (5 hen unit)	1.00	135	135	1.00	135	135	1.00	365	365
<b>Net Livestock Returns</b>			1,053			1,053			2,672
<u>Less Fixed Costs:</u>									
Land tax	1.00	30	30	1.00	30	30	1.00	30	30
Farm tools and other expenses <sup>1/</sup>	1.00	100	100	1.00	100	100	1.00	120	120
sub-total			130			130			150
<b>Net Farm Household Returns</b>			4,125			3,774			7,487
<b>Maintenance Fees <sup>2/</sup></b>							1.00	200	200
<b>Net Farm Household Returns (after maintenance fees)</b>									7,287
<b>Incremental Net Farm Returns (after maintenance fees)</b>									3,513
<b>Maintenance Fees as % Incremental Net Farm Returns (after fees)</b>									6%

1/ Farm tools, building repairs and miscellaneous expenses

2/ Fees to recover costs of maintaining SWC measures and rural infrastructure.

**Incremental Net Farm Returns, 2007 Financial Prices (Birr per annum)**

**c) Ribb**

**Cropped Area 1.00 hectare**

Season/Crop	Present			Future Without Project			Future With Project		
	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (ha)	Gross Margin per ha	Financial Gross Margin	Area (acre)	Gross Margin per ha	Financial Gross Margin
<b>Annual Crops</b>									
Teff	0.33	3,096	1,022	0.33	2,696	890	0.32	4,515	1,445
Wheat	0.20	3,367	673	0.20	3,100	620	0.20	4,791	958
Barley	0.15	2,801	420	0.15	2,551	383	0.15	3,745	562
Maize	0.08	3,395	272	0.08	2,742	219	0.08	4,266	341
Finger Millet	0.04	2,389	96	0.04	2,189	88	0.00	3,161	0
Pulses	0.09	1,402	126	0.09	1,102	99	0.15	1,712	257
Oilseeds	0.04	2,665	107	0.04	2,165	87	0.04	3,444	138
Vegetables	0.01	9,521	95	0.01	9,521	95	0.03	13,860	416
Potatoes	0.06	5,163	310	0.06	5,163	310	0.07	8,656	606
<b>Perennial Crops</b>									
Temperate Fruit	0.00	9,229	0	0.00	9,229	0	0.01	14,149	141
<b>Net Crop Returns</b>	1.00		3,120	1.00		2,790	1.05		4,864
<b>Livestock</b>	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM	No.Units	GM/unit	Fin.GM
Dairy Cows (1 cow unit)	1.00	506	506	1.00	506	506	1.00	1,711	1,711
Beef Cattle (1 bullock unit)	1.00	299	299	1.00	299	299	1.00	426	426
Sheep/Goat (3 sheep/goat unit)	1.00	113	113	1.00	113	113	1.00	170	170
Poultry (5 hen unit)	1.00	135	135	1.00	135	135	1.00	365	365
<b>Net Livestock Returns</b>			1,053			1,053			2,672
<u>Less Fixed Costs:</u>									
Land tax	1.00	30	30	1.00	30	30	1.00	30	30
Farm tools and other expenses <sup>1/</sup>	1.00	100	100	1.00	100	100	1.00	120	120
sub-total			130			130			150
<b>Net Farm Household Returns</b>			4,043			3,713			7,385
<b>Maintenance Fees <sup>2/</sup></b>							1.00	200	200
<b>Net Farm Household Returns (after maintenance fees)</b>									7,185
<b>Incremental Net Farm Returns (after maintenance fees)</b>									3,472
<b>Maintenance Fees as % Incremental Net Farm Returns (after fees)</b>									6%

1/ Farm tools, building repairs and miscellaneous expenses

2/ Fees to recover costs of maintaining SWC measures and rural infrastructure.

## **Appendix D.4: Derivation of Economic Farmgate Prices**

### Derivation of Economic Farmgate Prices for Internationally Traded Commodities

Item	Wheat		Maize		Pulses		Oilseed		Urea		DAP	
	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic	Financial	Economic
Projected World Price for Year 2010 1/	194	194	159	159	327	327			288	288	297	297
Quality Adjustment Factor 2/	85%	85%	90%	90%	150%	150%			100%	100%	100%	100%
Projected Price for Ethiopian Product	165	165	143	143	491	491			288	288	297	297
International Freight and Insurance	57	57	57	57	-47	-47			49	49	64	64
FOB or CIF Price, Djibouti	222	222	200	200	443	443			337	337	361	361
Exchange Rate : US\$ = Birr 9.24 (October 2007)												
CIF or FOB Price, Djibouti	2,051	2,051	1,851	1,851	4,095	4,095	6,000	6,000	3,118	3,118	3,340	3,340
Border Charges, Handling and Storage	120	108	120	108	-120	-108	-120	-108	130	117	130	117
Transport/Handling Costs to/from Addis Ababa	300	270	300	270	-300	-270	-300	-270	330	297	330	297
Transport/Handling Costs between Project Area and Addis Ababa	400	360	-400	-360	-400	-360	-400	-360	440	396	440	396
Local Market Price	2,871	2,789	1,871	1,869	3,275	3,357	5,180	5,262	4,018	3,928	4,240	4,150
Transport and Handling Costs between Farm and Local Market	-100	-90	-100	-90	-100	-90	-100	-90	100	90	100	90
Farmgate Price	2,771	2,699	1,771	1,779	3,175	3,267	5,080	5,172	4,118	4,018	4,340	4,240

Footnotes:

1/ World Bank commodity price projections for 2010 in constant 2007 prices

Wheat: US Gulf, Hard Red Winter, export price

Maize: US No. 2, yellow, fob Gulf ports

Soyabean: cif, Rotterdam (used as proxy for haricot bean and chickpea as legume crop)

Oilseed (Noug): fob, Djibouti

Urea: Bagged, fob NW Europe

DAP: Bulk, fob US Gulf ports

2/ Reflects the estimated difference in quality between the traded and locally produced commodity.



