New Partnership for
Africa's Development (NEPAD)

Comprehensive Africa Agriculture
Development Programme (CAADP)

Food and Agriculture Organization
of the United Nations

Investment Centre Division

GOVERNMENT OF ERITREA

SUPPORT TO NEPAD–CAADP IMPLEMENTATION

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Volume III of V

BANKABLE INVESTMENT PROJECT PROFILE

Tseada–Kelay Plains Integrated Development Project

January 2005

ERITREA: Support to NEPAD–CAADP Implementation

Volume I: National Medium–Term Investment Programme (NMTIP)

Bankable Investment Project Profiles (BIPPs)

Volume II: Hazemo Plains Integrated Development Project

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NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Eritrea

Sector of Activities: Agriculture

Proposed Project Name: **Tseada–Kelay Plains Integrated Development Project**

Project Area: Debub Administrative Region

Duration of Project: Five years

Estimated Cost: Foreign Exchange..... US$20.64 million
Local Cost..... US$6.05 million
Total..... US$26.69 million

Suggested Financing:

Source	*US$ million*	*% of total*
Government	3.20	12
Financing institution(s)	20.82	78
Beneficiaries	2.67	10
Private sector	–	–
Total	***26.69***	***100***

ERITREA:

NEPAD–CAADP Bankable Investment Project Profile

"Tseada–Kelay Plains Integrated Development Project"

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Abbreviations

AWPB	Annual Work Plan and Budget
BIPP	Bankable Investment Project Profile
CAADP	Comprehensive Africa Agricultural Development Programme
CBO	Community–Based Organization
FAO	Food and Agricultural Organization of the United Nations
GDP	Gross Domestic Product
HH	Households
IFS	Integrated Farming Schemes
MoA	Ministry of Agriculture
NEPAD	New Partnership for Africa's Development
NGO	Non–Governmental Organization
NMTIP	National Medium–Term Investment Programme
TKVIDP–1	Tseada–Kelay Valley Integrated Development Project – Phase 1

I. PROJECT BACKGROUND

A. Project Origin

I.1. The above project profile is being formulated within the framework of the *New Partnership for Africa's Development* (NEPAD) to support the implementation of the *Comprehensive Africa Agriculture Development Programme* (CAADP). It is to be recalled that CAADP has been given a strong political support by the Heads of State and Government of the African Union during the Second Ordinary Session in Maputo in July 2003. Among other things, the Heads of State and Government committed themselves to allocate 10 percent of the national budgetary resources to the agricultural sector within five years. To this end, the FAO has been requested to assist the member countries in preparing *National Medium–Term Investment Programmes* (NMTIPs), and a set of *Bankable Investment Project Profiles* (BIPPs).

I.2. The government completed the preparation of the NMTIP for Eritrea with the assistance of FAO, in September 2004. As intended, the NMTIP has articulated government's development strategies and priorities, and identified major areas for investment in the medium–term, taking into account their relevance to one or more of the five pillars of CAADP. The proposed *Tseada–Kelay Plains Integrated Development Project* (TKVIDP–1) has been recognized as one of the priority development areas, and has been selected to become an integral part of the medium–term investment plan as outlined in the NMTIP.

B. General Information

I.3. Eritrea has a total population of about 4.48 million, of which some 70–80 percent is considered rural. Of the total land area of about 12.4 million ha, 1.65 million ha is arable and roughly 0.6 million ha is suitable for irrigation. The area cultivated per year averages about 530,000 ha and only 28,000 ha are currently irrigated, leaving considerable potential for expansion. The country has numerous ecological zones due to its topography, which comprises altitudes that range from sea level to peaks of over 3,000 m above sea level. The diversity of ecosystems makes the country suited to produce a wide variety of tropical and temperate crops.

I.4. Although the majority of the population lives in the rural areas, agricultural contribution to the Gross Domestic Product (GDP) is relatively modest, accounting for only about 12 percent in recent years. This highlights the low value of agricultural production, reflecting the dominance of rainfed crop production by subsistence farmers and livestock rearing by pastoralists. Yield of crops are very low, varying from 0.2 to 1.5 tonnes/ha depending on rains. Likewise, productivity of livestock is also low, being subject to the vagaries of the climate. In the past few years, poor and erratic rains have lead to frequent droughts, discouraging farmers from adopting modern agricultural practices, thus exacerbating rural poverty. In addition to drought conditions, the country's soils are seriously eroded, particularly in the highlands, as the result of deforestation, overgrazing and inadequate resource management which is contributing to low agricultural productivity. Since 1998, agricultural production has also been affected by the war with Ethiopia as many farmers have been displaced and production systems disrupted. The country is dependent on food aid and its annual import requirements vary from 25 to 50 percent, depending on rainfall.

