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REPUBLIC OF KENYA

MINISTRY OF WORKS

ROADS DEPARTMENT

RURAL ACCESS ROADS PROGRAMME
EVALUATION OF ROADS IN BUNGOMA
REVISED

MAY 1978

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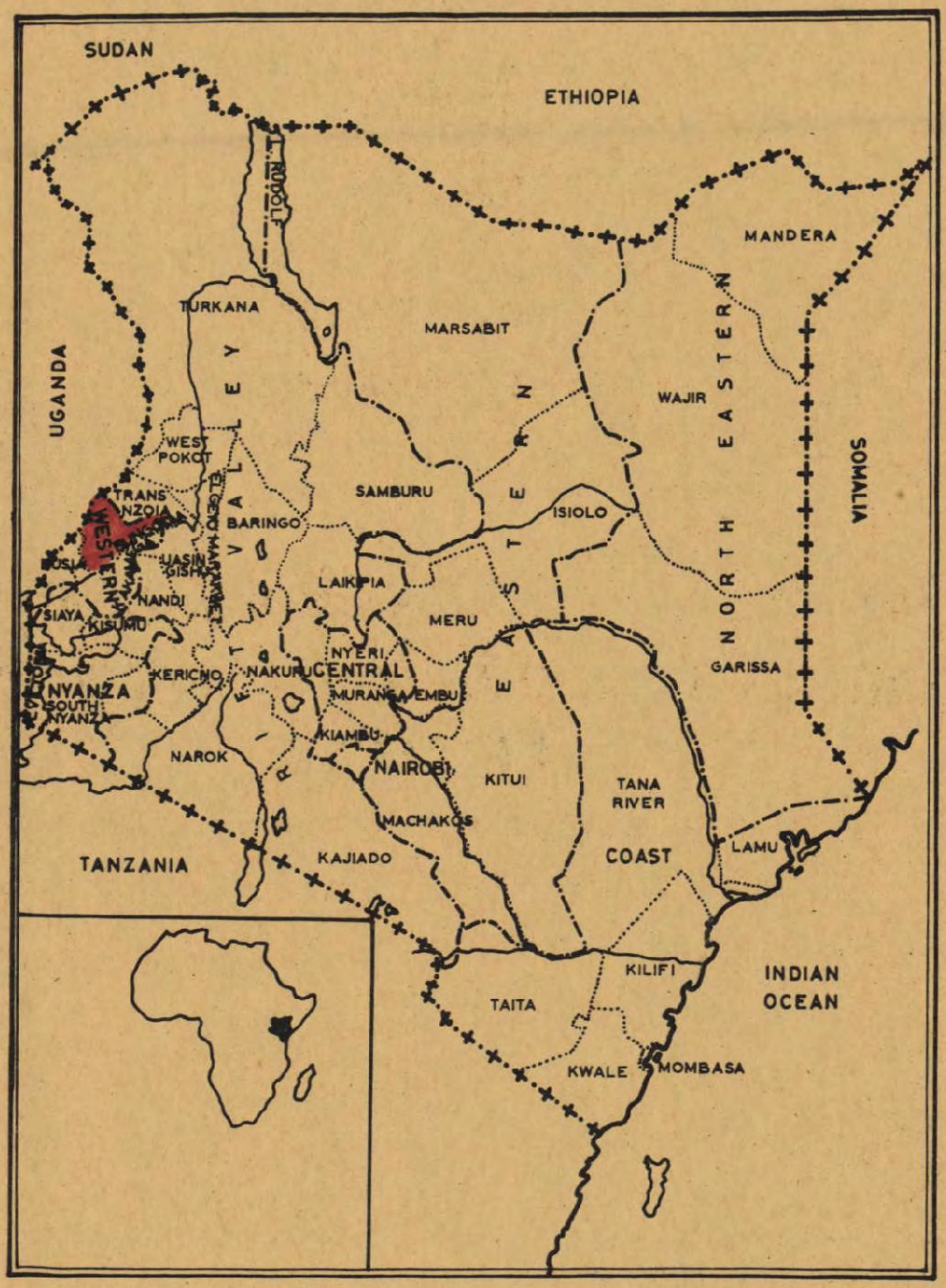
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Rural Access Roads Programme

Evaluation of Rural Access Roads in Bungoma District

Ministry of Works Roads Department,

revised april 1978

PART I

MAPS:

1. EVALUATION OF RURAL ACCESS ROADS IN BUNGOMA DISTRICT

This report evaluates the first 92 km of rural access roads within Bungoma district. The roads were selected by the District Development Committee (DDC) as priority roads in terms of much needed access into economically high potential areas of the district.

These roads were inspected as from 20th to 24th September 1976 by member of the planning section of the Ministry of Works, Roads Department, Nairobi.

The roads which were selected for inclusion in the R.AR.P 1976/77 period are as depicted on table 1 below:

TABLE 1

ROAD NO	DESCRIPTION OF THE ROAD	APPROX LENGTH KM	DIVISION	LOCATION
1	Machakha-Ndakalu C42	6	South Malakisi	North Kulusiru Changara
2	Nama Wanga - Lwa Khaba	3	North Malakisi	South Wamono
3	Wamono (D277)-Wasio School-Chepkube Coffee Factory	5½	North Malakisi	North Wamono
4	Chepkube (E377)-Chebweki-Chesiro-Cheptais (E277)	9½	North Malakisi	North West Sasuri
5	Mulatiwa (E277)-Kapkirongo	9	North Malakisi	East Sasuri
6	Kutere (D275)-Chelebei Market-Lwanda Market-Changeywa Market	11	North Malakisi	North Namwala
7	D275-Kopsiro-Chepyku-Kipsikirok-Chepton-D275	15	Mt.Elgon Forest/ SouthElgon	Mt.Elgon Forest Namorio
8	Kapkateny (E315)-Cheptonon	4	South Elgon	Kapkaton
9	Kimilili (42)-Kamution'g -Kimobo (D275)		South Elgon Kimilili	Kibengei Namorio Kapsakwony
10	Chesamisi (D285)-Kamusinde-Kamasielo (E317)	9	Kimilili	Kamakuywa Sokhendu
11	Chesenende-Kapchebou Market (E 318)	2	South Elgon	Kaptama
12	Chesito (E318)-Kamakoiwa River	3	South Elgon	Kaptama
13	Kaptalelia Junction (D275)-Kongit Kapsakwony Road (D275)	7½	South Elgon	Chemoge

The resulting report, completed in november 1976, has been submitted to the donoragency USAID for their perusal. After inspection of the proposed alignments by representatives of USAID and extensive deliberations with the MOW, USAID forwarded the following comments as listed below:

Road No:	approved kms	Commment
1	6	In principle approved, but without bridge. USAID regards this road as an experiment and should like to stress the point to the DDC that the bridge is not included.
2		Rejected, too close to existing classified road.
3/4		USAID requested a report from the RAR engineer on realignment of the proposed roads, so as to avoid bridges and patches of black cotton soil. Also the actual alignment of E277 and X6006 had to be checked out and taken into account when proposing the new alignments. See the technical reports as contained in appendix III and V
5	7.7	The adjusted alignment as proposed by the RAR engineer (see appendix IV) is in principle approved only the short length of 5A has to be justified.
6	8	The same as no 5, only leave out the western branch and consider opening up western area by a branch from road no 5B. (see appendix IV/V last possiblity not feasible).
7	15	Approved, if DDC provides statement that the area is an official settlement area. Also the length of the road should be explained. (see appendix V and VI)
8		Rejected technical not feasible, too steep.
9	7.5	Alignment in principle approved, but a technical feasibility report has to be submitted and approved before construction can start. (see appendix V)
10	9	Also this alignment needs further technical investigation. If technical feasible the road is approved. (see appendix III)
11/12	5	Approved in principle, only the short lengths have to be justified. Also the possibility of lengthening the roads, eventually into Trans Nzoia District has to be sorted out.
13	7.5	Approved.

Besides these comments pertaining to specific proposed alignments also more general remarks on the evaluation of RAR have been made by USAID. All this has been incorporated in this report. See also appendix I, containing a short report by the DDO Bungoma on the Rural Access Roads Programme.

On the basis of the technical reports (see appendix III - V) by the RAR engineer Bungoma and the above comments, the following roads have been evaluated:

ROAD NO.	DESCRIPTION OF THE ROAD	APPROX. LENGTH KM	DIVISION	LOCATION
1	Machakha-Ndakalu C42	6.3	South Malakisi	North Kulusiru Changara
3	Wamono (D277)-Wasio School-Chepkube Coffee Factory	3.5	North Malakisi	North Wamono
4	Chepkube (E377)-Chebweki-Chesiro-Cheptais (E277)	4.5	North Malakisi	North West Sasuri
5	Mulatiwa (E277)-Kapkirongo	7.7 5.2	North Malakisi	East Sasuri
6	Kutere (D275)-Chelebei Market-Lwanda Market-Changeywa Market	8.3	North Malakisi	North Namwela
7	D275 - Kopsiro-Chepyku-Kipsikirok-Chepton-D275	15	Mt. Elgon Forest/ South Elgon	Mt. Elgon Forest Namorio
10	Chesamisi (D285)-Kamusinde-Kamasielo (E317)	4.4	Kimilili	Kamakuywa/ Sokhendu
11	Chesenende-Kapchebou Market (E318)	2	South Elgon	Kaptama
12	Chesito (E318)-Kamakoiwa River	3	South Elgon	Kaptama
13	Kaptalelia Junction (D275)-K Kongit-Kapsakwony Road (275)	7.5	South Elgon	Chemoge

These roads together with their zones of influence 55.7 62 are depicted in map no VI to XI.

A detailed description of the roads is contained in appendix II

Other relevant data pertaining to the roads can be found in appendix I, the report on the RAR - programme by the DDO Bungoma.

11. A QUICK IMPRESSION

In order to get a quick impression of the selected 10 roads some indicators which are useful for comparison purposes are given in the following Table II.

TABLE II

ROAD NO	LENGTH KM	ZONE OF INFLUENCE ha	POPULATION DENSITY P/km²	POPULATION INZONE OF INFLUENCE	ZONE OF INFLUENCE ha/KM/RD	POPULATION PER KM/ROAD
1.	6.3	1065	183	1949	169	309
3	3.5	650	313	2035	186	581
4	4.5	750	303	2273	167	505
5	7.7	775	417	3232	101	420
6	8.3	700	276	1932	84	233
7	15	2065	162	3345	138	223
10	4.4	1400	302	4228	318	961
1	2	190	303	576	95	288
12	3	250	303	758	83	253
13	7.5	1010	265	2677	135	357

10.2

III. ACCESS - INDICATOR

The Access indicator is a criterion by which the adequacy of the access system to the local residents and Government administrative officers is measured within a given zone of influence to a road.

Only those social services for which a road is relevant are taken into account. The social services which will be supplied as part of another service (e.g. telephone services at post office) have not been taken into account.

Four social service facilities have been selected. These services include:

(1) Hospital (H) (3) Divisional Headquarters (D.Hq.)
(2) Post Office (P.O) (4) Health Centre (H.C.)

The relative importance of the above stipulated services are determined by the frequency with which they are utilised. The following subjective weights are attached to each facility of service. The scale is chosen between 1 to 10 indicating higher rating for increasing frequency.

a) Hospital (low frequency) ---2
b) Post Office (Medium frequency) ---5
c) Div. Headquarters (High frequency) ---10
d) Health Centre (Medium frequency) ---5

The actual distance from a Zone of influence to any social service will be multiplied by the weight attached to that facility. The sum of the weighted distances gives the total weighted distance for the Zone of influence and this total weighted distance gives the access-indicator for the zone.

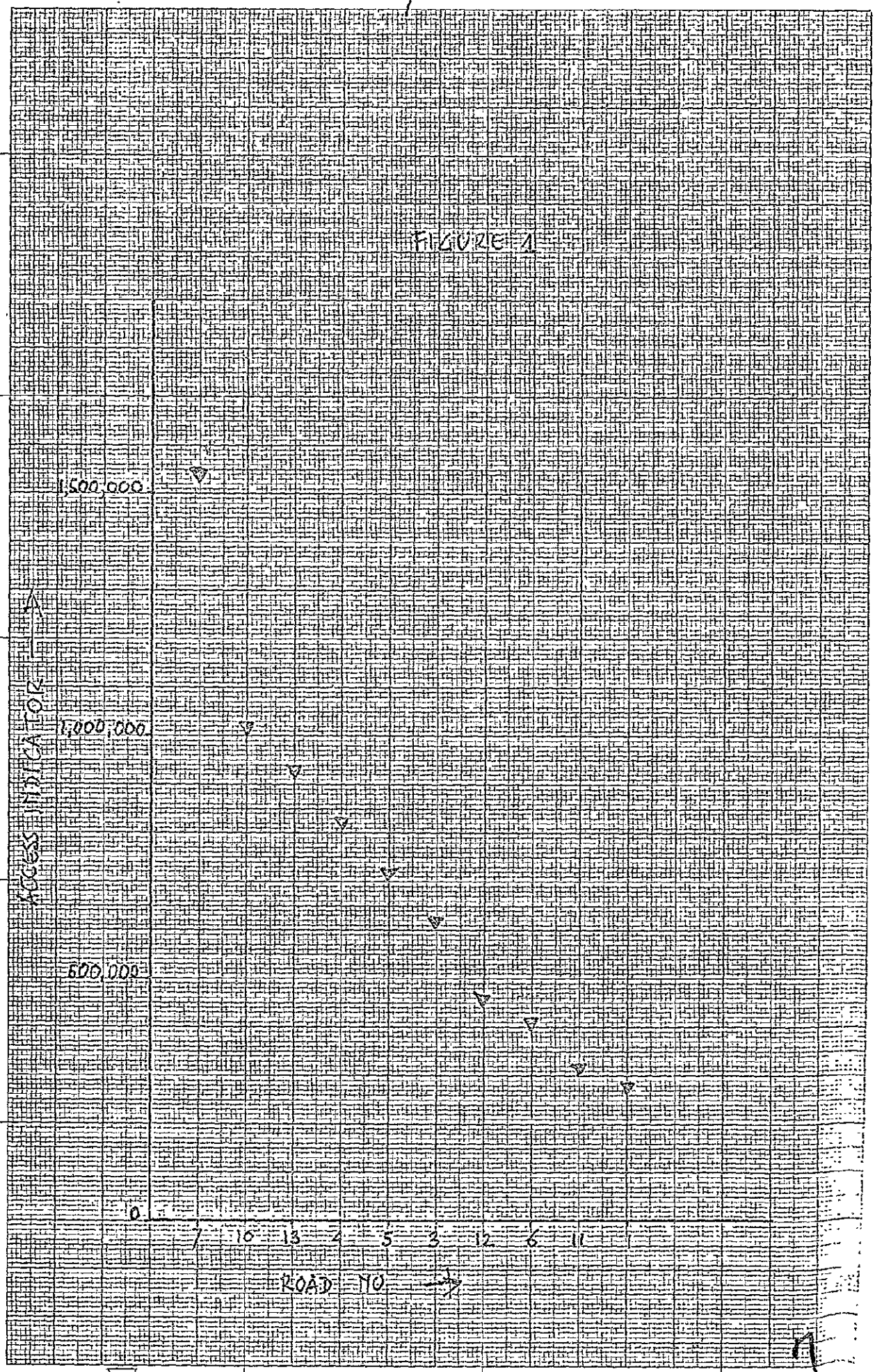
On the table III below are depicted all these distances culminating in the access - indicator. On map V is shown to actual location of the social services.

The figure on page 7 shows the range of access - indicator for the proposed roads.

TABLE III

ROAD NO.	POPULATION IN ZONE OF INFLUENCE 1	AVERAGE DISTANCE (IN KM) TO				WEIGHTED DISTANCE (IN KM)				TOTAL WEIGHTED DISTANCE 11	ACCESS INDICATOR (1 x 11)	PRIORITY RATING BASED ON ACCESS
		H.	P.O	D.HQ.	H.C	H.	P.O	D.HQ.	H .C			
1	1949	10	10	5	5	20	50	50	25	145	282605	10
3	2035	24	20	10	10	48	100	100	50	298	606430	6
4	2273	27	23	13	13	54	115	130	65	364	827372	4
5	3232	23	11	8	8	46	55	80	40	221	714272	5
6	1932	23	8	8	8	46	40	80	40	206	397992	8
7	3345	30	20	20	20	60	100	200	100	460	1538700	1
10	4228	19	10	10	10	38	50	100	50	238	1006264	2
11	576	32	23	23	23	64	115	230	115	524	301824	9
12	758	35	26	26	26	70	130	260	130	590	447220	7
13	2677	24	15	15	15	48	75	150	75	348	931596	3

FIGURE 1



IV. POTENTIAL FOR DEVELOPMENT

The potential for development is directly related to the agricultural development prospect within each zone of influence. The present and future land utilization are shown in the tables below:

M = Maize	C = Cotton
B = Beans	L = Livestock
CF = Coffee	O = Other crops (mostly subsistence
PT = Potatoes	T = Tea
P = Present Land Utiliz-	F = Future land Utilization
P = Pyrethrum	WH = Wheat

The agricultural data have been provided by the DAO - Bungoma.

TABLE IV

	ROAD NO.1				ROAD NO. 3				ROAD NO.4			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
M	224	245	21	23	130	143	20	22	188	188	25	25
B	43	85	4	8	32	52	5	8		75		10
C	255	311	24	29	1625	195	25	30				
CF	11	53	1	5		32		5	75	112	10	15
P												
T												
WH												
PT										38		5
S	212	212	20	20	130	130	20	20	225	225	30	30
L	320	159	30	15	195	98	30	15	262	112	35	15
TOTAL	1065	1065	100	100	650	650	100	100	750	750	100	100

TABLE V

	ROAD NO. 5				ROAD NO. 6				ROAD NO. 7			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
M	155	194	20	25	245	210	35	30	929	413	45	20
B	39	39	5	5								
C												
CF	116	194	15	25	35	70	5	10				
P					35	140	5	20	82	165	4	8
T												
WH									21	868	1	42
PT												
S	233	232	30	30	175	175	25	25	413	413	20	20
L	232	116	30	15	210	105	30	15	620	206	30	10
TOTAL	775	775	100	100	700	700	100	100	2065	2065	100	100

TABLE VI

	ROAD NO. 10				ROAD NO.11				ROAD NO. 12			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
M	504	420	36	30	63	38	33	20	50	37	20	15
B					13	-	7	-				
C												
CF	56	350	4	25								
P												
T					-	44	-	23	12	25	5	10
WH									50	87	20	35
PT					-	32	-	17				
S	420	420	30	30	48	48	25	25	63	63	25	25
L	420	210	30	15	66	28	35	15	75	38	30	15
TOTAL	1400	1400	100	100	190	190	100	100	250	250	100	100

TABLE VII

	ROAD NO.13			
	P ha	F ha	P %	F %
M	303	202	30	20
B	50	-	5	-
C				
CF				
P				
T	-	202	-	20
WH	-		-	
PT	-	151		15
S	303	303	30	30
L	354	152	35	15
TOTAL	1010	1010	100	100

V. CONSTRAINTS ON DEVELOPMENT

1. TYPES OF CONSTRAINTS

The constraints on (agricultural) development fall into two categories:

(a) Natural Constraints

- the constraints which can not be removed by man (such as soil - rainfall - and topographical charateristics).

b) Resource Constraints

- the constraints which can be removed when enough capital is available (such as land registration, agricultural credit, agricultural inputs, marketing of produce , agroindustry, road infrastrucure, attitude of the people towards modernisation and agriculture).

2. CONSTRAINTS AS THEY EXIST NOW

a) Rainfall

The 1975 rainfall figures for the weather stations are given in table VII. The weather stations are depicted on map V.
See also map IV.

In general the Northern part of the district has an annual rainfall of about 1270 mm compared to 1500 mm in the Southern part. The wet seasons are between April and October. However, the total amount of precipitation might vary from year to year.

b)

TOPOGRAPHY

The land form in the study area consists of gently sloping volcanic crystalline hills. The overall drainage pattern is radial with rivers emanating from Mt. Elgon forests flowing southwards.

c) SOIL

The main geological features in the area consists mainly of the volcanics. These have resulted in a predominance of dark-red sandy weathering with occasional clays. In view of the presence of poor surfacing materials the roads become slippery during wet seasons, to an extent which renders movement extremely hazardous

RAINFALL FIGURES (MM)

TABLE VIII

STATION	BUNGOMA	SIRISIA	MALAKISI	KAPSAKWONY	KIMILILI	WEBUYE	AVERAGE
JAN.	26.8	2.4	29.4	N/R	N/R	13.7	12.1
FEB.	N/R	N/R	11.0	10.0	N/R	20.7	7.0
MARCH	230.3	102.0	N/R	10.7	N/R	164.9	84.7
APRIL	526.2	195.0	N/R	N/R	195.3	263.1	196.6
MAY	160.2	206.9	N/R	250.0	202.1	174.7	165.7
JUNE	120.4	146.7	N/R	170.0	164.5	159.7	126.9
JULY	N/R	138.0	N/R	41.1	189.5	161.2	88.3
AUGUST	61.6	196.4	151.4	63.3	95.4	249.2	136.2
SEPT.	99.8	146.1	N/R	42.0	146.5	359.5	132.3
OCTOBER	N/R	111.4	40.5	40.5	103.0	133.1	71.4
NOVEMBER	32.6	16.1	N/R	N/R	20.7	51.6	20.2
DECEMBER	23.7	67.1	N/R	N/R	30.5	51.6	28.8
TOTAL	1165.1	1359.3	232.3	627.6	21144.6	1765.9	1070.2

d) LAND REGISTRATION

In the whole of Bungoma District the land is registered except the Mount Elgon Forest area. However, not everyone has title deed. It is normal practise to secure bigger loan for the improvement of land if one has a title deed.

e) AGRICULTURAL EXTENSION SERVICES

At the divisional level the extension staff was available. But due to the lack of transport they are mostly available at the divisional headquarters only.

f) MECHANISATION OF THE FARMS

Farmers are ploughing and harrowing their land using either tractors or Ox-ploughs whereas the other farming activities such as planting, weeding and harvesting are non-mechanized.

g) MARKET OF PRODUCE

Already some 30% of the whole area is under cash crop. The main bottleneck in reaching the markets as stated by the agricultural officers and the farmers, is the existin poor condition of the access roads which render the transportation of the agricultural produce quite difficult during the rainy seasons.

h) ROAD INFRSTRUCTURE

The collector road D275 (Kaptana-Kapsakwony - C42) is important if maximum benefits are to be derived from the improvement of the fore-mentioned Rurual Access Roads in the area.

This road however is earmarked for improvement under the proposed Gravelling Culverting and Bridging programme. All rural access roads connect to all weather (except D275) classified roads in fair condition.

i) ATTITUDE OF THE PEOPLE

The attitude of the people towards Modernisation of agri ultural production and towards cash crop as a way of existence is positive, especially in the Mount Elgon Forest area where the soil is very fertile.

VI IMPACT OF THE ROAD ON RURAL DEVELOPMENT

1. THE RURAL ACCESS ROAD CONSTRUCTION COST COMPONENT

Costs estimates of rural access roads show the following:

Construction costs: per kilometre.

Flat to rolling terrain K£ 1800

Rolling to hilly terrain K£2000

Hilly terrain K£.2500

A break down of these total costs into the different components will roughly compose of the following iterms:

COST COMPARENT	%	COST PER KILOMETER 1800	2000	2500
Wages permanent staff	8	144	160	200
Wages casual labour force	40	720	800	1000
Tools and equipment	27	486	540	675
Sand Ballast and Cement	6	108	120	150
Construction materials	7	126	140	175
Transport	10	180	200	250
Others	2	36	40	50
	100	£1800	£2000	£2500

The evaluated roads fall in the following categories 1800 10

K£ 1800 10

K£ 2000 1,3,4,7,11,12,13.

K£ 2500 5,6

- Wages of the casual labour force will all be spent in the rural area adjacent to the selected access roads;
- Wages of the permanent staff will be spent within the district
- at large;
- Sand, ballast are available within the district
- Tools, equipment, vehicles for transportation will all be imported and as such have little bearing on the rural and district economy;
- The maintenance expenditures are estimated at £ 80/km road. Out of this amount about 75% is paid to the casual labour force each year. Table IX shows a breakdown of the relevant cash component.for the selected access roads.

TABLE IX

ROAD NO.	CONSTRUCTION COSTS £	MAINTENANCE PER ANNUM £	CONSTRUCTION WAGES £	CASUAL LAB. MAN DAYS	MAINTENANCE WAGES £	MAN DAYS MAINTENANCE	PERMANENT STAFF WAGES CONSTRUCTION £
1	12600	504	5040	12680	378	951	1008
3	7000	280	2800	7044	210	528	560
4	9000	360	3600	9057	270	679	720
5	19250	616	7700	19371	462	1162	1540
6	20750	664	8300	20881	498	1253	1660
7	30000	1200	12000	30189	900	2264	2400
10	7920	352	3168	7970	264	664	634
11	4000	160	1600	4025	120	302	320
12	6000	240	2400	6038	180	453	480
13	15000	600	6000	15094	450	1132	1200

2. SHORT TERM EFFECTS OF THE RURAL ACCESS ROADS

The short term effect of the opening of the rural access roads will be substantial for the mobility of the divisional officers. The roads will provide the agricultural, educational, and health officers ect. an all weather mobility to the areas, which will enable them to carry out their duties more effectively.

3. LONG TERM EFFECTS OF THE RURAL ACCESS ROADS

The long term effects stem from the development of the agricultural potential within the zones of influence.

The potential for expansion of cash crops within the zones of influence is shown in table X.
For the gross margins see appendix VII
The present value of the agricultural production is calculated over 20 years period between 1978 and 1997. It is assumed that the prices over this period will remain reasonably constant.

The development of the agricultural potential will take 10 years. It is assumed that the potential will develop equally during the 10 years, starting in 1979. Moreover, the value of the subsistence crops are not taken into account in the final economi analysis.

The total increment in agricultural production will be K£ 462528. It is assumed that during the first 10 years the increment in agricultural production will be K£462553 every year From the available data "present" or future with RARP only, is calculated as 50% of the increment between future without and future with RARP.
This affects the orginal amount as follows 75% K£462528= K£3468
Whereas only part of the increment can be set against the investments in rural access roads, only 60% of the increments has been discounted.
The total discounted increment is K£208138. It is assumed that during the first 10 years (from 1979 up to 1989) the agricultur potential will develop equally with a discounted increment of K£20814 annually.

TABLE X

ROAD	POTENTIAL OF CASH - CROP EXPANSION (ha)								
No.	M	B	C	CF	P	T	WH	PT	TOTAL
1	21	42	56	42					161
3	13	20	33	32					98
4		75		37				38	150
5	39			78					117
6	35			35	105				105
7	516				83		847		414
10	84			294					210
11	25	13				44		32	38
12	13					13	37		37
13	101	50				202		151	202

TABLE XI

EXISTING CASH CROP AREA

ROAD NO.	EXISTING CASH CROP AREA UNDER							
	MAIZE	BEANS	COTTON	COFFEE	PYRE-THRUM	TEA	WHEAT	POTA-TOES
1	224	43	253	11				
3	130	32	162					
4	188	-		75				
5	135	39		116				
6	245			35	35			
7	929				82		21	
10	504			56				
11	63	13				-		-
12	50					12	50	
13	303	50				-		-

TABLE XII

FUTURE CASH CROP AREA UNDER

ROAD NO.	FUTURE CASH CROP AREA UNDER							
	M	B	C	CF	PT	T	WH	PT
1	245	85	311	53				
3	143	52	195	32				
4	188	75		112				38
5	194	39		194				
6	210			70	140			
7	413				165		868	
10	420			350				
11	38	-				44		32
12	37					25	87	
13	202	-				202		151

TABLE XIII

EXISTING GROSS MARGINS

ROAD NO.	EXISTING GROSS MARGINS K£								
	M	B	C	CF	P	T	WP	PT	TOTAL
1	13030	1011	8415	6097					28553
3	7562	752	5363						13677
4	10942			41573					52515
5	9016	917		64299					74232
6	14251			19401	2100				35752
7	54040			4920	4920		416		59376
10	29318			31041					60359
11	3665	306							3971
12	2909					2010	990		5909
13	17625	1175							18801

TABLE XIV

FUTURE GROSS MARGINS

ROAD NO.	FUTURE GROSS MARGINS K£									TOTAL INCREMENT
	M	B	CF	C	P	T	WH	PT	TOTAL	
1	20775	4616	29378	34210					88979	60426
3	12126	2824	17738	21450					54138	40461
4	15942	4073	62082					4180	86277	33762
5	16451	2118	107534						126103	51871
6	17608		38801		8400				65009	29257
7	35022				9900		28731		73653	14277
10	35616		194005						229621	169262
11	3222					7370		3520	14112	10141
12	3138					4188	2880		10206	4297
13	17130					33835		16610	67575	48774

TOTAL INCREMENT K£ 462528

75% = K£346896

VII DISCOUNTED COSTS AND BENEFITS OF THE PROPOSED INVESTMENT

The road construction has many impacts on the rural economy and rural welfare. Many of these impacts can not (yet) be measured, let alone quantified in monetary terms. For this reason the present monetary evaluation criteria for rural access road investments can be considered as an art rather than a scientific approach.

Since it is rather unrealistic to calculate the internal rate of return of each road in view of the very short lengths involved, the internal rate of return of the whole package of roads has been calculated. The cost of road construction and maintenance and the benefits of agricultural development are discounted to the base year 1978. The project gestation period has been assumed as 20 years.

The total increment as calculated in table XIV is K£462528, but a only the RARP will affect the area this increment will be only 75% of the original amount i.e. K£346896.
Then of this agricultural increment only 60% will be discounted as only part of the increment can be set against the investments in rural access roads.
i.e. 60%* K£346896 208138
The total costs shadow prices for the construction of the roads are: K£131520 * 0.83 = K£109162 to be spent wholly in 1978.
The yearly maintenance costs are in shadow prices K£4976 0.61= K£3035 annually starting in 1979.
The yearly increment in agricultural production during the first 10 years to be discounted is K£20814 starting in 1979.
From 1989 onward the full benefits of K£208138 will be gained annually.

In table XV are indicated the discounted costs and benefits for various discounting rates.
The internal rate of return is above 50%, and the investment is therefore very beneficial to be undertaken.

YEAR	COSTS	BENEFITS	DISCOUNTED 14%		DISCOUNTED 40%		DISCOUNTED 50%	
			COSTS	BENEFITS	COSTS	BENEFITS	COSTS	BENEFITS
1978	109162		109162		109162		109162	
1979	3035	20814	2662	18254	2167	14861	2024	13883
1980	3035	41628	2334	32012	1548	21230	1348	18483
1981	3035	62442	2049	42148	1105	22729	898	18483
1982	3035	83256	1797	49288	789	21647	601	16485
1983	3035	104070	1575	54012	565	19357	401	13737
1984	3035	124884	1384	56947	404	16609	267	10990
1985	3035	145698	1214	58279	288	13841	179	8596
1986	3035	166512	1065	58446	206	11323	118	6494
1987	3035	187326	935	57696	146	8992	79	4870
1988	3035	208138	819	56197	106	7285	52	3538
1989	3035	208138	719	49329	76	5203	36	2498
1990	3035	208138	631	43292	55	3746	24	1665
1991	3035	208138	552	37881	39	2706	15	1041
1992	3035	208138	486	33300	27	1873	9	416
1993	3035	208138	425	29129	18	1249	6	416
1994	3035	208138	373	25601	15	1041	6	416
1995	3035	208138	328	22479	9	624	3	208
1996	3035	208138	288	19773	6	416	3	208
1997	3035	208138	252	17275	6	416	0	0
TOTAL NET PRESENT WORTH			129050	731378	116737	175148	115231	122427

VIII. DEVELOPMENT OF RURAL INCOME

Given the development of the agricultural potential and the development of the population in the zones of influence of the roads, the rural cash income per capita can be calculated The income per capita is calculated for the year 1988 when the agricultural potential is fully developed. For the porpose of this submission, it is assumed that the gross margin of the agricultural output is equal to the income of the farmers. The population growth over the period, 1978-1988 is assumed to be 4%. The results are:

TABLE XVI

ROAD NO.	GROSS MARGIN 1988 K£	POPULATION IN ZONE OF INFLUENCE		INCOME PER CAPITA 1988 K£
		1978	1988	
1	88979	1949	2885	30.8
3	54138	2035	3012	18.0
4	86277	2273	3365	25.6
5	126103	3232	4784	26.4
6	65009	1932	2860	22.7
7	73653	3345	4951	14.9
10	229621	4228	6258	36.7
11	14112	576	853	24.5
12	10206	758	1122	9.1
13	67575	2677	3963	17.1

Given constant prices for agricultural products, the income per capita will diminish after the year 1988 at a rate equal to the population growth rate. In addition, more land will be needed for the cultivation of subsistence crops, at the expense of the area under cash crops.

APPENDIX I

THE DISTRICT COMMISSIONER'S OFFICE,
P.O. BOX 550,
BUNGOMA.
28. 3. 78.

The Chief Engineer(Roads)
Ministry Of Works
NAIROBI. (Att. Mr. Linden).

Dear Sir,

RURAL ACCESS ROADS REPORT.

Further to my discussion with me in my office on 23rd March, 1978, I hereby wish furnish you with the draft report which you requested. If I get an official request over the same report, I will have to revise the same report, according to what is specifically requested for, and officially bring it to you. Meanwhile this draft is only to assist you (Mr. Linden) in the preparation of your report.

Please acknowledge receipt of this report and I would appreciate to hear any comments on it.

Yours faithfully

(WANJALA WA MURICHO)
DISTRICT DEVELOPMENT OFFICER: BUNGOMA.

A REPORT ON THE IMPORTANCE OF BUILDING RURAL ACCESS ROADS IN BUNGOMA:

I. GENERAL.

1. CHOICE OF THE PLACE:

Bungoma District is divided into four (4) administrative divisions which are divided into eleven (11) locations. These are further divided into fifty four (54) sub-locations. The District has:-

99.2 km. of International Trunk Roads;
207.8 km. of Primary roads;
330.1 km. of Secondary roads;
324.5 km. of Minor roads;
77.1 km. of Special Purpose roads++; and
650.6 km. of Rural Accessroads being planned.

Out of these all the fully paved and gravelled roads are found in the three divisions of Tongaren, Kimilili and Kavujai only. Mt. Elgon division alone, in the whole District, suffers from total lack of paved and gravelled road system. Yet agriculturally, this division is highly potential producing maize and coffee as well as being a potential producer of many more cash crops like wheat, pyrethrum and horticultural crops as well as being the ideal division for grade cattle.

It is on the basis of these facts that the District Development Committee (D.D.C) gave the division first priority in the selection of proposals to the Rural Access Roads Programme.

2. POPULATION AND GROWTH CENTRES:

The total area for Bungoma District is 3074 sq. km. out of which over 900 sq. km. is Mt. Elgon Division. The division borders an approximately 500 sq. km. of government forest Reserve which contains soft wood. The forest is an important ecological factor as it constitutes the main catchment area for the network of rivers that supply the rest of the District with water. The forest also acts as a potential for the supply of raw materials for future industrial production.

The division was estimated to have had 86,538 people in 1976 with an average population density of 172 people per sq. km. This is quite a high growth rate given that the estimated District average at the same time was 151 people per sq. km. The 1969 census gave the division a total

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++ These roads exclude roads that have recently been completed in Tongaren division and whose ~~length~~ total length was not immediately available. These roads were constructed by the National Youth Service.

of 31,201 people in the division.

The following growth centres will benefit from the programme.; Kapsakwony, Kapkateny, Cheptais, Kaptama, Chepkube, Changara, Chesikaki, Namorio, Chemoge, Chesambs, Kimilili, Chepyuk, Kongit, Namwela and Chelebei. These centres have been held behind in deveopment because of the very poor communication network.

3. R.A.R. PROCEDURES AND GUIDELINES:

In selecting the roads every effort was made to keep to the R.A.R.P requirements and guidelines. It was, however, difficult to keep to the distance limit in all our proposals. This was mainly the case in roads Nos. 11, 12 and 7. In roads NOs. 11 and 12, we were limited by tho District boundary. Road NO. 11 should be extended to Sabot in TransNzoia District. This would give the road an approximate distance of 8km. Similarly, road NO.12. should be extended to E318 in TransNzoia to give the road a distance of 5 km. Both extensions are viable only if liaison with TransNzoia District can be made so that proposals from the other end can be made ~~to this end~~. Road No. 7 far exceeds the required maximum distance by 5 km. This is due to the fact that the road goes towards the forest reserve and turns to rejoin D275 at Cheptonon. Essentially each wing of road NO. 7 should be considered as one road only that they converge at a point after Chepyuk.

~~III~~ OTHER DEVELOPMENT PROJECTS IN THE AREA:

1. ROADS NOS. 1, 3, 4 and 5.

This roads are in the West of the division along the border with Uganda. This area produces maize and coffee mainly but more recently it is covered by the Tobacco programme. The soils in this area are suitable for any crop grown in Kenya although its exploitation has been hampered by poor communication system.

Over 500 farmers have been registered by B.A.T (Kenya) Ltd. as tobacco growers. B.A.T will provide both technical and financial assistance to these farmers. It is estimated that over 240 ha. are under tobacco in this area alone.

We have one tree nursery at Cheptais. This , when fully operational, will serve two purposes. First, to supply eucalyptus seedlings to the tobacco farmers who grow the trees with which to cure their crop. Secondly, the nursery will will provide seedlings ~~for~~ for soil conservation and tree planting programmes in the area.

There is a government sponsored Village Polytechnic in the area. This V.P

...../3

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is along the proposed road NO. 3. The Polytechnic has over 40 students training tailoring, carpentry, Agriculture and Home economics. The V.P could be expanded to provide most of the trades if only communication in this area could be improved.

Finally there are a number of service centres that could be developed because of the wealth in the area they serve, but because they are inaccessible for most part of the year, they have remained local centres and even some have had to be closed down. They include places like Cheptais, Chesikaki and Lwakhakha.

2.. ROADS NOS. 6,7,9,10, 11, 12 and 13.

This is the most agriculturally potential area extending from the lower ridges, (NOs 6, 9 and 10) to the upper part of Mt. Elgon slopes (NOs 7, 11, 12 and 13). This area also includes the newly settlement area of Chepyuk covered by road NO. 7 and borders Trans Nzoia District to the East and the Forest reserve to the north. The area produces maize, coffee and grade & cattle like most of the rest of the District. Besides, the area produces the following crops that could be developed as some of the major cash earners for the district as well as Kenya:-

(a). Pyrethrum.

Over 1500 ha. is under pyrethrum and the area has the potential for upto 7000 ha.. The D.DC has recommended that four stores be build using RDF funds at Tuywandet, Kaboywa, Chemoge and Namorio to assist pyrethrum farmers store their crop.

(b). Wheat.

There were 450 ha. of wheat in this area in 1976 yeilding just over 900 tons. of wheat. The area is capable of having over 2,500 ha. under this crop. The place has not been exploited fully because the failure to get suitable machinery to the area since most of the roads are impassable for most part of the year.

(c). Horticultural crops.

The area is ideal for crops like onions, passion fruits, cabbages and tomatoes, but they have not been grown on a commercial basis. This is due to the fact that these being perishable crops they either require to be processed locally or be transported quickly to the market and/or processing plant.

Finally, the Ministry of Water Development plans to finance major

water Scheme under the Rural Water Scheme. The scheme, when completed, will serve people and livestock in the two ~~xxxxxxxxx~~ sub-locations of Kapsakwony and Chemoge as well as parts Kimilili location around Chesamisi area. The proposed source of this scheme is at Kongit ~~xxxxxx~~ along road No. 13.

III. PRIORITY RANKING OF THE ROADS:

The DDC got the priority ranking of the roads from the Divisional Development Committees; in this case the Div. Dev. committees at Kapsakwony. Below is the ranking from the committees for the first seven Five roads with some of the more important justifications.

1. Road NO. 7. This road is to open up the new sub-location of Chepyuk which is newly settled and has so far no other road.
2. " " 13. The road is to connect people in the Kongit area extending to forest reserve to the major social centres down the slopes. The road will also open up and connect Wheat and pyrethrum farmers in this area to D275.
3. " " 9. This road will connect people in the upper side of the mountain slopes to Kimilili and other service centres down the slopes.
4. " " 6. same as road NO. 9.
5. " " 10. The road will connect, either way, people along the Sosio river to either D285 to the East or E317 to the West.

The remaining roads followed in the order; NOs. 11, 12, & 4, 5, 3 and 1. They do not however have any special reasons., except mere order of preference.

IV. EXISTING ROADS:

There is only one major road cutting across the area (D275) and in most parts this road is non-existent. The same can be said of the other classified roads in the area like E315, E316, E317, E318, E377, E277; etc, etc. Even where they are visible, they are impassable for most part of the year. There is no all-weather road in the area.

The District is covered by the Gravelling programme and this area is also given first priority in this programme. In particular, D275 has been recommended for being improved to bitumen standard.

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V: PRESENT LAND UTILISATION:

As it can be seen from section II. of this report, most of the crops are under-produced in this area. Many factors go to explain this state of affairs. First, most of the land is underutilised and secondly, production techniques are still sub-standard. Apart from poor communication system, the Ministry of Agriculture has pinpointed the following specific constraints all of which have some relationship to communication. The constraints include:-

(a). poor and insufficient supply of farm inputs.
(b). lack of storage facilities.
(c). poor marketing system.
(d). low level, (sometimes lack), of extension services.

Although it is difficult to state for certain the extend of under-utility of the agricultural land in this area, it is clear from the current figures of turnover as compared to the fertility of the soil plus the hectarage involved, that this area is capable of doubling its current agricultural as well as industrial output. This would mean that roughly the area is producing only 50% of what it is ~~xxxxxx~~ capable of.

VI. SOCIAL BENEFITS OF THE RURAL ACCESS ROADS PROGRAMME:

In the short run, the programme will benefit the people by providing employment to them. This will boost their incomes and provide them with a better standard of living. This is more so as the largest group of beneficiaries will be the unskilled labour force that cannot get employed elsewhere. In the long run, the programme will open up the place and enable the people to enjoy a higher standard of living than now. The roads will provide access to social and service centres such as educational and health ~~xxxxxxxxxxxx~~ institutions. Secondly, the roads will ensure speedy delivery of commodities and services that are required from outside the division. Finally, the improved roads system will facilitate more effective administration of the division which is currently cut off from the rest of the district for the most part of the year.

PREPARED BY: WANJALA WA MURICHO
DISTRICT DEVELOPMENT OFFICER,
BUNGOMA.
28TH. MARCH, 1978.

APPENDIX II

This appendix is copied from the original report.
Most of the proposed alignments are descripted in the other appendixes.
Also considerable alterations have been made in the proposed alignments.
The alterations have been indicated on the maps VI to XI.

(1) Machakha - Ndakalu - C42

This road crosses the Malakisi River by means of culverts.
This road follows an existing track.

(2) Nama Wanga - Lwa Khabha

This road follows an existing footpath and crosses the Sasuli River by means of culverts.

(3) Wamono - Wasio School - Chepkube Coffee Factory

The road crosses several streams mostly by means of drifts. The proposed road could slightly be realigned to avoid the crossing of one or two drifts.

(4) Chepkube - Chebweki - Chesiro - Cheptais

The road follows an existing track Crossing the Tisi, and the Kabamayi Rivers.

(5) Mulatiwa - Kapkirongo

In general, the road follows the existing track. The main river crossing is at the Malakisi River where a drift would be appropriate. The last section of the road to Kapkirongo follows the existing contours. The other branch of the road extends up to the Malakisi river in a North Easterly direction where it has a dead end.

(6) Kutere - Chelebei Market - Lwanda Market - Changeywa Market

This road is crossing some streams and ridges with fairly steep slopes.
The First part of the road is on an existing track. The second part follows a footpath and possibly some realignment will be necessary to avoid the steep hills.

(7) D275- Kopsiro - Chepyku - Kipsikirok - Chepton - D275

This road is a real access road into the Mount Elgon Forest. In the southern part some section are on all existing track. The northern part is at present a footpath. This road is highly dependent on D275.

(8) Kapkateny - Cheptonon

This small road is opening the area north of kapkatney. The Kapkateny River has to be crossed by means of culverts. The road follows an existing footpath but some realignment will be necesary to avoid excessive gradients.

(9) Kimilili - Kamution'g - Kimobo

This road has no rivercrossings of any significance. After three quarters of the road to the north, there is a steep rise. The first part is on an existing track. The second part follows an existing footpath.

(10) Chesamisi - Kamusinde - Kamasielo

This road crosses the swampy area around the Kamusinde River over a short stretch.

To the west, the Sosio River has to be crossed by means of culverts. The road is on an existing track.

(11) Chesinende - Kapchebou Market

This road is opening up an area bordered by the Kamakoiwa River. The river has to be crossed by means of culverts. The road is partly on an existing track and partly on a footpath.

(12) Chesito - Kamakoiwa River

The road gradually slopes down to the Kamakoiwa River (district border) and follows an existing track.

(13) Kaptalelia Junction - Kongit - Kapsakwony Road

This road opens up a more or less neglected area, with a fairly high population. The road is on an existing track.

APPENDIX III

RURAL ACCESS ROADS PROGRAMME, EVALUATION OF ROADS IN BUNGOMA, PART 1

FINAL REVIEW OF ROAD NO. 1, 3 AND 10

1. Road No.1

This road has been visited the 21.2.78 by the R.A.R.P. Engineer Bungoma and an assistant.

a. Condition of the connecting classified road:

Starting at Malakisi the connecting road is C42. The road is corrugated but sound.

b. Length of the proposed road: 6.3 km.

c. Describtion of sub-standard soils: none.

d. Describtion of structures required, if any:

When visiting this road with the US-Aid Engineer, the river at km 3.200 was the main obstacle and we estimated that a bridge with about 10m span would be necessary. This time with the aid of some villagers a ford about 600m stream up was discovered. (Foto No.1 As it can be seen the water is not high, considering the fact, that in the previous 2 nights heavy rains have been falling, we crossed safely with a Land Rover. In my opinion this is the situation to make a built up drift with pipe culverts. The river ground is firm and there are many suitable big stones nearby. However the construction should be done in dry season preverable just before the murraming.

2. Road No.3

This road has been visited the21.2.78 by the R.A.R.P. Engineer Bungoma and an assistant.
Judging road No.3 one has to consider No.4 too because they are related.
When visiting road No.3 with the US-Aid Engineer we reached as far as km 3.300 where a stream with high banks blocked the way for the Land Rover. We estimated that a bridge with a span of 6 m would be necessary. Considering in addition the steep rise after the bridge to the end according the contours in the map we have been thinking that it would be worthwile to check whether the coffee factory at the end of No.3 could not easier be reached by an indicated track from Cheptai.
This has been done this time and to my surprise the Land Rover could reach further with ease and would there not have been a small broken bridge (Foto No.2), then we would have reached the point where road No.4 ends.
This is in fact a road out of the 'caffee boom time'. The road has R.AR.P. standard exept the following few points which would have be to corrected:

- one or two small changes in alignments
- laying the available stones properly ~~in~~ to one drift
- constructing a big culvert, replacing the broken bridge (Foto No.2)
- reshaping and murraming the roadsurface

Considering the new situation, the proposed alignments of road No.3 and 4 do not make much sense anymore, this roads could be shortened. In this case the 'Coffee Road' should be taken in the R.A.R.P. if possible.

a. Condition of the connecting classified road

Starting from Malakisi, there is first road No. C32, then road No. D277 passing Wamono where road No.3 starts. Both roads are rough but sound and this up to Cheptai.

b. Length of the proposed roads

Road No. 3: 3.6 km
Road No. 4: 4.6 km
Coffee road: 5.9 km

3.

c. Describtion of sub-standard soils: none.

d. Describtion of structures required, if any: See 1.section.

3. Road No.10

This road has been visited the 23.2.78 by the R.A.R.P. Engineer Bungoma and the following local authorities:

- Chief from Kimilili, Mr.Timonah M.Wangila
- Sub Chief from Chesamisi, Mr.Reuben Muniole

In this area rain was falling the 3 previous nights and the problems camed to light.

Starting from Cheramisi (the end of the road) there are for 1.8 km no problems because a motorable track is existing. At km 1.800 starts a swamp with a length of 1 km which is for the most of a year impassable for a Land Rover, the soil is black-organic.(Foto No. 3)

I was asking the chiefs why this alignment has been chosen and not this 'around the pond' as indicated on the sketch where the soil is dry and sound. The reply was that this ground is of no agricultural use and that the farmers on my suggested alignment would ask for heavy compensations.

I feel this swampy area is no good for a R.A.R.P. because it would call for extensive soiltransport from a borrow-pit to build up a dam.

At km 3.000 there is a little village which is connected by a foot bridge at km 3.400 to Kamusinde-Village. The development of this foot bridge would need a span of 8m and worse the fundation would be a problem, there is no rock, gravel or sand just bottomless organic soil. After that one reaches on a motorable track Kamusinde with one short swampy spot on the way.

Here the chiefs could not understand that the alignment goes towards Kamasielo market and not as indicated as (B) in the sketch. In fact I have tc suport their opinion:

- The chosen alignment leads further from the markets in a classified road than the suggested by the chiefs.
- The chosen alignment is almost parallel to the classified road.
- The villages on the sections in question have already an outlet. (C)
- Part (B) is no problem for construction, there is again a short swampy spot, but any vehicle could have passed.

Solution:
Gathering all the facts I feel road No. 10 should be altered as indicated on my sketch.

a. Condition of the connecting classified road

For road 10 A it is D285 which is unmaintained and has a few soft spots but can be used the whole year.

For road 10 B it is E 317 and which is sound.

b. Length of the proposed roads:

Road 10 A	1.8 km
Road 10 B	4.4 km

c. Describtion of sub-standard soils: See 1. section.

d. Describtion of structures required, if any: See 1.section.

E. Reinhardt

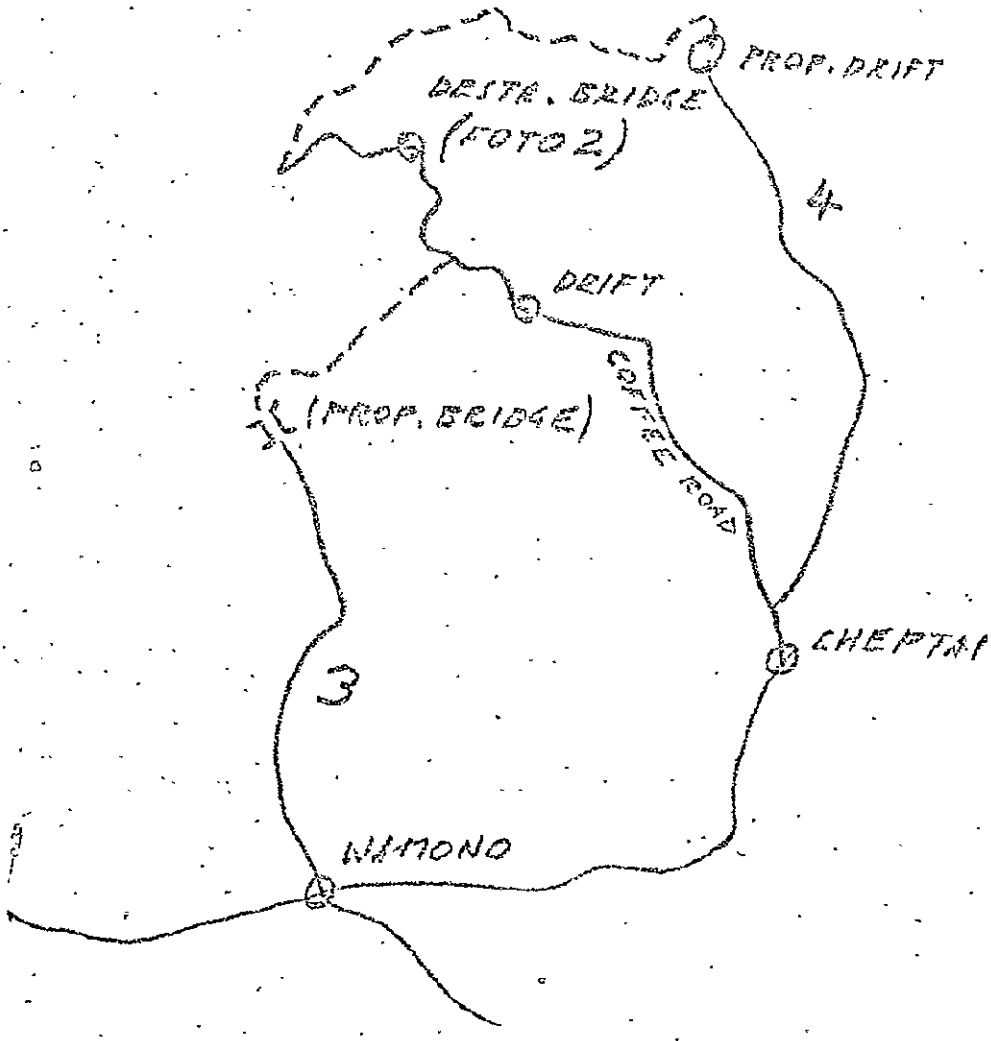
DAR-ENGINEER
BUNGOMA

SKETCH TO ROAD NO. 10

SCALE: 1:50,000

SKETCH TO ROAD NO. 3

SCALE : 1:50'000



APPENDIX IV

RURAL ACCESS ROADS PROGRAMME, EVALUATION OF ROADS IN BUNGOMA, PART 1

FINAL REVIEW OF ROAD NO. 5 AND 6

1. Introduction

The 5., 6. and 7. october Mr. Satash Shah, US-Aid Engineer has reviewed the roads in Bungoma District. However due to lack of time because of the difficulties to reach some roads, no. 5 and 6 have been left out.
The 16. november, when Mr. Shah and Mr. Simpson, Sen.Supt.Eng. R.A.R.P. have reviewed the roads in Kisumu District, I was asked to visit the two roads and to write a brief report about.

2. Road No. 5

Looking on the map, one could say that the road represents itself in the shape of a H with the horizontal line west-east (W-E) ending lower than the middle of the vertical line south-north (S-N) on the right.
I suggest to omit the W-E section for the following reasons:

- In the middle of this section there is a stream which can only be crossed with a bridge which has not less than 8 m span.
- As it can easy be seen on the map, the W-E section would serve only as a short cut, starting from Chesikaki, using about 1 km of the road E 277, then branching to the left and leading over a partly bad road to the S-N section on the right.

Instead I suggest to prolong the S-N section on the right all the way down until it reaches the road E 277. This additional section is about 2.2 km in length, is topographic wise not difficult but the road needs drainage work and reshaping.
Having now 2 independent roads, they should be named as follows:

- 5A left S-N section. Length 2.5 km
- 5B right S-N section. Length 5.2 km

3. Road No. 6

This road starts in a single line and then diverts in 2 branches, the first leading to the west and ending at a little market with a "coffee-factory" (Lwanda market), the second leading to the east, ending at Changwa market.

The road to the west is extremly difficult, starting from point 3 (see map in evaluation) it has to decend about 300 m down to a stream which can only be crossed with a bridge which has not less than 6 m span, the streams after that are smaller. More significant is however to work out the overall slope between point 3 and the first stream: Stunning 25%. A realignment would reach far in the forest reserve. I am not shure that this road would be anymore justified. The Sub-Chief claims that this road should be mainly for administrative reasons be buildt, because the road ends not far from road no. 5B.

I recommend to bring this roadbranch only as far as Chelebei.

The east branch of the road is feasible, however for topographic reasons it has to start 1 km earlier than indicated on the map. The access to the road itself is extremly bad and is without a realignment no allweather road.

I suggest to start the road 3 km earlier than originally planned, at the foot of the steep slope.

Considering the recommended changes the road would have a new length of 8.3 km.

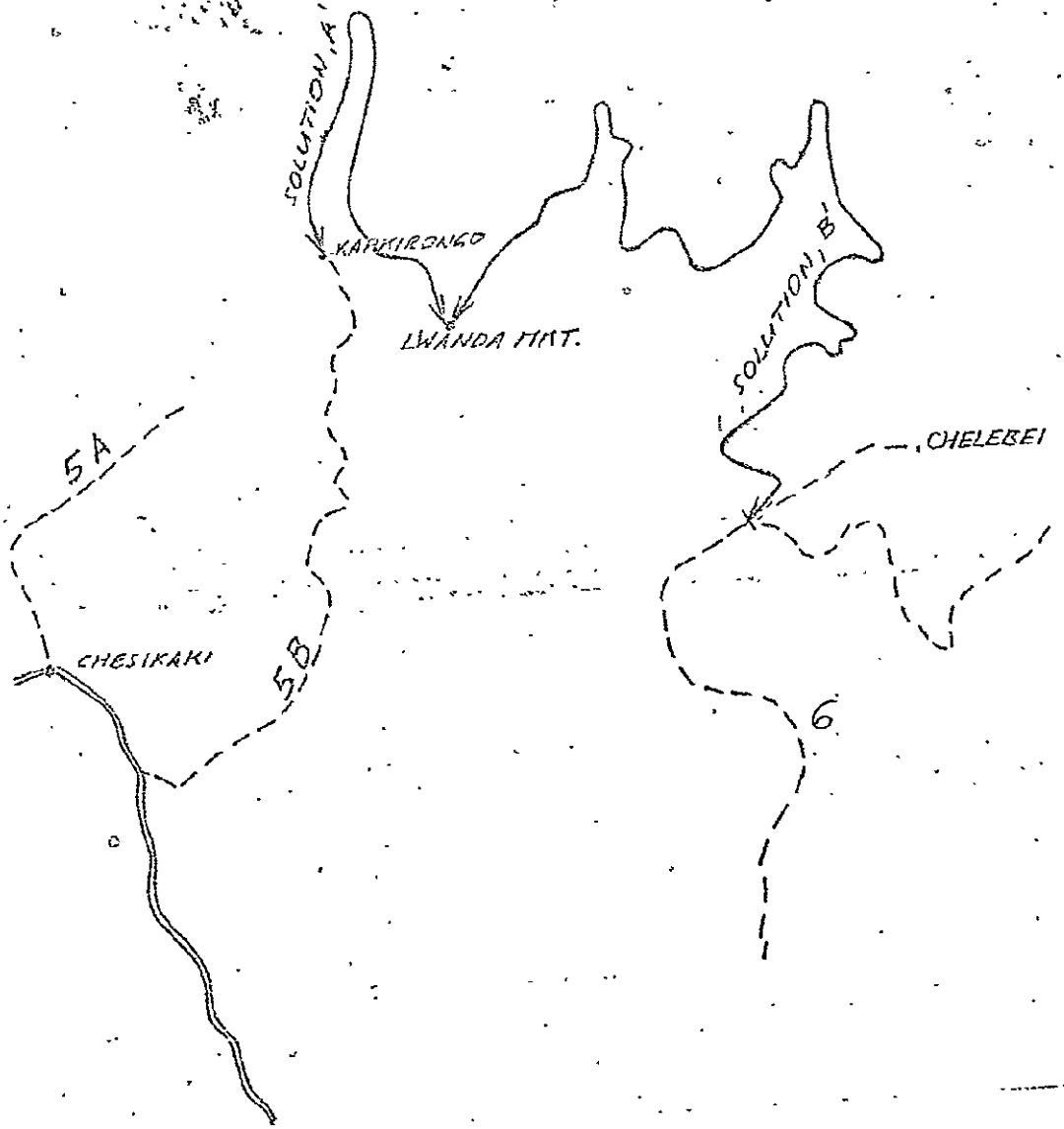
E. Reinhart

30.12.1977

E. Reinhart
Rural Access Roads Engineer Bungoma

MAP IV

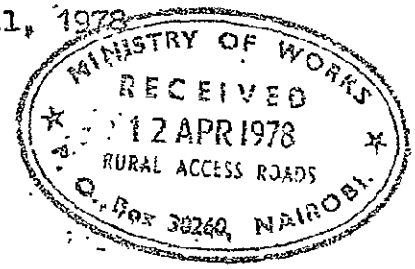
SCALE 1:50'000



APPENDIX V

The Engineer,
Rural Access Roads Programme,
Ministry of Works,
P.O. Box 1059,
BUNGOMA.

Our Ref: E7/I/039 10th April, 1978



The Chief Supt. Engineer (SP),
Ministry of Works,
P.O. Box 30260,
Nairobi.

(Att. The Senior Supt. Engineer (R.A.R.P.)

RURAL ACCESS ROADS PROGRAMME: FINAL REVIEW OF ROAD NO. 3,4,6,7, & 9.

This report is the result of a meeting which has taken place on the 2nd March, 1978 in the office of the District Development Officer, Bungoma with the following participants:-

(a) District Development Officer, Bungoma
(b) R.A.R.P. Engineer, Bungoma
(c) Mr. G. Linden, Planning Section M.o.W.

On this occasion I have received from Mr. Linden a draft of a report Ref. No. 6964/P85/18/1 addressed to the District Commissioner, Bungoma. This report is dealing with the remaining technical problems in connection with the approval for the construction of most of the roads.

ROAD NO. 3/4:-

For road No. 3 I have written a report on the 25th February, 1978 to the Chief Superintendent Engineer. This road has now been looked at considering the influence of road E-277 and X-6006. A discussion with the Supt. Roads Ministry of Works, Bungoma has given the following facts:-

The road which I described as "Coffee Road" is apart of road E-277 (Cheptai-Chepkube-Walanga-Lwandanyi). I have not seen the

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stretch from Chepkube until Lwandanyi, but the Superintendent assured me that this is the easy part which seems very much so when looking at the contours.

Road X-6006 starts at Walanga and goes until the Unganda Border. Both of this roads have received the last years and for 1977/78 funds for maintenance. In addition both roads are included in the Gravelling Programme (according to proposal of February, 1976). The fact that E-277 will be improved in the near future is supporting the suggestion made in my report that for Road No. 3, the Bridge and the part from the Bridge to the coffee factory can be omitted because the products from the coffee factory can be evacuated over road E-277.

For similar reasons Road No. 4 should only go as far as the deep cross-valley near "Rojo".

ROAD NO. 6.

Here the question has been raised whether it would be possible to connect the end of the west branch (Lwanda Market) with the end of Road No. 5.

Solution "A"

The difference in height between Lwanda Market and Kapkirongo is 320 meters, the measured direct distance is 1km.

Trying to place a road with an average slope of 9% between this 2 points, the road would have a length of 3.6 kilometres. Difficulties for construction would be caused by the excessive side slope in this area and the scattered rock outcrops.

Solution "B"

If the Lwanda Market has to be reached by all means then I would rather come back to the initially proposed layout, but to improve the alignment some how according to my sketch, giving the road a length of about 5km.

With this proposition there is little difference in height between the branching point and Lwanda Market, but for this alternative a bridge of over 5 metres span would be necessary. However, considering the forest nearby for the necessary beams I believe the overall technical difficulties of solution "B" are less and the

chances to make a good road are better. However, due to the length and the bridge solution "B" would hardly be cheaper than "A".

ROAD NO. 7

To my knowledge the Planning Team did not have the chance to see the east branch of the road. The track is improved now and on the 5th April, 1978 I was able to pass by Landrover. I was surprised to see that on this site there are more new settlers living than on the west branch where we have only Chepyouk, but on the east we find Kapkong, Kipsokork school, Kamukui Market and Simatwe Market. The population is complaining that because they have to rely on the expensive donkey-transport the progress of the settlement scheme is hampered.

The topographic situation is favourable for a road and it can follow the existing track except on the last kilometer. There are no bridges necessary on the whole length of the road. However, there are still big trees standing around and some basic tools for wood felling will be indispensable. I will contact a timber contractor to find out the right tools and submit the list to you in due course.
I find this road a true and meaningfull Rural Access Road which should be tackled soon.

ROAD NO. 9

In my opinion this road should not be constructed for the following reasons:-

(a) Starting from Kimilili for the first 3km. upto the sharp left bend, there is the existing road which has a standard above the R.A.R.P. one. (This road has been made and is maintained becaused of the Kimilili water treatment plant there).

(b) To a large extend road No. 9 would serve just as a short cut for the Kimobo-Area to reach Kimilili.

(c) Road No. 9 would have to overcome the escarpment on a very unsuitable location, it is very steep and has many rocks (Se Photo). When looking at the road approaching Kapsakwony just 3km. to the east one can see according to the contours in the map that a very suitable location has been chosen

44

and still the road with its loops must have been very demanding to be constructed and it is still a road which has stretches of over 10% slope.

IMPORTANT:-

On this occasion I wish to state that on the 1/4/1978 R.A.R.P. Bungoma started to work on Road No. 13 and this is the only road which is given free for construction up to now. To be able to do proper planning I hope to receive soon the green light for the start of the next few roads.

E. Reinhart

E. Reinhart
RURAL ACCESS ROADS ENGINEER
BUNGOMA DISTRICT.

Copy to:- The U.S. AID Engineer,
Ministry of Works,
Nairobi.

The District Development Officer,
Bungoma District,
BUNGOMA.

APPENDIX VI

P85/21/1 (19)

REPUBLIC OF KENYA

Telegrams: "DISTRICTER", Bungoma
Telephone: Bungoma 13
When replying please quote
No. ADM.15/8/Vol.VII/92
and date
When calling please ask

OFFICE OF THE DISTRICT COMMISSIONER
BUNGOMA DISTRICT
PRIVATE BAG, BUNGOMA

16th November, 1977.

The Chief Engineer (Roads),
P.O. Box 30260,
NAIROBI.

(15)

CSE(SP) SSE(CPK)

RURAL ACCESS ROAD PROGRAMME
Ref. Your R.7156/P85/21/1 of 22/10/77.

The area you refer to was formerly a part of Kimilili Forest and it was excised out and then Wanainchi settled on it. The area is a settlement area though not in the same sence as settlement area where the land was formerly white highlands and loans have to be paid.

G. M. KIWANGI
DISTRICT COMMISSIONER,
BUNGOMA

ROADS DEPARTMENT
RECEIVED
24 NOV 1977
Inwd. Reg. No. 3930
M.O.W. H.Q., NAIROBI

Mr. Lander
we talked.
13/12

46

APPENDIX VII

GROSS MARGINS

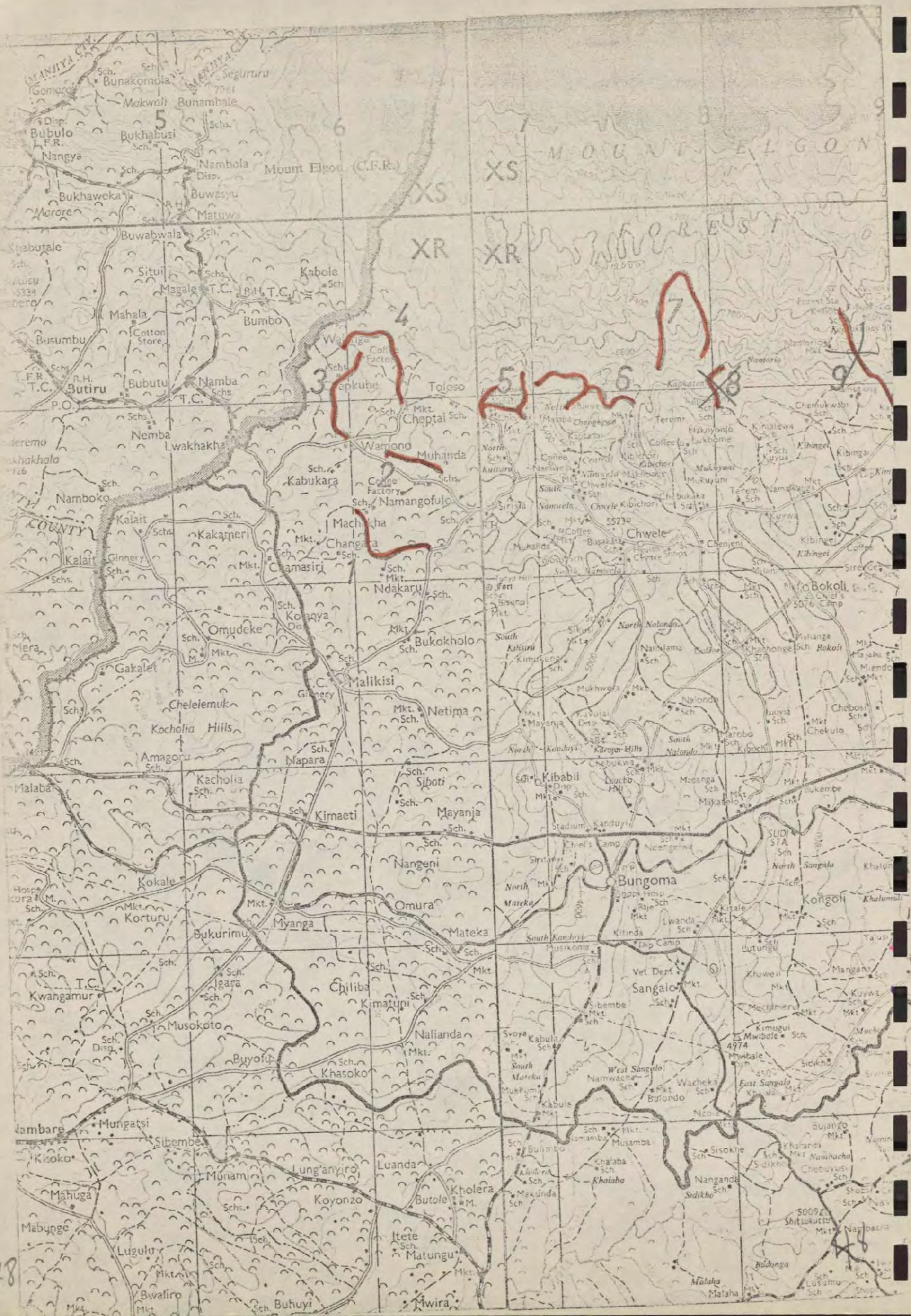
	PRESENT	WITHOUT IADP FUTURE	SOURCE
MAIZE	58.2	84.8	B
BEANS	23.5	54.3	B
COFFEE	554.3	554.3	C
POTATOES	14.9	110	B
COTTON	33	110	C
TEA	167.50	167.50	C
PYRETHRUM	60	60	D
WHEAT	19.8	33.1	D

A: COMMERCIAL FARMING PROJECT (1976)

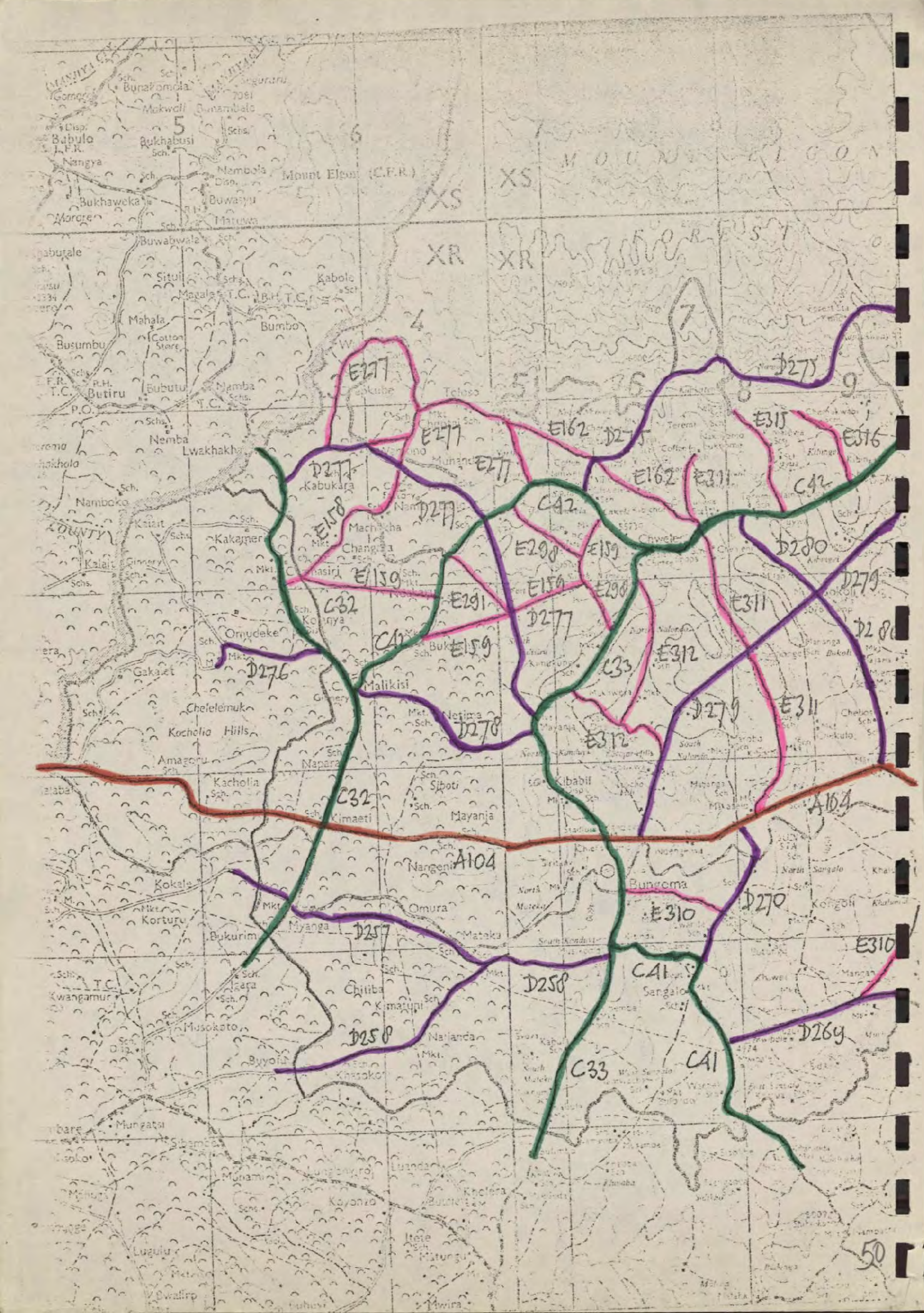
B: IADP (1976)

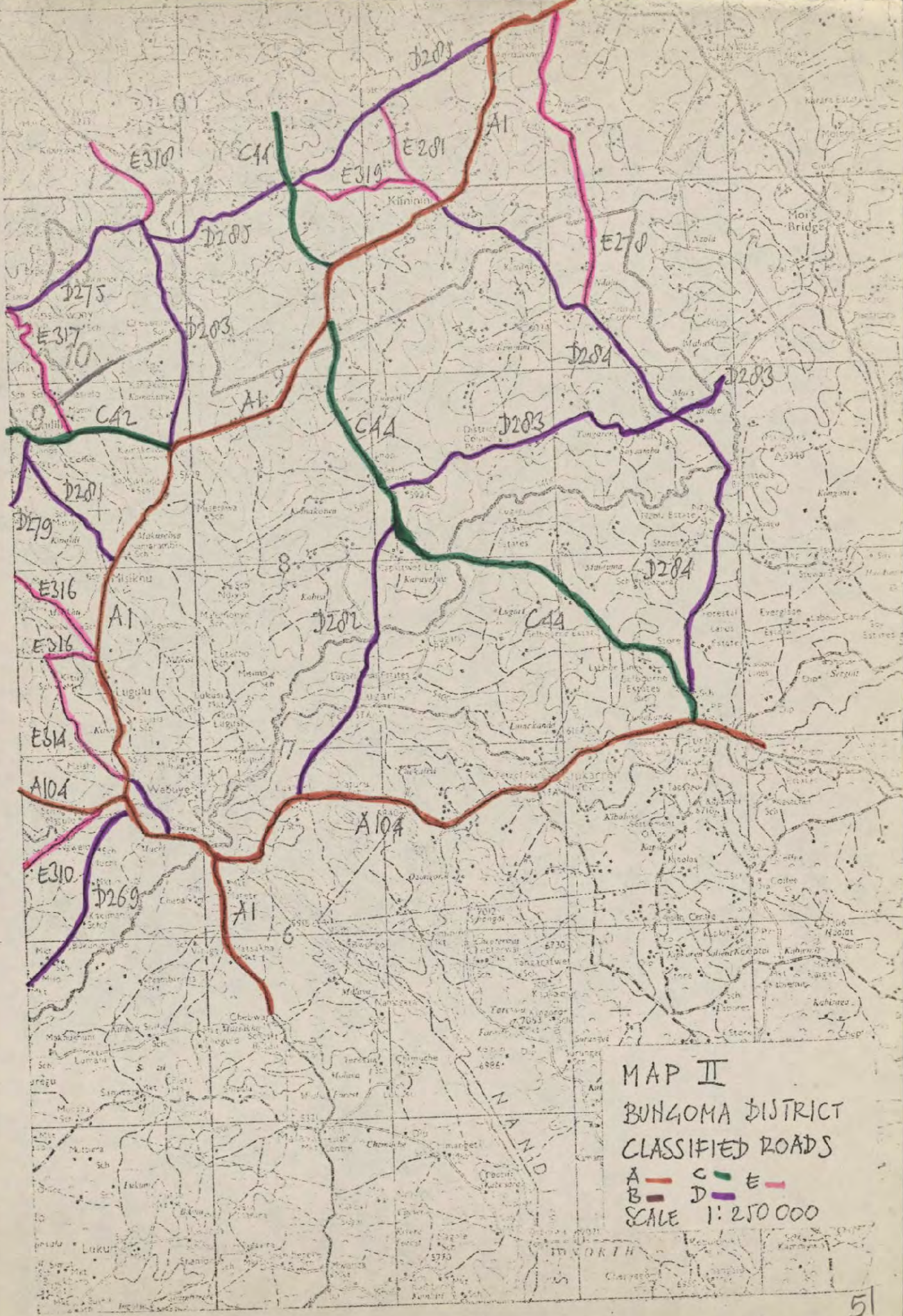
C: MINISTRY OF AGRICULTURE (1977)

D: ESTIMATED


Mount Elgon (C.F.R.)
MOUNT ELGON FOREST
Bunakomola
Segururu
Makwali
Bunambale
Bukhabusi
Bubulo
Nangya
Nambola
Bukhaweka
Buwasyu
Matuwa
Buwabwala
Situli
Kabole
Magale
Mahala
Bumbo
Busumbu
Cotton Store
Butiru
Bubutu
Namba
Nemba
Lwakhakha
Namboko
Kalait
Kakameri
Changara
Kamasiri
Ndakaru
Omudeke
Bukokholo
Gakalet
Malikisi
Chelelemuk
Kacholia Hills
Netima
Amagoru
Napara
Kacholia
Siboti
Kimaeti
Mayanja
Nangeni
Kokale
Korturu
Omura
Bukurimu
Myanga
Mateka
Kwangamur
Igara
Chiliba
Kimatuni
Musokoto
Nalianda
Buyofu
Khasoko
Mungatsi
Sibembe
Kisoko
Munami
Lung'anyiro
Luanda
Mahuga
Koyonzo
Kholera
Butole
Mabunge
Itete
Matungu
Lugulu
Bwaliro
Buhuyi
Mwira
Wamono
Muhanda
Kabukara
Namangofulo
Cheptai
Toloso
Chwele
Bokoli
Kibabii
Bungoma
Kongoli
Sangalo
Kibingei
Kapkaten
Mount Elgon (C.F.R.)
XR
XS
48


MAP I
BUNGOMA DISTRICT
WITH PROPOSED ROADS
SCALE 1: 250 000
49

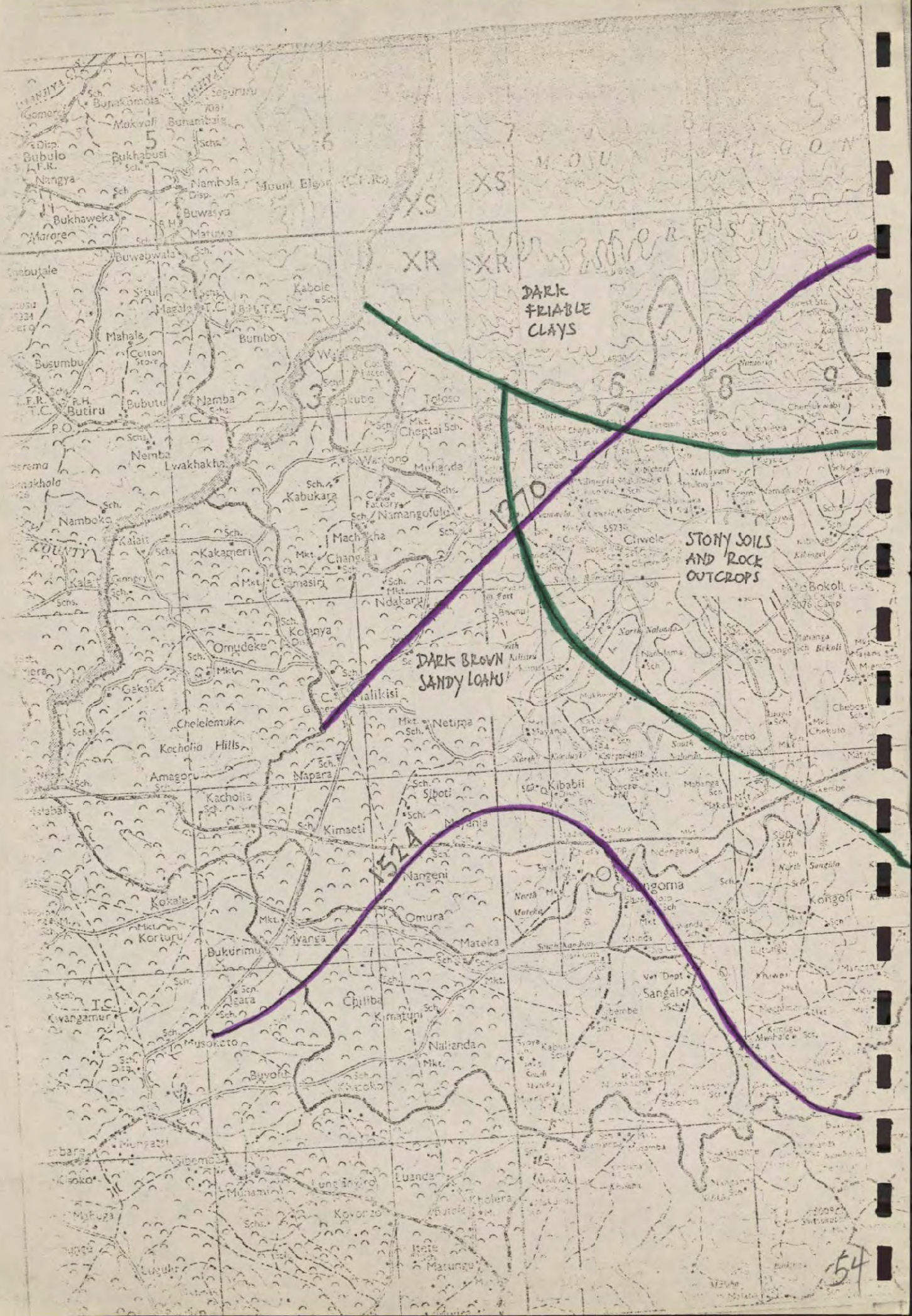

Mount Elgon (C.F.R.)
Bubulo
Bukhabusi
Nangya
Nambole
Bukhaweka
Buwasyu
Matuwa
Buwabwala
Situli
Kabole
Mahala
Bumbo
Busumbu
Butiru
Bubutu
Namba
Nemba
Lwakhakha
Namboko
Kakamera
Kakaret
Onyudeke
Chelelemuka
Kocholia Hills
Amagoro
Kacholia
Kimaeti
Siboti
Mayanja
Malikisi
Nesima
Nangeni
Kokale
Korturu
Omura
Bukurim
Myanga
Mateka
Chilibe
Kimasupi
Musokoto
Nalanda
Bwyofu
Khasokoi
Sangalo
Bungoma
Kongoli
Mungatsi
Sibembe
Mwima
Kayonza
Itete
Mutungu
Kwangamuri
Kabukara
Machacha
Changara
Chwele
Tolosa
E277
E162
E315
E316
E311
C42
D277
E158
E298
E159
E291
C32
C41
D276
D278
C33
E312
D279
D280
A104
A164
D270
E310
D257
D258
D269
C41
C33
50

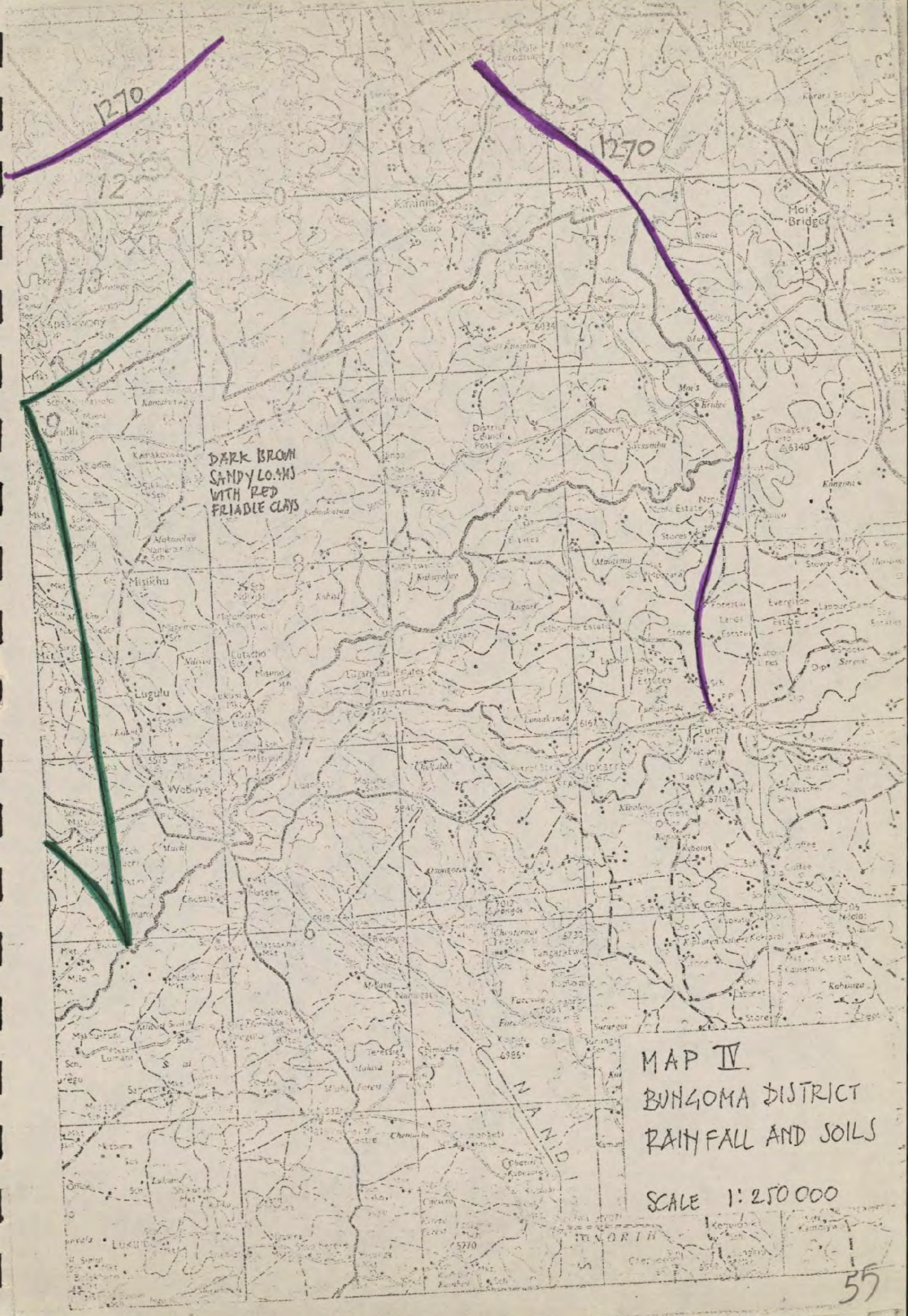

D283
E310
C41
E319
E281
A1
Kilimani
D285
E278
Moi's Bridge
D275
E317
D283
D284
D283
C42
A1
C44
D283
D281
D279
D284
E316
A1
D282
C44
E316
Lugulu
E314
A104
A104
E310
D269
A1
MAP II
BUNGOMA DISTRICT
CLASSIFIED ROADS
A
B
C
D
E
SCALE 1: 250 000

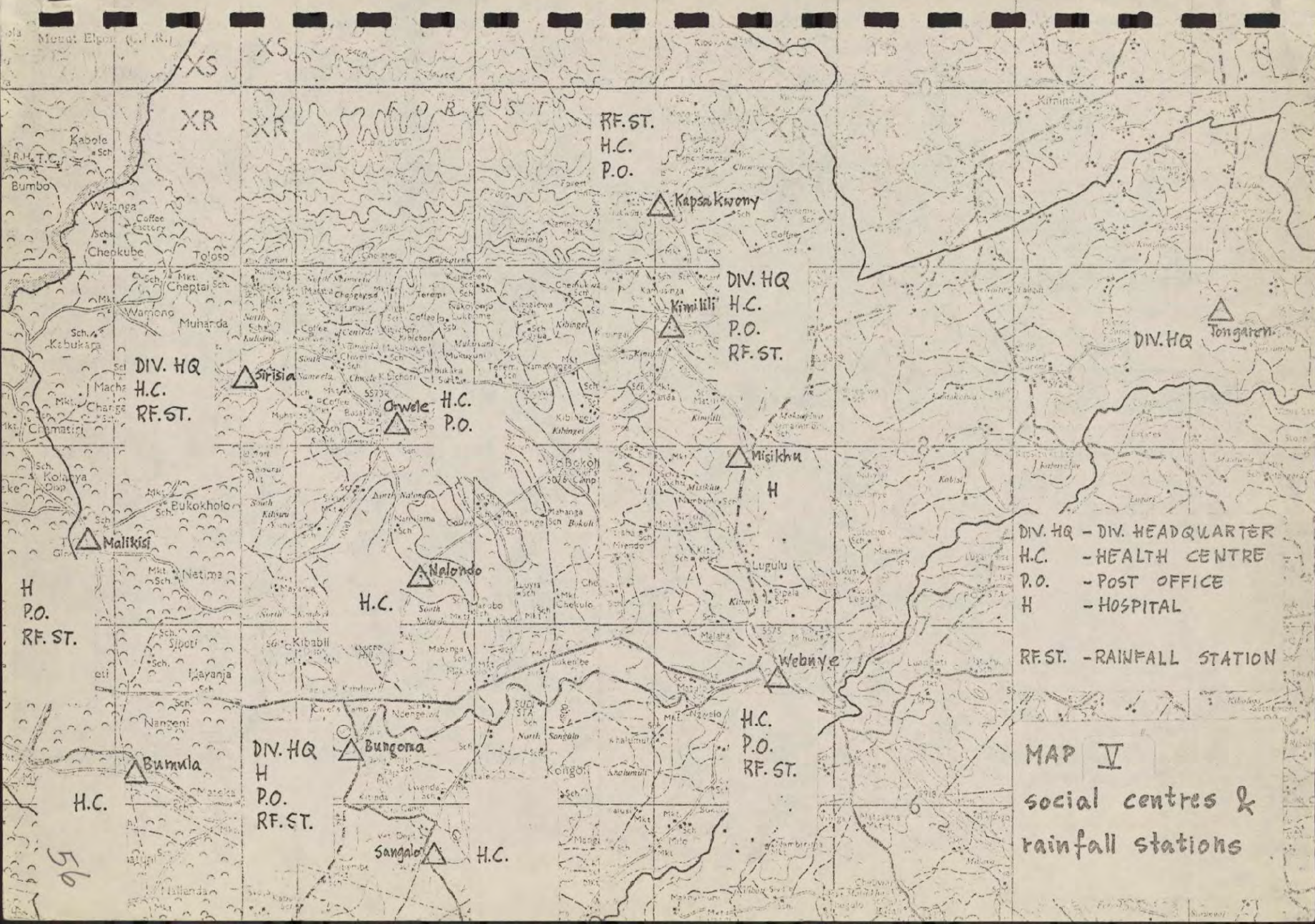

1
2
3
4
5
6
7
Bubulo
Bukhaweka
Busumbu
Butiru
Namboko
Kakamera
Kalait
Cakalet
Chelelemuko
Kacholio Hills
Amagoro
Kacholia
Kokale
Korturu
Kwangamur
Mutoroto
Tolobo
Chaptai
Muhande
Kabukaro
Nyamangofulo
Machina
Chemasiri
Nabkaru
Bukokholo
Malikisi
Netima
Sibuti
Kimaeti
Mayanja
Nangeni
Omura
Mateka
Chilibo
Kimaeni
Natianda
Kibabii
Bungoma
Sangalo
Kongon
Chwele
Bokoli
Chebos
Chekulo

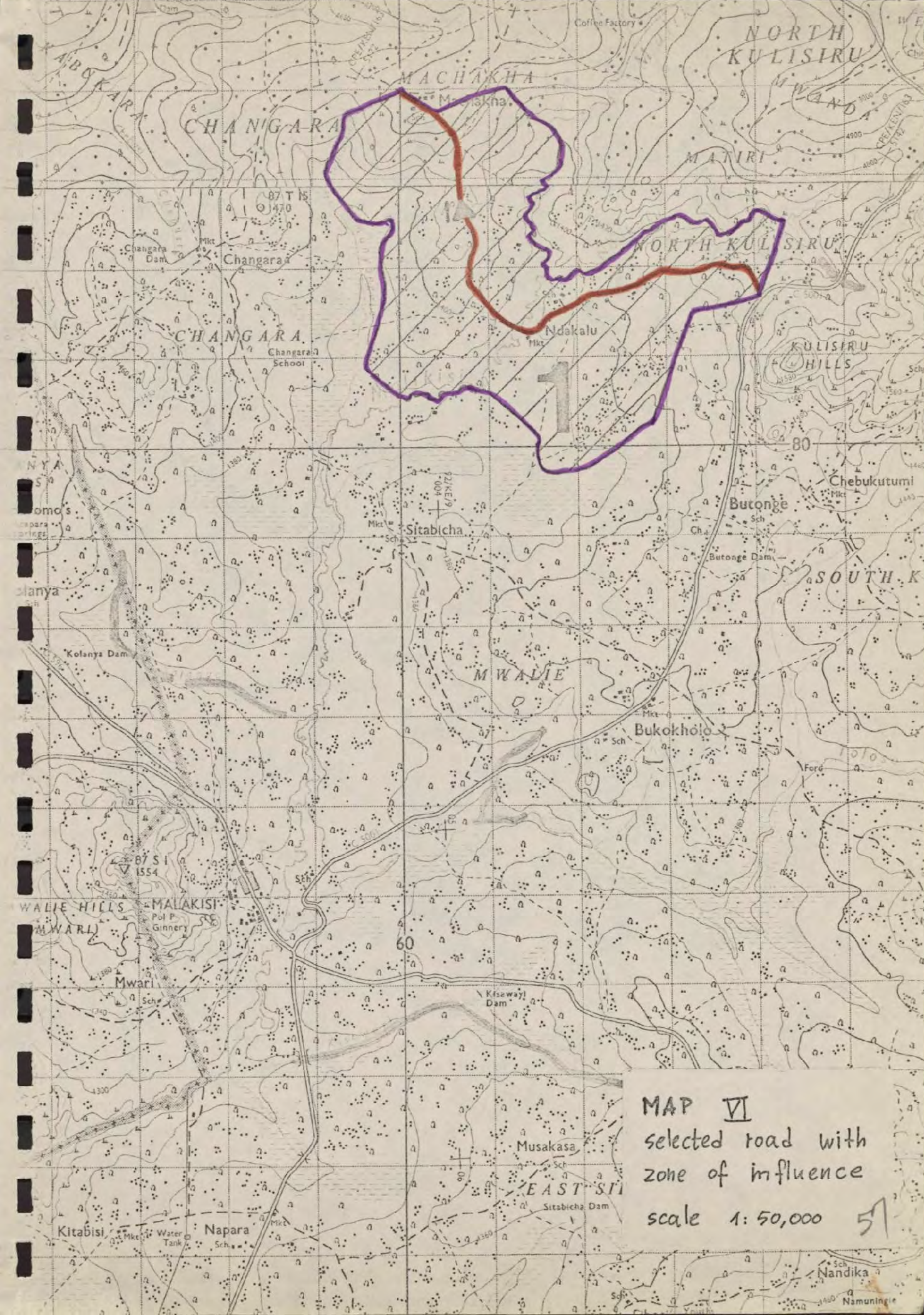
MAP III
BUNGOMA DISTRICT
SELECTED ROADS

SCALE 1: 250 000


DARK FRIABLE CLAYS
STONY SOILS AND ROCK OUTCROPS
DARK BROWN SANDY LOAMS


1270
1270
DARK BROWN SANDY LOAMS WITH RED FRIABLE CLAYS
MAP IV
BUNGOMA DISTRICT
RAINFALL AND SOILS
SCALE 1: 250 000


FOREST
RF.ST.
H.C.
P.O.
Kapsakwony
DIV. HQ
H.C.
P.O.
RF.ST.
Kimilili
DIV. HQ
Tongaren
Sirisia
DIV. HQ
H.C.
RF.ST.
Orwele
H.C.
P.O.
Misikhu
H
Malikisi
H
P.O.
RF.ST.
Nalondo
H.C.
Webuye
H.C.
P.O.
RF.ST.
Bungoma
DIV. HQ
H
P.O.
RF.ST.
Bumula
H.C.
Sangalo
H.C.
DIV. HQ - DIV. HEADQUARTER
H.C. - HEALTH CENTRE
P.O. - POST OFFICE
H - HOSPITAL
RF.ST. - RAINFALL STATION
MAP V
social centres & rainfall stations
56

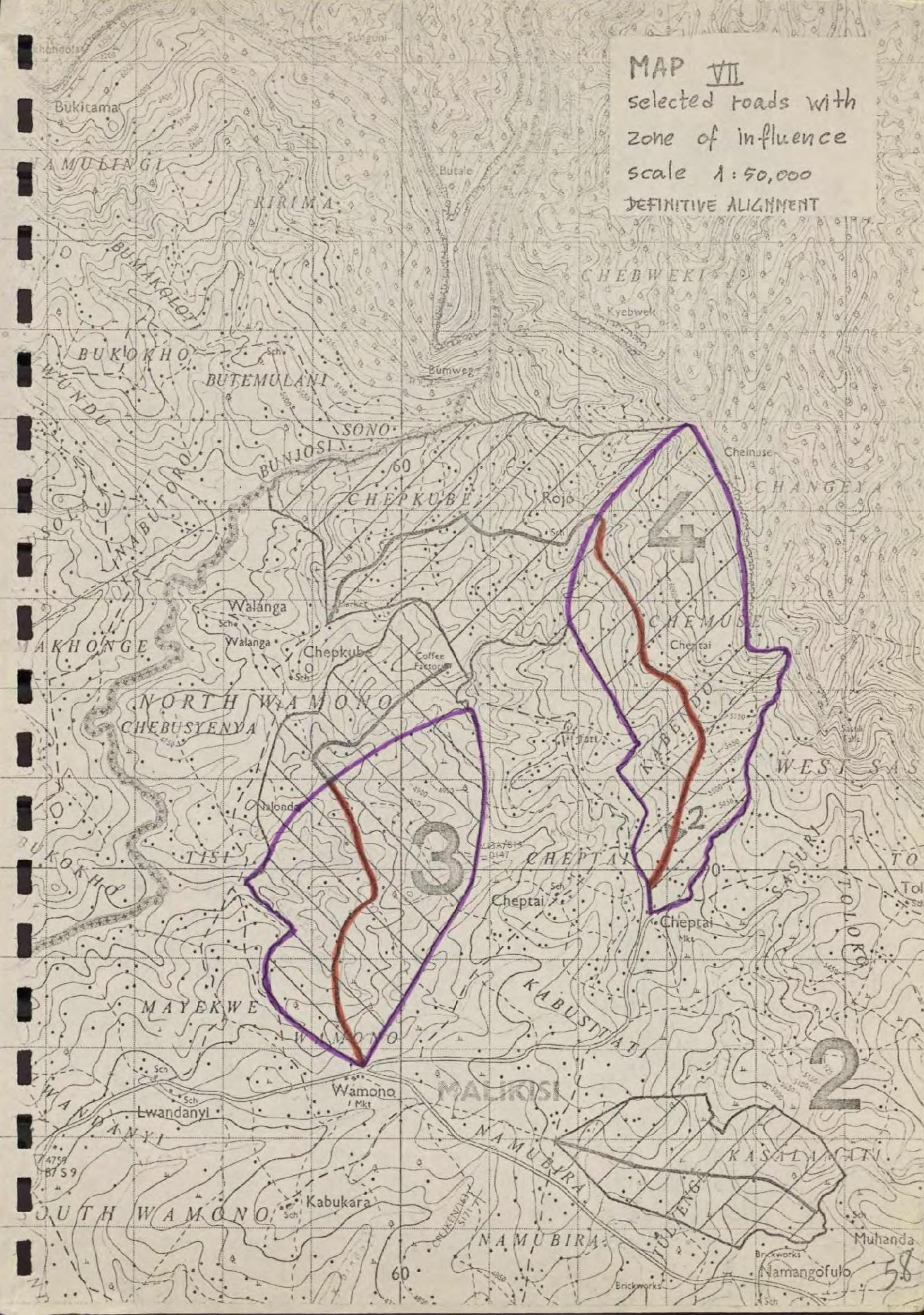


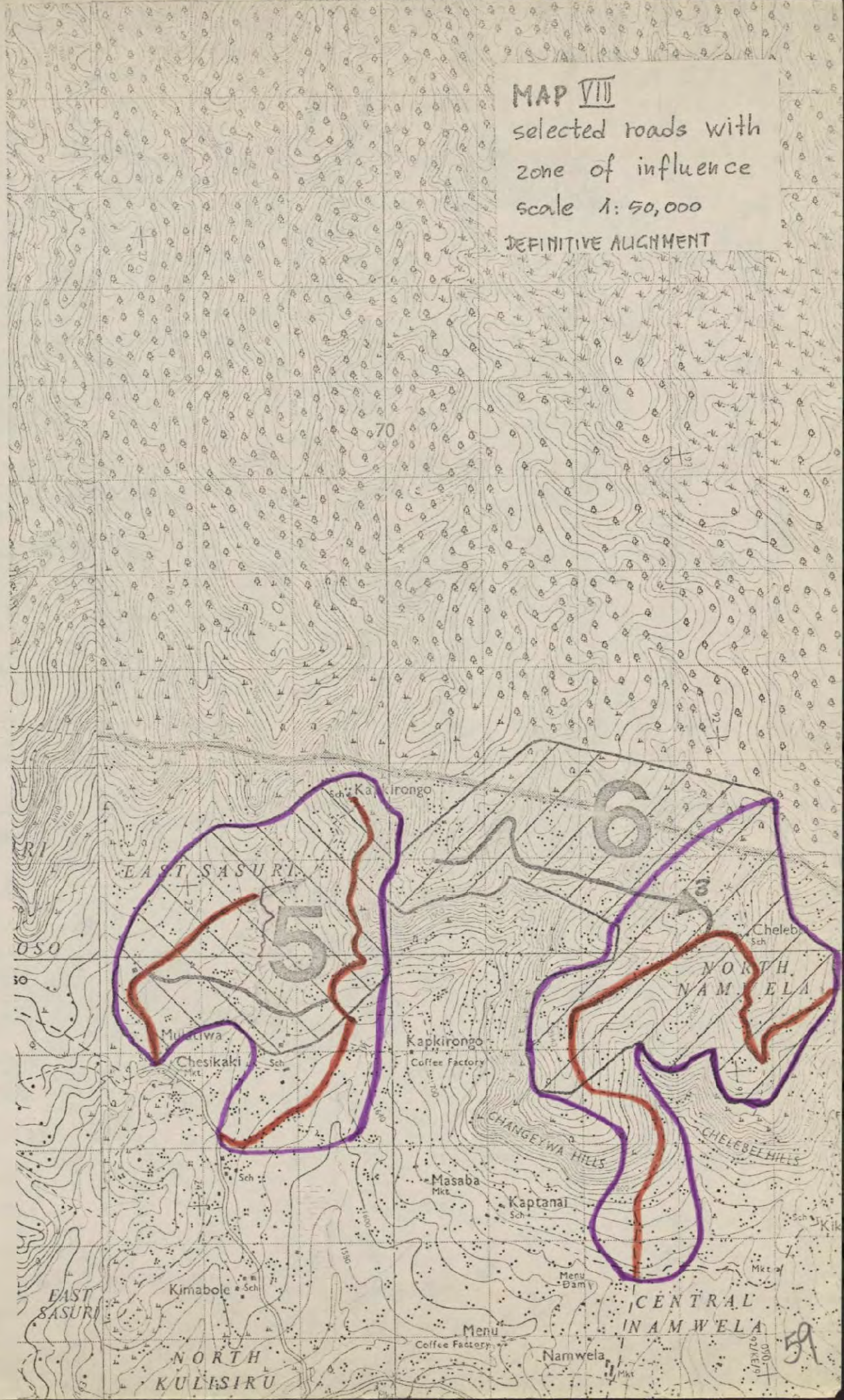
MAP VI

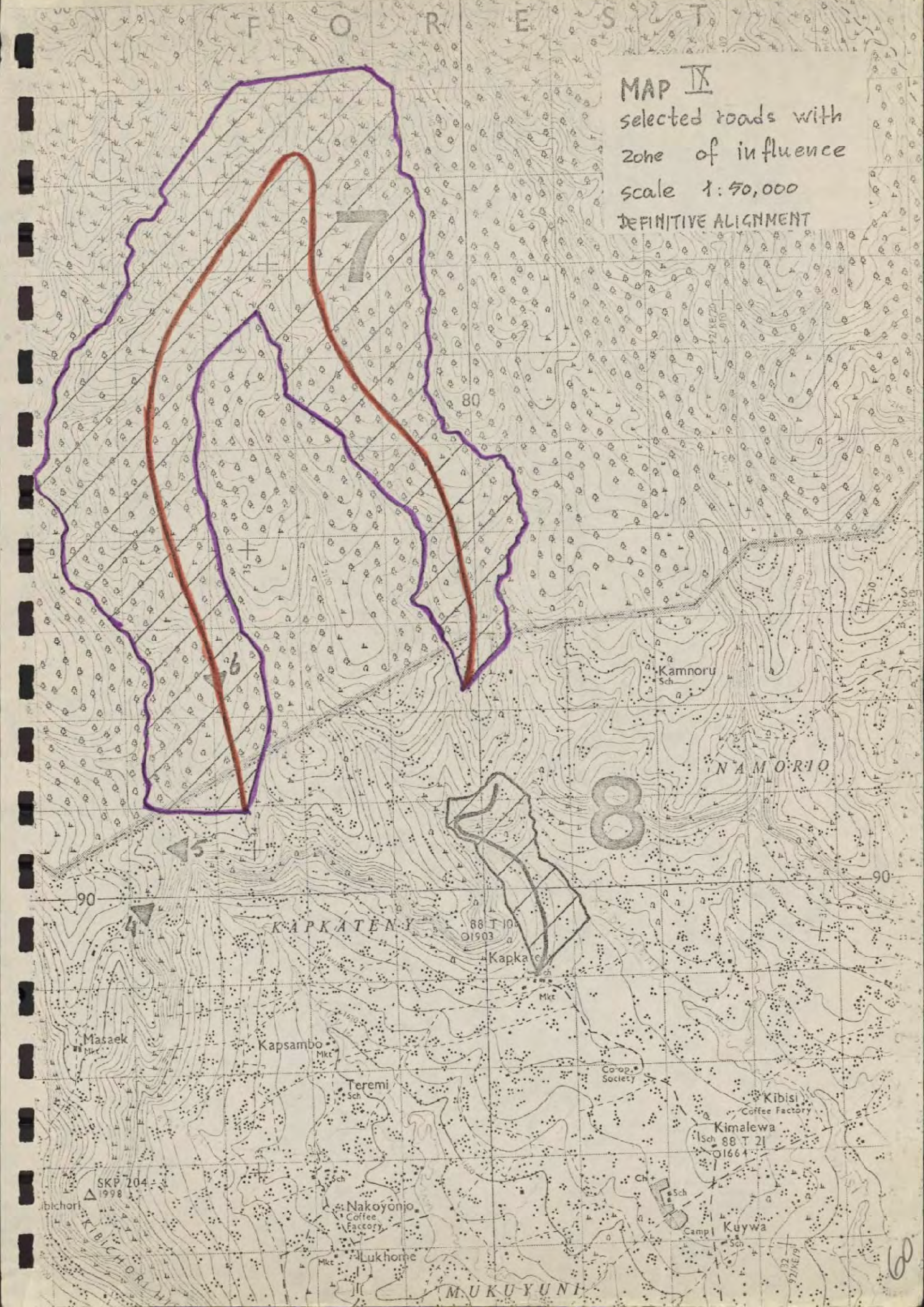
selected road with zone of influence

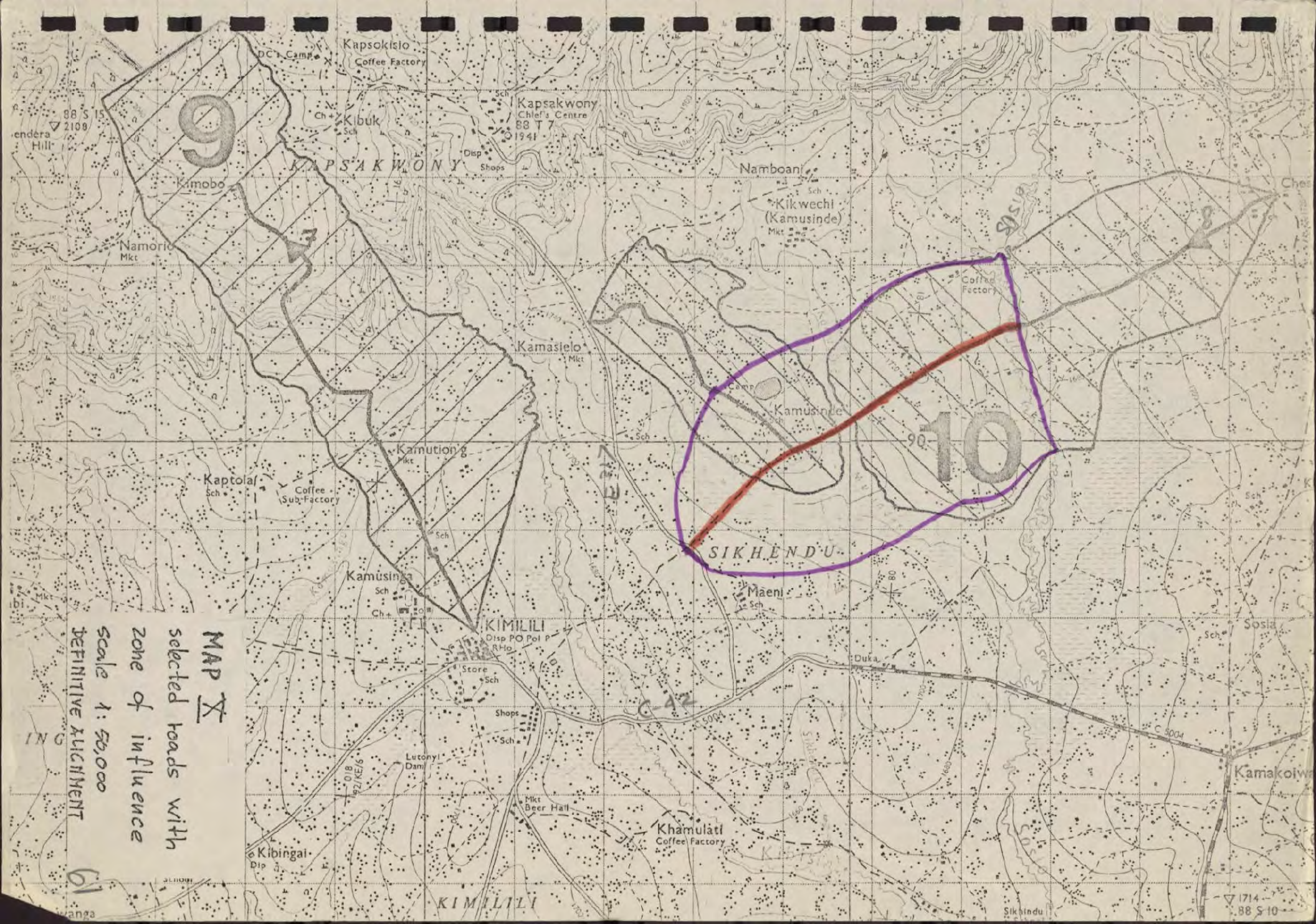
scale 1: 50,000

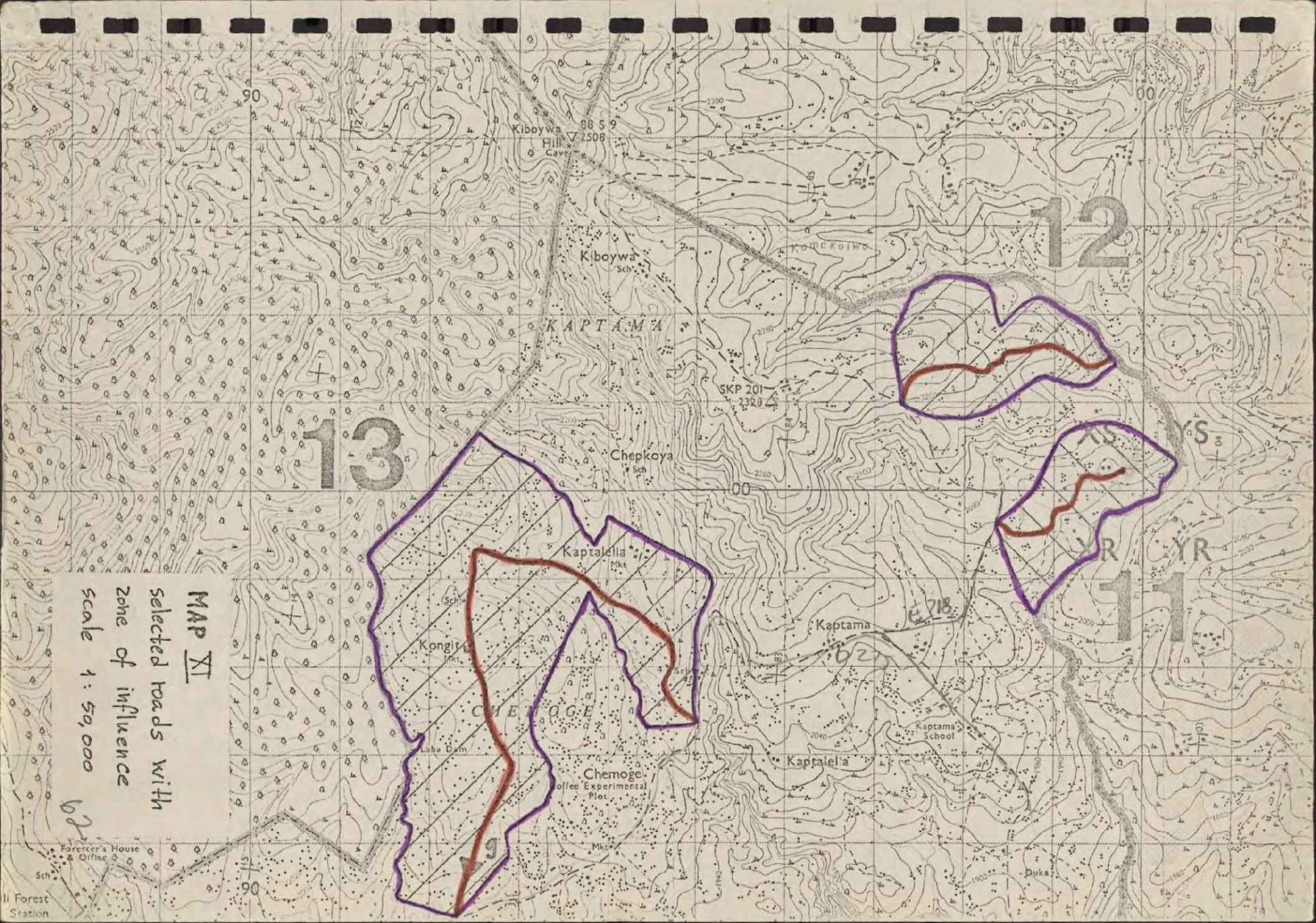
51


MAP VII
selected roads with
zone of influence
scale 1:50,000
DEFINITIVE ALIGNMENT
Bukitama
AMULINGI
RIRIMA
BUMAKOLOI
BUKOKHO
BUTEMULANI
WUNDU
SONO
BUNJOSI
CHEBWEKI
Kyebwek
Butale
Bumwez
CHEPKUBE
Rojo
Cheinuse
CHANGEYA
4
Walanga
Walanga
Chepkube
Coffee Factory
AKHONGE
NORTH WAMONO
CHEBUSYENYA
CHEMUSE
Cheptai
WESI SAS
Tulonde
3
2
CHEPTAI
Cheptai
Cheptai
Mkt
KABUSITATI
MAYEKWE
WAMONO
Wamono
Mkt
MAKHOSI
Lwandanyi
KASILIGATI
NAMUBIRA
Kabukara
SOUTH WAMONO
Muhanda
Brickworks
Namangofulo
Brickworks
60
58


MAP VIII
selected roads with
zone of influence
scale 1: 50,000
DEFINITIVE ALIGNMENT
5
6
EAST SASURU
NORTH NAMWELA
CENTRAL NAMWELA
EAST SASURU
NORTH KULISIRU
Kapkirongo
Coffee Factory
Chesikaki
Mkt.
Masaba
Mkt.
Kaptanai
Sch.
Kimabole
Sch.
Menu
Coffee Factory
Namwela
Mkt.
CHANGEYWA HILLS
CHELEBEI HILLS
Menu Dam
59


MAP IX
selected roads with
zone of influence
scale 1:50,000
DEFINITIVE ALIGNMENT
7
8
6
5
4
FOREST
KAPKATENY
NAMORIO
MUKUYUNI
KIBICHORI HILLS
Kamnoru
Kapkate
Masaek
Kapsambo
Teremi
Co-op Society
Kibisi
Coffee Factory
Kimalewa
88 T 21
01664
Nakoyonjo
Coffee Factory
Lukhome
Camp I Kuywa
SKP 204
1998
88 T 10
01903
90
80


9
KAPSAKWONY
10
SIKHENDU
Kapsokisio
Coffee Factory
Kapsakwony
Chief's Centre
88 T 7
Kibuk
Kimobo
Namoboani
Kikwechi
(Kamusinde)
Namorio
Kamasielo
Kamutiong
Kaptola
Coffee Sub-Factory
Kamusinga
KIMILILI
Maeni
Duka
Sosia
Store
Shops
Lutonyi Dam
Kibingai
Dip
Mkt
Beer Hall
Khamulati
Coffee Factory
Kamakoiwa
Sikhindu
MAP X
selected roads with
zone of influence
scale 1: 50,000
DEFINITIVE ALIGNMENT
61


MAP XI
selected roads with
zone of influence
scale 1: 50,000
12
13
11
Kiboywa
Hill
Cave
98 S 9
2508
Kiboywa
Sch
KAPTAMA
SKP 201
2328
Chepkoya
Sch
Kaptalelia
Mkt
Kongit
Mkt
CHEMOGE
Laba Dam
Chemoge
Coffee Experimental
Plot
Kaptama
Kaptama
School
Kaptalelia
Duka
Forester's House
& Office
Sch
Forest
Station
YS
YR
718
621

PROJECT NUMBER: _____

PROCESS:	ACTION:	DATES:	INITIALS:
CATALOGUE	1656 NS		
ABSTRACT			
FICHE	✓		

COMMENTS: _____

625.7 K37, 37a

DS/DIU