## **Appendix D.5: Financial and Economic Capital Cost**

**Capital Costs, Constant 2007 Financial Prices ('000 Birr)**

Cost Item	Implementation Years					Total
	Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Community Entry Points</b>						
Public Infrastructure Works	2,662	11,885	15,952	15,987	4,707	51,193
Recurrent Costs	0	91	492	1,028	1,632	3,243
sub-total	2,662	11,976	16,444	17,015	6,339	54,436
<b>Crop Production</b>						
DA Vehicles and Equipment	562	1,226				1,788
Extension and Training	772	1,614	780	780	0	3,946
Recurrent Costs	66	249	327	405	483	1,530
sub-total	1,400	3,089	1,107	1,185	483	7,264
<b>Livestock Production</b>						
Animal Health Posts and Other Works	531	106	425	106	0	1,168
DA Vehicles and Equipment	562	1,226	0	0	0	1,788
Extension and Training	1,260	1,661	2,402	2,585	2,027	9,936
Recurrent Costs	66	727	1,110	1,618	1,991	5,512
sub-total	2,419	3,721	3,937	4,310	4,018	18,405
<b>Non-farm Income Generation</b>						
Flour Mill	100	350	400	450	450	1,750
Technology and Innovation	125	250	250	313	313	1,250
Micro-credit Facility	12,000	6,000	0	0	0	18,000
Recurrent Costs	0	2	11	20	31	65
sub-total	12,225	6,602	661	783	794	21,065
<b>SWC, WSS and Irrigation</b>						
SWC Works	3,121	16,501	23,961	32,878	32,915	109,376
WSS and Irrigation	1,953	6,721	8,227	8,313	8,325	33,540
Recurrent Costs - SWC	0	192	1,177	2,616	4,591	8,577
Recurrent Costs - WSS and Irrigation	0	68	305	595	889	1,856
sub-total	5,075	23,482	33,670	44,402	46,720	153,349
<b>Forestry and Agro-forestry</b>						
DA Vehicles and Equipment	562	1,226	0	0	0	1,788
Extension and Training	750	1,450	2,050	2,250	2,000	8,500
Recurrent Costs	66	352	594	935	1,287	3,234
sub-total	1,378	3,028	2,644	3,185	3,287	13,522
<b>Capacity Development and Project Management</b>						
Office, Vehicles and Equipment	7,773	1,860	0	0	0	9,633
Government Staff	170	170	202	202	202	947
Training and M&E	1,877	1,809	1,809	1,206	904	7,605
Community Watershed Teams	4,823	5,738	5,738	5,738	5,738	27,775
Consultancy Services	2,282	2,282	1,820	1,820	1,820	10,024
Recurrent Costs	762	1,099	1,282	1,464	1,556	6,163
sub-total	17,687	12,959	10,851	10,430	10,220	62,147
<b>Base Cost</b>	42,846	64,857	69,314	81,309	71,861	330,188
<b>Physical Contingencies @ 10%</b>	4,285	6,486	6,931	8,131	7,186	33,019
<b>Total Capital Cost</b>	47,131	71,343	76,245	89,440	79,047	363,206

**Capital Costs, Constant 2007 Economic Prices ('000 Birr)**

Cost Item	Implementation Years					Total
	Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Community Entry Points</b>						
Public Infrastructure Works	2,091	9,336	12,530	12,558	3,697	40,212
Recurrent Costs	0	72	387	807	1,282	2,548
sub-total	2,091	9,407	12,917	13,365	4,979	42,760
<b>Crop Production</b>						
DA Vehicles and Equipment	351	766	0	0	0	1,118
Extension and Training	664	1,388	671	671	0	3,393
Recurrent Costs	55	207	271	336	401	1,270
sub-total	1,070	2,361	942	1,007	401	5,781
<b>Livestock Production</b>						
Animal Health Posts and Other Works	417	83	334	83	0	918
DA Vehicles and Equipment	351	766	0	0	0	1,118
Extension and Training	1,084	1,429	2,066	2,223	1,743	8,545
Recurrent Costs	55	603	921	1,343	1,653	4,575
sub-total	1,907	2,882	3,321	3,650	3,396	15,156
<b>Non-farm Income Generation</b>						
Flour Mill	88	306	350	394	394	1,531
Technology and Innovation	109	219	219	273	273	1,094
Micro-credit Facility	0	0	0	0	0	0
Recurrent Costs	0	2	9	18	27	56
sub-total	197	527	578	685	694	2,681
<b>SWC, WSS and Irrigation</b>						
SWC Works	2,261	11,955	17,360	23,820	23,847	79,243
WSS and Irrigation	1,534	5,280	6,462	6,530	6,539	26,345
Recurrent Costs - SWC	0	139	853	1,895	3,326	6,214
Recurrent Costs - WSS and Irrigation	0	53	239	467	698	1,458
sub-total	3,796	17,427	24,915	32,713	34,411	113,260
<b>Forestry and Agro-forestry</b>						
DA Vehicles and Equipment	351	766	0	0	0	1,118
Extension and Training	645	1,247	1,763	1,935	1,720	7,310
Recurrent Costs	55	292	493	776	1,068	2,684
sub-total	1,051	2,305	2,256	2,711	2,788	11,112
<b>Capacity Development and Project Management</b>						
Office, Vehicles and Equipment	4,858	1,163	0	0	0	6,020
Government Staff	149	149	176	176	176	827
Training and M&E	1,614	1,556	1,556	1,037	778	6,540
Community Watershed Teams	4,148	4,935	4,935	4,935	4,935	23,887
Consultancy Services	2,015	2,015	1,607	1,607	1,607	8,851
Recurrent Costs	632	912	1,064	1,215	1,291	5,115
sub-total	13,416	10,729	9,338	8,970	8,787	51,240
<b>Base Cost</b>	23,528	45,639	54,266	63,101	55,456	241,989
<b>Physical Contingencies @ 10%</b>	2,353	4,564	5,427	6,310	5,546	24,199
<b>Total Capital Cost</b>	25,881	50,203	59,692	69,411	61,002	266,188

