FOOD SECURITY PROGRESS AND RURAL ROAD IMPACT IN ERITREA

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Rural and Agricultural Incomes with a Sustainable Environment (RAISE)
IQC No. PCE-I-00-99-00001-00, Task Order 806:
Food Security Progress and Rural Road Impact Assessment

For USAID/Eritrea's Strategic Objective # 661-002-01
Increased Income of Enterprises, Primarily Rural, with Emphasis on Exports

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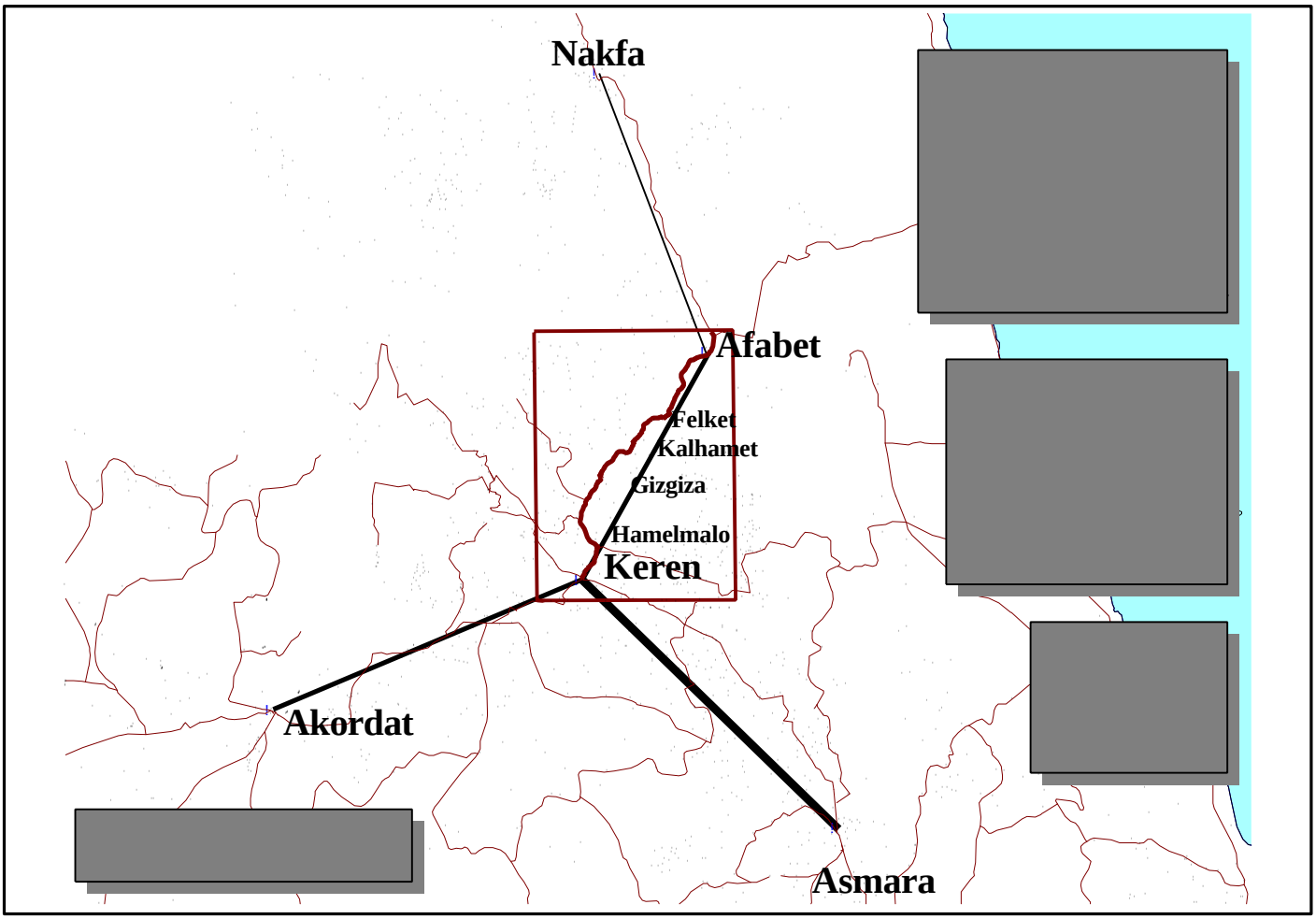
Area of Road Impact Assessment



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Any errors are solely the responsibility of the authors. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the US Agency for International Development.

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LIST OF ACRONYMS AND TERMS

ECDF	Eritrean Community Development Fund
EGB	Eritrean Grain Board
ERN	Eritrean Nakfa
ERREC	Eritrean Relief and Refugee Commission
FAO	Food and Agriculture Organization (United Nations)
FFW	Food for Work
GDP	Gross Domestic Product
GSE	Government of the State of Eritrea
IDP	Internally Displaced People
IRI	International Roughness Index
MLHW	Ministry of Labor and Human Welfare
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOLG	Ministry of Local Government
MOPW	Ministry of Public Works
MOTC	Ministry of Transportation and Communications
MTI	Ministry of Trade and Industry
NDVI	Normalized Difference Vegetation Index
NFIS	National Food Information System
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
OCHA	United Nations Office for Coordination of Humanitarian Assistance
RED	Roads Economic Decision Model
RTCD	Road Transport Construction Department
SD	standard deviation
UN	United Nations
UNDP	United Nations Development Program
UNDRO	United Nations Disaster Relief Organization
USAID	United States Agency for International Development
US$	United States Dollar
VAM	Vulnerability Assessment Mapping of the WFP
WFP	World Food Program
Zoba	Administrative unit level two (6)
Sub-Zoba	Administrative unit level three (58)
Kebabi	Administrative unit level four (756)
ha	hectares
km	kilometers
km^2	square kilometers
k/h	kilometers per hour
m	meters
mm	millimeters
mt	metric tons

EXECUTIVE SUMMARY

In September 1996, the United States Agency for International Development (USAID) and the Government of the State of Eritrea (GSE) signed a three-year, $20 million dollar PL-480 Title III Agreement to generate local currency and use this currency to improve food security and invest in secondary roads in Eritrea. The mechanism for the agreement gave food aid grain to the GSE. The GSE sold the grain to the Eritrean Grain Board (EGB), which then sold the grain on the market. The proceeds from the sale of the grain to the EGB went into a counterpart fund. The fund financed GSE-led development activities to improve food security. Each year, the GSE decided to allocate the development funds to the Ministry of Public Works (MOPW) to finance the rehabilitation of secondary rural roads.

As part of the Title III Agreement, the GSE committed itself to achieving five food security objectives by 2001. USAID/Eritrea initiated this assessment to determine GSE progress in achieving its objectives and to determine if road rehabilitation was a useful investment. The GSE objectives, as spelled out in the Agreement are:

- Implement a strategic food grain reserve of 50,000 mt.
- Produce 350,000 mt per year of domestic food grain.
- Have full rural employment.
- Stop all non-emergency food aid distributions.
- Rehabilitate 200 km of secondary rural roads.

Methods

This report links the GSE policy objectives, with the more physical objective of rehabilitating roads, through the use of a food security model based on household income. This model suggests that road rehabilitation increases incomes to rural households who use and live near the road because it is less expensive for them to travel, saves them time, reduces the cost of agricultural inputs and reduces the cost of getting their production to the market.

This report is the outcome of several methods, including a review of literature and documents on poverty, rural road rehabilitation, and food security; discussions with individuals representing six ministries in the cities and towns of Asmara, Keren, Hamelmalo, and Afabet; structured interviews with groups of administrators, traders, and agricultural producers in the Afabet and Hamelmalo Sub-Zobas; and five formal surveys:

- a traffic survey of all vehicles, animals, and pedestrians during the period from 6:00 to 18:00 for seven straight days to determine the amount of people and goods on the road;
- a passenger survey at Afabet of 100 passengers waiting for transport, to determine their costs of transport and travel times;
- a survey of 100 enterprises from Afabet and Hamelmalo Sub-Zobas to determine if changes in the ease of transport had helped their business;
- structured interviews with a focus group of 58 local village heads from the Afabet Sub-Zoba to get background information and impressions about how the road has change their communities; and
- physical inspection of 62 km of road from Keren to Afabet to determine the magnitude of the upgrade of the road.

Findings

Food Security Policy

The EGB is charged with managing the strategic grain reserve. By early 1998, the strategic grain reserve had reached 40,000 mt. In mid-1998, when the war with Ethiopia broke out, the EGB Board of Directors decided to use the reserve to feed expellees and internally displaced people (IDP). Since then, the reserve has not been completely replenished. It currently has 26 million Eritrean Nakfa (ERN) in cash, enough to purchase about 20,000 mt of cereal at current international market prices.

The GSE achieved the objective of domestic food grain production of over 350,000 mt in one year (1998), under an extensive GSE program of tractor plowing, subsidized fertilizer, and other inputs including labor. Ideal growing conditions also helped in achieving the high level of production. This was the first time that Eritrea had achieved such a high level of cereal production and it was due to the increased area under cultivation, not increased yield per ha. The achievement of this objective for annual production in one year shows that there is enough arable land in Eritrea to reach the objective. The management levels, and capital necessary, to annually improve yields per ha without subsidized inputs could become available when the producers, currently at the front, return to participate in more economically productive activities.

The GSE objective of full rural employment was difficult to assess because the definition of employment confuses official employment (GSE, factories, formal enterprises) with agricultural activities. From a legal point of view, most agricultural activities are more closely related to contract work and are not covered by programs of the Ministry of Labor and Human Welfare (MLHW). This report, therefore, used “access to sources of household income” as an indicator of “employment” for rural households. The primary sources of income for rural households are cereal production and livestock production. We were unable to quantify these sources because the administrative units of the country were reorganized from nine regions to six Zobas, and a sufficient historical data set was, therefore, not available. We were, however, able to document employment in formal enterprises.

The objective of eliminating non-emergency food aid distribution was attained in late 1996, when the GSE issued its food aid policy and stopped all food aid distribution programs. For three years now, the emergency has made food aid distribution the primary thrust of GSE food aid policy. The GSE is currently distributing full daily rations to one million people, and according to a recent nutrition survey in the area of the case study, levels of undernutrition have still increased in some households. These increasing levels of undernutrition could be due to poor targeting of food aid rations because food is available in the country.

Road Rehabilitation

The GSE objective of rehabilitating 200 km of secondary rural roads, is on track. A total of 221 km of road have been rehabilitated with Title III funds: Keren-Afabet (68 km), Akordat-Sawa (110 km), and Keren-Halhal (43 km). The road section from Keren to Afabet (the case study for this report) has been improved from “very rough” to “rough” resulting in lowered transportation costs for passengers and goods. Income levels have increased for rural households that use the road. Access to social services, such as schools and health facilities, has increased for many agropastoralists but it was difficult to quantify. The difficulties were related to an IDP camp of 30,000 people located in the case study area and who used health facilities along the road.

Economic activity has increased with the development of newly registered enterprises in Hamelmalo, Gizgiza, Kelhamet and Felket, and increased growth of enterprises in Afabet due to the road. The road has given the livestock producers of the Northern Red Sea Zoba better access to the markets in Keren and Asmara. Average passenger fares have decreased by over 30% in the past five years. More people from the Afabet Sub-Zoba are using the hospital in Keren than they did five years ago. Interviews with agricultural producers show that they travel more frequently now that the road is in better condition. They used to move their production by camel to markets in Keren at a cost of 20 ERN per 100 kg for two days travel. Now they can put it on a truck or bus for 10 ERN per 100 kg. This increased access to the market has increased the diversity of crops and vegetables they produce.

Conclusions

Food Security

At the national level of food security, Eritrea is now much more vulnerable to food insecurity than it was in 1997. The economic disruptions, associated with the war with Ethiopia, have reduced opportunities for trade, and increased labor shortages in the agricultural sector reducing national food production. In addition, many skilled people from administrative, management and analytical positions in the government sector, nongovernmental organizations (NGOs), and the private sector are also not available to contribute to the improvement of the rural economy because they are doing military service.

At the household level, the massive amounts of food aid being distributed as rations may be helping some people hold on to their productive assets (e.g., seeds and livestock) in the face of the general economic decline in the rural areas (this is the view of some GSE officials). The downside is that these massive inputs of food aid may be hurting the market for locally grown cereals, severely cutting into the incomes of cereal producers.

Road Rehabilitation

1. This study has generated enough baseline data so that the road can be monitored in the future to determine its continuing impact. The various survey instruments served as helpful devices for generating this data.

2. The road reconstruction has provided a solid amount of economic benefits to its users and to the adjacent areas.

3. The road is carrying a substantial amount of motorized traffic. When the traffic to Halhal is combined with that going north from Hamelmalo toward Afabet, the 150 vehicles per day is moving the statistics toward the point where hard surfacing of the Keren-Hamelmalo portion should be considered.

4. The people living and working near the road are generally quite happy with the road improvement and feel that their access to markets and services is much greater.

5. The road appears to be serving business interests: 1) the majority of those interviewed in the traffic survey (which did not include bus and truck passengers) were using the road for business reasons, and 2) the road is carrying a great amount of goods and products.

6. A substantial number of people in the area have acquired masonry skills because they worked on the road reconstruction.

7. Lack of a regular routine maintenance program: 1) has led to speeds that are slower than might be possible on many parts of the road, and thus suboptimal use of the road; and 2) may cause the base course of the road to start to deteriorate.

8. Overall, from a technical point of view, the road reconstruction work has been quite good. In the mountainous areas, there are still sections that are very rough and narrow. These sections need a layer of gravel and some of the fall rock needs to be removed.

9. The Road Inspection Report form used for this assessment provided much helpful technical information, including a format for comparison to previous and future road surveys.

Recommendations

Implement Vulnerability Assessment Mapping (VAM) under the Auspices of the National Food Information System (NFIS)

Implement the VAM immediately to improve GSE targeting of food aid distributions and reduce the possibility that some areas and households could be missed, or some areas in Eritrea could receive food aid unnecessarily. A list of potential indicators for an Eritrean VAM at the Sub-Zoba, or better at the Kebabi level could include:

- percent of the population living within five km of a good road or rail line,
- percent of the population living within ten km of a health center,
- percent of the population living within five km of a telephone,
- insecurity score,
- percent of households with access to electricity,
- average annual per capita cereal production,
- annual value of food aid distributions,
- average annual per capita livestock off-take,
- draft animals per capita,
- literacy rate,
- gross enrollment rate in primary school, and
- total annual biomass production as measured by the Normalized Difference Vegetation Index (NDVI).

Economic Analysis Before More Food Aid

Due to the large quantities of food aid being distributed as rations for such a long period of time, USAID should do an economic analysis of how food aid may influence incentive structures for local cereal producers.

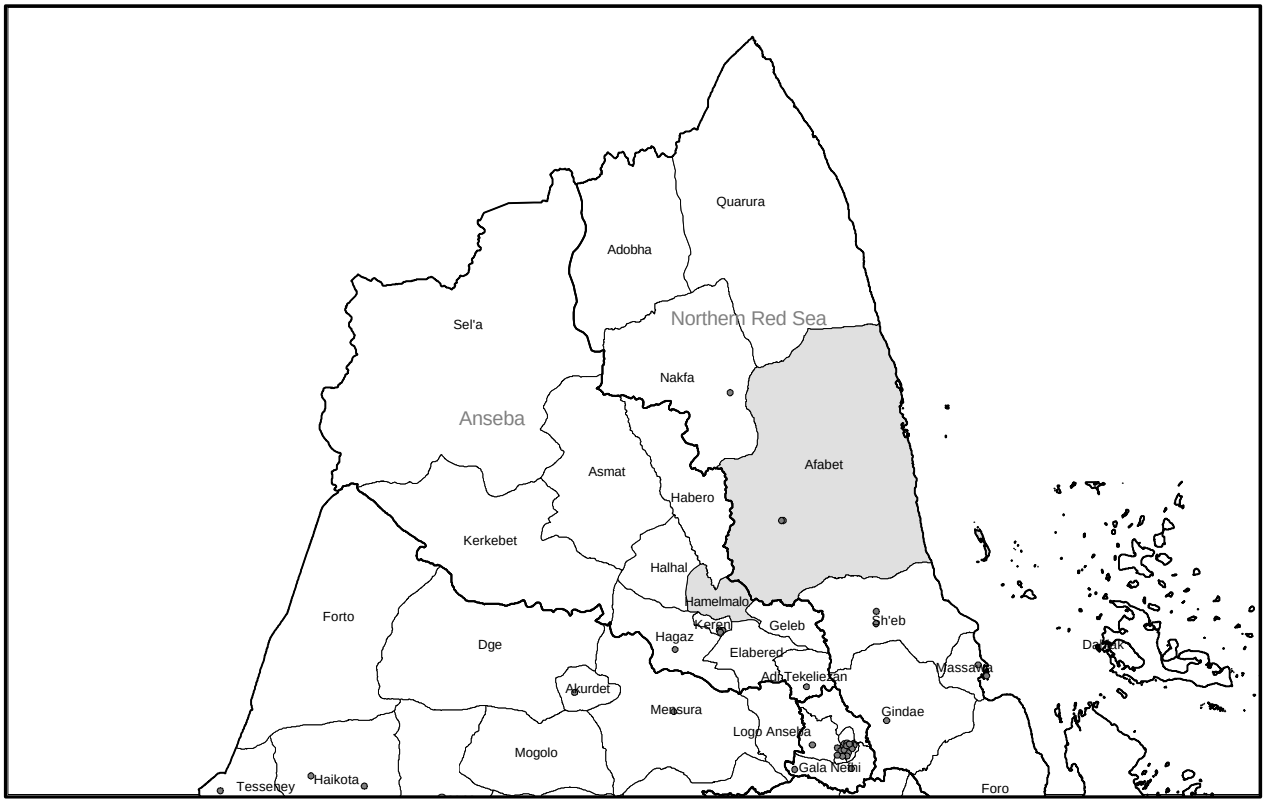
Disseminate Price Data

Structure and disseminate the price data collected by the Ministry of Trade and Industry (MTI) to assist producers and traders in finding their buyers and sellers. Price data is the most effective tool for monitoring food security. This information would be more helpful to more people if it were more readily available. It would increase the efficiency of the grain market and assist producers in determining their marketing strategies. Price signals from a freely functioning grain and livestock market are the best indicators of how producers of these commodities are faring.

Roads

1. Monitor the economic impact of the Keren-Afabet road on an annual basis, including a seven-day set of traffic interviews and more interviews in the community to better determine the road's actual impact in the communities. Survey tools should be based on versions of this assessment's survey instruments.
2. Consider reconstruction of other rural roads that have the potential for strong economic impact, giving priority to those with the highest potential. The World Bank's Roads Economic Decision Model (RED) computer model (copies were given to USAID and the Road Transport Construction Department [RTCD]) should be used to help make the choice.
3. Consider an economic projection of the impact to determine if hard surfacing of the road between Keren and Hamelmalo will provide net returns.
4. Conduct a study to determine how to make better use of the large group of people in the area who have acquired good masonry skills.
5. Develop a routine maintenance program to carry out grading, culvert inspections, and other repetitive tasks on a regular basis.
6. Complete the basic reconstruction of the Keren-Afabet road within the next year.
7. Consider use of the Road Inspection Report form (Appendix C) as a basis for future physical road inspections.

Figure 1. Map of Administrative Units in Northern Eritrea (The Case Study Area is in the Sub-Zobas of Hamelmalo and Afabet.)



CHAPTER 1.
INTRODUCTION

In September 1996, USAID and the Government of the State of Eritrea (GSE) signed a three-year, $20 million dollar PL-480 Title III Agreement to generate local currency and use the local currency to improve food security and invest in secondary roads in Eritrea. The mechanism for the agreement monetized US food aid grain by selling it to the EGB, which then retailed it on the market from its outlets around the country. The proceeds from the sale of the grain were made available to finance GSE-led development activities to improve food security. Each year the GSE decided to allocate the proceeds to the MOPW to finance the rehabilitation of secondary rural roads.

As part of the Title III Agreement, the GSE committed itself to achieving five food security objectives by 2001. USAID/Eritrea initiated this assessment to determine GSE progress in achieving its objectives and determine if road rehabilitation was a useful investment. The GSE objectives, as spelled out in the Agreement, and USAID's questions from the Scope of Work for the Assessment Team are:

1. A strategic food grain reserve of 50,000 mt

- What is the progress to date towards achieving this reserve?
- Has it ever been achieved?
- What is the current grain reserve?
- Is it considered adequate?
- What events may adversely influence the adequacy of this reserve?
- What actions is the GSE taking to accomplish this objective?

2. Domestic food grain production of 350,000 mt per year

- What is the progress to date towards achieving this objective?
- What is the current food grain production?
- What actions are the GSE taking to achieve this objective (i.e., increased area under cultivation, increased yield, change in cultivation practices)?
- Can this higher level of production be sustained?

3. Full rural employment

- What is the definition of employment in Eritrea?
- What is the progress to date towards achieving this objective?
- What is the current rural employment situation, taking into account the absence of a large number of young adults due to the border conflict since 1998?
- Are people underemployed?
- Are rural people able to generate cash income?
- Is the employment level creating pressure on wages in the region?
- What action is the GSE taking to accomplish this objective?

