

Kenya
615-0168
Rural Roads
Report
FY 81

Return to Christina Schoux
APP/DE/FAP
Rm 2450 NS

REPUBLIC OF KENYA

MINISTRY OF TRANSPORT AND COMMUNICATIONS
ROADS AND AERODROMES DEPARTMENT

THE IMPACT OF RURAL ACCESS ROADS IN KENYA:
BASELINE SOCIO-ECONOMIC FINDINGS
AND PRELIMINARY CHANGES FROM BASELINE

October 1980

Chief Engineer (Roads & Aerodromes)
Ministry of Transport
and Communications
P. O. Box 52692
Nairobi

Permanent Secretary
Ministry of Transport
and Communications
P. O. Box 52692
Nairobi

WEIGHTS AND MEASURES, EXCHANGE RATE AND ABBREVIATIONS

WEIGHTS AND MEASURES

1 kilogram (kg.)	=	2.204 pounds
1 metric ton	=	1,000 kg.
	=	2,204 pounds
	=	0.948 long ton
	=	1.102 short ton
1 kilometer (km.)	=	0.621 miles
1 square kilometer (km. ²)	=	1,000,000 square meters (m ²)
1 hectare (ha.)	=	10,000 m ²

EXCHANGE RATE

Kenya shillings (Ksh.) 7.02 = U.S. \$1.00

ABBREVIATIONS

CBS	=	Central Bureau of Statistics
DAO	=	District Agriculture Officer
GOK	=	Government of Kenya
MOTC	=	Ministry of Transport and Communications
RARP	=	Rural Access Roads Programme
USAID	=	United States Agency for International Development

TABLE OF CONTENTS

	<u>Page</u>
WEIGHTS, MEASURES, EXCHANGE RATES AND ABBREVIATIONS	1
TABLE OF CONTENTS	11
LIST OF MAPS	vi
LIST OF TABLES	vii
SUMMARY AND CONCLUSIONS	x
I. INTRODUCTION	1
A. Purpose	1
B. Socio-economic Effects of Rural Road Construction: A Survey of the Literature	2
1. Economic impacts	4
2. Socio-cultural impacts	12
3. Distribution of economic and social effects of road construction	17
4. Conclusion	21
II. KENYA RURAL ACCESS ROADS PROGRAMME	23
A. The Road Project	23
B. The Rural Road Impact Study	23
C. Rural Road Impact Study: Area Descriptions	26
1. Busia	30
2. Bungoma	38
3. Kakamega	40
4. Siaya	45
5. South Nyanza	49
6. Kisii	52
7. Kisumu	56
III. DATA BASE AND COLLECTION PROCEDURES	63
A. CBS Farm Surveys	63
B. MOTC Traffic and Community Inventory Surveys	67

	<u>Page</u>
IV. BASELINE DATA	69
A. By Impact Area	70
1. Household information	70
2. Livestock	75
3. Structures and assets	78
4. Tenure	80
5. Farm input and output	89
6. Crops harvested and marketed (value sold)	92
7. Non-farm occupations and income	96
8. Household expenditures	102
9. Capital transactions	104
10. Road use	106
B. By Male- and Female-headed Households	111
1. Household demography	112
2. Land tenure	117
3. Ownership of equipment and structures	119
4. Livestock holdings	122
5. Household amenities	124
6. Health care measures	128
7. Farm inputs and outputs	129
8. Non-farm economic activity	134
9. Household expenditures	136
10. Capital transactions	139
11. Conclusion	141
C. By Distance of Household from Road	142
D. By Self-employed and Non-self-employed Farmers	145

	<u>Page</u>
V. EXPECTED CHANGES FROM BASELINE AND OBSERVATIONS TO DATE.....	153
A. Introduction	153
B. Road Impact Areas--Socio-economic Factors	154
1. Expected changes from baseline	154
2. Observations to date	155
C. Road Impact Areas--Road Use	163
1. Expected changes from baseline	163
2. Observations to date	163
D. Male- and Female-headed Households	178
1. Expected changes from baseline	178
2. Observations to date	179
E. Distance of Households from Road	183
1. Expected changes from baseline	183
2. Observations to date	184
F. Tenure	189
1. Expected changes from baseline	189
2. Observations to date	189
G. Self-employed and Non-self-employed Farmers	190
1. Expected changes from baseline	190
2. Observations to date	190
VI. RELATIONSHIP OF BASELINE FINDINGS AND ROAD SELECTION PROCEDURES	194
A. Introduction	194
1. Developing appropriate road selection procedures	194
2. Desired results for selected roads	195

	<u>Page</u>
B. Findings Related to Road Selection Procedures and Criteria	197
1. Economic criterion	197
2. Other socio-economic criteria	198
C. Future Road Selection Considerations	199
1. Methods	199
2. Variables	201
3. Roads	202
4. Data	203
D. Summary	203
 ANNEX 1: Footnotes	 205
ANNEX 2: Survey Questionnaires	211

LIST OF MAPS

<u>No.</u>		<u>Page</u>
1	Western and Nyanza Provinces, Kenya.....	27
2	Busia District Rural Access Road No. 4 impact study area	31
3	Tangakona market, Busia Road No. 4	37
4	Bungoma District Rural Access Road No. 13 impact study area ...	39
5	Kakamega District Rural Access Road No. 6 impact study area ...	42
6	Siaya District Rural Access Road No. 1 impact study area	46
7	South Nyanza District Rural Access Road No. 7 impact study area	50
8	Kisii District Rural Access Road No. 9 impact study area	53
9	Kisumu District Rural Access Road No. 8	57
10	Kambare market, Kisumu Road No. 8	60
11	Riat market, Kisumu Road No. 8	61

LIST OF TABLES

<u>No.</u>		<u>Page</u>
1	Basic data on roads and road impact areas.....	28
2	Size, population and population density of road impact areas ..	29
3	Summary of market data on selected markets in Busia, South Nyanza and Kisumu districts	32
4	Sample population and sample size by road, number of households and distance to road	65
4a	Average size and composition of household	71
5	Sex and age of head of household	72
6	Population distribution by educational attainment	74
7	Distribution of population currently living within impact area by place of birth	76
8	Improved livestock by road impact area	77
9	Inventory of structures classified by type and impact area	79
10	Ownership of implements and equipment	81
11	Percentage of households owning given sizes of landholdings ...	82
12	Average size of households cropping area	83
13	The structure of tenure system of cropping area	85
14	Plots of cropping area distributed by size of plot holding and tenure system	86
15	Top ten crops by cultivated area	88
16	Top ten crops with greatest number of plots	90
17	Farm input, output and sales by road (9 mos.)	91
18	Top ten crops harvested by road area (9 mos.)	93
19	Value of top ten crops sold (9 mos.)	95
20	Baseline: Main non-farm activities	97
20a	Income earned in top 15 non-farm occupations (9 mos.)	101
21	Top 15 sources of monthly expenditures (9 mos.)	103

<u>No.</u>		<u>Page</u>
22	Capital transactions by road (9 mos.)	105
23	Average 12-hour traffic volume	108
24	Average 12-hour volume of bicycles, animal drawn carts, animals and pedestrians prior to road construction	109
25	Distance and travel time to schools, health clinics, shops, etc. from the road	110
26	Household demographic structure	113
27	Place of birth of household members by type of household head (M or F)	114
28	Level of education by household head (M or F) and by impact area	116
29	Landholding and cropping area by household type (M or F)	118
30	Ownership of equipment and implements by sex of head of house- hold (M or F)	120
31	Number of structures by sex of head of household	121
32	Livestock ownership by sex of household head (M or F)	123
33	Sewage disposal facilities for households with small children (6-60 mos.) by type (M or F)	125
34	Radio listening habits of households by type of household head (M or F)	126
35	Health care measures taken by households with small children (6-60 mos.) by type (M or F)	127
36	Agricultural and livestock inputs per sex of household head (6 mos.)	130
37	Agricultural output per sex of household head (6 mos.)	132
38	Principal non-farm income activity by sex of household head (6 mos.)	135
39	Household expenditures by sex of household head (14 days)	137
40	Major capital transactions by sex of household head (6 mos.) ...	140
41	Average value of selected variable by distance of household from road	144

<u>No.</u>	<u>Page</u>
42	Data for self-employed and non-self-employed farmer groups ... 146
43	Roads by tenure category 150
44	Roads by dry season water source 151
45	Roads by type of sewage disposal 152
46	Change in number of livestock from baseline 157
47	Changes in livestock production from baseline for all impact areas 158
48	Changes in household food consumption from baseline for all impact areas 159
49	Change from baseline holding area, proportion of land not cultivated and cropping area 161
50	Changes from baseline for household and per capita income and household expenditures by impact area 162
51	Use of roads in impact study areas by vehicles, November 1979 164
52	Use of roads by bicycles, motorcycles and pedestrians, November 1979 165
53	Road use by vehicles, bicycles and motorcycles, and pedes- trians, November 1979, August 1980 167
54	Use of road by animals, November 1979, August 1980 168
55	Total trips by transport mode--first quarter 170
56	Average time taken by transport mode--first quarter 171
57	Road use by pedestrians, Kakamega, August 1980 (market days) 173
58	Number of trips by trip purpose 176
59	Trip purpose by road impact area--first quarter 177
60	Utilization of modes of transport by female head of household 185
61	Utilization of modes of transport by male head of household 186
62	Composition of trips made by female head of household 187
63	Composition of trips undertaken by male head of household 188
64	Comparison of baseline and latest observations of selected variables for non-self-employed and self-employed farmers .. 192

SUMMARY AND CONCLUSIONS

A. Purpose

This report presents the results of the Rural Roads Impact Study being carried out by the Ministry of Transport and Communications (MOTC). To date, the results include the baseline data for the road impact areas being monitored and changes from this baseline during the first year of the study.

B. Project Description

The Kenya Rural Access Roads Programme (RARP) began in 1974 with the purpose of building low-cost rural roads to improve the income and quality of life of the residents in the road impact areas. The labour-intensive RARP aims at providing roads in 26 districts in Kenya and has undertaken construction activity in 23 to date.

The purpose of the Rural Roads Impact Study is to help monitor and evaluate the RARP, specifically by determining the impact of the roads being monitored upon the income and quality of life of the low-income rural people affected by them. The seven road impact areas included in the baseline in this report are described in detail in Chapter II. In the process of assessing the impacts of these rural roads, it is anticipated that criteria for the selection of new rural roads can be identified and developed.

C. Methods

The procedures used in developing the data base for this study are presented in Chapter III. Basically, a farm survey and a traffic and community inventory survey were used to collect the needed data.

The farm surveys collect information on household size, composition and structure, size of land and livestock holdings, other assets, cropping, marketing and numerous other variables. The traffic and community inventory surveys develop information about the volume of vehicular and pedestrian traffic before and after the roads are built; they also indicate the social services available to residents of the impact area and changes in access to local infrastructure.

In addition to these survey results, several topical studies are being carried out. They include efforts in such areas as women and the family, marketing, labour and labour productivity, social and economic integration, etc. The results of these studies will be used to expand and support the survey results.

Problems have arisen in collecting and analyzing some of the data. These include inconsistencies in data collected in monthly and quarterly cycles and lengthy periods of data verification, often through use of additional fieldwork. Both problems were especially apparent in the second year data collected to show changes from the baseline. As a result, field verification of several critical aspects of the second year data is currently underway, and changes from the baseline cannot be dealt with comprehensively. MOTC will be developing procedures to simplify and focus the data collection efforts that will help eliminate these data problems.

D. Findings

1. Baseline

a. Road impact areas

(1) Household and population characteristics

The different impact areas are described in detail in Chapter II. The seven impact areas contain 1,795 households and

10,931 people. The population is young, and more than half the people in each household are, on average, less than 15 years old. Nearly one-quarter of the households in the impact areas are headed by females. Roughly one-half the population eligible for education by age has received some formal education.

(2) Mobility

Most of the persons in the road impact areas (76 percent) were born there, and over 90 percent were born in the same district where the road was built. Given that most of the roads border a second district, this high percentage of locally born residents show that the population in the impact areas is not very mobile.

(3) Livestock

Livestock is important in the impact areas, especially Bungoma, Busia, and South Nyanza. There are 0.67 cows per person and 1.5 chickens per person in all impact areas.

(4) Structures and equipment

Nearly all structures in the impact areas are traditional (90 percent). Only two percent of the residential structures are "permanent." On average, there are nearly three persons per residential structure in all impact areas. The implements and equipment possessed by the households are relatively scarce, ranging from one lamp per 1.46 households to one bicycle per 4.37 households.

(5) Land

Landholdings in the impact areas are mostly small, although there are large tracts in Kakamega, Busia and Bungoma. Less

than two hectares are owned by 58 percent of the households, while eight percent of the households own over five hectares. There is substantial fragmentation of nearly all holdings; Very little land is rented in most impact areas.

(6) Crops

Hybrid maize, beans and local maize account for 75 percent of the land area cropped; the top ten crops account for over 98 percent of all cropped land. Grain crops account for 58 percent of the total cropped area, food crops (including grain) for 92 percent and cash crops for eight percent. Busia has 27 percent of cropped area in cash crops, while Bungoma and Kisumu report no land in cash crops. Sugarcane, coffee and cotton are especially important as cash crops, particularly in Kakamega, Kisi and Busia, respectively.

Local maize is the most important crop by far in terms of quantity harvested and marketed. The total value of local maize sold is nearly twice the value of coffee sold, six times that for sugarcane and nine times the value of cotton marketed. The sales of the top ten crops marketed account for over 90 percent of the total value of crops sold in each impact area.

(7) Non-farm occupations

Non-farm occupations are important in all impact areas as a source of income. The most important occupations are teacher, salesman, clerk, food-tobacco-beverage vendor, and general labourer. Protection/security, nursing and construction are also significant sources of off-farm income. It appears that women are involved mainly in the vending activities, and not in many other off-farm employment activities.

(8) Household expenditures

The most important household expenditures are at the duka (local store) and for clothing and footwear. School fees are also an important expenditure item.

There is substantial variation in overall expenditure levels between different impact areas. To assess the impact of the roads on consumption patterns, this variability will have to be understood in even more detail than at present.

(9) Capital transactions

The households in the impact area receive large inflows of cash from outside sources. On the average, remittances received account for 79 percent of all cash inflows from outside sources to the households, and thus create a permanent increase in their assets. Moreover, remittances received are five times larger than remittances sent.

There is a substantial variability between impact areas, however, with some receiving much more than they give or lend, whereas others give or lend much more than they receive. Such differences necessitate further attention and analysis at the field level to be certain the baseline data is well understood.

(10) Road use

Some of the tracks which became all-weather roads as a result of the rural roads project were partly motorable before the roads were constructed. Residents along these tracks were therefore able to use motorized transport from the nearest point available to them for passenger and freight transport. The amount of total

traffic on the tracks prior to their being changed to rural access roads depended substantially upon the trafficability of the track during all kinds of weather. For tracks that were not useable during part of the year, the use of the new all-weather road in terms of agricultural and related marketing activity increased more than for tracks that were formerly useable all year round. More motorized transport was made available to and used by residents along all tracks once they became new rural access roads, but this was especially true for those which became all-weather routes.

b. Male- and female-headed households

Female-headed households represent nearly one quarter of the households in the impact areas, ranging from nine percent in Bungoma to 47 percent in Siaya. Female-headed households are smaller, less educated, possess and crop less land, have less equipment and significantly fewer head of livestock, use fewer crop and livestock inputs, and harvest and sell less crop and livestock outputs than male-headed households. Likewise, fewer female-headed households participate in off-farm economic activities and those that do earn less than male-headed households.

Both regular and major household expenditures are 71 percent higher for male-headed households than for female-headed households. Thus, consumption for female-headed households is substantially lower than for male-headed households. Female-headed households do receive slightly more (five percent) in the way of loans and remittances, however, than male-headed households. This is probably a reflection of financial support for them from males working in the city.

c. Distance of households from road

The baseline developed for three different distance strata from the road (within $\frac{1}{4}$ km. of the road, between $\frac{1}{4}$ and $1\frac{1}{4}$ km. from the road, and more than $1\frac{1}{4}$ km. from the road) show few significant differences between households at the various distances. Thus, as future differences become apparent, they can be more easily linked to the impact of the road and any complementary programmes. The households in the three distance ranges from the roads now exhibit the following differences:

- o those nearest the road travel more than the others;
- o those nearest the road have a higher percentage of their primary school-age children in school;
- o those farthest away have greater non-farm incomes;
- o those farthest away have a greater percentage of their land under cultivation, but rely more heavily upon cultivation of staple crops;
- o those farthest away have more ploughs;
- o those farthest away are likely to own a store (storage building); and
- o those farthest away have larger landholdings.

Just as importantly, the households in the three distance strata do not differ significantly in terms of household income, per capita income, savings, expenditures, loans and remittances, structures, equipment, or cropping area, to mention a few.

d. Self-employed and non-self-employed farmers

Those farmers with substantial off-farm economic activity were broken out from those in the impact areas who depend primarily or exclusively upon farming for their incomes. Several variables show that there are substantial differences between these two groups.

In particular, non-self-employed farmers realize more total non-farm sales, more non-farm and household income, and more savings than self-employed farmers. Per capita income for non-self-employed farmers is 7.6 times as great as that of self-employed farmers. As a result, non-self-employed farmers have more permanent and semi-permanent structures and more regular (but not more total) expenditures. On the other hand, self-employed farmers hold about 50 percent more area than non-self-employed farmers; they have more ploughs, as well, but fewer radios.

Although this cross-sectional comparison is interesting, MOTC does not plan to pursue it in future rounds. First, the sample of non-self-employed farmers is small. Second, whereas MOTC believes the expected increase in the number of non-self-employed farmers as a result of the road is a good indicator of road impact, the cross-sectional analysis adds little that is not already obvious.

2. Expected changes and observations to date

a. Expected changes

The impact study is organized to describe, analyze and measure the socio-economic impacts that occur in the road impact areas being monitored as a result of the new or improved roads. Important changes anticipated as a result of the road have been postulated by drawing upon knowledge of the impact areas in Kenya (Chapter II) and upon data from a wide variety of other rural road impact studies (Chapter I). The key socio-economic changes anticipated from the introduction of a new road into the impact areas are presented in Chapter V. They include the following:

- o increased crop and livestock production and marketing, including more cash cropping
- o increased land area under cultivation
- o greater on-farm consumption
- o higher household income and expenditure levels
- o increased economic and social benefits for households closer to the road
- o increases in transporters' surplus
- o greater economic (and social) benefits for those holding larger amounts of land when the road was constructed
- o decreased costs for transport per trip or unit of freight
- o more trips for productive purposes--freight and passenger--and for non-productive purposes as well
- o Increased off-farm employment
- o greater benefits for male-headed households than for female-headed households in all areas--inputs, outputs, income, expenditures, off-farm productive activity and type of travel

These and other changes are viewed by MOTC as hypotheses to be tested and, if necessary, further refined during the impact study. They are intended to be flexible, although some are intimately related to producer surplus and road user savings analysis and will continue to be tested to determine the economic viability of the road.

b. Observations to date

Verifiable changes from the baseline to date have not been extensive for several reasons. Only one year of data from the baseline has been collected; since many of the changes anticipated require long time periods to show up in a definitive form, this one-year time period is too short to conclusively identify most changes. There were also problems with some of the data collected from baseline that made definitive conclusions difficult to reach. Some observations to date are so variable among impact areas or other

groups that, apart from data or time problems, it will be necessary to explore further to be certain of what conclusions can be reached.

Despite these difficulties, some observations of change from baseline could be verified. They are reported briefly below.

(1) Road impact areas -- socio-economic

Crop area showed almost no change between impact areas, but crop revenues did change, both increasing and decreasing from baseline by large amounts. Crop inputs also changed substantially, but also with high variability between impact areas.

Livestock numbers changed somewhat, with sheep and improved cattle increasing over all impact areas. Livestock production also changed, going up for some commodities (milk), but down for others (poultry). Livestock-related inputs and revenues also showed substantial variability.

Household food consumption generally went up over all impact areas, but it increased most in areas where output fell most. No pattern of change in household or per capita income, expenditures, or cropping is evident from the data collected since the baseline.

(2) Road impact areas -- road use

In November 1979 the roads over all showed greater use after new road construction, but the trend did not continue according to the August 1980 survey results. These results are probably the result of changes in methodology, including taking the traffic count at a different time of year and over a shorter time period. A 1980 repeat of the November 1979 time period will be undertaken to elimi-

nate these non-comparability problems.

A special traffic count was taken in August 1980 in Kakamega to determine the use of the road for marketing purposes. It showed that, at present, the market transaction trips taking place on the road were heavily pedestrian; this may indicate that pedestrian traffic will continue for some time to be the predominant type of road use, as one of the hypotheses (expected changes) in this study suggests. The same survey showed that easier transport of sick and travel to school are also important reasons that people value and use the improved road.

(3) Male- and female-headed households

Several of the differentials between male- and female-headed households did not increase as expected during the nine months, but decreased instead. This is probably the result of discrepancies in the data, but may merely reflect the tentative nature of the longitudinal analysis. Income for male-headed families decreased from 53 to 38 percent of that of female-headed families; likewise, crop harvest of male-headed households decreased from 123 to 55 percent of female-headed family harvests, and crop sales from 143 percent of that of female-headed households to which the latter were 15 percent above the male-headed families. Other baseline differences between male- and female-headed households such as capital transactions, farm inputs and outputs, and major expenditures widened in favor of male-headed households, as expected. All these trends will be monitored over more time by MOTC in order to reach firm conclusions.

As to road use, no definitive trends supportive of the expected changes--more motorized or bicycle usage and fewer marketing trips--were confirmed, although the males may be making fewer marketing trips.

(4) Distance of households from road(s)

Very few changes from the baseline could be noted as yet in households at varying distances from the road(s), probably because the time over which the data was collected is too short to enable road impacts to become apparent in terms of distance strata.

(5) Self-employed and non-self-employed farmers

The comparisons between self-employed and non-self-employed farmers remained essentially the same in all but a few cases. In the cases where significant change did occur, the direction of the change was as anticipated. For example, the non-self-employed/self-employed ratio based on data since the baseline for household income, household income plus remittances, total household expenditures, and regular and major expenditures, all increased over baseline ratios (in favor of the non-self-employed farmers). Despite these favorable results, the data is still considered by MOTC to be inconclusive.

E. Conclusions

1. Baseline

- o In general, the households in the road impact areas are large, poor, and live in traditional residences; they are heavily agricultural, with small landholdings, and few material possessions. Their members are relatively immobile.
- o The households grow more maize than any other crop, and strictly cash crops are not of central importance. Some livestock is raised, mostly cattle and poultry. There is some sale of most crops produced.

- o Off-farm remittances are of major importance to all types of households. Off-farm income is important to some of the households.
- o Use of the tracks (prior to construction of the new roads) was mostly by pedestrians, although motorized use was possible on some tracks, especially during dry parts of the year. The tracks were used primarily for marketing and social purposes and for traveling to school.
- o Female-headed households are important in the impact area(s) and are seriously disadvantaged as compared to male-headed households in terms of wealth, economic activity and consumption levels. They are less productive agriculturally and less involved with higher value and cash crops. The extra labour and management input of a male household head seems to be one of the important missing ingredients in female-headed households.
- o Households at different distances from the road do not show significant differences for most important variables.
- o Self-employed and non-self-employed farmers exhibit important differences in key areas such as income, expenditures, savings, etc., but most of it is attributable to the sizeable off-farm income received by non-self-employed farmers.

2. Change from baseline

- o Changes from baseline by impact area (as well as most other cross-sectional comparisons) are inconclusive for even the most important variables being observed. The variability exhibited by the data to date, whatever the reasons, makes it too difficult to make effective generalizations.
- o Data collection and presentation procedures have presented some major problems, both in constructing the baseline and in determining the change from baseline. Such problem areas need to be eliminated and data collection efforts need to be tightly focused on information essential to the road impact study. If the data being sought is properly collected and presented, NOTC believes the surveys and analytical procedures being used will enable the results desired from the impact study to be obtained.

- o Road use on the seven baseline roads increased from March 1979 to November 1979, but it fell off from November 1979 to August 1980. It is likely the decrease between November and August is due to seasonality and changed enumeration procedures, a thesis that will be tested in November 1980 by an effort to duplicate the November 1979 traffic survey.
- o Changes in the difference between male- and female-headed households are inconclusive, some changes moving in one direction and some in the opposite direction. More time and a better understanding of the processes affecting the variables are necessary to see if such variation continues and, if so, why it is occurring.
- o Differences among households located at different distances from the road show no significant change from baseline values.
- o Self-employed and non-self-employed farmers continue to show the same relationship between groups as the baseline for all key variables. The direction of change between these two groups that does appear to date further favors the non-self-employed farmers.

I. INTRODUCTION

A. Purpose

The purpose of this report is to present the results achieved to date in the Rural Roads Impact Study¹ being carried out by the Ministry of Transport and Communications (MOTC). The findings of the impact study are summarized with respect to the baseline data and changes from the baseline during the first year of the impact study.²

Baseline data for each road impact area has been collected in terms of household information, agricultural information and road use. It considers these same variables in additional cross-sectional baseline analysis for:

- o male- and female-headed households
- o distance from roads
- o tenure³
- o self-employed and non-self-employed farmers

This baseline and subsequent changes from baseline data are designed to obtain information for several different purposes. Priority, however, is given to the following three objectives:

First, the data allow a comparison of the level of pre- and post-project benefits and the distribution of these benefits among different socio-economic groups; it will also enable rate of return estimates for the roads using producer-surplus and road user-savings approaches.

This report is the first effort to organize and consider the baseline and change from baseline data in light of these purposes. The baseline data (Chapter IV) is developed in this report to determine the circumstances and the nature of important relationships between variables and structures that existed in road impact areas prior to new road construction. The report also gives attention to areas where improvements can be made in data collection, analysis and verification procedures.

Anticipated and actual changes from the above baseline are considered in Chapter V of this report. Substantial attention in these chapters continues to be given to hypotheses about changes that will be caused by the roads. How to describe, analyze and measure these changes, and the degree to which they can be attributed to the roads will continue to receive consideration in future analytical work. Such issues continue to be relevant because only nine months of data from the baseline are available now, and few of the changes expected to result from the roads can yet be observed.

B. Socio-economic Effects of Rural Road Construction: A Survey of the Literature

The effects of rural road construction are difficult to assess. It is clear that social and economic variables of various orders are involved and causal relationships are complicated and interwoven.

On a continuous basis, this same data is to be analyzed to determine whether a small cluster of variables can be substituted for a full-fledged internal rate of return analysis in selecting sites for new (or improved) roads. Developing such simple, credible selection criteria is very important to MOTC, not just because it reduces the amount of skilled resources necessary for the road selection process, but also because MOTC believes that new road sites should be selected at the local level without having to use complex economic and financial procedures and criteria. An analysis of the data collected, the variables considered and other factors relevant to the development of simple new road selection procedures are included in Chapter VI of this report.

Second, the data provide information about the impact of the roads on various households, including their standards of living and access to social amenities such as water and sewage disposal, education, etc.

Third, the baseline and change from baseline data identify and track some relationships which are relevant, but only indirectly related, to the impact of the road itself. Thus, several important issues that are affected by roads through a series of linkages, rather than directly, will be treated in this and subsequent reports. (An example is the differential in various types of expenditures by male- and female-headed households.)

While intuitively one may feel that roads bring progress and prosperity to the population concerned, it is another matter to trace the specific effects of new roads through the web of economic and social interaction that constitutes human life.

In order to effectively evaluate the socio-economic impact of rural road construction in Kenya, it is important to have a solid background in the research which has already been done on this subject. The results of such investigations, although far from conclusive, are presented below under two general categories: economic (production, distribution, consumption) effects and socio-cultural ramifications. While the data gathered on the impacts of the Kenya Rural Roads Programme is not presented in this way, it does provide a means for discussing the major findings of prior research, in particular, the distribution of economic and social effects of road construction on various population groups or categories. A discussion of the distribution effects follows the descriptive material on the economic social impacts.

1. Economic impacts

Economic production, in most cases agricultural, tends to increase in rural areas opened up by new roads. Certainly, it is hard to imagine an opposite effect. However, traditional agricultural output may decrease as opportunities for the marketing of cash crops, especially perishable goods, increase.

a. Productivity

(1) Agricultural production

There is much debate on the effects of rural road provision on agricultural productivity. Generally, researchers have found that new roads lead to an expansion of land cultivated and to more intensive use of land already under cultivation. The increased availability of inputs, the accessibility to new areas, and the greater potential for marketing appear to explain these effects.

An example of increased agricultural productivity for East Africa is that given by DeBeer, who reports that rural road construction in Uganda led to a per capita increase in cotton production of 450 percent.⁴ Specifically, an increase of 114 percent in road mileage in one region and a 280 percent increase in another led to increases in cotton production of 400 percent and 700 percent respectively.

In another Ugandan example, Smith states that a doubling of feeder road surface in Madi district and a quadrupling in Jonan during the period 1946-56 contributed strongly to increases in cotton acreage per capita during the same time period of 364 percent and 380 percent, respectively.⁵ The increases led to even greater percentage rises in income (373 percent and 525 percent), although part of this effect is explained by a rise in the price of cotton.

Naturally, distance from a new road will tend to influence the effect observed. The further from the road a farmer resides, the more tenuous the productivity increase can be expected to be. Owen states in a Brookings study that surfaced roads affect surrounding agricultural land to a depth of at least one mile on either side of the route.⁶ A study from India confirms the rapid fall-off of

increase in cultivated area beyond approximately one mile (for example, a 20 percent increase drops to 3 percent).⁷ Interestingly, beyond four miles in this case, the availability of until then little-used land stimulated a 48 percent rise in acreage cultivated.

Heightened agricultural productivity is a function of numerous factors other than improved or increased rural infrastructure. For example, in Shoab's review of road projects in four countries (Ethiopia, Thailand, Honduras, and Yugoslavia), the organization of indigenous production was a major barrier to development.⁸ Thus, with the exception of Ethiopia which achieved some success, new roads had little to do with changing traditional socio-economic patterns or in stimulating the introduction of new crops.

In general, rural road provision tends to result in a shift from subsistence cultivation to cash cropping.⁹ The distance from field to market is important in this respect, as perishability largely conditions this effect.

Areas of road construction where cash crops are already grown, as is the case to some degree in the Kenya Rural Roads Project, will tend to respond economically faster and more effectively than areas with only subsistence crops. The more developed the agricultural system and the more integrated it is in the national economy, the more it will react to the new opportunities provided by the new roads.¹⁰

Another study reports that the area used for cash cropping per mile of road is a function of the quality of the land, the distance of the land from commercial market centers, and the standard of the road used.¹¹ In addition to the obvious transportation benefits of new routes, there are other benefits, as Berger found in Malaysia, Indonesia, and the Philippines, to be derived from increased contact with middlemen, traders, and entrepreneurs that roads provide.

Roads provide a two-way benefit for farmers. First, the use of an enlarged rural transportation network helps to direct crops to market. Second, the use of the same roads facilitates the transport of new or now less expensive agricultural inputs, such as seed (including improved varieties), fertilizer, and agricultural labor, to once remote fields as well as visits by extension agents. These inputs in turn contribute to increasing productivity on existing fields, so that a surplus may be sent to market.¹³ Again, distance from new roads is a crucial factor. A study from Malawi indicates that households within five miles of a rural route spent two-and-one-half times as much for agricultural production as those in a control group located more than five miles away.¹⁴

(2) Non-farm economic activity

Economic activity other than agricultural is also stimulated by the addition of new rural roads. Retailing and wholesaling of new products is linked to consumer access to the outside world. Local entrepreneurship and regional enterprise are activated by new routes. A USAID study from the Philippines found an increase of 78 to 166 commercial enterprises along six new rural routes.¹⁵

Another AID study from Indonesia (Padat Karya Rural Works Project) examined the linkages between increased entrepreneurial activity in the region and the increased flow of cash into the local economy as production along new roads increased.¹⁶ The direct results of this were the reopening of markets, an increase in commercial activity, the opening of small shops along the thoroughfares, and a strong stimulation of local transportation services, such as truck haulage, minibus service, and smaller transport performed by carts, bicycles, and pedicabs.

The construction of new rural access roads not only opens up new areas, but stimulates local consumer demand pattern as wages for local labor on roadbeds swell family revenues. This in turn stimulates local commerce. The preliminary research in Kenya by Brokensha found that increased income from such wages were channelled into the following purchase priorities: clothes, livestock, school fees, household goods (mattresses, ploughs, corrugated iron) and general commercial activities.¹⁷

(3) Employment

The employment benefits of new road construction are both short- and long-term. Most obviously, the labor-intensive, road-building projects such as those now in Kenya, stimulate at least short-term wage earning among the poorer component of the population. In Kenya, for example, in the early stages of road construction 92 percent of the workers were men; 50 percent to 65 percent were under age 30; very few had substantial landholding, and half lived within four kilometers of the road project.¹⁸ In addition to economically

disadvantaged heads of families it is to be expected that large numbers of sub-adult males from a wide range of families will seek to earn cash by working on the roads in order to buy such consumer goods as radios, bicycles and clothing.

In addition to the direct stimulations of the local economy through increased cash earnings and the acquisition of new skills, roads also create opportunities for short-term regional wage labor by expediting the movement of such labor and allowing a combination of work on family farm and in regional commerce. Seasonal wage labor over a wider area than before is also made possible.

The long-term employment effects of road construction lie in the generally increased regional economic activity, both traditional and modern, following the opening up of new areas. The early stimulus of increased wage earning and the heightened consumer demand patterns combine with the easier access to markets, creating new job opportunities over the long term. While some groups may suffer, on the whole progress is to be expected from such infrastructure development.

Research has indicated, however, that the government must take care to complement burgeoning economic activity resulting from road construction with appropriate programs to maintain local developmental momentum. Shoab found in his study of highway projects that unemployment levels resumed their former values soon after the end of construction.¹⁹ If the government can provide continuing rural projects to maintain inward cash flow, the local population will be aided in its attempts to provide a higher standard of living for itself. Naturally, highway and road maintenance will generate some local income.

(4) Land values

The construction of a new road, generally speaking, will cause a rise in the value of the land bordering it. There is a tendency toward more intensive use of such land, both for agricultural and commercial purposes such as stores, houses and stands. The reasons for such increases in value lie in the reduced costs of transporting goods to market, the potential for setting up retail establishments along the roadway, the greater ease of bringing in construction materials, and the improved access to outside social services.²⁰

Examples of this phenomenon of increased land value are fairly common in the literature. In the Philippines, Villanueva found that land values rose between 39 and 77 percent in the year following road construction. The Ramnad-Mandapan road study in India found increases of land values of unirrigated land ranging up to 100 percent, the majority of cases lying between 25 and 75 percent.²¹ In the Padat Karya project in Indonesia, land value increased at least 50 percent for plots immediately next to the new road.²²

A phenomenon associated with rural road construction noted for Kenya is the creation of a "roadside elite", a group of wealthy entrepreneurs and farmers who are buying up the economically more useful land along the roadsides.²³ The former occupants of the land in such situations are displaced with little long-term gain to show; especially unfortunate are cases concerning tenant farmers and farmers with uncertain title to their land. They may sometimes simply be evicted by powerful men having recourse to local authorities.

b. Marketing (distribution)

The marketing of agricultural and livestock goods is greatly facilitated new roads construction. Not only are transportation costs reduced, but, as goods reach more markets, consumer demand is stimulated through price reduction due to competition. Thus the rural areas are more firmly incorporated into national economic life, as first local, then regional, markets begin to increase their volume of trade.

With the expansion of road networks, farmers are encouraged to produce a surplus because of increasing rates of return on their investments. Inputs are cheaper as transportation costs drop; outputs are shipped to markets at lower costs. Profits are higher for farmers in general, but increased competition tends to hold down the going price to consumers. The transport savings are thus passed through to consumers in some measure. Shoaib's regional study found that, in most cases he examined, savings in transport costs had reached consumers.²⁴ Regional price differentials and disparities in opportunity for effective marketing of produce are also clearly reduced by new roads.

c. Consumption

Researchers have found concrete evidence in nearly all cases of increased consumer consumption in areas of new road construction. In Thailand it was found that households surveyed had 51 percent more consumer goods (metal, roofs, bicycles, motorcycles, radios, electricity) after a road was built because greater access to the outside world increased reasons and opportunities for local travel. Also, price competition resulted in lower prices for goods.²⁵

Other changes in consumer habits have been seen as well, for example, in increased numbers of zinc roofs, radios, wells, and latrines in Liberia;²⁶ metal roofs, new rooms on houses, stone construction, more furniture, and increased lighting in Madagascar;²⁷ and masonry houses in Mexico.²⁸ In India, housing costs declined because of a 90 percent reduction in the costs of transporting bricks and other materials.

2. Socio-cultural impacts

a. Social services

The study preliminary to the Rural Roads Project in Kenya found that the rural population saw the results of road construction in terms of increased governmental services rather than in terms of opportunities for local cooperation and self-help.²⁹ The local populations surveyed stated that they expected more frequent visits by government officials concerning community development, social services, law enforcement and probation, health services, and economic cooperatives of various types.