I.5. It is widely recognized by practitioners and policy makers in the country that current agricultural production practices are not sustainable. Therefore, the government has been endeavouring to address the issues related to traditional farming practices and resource conservation in order to improve agricultural productivity. For instance, it launched a major development programme

known as the *Integrated Farming Schemes* (IFS) whose main thrust was to increase crop production through the use of modern farming practices, namely the provision of fertilizers, seeds, machinery ploughing and harvesting services. The result of this programme was mixed but general observations are that little impact was made in the shallow and poor soils of the highlands, which are characterized by erratic rains, while significant yield increases were recorded in the south western lowlands, where soils and rainfall are relatively better. The same observations were made following the implementation of other development programmes such as *Sasakawa Global 2000*, the FAO *Special Programme for Food Security* and other area specific development programmes.

I.6. A number of useful lessons have been learnt during implementation of these and other similar development programmes in the last decade, including the following, which deserve due consideration while designing future development programmes:

- provision of drought resistant crop varieties and adoption of moisture conserving cultural practices are important in mitigating rainfed crop failures when rainfall is below normal patterns;
- whenever possible, efforts should be made to shift farming towards irrigated agriculture (year round irrigation, supplementary or spate–based) to secure harvests;
- promotion of rational range management systems for livestock production in order to utilize such resources on a sustainable basis;
- rehabilitation of the environment for better soil and water conservation should be considered as an integral part of agriculture development; and
- the provision of support services should respond to critical problems of the individual farmers and their communities.

II. PROJECT AREA

II.1. The project area is located in the southern end of the Debub Administrative Region in the Adi–Quala Subzone (see map in Annex 1). It is part of the Central Highland Agro–ecological Zone. The drainage system is the Tseada–Kelay River originating mainly from Mendefera area and its tributaries from the Adi–Quala and Meraguz areas. This river joins the Mereb River at the Mai Tsebri area. The Tseada–Kelay plain is a sharp depression between the Adi–Quala and the Meraguz highlands on its northern eastern and western sides. To the south it merges with the Mereb River basin and leaving Enda Ghiorghis town to the east. The altitude of the plain drops by about 400 m forming a crater like lowland (1,500 m). The project area has relatively high rainfall and reasonably fertile soils. It is traditionally a major producer of cereal, pulses and livestock and in particular the latter. It is of low population density hence there is plenty of arable land available. This plain was in the past used as a seasonal (dry months) grazing area for cattle even coming from far points of the country. Gradually people from the adjacent villages started to settle permanently. The underground aquifer reserves are rich and the Tseada–Kelay River has springs which flow throughout the year. This area has extensive land for grazing under reasonably fair condition. It extends southward to Mai Tsebri and Mai Mine mountains; eastward to the Enda Ghiorghis town along the Mereb basin; and westward to the Ubel valley, another area of high agricultural potential.

II.2. The. TKVIDP–1 has a gross area of about 380 km^2 of which 125 km^2 is the Tseada–Kelay Valley proper that lies between the Adi–Quala and Meraguz plateau; and the remaining 255 km^2 is part of the upper catchments that extend up the villages of Durko and Shekayamo.

II.3. ***Location and Population.*** The valley is oriented from northeast to southwest and has two distinct parts with different topography and soils designated as site 1 (Mai–Hargets/Tseada–Kelay): and site 2 (Mai–Sagla/Mai–Tsebri). The valley has an average width of 7 km. There are 18,303 total beneficiary households out of which 6,652 are direct beneficiaries and the remaining 11,651 are indirect beneficiary households. The total population benefiting from the project is estimated at 91,100 living in 130 villages. The direct beneficiary population is 33,081 and the indirect beneficiary population is 5,019.

II.4. ***Physical Characteristics and Climate.*** The plain of the valley is generally slopping from its foot of the escarpments towards the Tseada–Kelay River with an average slope of 2.5 percent. In the upper part of the valley or site 1, the slope is about 2 percent; while that of site 2 it is about 3 percent. Altitude of the plain varies between 1,400 and 1,520 m above sea level. The major types of soil covering the valley are clay, clay loam and sandy loam. Clay soil is dominant along the river bank while sandy soils are dominant away from the stream banks. Soil depth varies from 1 to 1.5 metres. The climate is more of the south western escarpment with an average annual rainfall of 700 mm (Adi–Quala Station). The average annual temperature is 22ºC. The coldest months are December and January with an average temperature of 17ºC, while the hottest months are April and May where the average temperature is 30ºC. The rainfall is of high variability with poor distribution that leads to frequent droughts and crop failures.

II.5. ***Land Use and Land Tenure.*** About 7,000 ha or 56 percent of the Tseada–Kelay Valley is arable land and most of this is on rain fed crops. Irrigated agriculture is at an initial stage. The steep face of the bounding plateaus is covered by moderately dense trees of acacia, ficus and other tree species grasses and herbaceous legumes. This area is used as poor grazing land. The land use system in the project area is variable. Land use in site 1 is dominated by crop production with less livestock population. In site 2 mixed crop and livestock production is more prominent. The land tenure system in the project area is basically on a rotational basis. However, this area was populated later as an extension of the adjacent upland area. As a result, the land tenure system is less rigid than the proper rotational system of the highland.