4. No non-emergency food aid

- Has the elimination of non-emergency food aid distribution through nutrition programs, general rations to destitute families and Food for Work (FFW) had a negative impact on the nutritional status of children under five?
- Has the elimination of non-emergency food aid distribution increased poverty levels?
- What is the food balance (presented as a food balance sheet)?

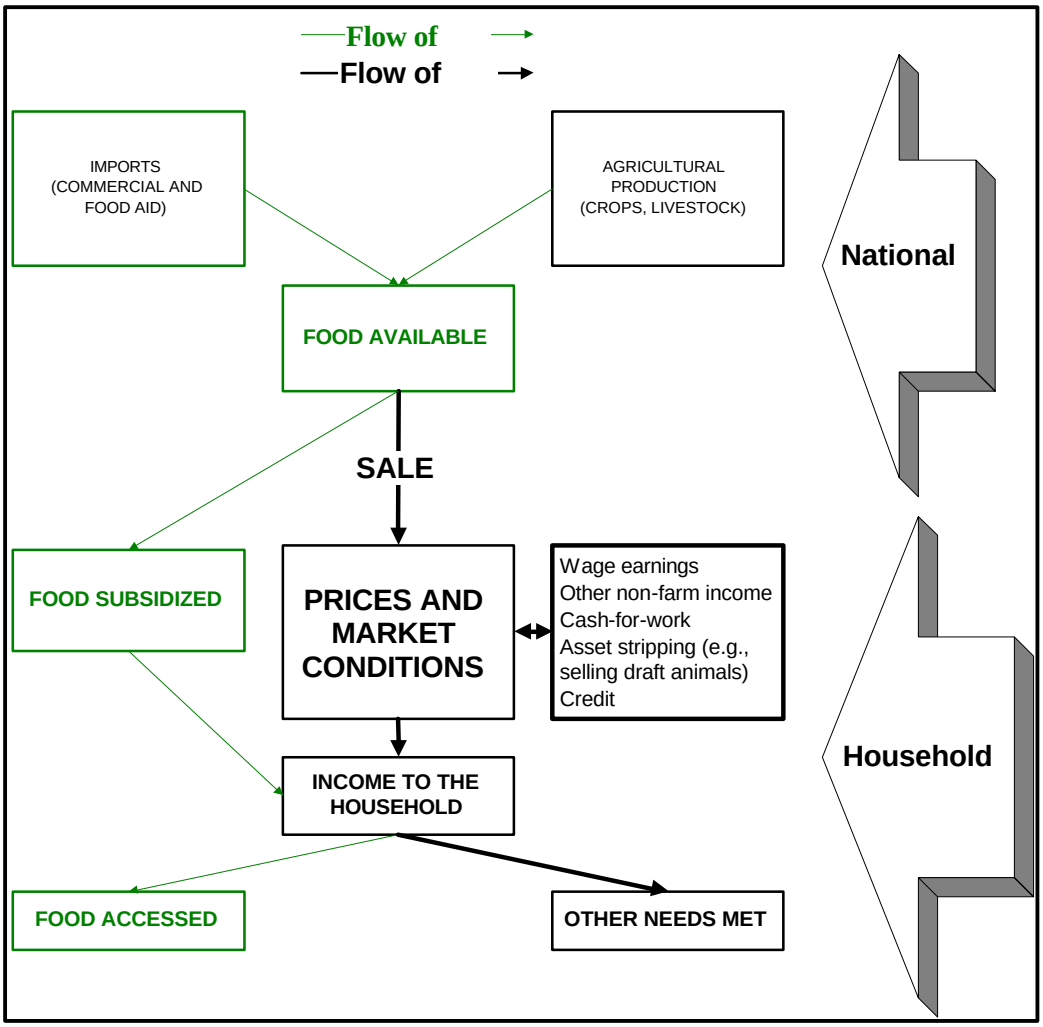
5. Rehabilitation of 200 km of secondary rural roads

- Has the road reduced transport costs?
- Has the road reduced travel time?
- Has the road increased the volume of goods transported?
- Has the road increased the amount of services available to rural communities (markets, health care)?
- What is the economic impact of the road for enterprises and communities?

1.1 The Food Security System

The five objectives GSE chose in signing the Agreement with USAID for improving food security show its understanding of the interrelatedness of agricultural production, imports, employment, working markets, and the detrimental effects of food aid. These interrelated components of food security form a system.

Figure 2. A Simplified Diagram of the Generic Food Security System



A food security system can be as simple as a feeding camp where it is an exercise in stock management and logistics. A food security system for a nation or a household can be very complex because it

includes everything from total production potential of the country to addressing differential eating habits within a household (Figure 2). Disruptions in any part of the system can cause food insecurity. This assessment of food security is limited to important constraints within the national food security system that can be assessed in secondary documents in a short amount of time. It will have relevance for implementing future USAID programs in Eritrea. This assessment will, therefore, answer two questions about the food security system:

- How well does the food security system work for the nation (top half of Figure 2)?
- How well does the food security system work for households in the case study area where the road has been rehabilitated (bottom half of Figure 2)?

Referring to Figure 2, the two traditional sources of food in Eritrea are imports and agricultural production of food crops. These sources make up the total **available** food in the country. Households **access** this food in the market. The price of the food is determined by how much food is available, the cost of transporting it, wage scales, employment levels, and other factors that influence household income. The household must make decisions about how to allocate its income to purchase food and other essentials (health care, education, livestock or other productive assets).

This assessment of food security in Eritrea will describe each box of Figure 2 and show how changes within each box may affect income to rural households. It will pay special attention to sources of income for rural households and agricultural producers, as this group seems to be the most vulnerable to food insecurity in Eritrea and the group that the GSE has targeted for many of its programs to raise agricultural production. This approach will answer many of the questions posed by USAID within a context that stresses access to markets, access to social services like healthcare and information, and access to opportunities for increasing household income.

1.2 Rural Road Rehabilitation and Household Incomes

The relationship between rural income and roads was first noted by Von Tunin in 1885. He pointed out that over most of Europe:

> *Transport improvements reduce the cost of shipping agricultural products to market and extend the distance to break-even locations, thereby expanding the area of land under cultivation, and expanding the production of exports. Moreover, transport improvement reduces production costs by lowering the delivered price of inputs, including capital and information (the latter by facilitation of increased speed of know-how and technological diffusion). Consequently, they increase net farm gate prices and raise producer incomes, although the extent hinges on the competitiveness of the transport service market* (the von Tunin theory from Liu 2001).

This report uses a case study approach, focusing on one section of road that joins two Zobas (level two administrative units): Anseba and Northern Red Sea. The MOPW chose this section to rehabilitate, to break with the colonial tradition of connecting all roads to Asmara. The funding for rehabilitating this section came from a USAID Title III Agreement. At the Anseba end is the large market town of Keren, and at the Northern Red Sea end is the market town of Afabet. This section of road helps connect the livestock producing areas of the Northern Red Sea Zoba and the fertile Naro valley, with the markets of Keren and Asmara. Work began on this section in 1997 and is expected to be completed in early 2002. The case study assessed changes in household income, access to social services (hospitals, primary education), and the reduction in transport time and cost that facilitated these changes.

CHAPTER 2.
THE NATIONAL FOOD SECURITY SYSTEM

In 1949, the Food and Agricultural Organization (FAO) developed a formula to calculate a food "balance" useful for determining the food security of a nation. This formula is **imports** plus **production** minus **consumption** for a calendar year equals the "balance". If the "balance" is positive, the nation is "food secure". If the balance is negative, the nation is "food insecure". This section examines the three components of FAO national food security in Eritrea and the role of a strategic grain reserve in maintaining a positive balance and stabilizing prices in times of economic stress.

2.1 Imports of Coarse Grains and Food Aid

Eritrea has always been an importer of coarse grains. Historically, it balanced these imports with exports of high value crops like flowers, fruits, cotton, and industrial goods. Following independence in 1993, there was considerable growth in the economy driven by trade with Ethiopia, Sudan and Europe. Beginning in 1998, the war and economic disruptions with Ethiopia caused export revenues to decline drastically.[1]

Since 1998, Eritrea's demand for imported food has remained the same but the sources for this food have shifted to more formal, and potentially more costly, imports of food from distant countries. One of these sources of imported food is food aid. Food aid is subsidized commodities that are obtained by countries or households at below market prices. These commodities help donor countries liquidate their surpluses while performing a service to countries whose people are too poor, or whose governments do not have enough foreign exchange, to purchase commodities they need on the international market. The quantity of food imported by the GSE has increased significantly due to the economic disruptions caused by the war with Ethiopia and several consecutive years of drought.

Table 1. Cereal Imports through Eritrean Ports

Year	Mt	Source
1995	143,000	FAO
1996	228,000	FAO
1997	32,200	FAO
1998	100,000	USAID
1999	31,504	EGB
2000	323,804	EGB
2001	92,000	EGB

Food aid contributes to short-term food security when it is well targeted to those most in need, as in feeding camps, or school feeding programs. When it is not well targeted, it is often detrimental to initiatives that promote long-term food security because it lowers the price that producers receive for their production, discouraging them from producing basic cereals. Most issues related to short-term food security will not be a part of this assessment. These short-term food security issues include nutrition surveys, targeting of programs for FFW and school feeding, maintenance of IDP and refugee camps, and other instances where food aid is the only social safety net available to the rural people of Eritrea.[2] The World Food Program (WFP), EGB, Eritrean Relief and Refugee Commission (ERREC), other GSE agencies, and NGOs have already put many resources into short-term food security (the ERREC and WFP are currently providing rations to one million people in Eritrea).

1 Hammond, 2001. (See Appendix A for full reference titles.)
2 United Nations (UN), 2001.

2.2 Strategic Grain Reserve

The role of the strategic grain reserve in Eritrea is to provide victims of disasters (a disaster requires assistance from outside the community or the nation) support until food aid can be imported from donor counties or purchased on the international market. In most cases, food aid from donor countries takes at least eight months from the time Eritrea declares a disaster until the time that food aid gets to those who need it. This time lag from request to delivery could be a critical period as food prices would rise and poor people, marginalized by limited access to markets and low incomes would not have enough money to purchase the food they needed.

The original plan for the strategic grain reserve was to have about 50,000 mt of reserve available, in grain or hard currency. This amount would be enough to feed 1.1 million people for three months. The reserve was established, and by 1997 had reached 40,000 mt, located in storage facilities throughout Eritrea. The members of the EGB decided to use the reserve for emergency assistance to war and drought victims in 1998. The war with Ethiopia has continued the emergency assistance program until now. The emergency program will probably continue until the military is demobilized, expellees and IDP settled, and Eritrea has a good harvest. The official segment of the reserve is currently 26 million ERN, enough to purchase about 20,000 mt of grain on the international market. Additionally, the EGB currently (December 2001) has 81,000 mt of cereal located in storage facilities throughout the country.

2.3 Cross-border Trade

Historically, large quantities of cereals consumed in Eritrea have come from Sudan and Ethiopia. These sources of cereals reduced the risk associated with normal, annual fluctuations in rain-fed agricultural production because the risks of variable rainfall and market disruptions, were widely spread among these neighboring countries. Crop failures in one area of one country were balanced by surpluses in another area of another country. Cereals flowed relatively freely through the porous borders from surplus to deficit areas, enhancing food availability, stabilizing prices, and providing a wider market for producers with a surplus to sell. Interviews with traders[3] suggest that 30-50% of the coarse cereals consumed in Eritrea in the early 1990s came from Sudan and Ethiopia. Table 2 shows official imports for the period 1997-2001. Imports of taff from Ethiopia have dwindled to almost nothing due to the economic disruptions initiated by the Ethiopian response to the introduction of the Eritrean currency and the war. Annual imports of sorghum from Sudan, which has improved its trading terms with Eritrea, change depending on production and price differences of cereals between the two countries, thus helping to increase food security by spreading the risks of crop failures over a larger area.

Table 2. Value (in ERN) of Official Imports of Taff from Ethiopia and Sorghum from Sudan

Year	Ethiopia	Sudan
	Taff	Sorghum
1997	72,087,560	401,315
1998	6,565,217	7,578,902
1999	940,048	21,552,204
2000	36,755	10,185,020

Source: Customs Department

[3] Reported in Hammond, 2001.

2.4 Potential Agricultural Production Food Crops

The second component of the food balance is the quantity of agricultural production. Agricultural production can be defined many ways in an FAO type balance sheet. When it includes only course grains it is a cereal balance sheet. If other foods are added it is a food balance sheet. If it includes the full range of agricultural commodities produced in a country, it is called a commodity balance sheet. A commodity balance sheet is useful where oil crops, wood, and cotton provide a significant source of income to the country or regions in the country. In these cases, the results are not reported in kg or calories but in cash equivalents.

2.4.1 Cereal Production

Eritrea uses a cereal balance sheet for most of its presentations related to food security. Cereal production captures the most important portion of the food consumed because other food crops like potatoes and vegetables only constitute a significant income source around urban areas.

Annual cereal production is highly variable. The environmental reasons for high variability of annual production of cereals is due to degraded landscapes, mostly on the highlands with poor water holding capacity,[4] and variability of annual rainfall distribution over both space and time over most of the county. During the war with Ethiopia other sources of variability in annual production include insecure areas and labor shortages at critical times of the year. These extra sources of production variability are temporary, due to many cereal producers working in the national service or the military. With demobilization, these people will be able to return to their farms.

The degraded landscape of most of the densely populated highlands of Eritrea will require nurturing over many years. Overgrazing and tree cutting has reduced the amount of vegetation on the surface and reduced soil water holding capacity. This has led to soil erosion on a large scale. To reduce erosion, the Ministry of Education (MOE) is perusing a natural resource management strategy consisting of terracing and creating “exclusion zones”. Exclusion zones are areas managed by the village. The village restricts grazing and wood harvesting so that the landscape can rejuvenate itself. Fodder for animals can be cut from the exclusion zone and carried to livestock outside the zone so that the zone is still productive. The exclusion system is economically sound but requires more management and organizational skills at the village level than terracing. Both of these management strategies have the potential to reduce erosion, improve soil water holding capacity, and improve cereal production.

In the more fertile and less densely populated lowlands, a more extensive strategy is being employed by the Ministry of Agriculture (MOA). In these areas, large tracts of arable land have not yet been exploited for production agriculture. In these areas, initiatives to support tractor plowing have been successful in increasing the amount of land under cultivation and improving production per capita. The tractors, originally GSE property, are currently being privatized, creating small rural enterprises in these areas.

2.4.2 Forage and Fodder Resources

Across the many agroecological zones in Eritrea, as annual rainfall decreases and rainfall variability over space and time increases, the quantity of livestock per capita increases. The areas of very high variability are exploited by livestock producers. As long as the markets are functioning, it is very easy for livestock producers to sell their livestock and buy the cereal and other commodities they need. The cereal producers can sell their cereal and purchase the meat and other commodities they need. Livestock

[4] Catterson, 1995.

serve the function of a savings account. In good years, people may accumulate more animals, and sell them for cash in bad cereal production years.

2.4.3 Potential Cereal Production

Domestic food grain production of over 350,000 mt per year was achieved in 1998 under an extensive GSE program of tractor plowing, subsidized fertilizer, and other inputs. In addition, 1998 had ideal growing conditions. It, therefore, appears that 350,000 mt per year is a realistic objective for national production. It shows that Eritrea can produce this amount because it has been produced previously, that enough arable land is available, and the GSE can supply the inputs necessary.

Is this level of production sustainable? The issue of sustainability of this level of production has been addressed by the MOA. The reason the MOA provided such high levels of inputs was to "jump start" cereal production by demonstrating, on a large scale, the improvements in production that can be realized from planting in rows, and using good seeds and fertilizer. These techniques, along with credit to producers, are the core of the MOA program of integrated production. What is not clear is the cost of production or the overall efficiency of the MOA program of integrated production. It may be that the costs of production in 1998 were very high and the GSE will not be able to allocate that much money on a yearly basis. It was also fortunate that 1998 was a good rainfall year because investments in fertilizer can be lost in a poor rainfall year.

MOA subsidizes fertilizer use at about 45% of the cost. Using fertilizer can increase yield when soil water is adequate. If the soil moisture is not adequate then the investments in fertilizer are lost because there are no increases in yield associated with fertilizer use. The MOA stresses that fertilizer use can increase yields when terracing or other measures are used to reduce runoff, but fertilizer is a high-risk input, especially in the past several years when rainfall has been more erratic than usual.

Balancing the risks and costs related to annual cereal production in the semi-arid zones (most of Eritrea) will require more basic agricultural research into cost effective production techniques and access to credit to help smooth over the seasonal cycles of purchasing inputs and getting paid for production. The MOA is actively researching the production techniques and other agencies like the Eritrean Community Development Fund (ECDF) are working on the credit side.

With these considerations of cost and risk in mind, the most likely indicator of potential cereal production in Eritrea, at least in the next few years, is average production over the past ten years or so. Table 3 presents the average annual production of some of the most important cereals over the past nine years. These production figures may seem conservative but it is better to be conservative when programming for the future food needs of a country like Eritrea because it relies heavily on trade and subsidized agricultural inputs for its food.

To reach consistently higher annual production will require improved soil water management at the farm level, improved management of subsidies and price supports at the macro-policy level to increase the efficiency of production, and access to credit for producers to balance annual variability of incomes from cereal production. These conditions could be met when people in the military are back to participate in more economically productive activities.

Table 3. Production (in rounded thousands of mt) of Selected Coarse Grains From 1992 to 2000 in Eritrea

Cereal	1992	1993	1994	1995	1996	1997	1998	1999	2000	Avg	SD
Wheat	8.6	5.4	13.5	8.3	7.9	5.1	22.9	19.0	10.6	**11.3**	6
Sorghum	132.8	44.9	118.3	61.0	39.2	55.3	269.8	207.2	62.0	**110.1**	76
F.Millet	16.1	14.7	17.0	3.4	5.8	3.2	7.6	5.4	2.7	**8.4**	6
P.Millet	31.3	4.4	40.6	9.3	6.6	4.3	44.2	17.8	4.5	**18.1**	15
Total ('000s)	188.8	69.4	189.4	82.0	59.5	67.9	344.5	249.4	79.8	**147.9**	95

2.5 Consumption and Nutrition

When the GSE signed the Title III Agreement in 1996, it understood the detrimental effects of food aid distribution and the GSE Legal Note 26/29 "On Food Monetization Policy", issued in 1996, that ended all free distributions as well as FFW. The contents of this legal note were temporarily suspended in 1998, due to the numbers of people displaced by the war. It may be reinstituted when the current emergency ends. The end of the current emergency has not been formalized and will probably be determined by peace with Ethiopia, settlement of all IDPs and expellees, and reintegration of the military into more economically productive activities. These conditions for ending the emergency could come as soon as 2003. Most hostilities have ceased and some demobilization was scheduled for 2001. Since the food monetization policy was suspended, the distribution of free rations has become the most predominate use of food aid.

At the household level, food aid is often justified by an appeal to improve nutrition levels within a country. The question of undernutrition and its relationship to food security is difficult to answer because in many other countries, undernutrition correlates well with literacy rates and education levels within the household and household income, but rarely with indicators of food availability. In addition, the type and quantity of food consumed is difficult to get at without having a consumption survey. Consumption patterns vary from household to household, one geographic region to another, and time of year. Most cereal consumption figures for national food balance sheets in the semi-arid zones of Africa are a convention of the nation and vary between 160 kg per capita to 220 kg per capita. In Eritrea, the goal of the GSE is to see that people have 180 kg per capita per year of cereals available in the country. This convention was adapted from the WFP ration for "people not living at home" of 500 grams per day or 2,000 calories per day.

Even when food aid is available in the country, it is difficult to target it. For example, a recent study by Mwadime (2001), shows a prevalence of global acute malnutrition of 21.0% in Zoba Anseba. She listed inadequate food intake, insufficient food aid, high morbidity rates, poor hygiene, poor environmental sanitation, severe water shortage (requiring very long walks), and inaccessibility of health facilities. It is difficult to generalize too far from a single study but it does point out that targeting food aid is difficult.

Another picture of consumption emerges from looking at the FAO food balance sheets from 1993-1999. These seven years contain good production and poor production years and some years where food aid was imported. The results of the average over these years is presented in Table 4.