In the case of health and education, for example, most researchers agree that the addition of rural roads to a region usually results in greater access to and increased use of health and education facilities than before the roads were constructed. Rural inhabitants perceive roads as very useful in obtaining speedy health care.³⁰ On the other hand, roads may have negative effects on the health of a population. Increased cash cropping coupled with reduced traditional dietary intake and more emphasis on curative rather than preventive measures, may result in a lowering of community health levels.³¹ In some cases, roads have also aided in the spread of disease vectors.

With respect to the education of a population group, new roads tend to encourage school attendance and the accessibility of such schools outside supervision, the latter resulting in the provision of better supplies and teachers. In the Kenya study, Brokensha found that isolated schools receive fewer books, supplies, and visits from education officials, and that there is difficulty in attracting qualified teachers.³² Rural road construction in Kenya will certainly help to reduce these trends.

b. Urbanization

Increased urbanization, especially over the long term, definitely follows rural road construction. As indicated below, community development is stimulated by the arrival of new roads. Local inhabitants, feeling increased involvement with national economic and social structures will tend to maintain the momentum toward infrastructural development created by the new roads. New buildings of a permanent type can be expected to rise around market sites and along roadways. Gradually villages become towns, a process firmly accelerated by the arrival of roads, especially paved highways.

c. Migration

The literature on migration patterns, especially rural-urban, is fairly extensive. Most research has focused on social dislocation and adaptive patterns in the cities. It is obvious, however, that rural roads link villages to each other as well as to large urban areas. Short-term as well as long-term migration is enhanced, particularly the former. Following road construction, a traditional

rural-urban migration pattern, involving first an entirely rural movement followed by migration to the cities, becomes a movement directly from the countryside to the urban areas. Cultural resistance to migration may be counteracted as ease of migration increases due to reduction in transport time and cost and the availability of better information.³⁴

The whole question of the impact of the provision of new roads in the countryside on migratory tendencies is complicated by the fact that analysis depends on the type and location of the road and upon the type of "push" and "pull" factors present. Added to these forces are the social and cultural characteristics of rural dwellers.

Shorter-term regional migration is more frequently facilitated by rural roads than is long-term urban migration. This is very likely to be closely correlated with road construction of the type presently occurring in Kenya. As increased local mobility and economic activity become established, households may tend to relocate to neighboring areas for economic and social reasons. By the same token, rural populations close to the large urban areas may find it convenient to commute on a weekly or even daily basis.³⁵

There is evidence that migration on a small scale occurs along the roadway itself. In Sierra Leone, Blair found that the total population of an impact area had declined by 21 percent, but that the population of villages within one mile of the road had increased by 18 percent (24 percent more females and 12 percent more males). Villages further away decreased by 26 percent.³⁶ Apparently males were generally migrating out of the region, while females were re-

locating to the vicinity of the roads. The result, in this case, was a serious shortage of farm labor in the areas farthest removed from the routes. A reduction in labor costs nearest the roads was surely also a result. It would thus appear that increased economic opportunity near new roads may be in part at the expense of areas further removed. It may also result in the accentuation of trends toward matricentric households and in an imbalance in the numbers of males and females in certain communities.

Social and cultural change are both a function and a cause of the types of changes in consumption, health care, education, urbanization, and migration patterns cited above. Consumption pattern changes are closely related to increased income resulting from heightened productivity and reduced costs of agriculture. Changes in health habits and educational trends relate more to improved communication with and increased access to the outside world. Finally, urbanization and migration reflect a mix of both economic and cultural variables. All these phenomena translate a common human striving for a better life.

d. Other effects

Other areas of road-induced social change studied by researchers include national integration, community development, impact on minority groups, community values, and differential impact on women. The last-named variable is examined below under the rubric of distribution of effects.

National integration is a very definite aim of most rural roads projects, as it is in Kenya. Communication with the outside world and speed of movement between remote areas and national cultural centers (developed regions, especially towns and the capital city) are made possible by roads. Government services flow into the rural areas, products and people flow outward.

There is much evidence that road construction also tends to promote overall community development. Local construction of permanent-type buildings built of concrete is made far easier by the facility of transporting cement. Following the introduction of roads, communities have been observed to build meeting halls, mosques, adult education centers, and libraries.³⁷ In other areas, new road segments have been built through community-based efforts.³⁸ In Indonesia during the Padat Karya Project, young men from small rural communities oversaw the construction of secondary access roads to their own towns and subsequently assumed responsibility for their continued maintenance.³⁹

In some cases, the introduction of roads into new areas has served as a catalyst for the introduction of new governmental infrastructure and services. In Mexico and Indonesia the construction of roads was quickly followed by additional governmental services--extension services, electricity, and potable water in Mexico,⁴⁰ and schools, roads, canals, and bridges in Indonesia.⁴¹

With respect to the impact of road construction on minority groups, two cases occur: (1) that of resistance by tribal or ethnic minorities to increased governmental control or outside cultural influence;⁴² and (2) that in which minority groups, such as Lebanese traders in West Africa, are clearly helped.

Whether or not social and economic development bring about a deterioration in community values depends on the perspective of the viewer. In the case of certain minorities and the traditional privileged sectors of changing societies, there is bound to be resistance to the development of new patterns of behavior, social roles, and authority structures as roads bring in outside values and ideas about the social order. Emerging power groups, such as the local educated elite, merchants, and wealthy cash-cropping agriculturalists, can be expected to embrace new values and social relationships in order to enhance their competitive positions vis-a-vis the traditional sources of power in local society.

3. Distribution of economic and social effects of road construction

The distribution of the socio-economic effects of rural road construction is a very important policy consideration. In recent years a great deal of interest has been shown regarding this question. In particular, concern has been placed on differential effects on various socio-economic levels, especially the poor.

a. Wealth and income distribution

The wealthy seem to profit more from rural road provision than do less advantaged rural dwellers, although all groups are better off in most cases. According to Edwards, the effect of new roads is primarily a reinforcement or widening of income disparities; capitalism in the local setting is stimulated and advanced.⁴³ While this may encourage subsequent local development, often complementary programs are needed to protect the poor from exploitation.

Land tenancy, or more particularly the distribution of landholding, is a major factor conditioning the differential benefits of road building programs. If land is rather equitably distributed, development benefits will tend to be evenly spread; the opposite is also true. Other capital-possessing groups (retailers, middlemen, and owners of transport vehicles) by the very nature of their entrepreneurial existence, will tend to respond to local investment opportunities faster and more effectively than even relatively well-off farmers.

Research conducted in Kenya concerning the distribution effects of future roads found specific cases of economically powerful truckers, traders, and farmers who could be expected to profit out of proportion to their numbers in the overall population.⁴⁴ Nevertheless, while distribution of benefits cannot be expected to be totally balanced, the Kenyan case is one in which there is not the great difference in rural wealth possession characterizing parts of South America, for example. It should not be difficult in Kenya to assure a reasonably equitable distribution of development benefits.

It is true, moreover, that a number of studies have found that road improvements are associated with a lessening of income differentials. In Haiti, for example, small farmers seemed to benefit far more than large landowners from development projects which included the construction access roads (also coffee centers and credit associations).⁴⁵ Thus, those owning up to three acres of land increased their income during the project by 74 percent, while increasing production by 87 percent. Those farmers having from three to five acres only increased

production by 20 percent and disposable income by 11 percent. Farmers having five or more acres actually suffered a decrease in income and production. These trends ran counter to those outside the project area.

Mitchell and Rakotonirina discovered a narrowing of income disparity between farmers and non-farmers in the Andapa-Sambava road project in Madagascar.⁴³ In 1965 the disposable income of traders was ten times that of farmers, while by 1975, following road construction, the differential had narrowed to a four-fold gap.

Berger conducted a study in four Southeast Asian countries on the impact of rural road projects on income distribution, and concluded that changes in production patterns and agricultural innovations were fairly evenly distributed among all socio-economic groups.⁴⁷ However, where cash cropping for export was important in the rural economy, there tended to be greater income disparity than in areas where primarily subsistence agriculture was practiced. Consequently, income levels tended to become more differentiated in cash-crop areas, where opportunities for cash croppers to profit from new roads were far greater than for primarily subsistence farmers.

b. Geographic distribution

The question of the geographic dispersion of socio-economic effects of rural roads has been treated by a number of authors. Berger in the Southeast Asia study defined the impact area to be ten kilometers on either side of the route.⁴⁸ However, Boonchuan found

the extent of impact to be only three kilometers;⁴⁹ Squire states a maximum of three to four kilometers;⁵⁰ and Ward posits "several miles."⁵¹ Mitchell maintains that for the Andapa-Sambava road farmers within five kilometers of the route gained nearly 50 percent more income than those further removed.⁵²

The standard of the rural road has a definite impact on the value of economic output at varying distances from the market center. All-weather roads were instrumental in increased value of production up to 25 kilometers from the market, according to a study by Bonney in Sabah, while earth roads conditioned economic activity out to only five to ten kilometers.⁵³ Bonney also posits the existence of a relationship between area given to export crops and distance along the road to a principal commercial center, the area of influence being shaped like an isosceles triangle with the road running from the midpoint of the base (market center) to the apex. Export cropping decreases in yield and increases in cost by about 20 percent per kilometer as one moves away from the market along the road.

c. Effects on women

Of increasing interest in development studies is the socio-economic impact on women. In general, studies find that women tend to benefit significantly from the effect of projects. In Mexico, Elmendorf and Merrill found that women, especially the younger ones, were more willing to change traditional behavior and values than men. They tended to see the new road as having a liberating influence on their lives.

Specific effects noted by Elmendorf were changes in the pattern of marriages and household structure. Marriage has tended to be postponed for young girls, who now also have a greater choice of mates. The joint family structure has also apparently changed into a less centralized "share family."

A comparative study on the impact of infrastructure projects--especially rural road construction--on the economic activity of women in two areas of the Philippines was conducted by Hackenberg.⁵⁵ The study concluded that all areas of women's commercial activities were favorably affected. The Philippine women also benefitted from these development projects in other ways, particularly with respect to education, health care, and modern-sector employment.⁵⁶ In the last-named activity, it was the young women who were most eager and successful in exploiting new employment opportunities.

Generally speaking, women's economic activities, especially outside the traditional household, are encouraged by rural road construction. Female vendors commonly profit from stationing themselves along new roads or in market centers stimulated by ease of access. It is to be expected that a similar result will occur in Kenya.

4. Conclusion

The Kenya rural roads program follows a long series of similar programs in other developing countries. The body of research dealing with the economic and social effects of road construction, while already fairly extensive, nevertheless fails to be satisfactorily specific in addressing the complex and manifold consequences of such rural development.

The reasons for this failure lie in the fact that no two cases are alike; replication of research studies is not possible. This is, however, a problem typical of the social sciences, and it is incumbent upon analysts to work with what they have.

Certain general conclusions do emerge from the literature on rural road effects. It appears clear that roads stimulate economic activity in the impact area, beginning with the wages paid to local laborers as the roads are built. Following construction of the new routes, cash cropping and local non-farm commercial activities augment rapidly. Construction along the roadways occurs, and regional market centers, now rendered more accessible to the local population, begin to take on increased economic and social importance.

Economic benefits tend not to be equally distributed among the local population, however. The wealthy usually profit out of proportion to their numbers, although all income levels may benefit in an absolute sense. The location of families with respect to the new roads will also have a differential effect on their future fortunes; those living nearest roads profit from increased land values, cash-cropping opportunities, and reduced transportation costs, while those living farthest from the roads may find themselves worse off, relatively speaking, than before.

Economic changes and increased communication with the outside would inevitably lead to social and cultural change, the exact nature of which depends on the society in question. Greater use of health care and education facilities, increased regional mobility, and rural-urban migration tend to blur traditional cultural and social distinctions and to forge a truly national culture.

II. KENYA RURAL ACCESS ROADS PROGRAMME

A. The Road Project

The Kenya Rural Access Roads Programme (RARP) was initiated in 1974 under the aegis of the Ministry of Transport and Communications (MOTC), with the purpose of constructing low-cost roads in previously non-accessible areas to improve the income and quality of life of the people living in those areas. The original goal was to construct 14,000 km. of all-weather feeder roads in 23 districts of the country between 1975 and 1982. Subsequently, the number of districts to be affected was increased to 26. Since 1975, construction activity has been undertaken in 23 of the targeted districts.

The roads programme is labor-intensive, employing about 10,000 workers throughout a year. Currently, the construction is carried out by 42 units, each supervised by an engineer. Each unit works through four overseers on four different roads. Although each unit is expected to construct 45 km. of feeder roads per year, the actual performance has so far been below the target.

B. The Rural Road Impact Study

The impact study is intended to help monitor and evaluate the Rural Access Roads Programme. Specifically, the study is designed to assess whether or not the expected benefits did in fact accrue to the people in the road impact areas in terms of increased incomes, technology, production and an improved standard of living. In the process of assessing the benefits, it is expected that improvements in the preconstruction, selection and evaluation methods and proce-

dures will be made. Other monitoring inputs to the program, such as those relating to wage levels, recruitment procedures, need for food subsidy for the workers, need for regionally differentiated policies for construction, location specification, etc., can be made through the impact study as well as through more casual observations that are made during the field trips undertaken by the impact study teams and the consequent systematic research.

Until early 1980 the impact study was meant to cover over 120 feeder roads. Farm surveys were to be undertaken by the Central Bureau of Statistics and traffic surveys were going to be implemented by the Ministry of Transport and Communications periodically on each of these roads. However, the financial and institutional restrictions made it necessary to limit the study to far fewer roads both for purposes of farm surveys and for the traffic surveys. Thus, a decision was made in April 1980 to cover a maximum of 36 roads with CBS surveys and to strengthen the substantive findings of the large scale surveys.

Since April 1980, however, additional budget constraints faced by CBS make it unlikely that even such a modest goal can be achieved. Moreover, the speed of data collection and processing as well as the quality problems faced shed some doubt on the utility of this type of periodic and systematic data collection far beyond the seven roads that are currently being surveyed by the Central Bureau of Statistics.

The impact study, in its present form, will be based upon the farm surveys that will be carried out by CBS in as many roads as is feasible. Minimally, the study that has started in the seven roads covered by this report will continue. Maximally, there will be a total of 36 roads (32 rural access roads and four roads falling under

the Gravelling Programme) to be covered through periodic farm surveys. Regardless of the number of roads covered by CBS, the MOTC will carry out traffic surveys in 36 road impact areas. However, as the discussion of traffic data in this report indicates, there is a need for further tests in terms of selecting the most suitable periods and intensity of traffic surveys.

In the future, the impact study will also rely on the findings of "topical studies" designed to cover limited and specific effects of feeder roads. The topics of particular interest are (1) women and the family; (2) migration; (3) marketing; (4) land ownership; (5) agricultural and livestock development; (6) complementary investments; (7) labor and labor productivity; and (8) regional integration. In April 1980, when the basic modifications were made for the impact study, the impact of roads on nutrition and health status was meant to constitute one of the topical studies. However, in view of the availability of a large body of nutrition data collected from the seven impact areas under the CBS survey and the lack of local interest in a more intensive study on the subject, a study of regional integration has been substituted. This new study will cover some of the health-related impacts of roads as well as those pertaining to the other topics suggested. These effects will be examined in a microcosm. The regional integration study will be carried out by the MOTC through short-term international consultants and with the co-operation of Devres, Inc., the firm which is assisting MOTC with the impact study on a long-term basis through USAID funds.

C. Rural Road Impact Study: Area Descriptions

The roads studied in this report are located in seven different districts of the Western and Nyanza provinces (Map 1, p. 27). These districts border Uganda and Tanzania on the one side and the Rift Valley on the other side, covering a small corner of the country as a whole but containing a large part of Kenya's population.

The length of the roads in these provinces varies between 4.5 and 14 km., as indicated in Table 1. The impact areas differ substantially in size, population and population density (see Table 2),¹ These differences make comparisons between the road impact areas especially fruitful. Both Tables 1 and 2 provide additional detail about each road and impact area in tabular form. The average cash crop area in the impact areas is 26 percent, or 1,209 ha. (Table 1). The unused portion of the impact areas averages 20 percent, or 896 ha., as also indicated in Table 1. The average distance to a hospital from the mid-point of the roads is 25 km., as noted in Table 1. Further descriptive information about each road impact area follows later in this section.

The impact areas in Table 1 were arbitrarily determined by asserting that the impact of the road would not be substantial beyond a distance of two km. from it. Two additional criteria are also used:

First, if the road is linked to a classified road, the first two km. starting from the junction of the classified and the feeder road are assumed to be under the influence of the classified road. If, on the other hand, the linkage is to another rural road, the two roads are combined for purposes of impact analyses. Second, topographical constraints such as high hills, rivers, etc., are taken into consideration in further limiting the impact zone within the two km. maximum. The construction of the roads in Tables 1 and 2.



Map 11 - Western and Nyanza Provinces
 Kenya
 showing Proposed Study Roads

1:500,000 NATIONAL SCALE

Table 1: Basic data on roads and road impact areas

<u>Variables</u>	<u>Unit</u>	<u>Source</u>	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	<u>Total</u>	<u>Average</u>
Road Length	km.	DDC	14	7	6	4.5	7	10	8	56.5	8.07
Population	no.	CBS	1,403	2,291	836	1,994.0	680	1,230	2,497	10,931.0	1,562.00
Impact Area	ha.	CBS	519	1,045	504	451.0	199	506	1,255	4,479.00	640.00
Unused Portion of Total Impact Area	%	DDC	23	0	0	48.0	44	75	35	—	32.00
Cash Crop Portion of Total Impact Area	%	DDC	26	23	40	17.0	25	15	35	—	26.00
Cash Livestock Portion of Total Impact Area	%	DDC	10	54	10	0.0	0	0	0	—	11.00
Subsistence Por- tion of Total Impact Area	%	DDC	41	23	50	37.0	31	10	30	—	32.00
Distance to Hospital ¹	km.	DDC	10	43	34	27.0	26	11	24	—	25.00
Distance to P.O. ¹	km.	DDC	10	23	14	27.0	26	17	15	—	18.90
Distance to Div. Hq. ¹	km.	DDC	20	23	15	7.0	26	20	15	—	18.00
Distance to H.C. ¹	km.	DDC	10	23	14	7.0	26	11	15	—	15.10
Crops Grown in Area	—	DDC	Maize Millet Cotton	Cotton Millet Cassava Maize Sorghum	Maize Sunflower Beans	Coffee Sunflower	Beans Coffee	Coffee Maize Bananas Pyrethrum Sugarcane	Maize Beans Potatoes		
Type of Live- stock in Area	—	DDC	Beef Cattle	—	Dairy Cattle	Dairy Cattle	Beef Cattle	—	—	—	—
Population Density	no. per km. ²	CBS	170	219	168	265.0	394	243	198	—	246.00

¹From the mid-point of the road.

Table 2: Size, population and population density of road impact areas

<u>Road</u>	<u>Impact Area</u> (ha.)	<u>Population</u>	<u>Population Density</u> (persons/km ²)
Siaya	519	1,403	270
Busia	1,045	2,291	219
Kakamega	504	836	166
S. Nyanza	451	1,994	442
Kisumu	199	680	342
Kiari	506	1,230	243
Bungoma	1,255	2,497	199
TOTAL	4,479	10,931	--
Average	640	1,562	244

Source: CBS and MOTC calculations.

was well underway in February 1979 when they were selected for the impact study. Siaya and Kakamega roads were still missing bridges in August 1980, but they were near completion. The remaining roads were completed prior to November, 1979. Following are short descriptions and maps of each of the road impact areas.

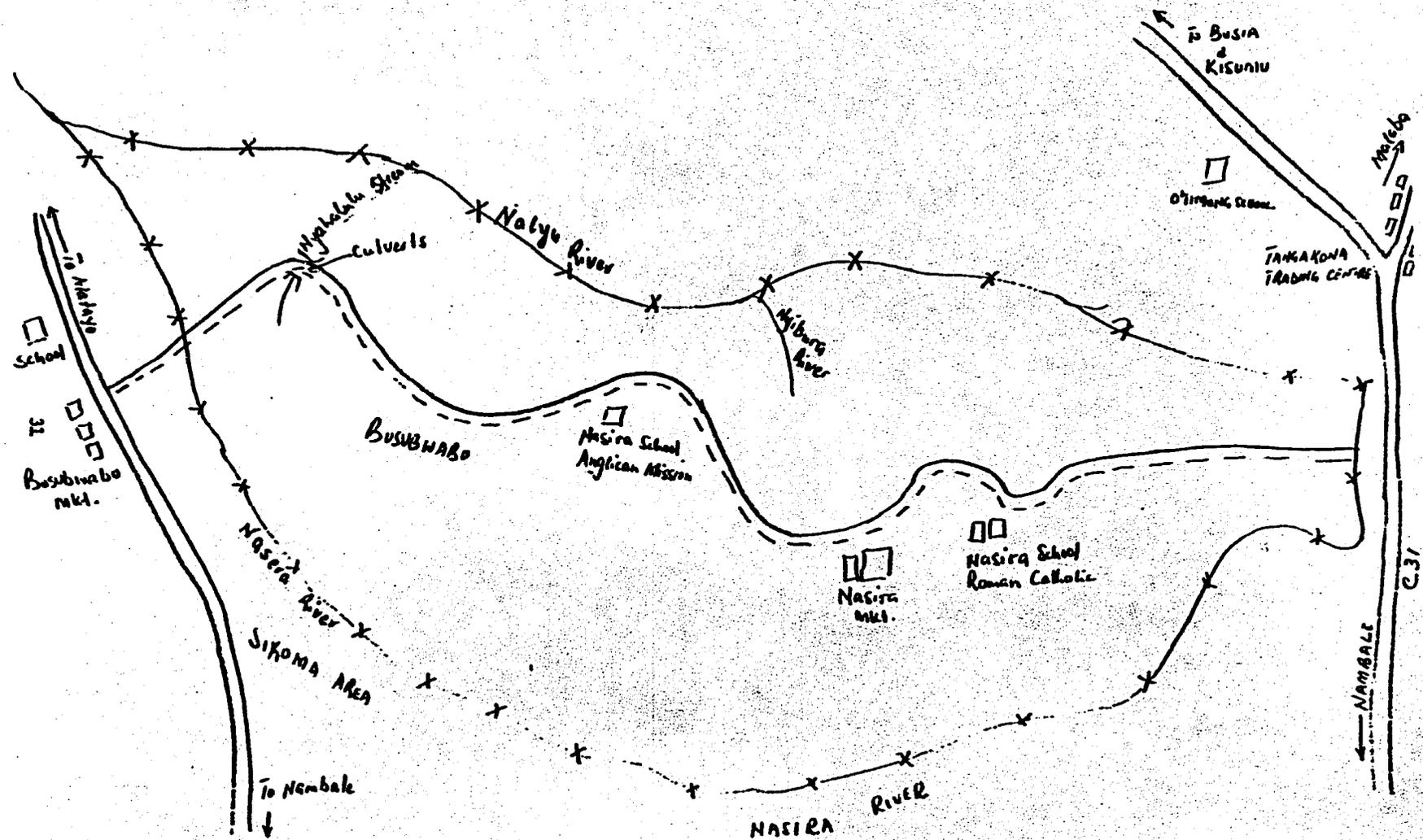
1. Busia

The rural access road (No. 4) starts off the main road from Busia to Nambala, ten km. east of Busia and five km. west of the Nambala township and market (Map 2, p. 31). Two small streams form the boundaries of the impact area, and over a small branch of one of these a short bridge has been built as part of the rural access road.

The major cash crops grown in the area are cotton and sugarcane with cotton predominating. In addition, millet, finger millet, maize, sweet potatoes and beans are grown. Of these crops, approximately one quarter is sold in the markets. The area is fertile and crops such as maize, millet, and beans can be harvested twice a year. Small quantities of bananas and green vegetables such as cabbage are also grown.

The impact area residents attend three different markets. (See Table 3, Summary of market data on selected markets...) The Nasira market, which is located within the impact area adjacent to the road, is open every afternoon, which is quite unusual compared to the mode of operation of markets in the other impact areas. Subsequent to the construction of the rural access road, a new store was added to the four stores already existing. The residents as well as the store owner believe the road will add to the level of business activity of this marketplace.

Of the five structures in the Nasira market, four are operating. Two of these are general retail shops, one is a butchery, and the other



Map 2: Busia District Rural Access Road No. 4 impact study area

Table 3: Summary of market data on selected markets in Busia, South Nyanza and Kisumu districts

<u>Occupation of owner</u>	<u>Owner residence inside/outside impact area</u>	<u>Type of shop</u>	<u>Status of shop</u>
<u>Busubwabo Market - Road #4 - Busia</u>			
6 structures			
3 farmers, 1 teacher, 1 jaggery worker, 17% owned	2 inside 3 outside 1 INA ¹	4 general retail shops, 1 posho mill, 1 cotton store	3 open 2 closed, 1 under construction
<u>Nasira Market - Road #4 - Busia</u>			
5 structures			
1 farmer, 1 teacher 1 sub-chief, 1 railway station master, 1 railway inspector	all inside	3 general retail shops, 1 butchery 1 posho mill	4 open, 1 in ruins
<u>Tangakona Market - Road #4 - Busia</u>			
8 structures			
2 farmers, 3 teachers, 2 jaggery workers	1 inside, 3 outside, 4 near impact area	3 general retail shops, 1 butchery, 1 hotel, 3 unclassified	6 open 2 closed
<u>Uhuru Market - Road #7 - South Nyanza</u>			
9 structures			
6 farmers, 1 businessman, 1 farmer/ businessman, 1 doctor/ businessman	3 inside 3 outside 1 near impact area	4 general retail shops, 1 posho mill, 4 unclassified	5 open, 1 under construction, 1 in ruins, 2 INA ¹

¹INA = Information not available.

Table 3: Summary of market data on selected markets in Busia, South Nyanza and Kisumu districts (cont'd)

<u>Occupation of owner</u>	<u>Owner residence inside/outside impact area</u>	<u>Type of shop</u>	<u>Status of shop</u>
<u>Riat Market - Road #8 - Kisumu</u>			
25 structures			
3 farmers, 1 teacher, 13 businessmen, 1 doctor, 1 watch repairman	3 inside, 16 outside 6 INA ¹	1 butchery, 3 hotels, 2 fish shops, 19 unclassified	5 open 3 under construction, 3 empty, 14 unclassified
<u>Awach Market - Road #8 - Kisumu</u>			
17 structures			
4 farmers, 1 teacher, 10 businessmen 2 INA ¹	1 inside, 14 outside, 1 near impact area 1 INA ¹	2 butcheries, 2 hotels, 1 bakery, 1 bicycle repair shop, 2 animal trading shops, 1 "soda shop", 8 unclassified	2 under construction, 1 now used as home, 14 unclassified
<u>Kambare Market - Road #8 - Kisumu</u>			
23 structures			
3 teachers, 13 businessmen 2 doctors, 5 INA ¹	All outside	2 hotels, 1 posho mill, 1 bicycle repair shop, 2 tailors, 1 shoe repair, 1 hardware shop, 1 tannery 14 unclassified	17 open 5 closed, 1 under construc- tion

¹INA = Information not available.

Table 3: Summary of market data on selected markets in Busia, South Nyanza and Kisumu districts
(cont'd)

<u>Occupation of owner</u>	<u>Owner residence inside/outside impact area</u>	<u>Type of shop</u>	<u>Status of shop</u>
17 farmers	17 inside	14 general	40 open,
10 teachers,	64 outside	retail shops,	9 closed
37 businessmen		5 butcherias,	8 under constuc-
3 doctors,		8 hotels,	tion,
3 jaggery workers,		4 posho mills,	2 in ruins,
2 coop-owned,		1 bakery,	3 empty,
1 sub-chief,		2 bicycle repair	
1 railway station		shops,	1 now used
master,		1 cotton store,	as home,
1 railway inspector		2 fish shops,	28 unclassified
1 watch repairman,		2 animal	
1 tailor,		trading shops,	
1 farmer/businessman,		1 "soda shop",	
1 doctor/businssman		1 shoe repair,	
		1 hardware shop	
		1 tannery	
		48 unclassified	

Total of 81 shops surveyed in seven marketplaces.

is a posho mill. The first retail shop was under construction in 1975 but was not opened until late 1979. This shop is very meagrely stocked as a result of the cash shortage suffered by its owner. The shop is said to have cost Ksh. 12,000 to construct. The other retail shop was built in 1977 at a cost of Ksh. 45,000 and has been operating successfully since its opening. It is relatively well stocked and satisfies the local demand to a great extent. The butchery was built in 1978 and has been in service since June 1980. The owner slaughters a cow twice a week, on Tuesdays and Fridays, which are market days for the Nasira area. Producers from this and other nearby areas bring their marketable goods to sell in the marketplace. They purchase items from other producers, as well as from the retail shops and the butcher. The butcher averages a profit of Ksh. 150-200 per cow, earning about Ksh. 1,200 per month in addition to his farm income. The monthly earnings of the small retail shop is around Ksh. 600, and that of the larger shop Ksh. 1,600. The shops in the Nasira market are owned by the residents of the road impact area.

The Busubwabo market on the end of the rural access road contains six structures of which only one is operating. There is almost no activity around this market, and even the retail shop which is open occasionally has no more than a few matches and small bags of tea to sell. Thus, residents near this market go either to Nambala or to Nasira to shop. The market days for this particular area are Mondays and Thursdays, but the attendance on both days is very poor.

The Nambala market is five km. from the main junction of the road. It contains 126 structures, of which 60 are in operation. These include 36 retail shops, four bars, eight "hotels" (tea shops are called

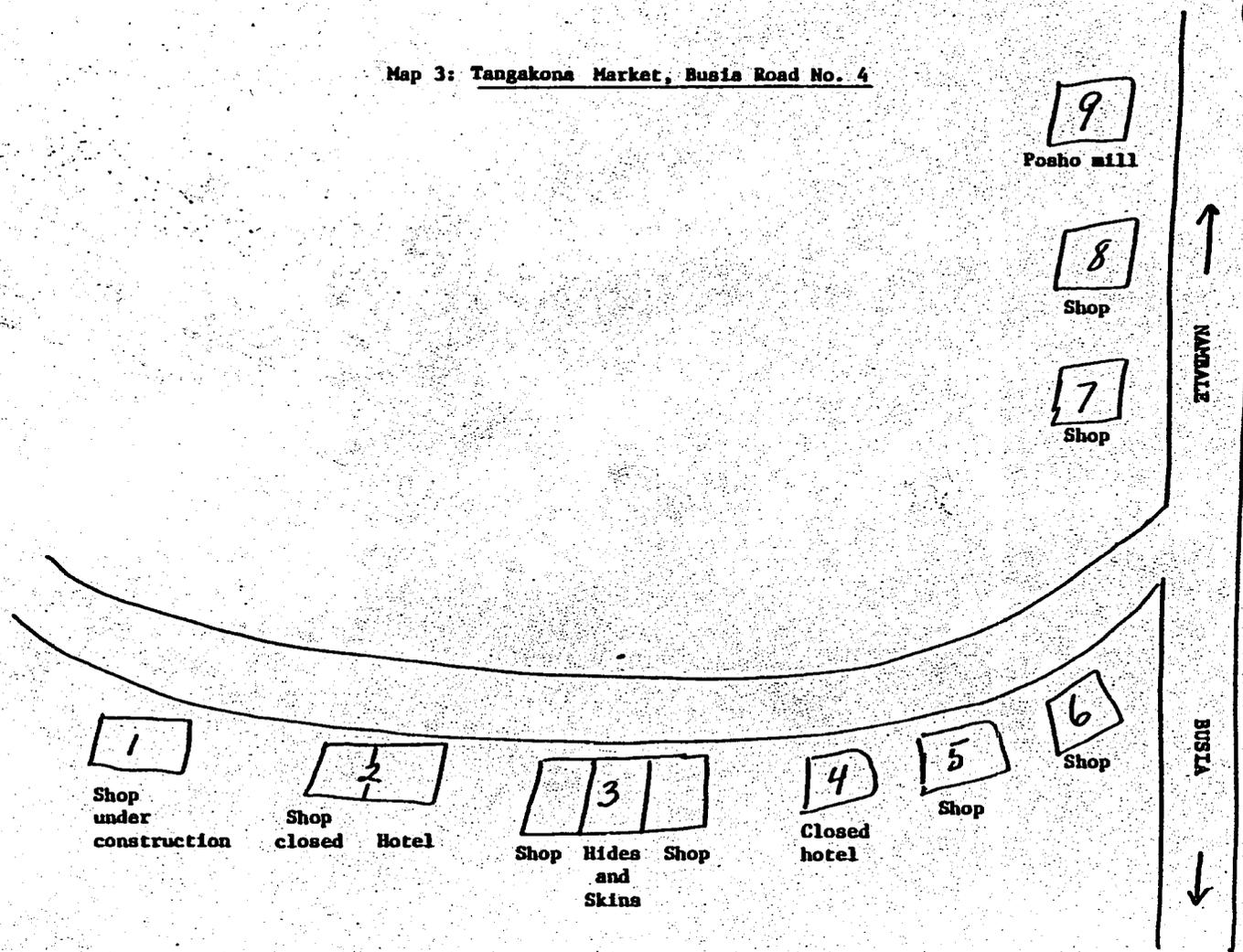
hotels in Kenya). two tailors, two butchers, two posho mills, two shoe shops, a furniture store, a post office, a bicycle repair shop, a record shop, a hardware store, a co-operative society and a jaggery. Monthly rent for shops in this area ranges from Ksh. 150 to 750, and the rent on bars varies from Ksh. 300 to 600. The plots on which the shops are built are sold for Ksh. 6,000, and an acre of land around the market area is priced at Ksh. 200. Ten households from the Busia road impact area own shops in this market. Its market days are Tuesdays and Saturdays, and the daily attendance is said to exceed 3,000 people, vendors and shoppers.

On the northwestern side of the impact area there is yet another market, Tangakona market. It is located almost adjacent to the road at its junction with the main classified road to Busia. There are nine structures in this market, seven of which are operating. There are four general retail shops, a hotel, a butchery, and a posho mill. Many of these stores have been built in the 1970s, the latest one in 1976. One of the stores is owned by a man who lives in the rural access road impact area. This does not seem to be a trend, however, as residents from the impact area have not as yet rented one of the available structures to go into business. Monday and Thursday are the market days for the Tangakona market which is frequented by several hundred buyers/sellers on those days. (See Map 3)

Because the development of this particular impact area is rather recent, adequate social services are generally lacking. There is a shortage of means of transportation. A few farmers use their own tractors or animal drawn carts to transport their goods to distant markets, but a major portion of the marketing is done by outside merchants. There are three primary schools within the impact area, one

61

Map 3: Tagakona Market, Busia Road No. 4



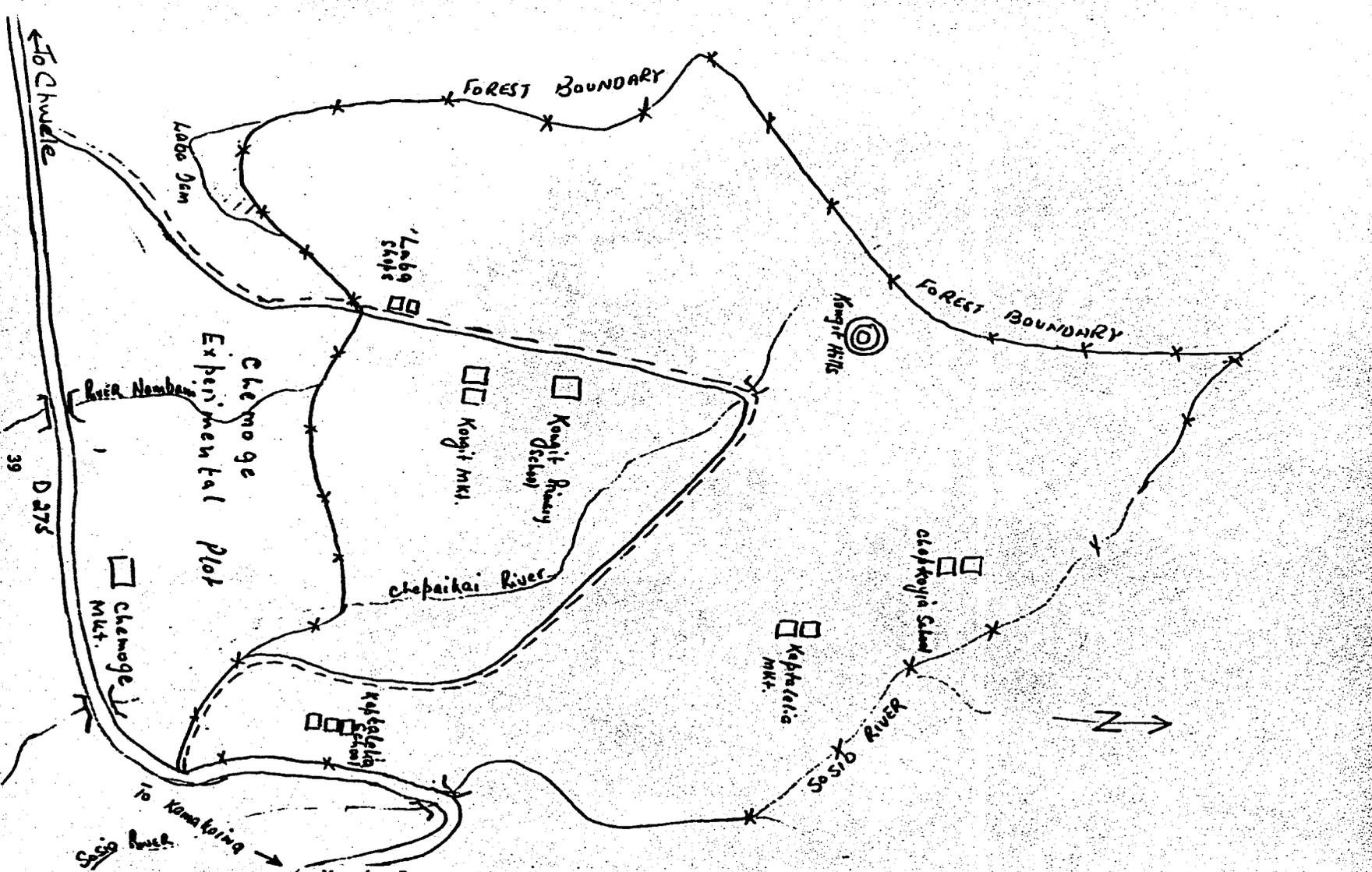
of which is near the Kongit trading centre. Two of the schools utilize permanent buildings, while the other is a temporary traditional building. There are no hospitals, clinics or health centres in or near this impact area. Residents attend the Kimilili General Hospital and Kapsakwony Mission Hospital at some distance. The police office, chief's office and other administrative offices are also located in the Kapsakwony trading centre.