## **Appendix D.6: Agricultural Benefits**



### Agricultural Benefits, 2007 Economic Prices (Birr per annum)

a) Crop Production	Crop Area: 43,525 hectares			41,349 hectares			42,437 hectares		
	Present			Future Without Project			Future With Project		
Season/Crop Type	Cropped Area (ha)	Gross Margin per ha (Birr)	Economic Gross Margin (Birr)	Cropped Area (ha)	Gross Margin per ha (Birr)	Economic Gross Margin (Birr)	Cropped Area (ha)	Gross Margin per ha (Birr)	Economic Gross Margin (Birr)
<b>Annual Crops</b>									
Teff	11,102	2,398	26,625,823	10,547	2,051	21,630,418	10,706	3,576	38,289,721
Wheat	5,773	3,020	17,435,312	5,484	2,772	15,201,720	5,628	4,391	24,712,138
Barley	4,158	2,457	10,217,036	3,950	2,220	8,769,752	4,054	3,353	13,594,238
Maize	7,370	3,106	22,890,281	7,001	2,486	17,408,613	7,186	3,998	28,727,817
Finger Millet	5,341	1,745	9,320,844	5,073	1,578	8,005,500	3,031	2,319	7,028,997
Pulses	2,856	1,355	3,869,743	2,713	1,041	2,824,058	5,503	1,704	9,376,655
Oilseeds	4,072	2,557	10,411,730	3,868	2,053	7,939,371	3,970	3,364	13,353,525
Vegetables	435	6,373	2,773,901	413	6,373	2,635,206	1,273	10,025	12,763,190
Potatoes	2,419	3,457	8,363,885	2,298	3,457	7,945,691	2,783	6,353	17,682,375
<b>Perennial Crops</b>									
Temperate Fruit	0	6,921	0	0	6,921	0	424	10,840	4,600,166
<b>Net Crop Benefits</b>	43,525		111,908,554	41,349		92,360,328	44,559		170,128,820
<b>b) Livestock Production</b>									
	Present			Future Without Project			Future With Project		
Livestock Type	Number of Units	Gross Margin per unit (Birr)	Financial Gross Margin (Birr)	Number of Livestock	Gross Margin per unit (Birr)	Financial Gross Margin (Birr)	Number of Livestock	Gross Margin per unit (Birr)	Financial Gross Margin (Birr)
Dairy Cow	18,000	245	4,417,650	18,000	245	4,417,650	18,000	1,199	21,589,650
Beef Cattle	4,500	164	738,000	4,500	164	738,000	4,500	266	1,196,550
Goats/Sheep	4,500	65	292,275	4,500	65	292,275	4,500	110	493,425
Poultry	18,000	90	1,620,000	18,000	90	1,620,000	18,000	293	5,274,000
<b>Net Livestock Benefits</b>			7,067,925			7,067,925			28,553,625
<b>Net Agricultural Benefits</b>			118,976,479			99,428,253			198,682,445

## **Appendix D.7: Economic Benefit and Cost Streams**

**Economic Benefits and Costs, Constant 2007 Prices ('000 Birr)**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
<b>PROJECT BENEFITS</b>													
<b>Crop Production</b>													
Net Crop Benefits in Future With Project	111,909	117,104	122,300	127,495	132,691	137,886	143,082	148,277	165,720	175,319	177,072	178,843	180,631
Net Crop Benefits in Future Without Project	111,909	114,296	116,683	119,070	121,458	123,845	126,232	128,620	131,007	92,360	91,899	91,439	90,982
<b>Incremental Crop Benefits</b>	0	2,808	5,616	8,425	11,233	14,041	16,849	19,657	34,713	82,958	85,173	87,403	89,649
<b>Livestock</b>													
Net Livestock Benefits in Future With Project	7,068	9,455	11,843	14,230	16,617	19,004	21,392	23,779	26,166	28,554	28,839	29,128	29,419
Net Livestock Benefits in Future Without Project	7,068	7,068	7,068	7,068	7,068	7,068	7,068	7,068	7,068	7,068	7,139	7,210	7,282
<b>Incremental Livestock Benefits</b>	0	2,387	4,775	7,162	9,549	11,936	14,324	16,711	19,098	21,486	21,701	21,918	22,137
<b>Forestry and Agro-Forestry</b>													
Homestead Plantations	0	0	0	0	0	540	1,080	1,620	2,160	2,700	2,700	2,700	2,700
Conservation Forestry	0	0	0	0	0	0	0	0	0	0	270	540	810
<b>Incremental Forestry Benefits</b>	0	0	0	0	0	540	1,080	1,620	2,160	2,700	2,970	3,240	3,510
<b>Incremental Agricultural and Forestry Benefits</b>	0	5,196	10,391	15,587	20,782	26,518	32,253	37,989	55,972	107,144	109,844	112,561	115,296
<b>PROJECT CAPITAL COSTS</b>													
Community Entry Points	2,300	10,348	14,209	14,701	5,477								
Crop Production	1,177	2,597	1,036	1,108	441								
Livestock Production	2,098	3,170	3,653	4,015	3,736								
Non-farm Income Generation	217	580	636	753	763								
SWC, WSS and Irrigation	4,175	19,169	27,406	35,984	37,852								
Forestry and Agro-forestry	1,156	2,536	2,481	2,982	3,067								
Capacity Development and Project Management	14,758	11,802	10,271	9,867	9,666								
Sub-total	25,881	50,203	59,692	69,411	61,002	0	0	0	0	0	0	0	0
<b>RECURRENT COSTS</b>													
Community Entry Points	0	0	0	0	0	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282
Crop Production	0	0	0	0	0	401	401	401	401	401	401	401	401
Livestock Production	0	0	0	0	0	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653
Non-farm Income Generation	0	0	0	0	0	27	27	27	27	27	27	27	27
SWC, WSS and Irrigation	0	0	0	0	0	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708
Forestry and Agro-forestry	0	0	0	0	0	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068
Sub-total	0	0	0	0	0	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139
<b>TOTAL CAPITAL AND RECURRENT COSTS</b>	25,881	50,203	59,692	69,411	61,002	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139
<b>INCREMENTAL NET BENEFITS</b>	-25,881	-45,007	-49,301	-53,824	-40,220	15,379	21,114	26,850	44,833	96,005	98,705	101,422	104,157