II.6. ***Surface Water.*** The water resources of the Tseada–Kelay Valley is entirely dependent on surface run–off generated in its upper basaltic plateaus and flow south west by dissecting the valley and on groundwater found with in the unconsolidated deposits of shallow alluviums present beneath the soil cover.

II.7. The main river that crosses the Tseada–Kelay Valley has different names along its course (Mai Hargets, Tseada–Kelay, Mai Sagle and Mai Tsebri) until it joins Mereb River. Tseada–Kelay River has a very narrow northeast–southwest oriented drainage with a total catchment area of 380 km^2 above the Enda Ghiorghis–Mai Mine road crossing. The river is ephemeral and it originates from the north east of the valley near Durko, Deki Arba and Shekayamo area and it flows south–west to join Mereb River. Rains falling in Adi–Quala plateau, Meraguz plateaus and all the steep mountains located in the periphery of the valley are the main sources of flows in the Tseada–Kelay River. About 65 percent of the catchments area is steep mountainous and plateau which lies between 1,600 and 2,136 metres elevation. Rocky mountains of basalt form the relief of this section and erosion is a highly observable phenomenon. The remaining 35 percent of the catchments is primarily valley and is relatively gentle slope and it stretches for about 20 km starting from the beginning of Tseada–Kelay Valley up to Mai Tsebri with an average width of 7 km. Though most of the run–off occurs during

July and August, small flash floods that are sufficient to recharge the alluviums along the streambed and keep base flows within the channel are common starting end of May.

II.8. No stream flows record is available for the Tseada–Kelay River but run–off is reported to be concentrated in July and August. Using the average run–off coefficient of 11 percent and 700 mm average rainfall for the catchments, the total surface run–off reaching the end of this plain is estimated to be about 29.3 million cubic meters, which can irrigate about 2,900 ha of land.

II.9. ***Groundwater Resources.*** No information is available on groundwater potential of the valley; however from a quick field visit and communication with the farmers it appears that the major groundwater aquifer of the valley is the unconsolidated deposits of shallow alluviums present beneath the soil cover. The width and thickness of the alluvium is higher in the upper part of the valley and could extend between 250–300 metres and 10 metres, respectively. Based on these parameters the total groundwater storage available for use is estimated at about 4.15 millions of cubic metres. The lack of a groundwater management or monitoring system in the project area or in the country as a whole makes it difficult to manage water resources on a sustainable basis.

II.10. ***Existing Irrigation Practices.*** Only less than 50 ha of land are under perennial irrigation from shallow groundwater along the stream bank of Mai–Tsebri, mainly concentrated at the south–west end of the Tseada–Kelay Valley. Despite the potential of groundwater in the upper valley, irrigation from groundwater is not common mainly because farmers are less exposed to irrigation practice, but it is also due to lack of capital for pumps and digging of wells and labour shortage. Since the villages of the valley are on top or slope of the plateau, their domestic water sources are from wells dug within the plateau. In most villages, water supply sources are not hygienic and it takes 2–3 hours to collect water on foot.

II.11. ***Crop Production.*** The major crops grown in the valley are teff, African finger millet, sorghum and maize. Teff covers over 90 percent of the total cultivated area and it is produced as cash and staple crop. Sorghum used to be the dominant crop in the valley, however, due to frequent shortages of rainfall during June and weed (*Striga hermonthica*) problems, its production has been on decline. Chickpea and grass–pea are pulse crops cultivated for crop rotation, staple food and cash. The average yield of the area for cereals and pulses are 6 and 8 quintals per hectare respectively. Horticulture production has been introduced in the area very recently and a few farmers have started to produce tomato, pepper and onion in the area that are close to the riverbanks and are irrigated from hand dug wells. The high variability of rainfall in the valley has resulted in shifting crop production and lower crop production and productivity.

II.12. The majority of crop production in the area is characterized by low productivity; degraded soil condition; low or no input use such as fertilizer and pesticide; and lack of improved seed varieties. Moisture is the main constraint for crop production and few farmers practice water harvesting techniques such as spate irrigation for cereal production.

II.13. ***Livestock Production.*** The animal species produced in the project area are of the indigenous breed types and they include cattle, goats and mutton sheep; a limited number of equine and camels are also produced. The estimated populations of the main animal species in the project area are: 13,445 cattle; 8,661 goats; and 10,639 sheep. The average ranges of herd/flock sizes that are commonly owned by a household are: 4–8 cattle; 10–15 goats; 5–10 sheep. Within the area, traditionally a livestock producer, the great majority of the households own at least some goats or sheep. In a mixed crop/livestock production system, livestock contributes significantly to the household economy and nutrition.

II.14. The livestock production system is an extensive system where animals travel long distances for grazing and in search of water. However, grazing is not controlled and feed conservation is not practiced. As a result, overgrazing, which results in land degradation and shortage of feed during the dry season and drought years, are major problems for livestock production. Supplements of minerals such as phosphorus and protein in particular are in shortage. Crop residues contribute to animal nutrition but due to their poor digestibility and low protein content, their nutritive value is insignificant. The grazing land is under pressure by expansion of rainfed cropping and its conditions are deteriorating fast due to soil erosion. Breeding is uncontrolled and selection is not practiced. Infectious diseases and parasites result into high mortalities and serious disturbances in growth, milk yield and reproduction. The productive and reproductive efficiency is very low as given in Table 1.

Table 1: Tseada–Kelay – Average Production Coefficients in the Present Extensive Livestock System

Parameter	Goat	Sheep	Cattle
Age at first kidding/lambing/calving (month)	17	18	42
Twinning rate (%)	15	10	–
Kidding/lambing/calving percentage	110	100	60
Kids/lambs/calves born per doe/ewe/cow per life time	7	7	8
Kid/lamb/calf mortality/year (%)	10	15	10
Kidding/lambing/calving interval (month)	11	12	20
Lactation period length (day)	90	–	160
Milk yield per lactation per doe/cow (litre)	26	–	280
Average flock size (No)	8	5	5
Age at slaughter weight (month)	19	18	50
Slaughter weight (kg)	22	27	250

II.15. The main constraints affecting the present traditional livestock system include shortage of feed in general but particularly during the dry season and drought years; poor feeding systems; high prevalence of infectious diseases and body wasting parasites; poor breeding and herd/flock management; inadequate water points to enable extensive grazing; and a poor marketing system.

II.16. ***Socio–economic Infrastructure.*** The area is of high agricultural potential but relatively little attention has been given to develop it. There are no road networks with the exception of the seasonal road connecting the project area to Adi–Quala through Enda Ghiorghis. The people of the area are mainly from Tigrigna ethnic group with a very small Saho population in villages like Keih Kurba.

II.17. Drinking water for humans and animals is from river streams and the most common diseases in the project area are malaria and waterborne diseases. Socio–economic services such as health stations and schools are not easily accessible to many people because of transportation problems. Elementary schools are available in the administrative villages, there is a junior secondary school in Enda Ghiorghis and a high school in Adi–Quala. The major market place for the area is Adi–Quala.

III. PROJECT RATIONALE

III.1. The project area is relatively rich in natural resources for agricultural development; however, due to the traditional subsistence system that is practiced, its vulnerability to droughts is high. As a result, the livelihood of the population is always at risk as the frequency of drought years is increasing. The groundwater aquifer and surface water are of reasonable level to enable irrigated crop production of high value. Adequate arable land resource with reasonable soil fertility is available. However irrigation has not been developed, there only about three shallow wells (1 m depth) irrigating less than

¼ ha each exist in the whole area. These are limited to vegetables production such as chillies for home consumption. Thus there is an excellent potential to develop irrigated horticulture of high value products by conserving surface water and digging wells.

III.2. The project area which is traditionally a major animal producer possesses large tracts of grazing/browsing land. The natural pasture is deteriorating due to soil erosion and loss of the more palatable and nutritious plant species due to droughts, uncontrolled grazing, inadequate water points and absence of appropriate pasture management practices. In principle, the existing system of poor productivity requires to be intensified. There is good opportunity to produce large quantities of various animal products and high quality meat in particular on a community based development approach. The factors constraining animal production in the area can be removed or reasonably reduced using simple techniques that improve health, nutrition, breed, management and marketing. The availability of good quality forage can be ensured by improving the productivity of the natural pasture and food conservation methods. Nutrition can be improved by introducing mineral and protein supplements, reseeding and controlling soil erosion controlling grazing and developing adequate water points. The effect of disease can be drastically reduced through the establishment of efficient community based veterinary services.

IV. PROJECT OBJECTIVES

IV.1. The objectives of the project would be to:

- to improve and maintain soil fertility and moisture through effective soil/water conservation measures;
- develop water sources and irrigation facilities by constructing dams and digging wells;
- increase crop production on a suitable basis by intensifying using irrigation, diversification and good production practices;
- increase animal production by intensifying the traditional methods through pasture development, disease control and management;
- develop the institutional base such as by training community based organizations to mange their resources and businesses; and
- establish research and extension mechanism specific to the project area.

V. PROJECT DESCRIPTION

V.1. The project would consist of ***nine components*** to be implemented in five years.

V.2. ***Irrigation Development.*** The project will support the Tseada–Kelay Valley by providing a means to control and harness run–off by constructing a medium size dam at Mai Hargets stream and conveyance system. The proposed dam will be able to store about 8.3 million m^3 and could irrigate up to 1,200 ha (48 percent) of the upper Tseada–Kelay Valley. Access for capital in the form of credit will be provided to farmers for the construction of 42 wells and 420 pieces of pipes. In the lower section of the valley five subsurface and sand storage dams will be constructed to enhance

groundwater recharge and increase effective ground water storage areas along the bank of Mai Tsebri Stream.

V.3. ***Drinking Water Supply.*** Construction of ten boreholes with community water supply distribution system mainly for the villages on the plateau will be constructed. Support to establish water committees on village levels will provide for sustainability of the village water supply system.

V.4. ***Soil and Water Conservation.*** In order to minimize the sedimentation rate of the proposed dam, a vast area of the Tseada–Kelay upper catchments will be treated by constructing hill side terraces and check dams to control gully erosions within the steep valleys and within farm lands; constructing of farm land terraces within the farms in the plateau; promoting afforestation through planting of multipurpose trees in the steep part of the plateau. In the lower valley riverbank erosion control structure, check dams to rehabilitate highly broken farm and grazing land will be constructed. In the foot of the hills water spreading low height embankments to intercept run–off and spread in about 2,000 ha farm land to increase moisture will be constructed. Three nurseries (one in the plateau, one in site 1 and one in site 2) will be established for tree seedlings and producing grass and legume seeds.

V.5. ***Surface and Groundwater Level Monitoring.*** Two stream gagging stations near Mai Tsebri and Mai Hargets will be established in order to collect stream flow that would be used in the water resources development planning of the Tseada–Kelay Valley. About five wells that serve as groundwater level monitoring piezometres will be constructed within the valley.

V.6. ***Crop Production.*** The aim of the project is to increase crop production in the area through adoption of improved production systems or models such as irrigation. The project area consists of two sites. In site 1 about 1,200 ha will be targeted for irrigated horticulture production and about 1,300 ha for rainfed cereal and pulse production. Site 2, which has shallow soils, will be developed for livestock production along the riverbanks and areas towards the mountains will developed for field crop production. The model used for horticulture production in the project will be about one hectare per household. About 2,500 ha, which is found outside the horticultural area will be used for cereal and pulse production.

V.7. The component will support the provision of irrigation equipment establishing nursery facility for horticulture and forage seed production; and provision of initial inputs such as seeds, fertilizer, pesticide and farm tools.

V.8. ***Livestock Production.*** The livestock component would aim to intensify the existing extensive production model in the project area. Because the project consists of two sites with different land capabilities and uses, the approaches for livestock production in the two sites will be different. In site 1, livestock will be integrated with the irrigated crop; and in site 2 livestock will be integrated with rainfed cropping. The standard model in the irrigated crop area will consist of beef cattle where each household is expected to keep two cows; while in site 2, cattle and goats will be produced on 300 ha of grazing land. The project will support pasture development through soil/water conservation, partial bush clearings and reseeding; constructing structures for controlling grazing and water points; restocking; forage production and conservation; establishing veterinary and market infrastructures; and restocking with more productive breeds.

V.9. ***Socio–economic Infrastructure.*** The project area is inaccessible during the rainy seasons because of the absence of access feeder roads. In addition, the marketing of farm products are constrained by lack of effective transport facilities. The approach would consist of:

- construction of access/feeder roads;
- construction of farm roads using labour–intensive techniques;
- establishing maintenance system of the seasonal road network; and
- establishing collection centres and stores for agricultural products in particular horticultural products.

V.10. ***Extension.*** The project will support the extension system in disseminating to farmers and CBOs information on matters such as technical, economic, marketing and finance. The approach would involve provision of training facilities and equipment for farmers and CBOs; establishing community based organizations and management systems.

V.11. ***Project Coordination.*** A project coordination unit will be established to ensure efficient implementation of the project. It will coordinate the activities of various partners involved in project implementation agencies. The unit will be responsible for preparing *Annual Work Plans and Budgets* (AWPBs) and monitoring and evaluation.

VI. INDICATIVE PROJECT COSTS

VI.1. Project costs by component are listed in Table 2 below. The costs are based on similar project costs implemented more recently in the country. The standards and current cots and trends that are prevailing in the country have been considered and converted into US$. The investment costs are presented for each site in the project area and for each component within each site. Major costs were based on detailed domestic price quotations. The costs for the irrigation infrastructure and wells are based on local standards as there are many similar projects in the country. It is assumed that imported materials are not subject to import taxes and that prices of the domestically produced items will be stabilized. It is also assumed that the government is committed to contribute 10 percent of its share for Agriculture. The costs of labour to be contributed by the beneficiaries were based on current domestic prices for labour.

Table 2: Cost Summary per Component

Component	Local	Foreign	Total (US$)	% Foreign Exchange	% of Total Base Cost
Irrigation Development	2,521,600	10,086,400	12,608,000	80%	54%
Drinking Water Supply Development	201,480	1,141,720	1,343,200	85%	6%
Crop Development	136,812	136,862	273,674	50%	1%
Soil Conservation	1,195,568	1,793,352	2,988,920	60%	13%
Socio–economic Infrastructure	400,000	800,000	1,200,000	67%	5%
Livestock Development	310,000	2,790,000	3,100,000	90%	13%
Research and Extension	100,000	200,000	300,000	67%	1%
Institutional Support	200,000	300,000	500,000	60%	2%
Project Coordination	200,000	300,000	500,000	60%	2%
Technical Assistance	–	400,000	400,000	100%	2%
Total Base Cost	5,265,460	17,948,334	23,213,794	77%	100%
Physical Contingency	263,273	897,417	1,160,690	77%	5%
Price Contingency	526,546	1,794,833	2,321,379	77%	10%
Total Project Cost (US$)	6,055,279	20,640,584	26,695,863	77%	115%
Investment Cost per Beneficiary HH (direct + indirect = 18,303 HH)			*1,459*		