Table 4. Annual Average Food Balance for 1993-1999 from the FAO Food Balance Sheets Website

	Per Capita Supply			
	(Kg/Year)	Calories /day	Protein Gr/day	Fat Gr/day
Vegetable Products				
Cereals - Excluding Beer	**137.41**	1206.97	34.92	6.79
Starchy Roots	34.86	79.94	1.53	0.16
Sugar & Sweeteners	3.30	32.20		
Pulses	14.67	137.39	9.20	0.88
Oil crops	1.04	16.45	0.60	1.43
Vegetable Oils	2.35	56.99		6.45
Vegetables	8.63	5.25	0.33	0.05
Fruits - Excluding Wine	1.23	1.52	0.02	0.02
Stimulants	0.03	0.03	0.01	
Spices	0.21	1.91	0.06	0.09
Alcoholic Beverages	20.51	24.91	0.25	
Animal Products				
Meat	8.20	45.01	3.15	3.50
Offals	1.72	5.22	0.77	0.19
Animal Fats	0.40	9.26	0.01	1.03
Milk - Excluding Butter	18.18	30.35	1.78	1.59
Eggs	0.84	3.19	0.25	0.22
Fish, Seafood	0.57	0.88	0.15	0.03
Total		**1657.47**		

This type of consumption is considered “apparent” by the FAO because it is a calculation from gross national estimates and assumes that all food, produced and imported, was consumed. Note in Table 4 that apparent consumption for all cereals (maize, taff, barley, sorghum, millet, wheat) is only about 137 kg per capita per year. This is less than the goal set by the GSE and may suggest that the FAO approach may have missed some important sources of food. In looking back on consumption patterns for a food balance sheet we will use this figure of 137 kg per capita per year.

2.6 Food Balance Sheet

An annual food balance sheet for the nation presents food availability (production, imports, consumption) in a concise form. The FAO style of food balance sheet is presented each year, and the results can be found at their Internet site. Some donors prefer to see a food balance sheet to help determine food aid needs for a single year. The FAO points out that using a single year balance sheet is very risky because of the many potential errors that can arise in a single year. The most significant sources of error are undocumented on farm stocks, undocumented imports and exports, poor estimates of production and poor estimates of population. Thus, the FAO style is not the most appropriate tool for measuring or presenting food availability for a single year especially in Eritrea where very few resources are available to estimate cereal production and document population movements.

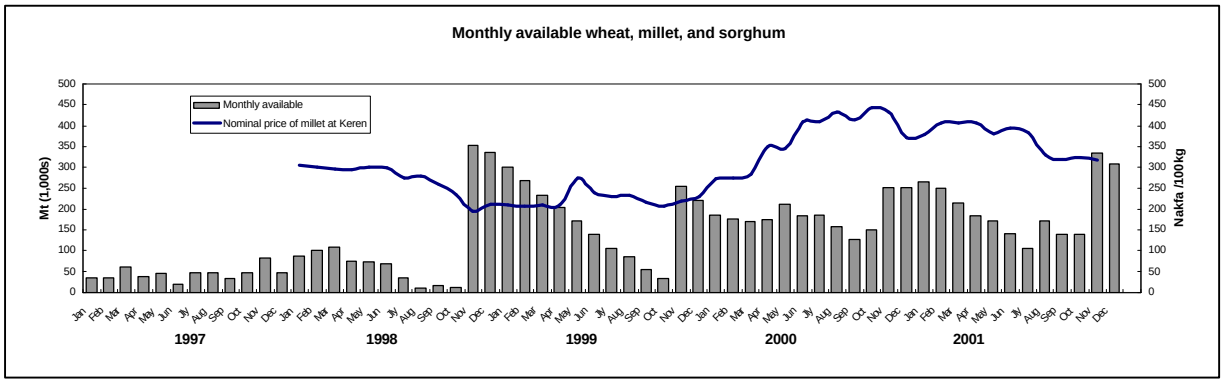
One other approach to the FAO-type food balance sheet, is a running monthly balance sheet that would include only sorghum, wheat, and millet for several years. The three cereals are by no means the only cereals that Eritrean households purchase, but they provide a small window into purchasing decisions at the household level. They constitute a sample that includes an expensive, primarily imported cereal

(wheat) and inexpensive locally grown cereal (sorghum). Because the food balance has many opportunities for error, it is most useful to use several years of the food balance and let the annual errors cancel themselves out.

The cereal balance sheet for this assessment will use a consumption figure of 137 kg/capita/year for the three cereals (from the average of FAO balance sheets). This may be a little high considering there are only three cereals but it is an adequate guess. A population of three million is an estimate derived from averaging several sources. This gives a national monthly consumption rate of 34,000 mt.

The component of production is derived from the production data of Table 3. Imports were obtained from the EGB and FAO and include commercial imports and food aid. Only documented imports are included from Sudan or Ethiopia. The spreadsheet for this cereal balance sheet is in Appendix D, and the results are summarized in Figure 3.

Figure 3. Monthly Balance of Three Cereals in Eritrea Compared with Price Data of Millet from Keren



Note that November is the month of high availability, when most local production comes onto the market. As the year progresses, the amount of cereal declines at the monthly consumption rate of 34,000 mt, occasionally buoyed up by commercial imports or food aid. The difference between this kind of running food balance and the FAO annual balance is that the running balance does not restart at zero mt available at the beginning of each year. So, for example, the good growing season of 1998 was harvested in November and not all consumed. The balance, before the next harvest, was carried over to the next production year.

Monthly nominal prices of millet from Keren, a large town 91 km north of Asmara, shows the general monthly price trend since 1998. Beginning in early 1998, the prices were stable but began falling in July until September, when they started to fall at a faster rate. The reason for this fall was probably due to the market responding to the excellent growing conditions or news of more area under cultivation (the GSE program). By November 1998, the price had fallen to 175 ERN. The prices leveled off for five months when the EGB stepped in to purchase cereals to support the price at 175 ERN. Although 1998 was a good production year, prices began to increase even as large quantities of imports were coming in. This was a time when war anxiety was high and perhaps some influence on prices were due to an IDP camp of 40,000 people, just three hours away from Keren. The price drop before harvest in August of 2001 is probably related to the dismantling of the camp.

We have tried to be careful using consumption figures because if the consumption figures were changed (population or ration per day) it would radically change the absolute values of the quantity of cereal

available. However, changing consumption figures would not change the overall trends in availability related to the nominal price.

2.7 Vulnerability Assessment Mapping by WFP (VAM)

The food balance sheet is useful for showing the national availability of cereals. It does not, however, provide any information on the accessibility of food for households, since accessibility is determined by income. This drawback to the cereal balance sheet has led to other forms of determining food security that incorporates access to food. This section describes the role of the VAM as a risk assessment tool for determining who is at risk for food security disasters (early warning). Vulnerability assessment mapping is a well-established tool for assessing the risk for food insecurity and has been used by UN agencies since 1987 for targeting various types of assistance. It is more useful than a food balance sheet because it can better identify geographic areas where households may be experiencing economic stress and becoming food insecure.

The VAM is a risk assessment. Risk assessments are the first step in disaster preparedness planning. The common characteristic of risk assessment methods is that they rely on inventories (formal data sets and less formal sources of information) of what is at risk, and what is available to reduce the risk (potential losses) and mitigate consequences of disasters. These inventories, of what can be lost and what is available as capacity to reduce the risk, are an essential part of all risk assessments. The better the inventories, the better the assessment. For example, the food balance sheet is a very crude risk assessment. It is a small, and not very accurate, inventory of what is at risk for food problems (estimated population of the country) and the resources available to reduce that risk (estimated food produced and imported).

Risk assessments can be done at any level from individual and household to community, town, city, or nation. They are usually formal documents that point out the strengths and weakness in preparedness and assess the hazards that people could face. Risk assessments formalize information that people may already have and know. It is the formal structure that provides decision makers with unambiguous information useful for making decisions and creates a transparent institutional knowledge base. The goal of a risk assessment is to quantify, as best as possible, some of the elements of risk. These quantities can be monetary units, units of energy intake such as kCals, lives lost or injuries if a trigger event of some magnitude occurs.[5] The structure of risk assessments is often geographic; mapping important hazards, elements at risk, and vulnerability.

The VAM uses a household income model for assessing vulnerability to food insecurity (risk). The model estimates income available to small farmers, agropastoralists, and herders.[6] Understanding the structure of rural household incomes in this way allows us to draw conclusions about the relative changes in vulnerability to food insecurity, by monitoring changes in household income over the long and short term. The income model assumes that interruptions in household income streams create economic stresses that could lead to an inability to obtain sufficient food. Thus, the model is driven by income sources related to agricultural production and access to markets.

The VAM is a process. It requires not only data, but a dedicated group of food security professionals to choose good indicators, by consensus, appropriate for conditions in Eritrea. A good indicator is inexpensive (usually secondary information that has already been collected by a GSE agency, or coarse resolution satellite imagery), provides valuable information, and is relevant in all Sub-Zobas. These

[5] United Nations Development Program (UNDP)/UNDRO, 1992, page 67.
[6] Downing, 1990; Riely, 1993.

professionals and representatives also have to decide how important each indicator is to the total food security picture in Eritrea.

The best time for doing a VAM is usually close to harvest when the outcome of the growing season can be captured by preliminary estimates of production. This timing is early enough to assist food security decision makers in programming the types of interventions that are necessary for victims of crop failures, livestock diseases, market disruptions, or other problems that will lead to reduced access to income (and food). In Eritrea, the VAM would need to be updated when production data from the Northern Red Sea became available.

Some possible indicators for a VAM exercise in Eritrea could include:

- **Percent of the population living within 5 km of a good road or rail line**. This indicator captures the value of access to markets. We have quantified this value in this report. This indicator also helps to remove urban areas from ever being food insecure.
- **Percent of the population living within 10 km of a health center**. This indicator captures the importance of healthcare for a productive, active life.
- **Percent of the population living within 5 km of a telephone**. This indicator captures the importance of information.
- **Percent of the land area in mine fields or a civil insecurity score**. This captures the insecurity of doing agriculture in areas affected by war or accessing markets when there is civil insecurity (unsafe to travel at night etc.)
- **Percent of households with access to electricity**. This indicator helps remove urban areas from being food insecure.
- **Average annual per capita cereal production**. This indictor helps separate the grain producing areas from the livestock producing areas. In areas where average annual per capita cereal production is high, people will depend more on cereal production for their income and be more likely to suffer when there is low rainfall. In areas where per capita cereal production is low, droughts will have very little affect on the income of the household. This indicator also helps remove urban areas from being food insecure.
- **Average annual per capita livestock off-take**. This indicator captures the relative value of livestock to the people living in an area. It can usually be approximated from sales tax information from the Ministry of Finance.
- **Value per person of food aid distributed each year**. This indicator captures the value of food aid distribution to households. Food aid for households is income support for the household. This kind of aid is similar to food aid as income support for a nation.
- **Literacy rate or gross school enrollment rate**. One of the characteristics of most food insecure households is that they do not have any literate members.
- **Average of the annual NDVI (the "greenness" index from the National Oceanic and Atmospheric Administration [NOAA] satellites)**. This indicator captures the quantity of biomass on the landscape. Areas of low annual biomass production are associated with livestock herding and areas of high annual biomass production are associated with forest products, fertile land, and diversified farming systems. Areas of high annual biomass production are, therefore, rarely food insecure.

Some other indicators that have appeared in various vulnerability assessments for countries in semi-arid areas of Africa are listed in Table 5. The indicators are grouped by dimensions of vulnerability:

- quality of life,
- the agricultural resource base,
- medium term indicators that capture recent trends, and
- events of the current year that affect household income.

Note that these dimensions of vulnerability focus primarily on the preconditions for food insecurity to occur. Food insecurity is a slow onset disaster requiring several factors to come together at once. Thus, the events of the current year, like a crop failure, are usually only a small determinant of vulnerability.

Table 5. Some Indicators Used in VAM Exercises in Africa

Dimension	Indicator
Quality of life	Water points per capita
	% households with access to electricity for lighting
	% households with access to electricity or gas for cooking
	% households with flush toilets
	Percent households with access to piped water
	Average relative cost of travel to nearest district market
	Average relative cost of travel to nearest major urban market
	Life expectancy
	Infant mortality rate
	Child mortality rate
	Under five mortality rate
	Rate of school attendance for population over 5 years old
	Literacy rate
	Population density
	Population growth rates
	Nonagricultural wage earners as a percent of all wage earners
Resource Base	Average length of the rainy season
	Average maximum greenness of the vegetation
	Variability of average maximum greenness
	Distance to river or lake
	GDP per capita
	Animal traction units per capita
	Km of paved road per km2
	Tin roofs per capita
Medium Term	Average per capita cereals production
	Average per capita roots/tubers production
	Average per capita cash crop production
	Average per capita fisheries production
	Average per capita livestock off-take
	Other transfers
	Available wild food
	Available forest products (charcoal, wood)
	Wages and salaries
	Crop diversification index

Dimension	Indicator
Current Year	Per capita production all crops
	Per capita livestock off-take
	Per capita fisheries
	Maximum maize price minus maize price two months later
	Livestock/cereal terms of trade
	Biomass maximum difference from average
	Drought days in February
	Drought days in March
	Rainfall more than 300 mm in a dekad
	Livestock disease
	Crop pests
	Per capita production of all crops from previous year
	Civil insecurity rating

CHAPTER 3.
ROAD REHABILITATION AND FOOD SECURITY

The food security system of Figure 2 shows the central role that the market plays for rural households to access income. As noted in the section on the VAM, access to markets is a critical factor for determining vulnerability to food insecurity. Roads serve the function of decreasing transportation costs so that the household pays less for transport of its agricultural inputs and less for taking its production to a market where they can exchange it for cash (ERN). These savings in transport costs help both the producing household and the consumer. This section of the report will discuss the effects of roads on market access and efficiency (that will directly benefit road users), growth of enterprises, and access to social services.

The link between household food security and quality of roads in Eritrea was assessed using information from five surveys:

- traffic survey conducted at Hamelmalo,
- passenger survey conducted at Afabet,
- enterprise survey at Afabet,
- physical inspection of the road, and
- guided discussion group with 58 producer-administrators from Afabet Sub-Zoba.

In addition, local administrative authorities supplied data on transport cost, prices of various commodities, school attendance, agricultural production, hospital attendance, numbers of formal enterprises and other essential data.

At the household level it is the interaction with, and access to, markets that is the critical factor for exchanging labor for goods (Figure 2). For the household then, we need a definition of food security that captures the importance of the market for households. This assessment, therefore, will use a limited, **operational** definition of food security more suitable for the case study area of the road rehabilitation project. This definition is:

> *Each rural household has enough money to purchase, at free market prices, the food it needs for each member to have a healthy active life, access to education, access to health care, and to maintain its cultural traditions and values.*

The components of this operational definition are:

- Eighty percent of Eritrea is **rural**. Urban food security may become more important as the current emergency in Eritrea continues, but the current GSE priority is rural areas where rehabilitation of the degraded landscape is a high priority to increase productivity and where the resources are available to significantly improve productivity of the land and improve the lives of most of its people.
- A **household** is people that share the same living quarters or pool their resources to purchase food. A household is most often a family. The household is the primary production and decision-making unit for rural people. Rural households are flexible in exploiting sources of income within their reach, depending on time of year, opportunities, opportunity costs, and personal preferences. Most rural households are engaged in agriculture. Agriculture is a culture of relating to land and climate in productive and sustainable ways. It is not a job in the sense that a salary and working time are guaranteed by the MLHW, nor is it highly regulated by labor laws. In Eritrea, rural households are provided with rudimentary healthcare, education and some subsidized transportation.

- **Money** is ERN or its equivalent. The sources of money for rural households are selling the agricultural products they produce or collect, like grain, livestock, vegetables, and wood; selling labor to other rural households or enterprises; migrating for salaried work where and when it is available; receiving food aid; and receiving remittances from members of the extended family.
- **Free market** prices means that that the GSE or donors do not provide subsidies for anything (transport costs, production inputs, etc.). A food secure household is free to make choices about how it wants to spend its money.
- **Food** is edible items processed at factory in Eritrea, or other countries, or at home. Most food in Eritrea is imported.
- Most urban households **need** to purchase all of their food. Rural households produce much of it themselves and only **need** to purchase some processed items. The cost of a monthly food basket for a family of average size of 4.5 people in Keren, for example, is about 1,375 ERN (Table 6).

Table 6. Annual Average Food Balance per Capita for 1993-1999

		Keren Food Basket	
	(Kg/Year)	Price 2001 ERN/kg	Cost 4.5 people ERN/Month
Vegetable Products			
Cereals - Excluding Beer	**137.41**	17	876
Starchy Roots	34.86	5	65
Sugar & Sweeteners	3.30	7	9
Pulses	14.67	10	55
Oil crops	1.04	16	6
Vegetable Oils	2.35	13	12
Vegetables	8.63	8	26
Fruits - Excluding Wine	1.23	7	3
Stimulants	0.03	34	0
Spices	0.21	8	1
Alcoholic Beverages	20.51	18	138
Animal Products			
Meat	8.20	39	120
Offals	1.72	16	10
Animal Fats	0.40	4	1
Milk - Excluding Butter	18.18	6	41
Eggs	0.84	12	4
Fish, Seafood	0.57	36	8
Total		256	**1,375**

Source: FAO Food Balance Sheets website and cost/month for that food determined by interviews with food purchasers.

- **A Healthy, active life** means adequate calories, and nutrients, distributed appropriately within the household. Nutrition problems may arise if the household does not have enough resources or knowledge to supply adequate amounts of calories and nutrients to all members.
- **Education and healthcare** are major long-term productive assets of the household chosen for this assessment because data is available from the Zoba, for primary school attendance and names of villages where people come from to seek medical care.

- **Cultural traditions and values**. Eritreans do not live by bread alone. As destitution sets in on a household, cultural values deteriorate. Marriages, funerals, and other rituals that bond the household with the wider community cannot be celebrated. Extreme destitution can lead to desperate migration to cities or other countries, breakdown of social structures, loss of history, and civil unrest.

Food insecurity will arise when the household does not have enough money to purchase the food it needs for its members and meet its other needs. If the cost of a basic food basket takes up a large proportion of the total household income, the household will have to make sacrifices so that they can eat. They will have to forgo education, essential medicines, and preventive healthcare. They may also have to sell things they cherish or things they need to produce income, separating them from their history and reducing the possibility that they will be able to recover quickly when their income returns to normal.

The reasons that the household may not have enough money could be temporary loss of income from a crop failure, the loss of the principle income earner, poor access to markets to exchange labor for goods, high prices for food due to reduced availability, or inadequate social safety nets provided by the extended family, community, or agencies of the government. Thus, food insecurity is a characteristic of very poor households and does not differ much from extreme poverty.

3.1 The Case Study Area

The road between the towns of Keren and Afabet joins Keren, the seat of the administration for Anseba Zoba, and Afabet, the seat of the administration of Afabet Sub-Zoba in the Zoba Northern Red Sea. This section of newly rehabilitated road shows some evidence of the new economic activity, which includes 61 new commercial buildings at Felket, 65 at Kelhamet, and 40 at Gizgiza. Other small villages within the catchment area of the newly rehabilitated road are connected by occasional tracks suitable for vehicles, and tracks suitable only for camels and donkeys. The seasonal river channels are dry for most of the year and are used for moving goods and moving livestock and watering livestock with shallow wells.

3.1.1 Keren

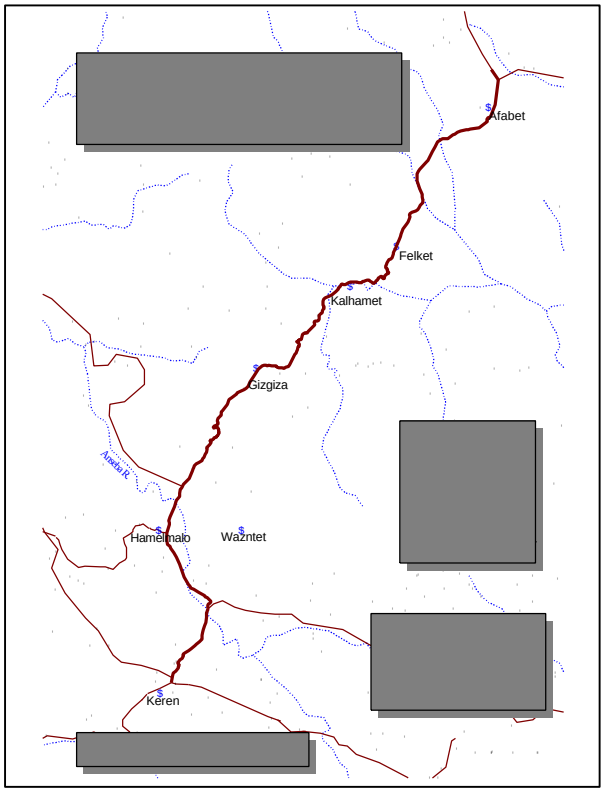
Keren is a large town of about 54,000 people and the administrative capital of Zoba Anseba. Anseba is one of the six Zobas (administrative level two) of the country and is located at 15° 31´ - 17° 32´ latitude and 36° 53´-38° 54´ longitude. Its boundaries are the Sudan in the north and northwest, Zoba Northern Red Sea in the east, Zoba Maekel in the south and southeast, Zoba Gash Barka in the south and southwest. It has a total area of 22,834.28 km^2 (2,283,428 ha). Its total population is 336,757. Anseba Zoba is composed of 11 Sub-Zobas, 105 Kebabis and 437 villages.