**ECONOMIC NET PRESENT VALUE @ 10% :**

314,354

**BENEFIT : COST RATIO :**

2.24 : 1

**ECONOMIC INTERNAL RATE OF RETURN :**

20.5%



**Economic Benefits and Costs, Constant 2007 Prices ('000 Birr)**

	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26
<b>PROJECT BENEFITS</b>													
<b>Crop Production</b>													
Net Crop Benefits in Future With Project	182,437	184,262	186,104	187,965	189,845	191,743	193,661	195,597	197,553	199,529	201,524	203,539	205,575
Net Crop Benefits in Future Without Project	90,527	90,074	89,624	89,176	88,730	88,286	87,845	87,406	86,969	86,534	86,101	85,671	85,242
<b>Incremental Crop Benefits</b>	91,910	94,187	96,480	98,789	101,115	103,457	105,816	108,192	110,585	112,995	115,423	117,869	120,333
<b>Livestock</b>													
Net Livestock Benefits in Future With Project	29,713	30,010	30,310	30,613	30,919	31,229	31,541	31,856	32,175	32,497	32,822	33,150	33,481
Net Livestock Benefits in Future Without Project	7,355	7,428	7,503	7,578	7,654	7,730	7,807	7,885	7,964	8,044	8,124	8,206	8,288
<b>Incremental Livestock Benefits</b>	22,358	22,582	22,808	23,036	23,266	23,499	23,734	23,971	24,211	24,453	24,697	24,944	25,194
<b>Forestry and Agro-Forestry</b>													
Homestead Plantations	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700
Conservation Forestry	1,080	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350
<b>Incremental Forestry Benefits</b>	3,780	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050	4,050
<b>Incremental Agricultural and Forestry Benefits</b>	118,048	120,819	123,338	125,875	128,431	131,006	133,600	136,213	138,845	141,498	144,170	146,863	149,576
<b>PROJECT CAPITAL COSTS</b>													
Community Entry Points													
Crop Production													
Livestock Production													
Non-farm Income Generation													
SWC, WSS and Irrigation													
Forestry and Agro-forestry													
Capacity Development and Project Management													
Sub-total	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>RECURRENT COSTS</b>													
Community Entry Points	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282
Crop Production	401	401	401	401	401	401	401	401	401	401	401	401	401
Livestock Production	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653
Non-farm Income Generation	27	27	27	27	27	27	27	27	27	27	27	27	27
SWC, WSS and Irrigation	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708	6,708
Forestry and Agro-forestry	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068
Sub-total	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139
<b>TOTAL CAPITAL AND RECURRENT COSTS</b>	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139	11,139
<b>INCREMENTAL NET BENEFITS</b>	106,910	109,680	112,199	114,736	117,292	119,867	122,461	125,074	127,707	130,359	133,032	135,724	138,437

## **Appendix D.8: Distribution Analysis and Poverty Impact**

**Distribution Analysis and Poverty Impact, 2007 Constant Prices ('000 Birr)**

**a) Distribution Analysis**

	Financial Present Value	Economic Present Value	Difference (Econ. minus Financial)	Distribution of Project Effects				
				Farmers		Hired Labour	Govt./Economy	
				Fin. Gain/Loss	SWR effect	SWR effect	Fin. Gain/Loss	SER effect/Tax
<b>Benefits</b>								
Incremental Agricultural, Livestock and Forestry Benefits	679,619	567,368	-112,251	679,619	46,153	0		-158,404
<b>Costs</b>								
Community Entry Points	-27,353	-21,485	5,867	-5,471		6,558	-21,882	-691
Crop Production	-6,343	-5,025	1,318	-1,269		0	-5,075	1,318
Livestock Production	-15,038	-12,333	2,705	-3,008		0	-12,030	2,705
Non-farm Income Generation	-19,904	-2,142	17,761	-3,981		0	-15,923	17,761
SWC, WSS and Irrigation	-71,910	-53,146	18,764	-14,382		30,057	-57,528	-11,293
Recurrent costs	-82,055	-62,780	19,275	-82,055		2,132	0	17,144
<b>Total Costs</b>	<b>-222,603</b>	<b>-156,913</b>	<b>65,690</b>	<b>-110,165</b>	<b>0</b>	<b>38,746</b>	<b>-112,438</b>	<b>26,944</b>
<b>Net Benefits</b>	<b>457,016</b>	<b>410,455</b>	<b>-46,561</b>	<b>569,454</b>	<b>46,153</b>	<b>38,746</b>	<b>-112,438</b>	<b>-131,460</b>