The rural access road in Busia will intensify the existing processes of change in the area. Market development may be speeded; farmers may obtain better prices for their products by being able to transport them to dealers in urban centres; greater monopolization of cotton and sugarcane production is also likely to develop.

2. Bungoma

The Bungoma rural access road is situated on the eastern side of Mt. Elgon, 25 km. from Kimilili Township and four km. from Kapsakwony trading centre (Map 4, p. 39). Various migratory waves have resulted in an ethnically mixed population, with the dominant Doruba being the original owners of the land and the owners of larger plots of the land, and the Kikuyu and the Masai as more recent and less privileged settlers. Unlike all other road impact area studies, plots as large as 350 acres were reported to be owned by individual Bungoma households, and almost 20 percent of the farmers rent the lands they cultivate.

The area itself is in high altitude, receiving ample rainfall, with fertile soil rich in lumus. There are many streams, and rivers, as well as a dam from which drinking water is obtained throughout the year. Agriculture is most important in the Bungoma area. The level



Map 4: Bungoma District Rural Access Road No. 13 impact study area

of farm technology employed in this road impact areas is higher than that utilized in the other impact areas. Tractors as well as animal drawn ploughs are widely used for cultivation, and their rental among the resident households is customary. Wheat, maize, beans and peas are grown in the area with tomatoes and green vegetables. The river banks and dam are particularly appropriate for the cultivation of the latter types of crop. After the road was constructed in the area, several small plots began growing coffee. Grazing is as important an activity as cultivation.

The road in this impact area is crescent-shaped, joining classified roads at both ends. Both the condition of the classified road and that of the rural access road have made it possible for the merchants and truck owners to purchase farm products from the farms themselves. The road has also provided an opportunity for the producers to market their products directly in Bungoma (50 km. away from the road), or in other major trade centres.

There are several markets within the impact area, but they serve more as suppliers of daily non-food necessities than as centres for sale of farm products. The Kongit market is relatively more developed with a modern posho mill and repair shop serving local demand of bicycle, motorcycle, auto, truck and tractor owners. People from the neighbouring areas also come to this shop. In the market there are hotels and retail shops. Only one of the retail shops is in operation and is relatively well stocked. Also, one of the hotels is in continuous operation.

The Kaptalelia market is almost dead, with all the retail shops closed, with a butcher providing meat only occasionally, and a work-

shop with two employees separating the corn from the husk. However, the marketplace is used by the local men as a social centre.

The third market, Laba, consists of a few retail shops, only one of which operates regularly.

There are two primary schools within the impact area, and another immediately outside it.

The area has a great deal of potential for further development. Residents have been experimenting with coffee and wheat; the area proves to be extremely suitable for both. Livestock is already an important sector; shifts in the type of livestock towards improved stocks as well as in the technology of livestock maintenance away from open area grazing are expected. Such shifts would not only enhance incomes from livestock activity, but would, by allowing more land to be cultivated, result in greater agricultural incomes as a whole.

3. Kakamega

Kakamega rural access road No. 6 starts off the international Kisumu-Webuye highway and links to another classified road (E313) on the other side (Map 5, p. 41). When a bridge is constructed, it will pass over the Nambirima River.

The altitude rises from the west towards the northeastern part of the impact area to 1,850 ft. above sea level. The precipitation varies between 1,250 and 2,000 mm., with a mean annual rainfall of 1,520 mm. Though the region receives heavy rains occasionally, the rainwater is swiftly drawn into small streams and rivers, so as to avoid any flooding. The groundwater table is less than 40 m. below surface level, but cannot be reached by traditional wells due to the

hard layers of rock below the surface. As in other road impact areas, the water is obtained from local streams and carried back home by women and children. In the Baseline Data section, tables are presented that indicate sources of water available to each impact area and the type of sewage utilized (see pp. 151 to 152).

Sugarcane has been gaining importance as the primary cash crop in this relatively productive area. An acre of land yields ten bags² of maize, one bag of beans and a few bags of cassavas at the same time twice a year. Wheat farming has also been introduced. Farmers receive higher prices (and pay more) for their crops in this area than in Busia. For instance, in April 1980, a bag of maize was sold for Ksh. 120 in Busia, and Ksh. 150 in Kakamega. The purchase price of such a bag in Kakamega was between Ksh. 160 and 180. Because transportation costs are very high, a truckload of sugarcane is sold to dealers for only Ksh. 80 to 100, but the prices are expected to normalize soon after the road is completed. Even then many side roads will be necessary to allow the transportation of the sugar cane from individual farms to the road.

There are also two minor shopping areas within the impact area, both removed from the road. The Shipala market has just two structures, both of which are in operation. The Mausil market has three shops which are also closed most of the time. This market area offers some potential, however, for future development.

Immediately outside the impact area at the junction of the rural access road and the main international road is the Butali market which operates on Mondays and Fridays, attracting buyers and sellers from a large area. The ticket officers in the marketplace estimate the number

of transactors during the harvest time to be from 7,000 to 8,000 people. Due to the legal restrictions recently imposed upon the movement of maize, the market attendance has fallen to approximately 3,000. Butali market is the center of the local economy, as well as an important avenue for social exchange.

Directly on the opposite side of the road from Butali is the Chegula market with a jaggery. On market day, Wednesday, the market can hold up to 1,500 people. Most sugarcane growers of the impact area take their produce to this jaggery since the sugar factory is very far and the transport cost charged by small trucks may exceed the price received for the load. The jaggery pays the farmers by load (rather than tonnage) a very small price of Ksh. 200 per truckload.

The Samitri market also visited by the residents of the impact area, is open on Tuesdays and Thursdays, with an attendance rate of 2,000 per market day throughout the year. The Malava market is southeast of the impact area and provides the administrative and medical centres. The District Officer's office, one of the two chiefs' offices, a health center and the police post are located in the Malava Market area. In addition, there is a secondary school and a number of shops on a larger scale than those found in Butali.

As for social services, the impact areas lacks schools and health centres. An adult literacy centre has been operating in the area for some time within the Shipala Friends Church. Adjacent to the impact area is a Nursery School of the Mausii Catholic Church. There is a cattle-dipping activity at Chegula and a Farmer Cooperative Society near the impact area which serves the residents of the rural access road (RAR) area satisfactorily. There is also a private health

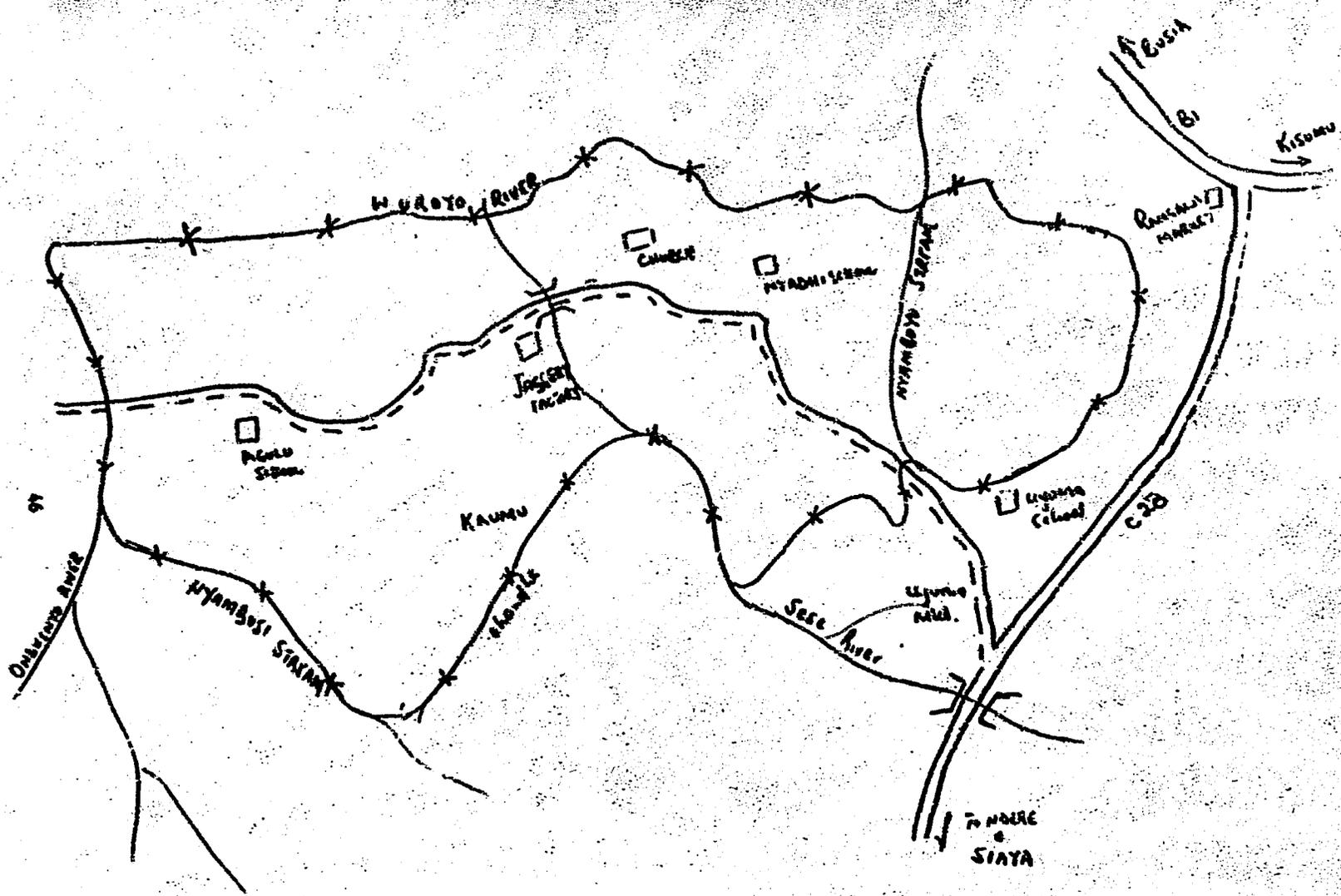
clinic at the junction of the rural access road and the main international road. Despite the incomplete bridge, residents of the area take their sick to nearby hospitals with modern vehicles which can enter the area from either of the classified roads up to the river. Until recently, as in other road areas, the patients were carried in animal drawn carts or, more often, on others' backs.

A major impact of the road in this area is likely to be the improved marketing of sugarcane. In addition, the completion of the bridge will open new economic and social avenues for residents living on either side of the river.

4. Siaya

The rural access road turns off the main road from Ndere to the Rangala market just northwest of the Sese River (Map 6, p. 45). The area is situated approximately 50 km. west of Kisumu. It extends from the Rangala bridge westward to Agali, and is bound on the north by the Wuroyo River. Several streams cut across the area toward Lake Victoria. The land rises gently between 2,000 and 5,000 feet above sea level. The area consists of 30 square km., or 1,875 ha., with a population of 4,838.

Except for some black cotton soil and gravel, most of the soils are red-brown clays and sandy loams. The soil is overworked, evidenced by the appearance of certain weeds which are indicators of over cultivation over the past 30 years. The topography is undulating with no marked geological features, though it does encourage soil erosion. The mean annual rainfall in the area is 1,500 mm. Water supplies no further than three km. from houses, even in the dry season, are closer than in many areas of the Eastern Province. The mean annual rainfall



Map 6: Siaya District Rural Access Road No. 1 impact study area

in the area is 1,500 mm. Distribution from year to year appears to be fairly even. Distribution throughout the year is not ideal, however, and the occurrence of a yield-reducing period of water stress is well established. Surface water is not a problem due to the presence of the Wuroyo and Sase Rivers, several streams and many wells. There is, however, a high level of salinity in these waters, and stagnant water is also a hazard. There is a dam just outside the impact area intended for cattle.

Numerous fig trees are to be seen, and paths, roads, compounds, and boundaries are sometimes planted with exotic trees. Only a few specimens of large indigenous trees remain, however. Fuelwood, both firewood and charcoal, is in increasingly scarce supply. Seventy-nine percent of the total District Development budget has been allocated for afforestation and soil conservation. Restricted access to the few patches of bush remaining and the small remaining forest have rendered firewood and chatching grass quite scarce. Costs of both are rising. The new roads will affect this situation by improving access to trees, and by increasing demand as commercial establishments open.

The economy of Siaya is characterized by small farms which cannot support a dense population. Hence, there is high out-migration, especially among adult males. Many fields are in poor condition, badly planted and inadequately weeded. This situation could be related to low levels of knowledge or skill, or the application of same, and/or the absence of many adult males. There is a sharp contrast between local fields where crops are properly spaced, have been manured or fertilized, weeded, and sometimes even fenced. Cash crops such as

cotton and sugarcane have been introduced to the area; traditional subsistence crops are maize, sorghum and cassava, with smaller amounts of beans, kale and sweet potatoes. Bimodal rainfall allows for two crops per year.

Money is earned by selling cash crops and some fruits and vegetables, by trading cattle, or by working as drovers for cattle dealers. Means of earning non-farm income include working for wages outside the impact area in widely varied occupations and time periods, and working for wages inside the impact area. Although officially discouraged, the sale of timber and charcoal is another form of non-farm income.

The employment of 80 people on the Rural Access Road in Siaya District is the largest wage-earning opportunity offered in the area. The jaggery factory in the southeast corner employs 60 people. The two primary schools employ a few people, as do a few farmers who employ labourers. Wages are difficult to determine, due to various bases with fluctuating demands on the labourers' time. Opportunities for self-employment include traditional skills such as pottery and blacksmithing on limited scales, and new skills which include carpentry, brick-making, bicycle repair and stone masonry.

Within the impact area, there are two tiny shops. Within four km. of the area are four market centres at Ugunja, Pangale, Kombare, and Ndere, all of which have regular busy market days and a posho mill. Most of these markets include a rural bakery, a butcher, a bar and specialized shops which sell, for example, timber or mattresses. Most major items, such as all farm inputs, cement, corrugated iron, beds, bicycles, and radios must be purchased at Siaya, about 12 km. distant.

There are two primary schools within the impact area, and another

immediately outside it. There is also a small church in the area.

Land adjudication is currently underway in the area. Officials say it may be complete in 1980, but given the amount of litigation elsewhere, titled deeds may not be issued until 1982. The area is in the midst of a transition period. There are disputes and bitterness as land is allocated to one man and not another, but the elders say the people will "settle down" as the cases are settled. Again, the rural road may intensify existing change processes in the area by strengthening sugar cultivation and encouraging market development within the area.

5. South Nyanza

The road impact area is situated approximately 30 km. southeast of Kisumu (Map 7, p. 49). It extends from Al southward to Uhuru market, a distance of 4.5 km. over an area of 650 ha., with a population of 1,645. The population is densest along the Oyugis River near the primary school. The land rises gently with undulating plains abruptly cut by mountain ranges to the north. There are two rivers in the impact area which flow year round and serve the northern and southern parts of the region.

The soil in the area is mainly ferruginous tropical soil. The mean annual rainfall is between 1,279 and 1,524 mm. Water drains into streams in the area, and no flooding occurs. The actual availability of water is unclear. Some sources claim there is an insufficient amount of drinking water because the two streams are roughly two to three km. apart; others state the sources are many.

Subsistence crops in the area, including bananas, maize, cassava and sweet potatoes, are only sold after a good harvest. Coffee and

sugarcane have been introduced since the construction of the road. People also keep cows, goats and chickens, but not in large quantities. While the land in this area is productive, the people have misused it in some instances through overgrazing.

There are two markets located outside the area which serve the people of the impact area. The first, the Uhuru market, is very small. Of nine structures, only five are operating. Four shops rent for Ksh. 45 to 75 per month. The fifth, which is a hotel, is run by its owner. It was built in 1976 with a loan from the County Council. The monthly incomes from the shops range from Ksh. 360 to 600; the hotel's monthly income is Ksh. 630. Two of the shops' owners live in the impact area. Market day is Wednesday. An acre of land in this area costs approximately Ksh. 2,000.

The second market is at Oyugis, which is the Divisional Headquarters. There are more than 150 structures, of which 105 are operating. There are 55 general retail shops, 13 furniture workshops, ten hotels, four bars, three posho mills, one post office, and one hardware store. Monthly rents for these shops range from Ksh. 200 to 350. The bars rent from Ksh. 400 to 900 per month. An acre of land costs between Ksh. 1,000 and 2,000, but it depends on the individual case.

There are two primary schools, one secondary school, and a church in the impact area. About ten percent of the students come from outside the impact area. There is an Adult Education Programme at one of the primary schools. Ninety percent of the population lives in temporary, traditional housing, which cost Ksh. 500 in this area. Seven percent live in semi-permanent houses, which cost more than Ksh. 20,000, depending on size.

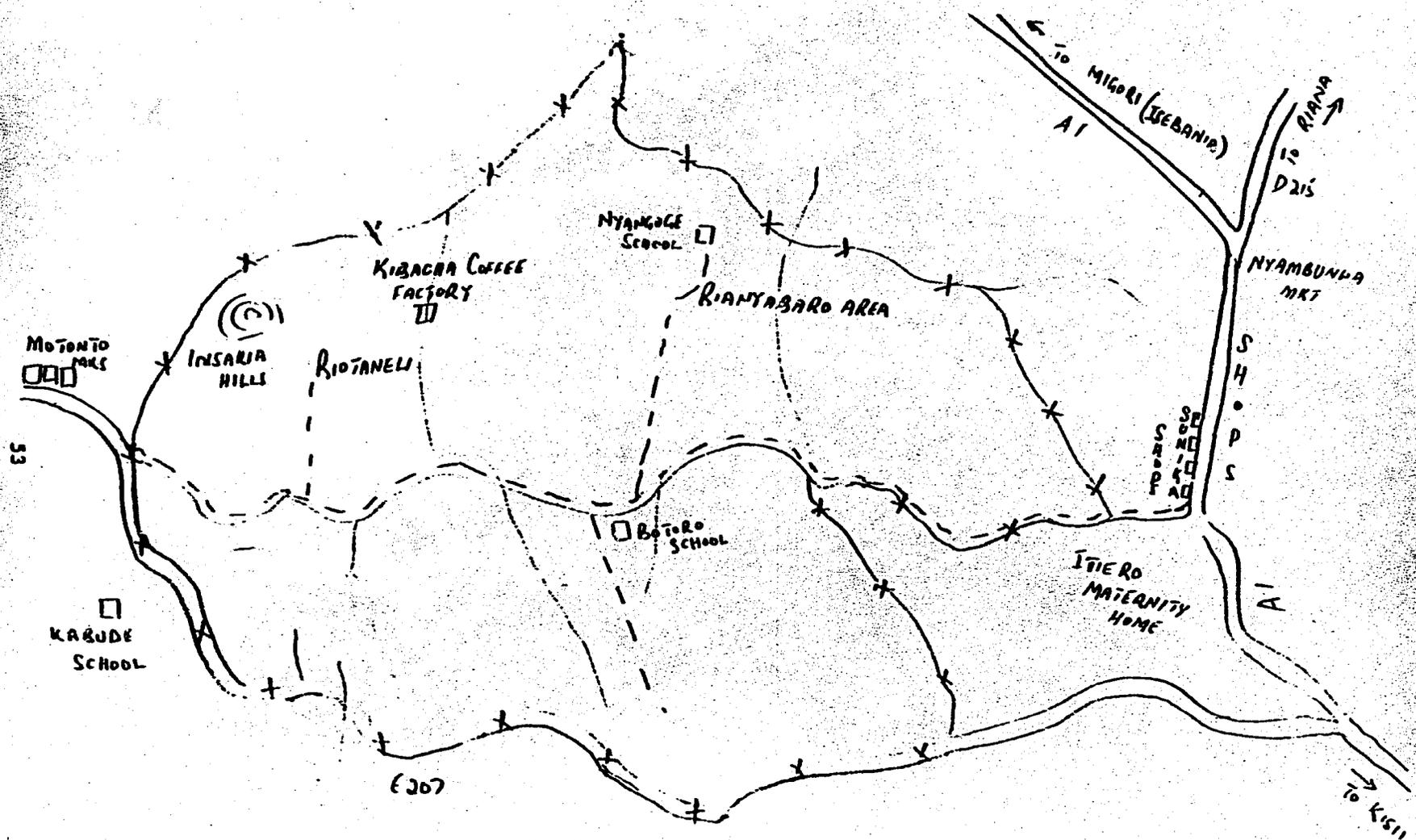
Before the construction of the road, people carried food to and from the market on their heads and backs and sometimes used donkeys and bicycles. There are no bridges or culverts on the road; vehicles on the road include pickups, cars, and trucks. The road is most heavily used on market days. The construction of the road has led to the cultivation of cash crops and the introduction of modern farming techniques.

6. Kisii

This area is situated approximately six km. southwest of Kisii (Map 8, p. 53). It extends from Sunika (also known as Itiero) market southward to Motonko market, a distance of roughly 20 km.², or 900 ha. The region ranges from approximately 5,000 to 9,000 ft. above sea level.

The soil of this impact area is generally rich red clay. The terrain consists of deeply indented valleys, scattered hills, and fast-flowing streams. The mean annual rainfall varies between 1,016 and 2,286 mm. and is very well distributed throughout the year. Most of the rainfall occurs in the afternoon. There are no distinct long and short rains. The mean maximum annual temperature varies from 25° C to 30° C, and mean minimum temperature from 10° C to 18° C. Floods are generally precluded by natural drainage into streams. The groundwater table is approximately 30 m. below the surface and can be reached with traditional means of well construction. Streams are approximately two km. apart, and hillsides are steep, making drinking water difficult to obtain. There are no significant salinity problems.

Rich soil and good rains provide for good banana, sugarcane, vegetables (tomatoes, beans and peas), and maize crops. An 18-kilogram



Map 8: Kisii District Rural Access Road No. 9 impact study area

(kg.) container of maize can be sold here for Ksh. 30; whereas the government-controlled price is Ksh. 18 for the same amount. The area is particularly renowned for its bananas, which are exported to Kisumu, Nakuru, Nairobi and Mombasa. Coffee is also grown for exportation. An average coffee farmer can sell more than 1,500 kg. of coffee per two acres per annum. There is only one coffee factory in the area, but it is sufficient for the small farms' needs. Due to the dense population, farms range from one to three ha. in size. There is small-scale dairy farming, with cattle tied to pegs to graze. There is no settlement scheme in the area; land is purely owner-occupied.

There are neither trading centres nor markets in the area. The residents use two markets, both located just outside the impact area. Both markets are a great distance for people in the centre of the area. The Sunika market is located at the junction of the main road and the R.A.R. Of 132 structures, 73 are operating. There are 43 general retail shops, nine hotels, seven butcheries, six tailoring shops, four bars, three carpenter shops, a record shop and a herbalist shop. Most of these are rented, and monthly rents range from Ksh. 35 for a small shop to Ksh. 400 for the largest. Incomes range from Ksh. 200 per month for a small bar, and Ksh. 600 for a bar with lodging accommodations. Average monthly incomes range from Ksh. 600 to 800. There are about ten people from the impact area who own shops in the Sunika market. Its market days are Wednesdays and Sundays.

The Motonto market is located at the opposite end of the R.A.R. Its market days are also Wednesdays and Sundays. There are about 43 structures, of which only 18 are in operation. There are ten general retail shops, two tailoring shops, two hotels, two posho mills, one

butchery, and one bar. The rents range from Ksh. 40 for a small hotel to Ksh. 100 for a bigger shop. Most are being run by the owners, 75 percent of whom come from within the impact area. Building costs range from Ksh. 2,800 for an iron-walled shop to Ksh. 14,000 for a "permanent" shop. These were built in 1971, through a loan from the County Council.

Within the impact area are two primary schools. They are quite a distance for many students of the impact area. Just outside the area are a private health centre and two primary schools, one of which is a day school; the other a boarding school. There are four development programmes in the area: an adult education programme at Botoro Primary School; a nursery school at Insariattius; a dispensary at Riocanch; and cattle dipping at Rianyabaro. Extension officers come regularly to supervise these development programmes. There is no credit programme. There is a Farmer's Cooperative Society, which deals mainly with coffee crop.

There are fewer means of transport and communication in this area than in others. The only telephone and electric lines run to the coffee factory, which has its own generator. There are no roads leading to the farms; only dirt tracks. Modern farm equipment is difficult to deliver. Women, children, and sometimes men carry bunches of bananas, sugarcane, chickens, and eggs on their heads and backs to market. Many trips are needed to carry all the produce to be sold. People go to work outside the impact area on non-market days in great numbers.

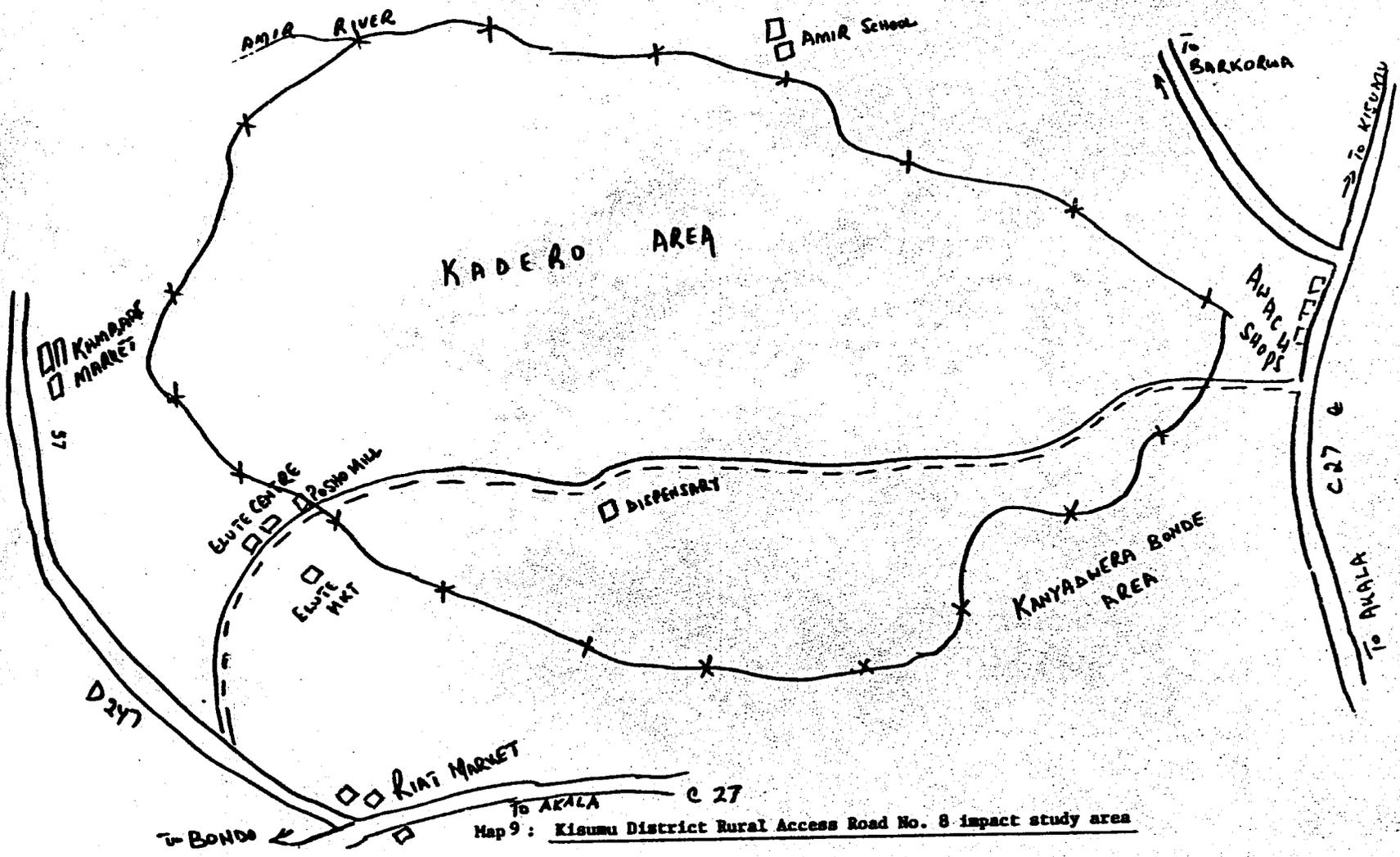
Since the Sunika market is developing at an extremely rapid pace, the major impact of the rural access road may be in making access to

this marketplace much easier, as well as in integrating the activities of the impact area with the trading sector. Greater concentration on coffee production is also expected as a result of the road being in place.

7. Kisumu.

This impact area is situated approximately 30 km. west of Kisumu (Map 9, p.57). It extends from the C27 classified road at Awach to Nayalunya School at the boundary of the Kisumu and Maseno districts, a distance of almost seven km. The total area is 675 ha. The land rises gently from the lake level of 1,140 m. at the Kano Plain to approximately 1,520 m. in the north at Maseno. Streams flow year round. The soil is generally sandy loam and red clay, except for the upper region towards Nydunya which has residuals of brown volcanic soil. Average annual maximum temperatures vary between 25° C and 30° C, and average minimum temperatures between 9° C and 18° C. With a population of 785 it is the most densely populated of the seven road impact areas.

Average annual rainfalls vary with altitude, the lakeshore areas showing a lower average annual rainfall. Maximum average annual rainfall is 1,524 mm., and the minimum is 1,016 mm. One-half of the total annual rainfall occurs between March and May. The second, smaller rainy season takes place during September, October and November. Flooding does not occur due to the presence of streams which drain the area, and the lack of plains. Groundwater can be reached with traditional methods of well construction, but the quantity of available water is insufficient, due to the distances which must be traveled in order to obtain it. Slow-moving streams constitute a further problem,



Map 9: Kisumu District Rural Access Road No. 8 impact study area

There are no major cash crops in this area due to underdevelopment. Families have an average of eight acres, only one of which is under cultivation, according to one source. Small quantities of mangoes and sometimes sugarcane and bananas are sold in Kisumu, but the remainder of these and maize, sweet potatoes, groundnuts and tomatoes are consumed at home. Any surplus is sold to generate income to purchase other household items. Some families keep cows to sell for school fees, provisions, and for dowries. One source reported an average of six cows per household. The main staple is ugali (porridge), sometimes mixed with dried cassava, fish or vegetables.

The Awach Market is situated at the intersection of the Bondo/Kisumu road and the R.A.R. It is the only market in the impact area. Its market days are Tuesdays and Thursdays. The attendance at this market is relatively low, between 800 and 1,000 people. Of 17 structures, only 11 are open, due to lack of business. There are seven general retail shops, two hotels, a butchery, and a bakery. Monthly rents vary according to size from Ksh. 40 to 200. One hotel is rented for Ksh. 60 per month. The other is run by its owner, who built it in 1975 through a loan from the County Council. One source mentioned that any monthly income must be returned to these shops to remain in operation. Seventy-five percent of the shop owners live within the impact area.

Kambare market is located four km. to the north, outside of the impact area. The majority of the residents of the impact area patronize this market, whose market days are Tuesdays and Thursdays. Its maximum attendance is between 1,500 and 2,000 people. Of 23 structures, ten are operating. The others are closed for no apparent

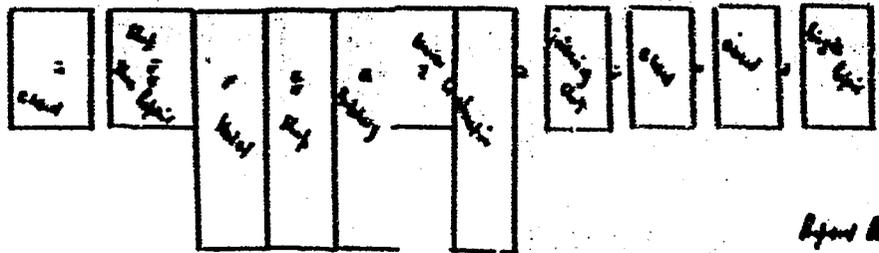
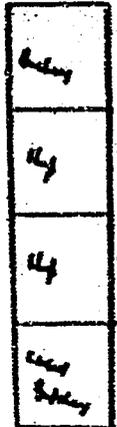
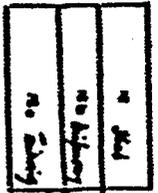
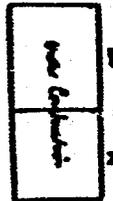
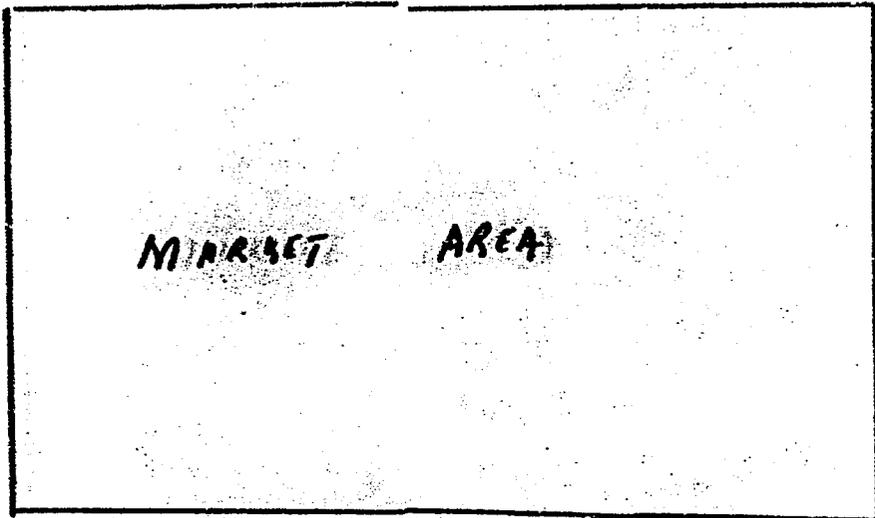
reason, or are under construction. There are four retail shops and two butcher shops which alternately operate two weeks per month; they slaughter two cows per week. The monthly rents range from Ksh. 40 to 120. The shop owners' monthly incomes range from Ksh. 600 to 3,000, depending on the shop. The building loans came from the County Council in 1943. One butcher shop cost Ksh. 15,000 to build in 1973. Three shop owners in this market come from the impact area.

The Mirieri (Riat) market is located to the southeast of the impact area. It is small and not very important to the residents of the impact area. Of its 25 structures, only seven are operating. The others are closed due to a shortage of operating capital among shop operators. Monthly rents range from Ksh. 40 to 200, with income ranging from Ksh. 400 to 1,000 (see Maps 10 and 11).

There are two schools within the impact area, a primary school and a nursery school. Children not enrolled in these schools attend nearby schools outside the impact area. A site for an Adult Education Programme is soon to be chosen. Some attend the Adult Education Programme at Bondo. At the time the study was made, there was no provision for the delivery of health care services to area residents, but a proposal for a dispensary was being considered. Malaria is a problem in the area. People travel to Riat or Akala for health services. There is no credit programme, nor a settlement scheme in the area. The Kombewa Farmers' Society serves the residents of the impact area.

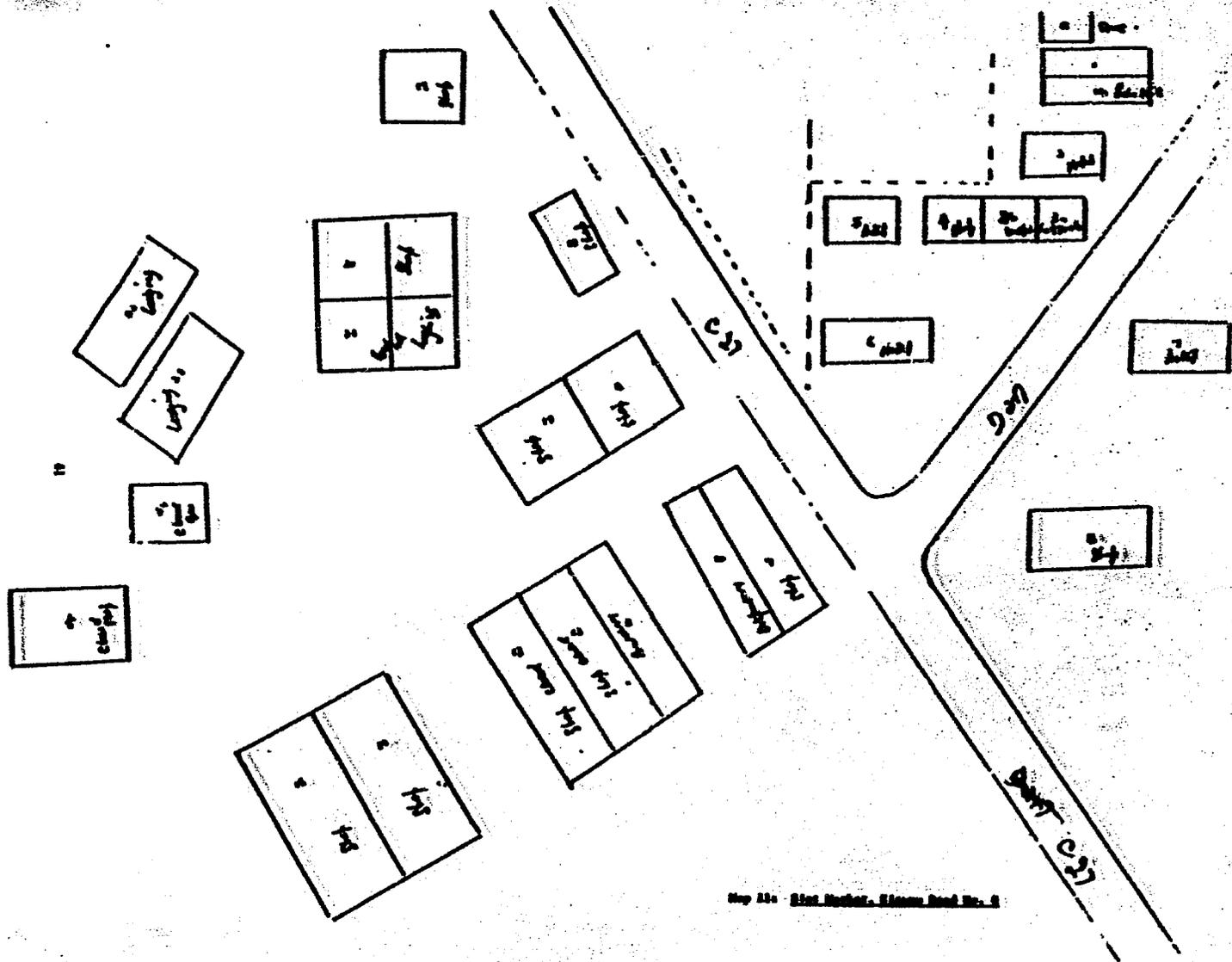
The Kisumu access road is approximately seven km. long. It turns off the Kisumu/Bondo road a few meters west of Awach Market. Although the road can be traveled by motorized vehicles, there is no reported vehicle movement, with the exception of one medium-sized truck which

Map No. Eastern Sector, Sierra Base No. 2



Byrd Base





Map 11 - Site Plan, 11th Street, No. 1

transports sand to Nduru Primary School, and two light vans. There are no buses, and people must walk to Awach to find adequate transport. Donkey-pulled carts are used to transport goods to and from market, and water vessels to and from rivers.

As residents of this area have already had access to many markets and to a reasonably well-developed classified road network in close proximity, it is difficult to pinpoint what further developments may result from the rural access road.

III. DATA BASE AND COLLECTION PROCEDURES

The data utilized in this report originate from two sources:

(1) farm surveys implemented in seven road impact areas by the Central Bureau of Statistics (CBS), Ministry of Economics Planning and Development; and (2) Traffic and Community Inventory Surveys implemented in the same areas by the Ministry of Transport and Communications (MOTC). The details of the impact study design as well as different procedures of data collection can be found in the Government of Kenya MOTC Report, A Modified Framework for the Impact Study to Monitor and Evaluate Rural Roads Falling Under the Rural Access and the Graveling, Bridging and Culverting Programmes, July 1980.

A. CBS Farm Surveys

CBS farm surveys were initiated in February 1979 in seven rural access road impact areas. The farm surveys aim at establishing the changes that relate to:

- o household size, composition and structure
- o size of land and livestock holdings, and of other assets
- o cropping, marketing and consumption patterns
- o non-farm activities
- o road use
- o nutrition and health status.

A total of 120 households were randomly selected in each of the impact areas for the seven rural access roads located in seven different districts of Western and Nyanza provinces (See Map 1, p. 27). As indicated in Table 4 the sample included different percentages of households in each impact area, covering in Kakamega 100 percent of all households and in Bungoma, less than 50 percent.

Of the 120 households included in the sample, 60 were within $\frac{1}{2}$ km. of the rural access road while the other 60 were more than $\frac{1}{2}$ km. from it. This was in practice the case for five of the roads, namely Kisii road 9, South Nyanza road 7, Kisumu road 8, Siaya road 1 and Busia road 4. Due to the fact that in Kakamega road 6 all of the 109 households were included in the sample, a special stratification was not made; rather, the households were divided into two categories of distance for purposes of analysis, those living within $\frac{1}{2}$ km. of the road and those living between $\frac{1}{2}$ and $1\frac{1}{2}$ km. from the road. In Bungoma road 13, the following stratification was utilized:

- o Stratum 1: 40 households within $\frac{1}{2}$ km. of the road
- o Stratum 2: 40 households $\frac{1}{2}$ - $1\frac{1}{2}$ km. from the road
- o Stratum 3: 40 households more than $1\frac{1}{2}$ km. from the road

This was necessary because the width of the impact area in Bungoma was greater than in the other areas.

All questionnaires, with the exception of the Nutrition Module, were administered to all households sampled. In accordance with

Table 4: Sample population and sample size by road,
number of households and distance to road

	<u>Total households</u>	<u>Sample households</u>	<u>Monthly¹</u>	<u>Quarter 1²</u>	<u>Quarter 2</u>	<u>Quarter 3</u>
Siaya						
½ km.	179	59	15	14	15	15
½-1½ km.	179	59	15	15	14	15
1½ km. +	---	---	---	---	---	---
Total	<u>358</u>	<u>118</u>	<u>30</u>	<u>29</u>	<u>29</u>	<u>30</u>
Busia						
½ km.	142	60	15	14	16	15
½-1½ km.	147	62	16	15	16	15
1½ km. +	---	---	---	---	---	---
Total	<u>289</u>	<u>122</u>	<u>31</u>	<u>29</u>	<u>32</u>	<u>30</u>
Kakamega						
½ km.	98	58	15	15	14	14
½-1½ km.	51	51	12	13	13	13
1½ km. +	---	---	---	---	---	---
Total	<u>109</u>	<u>109</u>	<u>27</u>	<u>28</u>	<u>27</u>	<u>27</u>
S. Nyanza						
½ km.	60	60	15	15	15	15
½-1½ km.	61	61	15	15	15	15
1½ km. +	---	---	---	---	---	---
Total	<u>290</u>	<u>121</u>	<u>31</u>	<u>30</u>	<u>30</u>	<u>30</u>
Kisumu						
½ km.	95	60	15	15	15	15
½-1½ km.	95	60	15	15	15	15
1½ km. +	---	---	---	---	---	---
Total	<u>190</u>	<u>120</u>	<u>30</u>	<u>30</u>	<u>30</u>	<u>30</u>
Kisii						
½ km.	127	60	15	15	15	15
½-1½ km.	127	60	15	15	15	15
1½ km. +	---	---	---	---	---	---
Total	<u>254</u>	<u>120</u>	<u>30</u>	<u>30</u>	<u>30</u>	<u>30</u>
Bungoma						
½ km.	128	42	11	11	10	10
½-1½ km.	122	40	10	11	10	9
1½ km. +	122	40	10	10	10	10
Total	<u>372</u>	<u>122</u>	<u>31</u>	<u>32</u>	<u>30</u>	<u>29</u>
GRAND TOTAL	<u>1862</u>	<u>832</u>	<u>210</u>	<u>208</u>	<u>208</u>	<u>206</u>

¹Households interviewed once a month

²Households interviewed every three months

procedures adopted by the National Nutrition Survey, the Nutrition Module was administered to those members of households whose ages ranged between six and 60 months.

Questionnaires dealing with household size and composition, livestock and assets, and landholdings (Forms E/S.1, E/S 2.3, E/S.6, and NUT-1 in Annex 6) were administered to all households sampled once a year starting in February 1979. Forms E/S.3, E/S.4, E/S.5, and E/S.6 (also in Annex 2) were administered periodically. Thirty households from each road were selected for purposes of monthly interviews. The remaining 90 households were divided into three groups to be interviewed every three months. For purposes of presentation, the data collected monthly were pooled with data collected quarterly corresponding to the appropriate months. For instance, unless otherwise indicated, "1st Quarter" data consists of data gathered from the same 30 households interviewed in each road during June, July, and August of 1979 plus the data gathered from those households visited every three months that were interviewed for the first time during the particular months named above.

Several problems have emerged in the collection and analysis of these data as follows:

- o Because households are being interviewed monthly and quarterly two resident enumerators are employed per road area. This procedure is not only expensive but also involves a great deal of supervisory effort. The analysis of these two different sets of data is cumbersome as the differences in the modes of collecting information make any interpretation difficult. Thus, subsequent to an analysis comparing the reliability of information gathered monthly as opposed to quarterly, the Central Bureau of Statistics has recommended the discontinuation of quarterly data collection. Future periodic data on these seven roads as well as those to be included in CBS farm surveys will be based upon monthly interviews.

- o Data verification involves a rather lengthy period which delays analyses and often requires verifications in the field. As a result, although 1980 second baseline data on all roads are available, and computer and hand verifications have been completed, a new verification in the field has become necessary. Thus, the second baseline data on these roads, which might have yielded some changes in household structure, livestock and assets, as well as holdings and cropping areas, cannot be comprehensively presented.

B. MOTC Traffic and Community Inventory Surveys

The Traffic and Community Inventory Surveys were implemented in March 1979 in all seven road impact areas covered by CBS. They were repeated in November 1979. In August 1980, Traffic Surveys were conducted in six of these road impact areas; another Traffic Survey will be carried out on all roads in November 1980 (See Chapter VI).

The Traffic Surveys aim at measuring changes in the volume of vehicle and pedestrian traffic on the roads both before and after their construction.

The Community Inventory Surveys aim at establishing the changes in the access to local infrastructure and to the services provided by local schools, health centres and stores to residents of the relevant impact areas.

All seven roads covered by CBS surveys are included in the Traffic Surveys. Community Inventory Surveys were administered to schools, health centers and duka stores within the impact areas in 1979. In 1980 an attempt was made to cover infrastructure "near" the impact areas to which the area residents could have relatively easy access.

The method utilized in Traffic Surveys was modified in 1980 to reduce costs. During 1979 the traffic on roads was measured during five consecutive week days. The enumerators stood at a point two km. from what was thought to be the "main linkage" of the rural access road. In 1980 traffic was counted only on two days, a market and a non-market day, on both sides of the roads.

IV. BASELINE DATA

This chapter summarizes the baseline survey findings for the seven roads included in the impact study. The information used is drawn from a series of observations taken by enumerators in each of the road impact areas. Some of this information is drawn from annual observations, some from quarterly observations and the remainder from monthly observations. Wherever possible, monthly and quarterly data were combined to help eliminate seasonality and to create a more representative composite baseline (rather than a baseline at one particular point in time).

The data that follows includes information by road impact area, by male- and female-headed households, by distance of households from the road, by tenure,¹ and by self-employed and non-self-employed farmers. The baseline information for impact areas is treated in several categories--household information, livestock, structures and assets, etc. These categories also are used in analyzing the cross-sectional categories to the extent they are appropriate and data is available.

As noted in the introduction to this report, while the baseline data being collected is to serve a variety of purposes, its major uses will be to determine the benefits of each road, the incidence of these benefits on various socio-economic groups, the economic value of the road project, and some of the more important costs and benefits that fall upon various households in the impact area(s).

A. By Impact Area

1. Household information

Data on the individuals living in the households primarily within the impact areas have been collected on a number of variables including size and composition of households, heads of households by sex and age, educational attainment of residents and distribution of population by place of birth.

a. Average size and composition of households

Table 4a indicates the composition of the households in each road impact area. A total of 1,795 households are located in the impact areas of the seven roads being considered. There is a substantial difference in the number of households in each of the road impact areas. For example, over three times as many households can be found in Siaya as in Kakamega. The number of persons in all households is 10,931. The average number of persons per household varies considerably, however, with households in Siaya having only half as many people per household as do households in either Busia or Kakamega. As is the case in many developing countries, the population is basically young with nearly half the people in each household being children who are under 15 years of age.

b. Head of households by sex and age

The total number of household heads in the seven road impact areas is 1,802. Of this total, 1,385 (77 percent) are male and 417 (23 percent) are female (See Table 5). There is a wide difference in the percentage of female-headed households between road

Table 4a: Average size and composition of household

<u>Impact area</u>	<u>Number of households</u>	<u>Total household members</u>	<u>Total children under 15 years in household</u>		<u>Average number of people per household</u>	<u>Average number of children per household</u>
			<u>No.</u>	<u>%</u>		
Bungoma	351	2497	1285	52	7	4
Busia	280	2291	1134	50	8	4
Kakamega	106	836	411	49	8	4
Kisumu	180	680	369	54	4	2
Kisii	242	1231	612	50	5	3
South Nyanza	278	1994	917	46	7	3
Siaya	<u>358</u>	<u>1403</u>	<u>557</u>	<u>40</u>	<u>4</u>	<u>2</u>
TOTAL	<u>1795</u>	<u>10931</u>	<u>5285</u>	<u>48</u>	<u>6</u>	<u>3</u>

Table 5: Sex and age of head of household

Impact area	Age:		15-19		20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60+		Total		Female as percentage of total (Z)
	Sex:		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Bungoma			-	-	18	-	21	6	55	3	37	-	37	6	31	6	31	9	31	3	61	-	322	33	9
Busia			-	-	7	5	9	7	14	12	31	17	14	7	24	2	40	2	31	2	54	2	224	56	20
Kakamega			-	-	2	2	13	1	14	-	8	3	6	2	11	2	5	4	8	1	24	-	91	15	14
Kisumu			2	-	3	2	11	6	3	3	8	6	11	13	14	9	21	-	8	6	33	16	114	66	37
Kisii			4	3	19	-	38	-	34	2	21	4	23	6	15	4	25	2	8	4	31	4	218	25	10
S. Nyanza			-	-	-	-	2	-	12	-	19	-	19	5	55	12	26	14	17	5	77	14	227	49	18
Siaya			-	-	6	3	-	3	6	15	12	18	3	21	3	21	24	21	21	6	112	61	187	169	47
TOTAL			<u>6</u>	<u>3</u>	<u>55</u>	<u>12</u>	<u>94</u>	<u>23</u>	<u>138</u>	<u>35</u>	<u>136</u>	<u>48</u>	<u>113</u>	<u>60</u>	<u>153</u>	<u>56</u>	<u>172</u>	<u>52</u>	<u>124</u>	<u>27</u>	<u>392</u>	<u>97</u>	<u>1383</u>	<u>413</u>	<u>30</u>

impact areas. In Bungoma, they constitute only nine percent of total households, while in Siaya they account for 47 percent of all household heads.

The percentage of female heads of households in different age categories is also shown in Table 5. The percentage of female head of households tends to increase in the higher age categories.

c. Population distribution by educational attainment

Table 6 shows the number of persons in each impact area who have attained certain levels of education. Of the 11,020 persons considered, 6,262 were too young to have been eligible for formal education. There were 4,758 persons eligible for education in terms of age; of this total, 50 percent received some education. Various levels of Standards 1 through 8 were reached by 41 percent (1,962) of those eligible for education. Form 1 through 6 attainment was achieved by 372 persons (7.8 percent of those eligible). Of this 372, seven achieved Form 5-6 level.

The percentage of those in each impact area who are eligible and who attained some formal education is as follows:

<u>Road impact area</u>	<u>Percentage of population formally educated</u>
Bungoma	49
Busia	48
Kakamega	65
Kisumu	38
Kisii	55
South Nyanza	69
Siaya	38

Table 6: Population distribution by educational attainment
(percentages)²

<u>Impact area</u>	<u>Total population</u>	<u>STD 1-3</u>		<u>STD 4-8</u>		<u>FORM 1-2</u>		<u>FORM 3-4</u>		<u>FORM 5-6</u>		<u>Other education</u>		<u>Never attended</u>		<u>Not applicable</u> ¹	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Dungoma	2497	168	7	204	8	43	2	15	1	-	-	-	-	458	18	1609	64
Busia	2285	95	4	310	14	28	1	43	2	-	-	-	-	518	23	1291	56
Kakamega	836	34	4	114	14	29	4	22	3	3	-	8	1	112	13	514	61
Kisumu	782	33	4	85	11	8	1	11	1	-	-	-	-	226	29	419	54
Kisii	1229	82	7	154	13	4	-	49	4	2	7	-	-	234	19	704	57
S. Nyanza	1994	182	9	271	14	26	1	36	2	2	-	-	-	374	19	1103	55
Siaya	<u>1397</u>	<u>52</u>	<u>4</u>	<u>178</u>	<u>13</u>	<u>27</u>	<u>2</u>	<u>24</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>12</u>	<u>1</u>	<u>482</u>	<u>34</u>	<u>622</u>	<u>44</u>
Total	<u>11020</u>	<u>646</u>	<u>6</u>	<u>1316</u>	<u>12</u>	<u>165</u>	<u>1</u>	<u>200</u>	<u>2</u>	<u>7</u>	<u>-</u>	<u>20</u>	<u>-</u>	<u>2404</u>	<u>22</u>	<u>6262</u>	<u>57</u>

¹"Not applicable" applies to those persons in each area who were too young to have been eligible for formal education.

²Percentages may not total exactly 100 percent due to rounding.

³The discrepancies in population for certain impact areas are a result of both sampling and weighting procedures and data problems.

The data for the number and percentage of those in the "never attended" category in Table 6 are not complete. They do indicate, as would be expected, that the older people are the largest group within the impact areas who have never attended school. Those in the younger age categories are mostly school attendees. Consequently, while it is possible for new rural roads to impact on school attendance, it is not likely that the roads being considered here will have a major impact on this variable.

d. Distribution of population by place of birth

Table 7 shows the birth place of those persons who now reside in the impact areas of the roads being considered as a percentage of the population born within the impact area, within the same district in which the road is located but outside the road impact area, or outside the district in which the road is located. Seventy-six percent of those now residing in the impact areas were born in the impact area. Another 15 percent were born outside the impact area but within the district in which the road is located. Thus, despite the fact that the roads are very near district borders (See Map 1, page 27) over 90 percent of the population was born in the same district where the road has been built indicating that the population is not very mobile. Only eight percent of the residents in the impact area were born outside the districts where the roads are located.

2. Livestock

Table 8 indicates the type and number of different kinds of livestock held by households in each road impact area. Three road

Table 7: Distribution of population currently living within impact area by place of birth

<u>Impact area</u>	<u>Total population</u>	<u>Born in</u>							
		<u>Impact area</u>		<u>District but outside impact area</u>		<u>Another district</u>		<u>Not stated</u>	
		<u>No.</u>	<u>(%)</u>	<u>No.</u>	<u>(%)</u>	<u>No.</u>	<u>(%)</u>	<u>No.</u>	<u>(%)</u>
Bungoma	2497	2184	88	225	9	61	2	27	1
Busia	2291	1728	75	278	12	263	12	22	1
Kakamega	836	576	69	221	27	37	4	2	-
Kisumu	680	432	64	53	8	193	28	2	-
Kisii	1230	1149	93	81	7	—	—	—	—
South Nyanza	1994	1510	76	326	16	149	8	9	-
Siaya	<u>1403</u>	<u>830</u>	59	<u>415</u>	30	<u>158</u>	11	—	—
TOTALS	<u><u>10931</u></u>	<u><u>8409</u></u>	76	<u><u>1598</u></u>	15	<u><u>861</u></u>	8	<u><u>62</u></u>	1

Table 8: Improved livestock by road impact area

A) Improved cattle

<u>Impact area</u>	<u>Improved bulls over 3 years</u>	<u>Improved bulls 1-3 years</u>	<u>Improved bulls under 1 year</u>	<u>Improved steers over 3 years</u>	<u>Improved steers 1-3 years</u>	<u>Improved steers under 1 year</u>	<u>Improved cows</u>	<u>Improved heifers</u>	<u>Improved female calves</u>	<u>Improved oxen</u>	<u>Improved cattle TOTAL</u>
Siaya	0	0	0	0	0	0	0	0	0	0	0
Busia	0	0	0	0	0	0	0	0	0	0	0
Kakamega	0	4	2	0	1	1	16	20	4	3	51
S.Nyanza	0	2	0	0	0	0	17	12	7	0	38
Kisumu	0	0	0	0	0	0	0	0	0	0	0
Kisii	0	0	2	6	2	0	4	0	0	0	14
Bungoma	104	76	88	0	0	43	320	165	131	92	1037
TOTALS	<u>104</u>	<u>82</u>	<u>92</u>	<u>15</u>	<u>12</u>	<u>44</u>	<u>357</u>	<u>197</u>	<u>142</u>	<u>95</u>	<u>1140</u>

B) Unimproved cattle and other livestock by road

<u>Impact area</u>	<u>Unimproved cattle totals</u>	<u>Number of total sheep</u>	<u>Number of total pigs</u>	<u>Number of donkeys</u>	<u>Number of chickens</u>	<u>Number of total goats</u>
Siaya	837	239	0	0	2763	252
Busia	1612	196	71	0	3443	220
Kakamega	763	106	0	0	1508	32
S. Nyanza	1046	247	0	0	3792	434
Kisumu	400	158	9	6	1127	125
Kisii	538	146	0	0	1525	168
Bungoma	900	561	0	27	2461	305
TOTALS	<u>6096</u>	<u>1653</u>	<u>80</u>	<u>27</u>	<u>16,619</u>	<u>1526</u>

areas--Busia, Kisumu, and Siaya--have no improved cattle. In contrast, Bungoma has more than 1000 head. The other three road areas have relatively small cattle holdings. These differences in amount of improved cattle held can in part be attributed to the difference in size of populations in the various road impact areas. For example, Bungoma, which has the largest population, also has the largest number of improved cattle. Kisumu, on the other hand, which has the smallest population has no improved cattle. Improved bulls make up 24 percent of the total; improved oxen account for eight percent and female stock for 61 percent. Steers comprise six percent of all improved cattle.

Unimproved livestock is also indicated in Table 8. Busia and South Nyanza lead in numbers of unimproved cattle with 1,612 and 1,046 head respectively. The number of sheep, hogs, donkeys, chickens, and goats is also shown in the Table. When the impact areas are taken collectively, the average number of chickens per person is just over 1.5. The average number of cows per person is just under 0.67.

3. Structures and assets

a. Structures by type

The type and number of structures present in each road impact area are shown in Table 9. Only two percent (73) of the residential structures in the impact areas are permanent; eight percent (328) are semi-permanent and 90 percent are of traditional construction. There are, on average, 2.19 residential structures per household and 2.82 persons per structure. Various animal shelters are more prominent in absolute and relative (per household or per animal) terms in Busia and Siaya than in other impact areas.

Table 9: Inventory of structures classified by type and impact area

Impact area	Total number	Type of structure											
		Domestic permanent		Domestic semi-permanent		Domestic traditional		Animal shelter		Stores		Other	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bungoma	1180	00	—	34	3	772	65	55	5	295	25	24	2
Busia	1171	2	—	24	2	863	74	116	10	38	3	128	11
Kakamega	461	7	2	20	4	336	73	15	3	41	9	42	9
Kisumu	336	5	1	38	11	232	69	17	5	60	—	44	13
Kisii	908	6	1	95	10	428	47	35	4	300	33	44	5
S. Nyanza	702	26	4	45	6	583	83	5	1	00	—	00	—
Siaya	<u>823</u>	<u>27</u>	<u>3</u>	<u>72</u>	<u>9</u>	<u>309</u>	<u>38</u>	<u>106</u>	<u>13</u>	<u>00</u>	<u>—</u>	<u>318</u>	<u>39</u>
Total	<u>5581</u>	<u>73</u>	<u>1</u>	<u>328</u>	<u>6</u>	<u>3523</u>	<u>63</u>	<u>349</u>	<u>6</u>	<u>674</u>	<u>12</u>	<u>600</u>	<u>11</u>

b. Implements and equipments

Table 10 shows implements and other equipment owned by households in the impact areas. The number of households per item for selected items are:

<u>Item</u>	<u>No. households per item</u>
radio	3.30
bicycle	4.37
paraffin lamps	1.46
plough	4.35

The range in numbers of households per item for each of these items is wide between impact areas. In the case of bicycles, for example, it varies from one bicycle per 2.52 households in Kakamega to one bicycle per 8.18 households in Kisumu.

4. Tenure

a. Ownership of land

The ownership of land by size of holding in each impact area is shown in Table 11. Overall, 58 percent of the households own less than 2.0 hectares. Eleven percent of the households own more than 5 hectares. Large landholdings are prominent in Kakamega, Busia and Bungoma.

b. Land area cropped

The land area actually cropped per household is shown in Table 12. Of the total cropped area, 78 percent is owned or partially owned² and two percent is rented. The type of ownership of 20 percent of the crop area was not stated. The total area cropped per household varies significantly between road impact areas. More than eight

Table 10: Ownership of implements and equipment

Impact Area	Number					Number of households	Per household				
	Ploughs	Wheel-barrowa	Bicycles	Radio	Lamps		Ploughs	Wheel-barrowa	Bicycles	Radio	Paraffin lamps
BUNGOMA	131	15	52	106	155	351	.40	.04	.15	.30	.44
BUSIA	59	19	105	83	208	280	.21	.07	.38	.30	.74
KAKAMEGA	71	12	44	67	121	111	.64	.12	.40	.40	1.10
KISUMU	14	15	22	33	101	180	.08	.08	.12	.18	..56
KISII	13	11	2	86	68	242	.05	.04	.01	.36	.28
S.NYANZA	117	31	72	101	288	278	.42	.11	.26	.36	1.03
SIAYA	9	42	115	69	294	358	.02	.11	.32	.19	.82
TOTAL	<u>414</u>	<u>145</u>	<u>412</u>	<u>545</u>	<u>1235</u>	<u>1800</u>	<u>.23</u>	<u>.08</u>	<u>.27</u>	<u>.30</u>	<u>.68</u>

Table 11: Percentage of households owning given sizes of landholdings

Impact area	Size categories in hectares										Percent		
	0.0-0.4 %	0.5-0.9 %	1-1.9 %	2-2.9 %	3-3.9 %	3-4.9 %	5-5.9 %	6-6.9 %	7-7.9 %	8 + %	0.0-1.9 Ha.	2-4.9 Ha.	5 & above Ha.
Bungoma	19	14	23	16	13	2	1	1	1	10	56	31	13
Busia	1	4	29	16	13	11	7	3	4	12	34	40	26
Kakamega	1	5	12	23	15	7	8	6	6	17	18	45	37
Kisumu	26	17	36	12	7	2	-	-	-	-	79	21	-
Kisii	14	11	21	27	17	5	1	2	1	1	46	49	5
S. Nyanza	37	16	30	4	4	4	1	1	-	3	83	12	5
Siaya	19	27	25	20	6	2	-	-	-	1	71	28	1

Table 12: Average size of households cropping area (in m²)

Impact area	Area owned	Area partially owned	Area rented	Area not stated	Total cropping area	Number of households	Average Size (m ²)				Total area
							Area owned	Area partially owned	Area rented	Not stated	
Bungoma	50993	673	22753	31	74450	351	145	2	65	—	212
Busia	290100	—	—	—	290100	280	1036	—	—	—	1036
Kakamega	152830	10580	—	—	163410	106	1442	100	—	—	1542
Kisumu	33183	844	—	—	34027	189	184	5	—	—	189
Kisii	11156	—	—	207482	218638	242	46	—	—	857	903
S.Nyanza	157584	—	—	—	157584	278	567	—	—	—	567
Siaya	94205	5035	—	—	99240	358	263	14	—	—	277
TOTAL	790051	17127	22753	207513	1037449	1795	440	10	12	116	578

¹10,000 m²=one hectare

times as much area is cropped per household in Kakamega, for example, than in Kisumu. In part this reflects the different size holdings per household in the various impact areas. Kakamega landholdings per household are much larger than Kisumu's, for example. It also is a result of the type of agriculture carried out, the land area in the impact area that is actually being used, and the total area within the impact boundaries.

c. Structure of land tenure for area cropped

Table 13 shows the tenure patterns for cropped area in each of the seven road impact areas. Total area is 1.037 km.² ³ (103.7 ha.). Of this amount, 807,178 km.², (or 79 percent) is owned or partially owned while 22,753 are rented. Only in Bungoma is a substantial amount of land rented.

d. Crop area distributed by tenure system and number of plots

The crop area in the seven road impact area is distributed by both number of plots per household and tenure system in Table 14. Very little cropped area is rented. Substantial variation occurs in the crop area owned by number of plots in some road impact areas, although not in all of them. Thus, in Bungoma, 81 percent of the crop area is found in one-plot holdings, and only one percent in more than three-plot holdings; in Busia, 29 percent of cropped area is held in one plot, while 37 percent of the total cropped area is held in more than three plots. Viewed together, however, the distribution of total cropped area holdings by number of plots is fairly similar. Thirty-two percent is held as one plot, 25 percent is held as two plots, 12 percent is held as more than three plots, and 31 percent is held as more than three plots.

Table 13: The structure of tenure system of cropping area
(m²)

<u>Impact area</u>	<u>Total Cropping area</u>	<u>Owner or owner-like tenancy</u>	<u>Partially owner-like or rented tenancy</u>	<u>Rented</u>	<u>Not stated</u>	<u>Percent</u>			
						<u>Owner like</u>	<u>Partially owned</u>	<u>Rented</u>	<u>Not stated</u>
Bungoma	74450	50993	673	22753	31	68	1	31	—
Busia	290100	290100	—	—	—	100	—	—	—
Kakamega	163410	152830	10580	—	—	94	6	—	—
Kisumu	34027	33183	844	—	—	98	2	—	—
Kisii	218638	11156	—	—	207482	5	—	—	95
S. Nyanza	157584	157584	—	—	—	100	—	—	—
Siaya	99240	99205	5035	—	—	95	5	—	—
TOTAL	<u>1037449</u>	<u>790051</u>	<u>17127</u>	<u>22753</u>	<u>207513</u>	<u>76</u>	<u>2</u>	<u>2</u>	<u>20</u>

Table 14: Plots of cropping area distributed by size of plot holding and tenure system

(a²)

Impact area	One-plot holding size				Two-plot holding size				Three-plot holding size				Three-plus plot holdings size			
	Area owner like	Area partially owned	Area rented	Total	Area owner like	Area partially owned	Area rented	Total	Area owner like	Area partially owned	Area rented	Total	Area owner like	Area partially owned	Area rented	Total
Bungoma	388	7	210	604	95	—	18	113	21	—	—	21	7	—	—	7
Busia	831	—	—	831	535	—	—	535	467	—	—	467	1068	—	—	1068
Kakamega	370	35	—	405	220	8	—	228	196	12	—	208	742	52	—	794
Kisumu	155	4	—	159	1047	3	—	1050	47	1	—	48	25	—	24	49
Kisii	410	—	—	410	292	—	—	292	261	—	—	261	154	—	—	154
S. Nyanza	690	—	—	690	341	—	—	341	210	—	—	210	335	—	—	335
Siaya	470	24	—	494	256	11	—	268	163	11	—	174	53	4	—	57
TOTAL	<u>3314</u>	<u>70</u>	<u>210</u>	<u>3594</u>	<u>2786</u>	<u>22</u>	<u>18</u>	<u>2826</u>	<u>1365</u>	<u>24</u>	—	<u>1389</u>	<u>2384</u>	<u>56</u>	<u>24</u>	<u>2464</u>
Percent of total	32	—	2	35	27	—	—	27	13	—	—	14	23	—	—	24

The geographical relationship of these plots to each other is not known from the data available to MOTC. Thus, it is difficult to develop conclusive findings as to the total extent of land fragmentation in the impact areas. It does appear, however, that land is substantially fragmented and that plots are often well dispersed geographically. Such a pattern of land tenure may make it more difficult to absorb some agricultural technologies such as more modern farm implements.

e. Area and number of plots in different crops

The area in the top ten crops by impact area is shown in Table 15. Hybrid maize, beans, and local maize constitute over 76 percent of the area planted in the top ten crops, and account for 75 percent of total cropping surface.

The top ten crops by surface cultivated constitute 98.4 percent of total area farmed. This surface planted represents 911.6 ha. The rather large figure for beans is in contrast to the small number of plots declared by farmers; we must conclude that bean plots are considerably larger than many others. More extensive verification of this (in the field) is required.

Grain crops account for 5,278,422 m.², or 58 percent of area. Food crops are grown on 8,377,584 m.² (92 percent), while cash crops (cotton and groundnuts) are grown on 738,170 m.² (eight percent) of the total cropped area of the top ten crops cultivated.

The percentage of area in cash and food crops in each road impact area can also be calculated from Table 15. Busia has the highest percentage of cropped area in cash crops (27 percent), while Bungoma and Kisumu have the lowest area (0 percent).

The percent of cropped land in grain crops varies substantially

Table 15: Top ten crops by cultivated area
(m²)

Crop type (m ²)	Road Impact Area							Total
	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	
Hybrid maize	0	244,584	275,745	351,302	0	627,029	1,420,126	2,918,786
Beans	183,345	100,547	351,628	287,251	0	320,245	1,255,502	2,498,518
Local maize	401,596	480,856	135,711	405,300	23,487	37,744	63,135	1,547,829
Cotton	10,302	674,810	0	0	0	0	0	685,112
Cassava	15,150	445,920	2,525	8,160	3,337	0	0	475,092
Sorghum	42,344	236,320	0	179,280	0	0	0	457,944
Finger millet	0	265,369	2,125	0	0	10,708	0	278,202
English potato	0	0	75	0	0	0	125,477	125,552
Yellow maize	0	49,059	0	0	0	4,642	21,960	75,661
Groundnuts	3,712	0	7,289	36,360	0	5,697	0	53,058
Total of topten crops by area (% of GRAND TOTAL)	656,449 (99.3%)	2,497,465 (98.1%)	775,098 (94.7%)	1,267,653 (98.9%)	26,824 (99.6%)	1,006,065 (99.1%)	2,886,200 (99.2%)	9,115,754 (98.4%)
GRAND TOTAL of all crops by area	<u>661,298</u>	<u>2,546,762</u>	<u>818,300</u>	<u>1,281,662</u>	<u>26,931</u>	<u>1,015,349</u>	<u>2,909,914</u>	<u>9,260,215</u>

between road areas, as also shown in Table 15. Kisumu has a larger proportion of its crops in grain (88 percent) than any other road impact area, whereas Busia has the least (51 percent).

The top ten crops with the greatest number of plots are presented in Table 16. The number of plots for all crops is 8,991, more than two times the reported number of 4,504 plots for all holding areas. It appears that this large increase in the number of plots reported is the result of counting any area in a single crop as a plot. Thus, a single garden plot containing cabbages, onions, beans and potatoes may be counted as four plots for purposes of specifying plots in different crops. The number of plots of sugarcane and coffee indicates their importance as cash crops in the impact areas, especially in Kakamega and Kisii.

5. Farm input and output

Table 17 presents the data relating to farm inputs, outputs, and sales of agricultural produce. Livestock product disposition data are as yet too incomplete for purposes of generalization.

The total value of farm inputs is Ksh. 57,479. District figures vary from a suspiciously low Ksh. 182 in Busia to Ksh. 24,086 in Bungoma. Differences in population between these regions does not explain the large disparity. Further close monitoring of the data with respect to the very low figures for Busia and Kisumu (Ksh. 395) is warranted.