VII. PROPOSED SOURCES OF FINANCING

VII.1. The financing arrangements were based on contributions from government, beneficiary communities and aid agencies. The government cost will include most of the technical and management staff and physical facilities such as offices for implementation. The government will not tax any materials and services imported to be used by the project. The arrangement is that the government will in general cover costs of local origin and it will ensure the allocation of the 10 percent counter part fund obligation. The communities will contribute their share of project through the provision of labour in labour intensive components or activities. The financing agencies are expected to meet mainly the costs of equipment, technical assistance, and major physical construction.

VIII. PROJECT BENEFITS

VIII.1. The benefits expected are financial, economic, social and institutional. From the financial stand point, the farmers will be gaining adequate cash income from sales of meat and milk to complement their energy food consumption. Economic benefits for the country will be by contributing to the national development programme and the national food supply. The benefits from the social aspect will be equity in incomes and improved child nutrition.

VIII.2. ***One Year Farm Budget for Tomato.*** The following farm budget was prepared under the assumption of two harvests per year per hectare. At present tomato yield in the area is assumed to be on the average 80 quintals per hectare and with the project it is expected to increase to 130 quintals per hectare. Present tomato yields in Eritrea are considered to be very low by international standards as well as by African standards. Cost calculations were made taking into account information gathered from discussions with farmers as well as experts estimation of costs and returns from tomato production. Market conditions were considered in addition to the perishable nature of the commodity. It is also important to note that the project is also supporting the establishment of tomato processing plant(s) in the Debub Region. Although the crop budget indicates high potential for profits, a detailed economic and financial analysis of the project should be undertaken.

Table 6: Tomato Crop Model – 1.0 ha

Item	(US$)
Fixed Costs	
Cost of wells	89
Cost of pumps	180
Cost of pipes	6
Cost of farm tools	10
Total Fixed Costs	285
Variable Costs	
Cost of seed	74
Cost of fertilizer	132
Cost of pesticides	236
Cost of oxen power	110
Cost of labour	1,424
Fuel and lubrication	230
Transport costs	443
Cost of stick	74
Total variable Costs	2,723
Total Expenditure	3,008
Returns	
Expected income from tomato (130 quintals @ US$26 x 2) =	6,760
Gross Profit	3,752

IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The project will be implemented within the framework of the concerned government agencies using the existing government institutional arrangements as much as possible. It will involve several partners; hence it will require extensive coordination. For this purpose, it will be provided with an efficient coordinating unit. A steering committee will be formed from among the partners to ensure project implementation is within the planned time and budget framework. The main partners will be the regional Administration, the MoA and the CBOs. The coordinating unit will be responsible for routine activities such as financial management, monitoring and evaluation and preparing the AWPBs. It will be responsible to the steering committee. The beneficiary committee will form CBOs for the various project functions by establishing committees. The CBOs will participate in planning, deciding, implementing and monitoring and evaluation functions. The specific roles and responsibilities of the different ministries and the local government and other parties involved in project implementation and its monitoring will be clarified and defined more precisely at the time of project preparation.

X. TECHNICAL ASSISTANCE

X.1. The project will require long–term technical assistance in irrigation techniques and water management. Short–term technical assistance will be required in animal and horticulture production.

XI. ISSUES AND PROPOSED ACTIONS

XI.1. There are a number of issues that require further clarification prior to finalization of the project:

- ***Irrigation.*** The design of dam and irrigation involve complex designs and the use of competent personnel with adequate experience. To ensure that appropriate designs are produced, adequate data on similar accomplished projects should be collected and analysis be made. For this purpose, a follow up study must be carried out before the planned feasibility study.

- ***Crop Livestock Models.*** The models presented in this project profile have been prepared based on local knowledge and science, but as the project represents an attempt to transform the traditional production model to an improved model, the parameters taken to prepare the models (production and economic) must be further verified and tested by carrying out direct observations and involving the beneficiaries.

- ***Soil Conservation Techniques.*** The project area is hot arid climate. The conservation techniques, and in particular when plants are to be used, must be determined scientifically. There has been some experience in this country, but the viability of such techniques needs to be tested. It is also important to ensure the willingness of the community to participate in this activity. It is essential that further details are obtained and the strategy is designed before the project paper is prepared for implementation.

- ***Land Tenure.*** The existing rotational land tenure system is not conducive to farmer investment in long term activities like soil conservation and irrigation. Innovative ways must be found to go around this bottleneck if some of the project proposals are to succeed.

- ***Scarcity of Farm Labour.*** This is an evolving problem, particularly for livestock as more and more children attend school and are unavailable for on–farm activities.

- ***Organization and Function.*** The implementing body, which is likely to be the Debub region Administration, must start to effectively establish the required organizational set up and engage qualified personnel at the project area, regional and national levels. It must also ensure that a competent authority is established for project coordination. The formation of CBOs and their training must be made early enough. The project will require several local committees to run irrigation water, land and other management activities.

- ***Link with Funding Agencies.*** It is essential that clarity is made on how the aid agencies are to participate in the project.

- ***Environment.*** The project area is arid, hence environmentally fragile. It is necessary that *Environmental Impact Assessment* (EIA) of project area is conducted. The project is mainly aimed at increasing the food production of the area by rehabilitating the degraded farmlands and steep slopes, improving the grazing land and by providing a medium size storage reservoir and associated irrigation infrastructure. The introduction of a large water body in that semi–arid climate could be a health concern mainly due to classical tropical water–associated diseases such as malaria and bilharzias. In addition to that there are grazing areas and few perennial crop growers downstream of the project area along the courses of Mai Hargets–Mai Tsebri River up to it junction with Mereb River. Therefore, it is necessary to conduct EIA in order to address the above mentioned and other environmental issues during the detailed project document preparation stage.

XII. POSSIBLE RISKS

XII.1. Possible risks that may negatively affect project implementation include:

- ***Irrigation Water.*** There is inadequate data on the flows of the rivers designated to be used for the proposed spate irrigation schemes. Thus, the risk of variation in irrigation water volume and river flow occurrences should be evaluated and further study should be made.

- ***Delays in Implementation.*** A risk of not implementing the project within the planned time framework may occur.

- ***Availability of Competent Personnel.*** It is likely that competent and experienced personnel may not be locally available to coordinate, manage and lead this project and in particular irrigation.

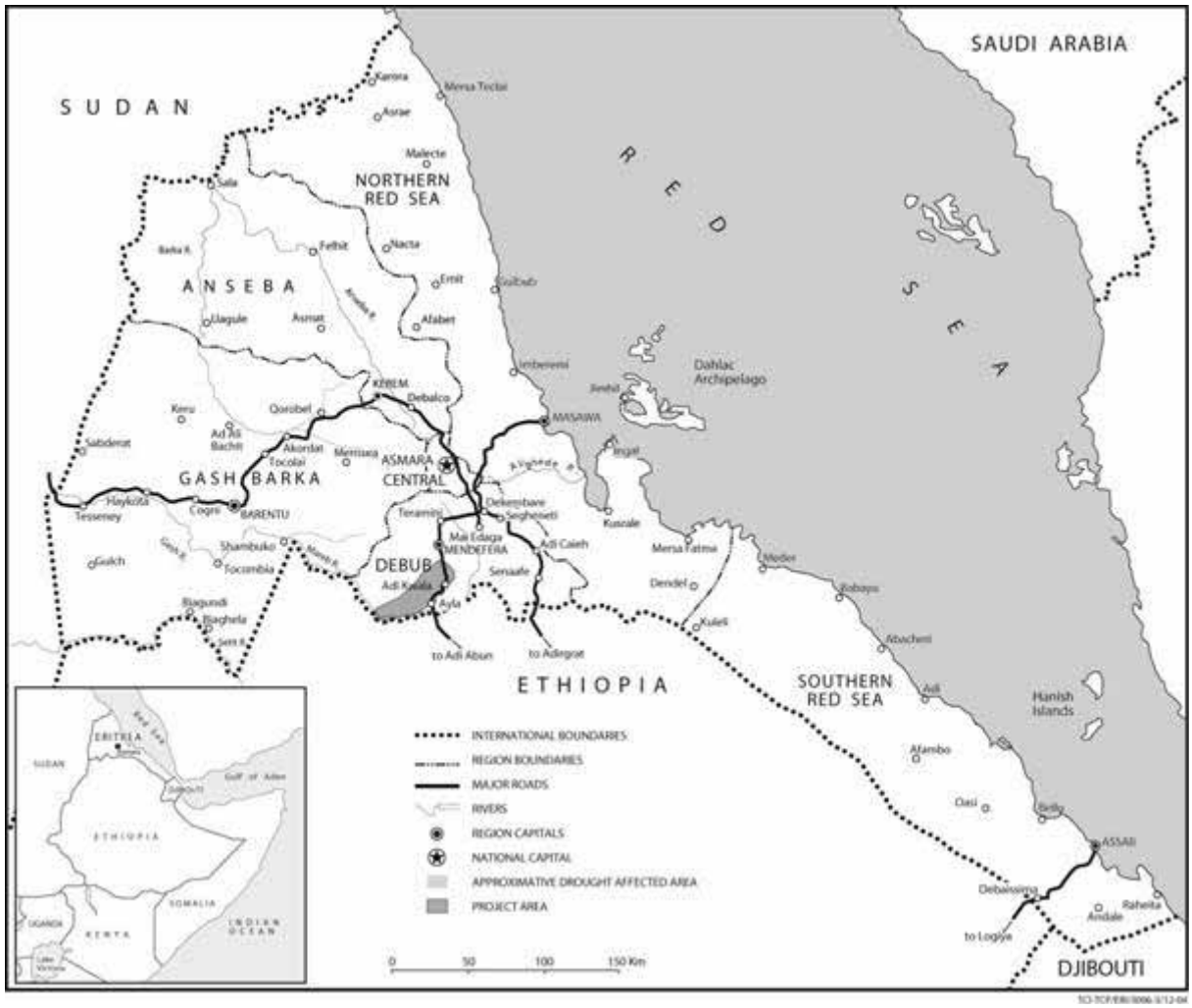
ANNEXES:

Annex 1: Map of Eritrea Showing Location of Project Area

Annex 2: Livestock Component Indicative Financial Returns

Annex 3: Production Cost of Some Crops Used to Calculate the Financial Results

Annex 1: Map of Eritrea Showing Location of Project Area



Annex 2: Livestock Component Indicative Financial Returns

Breeding goats:	4,000
Breeding cows:	2,000
Grazing land (ha):	3,300

Production Coefficients			
Parameter	Value	Parameter	Value
Cattle		Goat	
Breeding cow (Nº)	8,000	Breeding does (Nº)	20
Age first calving (month)	33	Breeding buck (Nº)	2
Calving interval (month)	12	Fertility rate (%)	90
Fertility rate (%)	75	Kid/doe/year (Nº)	1.8
Cow productive life (year)	9	Kid mortality/year (%)	2
Claves/cow/productive life (Nº)	8	Adult mortality/year (%)	0.8
Calf mortality/year up to mortality (%)	3	Milk yield/doe/day (kg)	1.3
Adult mortality/year (%)	2	Lactation period length (day)	90
Milk yield/cow/day (kg)	4	Total lactation length year @ 1.8 kid/year/day	162
Lactation period length (day)	240	Doe replacement rate (%)	15
Steer liveweight at slaughter age (kg)	210	Twining rate (%)	20
		Liveweight at slaughter age (kg)	30

Farm Budget (HH)				
	Unit	Qty.	Value (Nakfa)	
			Unit	Total
Income:				
Cattle				
Meat (lbw basis)				
Steer: 700 steer/year production @ 400 kg lbw each	t	280	30,000	8,400,000
Cull cow: 300 cows @ 360 kg lbw	t	108	25,000	2,700,000
Milk: yield 4 kg/cow/day after calf feeding @ 210 days lactation period length @ milking 1,800 cows = 1,512 t/year	t	1,512	4,000	6,048,000
Subtotal Cattle				*17,148,000*
Goats				
Meat (lbw basis)	t	175	20,000	3,500,000
Milk	t	270	4,000	1,080,000
Subtotal Goats				*4,580,000*
Total Income				21,728,000
Expenses:				
Pasture maintenance	ha	3,300	2,000	6,600,000
Feed conservation	t	3,500	200	700,000
Water system maintenance				800,000
Feed supplement	t	100	5,000	500,000
Veterinary				750,000
Buildings maintenance				400,000
Equipment maintenance				600,000
Labour	person–day	60	18,000	1,080,000
Transport				250,000
Total Expenses				12,680,000
Profit (before tax)				9,048,000

Project Area Total Annual Financial Result

Total HH (direct beneficiaries)	6,652
Total return/HH (Nakfa)	1,360
Total annual financial return of project area (Nakfa)	9,048,000

ASSUMPTIONS:

- *The prices of outputs taken to estimate the indicative financial results were about 30% lower than the actual prices in Eritrea during the last quarter.*
- *The prices of inputs taken were those of the years before the Eritro–Ethiopian war (1997) because current prices are too inflated to be representative.*
- *It is assumed that input and output price increases will balance with each other.*
- *The production coefficients given were based on wide experience in Eritrea comparing the typical traditional system with those improved systems. In effect, about 20% safety margin has been given in most cases.*
- *Exchange rate: 1.00 US$ = 19.00 Nakfa.*

Annex 3: Production Cost of Some Crops Used to Calculate the Financial Results

Cost of Production for Tomato				
Item	Unit	Qty.	Cost (Nakfa)	
			Unit	Total
Seed cost	kg	0.5	1,000	500
Seedling				
Seed bed prep. For seedling	person–day	2	50	100
Irrigation	person–day	4	50	200
Weeding	person–day	2	50	100
Land preparation (Ploughing)	oxen days	8	80	640
Fertilizer DAP	quintal	1	250	250
Urea	quintal	1	200	200
Transplanting	person–day	20	50	1,000
Irrigation				
Fuel	litre	150	11	1,500
Oil	kg	2	30	60
Labour (irrigation)	person–day	80	50	4,000
Cultivation	person–day	20	50	1,000
Weeding	person–day	20	50	1,000
Staking				
Stick for standing of tomato				1,000
Labour for sticking	person–day	15	50	750
Pesticide				
Insecticide	litre	4	200	800
Fungicide	litre	4	200	800
Harvesting labour	person–day	30	50	1,500
Transport to market	quintal	120	50	6,000
Total costs				21,450
Yield per hectare	quintal	120	350	42,000
Net benefit per ha				20,550