**b) Poverty Impact**

Beneficiaries	Farmers	Hired Labour	Govt./Economy	Total
PV Economic - PV Financial	46,153	38,746	-131,460	-46,561
Financial Return	569,454		-112,438	457,016
<b>Net Benefits</b>	<b>615,607</b>	<b>38,746</b>	<b>-243,898</b>	<b>410,455</b>
<i>Proportion of Poor (%)</i>	<i>65%</i>	<i>85%</i>	<i>39%</i>	
<b>Net Benefits to Poor</b>	<b>400,144</b>	<b>32,934</b>	<b>-95,120</b>	<b>337,959</b>

**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Projects  
Detailed Project Preparation

**Project Implementation Plan**

Annex E: Guidelines for community action  
planning and implementation

December 2007

**Halcrow Group Limited**

in association with

Metaferia Consulting Engineers

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# 1 Sub-project cycle for micro-watershed development

## 1.1 Shortcomings of conventional watershed management approach

In conventional watershed management projects, priority was given to the biophysical framework of watershed based on top-down and supply-driven approach, whereby resources were allocated by the central and state governments for watershed development. This top-down approach did not facilitate effective participation of the stakeholders at community level in the planning and design of project activities that were aimed to improve their livelihoods. Planning in conventional watershed projects was often based on the capacity of land rather than needs and capacities of local people. Local knowledge on local soil types and conditions for suitability of technology to the specific soil were usually ignored during the design and implementation of the projects. Proposed technologies were often ecologically and economically incompatible with local farming systems, especially with regard to labour availability. By being imposed on people as the way to prevent erosion, they often replaced rather than supplemented local methods of soil and water management in places where these had been practiced. The result of these centrally-controlled SWC programmes has often been more erosion rather than less, either because the new structures were not maintained or because they were simply technically inferior to existing practices. As a result, many watershed projects around the world have not performed well and failing in achieving their goals and targets, mainly due to the lack of effective community participation in the planning, implementation and management stages of these projects.

## 1.2 Concept of participatory watershed development

In response to these inherent weaknesses in the conventional watershed management approach, the concept of participatory watershed management has emerged as a new paradigm for the development of sustainable rural livelihoods in the fragile and semi-arid environments of the developing nations. There has been an awakening to the fact that problems with the sustainable use of natural resources are not only technical but socio-economic problems as well. Managing a watershed shall take into consideration the interaction in time and space not only of individual plots but also of the common pool resources, such as forests, springs, gullies, roads and footpaths, and vegetative strips along rivers and streams. Watershed resources provide different services to different users, and these users are differentially affected by resource use decisions. This implies that the success of any watershed project and its sustainability depends upon people's participation in all its stages, including the planning, design and implementation of watershed development activities as well as the management of the results.

If implemented properly, participatory watershed management is a bottom-up and demand-driven approach with local communities in the driving seat. Commitment to a participatory watershed management approach demands for significant changes in the way that watershed management projects are designed and implemented. Participation implies that stakeholders will work together to set criteria for sustainable management, identify priority constraints, evaluate possible solutions, recommend technologies and policies, and monitor and evaluate impacts. To achieve the desired level of people's participation in the planning, execution and management of watersheds on a sustainable basis, the roles of community organisations and groups are crucial.

### **1.3 Concept on integrated watershed development**

The development of the sustainable livelihoods concept started during 1990s based on growing awareness that rural development approaches based purely on agricultural production were insufficient to meet the livelihood needs of the rural and landless poor. Agricultural land and livestock frequently generate only a portion of rural livelihoods, which are not always agrarian or land-based. Other forms of income generation derived from migration, part-time trade or handicraft production often make a large contribution to an individual's or a household's livelihood. Instead of focusing only on land or water and its potential for development, attention should also be given to people's needs and their priorities for development. If the aim of a watershed management project is to improve the livelihoods of rural households, it must apply an integrated approach that emphasises the integration of disciplines (technical, social and institutional dimensions) and objectives (conservation, food security, income generation) based on a good understanding of the principles operating within natural and social systems.

Integrated watershed management contemplates not only the physical treatment and cultural practices that may be required to bring land itself under a sustainable management system, but also the greater range of individual and collective human endeavours that constitute community use of the resource base. These may include PWS, small-scale irrigation, area closures, communal grazing or forest areas, transport or market infrastructure, and other resource uses. Integrated watershed management shall focus on the people and their livelihoods and embracing all possible sectors that touch their livelihoods. Therefore, it is better to speak of watershed development, whereby management is seen as an outcome of the watershed development process. The essential elements of an integrated watershed development approach must be:

- People and their livelihoods shall be at the centre: unless the economic and social interests of the people managing the land in the watershed will benefit from the interventions, they will not invest in watershed management;
- SWC and water harvesting shall be placed within a broader context and implemented by the farmers themselves as much as possible to ensure ownership;

- Livelihoods improvements shall look beyond improving subsistence farming and towards diversifying and increasing income;
- Need for early, visible benefits in order to maintaining enthusiasm required for continued participation of the community members in implementation and maintenance of the interventions;
- Multiple factors contributing towards successful and sustainable interventions, including market access and social infrastructure, shall be recognised; and
- Benefits can also come in social and physical infrastructure, such as improved health and education, physical access to schools, health care and markets as well as improved community institutions and social cohesion.