Average value of inputs for the seven impact areas is Ksh. 8,211. Three regions lie in general proximity to the mean, Kisii (Ksh. 5,984), Siaya (Ksh. 10,847), and Kakamega (Ksh. 12,745). Bungoma is far higher (Ksh. 24,086), while the strangely low values for Kisumu

Table 16: Top ten crops with greatest number of plots

Crop Type (# Plots)	Road Impact Area							Total
	Siaya	Busia	Kakamega	S. Nyanza	Kisumu	Kisii	Bungoma	
Hybrid maize	52	1,204	1,120	648	14	432	539	4,009
Local maize	572	298	45	429	220	73	50	1,687
Sugarcane	153	4	361	113	13	176	0	820
Sorghum	28	398	0	117	33	0	0	576
Finger millet	0	449	15	3	0	36	0	503
Cassava	138	145	12	19	32	0	0	346
Coffee	0	0	0	34	0	243	0	277
Bananas	0	58	19	61	3	81	0	222
Sweet potatoes	16	9	23	34	4	7	144	137
Cabbage	0	71	1	0	0	5	36	113
Others (Principally groundnuts, beans, potatoes, cotton, bullrush millet)	30	30	24	58	37	28	94	301
TOTAL	<u>989</u>	<u>2,666</u>	<u>1,620</u>	<u>1,516</u>	<u>356</u>	<u>1,081</u>	<u>763</u>	<u>8,991</u>

06

Table 17: Farm input, output and sales by road (9 mos.)

<u>Variable</u>	<u>Road Impact Area</u>							<u>Total</u>
	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	
Total value of farm inputs (Ksh.)	10,847	182	12,745	3,240	395	5,984	24,086	57,479
Total quantity of crop output (kg.)	134,429	79,848	418,121	115,221	24,838	142,786	682,623	1,597,866
Quantity of output sold (kg.)	64,963	27,957	312,699	20,194	735	36,028	232,334	694,910
Value of output sold (Ksh.)	45,217	57,283	86,217	45,938	703	164,607	218,963	618,928

(Ksh. 395) and Busia (Ksh. 182) have already been mentioned. Only future survey runs will confirm whether such district variation is truly representative of population economic strategies, or whether it is a result of early data collection.

The average quantity of agricultural outputs is 228,267 kg. There is again considerable variation by region. Bungoma is highest (682,623 kg.), followed by Kakamega (418,121 kg.), Kisii (142,786 kg.), Siaya (134,420 kg.), South Nyanza (115,221 kg.), Busia (79,848 kg.), and Kisumu (24,838 kg.). Inputs do not appear to determine outputs; average ratio of value of inputs to output weight is .036. However, for Busia it is a surprising .002; or, taken inversely, total output in Busia in kilograms is 439 times the value of inputs in shillings. On the other hand, for Bungoma, leading input and output area, output is only 28 times the value of inputs, a figure exactly equal to the overall average.

The quantity of output sold averages 99,273 kg. and Ksh.88,418 over the seven impact areas. Kakamega has the highest value for weight of produce (Ksh. 312,699), but the lowest for price per kg. (Ksh. 0.28/kg.) Kisii, with a total weight well below the average (36,028 kg.) has the highest ratio of price to quantity (Ksh. 4.57/kg.). An examination of Table 19 indicates that 90 percent of total crop value in Kisii is due to coffee, a significant cash crop in that district.

6. Crops harvested and marketed (value sold)

As is indicated in Table 18, the ten most common crops by weight vary considerably in their distribution among the impact areas. Local maize, the major subsistence crop, is heavily grown in all areas; the average quantity harvested is 142,379 kg. Bungoma grows the

Table 18: Top ten crops harvested by road area (9 mos.)
(in kilograms)

Crop type	Road Impact Area							Total
	Siaya	Busia	Kakamega	S. Nyanza	Kisumu	Kisii	Bungoma	
Local maize	63,854	30,990	165,586	81,490	9,494	3,650	641,589	996,653
Sugarcane	30,297	0	235,926	0	0	21	0	266,244
Hybrid maize	0	924	102	0	1,706	102,388	0	105,120
Sorghum	23,789	12,492	9	20,460	6,388	0	0	63,138
Beans	4,394	652	2,744	677	41	2,089	32,678	43,274
Coffee	0	0	0	1,558	0	31,608	0	33,165
Cotton	2,257	18,199	0	0	111	0	0	20,567
Cassava	7,684	5,425	929	833	686	0	0	15,557
Sweet potato	1,736	0	7,244	1,882	103	538	988	12,491
Finger millet	52	9,302	373	96	0	1,182	0	11,004
Total of top ten crops harvested	134,063	77,984	412,913	106,996	18,529	141,476	675,255	1,567,213
Total of all crops harvested per area	<u>134,429</u>	<u>79,848</u>	<u>418,121</u>	<u>115,222</u>	<u>24,838</u>	<u>142,786</u>	<u>682,624</u>	<u>1,597,866</u>
Top ten crops harvested as % of total all crops harvested per area	(99.7%)	(97.7%)	(98.8%)	(92.9%)	(74.6%)	(99.1%)	(98.9%)	(98.1%)

largest total amount (641,389 kg.), Kisii produces the least (3,650 kg.). Population does not seem directly related to the figures for maize, as is exemplified by the fact that Bungoma produces about ten times the amount grown in Siaya, a district roughly similar in population size.

Cash cropping is extremely variable by region, according to the results of the survey. Coffee, for example, is grown in only two districts, and 95 percent of the total is grown in Kisii. Sugarcane is grown in three districts, though Kakamega is by far the major producer, harvesting 89 percent of the total. The pattern is the same for cotton, which is grown in Siaya, Kisumu, and particularly in Busia, which produces 88 percent of the total.

The total amount of all crops harvested in the seven impact areas is 1,597,866 kg., of which the ten most common crops comprise 98 percent (1,567,213 kg.). By impact area, the top crops comprise anywhere from 92.9 percent of the total as in South Nyanza, to 99.7 percent in Siaya. The rather low figure for Kisumu (74.6 percent) is explained by the fact that the population alone among the seven areas grows a significant quantity of a special variety of millet. When this crop is included in the total, 91.8 percent of the total output is accounted for.

Local maize is by far the dominant crop in the impact areas, both in terms of weight harvested (62 percent of total) and in value sold (48 percent--see Tables 18 and 19). The total value sold of local maize for all the impact areas combined is nearly twice that of coffee, over six times that of sugarcane, and about nine times the value received for cotton. All districts report substantial amounts of maize sold,

Table 19: Value of top ten crops sold (9 mos.)
(in Ksh.)

Crop type	Road impact area							Total
	Siaya	Busia	Kakamega	S. Nyanza	Kisumu	Kisii	Bungoma	
Local maize	22,661	15,113	57,816	7,925	684	95	195,795	300,090
Coffee	0	0	0	2,426	0	147,998	0	150,424
Sugarcane	6,908	178	24,179	14,340	0	1,217	0	46,823
Cotton	3,609	29,611	0	0	0	0	0	33,220
Beans	2,366	1,102	2,313	708	0	1,194	20,758	28,442
Bananas	0	1,533	630	10,781	0	4,053	0	16,998
Groundnuts	0	59	228	6,178	19	3,306	0	9,790
Finger millet	0	7,596	525	0	0	1,245	0	9,366
Sorghum	5,860	1,742	19	1,586	0	0	0	9,207
Hybrid maize	0	59	0	0	0	5,258	0	5,317
Total value of top crops	41,404	56,993	85,710	43,944	703	164,366	216,553	609,677
Total value of all crops sold per area	<u>45,217</u>	<u>57,283</u>	<u>86,217</u>	<u>45,938</u>	<u>703</u>	<u>164,607</u>	<u>218,963</u>	<u>618,928</u>
Value of top ten crops as % of total value of all crops sold	(91.6%)	(99.5%)	(99.4%)	(95.7%)	(100%)	(99.9%)	(98.9%)	(98.5%)

except for for Kisii (Ksh. 95) and Kisumu (Ksh. 684). Average maize crop sold over the period measured is Ksh. 42,857. Bungoma alone sells 65 percent of the total (Ksh. 195,795).

No other crop is reported sold by all impact areas. At the other extreme, Kakamega sells over one-half (52 percent) of the sugarcane (Ksh. 24,179), and Busia reports sales of 89 percent of the cotton marketed (Ksh. 29,611). These crops represent 28 percent and 52 percent of their total crop marketing, respectively.

The sales value of the ten most common crops in each of the regions is over 90 percent of total crop sold in any given area. The percentages range from a low of 91.6 percent for Siaya to a high of 100 percent for Kisumu. The crop sales values for Kisumu are sparse; close attention to the data for this district must be maintained in the future.

7. Non-farm occupations and income

By far, the most important non-farm occupations in the seven impact areas are those of teacher, salesman or clerk, vendor of food, tobacco and beverages, and general labourer (see Table 20). Other important occupations are those in construction, nursing, and protection (guarding).

Average total income of teachers for the road impact areas combined is Ksh. 51,903. Values by region vary from a low of Ksh. 20,089 in Siaya to a high of Ksh. 72,747 in Kakamega. However, the population of Siaya is about three times that of Kakamega, leading one to question the accuracy of the data. All in all, the seven regions have a significant part of their total non-farm income in teaching and teaching-related activities. (See Table 20a)

Table 20: Baseline: Main non-farm activities
(number & Ksh.)

Occupation	Unit	Road Impact Area						TOTAL	
		Siaya	Busia	Kakamega	Nyanza	Kisumu	Kisii		Bungoma
Engineering technician draftsman	no.	0	0	10	24	16	42	0	92
	income			960	1,824	395	2,291		5,470
	cost			356	0	106	0		462
Nursing	no.	0	0	0	240	16	127	0	382
	income				25,454	1,659	21,585		48,699
	cost				0	0	0		0
Teaching	no.	61	237	410	264	506	739	336	2,551
	income	20,089	35,834	72,747	31,728	49,492	124,123	29,311	363,324
	cost	0	0	0	0	0	0	0	0
Bookkeeping	no.	0	0	10	0	0	106	0	116
	income			750			17,935		18,685
	cost			0			0		0
Clerks	no.	0	0	40	0	32	148	0	219
	income			2,766		1,659	8,864		13,289
	cost			0		0	0		0
Salesworkers	no.	788	190	240	2,232	348	781	458	5,035
	income	81,674	22,918	23,097	99,835	18,119	18,727	57,981	322,350
	cost	48,419	16,486	356	5,506	8,655	0	9,290	88,712
Other administration	no.	0	0	0	48	0	42	61	151
	income				6,480		3,083	3,721	13,284
	cost				0		0	0	0
Protection services	no.	61	190	30	312	16	0	488	1,096
	income	0	2,986	790	6,646	553		26,779	37,754
	cost		0	0	0	0		37	37
Lodging, catering	no.	0	0	40	48	16	127	0	230
	income			4,985	1,296	0	1,361		7,642
	cost			0	0	0	0		0

Table 20: Baseline: Main non-farm activities
(cont'd)
(number & Ksh.)

Occupation	Unit	Road Impact Area							TOTAL
		Siaya	Busia	Kakamega	Nyanza	Kisumu	Kisii	Bungoma	
Personal services	no.	0	47	0	72	0	106	0	225
	income		2,489		4,632		2,954		10,075
	cost		1,659		0		0		1,659
Agricultural workers	no.	0	0	0	24	47	0	0	71
	income				864	648			1,512
	cost				0	106			106
Forestry workers	no.	182	0	0	0	47	21	31	281
	income	1,091				335	148	11,590	13,163
	cost	0				0	0	0	0
Agric, non-holding	no.	0	0	0	192	0	0	0	192
	income				1,704				1,704
	cost				0				0
Chemical/mineral	no.	0	0	0	0	32	0	0	32
	income					6,794			6,794
	cost					0			0
Textile/leather	no.	0	190	0	216	0	0	31	436
	income		1,363		7,051			671	9,085
	cost		142		1,620			0	1,762
Food/tobacco/beverage	no.	212	190	140	432	0	127	0	1,100
	income	69,748	18,948	14,400	36,929		6,393		146,418
	cost	51,452	12,831	5,930	10,898		0		81,112
Woodworkers	no.	0	0	10	0	0	0	0	10
	income			295					295
	cost			0					0
Smiths & welders	no.	0	0	20	0	0	0	0	20
	income			142					142
	cost			0					0

Table 20: Baseline: Main non-farm activities
(cont'd)
(number & Ksh.)

Occupation	Unit	Road Impact Area						TOTAL	
		Siaya	Busia	Kakamega	Nyanza	Kisumu	Kisii		Bungoma
Electrical works	no.	0	0	0	0	0	106	0	106
	income cost						3,585	0	3,585
Other manufacturing	no.	91	0	60	168	0	63	0	382
	income cost	364		283	4,402		6,710		11,758
Construction	no.	0	166	220	144	0	84	183	797
	income cost		15,275	9,240	10,838		1,183	33,245	69,716
Stationary engineers	no.	0	0	10	0	142	0	0	152
	income cost			60		5,309			5,369
Other production	no.	0	0	0	0	0	105	0	105
	income cost						6,277		6,277
General laborers	no.	515	1,066	1,166	984	126	591	458	3,780
	income cost	20,901	26,167	40	21,770	3,223	45,504	13,207	131,938
Jurists & legals	no.	0	0	0	0	0	63	0	63
	income cost						17,724		17,724
Cultural workers	no.	0	0	0	96	0	0	0	96
	income cost				4,776				4,776
Other profession	no.	0	71	0	144	0	0	0	215
	income cost		3,128		20,544				23,672

4.

Table 20: Baseline: Main non-farm activities
(cont'd)
(number & Ksh.)

Occupation	Unit	Road Impact Area						TOTAL	
		Siaya	Busia	Kakamega	Nwanza	Kisumu	Kisii		Burgoma
Public administrators	no.	0	0	0	0	47	106	0	153
	income cost					3,318	9,748	0	13,066
Fishermen	no.	0	0	0	360	0	0	0	360
	income				9,751				9,751
Wildlife workers	no.	0	0	0	120	0	0	0	120
	income cost				3,259				3,259
Other agriculture	no.	0	0	0	0	24	0	0	24
	income cost					96			96
Textile preparers	no.	0	0	0	24	0	0	0	24
	income cost				1,080				1,080
Metal works	no.	0	0	10	24	0	0	0	34
	income cost			720	672				1,392
Engine maintenance	no.	0	0	0	48	0	0	0	48
	income				3,840				3,840
Printing workers	no.	0	0	10	0	0	0	0	10
	income cost			150	0	0	0	0	150
Painters	no.	0	0	10	0	0	0	0	10
	income cost			246	0				246
Transport workers	no.	30	0	0	288	0	106	0	160
	income cost	6,363			24		9,179		15,830
TOTAL	no.	1,940	2,347	2,436	6,504	1,415	3,590	2,046	18,878
	inc. cost	200,230	129,108	131,671	305,399	91,601	307,374	76,505	1,343,210
	cost	199,742	31,118	7,381	12,734	8,877	0	9,327	174,805

Table 20a: Income earned in top 15 non-farm occupations (9 mos.)
(in Ksh.)

Occupation type	Road impact area							Total
	Siaya	Busia	Kakamega	S. Nyanza	Kisumu	Kisii	Bungoma	
Teachers	20,089	35,834	72,747	31,728	49,492	124,123	29,311	363,324
Sales workers	81,674	22,918	23,097	99,835	18,119	18,726	57,981	322,350
Food/tobacco/ beverage vendor	69,748	18,948	14,400	36,929	0	6,393	0	146,418
General labourers	20,901	26,167	1,166	21,770	3,223	45,504	13,207	131,938
Construction	0	15,275	9,240	10,838	0	1,118	33,245	69,716
Medical nurses	0	0	0	25,454	1,659	21,585	0	48,699
Protection services	0	2,986	790	6,646	553	0	26,799	37,754
Miscellaneous professions	0	3,128	0	20,544	0	0	0	23,672
Administrative and clerical	0	0	750	0	0	17,935	0	18,685
Jurists and legal	0	0	0	0	0	17,724	0	17,724
Transport workers	6,363	0	0	288	0	9,179	0	15,830
Clerks/operators	0	0	2,766	0	1,659	8,864	0	13,289
Miscellaneous administrative	0	0	0	6,480	0	3,083	3,721	13,284
Forestry workers	1,091	0	0	0	335	148	11,590	13,163
Public administration	0	0	0	0	3,318	9,748	0	13,066
Total of top 15 Occupations	199,866	125,256	124,956	260,512	78,358	284,130	175,854	1,248,912

This raises the question of the relevance of collecting data on households which may not be involved in agriculture except as an adjunct to teaching or other professional activities, e.g., nurses, clerks, bookkeepers, jurists and legals, and the like. The survey is designed to measure the non-farm economic activities of the agriculturalists and herders who make up the vast bulk of the local population. While data on the other non-farming groups may be important, it tends to confuse an examination of the economic evolution of the greater part of the population, the population for which roads are being constructed.

The categories which are more relevant for determining the economic impact on farming families are those of salesmen, food and tobacco vendors, labourers (including construction), protection services, and forestry workers. These types of occupations are those which can be engaged in by primarily male household heads and family members between major agricultural activities. There do not seem to be, moreover, many non-farm occupations in which female heads of households can engage. Probably sales or vending activity along the roadway or market area are alone in having any number of woman participants.

8. Household expenditures

The 15 most important household expenditures, as indicated in Table 21, account for on average, 98 percent of total disbursements. Regionally, these figures range from 91.8 percent in Busia, to 99.9 percent in Siaya and Kisumu.

Expenditures for supplies from the duka are in all cases, but Kakamega the most important. In this district, duka expenses are exceeded fairly closely by school fees.

Table 21: Top 15 sources of monthly expenditures (9 mos.)
(in Ksh.)

Road Impact Area								
<u>Expenditure type</u>	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	<u>Total</u>
<u>Duka</u>	11,317	12,355	8,638	21,175	9,281	14,129	52,573	128,468
clothing/footwara	5,139	9,615	5,273	12,600	2,043	10,567	15,726	60,963
School fees	152	4,636	9,745	444	1,738	13,821	17,233	47,769
Market	3,360	5,129	997	16,342	3,188	2,595	1,519	33,130
Gifts/contri- butions	1,503	4,204	2,411	5,671	2,944	1,017	12,334	30,084
Health care	1,775	315	2,420	5,762	853	3,589	7,415	22,130
Miscellaneous/ not stated	894	2,216	8,379	2,460	1,190	918	3,203	19,260
Other major	1,424	782	2,401	6,799	474	528	198	12,606
Kiosk	0	9	0	0	0	4	12,505	12,518
Housing repairs	248	81	972	48	229	10,453	409	12,440
Neighbors/ friends	542	545	938	216	381	127	7,970	10,719
Weddings/ funerals	4,778	1,258	0	439	259	403	61	7,198
Domestic wages	0	565	840	1,685	70	1,530	924	5,414
Other (assorted)	30	1,090	199	1,056	79	2	427	2,883
Roadside	12	0	79	1,464	6	245	15	1,821
Total of top 15 expenditures	<u>31,175</u>	<u>42,600</u>	<u>43,292</u>	<u>76,161</u>	<u>21,735</u>	<u>59,928</u>	<u>132,512</u>	<u>407,403</u>
Total of all expenditures	<u>31,218</u>	<u>46,398</u>	<u>43,459</u>	<u>78,472</u>	<u>21,760</u>	<u>61,700</u>	<u>132,724</u>	<u>415,731</u>
Top 15 expenditures as % of total ex- penditures	99.9%	91.8%	99.6%	97.1%	99.9%	97.1%	99.8%	98%

Clothing and footwear rank second to duka supplies, comprising 15 percent of all household expenditures. Duka goods constitute 31 percent of the total. School fees also require a large portion of the household budget (11 percent).

Total value of expenditures is quite variable by region, running from a high of Ksh. 119,809 for Bungoma to a low of Ksh. 21,261 for Kisumu. Part of this larger figure is explained by a larger population size for Bungoma.

Average total expenditures per region for the 15 most common expenses is Ksh. 27,160. It is clear that, even taking into account the different population sizes, there is considerable variability in consumption patterns among the areas. In order to appreciate the differential impact of road construction on consumption patterns and volume in the seven areas, we must know much more about the economic and socio-cultural reasons for the variety we encounter in Table 5.

9. Capital transactions

In Table 22, the data for capital transactions reveal a large inflow of cash to households in the impact areas. Disregarding sales and purchases of capital equipment (which monetarily are rather insignificant compared to loans and remittances), Ksh. 689,505, or 80 percent of the total of all loans and remittance flows represent cash inflow to households. Remittances received are 79 percent of the inflow, and constitute a permanent increase to household assets.

Remittances received are equal to over five times the value of remittances sent. The comparable ratio for loans received to those given is 2.4.

Table 22: Capital transactions by road (9 mos.)

(in Ksh.)

<u>Type</u>	<u>Road Impact Area</u>							<u>Total</u>
	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	
Capital purchases	0	1,078	2,903	379	799	0	3,355	8,515
Sales of capital equipment	0	0	100	0	0	0	0	100
Loans received	1,091	3,851	717	17,251	14,173	67,520	41,785	146,388
Loans given	409	14,481	4,342	13,003	10,949	1,585	16,440	61,208
Remittances received	91,124	96,613	61,305	150,238	23,994	317	119,526	543,117
Remittances given	5,754	13,682	9,927	10,212	8,611	3,756	55,781	107,723
Total value of transactions	98,378	129,705	79,294	191,083	58,526	73,177	236,887	861,051

It is interesting to speculate on the exact origin of the grantors of the loans received. If the loans are being granted locally between neighbours and relatives, we should expect to see figures for loans received and given which approach equality, assuming the data are truly being collected randomly. It may well be, as is the case for remittances, that loans are being granted from urban areas of Kenya. On the other hand, perhaps many household heads prefer to declare some or all of their cash remittances received as loans to avoid taxation.

The regional figures for remittances and loans are quite varied and, in some cases, truly problematical. The unusual imbalance in Kisii in the direction of loans received (43 times the value is received than granted) is contradicted by the situation in Kakamega (six times the value is given than received). The problem is the same for remittances. The ratio of loans received to given is nearly 16 in Siaya and 15 in South Nyanza. On the other hand, the ratio is reversed in Kisii, where slightly under 12 times the value of remittances is given out than received. Six of seven regions run in the direction of increased cash possession, however, as do five of seven for loans.

What sense to make of such variable statistics will definitely require more in-field analysis of the economic and social patterns of all regions. Data collection techniques must be vigorously supervised to ensure accuracy and comparability of categories.

10. Road use

The first traffic surveys on the seven impact study areas were taken in March, 1979 prior to the completion of the roads. At that time and during the subsequent survey period (November 1979) the

survey team visited one side of the road two km. away from what was considered to be the main linkage of the road.

Table 23 shows the average 12-hour traffic volume on each of these roads in March 1979. Although the volume of traffic was low on roads where some vehicle traffic was observed, the fact that on four of the seven roads studied there were cars or small trucks indicated that even prior to their construction, the existing tracks were somewhat motorable. Similarly, the existing tracks were extensively used by the pedestrians and by those in possession of bicycles and motorcycles. Obviously, the major reason why no vehicle traffic was observed on the Siaya, Kakamega and Busia roads was the absence of bridges that would have given access over the little rivers dividing them.

Table 24 indicates the bicycle, pedestrian and animal traffic on the seven roads prior to their construction. Table 25 lists some of the major institutions and locations frequented by the respective area residents and the corresponding distances and mode of travel to them. Also, as Table 25 indicates, prior to the construction of these roads, area residents did utilize buses or matatus in order to reach schools, markets or posho mills in the vicinity. Thus, the major differences brought by the construction of the roads is restricted to, first, the relative comfort offered to road users, and, second, the possibility of using them year-round because of the all-weather quality of the roads built. In addition, these data indicate that a more substantial difference in terms of agricultural and marketing activity is to be expected in road impact areas which were totally immotorable due to lack of bridges than in areas where the existing tracks offered access for most of the year except for the heavy rain seasons.

Table 23: Average 12-hour traffic volume

<u>Vehicle type</u>	<u>Road Impact Area</u>						
	<u>Kisii</u>	<u>Bungoma</u>	<u>Siaya</u>	<u>Kakamega</u>	<u>Kisumu</u>	<u>Busia</u>	<u>S. Nyanza</u>
Cars							2 (6)
Light goods		3 (9)			2 (6)		
Medium goods	1 (2)						
Heavy goods							
Buses							

Numbers in parentheses refer to number of occupants per vehicle type.

Table 24: Average 12-hour volume of bicycles, animal drawn carts, animals and pedestrians prior to road construction

<u>Item</u>	<u>Road Impact Area</u>						
	<u>Kisii</u>	<u>Bungoma</u>	<u>Siaya</u>	<u>Kakamega</u>	<u>Kisumu</u>	<u>Busia</u>	<u>S. Nyanza</u>
Bicycles	10	—	12	30	18	32	15
Animal drawn carts	—	—	—	—	—	—	—
Animals	12	34	60	91	13	3	29
Pedestrians	1206	105	108	360	305	111	255

Table 25: Distance and travel time to schools, health clinics, shops, etc. from the road

	APPROPRIATE MODE OF TRAVEL BY			DISTANCE BY		TRAVEL TIME BY		
	FOOT	BUS	BOTH	FOOT (ft)	BUS (m)	FOOT (min)	BUS (min)	
KISII	NYANGGOG PRY. SCHOOL	-	-	BOTH	3692	-	17	-
	OTORO PRY. SCHOOL	-	-	BOTH	3948	-	15	-
	NYANGGOG POSHO MILL	-	-	BOTH	3948	-	15	-
	NYAKESOBET RIVER	FOOT	-	-	18	-	30 ^{sec.}	-
BUNGOMA	NYASE/ATASHA COFFEE FACTORY	FOOT	-	-	1814	-	30	-
	KONGIT MARKET	FOOT	-	-	5000	-	35	-
	CHEMONGE DIKA	FOOT	-	-	3500	-	30	-
	KONGIT PRY. SCHOOL	FOOT	-	-	1500	-	35	-
	KAPSAMANI PRY. SCH.	FOOT	-	-	6000	-	90	-
	LABA DAM	FOOT	-	-	750	-	30	-
	KAPSAGER RIVER	FOOT	-	-	300	-	20	-
	HEALTH CENTRE OF CLINIC (HSE. NO. 632)	FOOT	-	-	440	-	7	-
SIAYA	NYADHI PRY. SCHOOL	FOOT	-	-	8215	-	124	-
	A.C. AGULU PRY. SCH.	FOOT	-	-	1835	-	34	-
	AGULU CANTEN	FOOT	-	-	1535	-	30	-
	SESE RIVER	FOOT	-	-	1554	-	30	-
	ONDHENYO RIVER	FOOT	-	-	755	-	14	-
KAKAMEGA	MAUSI SHOPS	FOOT	-	-	165	-	1.42	-
	SHITONI SPRINGS	FOOT	-	-	368	-	3.37	-
	SHIPARA RIVER	FOOT	-	-	450	-	9	-
	EUTALI MARKET	-	-	BOTH	3168	-	15	-
	SPRINGS	FOOT	-	-	400	-	2	-
KISUMU KAK	NDURU KADERO PRIMARY SCHOOL	FOOT	-	-	295	-	45	-
	ANGONG SPRINGS	FOOT	-	-	1000	-	10	-
HUSIA	NASIRA MARKET	-	-	BOTH	4134	-	24	-
	NASIRA JASHO STORE	-	-	BOTH	4134	-	24	-
	NASIRA PRY. SCH.	-	-	BOTH	3767	-	2	-
	NASIRA PRY. SCH.	-	-	BOTH	7005	-	11	-
	RIVER WELL	FOOT	-	-	1000	-	20	-
	WELL	FOOT	-	-	1000	-	20	-
S. NYAUZA	WELL			BOTH	1820	-	10	-
	OJUANDO PRY. SCH.	-	-	BOTH	4134	-	18	-
	NYATENDO PRY. SCH.	-	BUS	-	2782	-	20	-
	AWIDHI SPRINGS	-	-	BOTH	279	-	21 (109 sec)	-
	NYATENDO SEC. SCH.	-	BUS	-	2782	-	20	-
	OURUTI RIVER	FOOT	-	-	429	-	14	-
NYARUPUL RIVER	FOOT	-	-	1283	-	20	-	
KAKEIO RIVER	FOOT	-	-	952	-	14	-	
A.S. CHIEF'S OFF. (HS. 36)	-	-	BOTH	3372	2754	10	-	

B. By Male- and Female-headed Households

No analysis of the economic and social impact of rural road construction would be complete if it ignored the differential effects on various population groups or categories. It is highly important for host countries and donor agencies alike to appreciate who benefits most or least from development projects in order to complement such projects with measures designed to counteract undesirable economic or social consequences.

Important considerations dictate that we focus on the data relating to male- and female-headed households. Such female-dominated groups form 23 percent of the 1,660 households surveyed in the seven impact areas, and range from a low of nine percent in Bungoma to 47 percent in Siaya. It is apparent that such households are an important social characteristic of rural Kenyan society, and an examination of their present and changing demographic composition, share of productive resources and technology, basic standard of living, recourse to health and education facilities, and position in relation to male-headed households in rural economic activities is imperative.

We shall examine here the following baseline variables with respect to the two types of households: demographic characteristics, educational level of family head, land tenure and area cultivated, ownership of equipment and implements, types of household structures, possession of improved or unimproved livestock, sewage disposal facilities, radio listening habits, and recourse to health care facilities.

Following this, an examination shall be made of data covering a period of six months, which gives us an over-time baseline record of agricultural and livestock inputs, agricultural outputs, principal

non-farm income activity, and regular and major household expenditures. This baseline time period can be extended in subsequent data analysis.

1. Household demography

Family composition characteristics as presented in Table 26 reveal that, in respect to average household size for the whole sample, male-headed groups are 35 percent larger than their female-headed counterparts. However, when we compare female-headed families (always nuclear) with monogamous male-headed households (78 percent of the total of 1,279 surveyed), we find a difference which can be accounted for by the absence of the male head alone (5.74 and 4.90 persons, respectively). On the other hand, there is considerable difference in family size between male-headed polygynous households (11.15 members) and male nuclear and female nuclear families (5.74 and 4.90 members, respectively). Since polygamous households constitute an average of but 17 percent of all male-headed families (ranging from five percent in Kisii to 24 percent in Busia), the difference in number of children (under 16 years) per household between male-headed and female-headed families is not as great as might be expected. Nevertheless, male-headed groups as a whole have 27 percent more children than female-headed families.

With respect to the place of birth of family members as presented in Table 27, no remarkable differences appear between male- and female-headed families. There appears to be some tendency, as yet unexplained, toward a greater incidence in female-headed families of births outside the impact area. This is probably attributable to the practice of patrilocal residence, whereby wives may be obtained at some distance from their future living sites. Thus, the out-migration or death of

Table 26: Household demographic structure

<u>Variable</u>	<u>Road Impact Area</u>							<u>Total</u>
	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	
<u>Mean household size:</u>								
Male head (all)	4.77	8.53	8.08	7.52	4.81	5.32	7.25	6.61
Male head, monogamous	4.12	7.08	7.27	6.59	4.32	4.90	5.90	5.74
Male head, polygamous	7.50	13.27	13.42	11.00	7.25	13.60	12.00	11.15
Female head	2.98	6.83	6.73	5.57	3.57	2.73	5.91	4.90
<u>Mean number of children (under 15)</u>								
Male head	1.94	4.28	4.24	3.88	2.24	2.80	3.97	3.34
Female head	1.39	4.58	3.80	1.76	2.14	1.09	3.55	2.62
<u>Percentage of polygyny among male heads</u>								
	19	24	13	21	16	5	22	17

**Table 27: Place of birth of household members
by type of household head (M or F)**

<u>District</u>	<u>Impact Area</u>		<u>District, Outside Impact Area</u>		<u>Outside District</u>		<u>Not Stated</u>		<u>Total</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
Bungoma	2019 (88%)	165 (85%)	201	24	58	3	24	3	2302	195
Busia	1503 (79%)	225 (59%)	254	24	140	123	5	17	1902	389
Kakamega	511 (70%)	65 (64%)	190	31	32	5	2	0	735	101
Kisumu	295 (54%)	137 (59%)	32	21	119	74	2	0	448	232
Kisii	1097 (94%)	52 (79%)	68	13	0	0	0	0	1165	65
S. Nyanza	1342 (78%)	168 (60%)	242	84	120	29	9	0	1713	281
Siaya	594 (66%)	236 (47%)	239	176	64	94	0	0	897	506

the husband and the fact that some births probably occurred at the mother's father's homestead, result in a slight skewing of the data, as observed above.

One final population characteristic with reference to type of household head is that of education. In Table 28, level of education by impact area is presented. For the total area surveyed, the education levels of family heads by sex are clearly skewed in favor of male education--74 percent of females heads of households have never attended school; only 40 percent of male heads have not. This disparity ranges from a high of 80 percent versus 25 percent for Bungoma, down to a situation approximating equality in Kakamega, where 28 percent of men and 33 percent of women household heads have never had formal education.

In the future of the rural road impact study we will want to monitor household demographic data carefully. Of particular interest is the proportion of female-headed families in each area and the level of education of family heads. Will the trend toward matricentric nuclear families, itself largely a result of male, long-term migration, be reversed, or will it be accentuated? Elsewhere we have hypothesized that as economic opportunities increase in local impact areas as a result of rural road provision, long-term migration will tend to diminish. This would be directly observable in a reduced proportion of female-headed households. By the same token, as standards of living improve in rural areas, this should be reflected in an improved rate of education for both males and females, especially the latter.

Table 28: Level of education by household head (M or F)
and by impact area
(in percentage)

<u>Percent</u>	<u>Siaya</u>		<u>Busia</u>		<u>Kakamega</u>		<u>S. Nyanza</u>		<u>Kisumu</u>		<u>Kisii</u>		<u>Bungoma</u>		<u>Total</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
Std. 1-3	13	2	15	8	14	0	22	30	12	5	16	25	32	10	20	8
Std. 4-8	21	13	39	38	40	40	22	5	29	13	33	17	36	0	32	15
Form 1-2	0	0	1	0	9	20	6	0	1	0	2	0	5	10	3	2
Form 3-4	2	2	2	0	2	7	3	0	3	0	12	0	2	0	4	1
Form 5-6	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Other.	0	0	0	0	7	0	0	0	0	0	0	0	0	0	1	0
Never attended	64	83	43	54	28	33	46	65	55	82	34	58	25	80	40	74
Total	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Number of households	168	144	186	48	92	15	199	40	136	80	204	24	303	30	1279	381

2. Land tenure

With respect to landholding and cropping in the impact areas, we find the results shown in Table 29. The difference in land owned between male and female heads is considerable; male-headed families possess 43 percent more land than do their female counterparts (2.70 and 1.89 ha., respectively). Household member per capita values for the two types of families are .41 ha. and .39 ha., respectively. Thus, male-headed families have only five percent more land per household member than do their female counterparts. There is on the average essentially no difference between household types in respect to land ownership.

On the average and by district the number of plots declared per household is very similar; for the whole sample the values are 2.87 plots for male heads and 2.74 for females. Plot size is, thus, about the same for both types of families.

As might be expected, since male-headed families tend on the average to be larger, the cropping area declared by this category is 24 percent larger than for female heads (.63 and .51 ha., respectively). In view of the fact that, as was mentioned earlier, male-headed families on average are 35 percent larger than those of their female counterparts, it would appear that slightly less land is being cultivated per household head for the former type than for the latter. Such is the case, but the ratio of cropping area to average family size in both cases is about .10 ha./member (0.95 ha. for males and .104 for females).

In the future, the impact study should carefully observe landholding and cropping statistics in order to discern any definite trends. Changes in family structure and in traditional economic arrangements within and between households should soon be reflected in these data.

Table 29: Landholding and cropping area by household type (M or F)

<u>Variable</u>	<u>Road Impact Area</u>							<u>Total</u>
	<u>Siaya</u>	<u>Busia</u>	<u>Kakamega</u>	<u>S. Nyanza</u>	<u>Kisumu</u>	<u>Kisii</u>	<u>Bungoma</u>	
<u>Mean size of holding (ha.)</u>								
Male head	1.79	4.21	4.86	1.57	1.37	2.13	3.00	2.70
Female head	1.09	1.97	4.13	1.06	0.68	1.73	2.58	1.89
<u>Number of plots</u>								
Male head	1.90	3.94	5.99	2.10	2.10	3.03	1.01	2.87
Female head	1.79	3.00	6.93	2.24	1.33	3.00	0.91	2.74
<u>Size of cropping area (ha.)</u>								
Male head	0.33	1.08	1.55	0.57	0.23	0.42	0.22	0.63
Female head	0.21	0.81	1.43	0.42	0.09	0.48	0.10	0.51
<u>Ratio of cropping area to total landholding</u>								
Male head	0.18	0.26	0.32	0.36	0.17	0.20	0.07	0.22
Female head	0.19	0.41	0.35	0.40	0.13	0.28	0.04	0.26

3. Ownership of equipment and structures

Possession of household equipment and implements (Table 30) and household structures (Table 31) are in line with the figures in Table 29 for landholding. In general, it appears that male-headed households have slightly greater numbers of bicycles, radios, and ploughs. This can largely be explained by the larger size of these households. On the average there is .35 implement or piece of equipment per male household head and .27 per female head. The greatest difference is in number of ploughs owned (males having 87 percent more per family on the average than females); the least is the equal figure for possession of wheelbarrows. Whether or not significance lies in this rather anomalous figure for wheelbarrows will be determined in later survey rounds.

The data for household structures of Table 31 reveal again the numerical superiority of structure ownership by male heads, but on a per capita household member basis, when greater male household size is taken into account, there does not appear to be at present any significant difference between the family types. Male heads own 31 percent more structures of all types (3.57 to 2.72 per head), but they have families having 35 percent more members,

Two indices to watch in the future, however, are those concerning animal shelters and stores, where male-headed families possess rather larger numbers than females (77 percent and 277 percent more, respectively). It will be interesting to see if these data remain consistent in future survey rounds.

Table 30: Ownership of equipment and implements by sex of head of household (M or F)

<u>Impact area</u>	<u>Bicycles</u>		<u>Wheelbarrows</u>		<u>Radios</u>		<u>Paraffin lamps</u>		<u>Ploughs</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
Bungoma	52	-	15	-	100	6	137	18	119	12
Busia	81	24	7	12	66	17	168	40	52	7
Kakamega	36	8	10	2	53	14	96	25	59	12
Kisumu	17	5	9	6	27	6	79	22	9	5
S. Nyanza	70	2	29	2	84	14	207	40	100	17
Kisii	2	-	11	-	84	2	65	21	13	-
Siaya	<u>88</u>	<u>27</u>	<u>30</u>	<u>12</u>	<u>48</u>	<u>21</u>	<u>179</u>	<u>115</u>	<u>6</u>	<u>3</u>
TOTAL	<u><u>346</u></u>	<u><u>66</u></u>	<u><u>111</u></u>	<u><u>34</u></u>	<u><u>462</u></u>	<u><u>80</u></u>	<u><u>931</u></u>	<u><u>281</u></u>	<u><u>358</u></u>	<u><u>56</u></u>
Ownership per household head	.27	.17	.09	.09	.36	.21	.73	.74	.28	.15

Table 31: Number of structures by sex of head of household

Impact area	Domestic Permanent		Domestic Semi-Perm.		Traditional		Animal Shelter		Stores		Other		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Bungoma	-	-	34	-	705	67	46	9	271	24	12	12	1068	112
Busia	-	2	12	12	723	140	114	2	36	2	97	31	982	189
Kakamega	6	1	17	5	276	60	11	4	35	6	37	55	382	131
Kisumu	3	2	30	8	161	71	17	-	-	-	30	14	241	95
Kisii	6	0	95	0	384	44	33	2	283	17	44	-	845	63
S. Nyanza	26	-	38	7	468	115	5	-	-	-	-	-	537	122
Siaya	18	9	39	33	194	115	73	33	-	-	182	136	506	326
TOTAL	59	14	265	65	2911	612	299	50	625	49	402	248	4561	1038
Structures per household	.05	.04	.21	.17	2.28	1.61	.23	.13	.49	.13	.31	.65	3.57	2.72

Male households in sample = 1279
 Female households in sample = 381

4. Livestock holdings

In Table 32 a comparison is made between livestock possession per type of household. In all major categories of livestock, male households own significantly more animals than their female counterparts, although when family size is considered only three types of stock ownership appear important.

In the case of per household chicken and goat ownership, patricentric families have a superiority of 41 percent and 50 percent, respectively. Since they also have 35 percent more members, we may discount significance here. However, in the case of the more valuable animals, cattle and sheep, we see what may be a position of financial superiority.

Patricentric households own 105 percent more unimproved cattle, 96 percent more improved cattle, and 91 percent more sheep than do matricentric families. Of most significance for financial analysis are the data for unimproved cattle, the major rural store of value. The advantage in ownership is greatest in Busia, where male households have 3.7 times the number of these cattle, and least in Kisii where matricentric households on the average appear to own just slightly (one-fourth head per household) more than the male families.

It is critically important in the future years of this impact study to monitor trends in animal ownership. Although there are startling regional differences, there appears on the average to be some disparity in household wealth as reflected in livestock ownership. Male-centered households possess a greater store of wealth in animal capital, and this fact is supported by the strong difference in animal shelter and grain store ownership seen in Table 31. The balance of their landholding superiority (43 percent more land vs. 35 percent more

Table 32: Livestock ownership by sex of household head (male-female)

(Mean ownership)

Livestock Type	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Improved cattle	0	0	0	0	0.37	1.13	0.16	0.04	0	0	0.07	0	2.99	2.58	0.51	0.26
Unimproved cattle	3.31	1.24	6.77	1.82	7.25	6.87	3.80	3.56	2.89	1.07	2.20	2.45	2.67	1.61	3.85	1.88
TOTAL cattle	<u>3.31</u>	<u>1.24</u>	<u>6.77</u>	<u>1.82</u>	<u>7.62</u>	<u>8.00</u>	<u>3.96</u>	<u>3.60</u>	<u>2.89</u>	<u>1.07</u>	<u>2.27</u>	<u>2.45</u>	<u>5.66</u>	<u>4.19</u>	<u>4.76</u>	<u>2.14</u>
Sheep	0.86	0.46	0.76	0.46	1.03	0.80	1.01	0.34	1.27	0.18	0.62	0.45	1.57	1.88	1.01	0.53
Goats	0.98	0.39	0.95	0.16	0.30	0.30	1.44	2.12	0.84	0.42	0.72	0.45	0.85	0.51	0.93	0.62
Pigs	0	0	0.33	0	0	0	0	0	0.07	0.03	0	0	0	0	0.06	0.04
Donkeys	0	0	0	0	0	0	0	0	0.05	0	0	0	0.08	0	0.02	0
Chickens	9.87	5.31	13.07	9.35	14.22	14.27	14.06	11.72	6.20	6.30	6.50	4.36	7.20	5.17	9.91	7.05
TOTAL other livestock	<u>11.71</u>	<u>6.16</u>	<u>15.11</u>	<u>9.97</u>	<u>15.55</u>	<u>15.37</u>	<u>16.51</u>	<u>14.18</u>	<u>8.43</u>	<u>6.93</u>	<u>7.84</u>	<u>5.26</u>	<u>9.20</u>	<u>7.56</u>	<u>11.93</u>	<u>8.20</u>
TOTAL cattle and other livestock	<u>15.02</u>	<u>7.40</u>	<u>21.88</u>	<u>11.79</u>	<u>23.17</u>	<u>23.37</u>	<u>20.47</u>	<u>17.78</u>	<u>11.32</u>	<u>8.00</u>	<u>10.11</u>	<u>7.71</u>	<u>15.36</u>	<u>11.75</u>	<u>16.29</u>	<u>10.34</u>

members) is certainly supporting this larger livestock ownership along with outside income sources. It is clearly in cattle and sheep that household surplus capital is invested, and data reflecting such ownership are important for following shifting trends in rural economic fortunes as a whole, or between particular groups, such as male-female household type.

5. Household amenities

With respect to other household amenities and habits, we have chosen to focus here on three variables: type of toilet facilities owned (Table 33), radio listening habits for families with small children (Table 34), and health care response of household heads with small children (Table 35).

With respect to possession of sewage facilities by household type, we find no difference in the data, except in a few regions. On the average about one-third of both family types have no sewage facilities and two-thirds have a pit latrine. However, in certain regions (Siaya, Kisii, Kakamega and Kisumu) we find a much higher incidence of the pit latrine, and in others (Busia, South Nyanza) somewhat less. With respect to male-female household variation, we see from Table 33 that, while there is some slight difference regionally such as in Bungoma, Kisumu and Siaya, where woman-headed households have a somewhat higher frequency of no facilities, disparities are not impressive.

Radio listening habits of families with small children (six to 60 months) as given in Table 34, do not seem significantly divergent with reference to type of household head. On the average for all impact areas, about four of ten families listen, with male households having a slightly

Table 33: Sewage disposal facilities for households with small children (6-60 mos.) by type (M or F)
(percentage)

Disposal type	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
None	6.67	18.18	62.50	57.14	14.55	12.21	42.86	37.50	2.69	14.29	8.11	0	31.88	42.86	33.52	32.95
Main sewer	0	0	0	0	0	0	0	0	0	0	0	0	1.45	0	0.42	0
Septic tank	0	0	3.13	0	0	0	0	0	0	0	0	0	0	0	0.66	0
Cesspool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bucket latrine	0	0	0	0	0	0	0	12.50	0	0	0	0	0	0	0	1.74
Pit latrine	93.33	81.82	34.37	42.86	85.45	87.79	57.14	50.00	92.31	85.71	91.89	0	66.67	57.14	65.40	65.31
Number of families (N)	45	33	152	33	55	9	134	19	41	22	78	0	21	21	526	137

Table 34: Radio listening habits of households by type of household head (M or F)
(percentage)

		Road Impact Area															
		Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
<u>A. Listen to radio</u>		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Yes		40.00	45.45	23.44	42.86	85.45	66.67	58.93	50.00	15.38	14.29	51.35	0	43.48	14.29	44.38	37.04
No		60.00	45.45	73.44	57.14	14.55	22.22	41.07	50.00	84.62	85.71	48.65	0	55.07	85.71	54.53	60.04
Not applicable		0	9.09	3.13	0	0	11.11	0	0	0	0	0	0	1.45	0	1.09	2.92
N =		45.00	33.00	152.00	33.00	55.00	9.00	134.00	19.00	41.00	22.00	78.00	0	210.00	21.00	715.00	137.00
<u>*B. Source of listening</u>																	
Own radio		26.67	27.27	23.44	42.86	56.36	55.56	39.29	37.50	19.23	14.29	48.65	0	33.33	14.29	34.56	30.19
Neighbor's radio		13.33	18.18	0	0	29.09	11.11	19.64	12.50	0	0	2.70	0	10.14	0	10.04	6.85
Social center		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other		0	0	0	0	0	0	0	0	0	0	0	0	1.45	0	0.43	0
Not applicable		60.00	54.55	76.56	57.14	14.55	33.33	41.07	50.00	80.77	85.71	48.65	0	55.07	85.71	54.97	62.96

*Same sample as in A.

Table 35: Health care measures taken by households with small children (6-60 mos.) by type (M or F)
(percentage)

Measure Taken (%)	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Health clinic	9.52	10.53	40.35	45.16	13.86	29.41	31.63	43.75	25.64	24.00	27.27	0	15.50	7.14	25.17	27.39
Hospital	9.52	10.53	0	3.23	2.97	0	7.14	6.25	12.82	12.00	3.03	0	10.08	0	6.14	5.80
Tablets	28.57	36.84	21.93	12.90	37.62	35.29	30.61	18.75	20.51	4.00	0	0	6.98	7.14	18.00	18.06
Traditional methods	9.52	5.26	0	0	4.95	0	4.08	6.25	0	0	0	0	1.55	0	2.12	2.02
No treatment	0	5.26	4.39	3.23	3.96	0	0	0	5.13	4.00	0	0	1.55	0	1.99	2.60
Not available	42.86	31.58	33.33	35.48	36.63	35.29	26.53	25.00	35.90	56.00	69.70	0	64.34	85.71	46.59	44.14
Number of households	64	58	270	73	201	17	235	38	61	40	139	0	393	43	1363	269

higher positive percentage (44 percent vs. 37 percent). Such a difference does not appear significant at present. As indicated in Table 34, most listening occurs in one's own household (about 80 percent), and the remainder in neighbouring families' homes. No significant difference by household head type is apparent here.

Regional variation in radio listening habits occurs. In Busia a larger proportion of matricentric households (43 percent) than patricentric families (23 percent) regularly listen to the radio. This is also the case for Siaya, although the difference is smaller (45 percent to 40 percent). In the other areas the reverse is true. A much higher proportion of both types of households than the average do not listen in Kisumu, although no male-female family differences appear. Besides the radio, exposure to other types of mass media has not been covered by CBS surveys.

6. Health care measures

Table 35 presents data concerning (small-children) household use of possible health care services in the seven impact areas. Very little difference occurs on the average in the behavior of matricentric and patricentric households. We see from the table that slightly over one-fourth of all families in the sample use or have used recently a local health clinic. Approximately six percent of all families have had recourse to hospitals, while 18 percent buy tablets for pain or infection. Very few families (two percent) declare having had recourse to traditional curative measures and about the same percentage declare using no treatment.

Regional variation is, as usual, fairly great. Siaya and Bungoma have a much lower incidence of use of health clinics than the average,

while Busia and South Nyanza have a higher incidence. Obviously this may well relate to the availability of a clinic in or near the various impact areas

7. Farm inputs and outputs

Table 36 presents the data for mean cumulative six-month agricultural and livestock inputs for male- and female-centered households in the seven impact areas. The data are given first for households declaring crop inputs (eight percent of total for males, nine percent for females), then for households reporting livestock inputs (38 percent for males, 19 percent for females). Finally, the total amount of crop and livestock inputs are divided by all households in each category for each district, yielding means referring to all households surveyed by impact area (weighted). In this way a better male-female comparison may be presented, one which will refer to all households.

We see from Table 36 that for those households reporting inputs, male-headed families spend 83 percent more on crop inputs on the average than their female counterparts (Ksh. 113 to Ksh. 62). However, as we have seen, the number of households reporting inputs is but eight percent of the total surveyed. When we generalize these data to all households in the impact areas, we see a much smaller value for crop inputs, Ksh. 8.7 for males and Ksh. 5.7 for females--a 53 percent superiority for patricentric families.

In respect to households declaring livestock inputs, we find a greater number reporting these (38 percent of males, 19 percent of females--34 percent in total) than crop inputs. There appears to be

Table 36: Agricultural and livestock inputs
per sex of household head (6 mos.)

Variable	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		P.		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mean crop input value (Ksh.)	88	66	15	0	21	25	46	90	0	0	108	45	1600	0	113	67
Number of households declaring inputs	36	27	2	0	18	4	24	2	0	0	14	2	2	0	98 (82)	35 (92)
Mean livestock input value (Ksh.)	88	77	43	0	108	143	40	43	5	0	41	35	84	50	70	71
Number of households declaring inputs	45	27	9	2	70	11	67	7	1	0	120	8	173	18	48.7 (382)	74 (192)
Mean crop input for all households in survey (Ksh.)	18.9	12.4	0.2	0	4.1	6.7	5.8	4.5	0	0	7.4	3.8	15.8	0	8.7	5.7
Mean livestock input value for all households in survey	23.6	14.4	2.1	2.1	82.2	104.9	14.1	7.5	.04	0	24.1	11.7	48.0	30.0	26.7	13.8
Total mean value of inputs for all households in survey	42.5	26.8	2.3	2.1	86.3	111.6	19.9	12.0	.04	0	31.5	15.5	63.8	30.0	35.4	19.5
Total number of households in survey	168	144	186	48	92	15	190	40	136	80	204	26	303	30	1279 (1002)	381 (1002)

essential equality of value for the two types of households (Ksh. 70 for males, Ksh. 71 for females), but the much smaller sample of females tends to skew the data. When a comparison is made for livestock inputs for all households per category, we find a rather significant superiority for male over female values (Ksh. 26.7 and Ksh. 13.8--93 percent more for males.)

When we combine the means for all inputs for the total population per category we find that male-headed households spend 82 percent more for inputs than their female counterparts (Ksh. 35.4 vs. Ksh. 19.5). This figure is significant and should be carefully monitored in the future. Most of the superiority is due to the greater value for males of livestock inputs (93 percent), but they also spend more for crop inputs (53 percent) than is justified by the numerical superiority of their families (35 percent).

Table 37 presents data on agricultural output and crops sold. Values for livestock output and sales are as yet very sketchy; too few households have declared such activity to this point. The vast majority (90 percent) of all households surveyed, however, report having harvested crops (91 percent for males, 84 percent for females). On the average, male households declare having harvested 2.4 times as many kilograms of produce than their female counterparts (1,049 kg. and 442.7 kg. respectively). This disparity rises to 2.6 times, when all households in the survey are considered (958 kg. vs. 370.7 kg.). This is all the more surprising when we consider that declared crop surface cultivated per household member is almost identical (see Table 29). These data must be watched carefully in future years.

Table 37: Agricultural output per sex of household head (6 mos.)

Variable	Road Impact Area															
	Sisya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mean harvest in kg.	516.3	248.4	310.9	282.4	3517.1	1949.3	507.3	373.6	206.5	92.5	467.7	354.8	1992.0	1550.6	1049.9	442.7
Number of households declaring output	156	143	159	31	89	15	187	31	98	46	185	23	293	30	1167 (91%)	319 (84%)
Mean value crops sold (Ksh.)	405.8	84.9	98.8	92.7	2644.8	523.6	134.2	121.2	93.0	0	212.8	139.9	383.9	163.3	500.4	133.1
Number of households declaring value of crops sold	103	94	135	28	83	13	113	14	8	0	141	15	247	21	830 (65%)	189 (50%)
Mean quantity of crops sold in kg.	213.4	110.1	154.6	120.9	712.5	387.5	410.4	128.7	89.0	0	909.4	651.8	370.9	177.0	451.3	192.9
Number of households declaring kg. sold	103	94	135	28	83	13	120	17	8	0	154	19	247	21	850 (66%)	192 (50%)
Mean harvest in kg. for all households in survey	479.4	246.7	265.8	182.4	3402.4	1949.3	499.3	289.5	148.8	53.2	424.1	340.0	1926.3	1550.6	958.0	370.7

Table 37: Agricultural output per sex of household head (6 mos.) (continued)

Variable	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mean value of crops sold (Ksh.) for all households in survey	248.8	55.4	71.7	54.1	2386.1	453.8	79.8	42.4	5.5	0	147.1	110.8	312.9	114.3	326.7	66.0
Mean quantity of crops (kg.) for all households in survey	130.8	71.9	112.2	70.5	642.8	335.8	259.2	54.7	5.2	0	686.5	516.0	302.4	123.9	299.9	97.2
Total number of households in survey	168	144	186	48	92	15	190	40	136	80	204	24	303	30	1279	381
															(100%)	(100%)

With respect to agricultural produce sales, we again observe in Table 37 a clear superiority of male-headed households in terms of amount and value of sales; patricentric families report having sold 2.3 times the number of kilograms and three-eighths times the value (Ksh.) of crops than matricentric households (451.3 kg. vs. 192.9 kg. and Ksh. 500.4 vs. Ksh. 133.1, respectively).

When we compare all households per category throughout the seven impact areas (total sample), we find that on the average, male households sell 3.1 times the number of kilograms and 4.9 times the value of agricultural output than female-headed households (2999.9 kg. vs. 97.2 kg. and Ksh. 324.7 vs. Ksh. 66.0, respectively).

These figures attest to a much greater productivity for male farms than for female-run homesteads. The 24 percent larger cultivated area reported for male households comes nowhere near explaining the tremendous disparities noted here. It appears that greater inputs and more and better labour produce the numerical superiority of agricultural production we observe from these data. Not only are male households producing on the average two and one-half times the crop size of females, but they appear to be selling a similar-sized surplus (2.3 times), when in fact they have 35 percent more mouths to feed.

8. Non-farm economic activity

Table 38 refers to the principal non-farm income-producing activities of households. Data gathered on secondary activities is too sparse for presentation; very few families report secondary non-farm economic pursuits. In all only 29 percent of households have engaged in non-farm economic activities (34 percent of males, 15 percent of

Table 38: Principal non-farm income activity by sex of household head (6 mos.)

Variable	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mean gross household income (Ksh.)	3008	1400	1289	2733	2766	1939	1325	899	2046	1620	2654	1500	2124	1700	1971	1504
Mean household non-farm activity cost	1966	435	150	1750	51	214	69	0	18	347	0	0	200	0	247	363
Mean net household income (Ksh.)	1042	965	1139	983	2715	1725	1256	899	2028	1273	2654	1500	1974	1700	1724	1141
Monthly mean net income (Ksh.)	174	161	190	164	453	288	209	150	338	212	442	250	329	283	287	190
Number of households with non-farm income	39	12	54	7	30	7	144	19	23	4	80	4	57	3	429 (34%)	57 (15%)
Mean net household non-farm income (Ksh.) for all households in survey	242	80	331	143	885	805	952	427	343	64	1041	250	371	170	578	171
Total number of households in survey	168	144	186	48	92	15	190	40	136	80	204	24	303	30	1279 (100%)	381 (100%)

females). For those households reporting such income, mean gross household income over the six months was Ksh. 1,971 and Ksh. 1,504 for patricentric and matricentric families, respectively. Males thus earned 31 percent more than females.

Costs of engaging in non-farm activity were Ksh. 247 and Ksh. 363 for males and females, respectively, leading to an accentuation of the difference in true income for the two household types; mean net non-farm income for households reporting is Ksh. 1,724 for males and Ksh. 1,141 for females, a male superiority of 51 percent. Mean monthly net non-farm earnings are Ksh. 287 and Ksh. 190, respectively.

When major non-farm economic activity is computed for all households surveyed, mean six-month net income is Ksh. 578 for males and Ksh. 171 for females. Male-headed families, thus, earn 3.4 times the disposable income of their female counterparts. This is ten times greater than their 35 percent larger household size. It is, however, the larger size which permits a greater number of male members of the family to engage in wage labour or other commercial activities in the community.

9. Household expenditures

Household expenditure figures for male and female households are given in Table 39. The data for these expenses are divided into regular (food and common household supplies) and major (rent, school, transport, repair, clothing, health, and ceremonial) expenditures. The data are mean cumulative expenses for a seven-day period collected twice (quarterly) over a six-month period.

Table 39: Household expenditures by sex of household head (14 days)

Variable	Road Impact Area															
	Siaya		Busia		Kakamega		S. Nyanza		Kisumu		Kisii		Bungoma		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Mean value of regular (expenditures Ksh. for 14 days)	82.4	50.2	55.3	74.9	169.3	114.5	154.9	141.3	80.7	41.4	78.4	41.2	184.1	105.8	119.4	70.0
Number of households with regular expenditures	136	115	159	45	68	11	170	36	76	41	165	13	240	15	1014	276
	11206.4	5773	8792.7	3370.5	11512.4	1259.5	26333	5086.8	6133.2	1697.4	12936	535.6	44184	1587	(79%)	(72%)
Mean value of major expenditures (Ksh. for 14 days)	234.3	143.2	270.6	651.0	930.8	699.3	663.7	223.3	549.6	104.7	461.9	168.8	304.7	189.2	439.1	257.2
Number of households with major expenditures	133	115	135	40	68	11	170	36	62	27	152	13	238	15	958	257
	31161.9	16468	36531	26040	63294.4	7692.3	112829	8038.8	34075.2	2826.9	70208.8	2194.4	72518.6	2833	(75%)	(67%)
Mean value of regular expenditures (Ksh.) for all households in survey	66.7	40.1	47.3	70.2	125.1	84.0	138.6	127.2	45.1	21.2	63.4	22.3	145.8	52.9	94.7	50.7
Mean value of major expenditures (Ksh.) for all households in survey	185.5	114.4	196.4	542.5	688.0	512.8	593.8	201.0	250.6	35.3	344.2	91.4	239.3	94.6	328.9	173.5
Means total expenditures (Ksh.) for all households in survey	252.2	154.4	243.7	612.7	813.1	596.8	732.4	328.2	295.7	56.5	407.6	113.7	385.1	147.5	423.6	224.2
Total number of households in survey	168.0	144.0	186.0	48.0	92.0	15.0	190.0	40.0	136.0	80.0	204.0	24.0	303.0	30.0	1279.0	381.0
															(100%)	(100%)

Regular expenditures for the seven-day periods surveyed are reported by 78 percent of all households (79 percent for male heads, 72 percent for females). Mean regular expenditures reported are Ksh. 119.4 and Ksh. 70 for males and females, respectively, a 71 percent higher figure for the former.

Mean values for major expenditures are considerably higher for both types of households. Obviously, such figures will fluctuate greatly on a seasonal basis. For the periods covered, male households spent Ksh. 439.1 and females Ksh. 257.2, a 71 percent superiority for male-headed families. Thus, for both regular and major expenses, although the latter are 3.7 times the former in both cases, male-centered families spent 71 percent more for each type. It is to be noted also that slightly fewer households reported major expenditures; an average of 73 percent (75 percent males, 67 percent females) declared such disbursements.

When we compute the mean value of expenditures in relation to all households in the survey, we find that male family expenses are 87 percent and 90 percent greater for regular and major expenditures, respectively. Thus, on the average, male-centered families spent Ksh. 94.7 and Ksh. 328.9 for these needs compared to Ksh. 50.7 and Ksh. 173.5 for matricentric households. In both cases again, we find that the ratio of major expenses to regular expenses is the same--3.4 times. Total mean household expenditures for the surveyed families are Ksh. 423.6 for males and Ksh. 224.2 for females; male households disbursed on the average a total of 89 percent more money during the two seven-day periods measured.

Consumption figures, thus, are significantly higher for male-centered families in the impact areas than female groups, a figure far in excess of the 35 percent higher average household number. It would appear that male-centered households are enjoying a distinctly higher standard of living than are matricentric families.

10. Capital transactions

One final comparison to be made between the two types of households is that relating to the major capital transactions--loans and remittances. Table 40 presents these data for the impact areas as a whole. As in previous tables, we present the mean values for those declaring such disbursements and then generalize to the whole population surveyed. This allows more appropriate comparisons to be made.

Table 40 indicates that for both male and female households there was a net capital inflow per family over the 60-day period--Ksh. 297.32 for males and Ksh. 160.94 for females. Since these samples are different in size, the figures for all households will be referred to here (and subsequently)--a net inflow for females of Ksh. 380.29 and Ksh. 268.09 for males. Thus, female-headed households received only five percent more capital in the various transactions than male-headed families. However, this disparity is increased somewhat when we realize that at some point the females can call in their cash loans, while males must pay back their capital increase. This would mean a difference of Ksh. 33.36 in terms of assets owned, increasing the disparity in permanent capital inflow to 18 percent for the period examined (Ksh. 292.54 vs. Ksh. 246.98).

Table 40: Major capital transactions by sex of household head (6 mos.)

Variable	Households Declaring	Total Households (n=1279, F=381)
<u>Male Households</u>		
I. <u>Loans (Ksh.)</u>		
Mean loans received (n=413--32% of total)	177.44	57.30
Means loans given (n=300--23% of total)	154.51	36.19
Net of loans	+22.93	+21.11
II. <u>Remittances (Ksh.)</u>		
Mean remittances received (n=963--75% of total)	426.39	321.17
Mean remittances sent (n=624--49% of total)	152.00	74.19
Net of remittances	274.39	246.98
III. <u>Net capital flow</u>		
Net loans and remittances	297.32	268.09
<u>Female Households</u>		
I. <u>Loans (Ksh.)</u>		
Mean loans received (n=83--22% of total)	116.94	25.40
Mean loans given (n=69--18% of total)	208.15	37.65
Net of loans	91.21	12.25
II. <u>Remittances (Ksh.)</u>		
Mean remittances received (n=352--92% of total)	346.57	320.00
Mean remittances sent (n=111--29% of total)	94.41	27.46
Net of remittances	252.16	292.54
III. <u>Net capital flow</u>		
Net loans and remittances	160.95	280.29

Remittances account for 81 percent of the value of capital transactions for all male families and 85 percent for all female families (83 percent for both combined). A much larger number, also, of household heads participated in remittance transactions than those involved in lending; 92 percent of females and 75 percent of males received remittances (79 percent combined), while only 22 percent of the woman heads compared to 32 percent of their male counterparts accepted loans (30 percent combined). On the other hand, 49 percent of male heads and 29 percent of female heads sent out remittances (44 percent combined), compared to 23 percent of males and 18 percent of females (22 percent combined) who granted loans.

The larger capital inflow from remittances observed for female-headed families is expectable. It is not at all unusual to see that female-centered households are being partially supported by males established in the cities. The data tend to confirm this assumption about matricentric households, although the margin of difference would not seem to compensate for the much smaller farm income they receive. These data must be carefully monitored in the future.

11. Conclusion

In sum, the baseline survey data reveal some very distinct disparities between male- and female-headed families, particularly in terms of wealth possessed (especially livestock), level of economic activity and consumption behavior.

It is apparent from the data that patricentric households enjoy a higher standard of living than do their female counterparts. Greater disparities occur in livestock possession (particularly cattle),

agricultural input and output, non-farm income, and consumption expenditures. While female-centered households seem able to meet their basic subsistence needs, their agricultural productivity level and overall income stream are clearly inferior to those of male-headed families.

In the future years of this impact study, it is imperative to observe whether the disparities noted here tend to disappear or whether, on the other hand, they will be exaggerated. If the latter trend should prevail, the Government of Kenya may wish to intervene in impact areas with particular complementary policies designed to mitigate the worsening condition of female-headed households.

C. By Distance of Household from Road

As our review of the existing literature on feeder roads has shown, the distance of the households and plots to the road may be the most important determinant of the way road effects are manifested. Landholders adjacent to or near the road have far greater ease in marketing their products. Consequently they are more likely to shift their crop patterns and technological base. Similarly, the relatively greater and faster income mobility observed among households with land near the road may be devoted to the consumption of health and educational services and to the improvement of existing housing conditions with greater ease than those households further from the road. The distance from the road is likely to be a particularly significant variable in determining differential road impact in countries such as Kenya, where settlement patterns are as widely dispersed as fields.

In order to delineate the effects of distance on productivity and consumption changes observed within the impact areas, the baseline differences between households within $1\frac{1}{2}$ km. of the road, those between $\frac{1}{2}$ and $1\frac{1}{2}$ km. from the road, and more than $1\frac{1}{2}$ km. from the road were established. Monthly and quarterly data collected in impact areas throughout a nine-month period were pooled and treated as baseline. The result is presented in Table 41.

As the table indicates, there are presently no significant differences between the three sets of households. Thus, most of the differences that develop between these different sets of households in the future can be attributed directly to their varying proximities to the road. The three categories of households differ in the following dimensions:

- o those nearest to the road travel more extensively than others;
- o those farthest away have greater non-farm incomes;
- o those farther away have larger landholdings;
- o those farthest away have a greater percentage of their lands under cultivation, but rely more heavily on cultivation of staple crops;
- o those farthest away also have more ploughs;
- o those farthest away are more likely to own a store;
- o those nearer the road have a higher percentage of their school age children in primary school.

As can be seen, these differences are not necessarily advantageous for one particular category of households. Thus, should a consistently favourable situation develop for the households nearer the road, specific road impacts will be more clearly delineated.

Table 41: Average value of selected variable by distance of household from road

	Unit	Within ½ km.	½ to 1½ km.	More than 1½ km.	No. of observa- tions	Signifi- cance
Kilometers traveled	km.	76	53	33	691	0.00
Total non-farm sales	Shillings	1527	1363	5650	98	0.01
Total non-farm services	"	2205	1746	1201	179	0.50
Total secondary non-farm receipts	"	439	347	600	119	0.60
Total non-farm income	"	2125	1990	2984	324	0.73
Total non-farm expenditures	"	692	1076	2206	87	0.50
Net non-farm income	"	1928	1677	2617	327	0.60
Net non-farm investment	"	155	282	600	23	0.59
Household income	"	1764	1581	1899	722	0.59
Shillings borrowed	"	164	152	196	212	0.78
Shillings lent	"	158	181	118	174	0.83
Shillings remitted to 12D	"	404	418	357	572	0.86
Shillings remitted to 12E	"	142	145	150	321	0.97
Household income of remittances	"	1941	1758	2187	761	0.50
Total household expenditure	"	3313	3317	5380	771	0.14
Shillings saved	"	-936	-958	-1527	771	0.36
Per capita income	"	447	352	389	759	0.32
Regular expenditures	"	214	217	374	770	0.11
Major expenditures	"	574	530	316	733	0.83
Holding area	ha	229	296	384	624	0.01
Cropping area	ha	70	84	56	687	0.63
Proportion uncultivated	%	71	75	98	800	0.00
Tenure	ha	1.1	1.1	1.3	39	0.00
Proportion staple	"	84	33	97	418	0.01
Proportion local	"	89	89	95	74	0.90
Proportion improved	"	51	42	58	800	0.37
Bicycles	No.	0.26	0.24	0.11	800	0.17
Ploughs	No.	0.23	0.26	0.61	800	0.00
Radios	No.	0.36	0.31	0.40	800	0.34
Paraffin lamps	No.	0.71	0.78	0.53	800	0.25
Permanent structures	No.	0.04	0.04	0.00	800	0.49
Semi-permanent structures	No.	0.23	0.17	0.11	800	0.17
All structures	No.	2.37	2.23	2.03	800	0.30
Proportion traditional	%	84	87	80	800	0.27
Stores	No.	0.30	0.40	0.55	800	0.00
Proportion in primary	%	97	95	92	761	0.00
Proportion in secondary	%	61	68	60	106	0.41

Data were also developed to show type of tenure, sources of water in the dry season, and types of sewage disposal by (1) distance of household from road (stratum 1 and 2 only) and (2) roads. Chi square tests indicate that tenure is independent of (not associated with) road stratum, but associated with roads at the one percent level of significance. Source of water during the dry season is associated with stratum and road at the one percent level as well. Type of sewage disposal system is independent of road stratum, but associated with roads (at the one percent level).

D. By Self-employed and Non-self-employed Farmers

In considering self-employed and non-self-employed farmers, numerous variables were reviewed to determine differences between the two groups. Table 42 portrays a summary of the analysis, showing the mean value of the two groups for each of 40 variables, the number of observations for each variable and a statistical indicator of whether or not the means of the two groups are equal.

Several variables in the table are of particular note. Total non-farm sales, for example, are nearly 2.75 times as large for non-self-employed farmers as for self-employed farmers. Total non-farm income for self-employed farmers is only one-third of that for non-self-employed farmers. Household income for non-self-employed farmers is 2.5 times as great as that of self-employed farmers. Household income including remittances is 2.25 times as great for non-self-employed farmers. Per capital income of non-self-employed farmers is 7.6 times that of self-employed farmers. While savings of Ksh. 325 per year are achieved by non-self-employed farmers, self-employed farmers have negative savings per year of Ksh. 1002.

Table 42: Data for self-employed and non-self-employed farmer groups

Category	Unit	Average value for groups		Number of observations	Significance *
		Not-self-employed farmers	Self-employed farmers		
Veterinary fees	Ksh.	-	17	36	
Kilometers traveled	km.	79	66	562	0.55
Total non-farm sales	Ksh.	4291	1566	77	0.02
Total non-farm services	"	3460	1776	160	0.00
Total secondary non-farm receipts	"	310	379	98	0.88
Total non-farm income	"	5878	1991	273	0.00
Total non-farm expenditures	"	640	874	69	0.90
Net non-farm income	"	5835	1740	276	0.00
Net non-farm investment	"	205	119	19	0.57
Household income	"	4389	1759	581	0.00
Shillings borrowed	"	306	171	174	0.33
Shillings lent	"	229	157	140	0.49
Shillings remitted to family	"	690	413	425	0.25
Shillings remitted out	"	305	148	270	0.02
Household income w/remittances	"	4484	1981	595	0.00
Total household expenditures	"	4613	3674	604	0.52
Shillings saved	"	325	-1002	604	0.02
Per capita income	"	2595	342	593	0.00
Regular expenditures	"	271	240	604	0.78
Major expenditures	"	1204	573	580	0.01
Holding area	ha.	1.77	301	593	0.19
Cropping area	ha.	0.47	0.74	555	0.20
Proportion cultivated	ha.	0.77	0.74	536	0.47
Tenure, owner or owner like	ha.	1.17	1.09	622	0.33
Rented	ha.	5.02	1.64	33	0.10
Proportion staple crops	%	77	82	568	0.29
Proportion local	%	85	87	289	0.84
Proportion improved	%	70	51	64	0.44
Bicycles	no.	0.21	0.26	622	0.58
Ploughs	no.	0.10	0.30	622	0.04

Table 42: Data for self-employed and non-self-employed farmer groups (continued)

<u>Category</u>	<u>Unit</u>	<u>Employed farmers</u>	<u>Self employed farmers</u>	<u>Number of observations</u>	<u>Significance *</u>
Radios	no.	0.59	0.35	622	0.02
Paraffin lamps	no.	1.03	0.73	622	0.09
Permanent structures	no.	0.21	0.04	622	0.00
Semi-permanent structures	no.	0.45	0.19	622	0.01
All structures	no.	1.69	2.47	622	0.01
Proportion traditional	%	68	88	622	0.00
Stores	no.	0.38	0.45	622	0.68
Proportion in primary	%	99	96	592	0.18
Proportion in secondary	%	50	63	87	0.66

*Of F test for difference between means of the two groups. Any number less than 0.05 means that the chance the means of the two groups are the same is less than 5 in 100.

Total expenditures of both groups are not significantly different. Non-self-employed farmers spend Ksh. 4,613 per year, while self-employed farmers make expenditures of Ksh. 3,674 annually. Regular expenditures were not significantly different either, measuring 271 shillings for non-self-employed farmers and 240 shillings for self-employed farmer. Expenditures for regular items are different, however, with non-self-employed spending over two times as much as self-employed farmers.

In terms of size of holdings, self-employed farmers hold about 50 percent more area than do non-self-employed farmers. The former also have a slightly larger cropping area. There is no major difference between the two groups by farmers in terms of tenure.

Self-employed farmers have significantly more ploughs per household than non-self-employed farmers, but the latter have more radios. As would be expected given the income data above, non-self-employed farmers have more permanent and semi-permanent structures than self-employed farmers whereas self-employed farmers have more traditional structures and more total structures. There is no significant difference between the two groups with respect to school attendance.

Data were developed to show type of tenure, sources of water in the dry season, and types of sewage disposal by (1) self-employed and non-self-employed farmers and (2) roads. Chi square tests for independence showed that tenure, source of water and sewage disposal are not associated with self-employed and non-self-employed farmer groups. However, these categories were associated with different roads to a substantial degree. Thus, the two farmer groups exhibit similar proportions of tenure, water source and sewage disposal whereas the

different roads exhibit dissimilar proportions. Tables 43, 44 and 45 present the appropriate data by roads.

The major pattern that emerges in the data regards the two groups of farmers is that non-self-employed farmers have substantially higher incomes and better housing structures than do self-employed farmers, primarily because of their greater non-farm income. Non-self-employed farmers comprise a small portion of the households in the impact area, however, accounting for about five percent of all households in the sample used to develop the baseline data. Therefore, the data for self-employed farmers is much more representative of the road impact areas. The standard deviations for much of the mean data presented on this larger group are quite large, however, so that even the means should not be considered as entirely representative of self-employed farmers in the case of many variables.

Table 43: Roads by tenure category
(number of households)

<u>Tenure category</u>	<u>Kisii</u>	<u>Kisumu</u>	<u>Siaya</u>	<u>Nyanza</u>	<u>Bungoma</u>	<u>Busia</u>	<u>Kakamega</u>	<u>Total</u>
Not stated	0	0	0	0	1	1	0	1
Owner/owner like	104	70	61	95	75	94	86	585
Partly own/rent	0	2	2	0	1	0	5	10
Rented	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>26</u>	<u>0</u>	<u>0</u>	<u>26</u>
TOTAL	<u><u>104</u></u>	<u><u>72</u></u>	<u><u>63</u></u>	<u><u>95</u></u>	<u><u>103</u></u>	<u><u>94</u></u>	<u><u>91</u></u>	<u><u>622</u></u>

150

177

Table 44: Roads by dry season water source
(number of households)

<u>Water source</u>	<u>Kisii</u>	<u>Kisumu</u>	<u>Siaya</u>	<u>Nyanza</u>	<u>Bungoma</u>	<u>Busia</u>	<u>Kakamega</u>	<u>Total</u>
Other	0	0	42	0	0	0	0	42
Still pond	0	0	13	0	4	0	0	17
Small dam	-	-	-	-	-	-	-	-
Stream	51	69	8	48	41	26	17	260
Spring	53	1	0	22	32	21	73	202
Well	0	1	0	23	19	47	1	91
Borehole	0	0	0	2	7	0	0	9
Sub-surface dam	-	-	-	-	-	-	-	-
Jabias rain water	0	1	0	0	0	0	0	1
Piped water	-	-	-	-	-	-	-	-
TOTAL	<u>104</u>	<u>72</u>	<u>63</u>	<u>95</u>	<u>103</u>	<u>94</u>	<u>91</u>	<u>622</u>

Table 45: Roads by type of sewage disposal
(number of households)

<u>Type sewage disposal</u>	<u>Kisii</u>	<u>Kisumu</u>	<u>Siaya</u>	<u>Nyanza</u>	<u>Bungoma</u>	<u>Busia</u>	<u>Kakamega</u>	<u>Total</u>
None	9	5	16	42	36	56	14	178
Main sewage	0	0	0	0	1	0	0	1
Septic tank	0	0	0	0	0	2	0	2
Pit latrine	95	67	47	53	66	36	77	441
Bucket latrine	-	-	-	-	-	-	-	-
Cesspool	-	-	-	-	-	-	-	-
TOTAL	<u>104</u>	<u>72</u>	<u>63</u>	<u>95</u>	<u>103</u>	<u>94</u>	<u>91</u>	<u>622</u>

V. EXPECTED CHANGES FROM BASELINE AND OBSERVATIONS TO DATE

A. Introduction

This chapter summarizes the changes from baseline expected from impact of the road(s) and observations of such changes, if any, to date. It includes information on anticipated changes by road impact area (including road use), male- and female-headed households, distance of household from the road, tenure¹, and self-employed and non-self-employed farmers. The cross-sectional comparisons are important because they help donor agencies and the GOK understand who benefits most or least from the road projects and enable them to launch complementary actions to counteract undesirable economic or social consequences or to strengthen desirable impacts.

Information for impact areas and all cross-sectional comparisons was developed for many different variables. In fact, the amount of information generated by the enumerators in all these areas is so voluminous that it was difficult for the MOTC evaluation staff to carefully analyze all of it. Moreover, some of the information available was difficult to analyze because of unexplained discrepancies in the data. Both of these problems are being carefully considered by MOTC in order to sharpen the focus of data collection and to assure the precision and accuracy of the information that is collected.

The section immediately below indicates the most significant socio-economic and road use changes that MOTC anticipates within impact areas as a result of the new roads. While other changes are

also likely, these expected impacts are those where MOTC will concentrate much of its observation and analysis. These anticipated impacts can be viewed as tentative hypotheses to be tested via further observation and analysis. The treatment of road impact areas is followed, seriatim, by expected changes and observations to date for each cross-sectional comparison.

B. Road Impact Areas--Socio-economic Factors

1. Expected changes from baseline

The major anticipated changes from the baseline within the road impact area(s) that can be attributed to the new road(s) are as follows:

- o Crop and livestock production and marketing--The production (output, yield, hectarage, etc.) and off-farm marketing of both crops and livestock will increase.
- o Cash cropping--The amount of cash cropping in terms of output, hectarage, and marketings will increase within the impact area.
- o Proportion of cultivated land--The proportion of cultivated land in the impact areas will increase.
- o Crop diversification or concentration--The types of crops grown in the impact areas will change, increasing in either diversification or concentration, depending upon the baseline conditions and nearby marketing possibilities.
- o Crop and livestock proportions--The relative proportion of crop and livestock activity, as measured by inputs, sales, income, etc. will shift; the extent and direction of the change will depend on local conditions, but is likely to favor livestock in cases where subsistence food and income needs are met.
- o On-farm consumption--The quantity of both crop and livestock products consumed on farms in the impact area will increase.
- o Technology--The availability and use of agricultural and household technologies will increase; this will

include an expansion of both the type and volume of technologies available and in use in the impact areas.

- o Accessibility to outside agencies--The contact of residents of the road impact areas with outside agencies (extension agents, banks, doctors, other government officials, co-operatives, etc.) will increase.
- o Structures--More non-traditional household structures as well as dukas and other commercial buildings will be built in the impact areas.
- o Income and expenditures--Income and expenditure levels in all categories will increase.
- o Off-farm employment--Off-farm employment will increase in terms of numbers of people involved and income generated.

2. Observations to date

Observations have been made for all impact area variables during the first year of the study. Most of these observations do not yet show results which MOTC believes to be significant, although some do indicate directions of change. Other observations, however, do not yet indicate much change in any direction.

Results for the most significant changes from baseline and for certain important variables as observed to date are presented below. These and the other variables will be analyzed more fully in subsequent years as more data becomes available.

Cropping area showed almost no change during the observation period. Kisi apparently lost five percent of its cropped area, but all other impact areas were within one percent of the baseline area. On the other hand, crop revenues varied substantially from baseline, increasing by 400 percent in Bungoma and decreasing by over 80 percent in South Nyanza. Similar variability was evident in the case of

crop inputs. Such variability may be attributed to either poor enumeration or seasonality. It does indicate, however, that more observations of crop output and marketings will be needed to identify true trends and authentic road impacts.

The number of livestock in all impact areas at baseline and at last observation is presented in Table 46. Both improve cattle and sheep appear to be increasing in numbers. Farm livestock production over all impact areas also varied from baseline, ranging from 26 percent higher in milk output to 49 percent lower in poultry production (Table 47). Livestock related inputs varied substantially between the periods in different impact areas as well. Revenues from all livestock by impact area ranged from 95 percent of baseline in Bungoma to 248 percent of baseline in Kisumu. Again, additional observations are necessary to identify the true relationship between the road and livestock output and marketings. Likewise, more evidence is required to determine how the crop and livestock balance is affected by the road in the impact areas.

The household food consumption change from baseline for all impact areas is presented in Table 48. There were increases of two to 15 percent in three commodity categories and no change in three others. Interesting comparisons can be made between the production and consumption of these commodities by comparing Tables 47 and 48. Basically, while milk output increased substantially, household milk consumption increased very little. Conversely, while poultry output declined dramatically, consumption increased substantially. The reasons for such changes are not readily apparent, but they will be pursued carefully during the next year.

Table 46: Change in number of livestock from baseline

<u>Type livestock</u>	<u>Baseline</u>	<u>Latest observation</u>	<u>% change</u>
Improved cattle	1140	1456	+28
Unimproved cattle	6097	5993	-2
Sheep	1654	1876	+13
Pigs	81	58	-28
Donkeys	33	23	-30
Chickens	16621	17272	+4
Goats	1537	1531	0

Source: CBS data

**Table 47: Changes in livestock production
from basaling for all impact areas**

<u>Commodity</u>	<u>% change from baseline</u>
Sheep	-15
Goat	-07
Chicken	-49
Beef	-07
Milk	+26

Source: CBS data

Table 48: Changes in household food consumption from baseline for all impact areas

<u>Commodity</u>	<u>% change from baseline</u>
Mutton	0
Goat	0
Chicken	+15
Beef	0
Milk	+02
Fish	+11

Source: CBS data

The proportion of land uncultivated actually increased very slightly (one or more percent) in all but one of the road impact areas, as indicated in Table 49. The cropping area remained nearly constant, as earlier reported, as did the total holding area.

Household income and expenditures and per capita income changes from baseline are shown in Table 50. No obvious pattern shows up yet which supports the hypothesis stated above, namely that all these variables will increase as a result of the impact of the road.

In summary, the observations to date of socio-economic changes from the baseline for impact areas are inconclusive for even the most important variables being monitored. This, in the view of MOTC, neither proves nor disproves any of the above-mentioned hypotheses, nor does it indicate that the procedures being used are inappropriate. Rather, in that the data being reviewed represent at best a one-year period since the roads were completed, the inconclusive observations to date are merely an indication that the full socio-economic effect of the roads has not taken place in the impact areas; consequently, there is not yet enough hard observational data of what happens when it does. As the impact study goes forward, however, the changes occurring--whatever they are--should begin to emerge in a clear pattern that can be verified from year to year. MOTC will continue to work with and review the impact area socio-economic data with this in mind during the ensuing year. The various topical studies to be undertaken in addition to the regular observation exercises should help identify changes in some of the variables being examined during the upcoming year as well.

Table 49: Change from baseline holding area, proportion of land not cultivated and cropping area

<u>Road</u>	<u>% change</u>		
	<u>Holding area</u>	<u>Land not cultivated</u>	<u>Cropping area</u>
Kisii	-1	+1	-5
Kisumu	-4	+3	0
Siaya	+2	+6	0
S. Nyanza	+1	+1	0
Bungoma	+1	+1	0
Busia	-1	+1	0
Kakamega	0	-1	+1

Source: CBS data

Table 50: Changes from baseline for household and per capita income and household expenditures by impact area

<u>Impact area</u>	<u>% change from baseline</u>		
	<u>Household income (with remittances)</u>	<u>Per capita income</u>	<u>Household expenditures</u>
Kisii	-33	-21	-19
Kisumu	+55	+39	-16
Siaya	-21	-34	- 9
S. Nyanza	-11	+02	+ 4
Bungoma	+27	+67	+ 8
Busia	-02	-13	-36
Kakamega	+29	+38	-33

Source: CBS data

C. Road Impact Areas--Road Use

1. Expected changes from baseline

The anticipated changes in road use and costs due to the construction of a rural access road in place of a former "track" include the following:

- o Non-production related trips--Passenger trips for non-agricultural production purposes will increase and passenger costs per trip in terms of out-of-pocket and time expenditures will diminish.
- o Freight and passenger production related trips--Production related trips for both freight and passengers will increase and the cost per trip will decrease. Much more freight and many more passengers will move within and without the impact area(s).
- o Transporter's surplus--The difference between transporter's revenues and operating expenditures will increase as a result of the road.
- o Means of travel--Pedestrian traffic will be the predominant means of travel on the rural access roads during the next several years; pedestrians will account for a majority of marketing, social visits and other uses of the road(s).

2. Observations to date

The traffic surveys of November 1979 indicated a greater use of the roads over the previous period. More significantly, Siaya and Busia roads started to show some vehicle traffic. Tables 51 and 52 show the type of traffic observed on the roads during each of the five weekdays on which the traffic counts were taken. The use of the roads by bicycles, motorcycles, and pedestrians is also indicated.

Despite the dramatic increase in the volume of traffic from March to November 1979, the traffic counts of August 1980 did not maintain this trend. Instead, the traffic on certain roads fell below its

Table 5j: Use of roads in impact study areas
by vehicles November 1979

DISTRICTS	DAYS	CARS	LIGHT GOODS	LORRIES WITH ONE AXLE	LORRIES TRUCKS TRAILERS	BUSES	TRACTORS	TOTAL
KISII	MONDAY	1	12	-	-	-	2	15
	TUESDAY	2	-	-	-	-	-	2
	WEDNESDAY	3	4	-	-	-	1	8
	THURSDAY	4	5	-	-	-	-	9
	FRIDAY	4	7	-	2	-	-	13
TOTAL		14	28	-	2	-	3	47
BUNGOMA	MONDAY	1	2	-	-	-	-	3
	TUESDAY	-	2	1	-	-	-	3
	WEDNESDAY	1	3	-	-	-	-	4
	THURSDAY	-	-	-	-	-	-	-
	FRIDAY	-	-	-	-	-	-	-
TOTAL		2	7	1	-	-	-	10
KAKAMEGA	MONDAY	-	-	-	-	-	-	-
	TUESDAY	-	-	-	-	-	-	-
	WEDNESDAY	-	-	-	-	-	-	-
	THURSDAY	-	-	-	-	-	-	-
	FRIDAY	-	-	-	-	-	-	-
TOTAL		-	-	-	-	-	-	-
SIAYA	MONDAY	-	1	-	-	-	-	1
	TUESDAY	-	-	-	-	-	-	-
	WEDNESDAY	-	-	-	-	-	-	-
	THURSDAY	-	1	-	-	-	-	1
	FRIDAY	-	-	-	-	-	-	-
TOTAL		-	2	-	-	-	-	2
SOUTH NYANZA	MONDAY	3	-	-	-	-	-	3
	TUESDAY	1	2	-	-	-	-	3
	WEDNESDAY	-	3	-	-	-	-	3
	THURSDAY	1	1	-	-	-	-	2
	FRIDAY	-	3	-	-	-	-	3
TOTAL		5	9	-	-	-	-	14
BUSIA	MONDAY	-	1	-	-	-	-	1
	TUESDAY	-	-	-	-	-	-	-
	WEDNESDAY	-	-	-	-	-	-	-
	THURSDAY	-	-	1	-	-	-	1
	FRIDAY	1	-	-	-	-	-	1
TOTAL		1	1	1	-	-	-	3
KISUMU	MONDAY	-	-	-	-	-	-	-
	TUESDAY	-	-	1	-	-	-	1
	WEDNESDAY	-	-	-	-	-	-	-
	THURSDAY	1	-	2	-	-	-	3
	FRIDAY	-	3	-	-	-	-	3
TOTAL		1	3	3	-	-	-	7

Table 52: Use of roads, by bicycles, motor cycles and pedestrians, November 1979

		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	TOTAL
KISII	BICYCLES	6	5	17	6	9	43
	MOTOR CYCLES	1	1	1	-	-	3
	PEDESTRIANS	663	907	1700	915	845	5030
	TOTAL	670	913	1718	921	854	5076
BUNGOMA	BICYCLES	18	2	2	-	4	26
	MOTOR CYCLES	-	-	-	-	-	-
	PEDESTRIANS	311	150	266	347	300	1374
	TOTAL	329	152	268	347	304	1400
KAKAMEGA	BICYCLES	122	56	47	69	90	394
	MOTOR CYCLES	-	-	-	-	-	-
	PEDESTRIANS	1600	458	449	449	668	3624
	TOTAL	1732	514	496	518	758	4018
SIAYA	BICYCLES	5	17	13	12	14	61
	MOTOR CYCLES	1	-	-	-	3	4
	PEDESTRIANS	163	146	143	131	122	705
	TOTAL	169	163	156	143	139	770
BUSIA	BICYCLES	25	47	36	81	49	238
	MOTOR CYCLES	-	-	-	-	-	-
	PEDESTRIANS	97	99	120	142	111	569
	TOTAL	122	146	156	223	160	807
KISUMU	BICYCLES	22	38	66	57	38	221
	MOTOR CYCLES	-	-	-	-	-	-
	PEDESTRIANS	332	344	464	277	372	1789
	TOTAL	354	382	530	334	410	2010
SOUTH NYANZA	BICYCLES	19	15	14	13	13	76
	MOTOR CYCLES	-	-	-	-	-	-
	PEDESTRIANS	155	188	119	115	164	741
	TOTAL	174	203	133	130	177	817

pre-construction levels when measured in terms of bicycles, pedestrians, and vehicles (Table 53). While animal uses in some areas fell below the November 1979 level there was an overall increase in road use by animals (Table 54).

The decline in road use could be attributed to several things. First, changes were made in the methodology of data collection which took place in August 1980. At that time, the traffic counts were made in two days, rather than five continuous days, as was the case throughout the 1979 surveys. One of the days selected was a market day, the other, a non-market day. Also, in 1980 traffic on both sides of the road was counted and an average figure was entered to indicate the pedestrian and bicycle traffic. Since on all roads traffic counts differed significantly depending upon the positioning of the enumerators, an average of the two counts taken at both ends of the roads was used in the tables. Since the vehicle registration numbers were noted, double counting on the vehicle traffic was avoided and the actual number of vehicles using the roads were entered on the tables. Table 53 compares the traffic counts on market and non-market days for November 1979 and August 1980.

Second, it is possible that August, as compared to both November and March, is a month of low activity for harvesting and marketing purposes. More importantly, the fact that the schools are closed during the month of August may account for much of the reduced level of pedestrian and bicycle traffic observed during the 1980 period.

These data, while indicating greater use of the roads by motorized traffic, suggest that a greater level of seasonality than anticipated may be operating with respect to road usage. Thus, the impact study team is now planning to repeat traffic surveys on all roads during the same week of November that the counts were taken during the previous

Table 53: Road use by vehicles, bicycles and motorcycles and pedestrians - November 1979, August 1980

	<u>Market days</u>		<u>Non-market days</u>	
	<u>Nov. 1979</u>	<u>Aug. 1980</u>	<u>Nov. 1979</u>	<u>Aug. 1980</u>
<u>Kisii - #9</u>				
vehicles	8	5	9	8
bicycles & motorcycles	18	5	7	5
pedestrians	1700	548	866	517
<u>Kakamega - #6</u>				
vehicles	---	---	2	---
bicycles & motorcycles	100	108	64	62
pedestrians	1134	346	452	197
<u>Siaya - #1</u>				
vehicles	---	2	1	1
bicycles & motorcycles	15	31	10	21
pedestrians	134	262	146	149
<u>Busia - #4</u>				
vehicles	---	2	1	---
bicycles & motorcycles	36	44	51	55
pedestrians	120	145	112	156
<u>Risumu - #8</u>				
vehicles	2	---	1	---
bicycles & motorcycles	47	17	42	13
pedestrians	415	168	330	152
<u>S. Nyanza - #7</u>				
vehicles	3	1	3	---
bicycles & motorcycles	14	3	16	4
pedestrians	142	149	133	505
<u>TOTAL</u>				
vehicles	13	10	17	9
bicycles				
motorcycles	230	208	190	160
pedestrians	3645	1618	2039	1676

Table 34: Use of road by animals
November 1979, August 1980

	<u>12 hrs-average - non-market days</u>		<u>12 hrs-average - market days</u>	
	<u>November 1979</u>	<u>August 1980</u>	<u>November 1979</u>	<u>August 1980</u>
<u>Kakamega</u>				
Cows	---	116	---	205
Sheep	---	31	---	33
Goats	---	1	---	9
Others	---	4	---	---
Total	<u>226</u>	<u>152</u>	<u>117</u>	<u>247</u>
<u>Siaya</u>				
Cows	29	165	43	42
Sheep	4	13	9	6
Goats	1	5	16	1
Others	---	---	---	---
Total	<u>34</u>	<u>183</u>	<u>68</u>	<u>49</u>
<u>S. Nyanza</u>				
Cows	43	27	25	13
Sheep	16	---	4	---
Goats	4	---	2	---
Others	---	2	---	---
Total	<u>63</u>	<u>29</u>	<u>31</u>	<u>13</u>
<u>Kisumu</u>				
Cows	---	19	---	110
Sheep	---	---	---	2
Goats	---	---	---	12
Others	1	---	9	---
Total	<u>1</u>	<u>19</u>	<u>9</u>	<u>124</u>
<u>Busia</u>				
Cows	---	20	---	82
Sheep	---	---	---	---
Goats	---	---	---	---
Others	---	---	---	---
Total	<u>10</u>	<u>20</u>	<u>4</u>	<u>82</u>
<u>Kisii</u>				
Cows	2	22	4	20
Sheep	---	---	---	---
Goats	7	---	6	---
Others	18	3	86	3
Total	<u>27</u>	<u>25</u>	<u>96</u>	<u>23</u>
TOTAL	<u>361</u>	<u>428</u>	<u>325</u>	<u>538</u>

year. Experimenting with different ways of traffic data collection during that period may help reduce some of the data reliability problems currently being faced.

Over the years to come the main users of the rural access roads are likely to be pedestrians. Sugarcane being a major exception, most goods will continue to be marketed in small quantities on the heads of rural women. The expectation of increased pedestrian traffic is even stronger because purchasers are also mainly pedestrians, a situation which is likely to continue for at least several more years. When household heads were asked about the mode of transportation utilized for each trip, traveling on foot far exceeded other modes as Table 55 shows. There were some differences between the various impact areas in this respect. Bicycles followed pedestrians in number of trips, with matatus and buses being of lesser importance.

A higher level of animal drawn carts, more bicycles and motorcycles and more vehicles also are expected. Transportation of goods to markets at a greater distance in small trucks or matatus will gain greater importance over time. The quantities transported by this means will often be limited to the carrying capacity of one person, however, in that a person carries the goods, riding a matatu for a portion of the way. Depending upon the mode of transportation, the average time taken to reach one's destination varied (see Table 56).

Traders and merchants who control the transportation sector in certain regions, such as in the Bungoma study area, will move in slowly to the road impact areas and will limit their activities to the marketing of a selected number of products. Sugar-growing areas

Table 59: Total trips by transport mode - first quarter
(number of trips)

	ROAD NO. 1 SIAYA	ROAD NO. 4 BUSIA	ROAD NO. 6 KAKAMEGA	ROAD NO. 7 S. NYANZA	ROAD NO. 8 KISUMU	ROAD NO. 9 KISII	ROAD NO. 13 BUNGOMA	TOTAL
FOOT	489	1104	476	442	366	696	1566	5139
BICYCLES	-	88	12	2	30	4	57	193
MATATU	-	10	2	10	10	46	21	99
BUS	-	6	-	12	-	4	-	22
TOTAL	489	1208	490	466	406	750	1645	5454

Table 56: Average time taken by transport mode - first quarter
(minutes)

Road impact area									TOTAL NO. OF TRIPS
<u>MODE OF TRAVEL</u>	<u>ROAD NO. 1 SIAYA</u>	<u>ROAD NO. 4 RUSIA</u>	<u>ROAD NO. 6 KAKAMEGA</u>	<u>ROAD NO. 7 S. NYANZA</u>	<u>ROAD NO. 8 KISUMU</u>	<u>ROAD NO. 9 KISII</u>	<u>ROAD NO. 13 BUNGOMA</u>	<u>MEAN TIME</u>	
FOOT	30.5	23.1	35.0	34.9	43.2	23.8	20.1	27.4	1755
BICYCLE	-	27.6	40.0	20.0	8.0	12.0	8.0	18.8	48
MATATU	-	15.0	21.0	33.0	56.7	9.2	18.8	24.5	44
BUS	-	15.0	-	81.0	-	20.0	-	16.9	16
TOTAL NO. OF TRIPS	183	370	160	178	178	350	426	-	1863

are likely to experience such penetration in a shorter period of time. The marketing of products grown primarily for subsistence purposes (but a portion of which are sold in local markets), as well as cash crops grown in limited quantities such as coffee, are expected to be left out of the transactions that take place between the farmers and the merchant transporters, for the most part.

To illustrate the volume of goods transported to the markets and carried back home from the markets by pedestrians, a special traffic count was taken on the Kakamega road in August 1980. As will be recalled, this road is still uncompleted awaiting the construction of a bridge. The road is linked to two classified roads, one on its north end and the other on its south end with markets located near both main intersections. Since sugar is grown in the area, tractors and trucks come to the area from either side of the road during harvest season to take the sugarcane to the nearby jaggery. At all other times, vehicular traffic is extremely low on the road. However, many of the area residents utilize bicycles extensively. During the market day in August 1980, a total of 346 persons were counted walking on the road; 190 of these persons were seen carrying something and were asked to briefly describe what they were carrying. The interviewers also made an estimate of the amount carried. If a pedestrian was seen as carrying, for instance, several chickens he/she was asked about the expected sales value of the chickens. If that particular person was interviewed on the way back from the market, the actual price paid for the chicken was ascertained. Table 57 notes these observations. The data suggests that the market transactions that take place within an impact area through pedestrians may far exceed transactions secured through motorized traffic.

Table 57: Road use by pedestrians, Kakamega, August 1980
(Market days)

<u>Type of goods carried by the pedestrians</u>	<u>Number of persons</u>	<u>Average kg.</u>	<u>No. of items carried</u>	<u>Total amount of transaction in Ksh.</u>
chickens	17	—	36	700.20
eggs	2	17	34	17.00
maize	23	560 kg.	24	840.00
ropes	4	—	69	34.50
seedlings	5	—	—	23.00
sponges (bath)	1	—	10	3.00
groundnuts	1	10 kg.	—	60.00
pineapples	1	3 kg.	—	21.00
bananas	2	—	21	105.00
beans	1	2	—	6.00
vegetables	24	53 kg.	—	53.00
milk	1	½ kg.	—	1.00
sugar	11	30 kg.	—	135.00
millet	3	15 kg.	—	30.00
pots	1	—	1	4.50
salt	7	20 kg.	—	60.00
cloths	8	—	22 m.	220.00
brooms	5	—	3	31.00
empty jerricans	1	—	1	10.00
candle lamps	2	—	2	4.20
bags (empty)	2	—	2	7.50
jembe	2	—	2	12.00
match boxes	2	—	8	2.00
plates	2	—	2	25.00
cups	2	—	2	15.00
sweets	1	—	1	15.00
radio cells	1	—	2	4.20
feeding bottles (baby)	1	—	1	12.00
basins	3	—	3	45.00
pillow cases	1	—	1	12.00

Table 57: Road use by pedestrians, Kakamega, August 1980
 (Market days)
 (continued)

Type of goods carried by the pedestrians	Number of persons	Average kg	No. of items carried	Total amount of transaction in Ksh.
steel wool	1	—	4	4.00
liquid oil	1	—	1	3.00
blankets	5	—	5	188.00
baskets	3	—	6	32.00
onions	7	7 kg.	—	16.70
meat	18	17 kg.	—	207.00
traditional chairs	1	—	1	4.00
kimbo	4	1½ kg.	—	20.00
omo	1	—	1	2.60
soap	4	—	4	6.15
fish	3	—	8	16.00
sacks	1	—	1	5.00
paraffin	3	20 kg.	3	42.00
jag	1	—	1	13.00
tea	4	½ kg.	5	6.70
b/pounder	1	½ kg.	—	1.50
soda	2	—	1	25.90
mail	1	1	—	6.00
tomatoes	1	1	—	4.00
records	1	—	2	24.00

Marketing is not the only reason for the use of rural access roads. When one inquires of area residents about the utility of the roads, a rather typical answer is that the all-weather roads make it easier for people to take their sick to a health center. In order to establish the mode and the frequency of road use for different purposes, CBS included a road use survey in their farm surveys. It is used together with the cyclical surveys for monthly and quarterly sample households. The household heads are asked how many times during the past week members of their households utilized the road, the purpose of the trip, the mode of transport used and the cost of transportation. These inquiries reveal that schooling and marketing are the two main reasons for road use, with schooling being the most important in terms of frequency. Visiting relatives and friends and other social purposes constitute another major reason for using the roads (Table 58). Throughout the nine months during which such data have been collected and analysed, work related reasons were cited by about eight percent of the road users, while two percent of the users had a medical factor behind their trips. No consistent changes in trip purpose were observed between one quarter's observations and another. Road users from male- and female-headed households do not appear to behave differently in this respect. There are, however, differences between the road impact areas in the frequency of road use for certain purposes as illustrated in Table 59 using first quarter observations.

Of all the trips made by residents of the impact areas, about two-thirds went beyond the boundaries of the impact zone. Trips that were

Table 58: Number of trips by trip purpose

Trip purpose	1st Quarter						2nd Quarter						3rd Quarter						All 3 Quarters	
	No. male trips	% male trips	No. female trips	% female trips	Total no. trips	% total trips	No. male trips	% male trips	No. female trips	% female trips	Total no. trips	% total trips	No. male trips	% male trips	No. female trips	% female trips	Total no. trips	% total trips	% quarterly mean	Total trips
Work	129	6.8	132	10.8	261	8.4	104	10.8	105	9.8	209	7.7	111	7.7	92	9.7	203	8.51	8.18	673
School	737	38.8	398	32.5	1135	36.3	448	32.8	259	24.1	707	26.2	534	36.9	346	36.5	880	36.7	33.12	2722
Marketing	513	27.0	252	20.1	765	24.5	422	20.1	234	23.7	676	25.0	427	29.5	240	25.3	667	27.8	25.65	2108
Medical	20	1.0	28	2.3	48	1.5	53	2.3	16	1.5	69	2.6	27	1.9	19	2.0	46	2.0	1.98	163
Social	465	24.5	387	31.6	852	27.3	501	31.6	386	35.9	887	32.8	266	18.4	226	23.8	492	20.5	27.14	2231
Other	33	1.7	29	2.4	62	2.0	99	2.4	54	5.0	153	5.7	81	5.6	26	2.7	107	4.5	3.92	322
Total	<u>1897</u>	<u>100</u>	<u>1226</u>	<u>100</u>	<u>3123</u>	<u>100</u>	<u>1627</u>	<u>100</u>	<u>1074</u>	<u>100</u>	<u>2701</u>	<u>100</u>	<u>1446</u>	<u>100</u>	<u>949</u>	<u>100</u>	<u>2395</u>	<u>100</u>	<u>100</u>	<u>8219</u>

Note: Percentage numbers may not add due to rounding.

Table 59: Trip purpose by road impact area--first quarter
(percentages)

Trip purpose	Road Impact Area								TOTAL	
	ROAD NO.1 SIAYA	ROAD NO.4 BUSTIA	ROAD NO.6 KAKAMEGA	ROAD NO. 7 S.NYANZA	ROAD NO.8 KISUMU	ROAD NO.9 KISII	ROAD NO.13 BURIGOMA	Z	N	
WORK	-	10.3	7.5	8.2	6.7	14.9	3.5	7.8	145	
SCHOOL	13.1	30.3	24.4	12.2	4.5	1.1	17.9	15.4	289	
MARKETING	34.4	31.4	45.0	33.7	51.7	49.1	11.7	33.8	632	
MEDICAL	4.9	1.1	3.1	7.1	6.7	1.1	2.8	3.2	60	
SOCIAL	45.9	22.7	16.3	38.8	27.0	33.7	53.1	35.6	667	
OTHER	<u>1.6</u>	<u>4.3</u>	<u>3.8</u>	-	<u>3.4</u>	-	<u>11.0</u>	<u>4.3</u>	<u>79</u>	
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		
TOTAL NUMBER OF TRIPS	<u>183</u>	<u>370</u>	<u>160</u>	<u>196</u>	<u>178</u>	<u>350</u>	<u>426</u>	-	<u>1863</u>	

directed to the outside were predominantly for purposes of marketing and secondarily for social purposes; the trips that took place within the impact area were predominantly for social purposes and for schooling.

D. Male- and Female-headed Households

1. Expected changes from baseline

Anticipated changes between male- and female-headed households from the impact of the road(s) include the following:

- o Off-farm activity--Male off-farm activity will be even larger with respect to female off-farm activity "with" the road.
- o Capital transactions--Capital transactions by male-headed households will further increase in comparison to those of female-headed households; this is likely to be highly associated with the absolute differences in landholdings between the two groups, although other factors also are involved.
- o Inputs, outputs and income--Male-headed households will increase their inputs, outputs and income at a more rapid rate than female-headed households. This response will be attributable, in part, to institutional constraints and socio-economic differences that influence the way roads impact on male- and female-headed households.
- o Expenditures--Male-headed households will spend proportionately more of any road-induced increases in income on major items than female-headed households, whereas female-headed households will spend more of such income on regular expenditures such as nutrition-related needs.
Within the major expenditure category, male-headed households will spend more on infrastructure whereas female-headed households will spend more on items related to living standards and agricultural production.

- o Migration--Where road investment alone takes place, more male out-migration will occur than where road plus other complementary investments take place; the effect of road investment alone could thus be to increase the proportion of female-headed households within the road impact area.
- o Type of travel--Male-headed households will shift more rapidly from pedestrian travel to bicycle, matatu or bus than female-headed households.
- o Purpose of travel--Work related trips will become more important than other trips so that the number of trips made by male-headed household members would increase in proportion to the number of trips taken by female-headed household members; as mechanization of travel occurs, it will reduce the number of market trips necessary, first for male-headed households, then for female-headed households as they increase their use of mechanized means of travel.

2. Observations to date

a. Non-farm economic activity

It was noted in the section on male- and female-headed non-farm economic activity that male households have a significantly higher income on average from non-farm economic activity. Based on the data from Quarter 1-3 (Q1-3), which have been used as part of the baseline, male-headed families earn 53 percent more income in the principal off-farm activity than do female-headed families. We would expect this difference to increase as a result of the roads, but as yet the data does not support this hypothesis.

In fact, figures from third quarter observations indicate a reversal of the hypothesized trend. The differential between male and female household earnings from the main non-farm activity has

dropped to 38 percent. However, this is a reflection quite certainly of either seasonal economic opportunities or of the early and tentative nature of the longitudinal analysis.

b. Capital transactions

The total capital transactions for households reporting such during the Q1-3, period of data collection reveal a 19 percent higher volume in favor of male-headed households. For the Q3 data we find that the disparity has increased to 20 percent. This is not a significant increase, but the trend bears watching. If, as hypothesized, male-headed households will tend to benefit more economically from new roads, then an indicator of this benefit should be an increased capital flow for them relative to female-headed families.

c. Farm inputs and outputs

The figures for total farm inputs indicate positive support for the hypothesis of greater male household prosperity following road construction in the impact areas. In the Q1-3 data, male households used five percent more inputs of all types, but 82 percent more agricultural inputs than female families. In the Q3 data taken alone, the disparity in all inputs has risen to 21 percent, while that for crop inputs has jumped to a difference of 132 percent.

Seasonality should not explain such a growing differential in input expenditures, so that the hypothesis seems to be borne out here; it is premature, however, to draw firm conclusions.

With respect to output and crop sales, a reversal of the suggested

trend occurred. The crop harvest shown in the Q1-3 presentation indicates a 123 percent superiority for male-headed households, while the Q3 data alone show a drop in relative production for male families to a 55 percent superiority. This cannot be explained by seasonality. Such an anomalous trend, running counter to the hypothesis of increasing male crop production relative to female households, is probably as yet without significance. It may be a part of the inevitable variability in data collection and sampling techniques, although there may be other explanations as well that further data and observation will clarify.

Sales of crop produce, measured in both kilograms and shillings, seem to confirm the trend noted above. From a male preponderance in sales activity over the three quarters (Q1-3) of 78 percent of weight sold and 143 percent of the value of produce, the figures fall to a remarkable female superiority in crop sales—26 percent more sold by weight and 15 percent more by value. Such a significant reversal is certainly not a firm trend over the short time span covered. Again, additional experience and data will enable a clearer pattern to emerge.

d. Household expenditures

In terms of total expenditures, the data from the Q1-3 period indicate that male households spend 53 percent more than female families. The Q3 data show a drop in the male position to a six percent superiority.