Sub-Zoba (administrative level three) Hamelmalo is a newly established administrative center. Hamelmalo, and the area surrounding it, was under the administration of Sub-Zoba Halhal. It has a total population of 27,093. The Sub-Zoba has an altitude range of 1,310 to 2,134 m. Its total area is 454.25 km^2 (or 45,425 ha). Topographically, the total land area is divided into 52% mountains and hills, 24.6% plains and 23.4% valleys and eroded areas. Hence, the total arable land is 8,250 ha, of which 7,429 ha is under cultivation. Practically all of the people depend on land for their livelihood. By economic activities, 93% of the population are engaged on purely agricultural activities, 4% on agropastoral activities, 2% on purely pastoral activities, and 1% on other agricultural or pastoral related activities. In the Sub-Zoba there are about 4,400 cattle, 6,000 sheep and goats, 445 camels, and 1,700 donkeys. The main agricultural products of the Sub-Zoba are millet, sorghum, peanuts, onions, tomatoes, okra, lettuce,

pepper, mango, oranges, guava, and papaya. Several small-scale commercial farms produce fruits and vegetables on the banks of the Anseba River.[7]

The Sub-Zoba provides some basic social services to the semi-urban and rural communities. The Hamelmalo Elementary and Junior Secondary School provides education from grade one to grade seven. It has 634 students, of whom 209 are females and 423 are males. In terms of medical service, there is only one health station at Hamelmalo Kebabi, which provides only first aid service. So, for diseases or ailments that need a higher level of medical service, the people go either to Fredarb Kebabi where there is a health center, or to the hospital in Keren. The Sub-Zoba is composed of eight Kebabis and 47 villages. The eight Kebabis are Hamelmalo, Ajerbeb, Fredarb, Dadu, Libana, Ghizgza, Wazintet and Ghenfelom.

Figure 4. Area of the Case Study (Place names are from the OCHA data set.)



The Hamelmalo Kebabi (administrative level four) is composed of four villages. These villages are Hamelmalo, Bashra, Bereketia and Kirbabered with a total population of 3,012.

The village of Hamelmalo is fast growing and semi-urbanized due to the decentralization policy of the GSE. This policy provided administrative centers, schools, health facilities, improved roads, and potable water sources to assist the rural communities in providing services to the people of the community. Hamelmalo benefited greatly from this policy. It grew from an unknown community with a few clusters of huts, to its present state of 839 households in less than five years. Since many people are coming to open businesses or settle there, the population is expected to increase. At present it has adequate potable water and electric power supply.

[7] MOA, 1999.

3.1.2 Afabet

The town of Afabet is the administrative center of the Sub-Zoba of 73,000 people. The town of Afabet has a population of 23,000 during the months from November through May and 28,000 in during June through October. The services available in the town include one hospital, two clinics, one health center, one preschool, two elementary schools, and one junior high school. The following institutions and agencies work in the Sub-Zoba: The MOA, Ministry of Justice, Ministry of Finance (tax collection), Ministry of Local Government (MOLG), ERREC, National Union of Eritrean Women, National Union of Eritrean Youth and Students, ECDF, police, People's Front for Democracy and Justice, Eritrea Electric Authority (serving 10% of the population), and one telecommunication office. Licensed enterprises are presented in Table 7.

Table 7. Licensed Enterprises

Type of Licensed Enterprise	No.
1. Import & Export	18
2. Wholesale Trade	8
3. Retail Shops	74
4. Butchery	7
5. Hotel	3
6. Restaurants	9
7. Mill	9
8. Bakery	10
9. Tea & Bars	14
10. Carpentry (Wood)	2
11. Hide & Skin Drying	3
Total	**155**
Petty Trade and Informal	**No.**
1. Street Vendor	27
2. Vegetable Quarter	27
3. Cereal Trade	29
4. Sewa Brewing	4
5. Cart	19
6. Metal Forging	4
Total	**110**

3.2 Results of the Road Inspection

Part of the team spent one day inspecting the 61.8 km of road reconstruction between Keren and Afabet. All of the combined total of 136 culverts and bridges were counted, roughly measured and inspected. The road widths were noted as well as approximate international roughness index (IRI) roughness (which varies between 4 for smooth and 20 for very rough unpaved roads) and comfortable maximum driving speeds (as driven by a 4x4) at various intervals along the road. Locations and types of 14 stream fords (drifts) were noted, as were various landmarks along the road, which could serve as points of reference. Over 40 of the retaining walls were listed, with estimates of their size, but there was insufficient time to list all of them. A copy of the detailed report is in Appendix C.

A number of problems were noted at particular points along the road: road and shoulder erosion, "washboard surface," sight distance problems both vertically and horizontally, full or partially clogged drainage structures, landslides, excessively narrow road width, sections that needed retaining walls, areas of incomplete construction.

The general impression of the road as providing an all weather transport link to rural areas was quite favorable. The width was generally adequate, averaging 9.0 m, though restricted in some of the mountainous areas. The Road Transport Construction Department (RTCD), which is doing the re-construction work, has targets of a 10 m width in the flatter areas, and 8 m wide in the mountains; this has largely been achieved. The alignment was proper with only a few exceptions. The placing and number of culverts and bridges appeared appropriate, though there was insufficient time to analyze their drainage adequacy — however, they all seemed to be well-constructed. Retaining walls have been built in most of the critical areas, although a few steep areas still need walls to prevent potential severe erosion of the road surface.

In fact, the best quantitative measure of the great amount of improvement to the road is to compare a survey of the road conducted by an Italian consulting company in 1995 or 1996, before reconstruction started, and a survey completed as part of this assessment. In 1995 or 1996, the average roughness was 19.3, very close to the maximum of 20, which is "very rough." In 2001, the average roughness is now judged to be 12.2, which is "medium rough," a significant improvement. This improvement enables a maximum comfortable speed (as measured by a 4x4) to increase from an average of 32 k/h in 1995 or 1996 all the way to 51 k/h in 2001, again a significant improvement. (Certainly, most buses and trucks will not be able to travel this fast, nor were they able to average 32 k/h on this road in 1996.) Maintenance appeared to be limited to repairing problems as they occur, with little evidence of routine work, especially regular grading and maintenance of the base course.

3.3 The Keren-Afabet Traffic Survey

3.3.1 Methods

The objective of the traffic survey was to help determine the economic impact made by the reconstruction of the Keren-Afabet road. The survey was carried out during the seven-day period from November 24-30, 2001.

Prior to the survey period, the consulting team discussed the first draft of the survey instrument and made amendments; the second draft was translated into Tigrinya. In Keren, the team met with Mr. Lemma Hailemariam, the Chief Executive, and other staff members of Zoba Anseba administration and briefed them on the objectives of the study and its action plan. The administration provided information on the road and also assistance with the hiring of nine enumerators. One day was then spent in the intensive training of the enumerators — filling out questionnaires and a role-playing exercise. This tested the questionnaire and led to some further amendments.

At Hamelmalo, the consultants met with the Sub-Zoba Administrator, Mr. Hamid Hasabela, regarding the optimal location for stopping vehicles for the survey study. For practical reasons it was finally agreed that the site should be the checkpoint at Hamelmalo, even though some traffic turned off the Afabet road just north of the checkpoint and went toward Halhal. The decision was made to keep track of the Halhal traffic on a separate sheet but not to interview them since the survey emphasis was to be on the Afabet road. The administrator demonstrated his cooperation on the study by instructing two guards at the checkpoints to assist the enumerators in stopping vehicles for interviews and counts of passengers. These two were of great assistance.

The six enumerators were stationed at the checkpoint, supervised by the consultants, and worked from 6:00 a.m. to 6:00 p.m. for seven consecutive days to complete the survey. The enumerators checked all the goods being carried on the vehicles as well as counting all passengers.

Two issues not foreseen during the design of the survey instrument affected conduct of the survey. The first is the fact that buses commuting short distances crossed the checkpoint more than one time a day and that it is redundant to ask all the questions each time. The second is that a passenger or a merchant could be carrying more than one type of product at a time. The enumerators agreed to the solution, which was to insert a table — that addressed both issues — on the back of the questionnaire.

3.3.2 Results

Question 1: Type of Traffic
The first Survey question was to identify the kinds of traffic. A grand total of 1,756 vehicles (including bicycles), pedestrians, and animals passed along the road in the vicinity of the traffic survey checkpoint at Hamelmalo during the seven-day survey period between the hours of 6:00 and 18:00 hours. This is a combined total for traffic moving in both directions.

A total of 614 motorized vehicles passed by the survey point during the 7-day study period, an average of about 88 per day. Except for Saturday, the number of vehicles per day was relatively steady, varying between 85 and 102. The surveyors were a bit surprised that this number is so high, they had been told to expect only 50 to 60 per day.

Table 8. Type of Traffic

Motorized Vehicle	No.
Cars	53
4x4s	134
Light buses (less than 20 passengers)	169
Medium buses (20 to 40 passengers)	22
Heavy buses (over 40 passengers)	38
Light trucks (loads under 20 quintiles)	26
Medium trucks (loads 20 to 40 quintiles)	27
Heavy trucks (loads over 40 quintiles, less than 100)	136
Articulated trucks (loads over 100 quintiles)	9
Total motorized vehicles	**614**
Average number of motorized vehicles/day	**87.7**

More buses than trucks used the road during this period. Two hundred twenty-nine bus trips represented 37.3% of the motorized vehicles, a percentage higher than the 198 trucks, at 32.2%. One hundred and thirty-four 4x4s comprised 21.8% of motorized vehicles, and 53 cars comprise 8.6%. A number of the light buses, which was the largest single category of the motorized traffic trips (over 27%), made two or three round trips per day between Hamelmalo and Keren. Each one of the trips was counted separately.

The average number of livestock per day was 151. The actual number varied considerably due to the large number of animals (537) using the road on Sunday, (on their way to the Monday markets in Keren) and Tuesday (393), (returning from the markets). Quite a few were for sale; many others, especially camels carrying firewood, were carrying products for sale or returning with purchases.

The animals mostly traveled in herds or groups, so the enumerators tried to interview the herdsman accompanying each group of animals, as well as each vehicle and pedestrian. Thus, another way of viewing this survey is a count of animal groups plus the other vehicles and pedestrians, a total of 696 or about 99 per day, which is the number of interviews conducted.

The pedestrian count for the seven days was 271, averaging 39 per day, mostly consisting of herdsmen accompanying animals. Although there were a number of local pedestrians, these were not counted, as

well as village people with donkeys, goats, etc. who stayed within the village area. The survey team decided that these local pedestrians would have been using this short section of the road whether it had been improved or not. Instead, only pedestrians and animals, which were journeying some distance on the road, were interviewed.

Question 2: Number of People Using the Road

The number of people using the road — 7,162 drivers, passengers, bicyclists, herdsmen, pedestrians, etc. — were counted during the survey period, which is an average of over 1,000 each day. The average was exceeded on Sunday, Monday, and Tuesday due to the effects of people going to and returning from the Keren markets.

Buses and trucks were the major carriers of the road users — about 61% traveled by bus, and 24% by trucks.

Table 9. Number of People Using the Road

Categories of People	No.
Bus drivers and passengers	4,371
Trucks drivers and passengers	1,714
4x4s drivers and passengers	526
Car drivers and passengers	268
Subtotal, motorized vehicles	**6,879**
Pedestrians	271
Bicycle riders	12
Total	**7,162**

The interviewers were told that traditionally women in this region do not travel as much as men. This bit of information helped explain the finding that just over 80% of the road users were male, while only 20% were female.

Questions 3 and 4: Who Owns the Transport?

Road users were asked who owned the transport, multiple answers were allowed. As the table below indicates, nearly one-half said the transport was owned by a business. Over one-third indicated that they were the owners. Government vehicles represented about 15%; it is interesting to note that the government use was higher during normal business hours, Monday through Friday.

Table 10. Vehicle Ownership

Owner	No.	%
Self	299	34.7%
Business	394	45.8%
NGOs and international organizations	20	2.3%
Military	9	1.0%
Other government	28	14.9%
Other	11	1.3%
Total	**861**	**100.0%**

On 65 of the trips, the name of a particular company that owned the transport was given to the enumerators. Hayatt Habero owned vehicles used on 22 trips, ASBECO on 18 trips. Other company ownerships included Wadilaka Kelhamet, East Africa, Lilo Transport, Fontana, and SAMTS Construction. The large trucking company, Trans Horn Transport, was mentioned only once.

Question 5: Where did your Trip Start?
As might be expected, the largest number of transport using the road had started in the largest town, Keren, consisting of 40% of the total. This was followed by Hamelmalo, with nearly 19%, and Afabet, with 15%.

Table 11. Trip Origin

Town	No.	%
Asmara	63	9.0%
Keren	281	40.1%
Afabet	105	15.0%
Nakfa	25	3.6%
Hamelmalo	131	18.7%
Habero	35	5.0%
Other	60	8.6%

There were, of course, trips originating from and being completed to many localities; in fact, 34 different places were mentioned to the interviewers besides the seven listed on the survey form. These are included in the Appendix E table under "Other."

Question 6: What is your Final Destination?
Since this survey includes traffic in both directions, and since many travelers are making round trips, it is similarly not surprising that the destination for the largest number of road users are in the same order and close to the same percentages as the origination mentioned above, that is, Keren, 37%; Hamelmalo, 22 %, and Afabet 14%.

Table 12. Trip Destination

Town	No.	%
Asmara	60	8.6%
Keren	259	37.2%
Afabet	97	13.9%
Nakfa	22	3.2%
Hamelmalo	155	22.2%
Habero	43	6.2%
Other	60	8.6%

Question 7: Why are you Taking this Trip?
The interviewees were asked the purpose of their trip; they could give more than one reason if they wished. The single answer with the highest percentage was "to transport people." This is understandable when one recalls that in Question 1, bus trips represented over 37% of all the trips, and this answer would be expected from the bus drivers.

Table 13. Purpose of Trip

Purpose	No.	%
To transport people	246	30.5%
Take product to sell	102	12.6%
To purchase product	34	4.2%
Other business	158	19.6%
Visit friend or relative	4	0.5%
Other personal	31	3.8%
Govt. staff	57	7.1%
Go to government office	4	0.5%
Going to job	99	12.3%
Relief work	7	0.9%
School	5	0.6%
Tourist	3	0.4%
Healthcare or medicine	5	0.6%
Other	52	6.4%

If one adds together the first four answers, which are all related to business — " to transport people, take product to sell, to purchase product, other business" — the total is 66.9%. Thus, the overwhelming majority, over two-thirds, are traveling for business purposes. The next highest category was "going to job" at 12%, people using various forms of transport to get to their workplaces.

On the other hand, many interviewees spoke about how wonderful the road improvement was and one would expect, for example, increasing travel for health related reasons. This percentage, however, was less than 1%.

Questions 8: How Long Does the Trip take Between Karen and Afabet?
and 9: How Long did the Trip Take Before the Road Reconstruction Started in 1997?
Many people in the vicinity of the Keren/Afabet road are complimentary about the road improvement and about how much time is saved. However, when questions about travel time were posed, many seemed unable to quantify the amount of time. Less than one-half (317) of those interviewed answered Question 8, and only about one-quarter (181) answered Question 9. The average answers were 4.5 hours before reconstruction and 2.8 hours after. This is a saving of about 37%.

The objective of putting both questions together was to get a comparison of the trip times before and after reconstruction from the same interviewee. A mere one-quarter (174) answered both Questions 8 and 9. Their average answers were 4.6 hours before reconstruction and 2.7 hours after. This is a saving of about 41%. Thus, both methods of judging the answers produced roughly similar results, namely, an indicated time saving of about 40%.

Questions 10: How Often do you Travel Between Keren and Afabet?
and 11: How Often did you Travel Before the Road Reconstruction Started in 1997?
As was the case with Questions 8 and 9, the number answering these questions was low. Not quite one-third (228) answered Question 10; the average answer was 84 trips per year at the present time. Less than 20% (128) responded to Question 11; the average answer was 41 trips. This would indicate that the number of trips on the road have doubled since the reconstruction. Thus, the average interviewee is traveling the road not quite twice a week.

However, looking at the answers another way, based on respondents who answered both Questions 10 and 11, yields different results. The number is small; less than one-sixth (112) answered both questions.

They said they took an average of 43 trips before the reconstruction, and 63 after. This is an increase of about 47%. The inference of this is that the "old" road users have increased their usage by just under 50%, while "newer" users are taking more frequent trips than the "older" ones.

Question 12: Which products are being Taken to be Sold? (What products are you carrying?)
Initially, this question was posed to determine the amount of products which were being carried for business purposes, i.e., to be sold. However, firmly establishing this purpose during the interview became difficult, besides delaying the transport—many times a bus or truck carrying many people. Also, it became apparent at the outset of the survey that a great number of products were being carried, some of which had already been sold and were being transported to a particular destination. So, the decision was made to count all the products being carried to get an idea of their total value. This also helps to determine the amount of savings on transport costs due to the road improvement.

Table 14 lists the number of times during the survey period when a product in a particular category was being carried.

Table 14. Products in Transit

Product	No.	%
Building materials	45	11.5%
Coarse grain	28	7.1%
Livestock	34	8.7%
Oilseeds	31	7.9%
Agricultural inputs	6	1.5%
Processed food	55	14.0%
Vegetables & fruits	103	26.2%
Household goods	28	7.1%
Other (firewood, naphtha)	63	16.0%

The reader should note that much of the livestock recorded — most headed to or from the Keren livestock market — does not depend on improved roads for their journeys. In fact, many of the herds used long sections of the dry Anseba River bed, and adjacent dry streambeds, in trekking between Hamelmalo and Keren rather than the road itself.

Question 13: What is the Origin of the Product?
There is nearly an even split in product origin between the two cities, Asmara and Keren, supplying the southern end of the road, and the range of small towns and villages from Hamelmalo north, past Afabet. The reader should bear in mind that this is based on the number of times during the survey week when a particular product was being carried, and is not a measure of quantities or values.

Table 15. Origin of Product

Town	No.	%
Asmara	38	17.4%
Keren	63	28.9%
Afabet	23	10.6%
Nakfa	6	2.8%
Hamelmalo	29	13.3%
Habero	14	6.4%
Other	45	20.6%

Questions 14: What Quantity are you Taking Today?
and 16: What Selling Price do you Expect Today?
These two questions are best considered together since multiplying the two yields the value of the products being taken.

The survey team was rather impressed by the value of products being hauled over the road during the seven-day period, far more than had been anticipated. Even if — considering the economic impact of the road reconstruction — livestock were removed from this total, as well as some construction items (under building materials) destined for government project, and school beds (under household goods), there remains a value of goods well over two million ERN. Sugar alone, under processed food, amounts to over 1.1 million ERN.

Table 16. Current Value of Product

Value of	ERN	%
Building materials	265,369	8.5%
Coarse grain	263,268	8.5%
Livestock	660,193	21.2%
Oilseeds	33,575	1.1%
Agricultural inputs	1,453	0.0%
Processed food	1,337,295	43.0%
Vegetables & fruits	164,058	5.3%
Household goods	204,113	6.6%
Other (firewood, naphtha)	179,306	5.8%
Total Value	**ERN 3,108,628**	

Questions 15: What Quantity did you Used to Take Before Road Reconstruction Started in 1997? and 17: What Price did you Used to Receive at That Time?
There were very few answers to these questions — only 21 — too few to draw any serious conclusions. Regarding quantities, 11 said they were taking larger quantities today, four said the same amount, and six were taking less. Regarding prices, 16 expected higher prices today than in the past, and five expected lower prices.

Question 18 through 23, Regarding Planned Purchases
There were also very few answers to these questions — only 11 responses — again, too few to draw any meaningful conclusions.

3.3.3 Discussion

One farmer, squatting along the side of the road at Hamelmalo, on the first morning of the survey, told the enumerators that he was waiting for a minibus or truck to take him and his four bags of sorghum to Afabet; an hour later he got a ride. He said that he farms some ground in the Hamelmalo area where he has just harvested the grain, but lives in Afabet where he is a day worker. This amount of sorghum will be enough to feed seven or eight people for six months. He was very happy about the reconstruction since with so many more buses and trucks offering transport to Afabet, he now only has to wait for a couple of hours to get a ride. Before the reconstruction there was little traffic, he said, and he often had to wait for days.

People from the small village of Habero appear to be taking special advantage of the improved road even though about one-half of their journey to Keren is on an unimproved road (30+ km) which intersects the Keren/Afabet road a few km north of the Anseba River ford. The enumerators first noted two large groups of Habero people on Sunday who completely jammed two trucks, 50 in one and 100 in

the other. This was late in the day, about 5:30, and the villagers were on their way to the Monday markets in Keren. The surveying crew knew very little about Habero, but wondered whether there was anyone still left in the village. The enumerators also noticed that a number of the trucks and buses, on 22 of the trips altogether, were owned by Hayatt Habero. They later found that, indeed, these transports were based in the village and that the villagers had pooled their funds to buy several vehicles — quite an investment for a small village.

CHAPTER 4.
RURAL EMPLOYMENT AND ENTERPRISE DEVELOPMENT

4.1 Objectives and Methodology

These surveys assessed the impact of the existing Keren-Afabet road as viewed by passengers, enterprises, and government officials, with the implications to food security, employment, and access to social services.

Table 17. Sample Surveys of Passengers, Enterprises, and Public Representatives

Type of Sample Survey	Number of Responses		
	Total	Male	Female
Passengers	100	75	25
Enterprises Survey	100	81	19
Administrative/community representatives	59	59	0
Total	259	215	44
Percent	100%	83%	17%

Source: Field Surveys in Afabet, 25 November-2 December 2001

4.1.1 Results from the Passenger Survey

- The average age of passengers interviewed was 42 years; their average household size (i.e., number of members economically dependent on the household head) was 5.5 members.
- Males travel more than females along the road. Passenger departures or destinations totaled 33 locations within Eritrea.
- Generally, passengers reported no significant change of occupation during the past few years, except that about 10% of those who were formerly students are now soldiers.
- The types of roofing on shelters owned by the interviewees may be an indicator of lifestyle or income. A total of 75% of the passengers appeared to have a settled lifestyle based on those who answered thatch (48%), corrugated metal sheet (19%), other materials (8%). About 21% indicated Agnet (woven mat), indicating a more mobile lifestyle. The other 4% do not own a home.

4.1.2 Frequency of Passengers' Trip on Keren-Afabet Road

- Afabet-Keren was the most frequent departure-destination (27%).
- Nearly half of the passengers travel on the road all year round; 33% travel mostly in the dry season, and 18% most frequently in the rainy and fall seasons.
- A passenger typically traveled an average of 1.60 times per month or about 19 times per year.
- Buses and trucks account for 82% of passenger transportation on the Keren-Afabet road.
- About half of the passengers have traveled along the Keren-Afabet road for more than five years. The rehabilitation of the road has attracted additional passengers almost equal to the number who were using the road before it was rehabilitated.
- While the large majority of passengers have not changed their traveling habits because of improvements to the road, about 10% have made changes.

4.1.3 Passenger Benefits and Costs

- About two-thirds of the passengers travel on the Keren-Afabet road for economic reasons (i.e., to buy and/or sell goods) and one-third travel for social reasons (e.g., to visit relatives).
- Prior to rehabilitation of the road which started in 1997, 80% of passengers used vehicles and 17% pack animals. The improved road has shifted these ratios to favor vehicle use, with almost none now using pack animals.
- The average costs of traveling to the all destinations before 1997 and in 2001 were ERN 22 and 26 per trip respectively, while the average costs of traveling from Afabet to Keren before 1997 and in 2001 were ERN 9.26 and ERN 6.48 respectively. The following tables (18 and 19) show the comparisons of those respondents who only traveled to the Keren destination.

Table 18. Question 12b. How much was the average cost of traveling from Afabet-Keren before 1997?

	Average	Frequency	Sum
ERN 8	4	4	16
ERN 10	5	3	15
ERN 12	6	1	6
ERN 20	10	7	70
ERN 25	12.50	2	25
ERN 30	15	3	45
ERN 35	17.50	1	17.50
Total	**21**	**194.50**	
Average			**9.26**

Table 19. Question 14b. How much was your average transportation cost of traveling from Afabet to Keren in 2001?

	Average	Frequency	Sum
ERN 12	6	17	102
ERN 18	9	1	9
ERN 15	12.50	2	25
None		-1	-
Total		**21**	**136**
Average			**6.48**

From comparisons of the two periods, it is clear that the transportation cost has been reduced which should be attributable to the improvement of the road. A huge majority, 93% of the passengers, said they get major advantages by traveling on this road, while only seven percent said that they see no advantage to it.

Table 20. Advantages to Travel on Road

Advantage	%
Efficient and suitable transportation	48%
Access to markets	23%
Access to health facilities	12%
Cheaper costs	10%
No advantage for the new road	7%
Total	**100%**

4.2 Survey of Enterprises

4.2.1 Description of the Enterprises in the Survey

There are 365 enterprises in Afabet of which a sample of 100 was surveyed. The sample enterprises consisted of retail trade (43%), service (24%), manufacturing (14%), the informal sector and petty trade (14%), and agriculture (5%). A total of 48% of the enterprises were established prior to 1997 and 52% thereafter. All the sampled enterprises were established by permanent residents of Afabet. No impact was observed on the establishment of new enterprises due to the large number of IDP who came to the Afabet Mekete Camp in 2000, as the result of the border conflict with Ethiopia, and then left in 2001. The ownership form of the overwhelming majority (89%) of the sampled enterprises is sole proprietor, followed by 8% partnerships and 3% share companies. The majority of the enterprises are small; less than a handful can be categorized as medium scale.

The owner/operators of the sample enterprises have an average household size (i.e., number of members economically dependent on the household head) of 6.7. An enterprise has an average of two employees. About 14% of the respondents reported household members employed outside the household enterprise, most of them as civil servants, traders, farmers and day laborers. Despite these family members employed elsewhere and generating some income, 86% of the household members depend on the income from the household enterprise.

4.2.2 Road and Frequency of Trip of Enterprise Owners/Operators

The enterprise representatives in the sample reported that 72% have traveled along the Keren-Afabet road for more than five years, 24% for two to five years, and 4% for a year or less. The most frequent business related departures and destinations of the enterprise representatives were Afabet or Kelhamet to Keren (71%), followed by Afabet to Asmara (28%).

Enterprise owners/operators make an average of 10 trips per year using buses 56% of the time, and trucks 41% to transport their merchandise. Before the road started to be rehabilitated in 1997, buses were used on 49% of the trips and trucks on 50%. The shift to more bus usage is likely due to the increased availability of buses on this route; previously, buses could not travel efficiently on the very rough road.

The seasonal traveling behavior of the enterprises owners and representatives indicates that 66% of them travel all year round, 15% do most of their traveling in the summer, 12% mostly in the winter, and 5% in the fall. This would seem to indicate the seasonality of one-third of the businesses.

The great majority of the enterprise owners and representatives (84%) travel on this road in order to purchase goods; 53% are buying merchandise, 31% are buying consumer items. About 8% are selling agricultural produce and livestock.

The number of trips for transporting merchandise in 2001 was about 10 trips per enterprise per year. In other words, the enterprise owners and operators use the Keren-Afabet road almost once a month to transport their merchandise. One can thus infer that owners of all the 365 enterprises in Afabet are making about 3,650 trips along the road in a year. This is an indication of the substantial use of the improved road by the enterprises in Afabet.

4.2.3 Enterprise Benefits and Costs

The enterprises are small. The average registered capital per enterprise in the sample is about ERN 8,600 with a range from ERN 2,000 to 100,000. The average value of enterprise assets on the date of survey was ERN 7,600. One-third was in merchandise (current assets) and two-third in fixed assets. About 73% of the enterprises own the assets; the others have use of the assets by means of either rent or credit.

The average sales (revenue) of the sampled enterprises are ERN 75 per day. Assuming 300 days of operations in a year, the average annual sales of an enterprise would be ERN 22,500 per year or ERN 1,875 per month. The average monthly expenses of an enterprise is ERN 748, which is about 40% of the enterprise revenues.

The average cost of transporting goods before 1997 was ERN 224 per trip and in 2001 was ERN 265 per trip. The total transportation cost per enterprise in this year is slightly higher (by 18%) than in 1997. This may be explained by the fact that the volume of goods transported in recent years is higher than in previous years. But, more importantly, considering the effects of high inflation, the real value of the ERN in 1997 was higher than the current. Hence, transportation costs of goods have decreased and the improved road has helped reduce these costs.

Net income from the enterprise supports the household in 77% of the enterprises surveyed. For other households, income is derived from additional activities: agriculture (9%) and salaries of household members (3%). The balance of sources of income of the households included food aid (9%) and various sources such as remittances, house rent, and government support (2%).

The road has helped the enterprises to access markets either for selling or buying goods. The major advantages which the enterprises reported they had, in particular, by using the Keren-Afabet road today, as compared to before 1997, are 1) immediate replenishment of merchandise (35%), 2) access to market for buying goods (34%), and 3) access to market for selling goods (30%).

The enterprises identified three major constraints that need to be addressed: 1) the road is rough and dusty not suitable for transporting goods (54%), 2) inadequate transport service (24%), and 3) summer rain floods deter movement of people and goods (14%).

They recommended that the road should be asphalted and regularly maintained.

4.3 Access to Social Services

One proposed benefit of improved transport systems is that they make it easier to move people to visit their families, go to school, seek health care, and handle their administrative requirements. Of these, attendance at schools and healthcare centers are the easiest to document because the GSE ministries responsible for these sectors keep good records.

4.3.1 Schools

School attendance did not increase for schools along the road. In fact the road may have made it easier to attend schools in the larger towns of Keren and Afabet. Since 1996, there has been a general decline in attendance at schools in the smaller villages of Felket and Kelhamet with an increase in attendance in the schools of Afabet. The representative from the MOE at Afabet explained that this trend was because people prefer the opportunities and services that are available in the larger town of Afabet and the improved road makes it easier to attend school there.

Table 21. Primary School Attendance at Two Villages Along the Road and Afabet

Year	Felket		Kalamet		Afabet	
	Boys	Girls	Boys	Girls	Boys	Girls
1996-1997	210	63			722	468
1997-1998	131	43	294	79	1070	777
1998-1999	181	46	274	83	1285	949
1999-2000					1615	1071
2000-2001	210	63	259	70	1533	1122

4.3.2 Hospital Attendance

Hospital attendance is also an indicator of access to social services. Data is available from health facilities, concerning where (village name) patients come from. The original idea for this assessment was to get an idea how the catchment area for clinics and hospitals may have changed shape due to the improvement of the road. However, the attendance records are not in digital form and it required more time than allocated to go through all the registers. Two towns were chosen that could show the changes: Gizgiza is 18 km away from the clinic on the rehabilitated road and Wazintet is six km away on an unimproved feeder road. The examination of registry entries at Hamelmalo for patients from Gzgza showed an increase of 272% between 1997 and 2001 and at Wazintet, only 138% during the same period (Table 22).

Table 22. Clinic Patients at Hamelmalo

Village	Distance to Clinic (km)	1997	2001	% Increase
Gizgiza	18	123	335	272%
Wazintet	6	211	291	138%

A similar count of patient registrations at Keren Hospital showed no real trend other than a large increase in patients in 2001. The reason for this large increase cannot be attributed to the road rehabilitation alone and is probably related to the IDP camp near Afabet.

Table 23. Total Number of Patients to Keren Hospital from Villages Along the Keren-Afabet Road (1996-2001)

Year	Male	Female	Total	% Female
1996	695	188	883	21%
1997	390	404	794	51%
1998	585	285	870	33%
1999	313	183	496	37%
2000	519	257	776	33%
2001	910	730	1640	45%

Table 24 shows the number of patients that came from Afabet and its surrounding villages. Again, the increase in numbers in 2001 are probably related to the IDP camp located near Afabet.

Table 24. Patients from Afabet and Nearby Villages

Year	Male	Female	Total
1997	161	127	288
2001	494	435	929

Interviews with hospital administrators and agricultural producers told many stories of complications during pregnancy where women or newborns died on the way to the hospital because they were coming in on the back of a camel and the trip would take two days. Now it is only a matter of hours for women to reach the safety of the Keren Hospital.

4.3.3 Information and Know-how

The primary information sources for people living in Afabet are limited to one phone exchange, no radio stations, and the GSE newspaper that comes infrequently. The agricultural extension service is very understaffed, resulting in very little contact time with agricultural producers. Most commodity price information for both traders and producers is through word of mouth. The road reduced the transit time for newspapers by several hours. The increased number of people using the road means there is more opportunity for news to move back and forth from villages and Keren.

GSE administrative services have benefited from easier access to the leaders of Kebabis promoting a better understanding of constraints at the village level and resources available to the village for improving the life of the people. These resources include schools and clinics, and feeder road rehabilitation.

CHAPTER 5.
ECONOMIC IMPACT FROM ROAD REHABILITATION

The greatest difficulty in measuring the economic impact of the Keren-Afabet road reconstruction is that a comprehensive set of data about the situation in 1996, before the reconstruction started, has not been available. The consultants do have a good sense of the road condition — very rough — at that time based on a overall engineering assessment conducted by an Italian consulting firm, which assessed many roads in the country, and confirmed by comments from officials and interviewees. Some information is available about road usage--numbers of buses and trucks, passengers, freight, operating costs — but it is incomplete. Other factors have also had an economic impact on areas surrounding the road — including the refugee camp near Afabet, gold mining areas some distance north of the road, reconstruction of the Hamelmalo-Halhal road, new Sub-Zoba administrative personnel and facilities in Hamelmalo — and it is hard to separate out their impact as opposed to the impact of the road reconstruction. Nevertheless, the consultants feel that the following list includes the major components of the economic impact, some of which are difficult to quantify. The consultants would also like to point out that they have tried to be conservative in assessing the amount of the impact in an effort to not overestimate the economic impact of the road improvement.

5.1 Economic Benefits

5.1.1 Fare Savings to Passengers on Buses and Trucks

Passengers on buses and trucks are saving time and money because of the road reconstruction. The smoother surface enables them to make trips along all or portions of the road in less time. The improved surface also makes lower fares possible because bus and truck operators can operate at lower costs. In quantifying the economic impact, the lack of complete data from 1996 has forced the consultants to use other information. The best “proxy” appears to be the tariffs, ERN per km of travel, which give specific information for fares charged to bus passengers on three types of roads — smooth, rough, and very rough. The consultants feel that the first measure of economic impact is that the road reconstruction has definitely improved the status of the road from very rough to rough. If the reconstruction work had not been done, the passengers would be paying the higher, “very rough” fees. Instead, they are paying the lower “rough” fees. The difference between the two rates is the savings in fare costs due to reconstruction — 0.18266 less 0.12177, which is 0.06089 ERN per km.

The consultants acknowledge the comments from representatives of the Department of Land Transport, Ministry of Transportation and Communications (MOTC), on Dec. 12, 2001, that the portion of the road between Keren and Gizgiza had already been judged as “rough” (rather than “very rough”) by MOTC, and thus subject to a lower bus tariff, before the road reconstruction began in 1997. The implication is that the amount of fare savings should not be applied to this portion of the road. Regardless of the MOTC judgment, however, the information gleaned by the traffic survey team from passengers and drivers was that the reality instead was that “very rough” higher tariffs were charged for the entire road between Keren and Afabet before the reconstruction began. Only recently has the lower fare basis been used. This was because, from a practical point of view, the entire road was in actuality “very rough.” Indeed, the Italian consulting company in 1995 or 1996 assessed the roughness of the Keren-Gizgiza portion as “20,” which is “very rough.” Thus, with due respect to the Ministry, the consultants will stick with their contention that the fare savings should apply to the entire road between Keren and Afabet.

The consultants have used the same factor for truck passengers, which represented 24% of the passengers in the traffic survey, because selected interviews indicated that these passengers are paying

at least the bus rate and frequently higher rates. The actual average rates, which could not be accurately measured, are doubtless higher so the actual savings are higher than as indicated below.

In order to ascertain these savings, the consultants determined a travel distance for each one of the 6,071 trips made during the survey week. Many, of course, were repetitious. It is important to note for the sake of a conservative and accurate analysis, that only the portion of the travelers' trips, which were completed on the Keren-Afabet road, were included in the calculations. Thus, for example, the only part of the journey for travelers from Asmara to ERN that were used were those 62 km between Keren and Afabet. Neither the Asmara/Keren portion, nor the Afabet-ERN portion were included.

The number of passengers was multiplied by the number of km per trip. These were then summarized for the seven days of the survey:

all buses	130,058	passenger-km
all trucks	69,804	passenger-km
all buses & trucks	199,862	passenger-km
which was multiplied by	0.06089	ERN/km bus and truck fare savings/week due to rough, not extra rough road
This yields a total of ERN	12,169.60	Bus and truck fare savings/week

5.1.2 Value of Time Saved by Passengers on Buses and Trucks

Due to the road improvements, trips along the road are made in shorter lengths of time (and with less discomfort — but that is harder to measure in economic terms). Travelers thus save time; and their time has an economic value. Standard economic analyses of the impact of road projects normally include an economic value for time savings. Robley Winfrey, for example, has a long discussion in his *Economic Analysis for Highways*[8], stating "the value of travel time for passenger cars usually has been assumed by each analyst of economy studies according to his own (or borrowed) idea. Usually, the basis has been the prevailing wage for a semiskilled worker, adjusted to suit the analyst's thinking of what was appropriate." Ole Muller writes in *Highway and Traffic Engineering in Developing Countries*[9], "travel time savings for passengers in buses and occupants of private cars should be divided into time savings during working hours and non-working hours. In the absence of better data, working hour time can be valued at the average wage rate plus social overheads."

Deciding on a value of time is difficult because of the diversity of travelers, travelers' opportunities to earn income, agreement on appropriate wage rates, etc. Winfrey says "each analyst…must find his own answer…the value of travel should be adapted to the local conditions and the specific proposal for highway improvement.[10]" Whether the traveler uses the 15 minutes or two hours saved to actually earn income is not the point. The point, rather, is that a value for the time needs to be selected. In this analysis, the traffic survey determined that 67% of the interviewees were involved in some type of business, another 12% were going to a job, and 7% were government staff. Thus, 86% appear to have a particular source of income which, the consultants feel, justifies the use of ERN 40 per day, or ERN 5 per hour, in these calculations. This amount is an average wage rate for the area.

[8] p. 269, International Textbook Company, Scranton, PA, USA, 1969.
[9] p. 48, ed. Bent Thagesen, E&FN Spon, London, UK, 1996.
[10] p. 272, , International Textbook Company, Scranton, PA, USA, 1969.

A total of 6,071 truck and bus trips were made during the survey week. The total passenger-km were 199, 862. The average trip was thus 199,862 divided by 6,071, which is 32.92 km.

The amount of time saved is based on the answers to Questions 8 and 9 from the survey, which determined that the trip between Keren and Afabet took about 4.5 hours before reconstruction, with an average speed of 14 km/hr. Currently, those surveyed said that the trip now takes about 2.8 hours, which would mean a speed of 23 km/hr. Certainly, one can currently travel the distance in a shorter time (which would yield even greater savings to the amount stated below), but the consultants feel the number should be an average for the buses and trucks, and the best source of that information to determine that average was from the survey.

The average trip would thus have taken 32.92 (average trip)/14 (average speed on old road), which is 2.35 hours, and 32.92/23 (average speed on new road), which is 1.43 hours.

The time saved for each average trip is thus 2.35 less 1.43, which is 0.92 hours.

If passengers' time value of	ERN 5.00 per hour
Multiplied by hours saved	.92
Then value of time saved in per trip =	ERN 4.60
Multiply by the number of trips per week	6,071
Value of time saved in per week =	ERN 27,931.02

5.1.3 Annual Bus and Truck Passenger Savings

The combination of savings for bus and truck passengers from lower fares and shorter travel times can now be combined to view the economic benefits on an annual basis

Bus and truck fare savings per week	ERN 12,169.60
Value of time saved per week	ERN 27,931.02
Total saving/week	ERN 40,100.62
Multiplied by	52
Which is the total amount saved per year	ERN 2,085,232.35
(Or, at 13.5 exchange rate, savings per year	US$ 154,461.66)

5.1.4 Value of Savings on Freight Carried

Freight shippers on trucks and buses are also saving time and money because of the road reconstruction. The improved road enables shorter length trips and also makes lower freight rates possible because truck and bus operators can operate at lower costs. As was the case with bus and truck passengers discussed above, the best “proxy” appears to be the published freight rates, ERN per km of travel, which give specific information for rates charged on three types of roads — smooth, rough, and very rough. If the reconstruction work had not been done the freight shippers would be paying the higher, “very rough” rates. Instead they are paying the lower “rough” rates. The difference between the two rates is the savings in freight due to reconstruction — 0.130 less 0.114, which is 0.016 ERN per km.

The consultants have used the truck rates for both freight carried by truck, as well as that carried by bus, for two reasons: first, because the weight carried by bus was not significant, only 5% of the total carried by both trucks and buses; and second, because the rates seem to vary based on interviews. In reality the bus passengers are probably paying higher rates than the truck rates, which would increase the amount of savings, but these could not be accurately measured.

In order to ascertain these savings, the consultants determined a travel distance for each portion of freight carried during the survey week. Many, of course, were repetitious. It is important to note, for the sake of a conservative and accurate analysis, that only the portion of the trips, which were completed on the Keren-Afabet road, were included in the calculations (which was also the case in analyzing passenger trips above).

The amounts of freight carried were converted into quintals and multiplied by the number of km that each group of freight traveled. These were then summarized for the seven days of the survey.

all trucks	539,681.1	quintal -km
all buses	29,225.2	quintal -km
all buses & trucks	568,906.3	quintal -km

which was multiplied by	0.016	ERN/km freight cost savings/week due to rough, not extra rough road

This yields a total of	ERN 9,102.50	Freight cost savings/week
Multiplied by	52	
Is total amount saved per year	ERN 473,330.03	
(Or, at 13.5 exchange rate, is	US$35,061.48)	

5.1.5 Value of Operating Expense Savings to Bus and Truck Owners

As shown above, the customers — the bus and truck passengers and the freight shippers — have actually saved money by means of lower fares and freight rates, made possible by the improved road. The suppliers — the truck and bus operators and owners — have also saved on operating expenses because of the improved road compared to what it would have cost them for these same trips if the road had not been improved. Since adequate vehicle operating cost information was not available, the consultants are once again using published tariffs and freight rates as “proxies.” Based on discussions with some bus operators, the tariffs are probably below their actual cost of operation; thus use of the tariffs is conservative and should not overstate the amount of savings. On the other hand, based on some meetings with trucking companies, the freight rates appear to be close to their actual cost of operation, including a factor for profits.

Allowing for the fact that an amount needs to be subtracted for profit, the consultants have decided that vehicle operating costs can be considered to be about 75% of the bus tariffs and freight rates. This should be a conservative figure, not overstating the actual savings.

Savings to truck and bus operators and owners:			
For passenger services	ERN 12,169.60	multiplied by 75% is	9,127.20
For freight services	ERN 9,102.50	multiplied by 75% is	6,826.88
Total saved per week			15,954.08
Multiplied by			52
Is total amount saved per year			ERN 829,612.05
(Or, at 13.5 exchange rate, is)			US$ 61,452.74

5.1.6 Benefits of the Creation of New Enterprises in the Vicinity of the Road

A number of new enterprises have been created as the result of the road reconstruction. A number of preexisting enterprises would not still be in business if the roadwork had not been done. Based on the survey of enterprises, the consultants estimate that 365 enterprises in Afabet and 110 in the other villages, which were visited, fit these qualifications. In other words, there are a total of 475 enterprises that would not be operating today if the road reconstruction had not been done. Also, based on the survey, the average annual revenue per enterprise in the area is estimated to be 22,500 ERN, and the average net income is 30%. These two numbers, when multiplied together, yield an annual net income of 6,750 ERN per enterprise. This net income is an additional category of benefits created by the road reconstruction project, which is:

Benefits of new enterprises = 6,750 ERN X 475 enterprises = 3,206,250 ERN

5.1.7 Economic Benefits to Road Reconstruction Workers

Quite a number of local people living near the road route have benefited personally from the road reconstruction which has been going on for five years. The RTCD Manager in Afabet, Mr. Ghebrehiwet Bashay, said that he believed about 2,000 people have benefited. The Hamelmalo Administrator, Mr. Hamid Hasabela, felt that over 1,500 had participated in the road construction work. The benefits, although not quantifiable, include:

- wages paid on a regular basis for several years;
- future construction work due to acquisition of particular “saleable” skills such as masonry and equipment operation;
- construction of their own homes due to skills acquired, saving the cost of hiring someone else; and
- payment earned for construction of homes or buildings for others.

5.1.8 Economic Benefits to Villages and Towns

Mr. Hamid, in particular, felt that his area had seen the construction of 600 new buildings, each averaging about ERN 10,000, a total value of ERN six million, mainly because of the improved road. Previously, there were few buildings and homes in the area. He believed that people had moved to the area to get better access to transport. The Sub-Zoba population has grown by one-third in the past two years. A village judge, Mr. Idris Omar Abib, who helped with stopping traffic for the traffic survey, agreed that most of the new construction in the past three to four years was due to the effects of the road improvement. Unfortunately, these statements and statistics could not be independently verified. It does appear, although not quantifiable, that the following benefits have accrued to the villages:

- increased investment in homes, shops, and other buildings;
- increased employment due to new businesses;
- lower costs to local people who no longer have to travel so far to obtain goods and services;
- lower transportation costs for local people; and
- access to lower prices in other markets because of increased amount of transport available.

5.1.9 Other Economic Benefits to Bus and Truck Companies and Owners

Although records for this were not available, bus companies and owners have been able to increase their revenues by adding more buses and more frequency due to the road improvement. Likewise, truck

companies and owners, such as Hayat Habero, have been able to increase their revenues by adding more trucks and more frequency due to the road improvement. Records also cannot back this up.

5.1.10 Other Miscellaneous Economic Benefits

The following, although not quantifiable, are other benefits:

- local subcontractors hired to work with the road reconstruction;
- commercial farmers have reduced costs due to less spoilage getting produce to market faster;
- farmers selling goats at slightly higher prices because animals did not lose weight on long walk to markets; and
- farmers can buy and sell at more favorable prices due to being better informed by more current newspapers, and also by faster access to the markets.

5.2 Comparison of Costs and Benefits of the Project

RTCD reported to the consultants that the following had been spent on reconstruction costs of the road during the past five years. This represents the reconstruction investment in the road:

Table 25. ERN Spent on Road Reconstruction Costs

Year	ERN
1997	8,579,681
1998	8,817,224
1999	8,294,738
2000	21,493,964
2001	21,658
Value of total investment, without interest	47,207,265
Value of total investment, at 8% interest rate	55,689,846

Loans in the transport and communications sector were made at 8% during this period, so this interest rate appears to be the proper rate at which to assess the investment.

During 2001, based on the potential saving listed above, the following annual benefits can be quantified, as well as road maintenance costs, supplied by the RTCD:

Table 26. Annual Savings/Benefits of Road Rehabilitation

Benefit	ERN
Bus and truck fare savings	2,085,232
Freight cost savings	473,330
Operating expenses savings to truck and bus owners	829,612
Net income from creation of new enterprises	3,206,250
Total benefits, based on savings	6,594,424
Less, cost of road maintenance for this year	-1,422,208
Net benefits for year	5,172,216
Return on investment for the year	9.3%

The actual savings, which are higher, would increase the benefits, yielding a higher return on investment. But, as mentioned above, quantification of these was not possible.

CHAPTER 6.
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 Food Security

At the national level of food security, Eritrea is now much more vulnerable to food insecurity than it was in 1997. The economic disruptions, associated with the war with Ethiopia, has reduced opportunities for trade, and increased labor shortages in the agricultural sector reducing national food production. In addition, many skilled people from administrative, management and analytical positions in the Government sector, NGOs and the private sector are also not available to contribute to an improved rural economy because they are doing military service.

At the household level, the massive amounts of food aid being distributed as rations may be helping some people hold on to their productive assets in the face of the general economic decline in the rural areas (this is the rational of some GSE officials). The downside is that these massive inputs of food aid may be hurting the market for locally grown cereals, severely cutting into the incomes of cereal producers.

6.1.2 Road Rehabilitation

1. This study has generated baseline data that could be monitored in the future to determine the continuing impact of the road. The various survey instruments served as helpful devices for generating this data.
2. The road reconstruction has provided a solid amount of economic benefits to its users and to the adjacent areas.
3. The road is carrying a substantial amount of motorized traffic; when the traffic to Halhal is combined with that going north from Hamelmalo toward Afabet, the 150 vehicles per day is moving the statistics toward the point where hard surfacing of the Keren-Hamelmalo portion should be considered.
4. The people living and working near the road are generally quite happy with the road improvement and feel that their access to markets and services is much greater.
5. The road appears to be serving business interests: 1) the majority of those interviewed in the traffic survey (which did not include bus and truck passengers) were using the road for business reasons, and 2) the road is carrying a great amount of goods and products.
6. A substantial number of people in the area have acquired masonry skills because they worked on the road reconstruction.
7. Lack of a regular routine maintenance program: 1) has led to speeds that are slower than might be possible on many parts of the road and thus suboptimal use of the road, and 2) may cause the base course of the road to start to deteriorate.
8. Overall, from a technical point of view, the road reconstruction work has been quite good, although in the mountainous areas, some gravel needs to be added and fallen rocks removed to make the road wider.
9. The Road Inspection Report form used provided much helpful technical information including a format for comparison to previous and future road surveys.

6.2 Recommendations

6.2.1 Implement VAM under the Auspices of the NFIS

Implement the VAM to improve GSE targeting of food aid distributions and reduce the possibility that some areas and households could be missed, or some areas in Eritrea could receive food aid unnecessarily. A list of potential indicators for an Eritrean VAM at the Sub-Zoba or better at the Kebabi level could include:

- percent of the population living within five km of a good road or rail line,
- percent of the population living within ten km of a health center,
- percent of the population living within five km of a telephone,
- insecurity score,
- percent of households with access to electricity,
- average annual per capita cereal production,
- annual value of food aid distributions,
- average annual per capita livestock off-take,
- draft animals per capita,
- literacy rate,
- gross enrollment rate, and
- total annual NDVI.

6.2.2 Economic Analysis of Impact of Food Aid on Producer Incentives

Due to the large quantities of food aid being distributed as rations for such a long period of time, USAID and perhaps other donors should do an economic analysis of the affect of food aid on local cereal producers before any more food aid is brought in.

6.2.3 Disseminate Price Data

Structure and disseminate the price data collected by the Ministry of Trade and Industry (MTI) to assist producers and traders in finding their buyers and sellers. Price data is the most effective tool for monitoring food security. This information would be more helpful to more people if it were more readily available. It would increase the efficiency of the grain market and assist producers in determining their marketing strategies. Price signals from a freely functioning grain and livestock market are the best indicators of how producers of these commodities are fairing.

The MTI currently does not have the resources to structure the price data. These resources will be available with demobilization. In the meantime, it may be useful to support the NFIS to help structure this data.

6.2.4 Roads

1. Monitor the economic impact of the Keren-Afabet road on an annual basis, including a seven-day set of traffic interviews and more interviews in the community to better determine the road's actual impact in the communities. Survey tools should be based on versions of this assessment's survey instruments.

2. Consider reconstruction of other rural roads which have the potential for strong economic impact, giving priority to those with the highest potential. The World Bank's RED computer model (copies were given to USAID and RTCD) should be used to help make the choice.
3. Consider an economic projection of the impact to determine if hard surfacing of the road between Keren and Hamelmalo will provide net returns.
4. Conduct a study to determine how to make better use of the large group of people in the area who have acquired good masonry skills.
5. Develop a routine maintenance program to carry out grading, culvert inspections, and other repetitive tasks on a regular basis.
6. Complete the basic reconstruction of the Keren-Afabet road within the next year.
7. Consider use of the Road Inspection Report form (Appendix C) as a basis for future physical road inspections.

APPENDICES

APPENDIX A. REFERENCES

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APPENDIX B. PEOPLE INTERVIEWED

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APPENDIX C. ROAD INSPECTION REPORT FORM

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
drift, edge of Keren, next to livestock market	0.0	0.0		10																					concrete
	0.0	0.1		10			x			12		x	50	x											
culvert @ 0.1				10																	1.2 round	good			
	0.1	0.5		10			x			15		x	40												
culvert @ 0.5				10																	1.2 round	good			
	0.5	0.8		10			x			12			50												
culvert @ 0.8				10																	1.2 round	good			
	0.8	0.9		10			x			12			50												
culvert @0.9				10																	1.2 round	good			
Cemetery @ 1.1	0.9	1.3		10			x			12			50												
culvert @ 1.3				10																	3.3 x 3.5	good	30	good	
	1.3	1.4		10			x			12		x	40												
culvert @ 1.4				10																	2.4 x 3.5	good			
	1.4	1.9		10			x			15			50												
culvert @ 1.9				10																	1.2 round	good			
	1.9	2.7		10			x			15			40		x										
culvert @ 2.7				10																	1.2 round	good			
	2.7	3.0		10			x			15			40	x											
junction to Ghelab @ 3.0				10																					
	3.0	3.7		10		x				12			50	x											
culvert @ 3.7				10																	3.5 x 3.6	good			
	3.7	3.8		10		x				12			50												
culvert @ 3.8				10																	1.2 round	good			
	3.8	4.2		9		x				12			50												
culvert @ 4.2				9																	1.2 round	good			narrow roadway
	4.2	4.6		10		x				12			50				x								sight distance limited
culvert @ 4.6				10																	1.2 round	good			trash at inlet
	4.6	4.7		10		x				12			50												
culvert @ 4.7				10																	1.2	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
																					round				
	4.7	4.8		10		x				12			50												
culvert @4.8				10																	1.2 round	good			
	4.8	4.9		10		x				12			50												
culvert @ 4.9				10																	3.2x 2.5	good			
	4.9	5.1		10			x			12			50												
culvert @ 5.1				10																	1.2 round	good			
	5.1	5.3		10			x			12			50												
culvert @ 5.3				10																	1.2 round	good			
	5.3	5.5		10			x			12			50												
culvert @ 5.5				10																	1.2 round	good	30	good	
	5.5	5.8		10			x			15			30												
culvert @ 5.8				10																	2.3 x 4.6	good			
	5.8	5.9		10			x			12			50										130	good	
culvert @ 5.9				10																	1.2 round	good			
	5.9	6.3		10			x			12			50												
culvert @ 6.3				10																	2.2 x 1.5	good			
	6.3	6.7		10			x			12			60												retaining wall needed
culvert @ 6.7				10																	3.2 x 3.5	good			
	6.7	7.3		10		x				12		x	50				x								sight distance limited
culvert @ 7.3				9.3																	3.6 x 5	good			
	7.3	7.4		10		x				10			50												"washboard"
culvert @ 7.4				10																	1.2 round	good			
	7.4	7.6		10		x				10			70												
culvert @ 7.6				10																	3.3 x 3.5	good			
	7.6	7.7		10		x				10			70												
culvert @ 7.7				10																	3 x 4	good			
	7.7	7.9		10		x				10			60												
culvert @ 7.9				10																	1.2 round	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
	7.9	8.1		10			x			10		x	60												
Bridge @ 8.1				10																	5.8 x 4.5	good			
	8.1	8.3		10			x			10			60												
culvert @ 8.3				10																	1.2 round	good			partially clogged
	8.3	8.4		10			x			12			60							x					
Bridge @ 8.4				10																	4.3 x 3.5	good			
	8.4	8.8		10			x			12			50		x	x				x					sight distance limited
culvert @ 8.8				10																	1.2 round	good			
	8.8	9.4		10		x				12			70												
culvert @ 9.4				10																	2.5 x 4	good			
	9.4	10.6		9.7		x			x	10			70												
Agricultural school				10																					
	10.6	11.0		10			x			10			70												
drift, under construction @ 11.0				10																x					concrete
	11.0	11.7		10			x			10			70			x									sight distance limited
Bridge @ 11.7				9																	5.5 x 2.5	good			narrow roadway
	11.7	12.2		10		x				10			70												"washboard"
culvert @ 12.2				10																	1.2 round	good			
	12.2	12.4		10		x				10			70												
Hamelmalo town control gate @ 12.4				10																					
	12.4	12.5		10			x			10			70												
culvert @12.5				10																	1.2 round	good			
	12.5	12.7		10			x			10			70												
culvert @12.7				10																	1.2 round	good			
	12.7	12.9		10			x			12			70												
junction to Halhal @12.9				10																					
	12.9	13.4		10		x				12			70												
culvert @13.4				10																	1.2 round	good			
	13.4	14.0		10		x				12			50												
culvert @14.0				10																	1.2	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
																					round				
	14.0	14.4		10		x				12			60												
culvert @14.4				10																	1.2 round	good			
	14.4	14.5		10			x			12			60												
culvert @14.5				10																	1.2 round	good			
	14.5	16.3		10			x			12			70							x					
Anseba River, drift @ 16.3				8																		good			concrete
	16.3	16.9		6			x			10		x	50							x					
bridge @16.9				8																	5 x 4	good			
small village	16.9	17.9		8		x				10			60												
culvert @17.9				10																	1.2 round	good			
	17.9	18.2		8		x				8			60					x							
culvert @18.2				10																	1.2 round	good			
	18.2	18.5		10		x				8			60					x							
culvert @ 18.5				10																	1.2 round	good			
	18.5	18.7		8		x				8			60					x							
culvert @18.7				9.8																	4 x 3	good			
	18.7	19.5		8			x			8			70			x		x							nice road!
ford @ 19.5				6																			15	good	no concrete paving, just walls
	19.5	20.0		6			x			12	x		40	x	x										
ford @ 20.0				6																					no concrete paving, just walls
beside stream	20.0	20.8		5				x		15			40			x				x					mountainous
wall @20.8				5																			20	good	
	20.8	20.9		5				x		18			30							x					
bridge @ 20.9				5.7																	9 x 2.5	good			
	20.9	21.0		6				x		20			30												
culvert @21.0				6																	4.5 x 2.5	good			
	21.0	21.6		4				x		20	xx		20		x					x					too narrow
culvert @ 21.6				10																	1.9 x 2	good			
	21.6	21.7		5				x		15			40												small landslide
culvert @ 21.7				9.5																	3 x 1	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
	21.7	21.8		8				x		15			40										35	good	well done walls
culvert @ 21.8				9.8																	3.5 x 1.5	good			
	21.8	21.9		8				x		15			40										35	good	well done walls
culvert @ 21.9				10																	3.5 x 1.5	good			
	21.9	22.1		7				x		12	x		30		x										steep
culvert @ 22.1				10																	3 x 2	good			
	22.1	22.3		9				x		12			30			x									
Mescelit mountain pass @22.3				8								x													blasted rock chips
	22.3	22.5		8				x		12		x	40												
culvert @ 22.5				7.5								x									1.8 x 1.5	good	25	good	
	22.5	22.63		8				x		12		x	40												
culvert @22.63				10								x									1.2 round	good	25	good	
	22.63	22.7		9				x		12		x	40												
culvert @22.67				8.5								x									1.2 round	good	25	good	
	22.7	22.7		9				x		12		x	40												
culvert @ 22.7				9.5								x									2.2 X 1	good			clogged culvert
	22.7	22.9		8				x		12		x	40												
culvert @ 22.9				10								x									2.5 x 2	good			clogged culvert
	22.9	23		9				x		12		x	40												
culvert @ 22.95				8.5								x									2.5 x 2	good			
	23	23.0		8				x		12		x	40												
2 retaining walls @23.0				8								x											2 x 25	good	
	23.0	23.1		9				x		12		x	40												
culvert @ 23.1				10								x									3 x 2.5	good			landslide
	23.1	23.3		9				x		12		x	40												
culvert @ 23.3				9								x									3 x 1.5	good	20	good	partially clogged culvert
	23.3	23.4		9				x		12		x	40												
culvert @ 23.4				10																	2.5 x 2.5	good	20	good	
	23.4	24.0		6				x		12	x	x	40		x										parts are narrow
culvert @ 24.0, bottom of pass				8.8																	1.2 round	good			
	24.0	24.2		9			x			10			50												

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
culvert @ 24.2				9																	3 x 3	good			
	24.2	24.3		10			x			10			50												
culvert @ 24.3				10																	3.5 x 2	good			
	24.3	24.4		10			x			10			50												
culvert @ 24.4				10																	1.2 round	good			
	24.4	24.6		10		x				12			50		x										
culvert @ 24.6				8.5																	1.2 round	good			
	24.6	24.9		10		x				12			60												
bridge @ 24.9				10																	4.5 x 3	good			
	24.9	25.3		10			x			12			60												
culvert @ 25.3				10																	3 x 2	good			
	25.3	25.5		10		x				10			60												
culvert @ 25.5				10																	1.2 round	good			
	25.5	25.7		10		x				10			60												
culvert @ 25.7				9.5																	1.2 round	good			
	25.7	25.9		8		x				10			60												
culvert @ 25.9				10																	1.2 round	good			
	25.9	26.0		10		x				10			60												
culvert @ 26.0				10																	1.2 round	good			
	26.0	26.1		10		x				10			60												
culvert @ 26.1				10																	4.5 x 2.5	good			
	26.1	26.3		10		x				10			60												
culvert @ 26.3				10																	1.2 round	good			
	26.3	26.7		10		x				10			60												
culvert @ 26.7				9.5																	3.3 x 2.5	good			
	26.7	27.0		8			x			10		x	50												
culvert @ 27.0				10																	3 x 1.5	good			
	27.0	27.4		10			x		x	10			60	x	x										
culvert @ 27.4				8																	1.2 round	good			
	27.4	27.7		10		x				10			70												
culvert @ 27.7				8																	3 x 1.5	good			

Location/Structure	from	to	Pavement		shoulder	Orography			Ditch	Inputs for VOC	Speed	erosion	Alignment problems	adequate	const	Culvert	retaining wall
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous									

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
culvert @ 33.2				10																	3 x 2	good			
	33.2	33.5		8			x			15			30							x					under construction
culvert @ 33.5				9.5																	2.8 x 1	good			
	33.5	34.0		6				x		15	x	x	30							x			5	good	
culvert @ 34.0				10																	3.5 x 5	good			clogged
	34.0	34.3		5				x		20	x	x	20		x		x			x					old road
culvert @ 34.3				10																	3 x 1.5	good			
	34.3	34.4		7				x		18			20							x					
Kogai Pass @ 34.4				5																					
	34.4	34.5		7				x		18			30							x					
culvert @ 34.5				9.5																	1.8 x 2	good			
	34.5	34.7		6				x		18			20							x					
culvert @ 34.7				8.8																	3.8 x 5	good			mostly clogged
	34.7	34.8		7				x		15	x	x	20							x					
culvert @ 34.8				9																	4.5 x 5	good			mostly clogged
	34.8	35.0		9				x		20	x	x	20							x					
culvert @ 35.0				8.5																	1.6 x 5	good			mostly clogged
	35.0	35.1		9				x		20	x	x	20							x					
culvert @ 35.1				10																	4 x .5	good			mostly clogged
	35.1	35.7		5				x		20	x	x	25							x					
bridge @ 35.7				9																	5 x 3	good			
	35.7	36.0		5				x		18	x	x	20							x			15	good	
culvert @ 36.0				10																	3.8 x 2.5	good			
	36.0	36.4		6			x			18			30							x			30	good	
bridge @ 36.4				5.9																	6 x 1	good			too narrow
	36.4	36.6		8			x			18			30												
culvert @ 36.6				10																	1.5 x 1	good			
	36.6	36.8		10			x			18			25												
culvert @ 36.8				9.5																	1.5 x .5	good			mostly clogged
	36.8	37.0		7				x		18			30												
culvert @ 37.0				8.4																	1.2 round	good			partially clogged
	37.0	37.1		9			x			15			40												
culvert @ 37.1				10																	1.2 round	good			
	37.1	37.2		10			x			15			40												
culvert @ 37.2				10																	4 x 2	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
	37.2	37.7		8			x			18			30										30	good	
culvert @ 37.7				10																	1.2 round	good			
	37.7	37.8		10			x			18			30												
culvert @ 37.8				10																	4.5 x 3	good			
	37.8	37.9		10				x		20	x		30		x					x					
culvert @ 37.9				10																	1.8 x 1	good			
	37.9	38.3		7			x			20			30										30	good	
culvert @ 38.3				8.5																	1.2 round	good			
	38.3	38.4		9			x			18			30		x										
culvert @ 38.4				10																	4 x 2	good			
	38.4	38.6		6			x			20			20										35	good	
culvert @ 38.6				9																	2 x 2.5	good			well built
	38.6	38.8		8			x			20			20			x									
culvert @ 38.8				9																	1.2 round	good			
	38.8	38.9		10				x		20			20		x								40	good	
culvert @ 38.9				10																	1.2 round	good			
	38.9	39.5		10				x		20			20												
ford @ 39.5				10																			10	good	uncompleted
	39.5	40.3		8		x				12		x	45												
drift @ 40.3				8						8			50												concrete
	40.3	40.8		7			x			15			30										20	good	
culvert @ 40.8				9																	1.2 round	good	10	good	
	40.8	41.5		6				x		15			30										30	good	
Kalhamet village@ 41.5				10						10															
	41.5	42.0		7			x			20			30										10	good	
culvert @ 42.0				9											x						1.2 round	good			
	42.0	42.4		10		x				18			30												
culvert @ 42.4				9																	1.2 round	good			clogged
	42.4	42.6		9		x				15			30												
culvert @ 42.6				9																	1.2 round	good			partially clogged
	42.6	42.9		9		x				15			30												
culvert @ 42.9				10																	2 x 2	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
	42.9	43.7		6			x			18			30												
drift @ 43.7				8																x					concrete
	43.7	44.5		7		x				15			30										70	good	
ford @ 44.5				6																					uncompleted
	44.5	45.3		6			x			15			30										200	good	
culvert @ 45.3				9																	1.2 round	good			partially clogged
	45.3	45.7		8			x			12			40			x									
bridge @ 45.7				11																	5 x 3	good			
	45.7	47.0		7			x			12			50			x							70	good	
culvert @ 47.0				9.5																	2.5 x 2	good	80	good	
	47.0	47.1		9			x			12			60												
culvert @ 47.1				9																	1.2 round	good	20	good	
	47.1	47.4		8			x			12			60												
culvert @ 47.4				9																	1.2 round	good			
	47.4	47.9		7			x			12			60			x									
Felkat village, culvert @ 47.9				9																					
	47.9	48.0		10		x				10			60												
culvert @ 48.0				10																	2.5 x 2	good			
	48.0	48.9		8		x				8			60												
culvert @ 48.9				9																	2--3.5 x 3	good			double culvert
	48.9	49.5		8		x				12			50												
culvert @ 49.5				9												x					1.2 round	good			
	49.5	50.0		9		x				8			70												
culvert @ 50.0				8																	1.2 round	good	300	good	
	50.0	50.2		9				x		8			70												
culvert @ 50.2				10																	1.8 x 2	good			
	50.2	50.5		10			x			8			60										100	good	
culvert @ 50.5				10																	1.2 round	good			
	50.5	51.5		10		x				8		x	80						x						
culvert @ 51.5				9																	2 x 2	good			
	51.5	52.0		9			x			8		x	80												
culvert @ 52.0				9																	1.2	good			

Location/Structure	from	to	Pavement		shoulder		Orography		Ditch		Inputs for VOC		Speed	erosion		Alignment problems		adequate		const	Culvert		retaining wall		
	km	km	type	Width m.	m.	Flat	Rolling	Mountainous		estimate of IRI roughness	Rise & fall	curvature	kph (as driven by 4x4)	road	shoulder	vertical	horiz	gravel	grading	incomplete construction	size--1.2m round or width X height, m.	condition	length, m.	condition	Comments
																					round				
	52.0	54.8		9		x				8		x	70				x	x	x						some "washboard"
culvert @ 54.8				10																	1.2 round	good			
	54.8	54.9		10		x				10			60					x	x						very nice road
culvert @ 54.9				10																	3--3.8 x 3.5	good			triple culvert
	54.9	56.0		10		x				10			60						x						some "washboard"
culvert @ 56.0				10																	4 x 2.5	good			
	56.0	57.1		10		x				10			60						x						
culvert @ 57.1				10																	1.2 round	good			
	57.1	57.6		10			x			10			60						x						
culvert @ 57.6				10																	1.2 round	good			
	57.6	57.7		10		x				10			60												
culvert @ 57.7				10											x						2.3 x 3	good			
	57.7	58.3		10		x				10			60			x									
culvert @ 58.3				10																	1.2 round	good			
	58.3	58.5		8			x			12			50												
drift @ 58.5				8																					concrete
	58.5	59.1		8		x				10			50												
culvert @ 59.1				10																	2--1.2 round	good			double culverts
	59.1	61.8		10		x				10			60												some "washboard"
Afabet control gate @ 61.8																									
IRI=International Roughness Index																									
unpaved roads																									
smooth	4																								
reasonably smooth	8																								
medium rough	12																								
rough	15																								
very rough	20																								

APPENDIX D. FOOD BALANCE SHEET

Table 1. Summary of consumption, production, stocks and imports, for wheat, millet, and sorghum in Eritrea (1000s mt).

							1997												1998						
		Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
Consumption needs																									
3	million population	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
137	Kg/capita/year																								
Available from harvest		40	0	0	0	0	0	0	0	0	0	68	0	0	0	0	0	0	0	0	0	0	0	345	0
	Central	40										68												345	
	Anseba																								
	Gash Barka																								
	Debub																								
	Northern Red Sea																								
	Southern Red Sea																								
Available		30.0	0.0	60.0	0.0	30.0	0.0	50.0	24.0	0.0	50.0	0.0	0.0	72.0	50.0	40.0	0.0	32.0	24.0	0.0	0.0	40.0	30.0	29.0	17.0
	WFP/ERREC													32.0				32.0					30.0	29.0	17.0
	Bilateral/ERREC	30.0		60.0		30.0		50.0	24.0		50.0				50.0										
	Bilateral/EGB													40.0		40.0			24.0			40.0			
	Commercial																								
Sudan and Ethiopia		0.0	33.8	0.0	10.0	10.0	10.0	10.2	10.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	9.0	0.0	0.0	0.0	0.0
	Formal Sudan							0.2													4.5				
	Formal Ethiopia		23.8																3.3						
	Informal Sudan					10.0	10.0		10.0	10.0											4.5				
	Informal Ethiopa		10.0		10.0			10.0		10.0									3.3						
Total available		70.0	33.8	60.0	10.0	40.0	10.0	60.2	34.0	20.0	50.0	68.0	0.0	72.0	50.0	40.0	0.0	32.0	30.6	0.0	9.0	40.0	30.0	374.0	17.0
Monthly balance		36	0	26	-24	6	-24	26	0	-14	16	34	-34	38	16	6	-34	-2	-3	-34	-25	6	-4	340	-17
(Total available - Consumption needs)																									
Monthly available		**36**	**36**	**62**	**38**	**44**	**20**	**46**	**46**	**32**	**48**	**82**	**48**	**86**	**102**	**108**	**74**	**72**	**69**	**35**	**10**	**16**	**12**	**352**	**335**
(previous + current monthly balance)																									
														7	7	7	7	7	7	7	7	7	7	7	7
Nominal price of millet at Keren														306	300	296	293	300	297	275	280	259	234	195	212

					1999												**2000**						
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jly**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jly**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
0	0	0	0	0	0	0	0	0	0	249	0	0	0	0	0	0	0	0	0	0	0	80	0
										249												80	
0.0	0.0	0.0	6.2	0.0	2.0	0.0	0.0	5.3	13.0	5.0	0.0	0.0	24.3	25.9	39.6	70.4	7.0	36.1	0.0	3.0	58.0	54.5	34.6
			6.2		2.0			5.3	13.0	5.0			24.3	25.9	39.6	70.4	7.0	36.1		3.0	28.5	54.5	34.6
																					29.5		
0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
							12.8												6.0				
0.0	0.0	0.0	6.2	0.0	2.0	0.0	12.8	5.3	13.0	254.0	0.0	0.0	24.3	25.9	39.6	70.4	7.0	36.1	6.0	3.0	58.0	134.5	34.6
-34	-34	-34	-28	-34	-32	-34	-21	-29	-21	220	-34	-34	-10	-8	6	36	-27	2	-28	-31	24	101	1
301	**267**	**233**	**205**	**171**	**139**	**105**	**84**	**55**	**34**	**254**	**220**	**186**	**176**	**168**	**174**	**210**	**183**	**185**	**157**	**126**	**150**	**251**	**251**
8	8	8	8	8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	10	10
210	207	208	208	275	240	230	233	217	207	218	230	273	275	285	350	345	408	408	431	414	444	431	372

Table 1. Summary of consumption, production, stocks and imports, for wheat, millet, and sorghum in Eritrea (1000s mt).

					2001											Year		
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jly**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**			**1997**	**1998**	**1999**	**2000**	**2001**	
												Consumption needs		**408**	**408**	**408**	**408**	**408**	
34	34	34	34	34	34	34	34	34	34	34	34	**3**	million population	408	408	408	408	408	
												137	Kg/capita/year						
0	0	0	0	0	0	0	0	0	0	180	0	**Available from harvest**		**108**	**345**	**249**	**80**	**180**	
										180			Central	108	345	249	80	180	
													Anseba	0	0	0	0	0	
													Gash Barka	0	0	0	0	0	
													Debub	0	0	0	0	0	
													Northern Red Sea	0	0	0	0	0	
													Southern Red Sea	0	0	0	0	0	
47.8	17.1	0.0	2.6	23.0	2.0	0.0	100.0	0.0	32.8	49.1	10.0	**Available**		**244**	**334**	**32**	**353**	**284**	
														0	0	0	0	0	
47.8	17.1		2.6	23.0	2.0				32.8	24.1			WFP/ERREC	0	140	32	324	149	
							100.0			25.0	10.0		Bilateral/ERREC	244	50	0	30	135	
													Bilateral/EGB	0	144	0	0	0	
													Commercial	0	0	0	0	0	
														0	0	0	0	0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	**Sudan and Ethiopia**		**104**	**16**	**13**	**6**	**1**	
								0.8					Formal Sudan	0	5	13	6	1	
													Formal Ethiopia	24	3	0	0	0	
													Informal Sudan	40	5	0	0	0	
													Informal Ethiopa	40	3	0	0	0	
												Annual balance (calendar y		**48**	**287**	**-115**	**31**	**57**	309
47.8	17.1	0.0	2.6	23.0	2.0	0.0	100.0	0.8	32.8	229.1	10.0								
14	-17	-34	-31	-11	-32	-34	66	-33	-1	195	-24								
265	**248**	**214**	**183**	**172**	**140**	**106**	**172**	**139**	**137**	**333**	**309**								
10	10	10	13	13	13	13	13	13	13										
377	406	407	407	380	395	382	329	320	325	317									

APPENDIX E. TRAFFIC SURVEY AT HAMELMALO

Question 1: Type of traffic

	pedestrian	bicycle	animal cart	car	4x4	light bus	medium bus	heavy bus	light truck	medium truck	heavy truck	articulated truck	livestock groups	number of livestock	total vehicles, people & animal groups	motorized vehicles	total vehicles, pedestrians, animals
Sat, 24/11	7	3	0	5	9	24	2	6	7	3	8	0	6	11	74	64	85
Sun, 25/11	24	0	0	9	6	25	6	6	4	6	28	1	29	537	115	91	652
Mon, 26/11	6	1	0	8	11	33	5	4	7	1	18	0	10	88	94	87	182
Tue, 27/11	19	2	0	12	26	22	1	6	2	4	23	3	19	393	120	99	513
Wed, 28/11	5	2	0	10	28	23	6	5	3	3	22	2	5	10	109	102	119
Thu, 29/11	3	2	0	6	29	20	1	6	0	6	16	1	3	8	90	85	98
Fri, 30/11	7	1	0	3	25	22	1	5	3	4	21	2	7	13	94	86	107
Totals	71	11	0	53	134	169	22	38	26	27	136	9	79	1060	696	614	1756
averages														151.4	99.4	87.7	250.9
							229	buses		198	trucks						
% of total transport	3.9%	0.6%	0.0%	2.9%	7.3%	9.2%	1.2%	2.1%	1.4%	1.5%	7.4%	0.5%	4.3%	57.8%		35.0%	
					buses		12.5%	trucks		10.8%							
% of total motorized transport				8.6%	21.8%	27.5%	3.6%	6.2%	4.2%	4.4%	22.1%	1.5%					
					buses		37.3%	trucks		32.2%							

Question 2: Number of people using the road

Number of passengers, drivers, and others using the road			
	total	male	female
Sat, 24/11	734	585	147
Sun, 25/11	1396	1154	251
Mon, 26/11	1235	1016	219
Tue, 27/11	1076	875	190
Wed, 28/11	964	778	194
Thu, 29/11	824	657	167
Fri, 30/11	926	697	219
Totals	7155	5762	1387
average	1022.1		
		80.5%	19.5%

Questions 3 and 4: Who owns the transport?

Ownership of the transport						
	self	business	NGOs and international	military	other	other
Sat, 24/11	28	33	5	1	9	1
Sun, 25/11	59	76	1	0	9	2
Mon, 26/11	41	57	2	0	12	2
Tue, 27/11	58	67	5	2	17	4
Wed, 28/11	49	64	4	1	24	0
Thu, 29/11	34	49	2	3	28	1
Fri, 30/11	30	48	1	2	29	1
Totals	299	394	20	9	128	11

Question 5: Where did your trip start?

Origination of trip								
	Asmara	Keren	Afabet	Nakfa	Hamelmalo	Habero	Kalhamet	Other
Sat, 24/11	6	32	9	8	12	0	0	7
Sun, 25/11	12	33	18	6	21	9	0	17
Mon, 26/11	4	49	9	3	21	3	0	4
Tue, 27/11	12	52	22	2	19	9	0	6
Wed, 28/11	11	45	16	1	20	6	0	10
Thu, 29/11	7	33	16	1	19	7	0	9
Fri, 30/11	11	37	15	4	19	1	0	7
Totals	63	281	105	25	131	35	0	60
	9.0%	40.1%	15.0%	3.6%	18.7%	5.0%	0.0%	8.6%

Question 6: What is your final destination?

Destination of trip								
	Asmara	Keren	Afabet	Nakfa	Hamelmalo	Habero	Kalhamet	Other
Sat, 24/11	10	21	11	1	18	3	0	9
Sun, 25/11	9	59	19	4	20	4	0	1
Mon, 26/11	7	32	9	2	30	4	0	12
Tue, 27/11	6	43	14	5	17	15	1	20
Wed, 28/11	9	37	18	4	26	8	0	7
Thu, 29/11	9	34	14	3	20	4	0	4
Fri, 30/11	10	33	12	3	24	5	0	7
Totals	60	259	97	22	155	43	1	60
							total	697
	8.6%	37.2%	13.9%	3.2%	22.2%	6.2%	0.1%	8.6%

Question 7: Why are you taking this trip?

Purpose of trip														
	take product to sell	other business	to pur chase product	visit friend or relative	other per sonal	govt staff	got to govt office	going to job	relief work	school	tourist	health care or medi cine	to trans port people	other
Sat, 24/11	8	32	3	1	11	3	0	12	0	0	0	0	27	5
Sun, 25/11	27	42	3	0	4	4	0	10	0	1	0	3	42	18
Mon, 26/11	12	14	3	1	5	7	0	10	1	0	1	0	49	4
Tue, 27/11	27	33	11	0	5	10	4	8	1	1	1	1	34	8
Wed, 28/11	13	11	9	2	3	13	0	19	1	1	0	0	35	6
Thu, 29/11	5	17	2	0	0	14	0	19	0	0	1	1	28	7
Fri, 30/11	10	9	3	0	3	6	0	21	4	2	0	0	31	4
Totals	102	158	34	4	31	57	4	99	7	5	3	5	246	52
												total responses		807
	12.6%	19.6%	4.2%	0.5%	3.8%	7.1%	0.5%	12.3%	0.9%	0.6%	0.4%	0.6%	30.5%	6.4%

APPENDIX F. PASSENGER SURVEY AT AFABET

Date: 25-27 November 2001 Place of Interview: Afabet

The following locations were identified either as departure or destination of the passengers

1. Afabet
2. Keren
3. Nakfa
4. Kelhamet
5. Gadim Halib
6. Aithal
7. Naro
8. Asab
9. Himbol
10. Tesenei
11. Sudan
12. Gizgiza
13. Asmara
14. Kubkub
15. Karora
16. Sawa
17. Mahmimet
18. Shieb
19. Haicota
20. Barentu
21. Felket
22. Agordet
23. Maidima
24. Hagaz
25. Ghindae
26. AdiHumed
27. Massawa
28. Hota
29. Shabi mengir
30. Lab
31. Hidam
32. Marsagulbub
33. Gebgeb

1. Interviewee's
   - Sex : Males 75 Females 25
   - Average Age : 42 years
   - Average Household size: 5.51 members

4-5 Former and Present Occupations

Occupations	Former	Present
1. Housewife	25	24
2. Farmer	44	40
3. Soldier	0	10
4. Merchant	5	11
5. Shopkeeper	0	1
6. Student	13	1
7. Gardner	1	0
8. Other	11	10
9. No Occupation	1	3
Total	100	100

Direction and Frequency of Trip

1. What type of transportation services do you most often use?

1. Bus	53
2. Truck (lorry)	29
3. Hilux	14
4. Other	4
Total	100

7. How many years have you traveled along this road?

1. 1 year or less	8
2. 2- 3 years	15
3. 4-5 years	25
4. > 5 years	52
Total	100

8. If you were using other roads before, why did you change your traveling habit?

1. Change of address	8
2. Suitability of road	10
3. Change of occupation	6
4. No change in traveling habit	76
Total	100

9. Which towns/city are your frequent departures and destinations along this road?
Departure from_____ Destination to --------

1. Afabet-Keren (1-2)	27
2. Afabet -Nakfa (1-3)	23
3. Afabet- Asmara (1-13)	1
4. Afabet-Barentu (1-20)	0
5. Others	49
Total	100

Road and Cost Benefit Analysis

10. Why do you travel on this road?

1. Sell agricultural produce	13
2. Sell livestock	6
3. Sell firewood	2
4. Buy consumer items	37
5. Visit relatives	34
6. Others	6
7. I do not travel	2
Total	100

11. What transport means were you using before the road started to be rehabilitated in 1997?

1. Bus	39
2. Truck	39
3. Hilux	2
4. Pack Animal	17
5. I have not used any	3
Total	100

12. How much was the average cost of f traveling to the destination before 1997?

- Average of ERN 21.60 per trip.

13. How often have you traveled to the destination using the road in this year?

- Average of 1.60 per month or about 19 times per year. (See Data Sheet for breakdown)

14. How much was your average transportation cost of traveling on this road this yr?

- ERN 25.79 per trip

15. What type of roof does your own house (shelter) have?

1. Thatch	48
2. Agnet	21
3. Tin (corrugated Sheet)	19
4. Other	8
5. I do not own	4
Total	100

16. What the major advantages do you get by traveling on this road?

1. Efficient transport	48
2. Cheaper costs	10
3. Access to markets	23
4. Access to health services	12
5. I have no advantage	7
Total	100

17. Which season do you often travel on this road?

1. January-June	33
2. July-September	7
3. October–December	11
4. All year round?	49
Total	100

APPENDIX G. ENTERPRISE SURVEY AT AFABET

People Interviewed

Code	Enterprise ID		Date Established		Registered Capital in 000' ERN	No. Empl.	Sex	House hold size
	No. Name	Location	Month	Year				
001	Mohammed Ibrahim	Afabet	3	93	2,000.00	1	M	19
002	Fatuma Mohammed	Afabet	-	97	-	1	F	2
003	Kelifa Wehabrebi	Afabet	11	01	2,000.00	1	M	6
004	Mohammed Idris	Afabet	11	98	2,000.00	1	M	10
005	Hamid Mohammed	Afabet	2	98	10,000.00	1	M	9
006	Netsanet Pharmacy	Afabet	3	93	5,000.00	1	M	8
007	Mohammed Omer Mahmud	Afabet	11	00	-	1	M	6
008	Ibrahim Mohammed Ibrahim	Afabet	3	95	1,000.00	1	M	8
009	Hassen Mohammed Ali	Afabet	2	99	-	3	M	7
010	Faid Ali Mahmud	Afabet	2	93	3,000.00	2	M	3
011	Abdat Gheber Edris	Afabet	8	92	6,000.00	1	M	17
012	Idris Omer Mohammed	Afabet	8	92	3,000.00	2	M	8
013	Ibrahim Said Ibrahim	Afabet	4	01	2,000.00	1	M	6
014	Mohammed Nur Idris	Afabet	3	01	1,500.00	1	M	1
015	Ali Mahmud Mohammed	Afabet	4	92	2,000.00	1	M	9
016	Musa Idris Musa	Afabet	3	93	10,000.00	2	M	15
017	Idris Omer Mohammed	Afabet	3	93	3,000.00	1	M	18
018	Idris Mohammed Sheker	Afabet	3	93	2,000.00	1	M	5
019	Haji Mohammed Ali	Afabet	8	92	-	2	M	10
020	Mohammed Idris Ali Said	Kismet	-	99	4,000.00	1	M	6
021	Mohammed Ali Hassen Abdel	Afabet	-	01	8,000.00	1	M	9
022	Brikty Ijel Hamedali	Afabet	-	01	3,000.00	1	F	7
023	Mohammed Said Mohammed	Afabet	-	00	8,000.00	1	M	8
024	Idris Mohammed Said Hamid	Afabet	-	93	10,000.00	1	M	8
025	Salih Mohammed Hamid	Afabet	-	00	4,000.00	1	M	6
026	HamedNur Haji ali Omer	Afabet	-	99	5,000.00	1	M	5
027	Ibrahim Mahmud Ibrahim	Afabet	-	91	2,000.00	1	M	6
028	Omer Abdelkadir Dirar	Afabet	-	91	10,000.00	1	M	8
029	SalihMohammed Abdulkadir	Afabet	-	93	10,000.00	1	M	5
030	Mahmud Idris Ibrahim	Afabet	-	97	5,000.00	1	M	12
031	Jemil Ali Jemil	Afabet	-	91	7,000.00	1	M	4
032	Mohammed Nur Mahmud	Afabet	-	00	5,000.00	1	M	2
033	Alem Awalom Ghebre	Afabet	-	00	1,000.00	1	F	5
034	Salih Osman Mohammed	Afabet	-	91	15,000.00	1	M	6
035	Haji Ali Omer Ali	Afabet	-	91	8,000.00	1	M	9
036	Said Hamid Mohammed	Afabet	-	91	10,000.00	1	M	5
037	Mohammed Nur Osman Salih	Afabet	-	93	6,000.00	1	M	4
038	Kesete Debessai Ghebere	Afabet	-	00	6,000.00	1	M	4
039	Ibrahim Abe Ali	Afabet	-	01	3,000.00	1	M	6
040	Ibrahim Hamid Mahmud	Afabet	-	91	4,000.00	1	M	9
041	Shewit Restaurant	Afabet	8	95	1,000.00	2	F	2
042	Harena Restaurant	Afabet	1	97	500.00	1	F	2
043	Diana Restaurant	Afabet	7	96	16,000.00	1	F	1
044	Mill	Afabet	7	01	25,000.00	2	M	6
045	Wood W/Shop	Afabet	10	00	4,000.00	1	M	11
046	Teberh Restaurant	Afabet	3	01	1,000.00	1	F	1

Code	Enterprise ID		Date Established		Registered Capital in 000' ERN	No. Empl.	Sex	House hold size
	No. Name	Location	Month	Year				
047	Mill	Afabet	10	98	20,000.00	4	M	6
048	Gheled Restaurant	Afabet	6	99	49,478.00	7	M	15
049	Luna Restaurant	Afabet	11	94	2,000.00	1	F	3
050	Eritrea Restaurant	Afabet	2	99	15,000.00	2	F	2
051	Bar Dubaruwa	Afabet	8	98	2,000.00	1	F	2
052	Bar Kokeb	Afabet	1	01	1,000.00	2	F	2
053	Bar Fireselam	Afabet	6	93	2,000.00	2	F	2
054	Butcher Shop	Afabet	8	00	1,000.00	1	M	9
055	Butcher Shop	Afabet	4	95	1,000.00	1	M	4
056	Butcher Shop	Afabet	2	96	180.000	1	M	8
057	Mill	Afabet	2	99	48,000.00	1	M	9
058	Jerit Mill	Afabet	4	98	30,000.00	15	M	8
059	Afabet Wood W/Shop	Afabet	5	95	2,000.00	7	M	7
060	Aflibie Mill	Afabet	10	95	50,000.00	9	M	4
061	Idris Shop	Afabet	10	00	3,000.00	1	M	11
062	Idris Salih Shop	Afabet	10	00	2,000.00	1	M	7
063	Shabir Grain Shop	Afabet	8	94	3,500.00	1	M	8
064	Grain Shop	Afabet	6	92	2,500.00	1	M	7
065	No. 065	Afabet	7	87	3,000.00	2	M	10
066	No. 066	Afabet	-	86	2,300.00	1	M	6
067	Ali Utensils Shop	Afabet	3	95	4,000.00	1	M	5
068	Idris Utensils Shop	Afabet	10	00	3,000.00	1	M	8
069	Gheled Whole Seller	Afabet	9	98	40,000.00	20	M	15
070	Ahmed yasin Grain shop	Afabet	3	96	4,500.00	1	M	6
071	Sulieman Ahmed Grain Shop	Afabet	7	97	5,000.00	1	M	9
072	Maemide	Afabet	10	95	10,000.00	1	M	3
073	Red Sea	Afabet	6	01	8,000.00	3	M	9
074	Saadia Fekak	Afabet	6	00	2,000.00	1	F	2
075	Mahmud Yassin	Afabet	4	99	35,000.00	1	M	5
076	Yassin Monsur	Afabet	6	00	4,000.00	1	M	7
077	Hassebela Ahmed	Afabet	9	92	4,000.00	2	M	5
078	Skin Sales Shop	Afabet	-	93	2,000.00	1	M	15
079	Agri. & Skin Sales Shop	Afabet	-	91	2,000.00	2	M	7
080	Agri. Irrigation	Hudet	-	93	5,000.00	1	M	13
081	Agri Irrigation Jabir Said	Kelhamet	-	93	300.00	1	M	8
082	Selam Hotel	Afabet	-	94	50,000.00	1	M	10
083	Semhar Hotel	Afabet	-	91	100,000.00	3	M	5
084	Agri. Irrigation	Kelhamet	12	97	2,000.00	1	M	10
085	Eritrea Hotel	Afabet	-	93	5,500.00	3	M	8
086	Mohammed Tea Shop	Afabet	11	01	200.00	1	F	1
087	Fatuma Osman Tea Shop	Afabet	11	01	300.00	1	F	1
088	Wedi Amaro Tea Shop	Afabet	10	01	500.00	1	F	4
089	Sawa Tea Shop	Afabet	11	00	300.00	1	F	3
090	Selam Club	Afabet	4	01	200.00	1	F	3
091	Teachers' Club	Afabet	-	91	500.00	1	M	4
092	Hospital Club	Afabet	-	95	20,000.00	1	F	5
093	Karo Mohammed Mahmud	Afabet	10	01	3,000.00	1	M	5
094	Awet Bakery	Afabet	-	91	10,000.00	2	M	9

Code	Enterprise ID		Date Established		Registered Capital in 000' ERN	No. Empl.	Sex	House hold size
	No. Name	Location	Month	Year				
095	Netsanet Bakery	Afabet	-	91	5,000.00	2	M	6
096	Gheled Bakery	Afabet	-	98	50,000.00	7	M	5
097	Red sea Bakery	Afabet	-	91	2,000.00	2	M	7
098	Idris Esmael Humed Bekit Bakery	Afabet	-	74	200.00	2	M	7
099	Osman Jabir Idris Bakery	Afabet	-	85	5,000.00	1	M	8
0100	Idris Humed Bekit Bakery	Afabet	-	86	500.00	2	M	6
	Total				858,958			678

Summary of Results

5. Ownership form of enterprise:

1. Sole Proprietor	89
2. Partnership	8
3. Private Company	-
4. Share Company	3
Total	100

6. Business Purpose:

1.Whale Sale Trade	0
2. Retail Trade	43
3. Service	24
4. Agricultural	5
5. Manufacturing (mill, carpentry, metal works)	14
6. Agricultural	-
7. Informal and Petty trade	14
Total	100

7. Employment of other household members:

1. Husband	3
2. Wife	1
3. Son	8
4. Daughter	2
5. Other (specify)	1
Total	14

8. Type of Employment of other household members: _____

1. Civil Servant	6
2. Trader	3
3. Daily laborer	2
4. Farmer	2
5. Other specify	13

9. What is the source of income of the household?

1. Net Income from enterprise	98
2. Support/Remittance from relatives	1
3. Support from neighbors	-
4. Food aid	11
5. Salary of family members	4
6. Others specify - Agriculture	12
- Support from War Disabled Fighters Association	1
- House rent	1
Total	128

10. What is the average Sales (Revenue) of your Enterprise per day?

Interval	Average	Frequency	Sum
ERN 10 or less	5	15	75
ERN 11-50	30	56	1680
ERN 51-100	75	7	525
ERN 101-200	150	11	1650
ERN 201-300	250	4	1000
ERN 301-400	350	0	0
ERN 401-500	450	2	900
ERN 501-600	550	1	550
ERN 601-750	675	0	0
Nkafa 751-1000	8750	1	875
ERN 1001 and over	-	0	0
Total		97	7255
Average			**75**

11. What is the Average monthly Expenses of Enterprise?

Interval	Average	Frequency	Sum
1 ERN 50 or less	25	4	100
2 ERN 51-100	75	11	825
3 ERN 101 - 200	150	18	2700
4 ERN 201 - 300	250	5	1250
5 ERN 301 - 400	350	3	1050
6 ERN 401 - 500	450	9	4050
7 ERN 501 - 600	550	4	2200
8 ERN 601 - 750	675	7	4725
9 ERN 751 - 1000	875	17	14875
10 ERN 1200	1200	3	3600
11 ERN 1500	1500	8	12000
12 ERN 1600	1600	2	3200
13 ERN 1700	1700	1	1700
14 ERN 3000	3000	2	6000
15 ERN 6500	6500	1	6500
16 ERN 7000	7000	1	7000
Total		96	71775
Average			**748**

12. What was the average Enterprise transportation cost of Goods prior to 1997 per trip?

Interval	Average	Frequency	Sum
17 Less than ERN 100	50	26	1300
18 ERN 100 - 200	150	22	3300
19 ERN 201 - 300	250	8	2000
20 ERN 301 - 400	350	2	700
21 ERN 401 - 500	450	2	900
22 ERN 501 - 600	550	2	1100
23 ERN 601 - 750	675	3	2025
24 ERN 751 - 1000	875	5	4375
Total		70	15700
Average			**224**

2. What was the number of trips for transporting merchandise in this year (2001)?

Frequency	Per week	Per month	Per year	Per five years	Total
Once	2	40	6		48
Twice		8	7	1	16
3 times		4	2		6
4 Times			2		2
5 times			3		3
8 times			1		1
Total	2	52	21	1	76
Equivalent in Year	52	12	1	0.20	
Total in year	104	624	21	0.20	949
Av. trip/ person/year					9.857

14. What was the average purchase Cost of goods (merchandise) per trip in this year?

Average cost of Goods purchased /year/trip	Average	Frequency	Sum
1. ERN < 500	250	30	7500
2. " 501-1000	750	13	9750
3. " 1001-3000	2000	7	14000
4. " 3001-5000	4000	8	32000
5. " 5001-10000	7500	8	60000
6. " Over 10,000 specify > 25,000	25000	1	25000
> 40,000	40000	1	40000
Total		68	188250
Average			**2768**

15. What was the average cost of transporting merchandise per one trip in this year (2001)?

Average cost of Goods purchased /year/trip	Average	Frequency	Sum
1. ERN < 100	50	33	1650
2. " 101-200	150	23	3450
3. " 201-300	250	7	1750
4. " 301-400	350	2	700
5. " 401-500	450	2	900
6. " 501-600	550	3	1650
7. " 601-750	675	5	3375
8. " 751-1000	875	2	1750
9. " 1001 & over	1000	4	4000
" 2000-3000	2500	1	2500
Total		82	21725
Average			265

16. What is the average number of working hours of the enterprise per day?

Average No. of working hours of enterprise /day	Average	Frequency	Sum
1. About 4 hours or less	2	7	14
2. About 5-8 hours	6.5	25	163
3. About 9-12 hours	10.50	33	346
4. Above 12 hours	15	33	495
Total	10	98	1018

17. What is the current cost of the enterprise Assets?

Assets	1 Owned	2 Rented/ credit	3 1-5000	4 5001-10000	5 10,001 15,000	6 15000-20,000	7 20001 50,000	8 >50000	
Merchandise	71	21	60	11	8	8	7		94
Building	29	43	23	6	7	4	3	5	48
Machinery	7			2	2		3	1	8
Equipment	78	10	67	8			2	1	78
Furniture	47	14	47	5	1			1	54
Vehicle	2						1	1	2
Cart	2		2						2
Total	236	88	199	32	18	12	16	9	286
Avg.Cost			2500	7500	12500	17500	35000	50000	
Total			497500	240000	225000	210000	560000	450000	2182500
Average			**2500**	**7500**	**12500**	**17500**	**35000**	**50000**	**7631**

18. What type of transportation services do you most often use for your merchandise?

1. Bus	51
2. Truck (Lorry)	37
3. Pick up	1
4. Other - Any vehivle	2
Total	91

19. How many years have you traveled along this road on business?

1. More than 5 years	66
2. 4-5 years	7
3. 2-3 years	15
4. 1 year and less	4
Total	92

20. Which towns/city is your frequent business related departures and destinations along this road?

1. Afabet-Keren	57
2. Afabet- Nakfa	-
3. Afabet-Asmara	24
4. Afabet- Barentu	-
5. Others(Specify) Within Afabet	1
Kelhamet-Keren	3
Afabet-Dubarwa	1
Afabet-Dekemhare	7
Total	93

21. Why do you travel on this road?

1. Buy merchandises	61
2. Buy consumer items for household consumption	36
3. Sell agricultural produce	4
4. Sell livestock	
5. Other specify - For medication	5
- Visiting relatives	8
Total	115

22. What transport means were you using before the road started to be rehabilitated in 1997?

1. Bus	40
2. Truck	41
3. Pick up	-
4. Pack animals	1
5. Others specify	-
Total	82

23. What advantages does your enterprise have using this road now compared to years before 1997?

1. Access to market for selling goods	40
2. Access to market for buying goods	46
3. Immediate replenishment of merchandise	47
4. High sales turn over	0
5. Others specify	2
Total	135

24. Which season do you often travel on this road on business related to your enterprise?

1. January - March	11
2. April - June	1
3. July September	14
4. October - December	5
5. All year round	61
Total	92

25. What are the three major constraint constraints related to the road?

	Frequency
1. Dusty road	1
2.Need of asphalt	50
3. Inadequate transport service	26
4. Summer rain deter moved (flood)	15
5. Utilities (telephone, water, electric) need	4
6. Need of additional school, hospital, factories	1
7. Rough road not suitable for goods	7
8. Lack of mechanic and garage	1
9. Cost of transport is expensive	2
10. No problem	----
Total	**107**

APPENDIX H. LOCAL ADMINISTRATIVE AND COMMUNITY LEADERS

Questionnaire for key Informants (Administrative + Representatives)

1. Was the construction of the Keren - Afabet Road a useful investment? Discuss.
2. How many villages (people) make use of this road per day?
3. Type and number of major enterprises established since 1997.
4. What are the major changes brought by this road?
5. How many vehicles travel along this road per day?
6. What is the estimated number of people traveled?
7. What is the estimated number of goods volume transported?
8. What are the major services of the vehicles in this road?
9. Has the construction of the road reduced transportation cost? Why?
10. What is the economic impact the road to enterprises and communities?

List of Administrative and Community Representatives Interviewed in Afabet.

Ser. No.	Full Name	ID. No.	Administration Area	Sub-zone
1	Oman Keras		Administrator	Afabet
2	Mohammed Nor Hamid		Water Dept	Afabet
3	Mahmud Omer Abdulkadir	06347257	Gulbub	Afabet
4	Mohammed Nur Mohammed	0364643	"	"
5	Mahmud Idris faid	1179397	"	"
6.	Salih Osman Idrisay	0363419	Naro Ans	
7.	Osman Mohammed Hamid	0363352	Naro Ans	
8.	Omer Idris Nur	0363525	Naro Ans	
9.	Mohammed Ali Abdu	0364266	Naro Ans	
10.	Mohammed Ali Mahmud	1190163	Naro Ans	
11.	Abdu Mohammed Adem	0926496	G/Halib	
12.	Hassen Mahmud Ali Idris	1185617	G/Halib	
13.	Mahmud salih Mahmud	0347230	G/Halib	
14.	Jamie Mahmud Hamid	0355690	G/Halib	
15.	Hassen Idris Ali	0357514	G/Halib	
16.	Ismael Idris Ali	0346981	G/Halib	
17.	Idris Osman Hamid	0352471	Mihdaf	
18.	Hamid Mahmud Faid	0352472	Mihdaf	
19.	Mahmud Idris Ali	0357760	Mihdaf	
20.	Idris Mohammed Ahmed	1182811	Gulbub	
21.	Mohammed Ali Mohammed	0354675	Kebkeb	
22.	Mahmud Said Mohammed	0354770	Kebkeb	
23.	Abdela Mahmud Cheway	0348834	Kebkeb	
24.	Ibrahim Mohammed Ali	0357652	Kebkeb	
25.	Mohammed Ali Zaid	0353005	Kelhamet	
26.	Mohammed Mahmud Omer	0356886	Kelhamet	
27.	Mohammed Ali Abdela	0358671	Kelhamet	
28.	Ahmed Salih	---	Kelhamet	
29.	Mahmud Mohammed Ali		Felket	
30.	Mohammed Nur Osman	0356717	Felket	
31.	Mohammed Ali Mohammed	0359784	Felket	
32.	Mohammed Ali Mahmud	0361620	Felket	

Ser. No.	Full Name	ID. No.	Administration Area	Sub-zone
33.	Adem Idris Ali	0360860	Ayethal	
34.	Idris Mohammed Omer	0352815	Ayethal	
35.	Osman Adam Ali	0443519	Ayethal	
36.	Mohammed Faid Ali	0351455	Shabait	
37.	Mohammed Ali Hamid	0351735	Shabait	
38.	Omer Mohammed Osman	0353334	Shabait	
39.	Mohammed Ali M/Said	0351525	Shabait	
40.	Hamid Osman Mohammed Hamid	0362046	Kebkeb	
41.	Osman Omer Mahmud	0362188	Kebkeb	
42.	Mahmud Said Dirar	0350621	Kebkeb	
43.	Mohammed Nur Mahmud	0347150	Mibrak	
44.	Mahmud Hamid Mahmud	0897094	Mibrak	
45.	Biemnet Kentiba Ali Nur	0347482	Mibrak	
46.	Gheris Hamid Mahmud	0347483	Mibrak	
47.	Mahmud Salih Mahmud	0349405	MIrab	
48.	Ali Abdela Sheif	---	MIrab	
49.	Hamid Idris Drar	1180684	MIrab	
50.	Mohammed Nur Ali Mahmud	0347918	MIrab	
51.	Idris Omer Bahrai	0366021	Aget	
52.	Hussen Mantai Adem	----	G/Halib	
53.	Mohammed Shifa Idris Drar	---	G/Halib	
54.	Ali Biemnet Mahmud	1592250	G/Halib	
55.	Mohammed Nur Abdela Idris	0365155	Noro Tibat	
56.	Adem Mohammed Ali Mohammed	0365172	Noro Tibat	
57.	Idris Mohammed Ali Mohammed Omer	1171209	Noro Tibat	
58.	Mohammed Ali Said Hamdi	---	Noro Tibat	
59.	Mohammed Ali Nur Ashake	---	G/Halib	

APPENDIX I. ENUMERATORS

These Enumerators assisted in the nine days of survey work. All are from the Keren-Afabet area and are fluent in the local languages and are familiar with the local customs.

Tsighereda Adhana Arbed
Selamawit Melake W-Gabriel
Asmerom Tikue Gebretensae
Nurayni Abdlerezak Beyan
Yohannes Solomon Kahsai
Belai Tesfamikael
Eden Ghebrekirstos Habtu
Mekonen Woldeyesus Awalom
Berhan Abraha Kiflai
Mehari Zemicael Aray