#### **1.4 Community-based participatory watershed development**

In order to have a common, standardised and more effective approach for the country, the MoARD has prepared the Community-Based Participatory Watershed Development Guideline, which was issued in January 2005. Based on the aforementioned concepts of participatory and integrated watershed development, the Guideline aims to harmonise and consolidate planning procedures at the grass-root level by providing DAs and rural communities a workable and adaptable planning tool. Participatory (and integrated) watershed development is the key to understand what needs to be done at various levels to sustain, improve and diversify production while developing and managing the natural resources base, promote income generation opportunities, increase access to basic services (i.e. roads, markets, schools, water) and make livelihood systems resilient to shocks (i.e. drought).

According to the Guideline, the overall objectives of participatory (and integrated) watershed development are as follows:

- to improve the livelihood of community/households in rural Ethiopia through comprehensive and integrated natural resource development; and
- to optimise the use of existing natural resources and untapped potentials in both already degraded areas and in the remaining potential areas of the country.

Participatory (and integrated) watershed development aims at a) productivity enhancement measures for improved income generation opportunities; b) enhanced livelihood support systems; and c) high resilience to shocks. Furthermore, it also aims to generate greater cohesion within the local communities and the society and to enable its poorest members to benefit from the various assets created and eventually to overcome their food insecurity

#### **1.5 Proposed participatory approach for integrated watershed development**

Based on MoARD's Community-Based Participatory Watershed Development Guideline as well as the Guidelines for Participatory Land Use Planning of the GTZ-implemented Land Use Planning and Resource Management Project in Oromia (July 2003), FAO's Resource

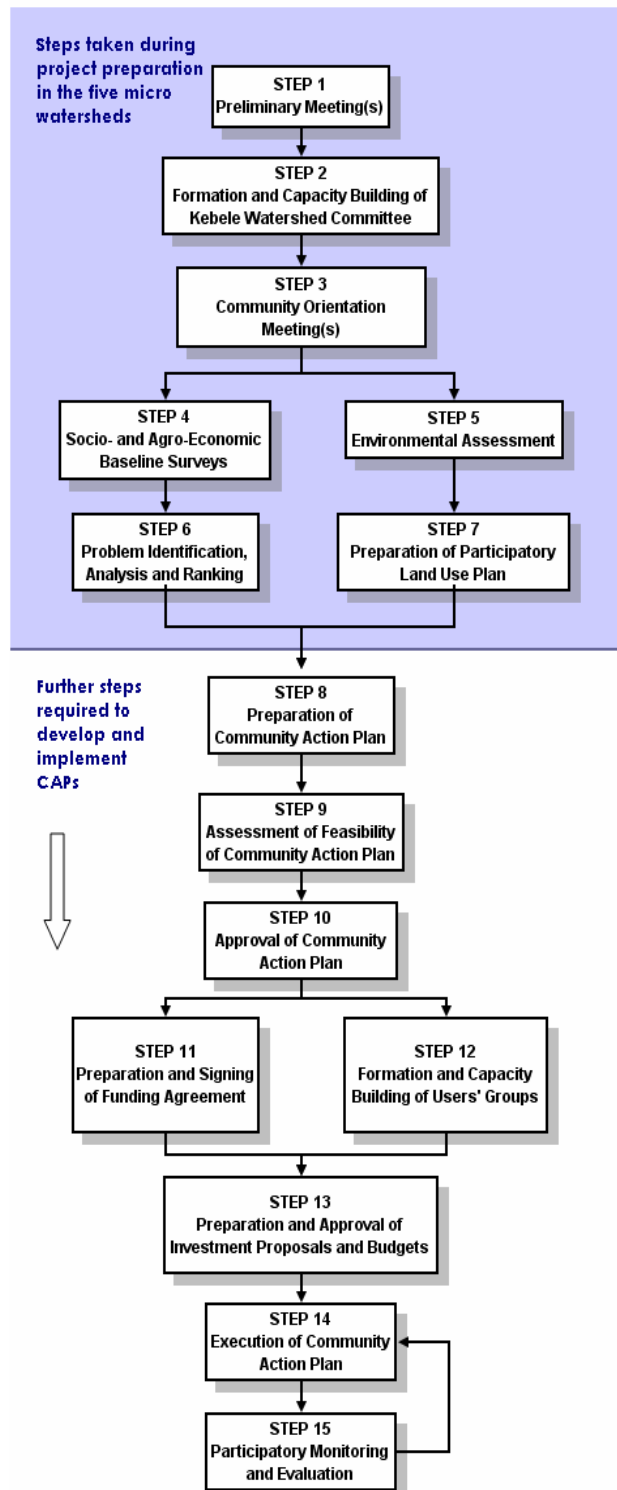


Book on Participatory and Integrated Watershed Management in Nepal (2000), participatory approach of the World Bank-funded Karnataka Watershed Development Project in India and the Consultant's experience with planning and implementing natural resources development and management projects, the Consultant has prepared a participatory approach for integrated watershed development at micro-watershed level in the three Project areas situated in the Tana Sub-Basin in Amhara State.

The 15 steps of the proposed participatory approach for integrated watershed development are summarised in the following flow chart. A short description of each step of the proposed approach is given overleaf.

Prior to the implementation of the participatory approach for integrated watershed development at micro-watershed level, a multi-disciplinary watershed team shall be formed at catchment level. In principle, the concerned Wereda Offices (i.e. Wereda Office ARD, Wereda Office WRD, Wereda Office of Health and Wereda Office of Women's Affairs) should provide the experts in the aforementioned fields of expertise on a full-time basis to the Community Watershed Management Teams (CIT). The reality at Wereda level is that the Wereda Offices are unable to second staff on full-time basis for the implementation of project activities as the SMS are too busy with the regular work.