A division of total expenditures into regular and major components reveals that for regular expenses male households have increased their preponderance from 51 percent over Q1-3 to 177 percent in the Q3 data. This would tend to support the hypothesis that household consumption increases as a result of rural road construction, and that male households will benefit the most.

On the other hand, data for major expenditures show a drop in male expense superiority from 57 percent over Q1-3 only two percent in Q3. This may reflect a seasonal need common to both households and therefore would not necessarily contradict the hypothesis of greater male household prosperity. Future data analysis should show an increasing differential in expenditures between the two types of household heads.

e. Road use

Male- and female-headed households also were compared with respect to possible changes they may manifest in their mode and purpose of travel. The major hypothesis entertained was a shift away from trips made by foot towards trips taken by bicycle, matatu or bus. Such a trend was not evident for either male- or female-headed households for which data are available. As noted earlier, it was expected that work related trips would increase in their relative importance (together with the trips providing access of the area residents to health services). Evidence does not yet support this expected change. The transition to more mechanized means of mar-

keting such as the use of bicycles, mutatus and trucks may enable farmers to reduce the number of trips made to a marketplace. Such a trend seems to be underway for male-headed households, but female-headed households show almost no change in their trip behavior to date (See Tables 60 through 63). Again, lack of evidence at this point does not disprove the suggested relationship. Rather, it simply shows it is still too early to see significant changes with respect to road use, just as it is with respect to many other rural activities.

E. Distance of Households from Road

1. Expected changes from baseline

The distance of various households from the road should have a substantial bearing on many of the road impacts experienced by those households. The most important of those anticipated differential impacts are mentioned briefly below:

- o Proportion of cultivated land--The proportion of cultivated land will increase more for households close to the road than for those further away.
- o Crop and livestock input, output and marketings--Crop and livestock input, output and marketing and cash cropping will increase more for households nearer the road than for those at a greater distance from it.
- o Infrastructure--Households nearer the road will increase their infrastructure more than households further from it.
- o Crop diversification and/or intensification--Cropping will become more intensive and either more diversified or specialized (depending on the particular circumstances) closer to the road than it will further from the road.

- o Livestock/agriculture proportions--Whatever shifts between livestock and agriculture proportions occur in the road impact area, they will be more pronounced closer to the road.
- o Technology--New technology will be used more intensively closer to the road. This will include agricultural (fertilizer, pesticides, implements, etc) and household (radios, bicycles, paraffin lamps, etc) technology.
- o Land adjudication--More land area will be adjudicated closer to the road. (This impact is not accounted for in the general survey information being obtained, but will be a consideration in several of the topical studies being undertaken.
- o Non-farm activity--The level of non-farm activity and income from non-farm activities will be greater in households nearer to the road(s).
- o Income and Expenditures--The income of households and their expenditures on major and regular items will be larger for those households closer to the road; this will be a reflection of their larger economic potential, increased economic activity and the higher levels of credit and other support they obtain.

2. Observations to date

As noted in considering households at different distances from the road(s) in the baseline analysis, very few differences were apparent prior to construction of the new road (even though a "track" was already in existence in each case). In the short interviewing time period since the baseline was established, the newly-constructed roads have not had enough impact to cause noticeable changes between the household groups in different distance strata. Such changes are still anticipated, however, as indicated above, and careful attention will be given to their documentation in future reports.

Table 60: Utilization of modes of transport
by female head of household

Type of Transport	FIRST QUARTER				SECOND QUARTER				THIRD QUARTER			
	Average Trip Frequency	Average Trip Time Minutes	Average Trip Distance	Average Trip cost	Average Trip Frequency	Average Trip Time	Average Trip Distance	Average Trip Cost	Average Trip Frequency	Average Trip Time	Average Trip Distance	Average Trip Cost
1. Foot	3.04	26.15	2.79	0.00	2.92	24.47	2.59	0.00	3.08	23.99	2.53	0.00
2. Bicycle	3.96	19.23	5.17	0.00	3.44	18.79	5.10	0.00	3.26	16.41	4.40	0.00
3. Matatu	2.15	25.89	22.30	8.39	1.87	51.22	28.37	8.18	1.62	60.07	29.15	8.92
4. Bus	1.98	76.89	41.15	10.08	1.50	78.64	43.88	8.36	1.43	57.89	36.13	6.66

Table 61: Utilization of modes of transport
by male head of household

Type Transport	FIRST QUARTER				SECOND QUARTER				THIRD QUARTER			
	Average Trip Frequency	Average Trip Time Minutes	Average Trip Distance	Average Trip cost	Average Trip Frequency	Average Trip Time Minutes	Average Trip Distance	Average Trip Cost	Average Trip Frequency	Average Trip Time Minutes	Average Trip Distance	Average Trip cost
1. Foot	3.07	27.39	3.08	0.00	2.83	23.73	2.45	0.00	2.80	25.97	2.64	0.02
2. Bicycle	5.33	12.00	3.00	0.00	4.46	16.69	4.49	0.00	3.77	20.99	5.45	0.00
3. Matatu	2.15	26.62	25.29	8.81	2.00	40.00	20.00	3.00	2.00	119.30	52.44	16.39
4. Bus	2.59	47.94	33.56	5.00	2.42	97.54	44.89	14.77	1.00	28.22	14.11	3.11

Table 62: Composition of trips made
by female head of household

TRIP PURPOSE	FIRST QUARTER			SECOND QUARTER			THIRD QUARTER		
	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip time (Minutes)	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip Time (Minutes)	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip Time (Minutes)
1. Work	4.77	4.22	29.29	4.38	5.29	37.09	4.28	5.21	35.40
2. School	4.74	1.82	16.78	4.57	1.59	14.39	4.82	1.74	15.94
3. Marketing	2.05	3.37	28.77	2.11	3.60	29.60	2.25	3.13	26.83
4. Medical	1.70	9.51	46.95	1.61	10.21	49.23	2.17	6.58	43.80
5. Social	2.79	4.36	28.34	2.85	3.00	22.16	2.50	2.84	23.40
6. Other	3.25	1.95	15.32	2.43	2.82	18.59	2.65	3.59	21.64

Table 63: Composition of trips undertaken
by male head of households

TRIP PURPOSE	FIRST QUARTER			SECOND QUARTER			THIRD QUARTER		
	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip Time Minutes	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip Time Minutes	AVERAGE Trip Frequency	AVERAGE Distance	AVERAGE Trip Time (Minutes)
1. Work	4.69	3.48	28.73	4.99	3.26	18.37	5.19	3.18	17.51
2. School	4.76	1.68	16.23	4.59	1.59	15.14	4.61	1.33	12.58
3. Marketing	2.28	3.60	30.90	2.31	3.95	29.42	2.19	3.61	32.29
4. Medical	1.37	4.93	33.77	1.91	4.29	40.72	2.08	8.80	78.41
5. Social	2.59	5.14	32.09	2.53	2.26	22.22	1.83	4.20	29.06
6. Other	2.08	5.04	22.67	2.59	3.47	21.47	3.10	3.21	21.17

F. Tenure

1. Expected changes from baseline

The type of landholdings--owned, partly owned, rented, degree of fragmentation, etc.--is expected to influence the incidence of socio-economic impacts of new or improved roads within the impact area. The major differential impacts expected are:

- o Land use--Owned land will be used more intensively for agricultural purposes than rented land, and more fragmentation of prime land will occur, especially that near the road.
- o Ownership changes--There will be an increase in institutional arrangements enabling non-owners to use land, but there will be little change in the pattern of land ownership or in the frequency of ownership changes in land.
- o Landholdings--There will be increased concentration of landholdings--including area owned, rented, etc.--by some individuals and an increase in the area cropped by these same individuals; overall landholdings of all types and area cropped will increase in the impact area(s).
- o Land adjudication--There will be additional adjudication of land titles in the road impact area so that partially owned land (i.e., land without secure title) decreases as a proportion of total land holdings.

2. Observations to date

Tenure information is only now being collated in a cross-sectional format. Consequently, data is not yet available to compare changes from the baseline by different tenure categories. Road impacts on those households affected by different tenure arrangements are planned by MOTC as a part of the analysis in subsequent reports.

G. Self-employed and Non-self-employed Farmers

1. Expected changes from baseline

The baseline data comparing self-employed and non-self-employed farmers presented in Chapter IV showed numerous significant differences between the two groups. Particularly important differences include non-farm and household income, savings, major expenditures and number of structures. Anticipated impacts of the road(s) on these two groups include the following:

- o Income--non-farm and household income for non-self-employed farmers will grow more rapidly than that of self-employed farmers so that the gap in household total income and income per capita between the groups will widen even further.
- o Savings--Non-self-employed farmers will further increase their savings relative to self-employed farmers.
- o Expenditures--Major regular and total household expenditures of non-self-employed farmers will increase more rapidly than those of self-employed farmers resulting in larger differences between these two groups than reflected by the baseline.
- o Structures--The proportion of traditional structures used by non-self-employed farmers will decrease at a greater rate than that for self-employed farmers.
- o Holding area--the holding area of non-self-employed farmers will increase at a greater rate than that of self-employed farmers.

2. Observations to date

Data collected during the first year of the impact study shows some changes in the anticipated directions suggested above. The number of observations for most variables was lower, however, than the baseline and the mean values of the variables being

examined were also lower in many cases. Moreover, the relationships between self-employed and non-self-employed farmers remained the same as in the baseline case for all but a few variables. Specific comparisons of change in the relationship of the two groups between the baseline and the observations drawn from the latest enumeration are shown in Table 64. Although the data is not extensive and certainly not conclusive, it does suggest that the anticipated changes between the two groups mentioned above are reasonable.

The number of observations for non-self-employed farmers is quite small in the study, averaging in the low thirties. Moreover, the cross-sectional analysis of self-employed and non-self-employed farmers is not of primary importance. While the number of persons in the non-self-employed category is expected to increase as a result of the road, the analysis of differences between the groups is not likely to extend what is already known about farm and non-farm households very much. For this reason, MOTC is anticipating dropping the cross-sectional analysis of self-employed and non-self-employed farmers in the future. To summarize the cross-sectional comparisons touched on above, there appears to be justification for the hypotheses being considered in some cases, whereas in other cases the data suggests just the opposite of the expected relationship. The final conclusion, in all cases, is that the data collected and reviewed to date is too preliminary to enable any clearcut conclusions. Other findings are that, (1) if properly collected and analyzed, the surveys and procedures will develop data to enable the overall and particular analysis needed to

Table 64: Comparison of baseline and latest observations of selected variables for non-self-employed and self-employed farmers

<u>Variable</u>	<u>Unit of measure</u>	<u>Non-self-employed/self-employed ratio</u>	
		<u>Baseline</u>	<u>Latest observation</u>
Household income	Shillings	2.50	2.52
Household income plus remittances	"	2.26	2.60
Total household expenditures	"	1.26	1.49
Regular expenditures	"	1.13	1.21
Major expenditures	"	2.10	2.22

be carried out; (2) some data difficulties must be examined with care to eliminate such obvious problems as indicating that the number of permanent structures in all impact areas decreased by 26 percent between 1979 and 1980; (3) the very widespread data collection effort might well be more tightly focused so that data essential to producer surplus, road user savings, and key socio-economic issues are collected with greater precision while other non-essential or less essential data collection is eliminated or reduced. MOTC will give these and related issues detailed attention in planning for data collection and analysis and special topical studies in the next year.

VI. RELATIONSHIP OF BASELINE FINDINGS AND ROAD SELECTION PROCEDURES

A. Introduction

One important aspect of the road impact study is to determine criteria for the selection of sites for new or improved roads. These criteria will hopefully be easy to use, especially at the local level. Nearly all roads meeting these criteria should be economically and socially viable according to more rigorous and sophisticated economic tests and social analysis.

Developing such road selection criteria from evaluation of the impact of rural roads is but one way to achieve the desired result;¹ it is also slow and inconclusive for a fairly long period as one waits to determine the actual impact of the road on relevant economic and social variables. Until such impact data is firmly in hand, identifying one or another variable as indicative of a "sound" road project cannot be supported by study results. This chapter briefly considers those facets of the road impact study to date that relate to the development of such road selection criteria.

1. Developing appropriate road selection procedures

An MOTC report on the issue of road selection procedures has been issued recently to the donor agencies involved in the roads project. It noted the cumbersomeness, data problems and centralized nature of the internal rate of return procedures used to select roads to date and suggested substituting the size of the impact area as the primary criterion for selecting sites for new and improved roads. This single criterion, and the other guidelines used with it, were shown to be fairly well correlated with the internal rate of return of the

roads already analyzed and amenable to use by local people in selecting their road sites.

This single criterion appears, for the moment, to be the best indicator of road success in economic terms in the particular circumstances of the Kenyan Rural Access Roads Project. Additional criteria may be able to be added to it later, however, so that a broader based set of selection criteria could be used in making important road investment decisions. The experience to date in obtaining conclusive evidence regarding any of the hypothesized changes suggested in Chapter V or any potential criteria for road selection suggests that this impact project will not be any more rapid than most in identifying simple and credible road selection criteria. Throughout the impact study, however, all potential variables are to be examined to identify criteria which will enable increasingly precise road selection to be achieved without the need to undertake complex financial and social analysis prior to their actual selection. Those aspects of the study related to road selection criteria that can be reported upon on the basis of the first year of information are included in section B, below.

2. Desired results for selected roads

The criteria to be developed for selecting rural roads without complex economic, financial and social analysis must still, ex post, be shown to select roads that produce the same socio-economic results as those roads that would be chosen ex ante using the more sophisticated criteria. Thus, an appropriate internal rate of return criterion and other appropriate social criteria should be met by roads selected by both methods.

The roads analyzed in the baseline study were selected as part of a group of roads using an internal rate of return criterion for the entire group. Thus, an internal rate of return analysis was not carried out for each particular road included in the baseline analysis. This suggests a three-step approach to identifying road selection criteria based upon analysis of the impact of these roads (and any others to be added). First, as has already been begun in the earlier MDTC memo mentioned above, continuous attempts should be made to identify variables that seem to measure or account for the overall economic and social impacts of the road(s). This process is continuous and precedes the amount of data and type of analysis that would conclusively show that the performance of the roads being analyzed meets the required economic and social criterion.

Second, as the economic and social performance of each road becomes more evident, analyses can be undertaken to help identify common variables that explain or are proxies for the desired minimum levels of economic and social impact of the road.

Third, as the "final" economic and social results of each road become evident through use of all methods of analysis, criteria can be adjusted to account for those results and then can be utilized and tested for new road selections.

At each stage it will be possible to suggest or use tentative criteria for road selection and to refine such criteria as evidence mounts at all points undergoing analysis. Even rural access roads are expensive, however, so that criteria used should have a fairly high degree of certainty as opposed to being too experimental.

B. Findings Related to Road Selection Procedures and Criteria

1. Economic criterion

The economic test to be used in evaluating the rural access roads in the study is whether the internal rate of return using economic values is equal to the cost of capital. When the necessary data becomes available to carry out producer surplus and road user savings analyses on each road, such analyses will be undertaken. At present, as noted fully in Chapter V, the information in hand is not extensive enough nor available for a long enough period of time to justify such an effort.

Observations to date in terms of producer surplus show increases in crop and livestock output and marketings in some impact areas, but declines in others. As also noted earlier (Chapter V), cultivated area, value of production, on-farm consumption and the other components of a producer surplus analysis have not shown enough change or a consistent enough pattern of change as a result of the road to suggest that a producer surplus analysis can be carried out.

Road user savings information does show changes in road use, including some decrease in the time required for each trip. Insufficient data is in hand, however, to justify a road user savings effort yet. Moreover, detailed attention will have to be given to some aspects of road user savings via topical studies and independent analysis for a high quality road user savings analysis to be carried out.

Thus, while most of the information for both types of economic analysis is being developed through the survey effort, some additional time will be necessary for the road impacts to become apparent so that both analyses will be meaningful. Until that time, criteria

for selecting new roads will have to be developed through special efforts that draw upon the data collection and analysis effort but do not depend upon its final completion. Efforts along such lines that are being undertaken or considered by MOTC are discussed later in section C.

2. Other socio-economic criteria

The cross-sectional comparisons included in the baseline are mostly designed to obtain information about how social groups or types of households are differentially affected by the road. While male- and female-headed households seem to offer the most significant comparisons in this regard, households at different distances from the road and those holding different quantities of land also offer the prospect for important socially related findings.

These different groups will find their income levels, types and levels of expenditures, availability and use of technology and other features of their livelihood differentially affected by the new roads. As detrimental and beneficial impact patterns emerge for impact areas, social criteria for road selection in similar areas may be able to be developed. For example, based on survey information to date, people in the various road impact areas value the roads highly because they make it much easier to take sick family members to a clinic. Later, other findings may indicate that woman-headed households cannot tap into the economic benefits brought by the road because they are constrained by their children from participating in off-farm employment, from purchasing major items needed on the farm, or from adequately marketing their output. Complementary programs to enhance the opportunity of such persons to benefit from the road may be

required in these and similar cases; or road selection procedures may need to account for them in determining which road to implement.

As patterns emerge that show the social costs and benefits of roads in the impact area in this study, these patterns may provide guidance in selecting or developing criteria for choosing sites for other new or improved roads. Of particular relevance is both the kind of variables to be selected as site indicators and the weights that such indicators should be given with respect to economic criteria in designating sites for new roads.

The results from the baseline analysis to date and from related observations and work do not yet suggest specific social indicators for which certain values might be used as criteria in the road selection process. The impact study will focus on identifying any such indicators as one objective among others, however, by careful use and analysis of the data being gathered and the topical studies being conducted. Several of the topical studies will lend themselves in particular ways to identifying social variables which might be used as criteria for rural road selection.

C. Future Road Selection Considerations

1. Methods

MOTC has suggested that simplified procedures be used to select sites for future new and improved road work under the project. Use of the size of the impact area, plus other detailed guidelines, have been proposed as the means for identifying and ranking roads to be constructed or improved in the MOTC report mentioned earlier in this chapter. As further criteria or evidence regarding the economic and social results of such road selection procedures become apparent,

the selection criteria can be improved upon accordingly.

MOTC recognizes that many of its activities in the coming year will bear upon this issue, and it assumes that substantial progress can be made in delineating selection criteria once two years of data from baseline are available for analysis. It plans to spend substantial time following the annual donor's meeting in sharpening the use and focus of its field data collection effort and the presentation of that same data. During this effort it will also emphasize the use of the data for developing further road selection criteria. This planning effort, plus additional survey data, should result in more detailed conclusions regarding variables to reflect both economic and social selection criteria within another year. Likewise, the start-up of several topical studies should bring more definition to this important area in future months.

In addition to these already planned means for pursuing road selection criteria, two other approaches could be taken toward such an end, although they are not planned at present because of MOTC budget limitations. First, a special topical study effort could be launched for a single road that would, using existing economic and social baseline data, make an in-depth determination of the internal rate of return and social benefits of the road every year through both survey and other research. The primary purpose of this effort would not solely be to determine the impact of the road, but to identify criteria which might be used in selecting other roads so that they would be economically and socially viable. The criteria identified in the in-depth study could be pursued, or perhaps even tested, through analysis of the data base and topical study results in the other road impact areas.

Second, a topical study to work with farm models in one or more impact areas to determine road impacts could be undertaken. This effort, although somewhat complicated, as explained in the MOTC report on road selection procedures mentioned earlier in this chapter, would identify the producer surplus benefits likely to result from a road. The results of the analysis would be used to design simple guidelines related to size and type of farm, cropping area, etc., in each potential road impact area as criteria for road selection that would assure the road site chosen could justify the investment economically.

2. Variables

The variables to be considered in developing road selection criteria are legion, but some have already been shown to be more important than others and several appear to deserve special attention in the coming year.

In the economic sphere the variables affecting producer surplus and user savings will receive the most attention. Different kinds of crops, the proportion of land uncultivated and in cash crops, yields (as a function of both land area and off-farm inputs), and average size of holdings will be given attention in the consumer surplus area. Some marketing variables such as proportion of farmers and traders using vehicle or non-pedestrian transport for marketing and receiving goods and potential for increases in exported produce and imported productive goods would also be considered.

In the transportation area, the potential for daily trips using various kinds of transport, the composition and purpose of such traffic, and its costs will be considered in searching for road selection criteria.

At the household level, both sociological and economic variables will be examined in the search for potential road selection criteria; these would include, but not be limited to: trips for social and non-economic household related purposes, distances to various social and governmental institutions, and levels of expenditures of various types. Particular attention will be given to differences in these and other economic related variables as between male- and female-headed households in the search for road selection criteria.

It is important to note that some of these variables, were they to be developed for use as road selection criteria, would require substantial judgment by those at the local level trying to use them. Thus, it is much easier for a local government official to select an effective road impact area of at least a minimum size than it is for that person to figure out and analyze the level of expenditures of various types being made by local households or the potential for daily trips of various kinds of traffic over a potential road. The effectiveness of the criteria, then, turns as much on their simplicity and usefulness in the field as upon their accuracy. Put another way, a criterion that is accurate but complicated is not necessarily better than one that is less accurate but easy to use accurately in the field. A part of MOTC's task in coming years will be to identify and develop criteria which meet the standards of accuracy and local usefulness.

3. Roads

Neither the roads to be used in developing the simple road selection criteria nor the road sites such criteria are to be applied to have been rigidly established by MOTC. To date, all seven roads

in the baseline analysis are providing raw material for the pursuit of such guidelines. As potential criteria emerge, however, MOTC will determine whether they are useful for all road areas or for only certain road impact areas.

4. Data

As mentioned in the summary and conclusions of this report, there are major data problems in the baseline and subsequent surveys. While substantial amounts of data have already been collected, their internal consistency is sometimes troublesome, and at times data has been collected in the wrong form. Also the subsequent weighting and presentation of the sample data sometimes introduce discrepancies between different series of information one would like to compare. Several field checks, for example, are underway at this writing to verify certain aspects of the data before its final presentation.

MOTC plans to simplify the data collection and manipulation process so as to focus its survey efforts upon the essential information and to assure that the presentation of that data is commensurate with the needs of those reviewing it and using it for further analysis. As this slight revamping of the current effort is carried out, the data needed for developing road selection criteria will be carefully considered along with the other data needs of the impact project.

D. Summary

In summary, no clear road selection criteria have emerged yet from the impact analysis, although the size of the road impact area has been suggested by MOTC as a very important road selection criterion. Further work is planned in seeking to identify and develop

such criteria; this requires analysis of the data from all roads being reviewed at present, some clarification of data collection and presentation, and special work through topical studies and analysis of survey data directed at criteria development before the actual impact of the roads being considered is known with finality. MOTC plans further work on all these aspects of the development of road selection criteria during the next year of data collection and analysis for the overall impact project. Should additional special efforts to develop these criteria be mandated by the donors, those efforts would require that additional financial and technical assistance be provided to MOTC in order to effectively carry them out.

ANNEX 1

Footnotes

CHAPTER I: INTRODUCTION

¹The impact study is described in Chapter II.

²Details regarding the roads included in the study and the data collection procedures used are provided later in this report. Readers also can refer to the most recent MOTC impact study, A Modified Framework for the Impact Study to Monitor and Evaluate Rural Roads Falling Under the Rural Access and the Graveling, Bridging and Culverting Programmes (MOTC: Nairobi, 1980).

³Type of tenure also will be used as a cross-sectional comparison. However, data collection and analysis procedures were not completed for this variable at the time of this report. It is anticipated that this data will be available for subsequent analyses.

⁴De Bear, A.R., "The Economic Justification of Roads in Developing Countries", Road International (1963) p. 48.

⁵Smith in Wilson, George, et al., The Impact of Highway Investment on Development (Washington, D.C.: The Brookings Institution, Transport Research Program, 1966).

⁶Owen, Wilfrid, Distance and Development: Transport and Communications in India (Washington, D.C.: The Brookings Institution, 1968).

⁷India, Government of, Ministry of Transport and Communications, Economic Benefits of Ramnad-Mandapan Road, 1959-60 (India: Department of Transport, Road Wing, 1961).

⁸Shoalb, M., Comparative Evaluation of Selected Highway Projects Report 349 (Washington, D.C.: World Bank, Operations Evaluation Department, 1974).

⁹Chisholm, M., Rural Settlement and Land Use (London: Hutchinson University Library, 1962).

¹⁰U.S. Department of Agriculture, Foreign Economic Development Service, Improving Marketing Systems in Developing Countries: An Approach to Identifying Problems and Strengthening Technical Assistance Staff Report 7 (Washington, D.C.: U.S. Department of Agriculture, Foreign Economic Development Service in cooperation with U.S. Agency for International Development, 1972).

¹¹Bonney, R.S.P., "The Relationships between Road Building and Economic and Social Development in Sabah" (Drayton, England: Ministry of Transport, Road Research Laboratory, 1964).

¹²Louis Berger International, Study of Transport Investment and Impact of Distribution of Income in Remote Areas, Phase I Final Report. Report prepared for Southeast Asian Agency for Regional Transport and Communications Development, and U.S. Agency for International Development (East Orange, N.J., 1979).

¹³Owen, Wilfrid, "Road Transportation and Food Production", Highway Research Record 125 (1966).

¹⁴Braida, Richard, et al., The Role of AID in the Development of Sahel Transportation Infrastructure: A Strategy Proposed by the Office of International Transportation Programs, U.S. Department of Transportation (Washington, D.C.: Department of Transportation, 1978).

¹⁵USAID, Philippines Provincial Development in cooperation with Rural Roads Program, Department of Local Government and Community Development, Rural Roads Evaluation Project (Philippines: USAID, 1978).

¹⁶Okada, Ferdinand, Rural Works Project, Padat Karya Gaya Baru: Socio-Economic Assessment. Report prepared for USAID/Indonesia (1978).

¹⁷Devres, Inc., Kenya Rural Access Roads and Graveling, Bridges and Culverts Programme: Consultants' First Annual Report. Report prepared for USAID and Government of Kenya, Ministry of Transport and Communications (Washington, D.C., 1979).

¹⁸Ibid.

¹⁹Shoaib, M., Comparative Evaluation of Selected Highway Projects Report 349 (Washington, D.C.: World Bank, Operations Evaluation Department, 1974).

²⁰Blaikie, Piers, et al., The Effects of Roads in West Central Nepal, Part I (Summary). Report prepared for ESCOR, Ministry of Overseas Development (1977).

²¹India, Rammad-Mandapan Road.

²²Okada, Padat Karya.

²³Devres, Kenya Rural Roads.

- 24 Shoab, Evaluation of Highway Projects.
- 25 Louis Berger International, Transport, Investment and Impact.
- 26 Ellis, Richard, et al., Liberia Rural Roads Study, Volume II: Socio-Economic Baseline Report (Washington, D.C.: Checchi and Company, 1975).
- 27 Mitchell, B. and Rakotonirina, X., The Impact of the Andapa-Sambava Road: A Socio-Economic Study of the Andapa Basin, Madagascar, Volume I and II (Washington, D.C.: The World Bank, Transportation Department and Democratic Republic of Madagascar, 1977).
- 28 Elmendorf, M. and Merrill, D., "Socio-Economic Impacts of Development in Chan Kom - 1971 to 1976: Rural Women Participate in Change." IBRD, n.p. (March 1978).
- 29 Devres, Kenya Rural Roads.
- 30 Louis Berger International, Transport, Investment and Impact.
- 31 Edwards, Chris, "Some Problems of Evaluating Investments in Rural Transport", Transport Planning in the Developing Countries (London: Planning and Transport Research and Computation, 1978).
- 32 Devres, Kenya Rural Roads.
- 33 Foster, George, Traditional Societies and Technological Change (New York: Harper and Row, 1973).
- 34 Connell, John, et al., Migration from Rural Areas (Delhi: Oxford University Press, 1976).
- 35 Ibid.
- 36 Blair, James, "The Regional Impact of a New Highway in Sierra Leone", African Environment 3.2 (1978).
- 37 Hughes in Haeefe, Edwin (ed.), Transport and National Goals (Washington, D.C.: The Brookings Institution, 1969).
- 38 U.S. Department of Agriculture, Improving Marketing Systems.
- 39 Okada, Padat Karya.
- 40 Elmendorff and Merrill, "Development in Chan Kom".

- 41 Okada, Padat Karya.
- 42 Bunker, R. and Adair, J., The First Look at Strangers (New Brunswick: Rutgers University, 1959).
- 43 Edwards, "Problems of Evaluating Investments."
- 44 Davres, Kenya Rural Roads.
- 45 Hoskins-Western-Sonderegger, Inc., Final Report: Labor Intensive Road Program, Small Farmer Development Project, Haiti (Lincoln, Nebraska: Hoskins-Western-Sonderegger, Inc., 1978).
- 46 Mitchell and Rakotonirina, Impact of the Andapa - Sambava Road.
- 47 Louis Berger International, Transport, Investment and Impact.
- 48 Ibid.
- 49 Squire, Lyn, "Optional Feeder Roads in Developing Countries: The Case of Thailand", Journal of Development Studies 9 (1973).
- 50 Ibid.
- 51 Ward, Marion, The Rigo Road: A Study of the Economic Effects of New Road Construction, New Guinea Research Bulletin No. 33 (Canberra and Port Moresby: The Australia National University, Research Unit, 1970).
- 52 Mitchell and Rakotonirina, Impact of the Andapa - Sambava Road.
- 53 Bonney, R.S.P., "The Place of Transport, Particularly Road Transport, in the Economic and Social Development of North Borneo", Proceedings of the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, E/conference, n.p. (1962).
- 54 Elmendorf and Merrill, "Development in Chan Kom".
- 55 Hackenberg, Beverly, Research Report: Impact of Infrastructure on the Changing Economic Lives of Women in Southeast Mindanao (Davao City, Philippines: Davao Research and Planning Foundation, Inc., 1978).
- 56 Ibid.

CHAPTER II: KENYA RURAL ACCESS ROADS PROGRAMME

¹There are some substantial differences between estimates of road impact areas made by District Agriculture and Development Officers and CBS enumerators. MOTC has chosen to use the CBS estimates because they are based on field interviews and intensive observations within the impact areas, whereas the District Agriculture Officers' estimates were made from a general knowledge of the areas involved, plus a review of generalized maps of the areas.

²One bag equals 90 kg.

CHAPTER IV: BASELINE DATA

¹Tenure data is not available in cross-sectional form; it will be pursued in subsequent analyses as cross-sectional data, however.

²Partially owned or "owner-like" is land which is controlled and operated by one person for which title is held by another. Thus, a son may farm a plot for which title is still held by his father.

³One square kilometer equals 1,000,000 square meters (m.²).

CHAPTER V: EXPECTED CHANGES FROM BASELINE AND OBSERVATIONS TO DATE

¹As noted earlier, tenure data is not available now in cross-sectional form, but will be developed for subsequent analysis. Some ideas of expected changes in tenure are included in this chapter, however.

CHAPTER VI: RELATIONSHIP OF BASELINE FINDINGS AND ROAD SELECTION PROCEDURES

¹Assuming pre- and post-producer surplus and road user savings results, then identifying critical factors which determine or are highly correlated with the desired economic results is another means of achieving the desired result. It would also be feasible to assume certain impacts a road would have on social indicators, and then suggest specific indicators that must be present in the impact area.

ANNEX 2

Survey Questionnaires

6L.

FORM E/8.1

CENTRAL BUREAU OF STATISTICS: KENYA GOVERNMENT

CONFIDENTIAL

RURAL ROADS EVALUATION STUDY 1978 - 79

PROVINCE _____

DATE OF THIS VISIT.....

HOUSEHOLD BASELINE SURVEY

DISTRICT _____

CODE	E	8							
	1	2	3	4	5	6	7	8	

	0	1
	9	10

FORM 1: HOUSEHOLD MEMBERS.

LOCATION _____

TOTAL IN HHOLD	NAME	(1)	(2)		(3)		(4)	(5)		(6)	(7)		(8)		(9)		(10)		(11)	
		SERIAL NUMBER	RELATIONSHIP TO HEAD OF HHOLD		AGE	SEX	MARITAL STATUS	AT SCHOOL FULL TIME	IF YES: STATE TYPE OF SCHOOL	IF NO: STATE GRADE REACHED	PLACE OF BIRTH	MAIN OCCUPATION		PRESENT/ABSENT						
11			1-Head 2-Wife 3-Son 4-Daughter 5-Father 6-Mother 7-Other rel. 8-No relative	1-M 2-F	1-Single 2-Married 3-Widowed 4-Divorce or Sep.	1-Yes 2-No	1-Primary 2-Secondary 3-Other	1-Under Std.4 2-Std.4 to 8 3-Form 1 or 2 4-Form 3 or 4 5-Form 5 or 6 6-Other	01-Within Loc. 02-In Dist. but outside Loc. (If outside Dist State District or Town)									1-Pres. 2-Abs.		
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27
		13 14			15 16 17 18			19		20		21		22		23 24		25 26		27

FORM C/S.6

CENTRAL BUREAU OF STATISTICS: KENYA GOVERNMENT

CONFIDENTIAL

DATE OF LAST VISIT.....

RURAL ROADS EVALUATION STUDY 1978-79

PROVINCE _____

DATE OF THIS VISIT.....

HOUSEHOLD SURVEY (CYCLICAL)

DISTRICT _____

CODE

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

HOUSEHOLD EXPENDITURE

LOCATION _____

60	CYCLE		PERIOD	13
----	-------	--	--------	----

(Excludes capital, maintenance and input expenditure on farm and non-farm enterprises)

REGULAR HOUSEHOLD EXPENDITURE IN LAST 7 DAYS									
ITEM	CODE	VALUE -SPs							SOURCE
		14	15	16	17	18	19	20	
BEEF	01								
GOAT	02								
SHEEP	03								
PORK	04								
POULTRY	05								
OTHER MEAT	06								
FISH	07								
EGGS	08								
FRESH MILK	09								
DATED/TYRED MILK	10								
BUTTER	11								
OTHER DAIRY PRODUCTS	12								
MARGARINE	13								
KIMBO/COWBOY ETC.	14								
FOODING OIL	15								
GREEN MAIZE	16								
MAIZE MEAL	17								
MAIZE MEAL	18								
SIMBAHE	19								
MILLET	20								
OTHER GRAINS	21								

REGULAR HOUSEHOLD EXPENDITURE IN LAST 7 DAYS									
ITEM	CODE	VALUE -SPs							SOURCE
		14	15	16	17	18	19	20	
WHEAT FLOUR	22								
BREAD	23								
CAKES & BISCUITS	24								
SUGAR CANE	25								
SUGAR	26								
SWEETS/JAMS	27								
BEANS	28								
PEAS	29								
OTHER PULSES	30								
ENGLISH POTATOES	31								
SWEET POTATOES	32								
OTHER ROOTS	33								
CABBAGES	34								
CUPING MIKI	35								
OTHER VEGETABLES	36								
ONIONS	37								
POTATOES	38								
OTHER MILLS	39								
HERBS	40								
ONION	41								
OTHER	42								
SPICES									

REGULAR HOUSEHOLD EXPENDITURE IN LAST 7 DAYS									
ITEM	CODE	VALUE -SPs							SOURCE
		14	15	16	17	18	19	20	
COFFEE/TEA	43								
SOODAS	44								
BEER/SPIRITS	45								
OTHER	46								
BABY FOODS	47								
OTH TUNED FOODS	48								
OTH. PACKAGED FOODS	49								
STARCH.....	50								
FOOD & DRUG CONSUMED OFF HOLIDAYS	51								
CIGARETTES & TOBACCO	52								
MATCHES	53								
ELECTRIC	54								
GENERAL'S	55								
CRUSTIC MATERIALS	56								
MEDICINE	57								
HEEL-LOOKING SHOE & SHIRT	58								
SHIRT	59								
SHIRT	60								
SHIRT	61								
SHIRT	62								
OTHER REGULAR PURCHASES	63								

RAJON PURCHASES & EXPENSES SINCE LAST VISIT									
ITEM	CODE	VALUE -SPs							SOURCE
		14	15	16	17	18	19	20	
RENT	70								
SCHOOL FEES	71								
OTHER FEES	72								
INSURANCE	73								
TRANSPORT REPAIRS	74								
TRANSPORT PURCHASES	75								
HOUSING REPAIRS	76								
GIFTS/CONTRIBUTIONS	77								
FURNITURE	78								
ELECTRIC/FOOTING	79								
HEALTH (Doctor, med. bills)	80								
DEETING/FUNERAL	81								
DOMESTIC WAGES	82								
OTHER NON-RAJON OUTLAYS	83								

*PERIOD (since last visit)
1-4 weeks
2-3 months

**SOURCE
01. Home, Retail Shop
02. Home
03. Market
04. Informal market
05. Neighbourhood; friend
06. Hospital
07. Comp. Store
08. Public Institution; Shop
09. Other
10. Other