**Participatory approach for integrated watershed development and management at micro-watershed level**



To ensure the successful implementation of Project activities at Kebele level, it is crucial that all key staff of the CIT is available on a full-time basis for the planning, preparation, supervision and monitoring of the integrated watershed development activities at Kebele level. Further details of the CIT are given in the main report and Annex H.

Following the establishment of the CIT, its members and the DAs shall be given training in various (non-technical) topics, such as participation, communication and facilitation skills, gender issues, land use planning, PRA techniques.

Before the DAs would start with the first step of the participatory approach for integrated watershed development, a Start-up Workshop shall be conducted at Wereda level in order to present to and discuss all major aspects and modalities of the Project and the participatory approach for integrated watershed development, including the modalities for collaboration, with the Wereda Administration Office and the envisaged implementation partners (i.e. Government agencies, NGOs).

#### **STEP 1: Preliminary meeting(s)**

Prior to the Preliminary Meeting(s) with the Kebele Council and other stakeholders (i.e. cooperative, WMC, Land Administration Committee) at Kebele level, the DAs with the support of the CIT shall identify the number and (tentative) boundaries of the micro-watersheds in the Kebele. The DAs shall convene a Preliminary Meeting with the Kebele Council and other stakeholders in order to brief its members about the main aspects of the Project as well as the planned activities. During the Preliminary Meeting, the DAs shall ask the Kebele Council to fix one or more dates for Community Orientation Meetings in the (main) *got* in each micro-watershed. It is recommended that one or more CIT members would also attend this meeting. Together with the CIT, the DAs shall conduct a walk through the identified micro-watersheds within their Kebele in order to assess their sizes as well as the scope and degree of land degradation.

#### **STEP 2: Formation and capacity building of kebele watershed committee**

To facilitate the execution of the following steps of the participatory approach for integrated watershed development as well as the coordination with the DAs and CIT, a KWC at Kebele level shall be formed before the execution of the baseline surveys. It is very important that each micro-watershed located within the boundaries of the Kebele is represented in the KWC by one male and one female representative. As soon as the KWC has been formed, the DAs with the support of the CIT shall develop the capacity of the KWC members through the execution of (formal) training courses and exchange visits to other KWCs that have been formed earlier.

#### **STEP 3: Community orientation meeting(s)**

Before the DAs commence with the execution of the socio- and agro-economic baseline surveys in each micro-watershed situated within the Kebele, one or more Community Orientation Meeting(s) in the (main) villages of each micro-watershed shall be conducted

with the aim to inform as many community members as possible about the main aspects and implementation modalities of the Project, including the importance of community participation in all stages of the entire integrated watershed development process. The use of a brochure and/or posters shall be considered as well. The Community Orientation Meeting(s) are also an opportunity to present the CIT members and representatives of potential partners to the community members. At the end of each Community Orientation Meeting, the DAs shall assess the community's interest to participate actively in the entire integrated watershed development process and the willingness to become responsible for the implementation and management of any integrated watershed development interventions that would be undertaken under the Project.

#### **STEP 4: Socio- and agro-economic baseline surveys**

If a (large) majority of community members has expressed their enthusiasm for participating in the envisaged Project activities, the DAs shall continue with the implementation of socio- and agro-economic baseline surveys in the micro-watershed. The main objectives of the baseline surveys is not only to collect relevant data and information about the without project situation required for impact evaluation at later stages, but also to understand the communities better (i.e. social cohesion, disputes, etc.) and to identify key persons who could play an active and supportive role during all steps of the participatory approach for integrated watershed development. One of the aims of the baseline surveys is to assess the role of local institutions with regard to NRM. For the collection of data and information, the DAs shall use different data collection techniques, including thematic focus group discussions, household surveys, transect walk and any other appropriate (PRA) technique. As soon as the baseline surveys have been completed, the collected information and data shall be processed and analysed by the DAs with the support of the CIT.

#### **STEP 5: Environmental assessment**

Simultaneously with the socio- and agro-economic baseline surveys, the DAs with the support of the CIT shall undertake a detailed biophysical survey and mapping of all natural resources in the micro-watershed, including an assessment of the existing conditions, current use, degree of degradation and the risks of the available natural resources. The collected information and data shall be processed and analysed by the DAs with the support of the CIT.

#### **STEP 6: Problem identification, analysis and ranking**

Immediately after the completion of the socio- and agro-economic baseline surveys, the DAs shall plan and implement a series of meetings with representatives of different social/interest groups within the micro-watershed with the aim to: a) identify main problems related to use and management of natural resources as well as their livelihoods; b) analyse the reported problems in order to find the underlying causes; and c) prioritise/rank the reported problems according their importance. Subsequently, the KWC together with the DAs and CIT shall review the prioritised/ranked problems of the different social/interest groups in order to prepare a list with the problems that have the highest priority/ranking. During one plenary

meeting or a number of village meetings, the KWC with the support of the DAs shall present the list with the highest ranked problems to the (representatives of) different social/interest groups.

#### **STEP 7: Preparation of participatory land use plan**

Simultaneously with the identification, analysis and ranking of the problems in consultation with representatives of the different social groups in the micro-watershed, the preparation of the PLUP for the micro-watershed shall start with the collection of GPS and socio-economic data related to land use and land resources situations by the CIT with the support of the DAs and KWC. In addition, the DAs and KWC shall also organise participatory mapping sessions with different social groups in the micro-watershed. Based on the results of both exercises, the CIT shall prepare a land use/cover map for the micro-watershed. During the preparation of the land use map, it is very important that local knowledge about the condition, use and management of the natural resources is used as much as possible, including the local names used. Another important topic during the preparation of the land use map is the assessment of individual land use rights. As soon as the land use map has been completed, all direct stakeholders (i.e. KWC, DAs and CIT) shall assess the present condition as well as the long-term effects of existing use, risks and potential of all available natural resources. This shall be followed by the preparation of the PLUP by the CIT based on existing use and land potential. As soon as the PLUP is completed, it shall be reviewed with the KWC together with representatives of the different social/interest groups.

#### **STEP 8: Preparation of community action plan**

As soon as the PLUP and the problem ranking exercise are completed, the DAs shall organise one or more sessions with the KWC and representatives of the different social/interest groups with the aim to formulate appropriate solutions for the highest ranked problems. Subsequently, the KWC with the support of the DAs and CIT shall prepare a draft Community Action Plan (CAP) specifying the planned activities, location, time frame, implementation responsibilities as well as estimated budget. As soon as the draft CAP is completed, the KWC shall conduct a plenary session or a number of community meetings within the micro-watershed with the aim to review the draft CAP with the (representatives of) different social/interest groups and to get their approval.

#### **STEP 9: Assessment of feasibility of community action plan**

As soon as the draft CAP has been approved by the different social/interest groups in the micro-watershed, the Wereda Cabinet with the support of the SMS from the different Wereda Offices shall assess the technical, financial, economic, social and environmental feasibility of all measures/solutions as proposed in the CAP. Subsequently, the CIT with support of the DAs shall present the results of the feasibility assessment of the CAP to the KWC and propose alternatives for proposed solutions/measures that are not feasible. Ultimately, the KWC shall prepare the final version of the CAP with the assistance of the DAs and CIT.

**STEP 10: Review and approval of community action plan**

As soon as the KWC has completed the preparation of the final version of the CAP, one or more community meetings in the micro-watershed shall be conducted with (representatives of) the different social/interest groups. Subsequently, the final CAP shall also be formally approved by the Kebele Council. Ultimately, the Wereda Council comprising representatives from all Kebeles shall also review and approve the CAP (NOTING THAT FOR Project purposes the Catchment Project Steering Committee shall have the final authority over the use of project funds, and thus shall provide ultimate approval of CAP-related investments)..

**STEP 11: Signing of funding agreement**

As soon as the CAP has been approved by the Wereda Council, a Funding Agreement shall be prepared and signed between the Wereda Administration Office and the Kebele Council, in which the funding modalities as well as the responsibilities of all stakeholders are specified. Following the signing of the Funding Agreement, the Kebele Council shall open the Project Investment Account.

**STEP 12: Establishment and capacity building of users' groups**

Following the formal approval of the CAP by the Kebele Council and Wereda Council respectively, the KWC with the support of the DAs shall organise the formation of different Users' Groups, which will be responsible for the execution of the planned collective activities as well as the management of the results. Before these newly formed Users' Groups can start with the execution of their activities, the DAs with the support of the CIT shall strengthen their technical and institutional capacity.

**STEP 13: Preparation and approval of investment proposals**

With the support of the DAs and CIT, the KWC and/or Users' Groups shall prepare detailed investment proposals and budgets for the different activities specified in the approved CAP. Any investment proposal and budget shall be submitted to the Kebele Council for review and approval. Subsequently, each investment proposal and budget shall be reviewed and approved by the Wereda Cabinet with support of the SMS from the Wereda Offices..

**STEP 14: Implementation of project interventions**

Following the formation and capacity building of the Users' Groups, the KWC with the support of the DAs shall organise activity-planning workshops in order to prepare detailed work plans and budgets for the execution of the different CAP activities. Each prepared work plan and budget shall be reviewed and approved by the KWC. Finally, the Users' Groups and individual community members shall implement their respective CAP activities according to their approved work plans. In addition to the existing cooperative, it is envisaged that Users' Groups and individual households would also establish linkages with the private sector and (local NGOs) to obtain the necessary advice, support and services to improve their livelihoods. The DAs would have to facilitate the establishment of the linkages between the community members and potential service providers.

**STEP 15: Participatory monitoring and evaluation**

During the execution of the CAP activities by the Users' Groups and individual community members, the Kebele Council, KWC and DAs shall closely monitor the progress and quality of the ongoing CAP activities. If necessary, the DAs shall arrange the provision of technical assistance to the Users' Groups and/or individual community members from the CIT. Once a CAP activity has been completed, the concerned Users' Group and/or individual community members together with the KWC and DAs shall undertake an evaluation in order to assess if the CAP activity has been completed in accordance with the work plan and which lessons can be learned. The DAs with support of the CIT shall also regularly monitor and evaluate the functioning of the KWC and the Users' Groups. Once every 2 to 3 years, the Kebele Council and the KWC with the support of the DAs shall evaluate the PLUP and CAP in order to assess if it needs to be updated and/or changed.

## 2 Recommended structure of community action plan

The recommended structure of a CAP is as follows:

- First column: agreed priority ranking number;
- Second column: short description of planned main activity/intervention together with more detailed sub-activities (i.e. Soil & Water Conservation as main activity, including construction of bunds, gully treatment and planting of vetiver grass as sub-activities);
- Third column: short description of the location(s) where the main activity and its sub-activities will be executed;
- Fourth column: Planned period(s) for execution of main activities and sub-activities by specifying month(s) and year(s);
- Fifth column: Name(s) of institutions and/or individuals to be involved in execution of main activity and its sub-activities (i.e. Wereda Offices, users' groups, NGO, private sector and/or individual community members); and
- Sixth column: Estimated budget for the execution of the proposed main intervention and its sub-activities.

The proposed layout of the CAP is presented below.

No.	Activity/Intervention	Location(s)	Timing	Implementers	Estimated Budget
1					
2					
3					
4					
5					
6					
7					
8	etc				

### 3 Preparation and approval of community action plan

The recommended procedure for the preparation, review and approval of a CAP is presented in the following flow chart:

