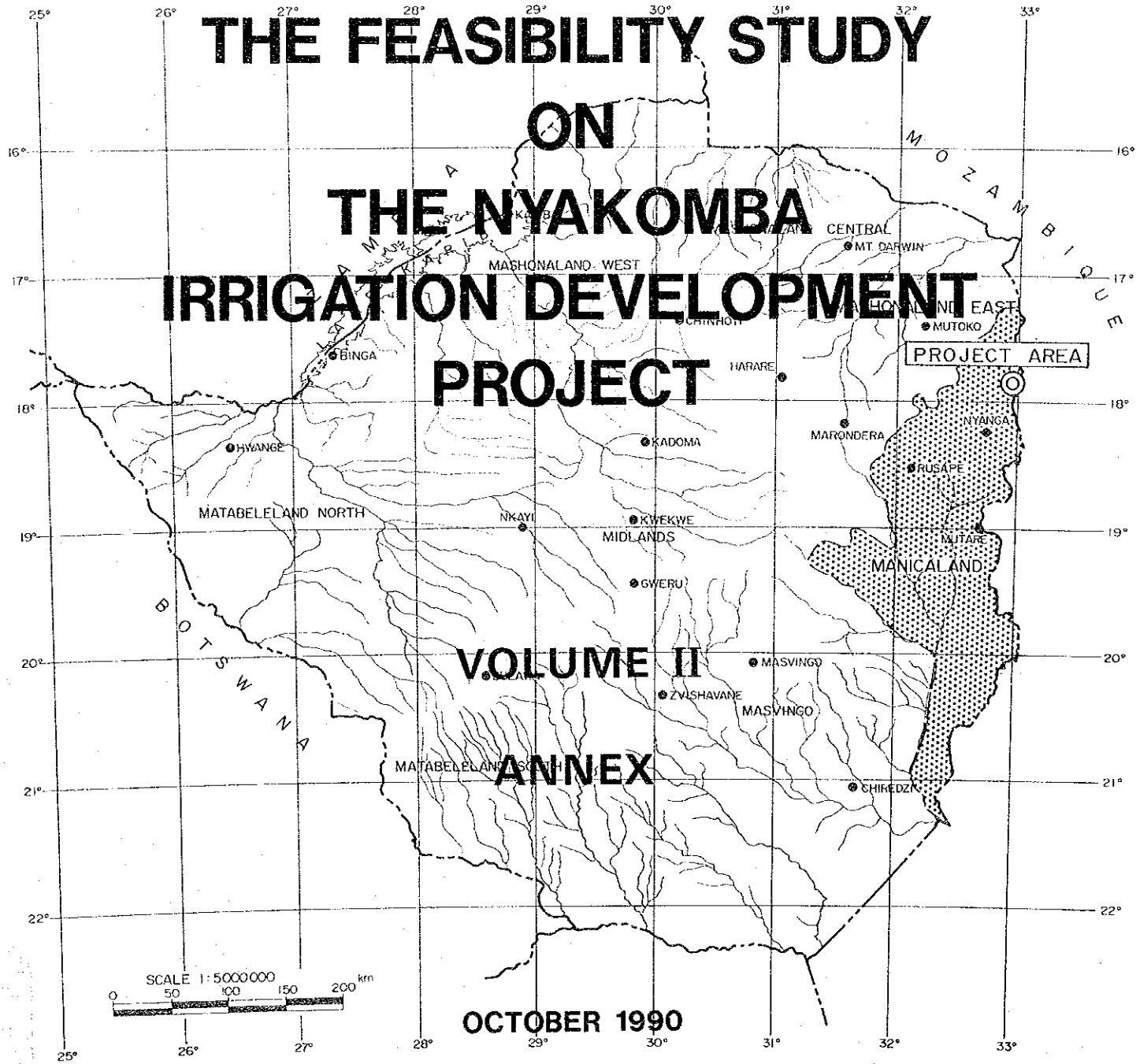
REPUBLIC OF ZIMBABWE

THE FEASIBILITY STUDY ON THE NYAKOMBA IRRIGATION DEVELOPMENT PROJECT



VOLUME II

ANNEX

OCTOBER 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

THE FEASIBILITY STUDY
ON
THE NYAKOMBA IRRIGATION DEVELOPMENT PROJECT

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REPUBLIC OF ZIMBABWE

THE FEASIBILITY STUDY
ON
THE NYAKOMBA IRRIGATION DEVELOPMENT PROJECT

VOLUME II

A N N E X

OCTOBER 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX A

METEOROLOGY AND HYDROLOGY

ANNEX A METEOROLOGY AND HYDROLOGY

Table A 3.3.1 MONTHLY RAINFALL AT NYAMAROPA IRRIGATION STATION

LAT. 17.52S LONG. 32.57E ALT. 840M GRID REF. VR 9525

in mm/month

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL
1971/72	19.0	106.1	144.7	387.4	130.3	157.9	47.0	32.1	-	-	0.3	-	1024.8
1972/73	19.2	31.2	78.6	114.2	123.4	27.1	29.6	-	-	1.9	0.7	-	425.9
1973/74	13.2	201.3	187.3	268.1	454.6	256.7	33.4	67.0	-	10.6	2.0	1.6	1495.8
1974/75	1.3	100.9	345.7	249.7	247.9	17.3	36.7	0.8	-	-	0.8	-	1001.1
1975/76	8.0	80.8	165.8	216.8	427.3	222.9	9.5	9.0	-	-	-	-	1140.1
1976/77	46.9	13.8	192.4	136.5	270.5	187.3	1.0	-	-	3.4	-	18.4	870.2
1977/78	-	195.5	255.6	333.5	173.8	280.7	25.0	0.5	-	9.0	-	-	1273.6
1978/79	23.0	66.5	※	※	※	※	※	※	※	※	※	※	※ (89.5)
1979/80	10.5	85.1	93.6	110.4	246.5	83.0	42.8	-	0.4	-	-	38.2	710.5
1980/81	27.2	51.2	357.0	272.6	425.4	114.6	160.3	-	-	3.2	-	-	1411.5
1981/82	23.5	123.2	158.0	239.5	234.7	44.0	22.7	-	-	-	-	-	845.6
1982/83	101.1	16.9	63.9	73.5	160.1	49.0	4.0	3.5	7.0	9.0	-	-	488.0
1983/84	5.5	17.9	145.2	41.8	217.4	100.2	47.4	-	-	-	-	19.4	594.8
1984/85	28.4	96.8	198.3	445.8	188.5	372.1	16.3	-	8.5	-	-	4.1	1358.8
1985/86	39.6	175.3	317.8	452.2	94.4	61.8	43.9	-	-	-	-	-	1185.0
1986/87	48.8	24.6	201.9	170.7	61.7	42.5	3.6	-	-	-	4.1	-	557.9
1987/88	15.3	63.5	199.4	165.8	336.4	271.0	44.6	10.5	8.4	3.5	-	-	1118.4
1988/89	95.8	67.5	79.5	173.3	379.7	56.1	19.0	10.7	-	-	7.7	-	889.3
Total	526.3	1518.1	3184.7	3851.8	4172.6	2344.2	586.8	134.1	24.3	40.6	15.6	81.7	16391.3
Mean	29.2	84.3	187.3	226.6	245.4	137.9	34.5	7.9	1.4	2.4	0.9	4.8	955.9

Table A 3.3.2 MONTHLY RAINFALL AT NYANGA STATION

LAT. 18°17' S LONG. 32°45' E ALT. 1878M GRID REF

in mm/month

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL
1975/76	-	-	-	-	-	-	-	-	-	12.5	1.3	51.5	-
1976/77	49.2	91.9	206.8	257.0	440.5	193.2	40.8	7.3	2.6	42.7	17.4	78.2	1422.6
1977/78	46.3	267.6	295.1	110.1	268.7	270.9	145.0	16.9	25.5	13.8	0.0	0.0	1459.9
1978/79	73.9	102.5	265.8	305.7	237.1	95.6	20.2	7.2	43.8	26.9	6.2	3.4	1138.3
1979/80	93.0	120.7	245.5	136.6	131.8	142.5	41.5	62.3	1.5	15.2	23.3	87.8	1086.5
1980/81	31.7	67.2	422.3	406.2	530.9	86.6	182.7	25.9	3.2	19.2	2.9	0.3	1779.1
1981/82	38.5	209.9	163.0	756.5	378.3	19.6	82.0	9.4	11.3	27.1	0.0	5.1	1150.7
1982/83	84.0	47.2	116.9	77.2	275.5	248.1	11.7	15.5	12.6	88.3	24.4	0.0	1001.4
1983/84	30.3	71.4	137.7	138.7	776.4	174.8	38.3	12.7	16.5	18.3	14.7	72.7	952.5
1984/85	29.8	140.2	187.1	444.2	255.5	217.6	37.8	12.0	4.8	10.1	7.3	2.5	1348.9
1985/86	75.4	135.0	289.3	491.8	250.9	118.5	42.7	10.9	2.5	28.5	0.0	9.9	1483.9
1986/87	66.4	76.4	155.4	245.5	92.1	98.1	31.9	6.1	30.8	0.0	9.4	11.1	823.2
1987/88	44.2	46.8	384.0	330.8	259.6	304.1	164.7	48.9	12.1	7.4	3.7	3.6	1609.9
1988/89	116.1	55.7	122.0	178.1	375.0	83.6	59.0	4.6	18.2	-	-	-	-

Table A.3.3.3 GENERAL METEOROLOGICAL DATA AT NYANGA STATION

MONTH	Solas Radiation (MJ/m^2)	Mean Wind Speed (knots)	Relative Humidity (%)		REMARKS
			At 08:00	At 14:00	
OCT.	22.9	7.3	54	45	
NOV.	70.3	6.2	66	60	
DEC.	19.7	5.1	76	68	
JAN.	19.7	4.7	81	71	
FEB.	20.2	4.9	83	71	
MAR.	21.2	5.7	82	67	
APR.	19.8	5.9	77	63	
MAY	18.3	5.3	71	53	
JUN.	16.2	5.5	72	48	
JUL.	17.3	6.1	70	46	
AUG.	19.3	6.4	61	42	
SEP.	21.6	7.2	48	38	
MEAN	19.7	5.9	70	56	

Table A.3.3.4 MONTHLY SUNSHINE AT MUTARE STATION

hr/day

MONTH	Max.	Mean	Min.	REMARKS
OCT.	10.9	9.2	7.1	
NOV.	10.6	7.7	5.6	
DEC.	8.4	6.3	3.2	
JAN.	9.4	6.6	4.3	
FEB.	9.3	7.8	5.0	
MAR.	9.9	8.0	5.1	
APR.	9.9	8.9	7.9	
MAY	10.2	9.5	8.3	
JUN.	10.3	9.3	8.4	
JUL.	9.1	7.5	6.4	
AUG.	10.0	8.3	7.6	
SEP.	9.8	8.7	7.3	
MEAN	10.9	7.5	3.2	

Table A 3.3.5 MONTHLY EVAPORATION AT NYANGA STATION

LAT. S LONG. E ALT. M GRID REF.

(mm/month)

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL
1971/72	173.9	118.1	97.6	82.9	96.8	95.0	87.1	85.8	92.3	94.8	134.4	160.5	
1972/73	151.6	149.9	151.7	120.4	111.1	131.8	87.4	98.8	59.3	93.9	123.8	174.1	
1973/74	161.9	108.2	67.0	102.2	66.9	96.4	85.6	69.6	87.2	70.3	110.9	154.8	
1974/75	181.7	105.8	101.9	111.8	86.1	105.2	93.7	87.7	65.7	94.3	103.2	162.9	
1975/76	179.0	176.2	114.4	117.0	91.8	82.8	93.7	77.3	71.0	92.5	121.0	142.4	
1976/77	135.1	158.5	89.3	131.6	71.0	82.4	107.2	97.6	93.2	86.7	102.2	133.5	
1977/78	175.2	178.8	88.8	94.3	89.7	95.8	95.6	79.9	73.9	87.7	140.1	164.1	
1978/79	152.9	159.9	107.7	131.6	98.7	106.7	108.1	83.4	69.3	85.2	120.3	166.7	
1979/80	163.8	122.2	110.9	139.6	110.6	106.9	110.7	118.1	86.9	79.6	110.2	118.4	
1980/81	153.2	130.3	107.6	90.5	65.3	100.7	84.4	77.2	76.2	100.2	125.2	153.0	
1981/82	126.5	146.0	126.0	110.7	95.1	124.5	102.5	101.6	81.0	88.1	114.7	137.8	
1982/83	127.8	148.8	161.6	178.2	145.9	121.8	121.6	100.6	84.4	80.8	101.3	163.3	
1983/84	141.7	159.5	108.5	146.0	102.4	102.0	103.8	84.1	65.8	73.6	109.3	163.8	
1984/85	141.3	113.5	108.7	98.3	103.8	104.3	102.7	97.5	79.9	98.6	115.3	135.3	
1985/86	168.8	129.9	81.7	127.2	99.1	132.1	129.2	98.0	103.8	111.1	165.3	174.7	
1986/87	143.8	139.4	131.0	147.1	153.1	145.9	130.9	126.9	93.9	116.8	113.7	149.1	
1987/88	172.5	195.8	99.8	138.3	96.4	116.9	99.0	82.4	86.9	97.4	141.0	188.5	
1988/89	177.4	151.1	129.3	121.8	57.6	122.9	104.6	-	-	-	-	-	

Table A.3.3.6 MAXIMUM DAIRY RAINFALL

mm/day

YEAR	MAXIMUM DAIRY RAINFALL	DATE OF OCCURANCE
1975/76	177.0	02/FEB.
1976/77	63.3	24/DEC.
1977/78	75.0	06/MAR.
1978/79	-	-
1979/80	59.6	27/FEB.
1980/81	89.5	05/FEB.
1981/82	49.5	29/DEC.
1982/83	40.0	04/FEB.
1983/84	104.0	03/FEB.
1984/85	102.4	19/MAR.
1985/86	87.1	29/JAN.
1986/87	51.6	10/DEC.
1987/88	86.0	23/FEB.
1988/89	70.4	14/FEB.

Table A 3.3.7 DAILY RAINFALL AT NYAMAROPA IN BASIC YEAR FOR PLANNING 1986/87

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	REMARK
1		15.0		1.4									
2		5.5		76.7									
3			30.5	7.7							1.5		
4			2.0		26.4								
5													
6			42.3										
7			24.5										
8			12.9										
9			18.2			32.0							
10		4.1	51.6*										
11	5.7		4.4										
12	3.8		0.1			5.0							
13													
14	14.3										2.6		
15													
16					16.6		3.6						
17				32.4									
18													
19													
20													
21				9.4	11.7	1.0							
22			5.0	3.2									
23	25.0			28.6									
24				26.1	7.0								
25				12.6		4.5							
26				20.1									
27				2.5									
28													
29													
30			3.5										
31			6.9										
TOTAL	48.8	24.6	201.9	170.7	61.7	42.5	3.6	0.0	0.0	0.0	4.1	0.0	557.9

Note: Rainfall probability in this year is nearly equivelent to a value of 537.6 mm in 10 year probability.

Table A.3.3.8 SUMMARY OF HYDROLOGICAL STATIONS

ZONE REFERENCE No.	STATION	RIVER	LOCATION		CATCHMENT AREA	OPEND DATE	RIVER SYSTEM
			LAT.	LONG.			
F.6	TROUTBECK DAM D/S	TSANGA	18 ° 11′ S	32 ° 49′ E	17.90	1958.0202	GAIREZI
FGP.77 (F.G.P.C.7)	MYAMAROPA DEVERSION WEIR (NYAMAROPA CANAL)	MAROZI	17 ° 54′ S	37 ° 53′ E	109.00	1969.01.03	GAIREZI
FGP.78 (G.G.P.C.8)	NYAMAROPA DEVERSION WEIR (NYAMAROPA CANAL)	NYARUWAKA	17 ° 52′ S	32 ° 54′ E	77.70	1969.01.03	GAIREZI
F.14	PUNGWE CAUSEWAY	DUNGWE	18 ° 24′ S	32° 47′ E	85.50	1970.10.22	PUNGWE

Data sources : Manistry of enerby. Water Resources & Development.

Table A.3.3.9 RUNOFF IN A DEKAD AT MAROZI (CANAL & WEIR) (m^3/s) 1986/87

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	0.520	0.504	0.472	
NOV.	0.713	0.557	0.400	
DEC.	0.390	0.492	0.568	
JAN.	0.601	0.747	0.872	
FEB.	0.643	0.544	0.520	
MAR.	0.520	0.520	0.520	
APR.	0.517	0.504	0.460	
MAY	0.418	0.391	0.372	
JUN.	0.367	0.367	0.356	
JUL.	0.333	0.326	0.315	
AUG.	0.306	0.284	0.274	
SEP.	0.252	0.252	0.234	

Table A.3.3.10 RUNOFF IN A DEKAD AT TROUTBECK DAM (m^3/s)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	0.141	0.125	0.184	
NOV.	0.172	0.116	0.070	
DEC.	0.325	0.250	0.138	
JAN.	0.115	0.123	0.127	
FEB.	0.513	0.315	0.225	
MAR.	0.199	0.174	0.148	
APR.	0.124	0.101	0.085	
MAY	0.081	0.073	0.103	
JUN.	0.098	0.092	0.087	
JUL.	0.082	0.076	0.070	
AUG.	0.065	0.060	0.055	
SEP.	0.050	0.046	0.042	

Table A.3.3.11 RECORDING OF WATER LEVEL IN GAIREZI RIVER

1989 (1/3)

	UPPER STREAM SIDE GL=809.153			DOWN STREAM SIDE GL=798.709		
DATE	TIME	WATER LEVER(cm)	ELEVATION (m)	TIME	WATER LEVER(cm)	ELEVATION (m)
20/SEP	15:00	37.0	809.523	15:27	96.0	799.669
	16:35	37.0		18:00	96.0	
21/SEP	6:00	37.0	809.528	7:00	96.0	799.674
	16:35	38.0		18:00	97.0	
22/SEP	6:00	39.0	809.538	7:00	98.0	799.684
	17:00	38.0		18:00	97.0	
23/SEP	6:00	38.0	809.528	7:00	97.0	799.674
	17:00	37.0		18:00	96.0	
24/SEP	6:00	37.0	809.523	7:00	96.0	799.669
	17:00	37.0		18:00	96.0	
25/SEP	6:00	37.0	809.518	7:00	96.0	799.664
	17:00	36.0		18:00	95.0	
26/SEP	6:00	37.0	809.523	7:00	95.0	799.659
	17:00	37.0		18:00	95.0	
27/SEP	6:00	45.0	809.608	7:00	101.0	799.739
	17:00	46.0		18:00	105.0	
28/SEP	6:00	40.0	809.543	7:00	100.0	799.699
	15:00	38.0		15:10	98.0	
29/SEP	6:00	37.0	809.518	7:00	97.0	799.674
	17:00	36.0		18:00	96.0	
30/SEP	6:00	36.0	809.513	7:00	96.0	799.664
	17:00	36.0		18:00	95.0	
01/OCT	6:00	36.0	809.513	7:00	95.0	799.659
	17:00	36.0		18:00	95.0	
02/OCT	6:00	36.0	809.508	7:00	95.0	799.654
	17:00	35.0		18:00	94.0	
03/OCT	6:00	35.0	809.503	7:00	94.0	799.649
	17:00	35.0		18:00	94.0	

Table A.3.3.11 RECORDING OF WATER LEVEL IN GAIREZI RIVER

1989 (2/3)

	UPPER STREAM SIDE GL=809.153			DOWN STREAM SIDE GL=798.709		
DATE	TIME	WATER LEVER(cm)	ELEVATION (m)	TIME	WATER LEVER(cm)	ELEVATION (m)
04/OCT	6:00	35.0	809.503	7:00	94.0	799.649
	17:00	35.0		18:00	94.0	
05/OCT	6:00	34.0	809.493	7:00	94.0	799.649
	17:00	34.0		18:00	94.0	
06/OCT	6:00	34.0	809.493	7:27	94.0	799.649
	17:00	34.0		18:00	94.0	
07/OCT	6:00	36.0	809.513	7:00	94.0	799.649
	17:00	39.0	809.543	18:00	98.0	799.689
08/OCT	6:00	38.0	809.533	7:00	97.0	799.679
	17:00	36.0	809.513	18:00	95.0	799.659
09/OCT	5:00	36.0	809.513	7:27	95.0	799.659
		35.0	809.503	18:00	94.0	799.649
10/OCT	5:00	34.0	809.493	6:00	94.0	799.649
11/OCT	5:00	34.0	809.493	6:00	94.0	799.649
12/OCT	5:00	41.0	809.563	6:00	99.0	799.699
13/OCT	5:00	49.0	809.643	6:00	110.0	799.809
14/OCT	5:00	40.0	809.553	6:00	100.0	799.709
15/OCT	5:00	37.0	809.523	6:00	97.0	799.679
16/OCT	5:00	35.0	809.503	6:00	95.0	799.659
17/OCT	5:00	35.0	809.503	6:00	94.0	799.649
18/OCT	5:00	34.0	809.493	6:00	94.0	799.649
19/OCT	5:00	34.0	809.493	6:00	94.0	799.649
20/OCT	5:00	33.0	809.483	6:00	93.0	799.639
21/OCT	5:00	33.0	809.483	6:00	93.0	799.639
22/OCT	5:00	35.0	809.503	6:00	95.0	799.659
23/OCT	5:00	50.0	809.653	6:00	109.0	799.799
24/OCT	5:00	50.0	809.653	6:00	109.0	799.799

Table A.3.3.11 RECORDING OF WATER LEVEL IN GAIREZI RIVER

1989 (3/3)

	UPPER STREAM SIDE GL=809.153			DOWN STREAM SIDE GL=798.709		
DATE	TIME	WATER LEVER(cm)	ELEVATION (m)	TIME	WATER LEVER(cm)	ELEVATION (m)
25/OCT	5:00	44.0	809.593	6:00	102.0	799.729
26/OCT	6:00	50.0	809.653	6:00	109.0	799.799
	17:00	68.0	809.833	18:00	127.0	799.979
27/OCT	5:00	65.0	809.803	6:00	124.0	799.949
28/OCT	5:00	50.0	809.653	6:00	110.0	799.809
29/OCT	5:00	44.0	809.593	6:00	103.0	799.739
30/OCT	5:00	42.0	809.573	6:00	100.0	799.709
31/OCT	5:00	40.0	809.553	6:00	100.0	799.709
1/NOV	5:00	39.0	809.543	6:00	98.0	799.689
2/NOV	5:00	37.0	809.523	6:00	97.0	799.679
3/NOV	5:00	36.0	809.513	6:00	96.0	799.669
4/NOV	5:00	36.0	809.513	6:00	96.0	799.669
5/NOV	5:00	35.0	809.503	6:00	95.0	799.659
6/NOV	5:00	36.0	809.513	6:00	96.0	799.669
7/NOV	5:00	40.0	809.553	6:00	100.0	799.709
8/NOV	5:00	36.0	809.513	6:00	96.0	799.669
9/NOV	5:00	35.0	809.503	6:00	95.0	799.659
10/NOV	5:00	34.0	809.493	6:00	94.0	799.649

Table A 4.2.1 MONTHLY RAINFALL AT NYAMAROPA IRRIGATION STATION

LAT. 17.52S LONG. 32.57E ALT. 840M GRID REF. VR 9525

in mm/month

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL
1971/72	19.0	106.1	144.7	387.4	130.3	157.9	47.0	32.1	-	-	0.3	-	1024.8
1972/73	19.2	31.2	78.6	114.2	123.4	27.1	29.6	-	-	1.9	0.7	-	425.9
1973/74	13.2	201.3	187.3	268.1	454.6	256.7	33.4	67.0	-	10.6	2.0	1.6	1495.8
1974/75	1.3	100.9	345.7	249.7	247.9	17.3	36.7	0.8	-	-	0.8	-	1001.1
1975/76	8.0	80.8	165.8	216.8	427.3	222.9	9.5	9.0	-	-	-	-	1140.1
1976/77	46.9	13.8	192.4	136.5	270.5	187.3	1.0	-	-	3.4	-	18.4	870.2
1977/78	-	195.5	255.6	333.5	173.8	280.7	25.0	0.5	-	9.0	-	-	1273.6
1978/79	23.0	66.5	※	※	※	※	※	※	※	※	※	※	※ (89.5)
1979/80	10.5	85.1	93.6	110.4	246.5	83.0	42.8	-	0.4	-	-	38.2	710.5
1980/81	27.2	51.2	357.0	272.6	425.4	114.6	160.3	-	-	3.2	-	-	1411.5
1981/82	23.5	123.2	158.0	239.5	234.7	44.0	22.7	-	-	-	-	-	845.6
1982/83	101.1	16.9	63.9	73.5	160.1	49.0	4.0	3.5	7.0	9.0	-	-	488.0
1983/84	5.5	17.9	145.2	41.8	217.4	100.2	47.4	-	-	-	-	19.4	594.8
1984/85	28.4	96.8	198.3	445.8	188.5	372.1	16.3	-	8.5	-	-	4.1	1358.8
1985/86	39.6	175.3	317.8	452.2	94.4	61.8	43.9	-	-	-	-	-	1185.0
1986/87	48.8	24.6	201.9	170.7	61.7	42.5	3.6	-	-	-	4.1	-	557.9
1987/88	15.3	63.5	199.4	165.8	336.4	271.0	44.6	10.5	8.4	3.5	-	-	1118.4
1988/89	95.8	67.5	79.5	173.3	379.7	56.1	19.0	10.7	-	-	7.7	-	889.3
Total	526.3	1518.1	3184.7	3851.8	4172.6	2344.2	586.8	134.1	24.3	40.6	15.6	81.7	16391.3
Mean	29.2	84.3	187.3	226.6	245.4	137.9	34.5	7.9	1.4	2.4	0.9	4.8	955.9

Table A.4.2.2 MAXIMUM MEAN TEMPERATURE AT NYANGA

(℃)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	22.5	22.7	22.6	
NOV.	21.7	21.5	21.3	
DEC.	21.3	21.2	21.1	
JAN.	21.1	21.1	21.1	
FEB.	21.2	21.1	21.0	
MAR.	20.9	20.7	20.5	
APR.	20.2	19.8	19.4	
MAY	18.8	18.2	17.6	
JUN.	16.8	16.3	16.1	
JUL.	15.8	15.9	16.3	
AUG.	17.2	18.0	18.9	
SEP.	20.3	21.2	21.8	

Table A.4.2.3 CONVERTED MAXIMUM MEAN TEMPERATURE AT NYAKOMBA

(Lapso rate=0.81℃/100m)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	31.1	31.3	31.2	
NOV.	30.3	30.1	29.9	
DEC.	29.9	29.8	29.7	
JAN.	29.7	29.7	29.7	
FEB.	29.8	29.7	29.6	
MAR.	29.5	29.3	29.1	
APR.	28.8	28.4	28.0	
MAY	27.4	26.8	26.2	
JUN.	25.4	24.9	24.7	
JUL.	24.4	24.5	24.9	
AUG.	25.8	26.6	27.5	
SEP.	28.9	29.8	30.4	

Table A.4.2.4 MAXIMUM MEAN TEMPERATURE AT NYANGA

(℃)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	10.6	11.3	11.7	
NOV.	11.6	11.8	12.0	
DEC.	12.3	12.5	12.7	
JAN.	12.9	13.0	13.0	
FEB.	13.0	12.8	12.6	
MAR.	12.3	11.9	11.5	
APR.	11.1	10.4	9.7	
MAY	8.6	7.8	7.1	
JUN.	6.3	5.8	5.5	
JUL.	5.4	5.4	5.7	
AUG.	6.3	6.8	7.3	
SEP.	8.3	8.7	9.4	

Table A.4.2.5 CONVERTED MAXIMUM MEAN TEMPERATURE AT NYAKOMBA

(Lapse rate=0.81℃/100m)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	19.1	19.8	20.2	
NOV.	20.1	20.3	20.5	
DEC.	20.8	21.0	21.2	
JAN.	21.4	21.5	21.5	
FEB.	21.5	21.3	21.1	
MAR.	20.8	20.4	20.0	
APR.	19.6	18.9	18.2	
MAY	17.1	16.3	15.6	
JUN.	14.8	14.3	14.0	
JUL.	13.9	13.9	14.2	
AUG.	14.8	15.3	15.8	
SEP.	16.5	17.2	17.9	

Table A.4.2.6 CONVERTED MAXIMUM MEAN TEMPERATURE AT NYAKOMBA

(Lapso rate=0.81℃/100m)

MONTH	1ST. DEKAD	2ND. DEKAD	3RD. DEKAD	REMARKS
OCT.	25.1	25.6	25.7	
NOV.	25.2	25.2	25.2	
DEC.	25.4	25.4	25.5	
JAN.	25.6	25.6	25.6	
FEB.	25.7	25.5	25.4	
MAR.	25.2	24.9	24.6	
APR.	24.2	22.9	23.1	
MAY	22.3	21.6	20.9	
JUN.	19.6	19.6	19.4	
JUL.	19.2	19.4	19.6	
AUG.	20.3	21.0	21.7	
SEP.	22.7	23.5	24.2	

Table A 4.2.7 RUNOFF AT NYKOMBA DAM SITE WITHOUT BASE FLOW 986/87

DATE	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	REMARK
1		221.22		21.24									
2		87.08		393.66									
3			450.18	113.76							21.24		
4			29.16		388.8								
5													
6			623.16										
7			361.98										
8			189.90										
9			266.94			471.24							
10		61.56	760.14										
11	84.24		65.52										
12	57.06					73.98							
13													
14	213.3										37.62		
15													
16					243.90		52.56						
17				478.08									
18													
19													
20													
21				138.96	172.44								
22			72.90	46.26									
23	369.36			421.38									
24				385.38	103.50								
25				185.40		67.32							
26				297.00									
27				37.62									
28													
29													
30			52.74										
31			101.16										
TOTAL	723.96	364.86	2973.78	2518.74	908.64	612.54	52.56				58.86	8213.94	

NOTE Beeflow = 0.007 ×86400 ×365=220.752 m^3/yeare

Total Runoff = 8213.94 + 220.75 = 8434.69 $10^3.m^3$/year

ANNEX B

SOIL AND LAND CAPABILITY CLASSIFICATION

ANNEX B SOIL AND LAND CAPABILITY CLASSIFICATION

B-1 Code framed according to criterion of Soil Coding of Zimbabwe.

Figure B.3.3.1 TEXTURE DIAGRAM

Figure B.3.3.2 CRITERIA for CLASSES I to IV

B-2 Cultivated Land

Table B.1 Comtarison of Arable Land

ANNEX B

B-1 Code framed according to criterion of Soil Coding of Zimbabwe

The symbols in code are as follow

(1) Effective depth

Symbols used for effective depth are defined as follows:

Symbol	Descriptive Term	Range (centimetres)
1	Deep	More than 150 cm
2	Moderately deep	100 - 150 cm
3	Moderately shallow	50 - 100 cm
4+	Shallow	40 - 50 cm
4–	Very shallow	25 - 40 cm
5	Extremely shallow	Less than 25 cm

(2) Soil Texture

Eight soil textural classes are identified in Rhodesia and are defined according to the relative proportions of clay, silt and sand fractions, and have the following size dimensions on the International Scale.

Clay less than 0,002 mm diameter
Silt from 0,002 mm to 0,02 mm diameter
Fine sand from 0,02 mm to 0,2 mm diameter
Medium sand from 0,2 mm to 0,5 mm diameter
Coarse sand from 0,5 mm to 2,0 mm diameter

Particles bigger than 2,0 mm are defined as gravel and are not considered part of the soil body.

In the field the textural classes are determined by working the soil in the hand at the sticky point, that is, wetted to approximate field capacity. This requires skill and experience, but good accuracy can be obtained. The code symbols for the various textural classes are as follows:

Symbol	Texture	% Sand	% Clay
A	Sand	More than 85%	–
X	Loamy sand	75 - 85%	–
B	Sandy loam	50 - 75%	Less than 20%
C	Sandy clay loam	45 - 80%	20 - 35%
D	Clay loam	Less than 45%	20 - 40%
E	Sandy clay	45 - 65%	More than 35%
F	Clay	Less than 45%	More than 40%
G	Heavy clay	Stiff sticky clays, with pronounced blocky prismatic, or columnar structure and with shiny surfaces when dry. They are usually dark yellowish, greyish or black, frequently strongly mottled. Includes typical vlei clays and the more vlei-like black turf soils.	

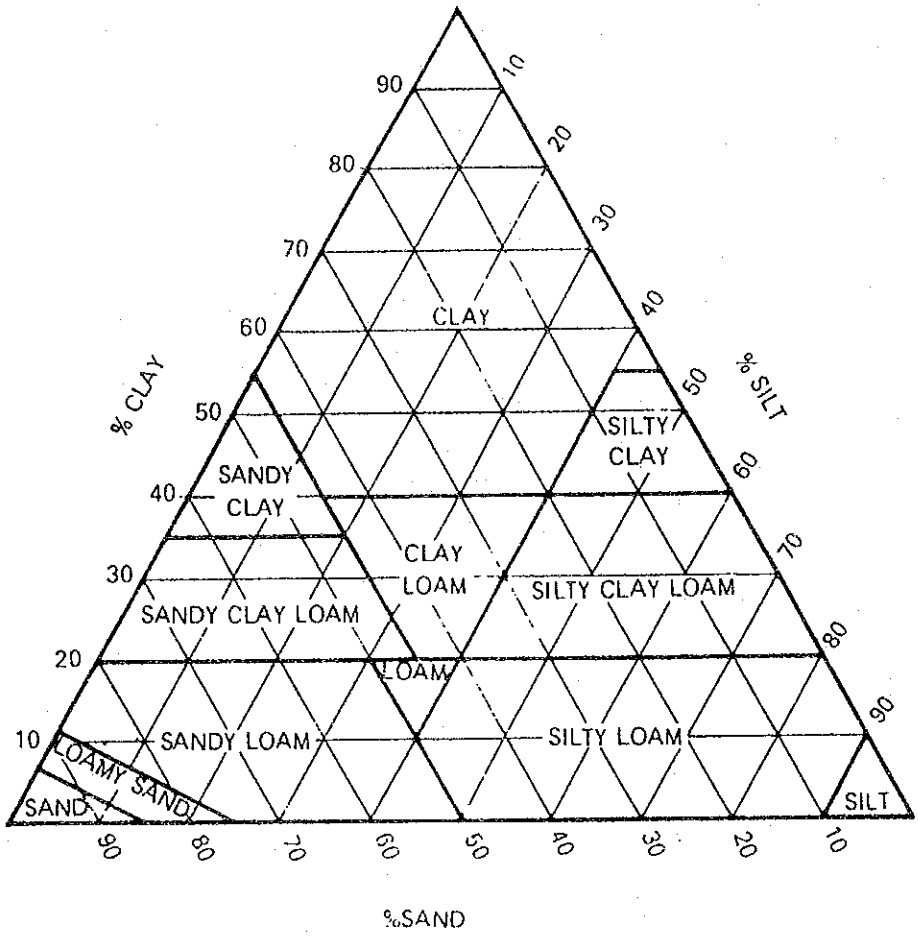


Figure B.3.3.1 TEXTURE DIAGRAM

(3) Soil Colour

Colour Descriptions	*Symbol*
All reds	1
Reddish-brown	2
Yellowish-reds and reddish-yellows	3
Browns	4
Grey-browns	5
Yellowish-browns	6
Yellows and olive-yellows	7
All greys except very dark and light greys	8
All very dark greys and dusky colours	9
All very pale colours of whatever hue	0

(4) Permeability

Guide to recognition

Symbol 7: Excessively rapid permeability. Open gravel without soil, and very coarse and gravelly sands.

Symbol 6: Rapid permeability. Sands and loamy sands only.

Symbol 5: Good permeability.

(i) Sandy loams, sandy clay loams, and sandy clays, provided they are not compacted or deflocculated.

(ii) Clays and clay loams of good crumb, or granular structure, readily permeable (includes typical red soils.)

Symbol 4: Slightly restricted permeability. Soils that are intermediate in permeability between 5 and 3 mainly by reason of somewhat heavy texture or slight compaction or denseness. Some clay skins are often visible. Moderately blocky structures which crumble readily on wetting may be given a "4" permeability.

Symbol 3:

(i) Clays or clay loams, greyish, yellowish or brownish sometimes slightly mottled, massive or angular blocky, hard consistence and sometimes moderately compacted. Clay skins often conspicuous. (Includes many subsoils derived from sedimentary rocks).

(ii) Sandy clay loams, and sandy clays tending to massive structure; moderately compacted and usually somewhat mottled and yellower than normal for the type. (Often found in lower members of sandveld catenas in the lower-rainfall areas.)

(iii) Self-ploughing clays and heavy clays, dark brownish-grey or black, with moderately strong grades of structure. (Typical black turf soils derived from basalt and norite).

(iv) Gravel or lateric gravel, moderately compacted, but penetrated by roots.

(v) Soft highly-weathered rock, or relatively unweathered but well-jointed rock; slight penetration by roots.

Symbol 2: Severely restricted permeability.

(i) Clays or heavy clays with very strong grades of blocky prismatic or columnar structure, and with shiny surfaces; very hard consistence (includes typical vlei clays and the more vlei-like black turf soils.

(ii) Deflocculated soils.

(iii) Gravel or lateric gravel, very compact and partially cemented, with only slight root penetrations.

(iv) Highly weathered rock that is very clayey and dense, often cracking into large angular blocks when dry. Signs of waterlogging are often visible in this horizon.

Symbol 1: Relatively impermeable.

Heavy, stiff, sticky clays, with pronounced blocky prismatic, or columnar structure, and with shiny surfaces. Roots, if present, are flattened and occur entirely between structural elements. Dark yellowish, greyish, or black, usually strongly mottled with yellowish and bluish colours.

(ii) Severely deflocculated soils.

(iii) Massive laterite, cemented, not penetrated by roots.

(iv) Solid unfissured rock, not penetrated by roots.

(5) Slope of Land

The slope of the land is described by slope classes defined as follows :

Slope Class	Percentage Slope
A	0 – 2
B	2 – 5
C	5 – 8
D	8 – 12
E	12.

Procedure for measuring the slope of land using an *abney* or *hand level*.

(6) Erosion

The following symbols are used and included in all code descriptions :

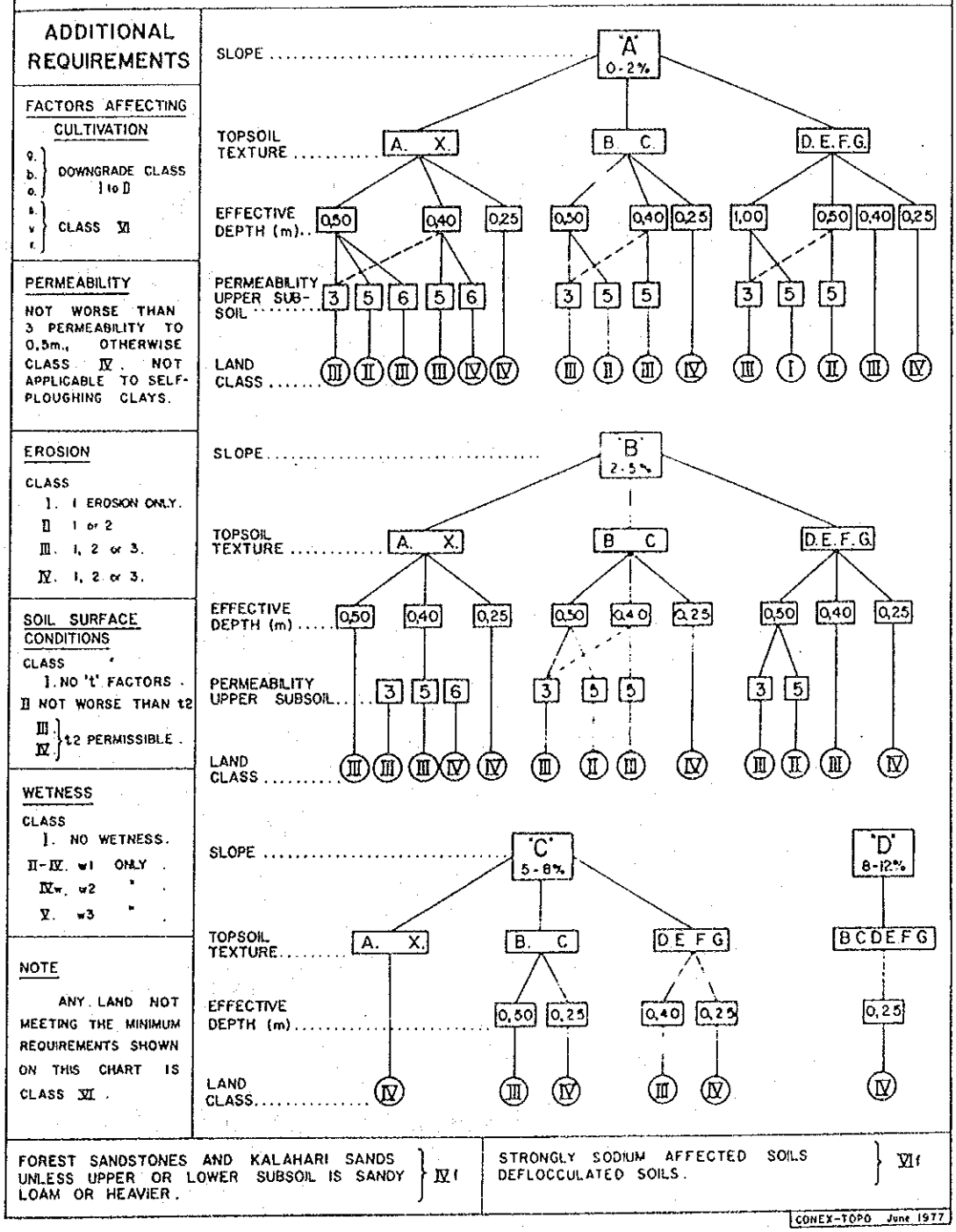
Symbol	Description
1.	No apparent, or slight, erosion.
2.	Moderate erosion : Moderate loss of topsoil generally and/or marked dissection by run-off channels or gullies.
3.	Severe erosion, severe loss of topsoil generally and/or marked dissection by run-off channels or gullies.
4	Very severe erosion : complete truncation of the soil profile and exposure of the subsoil (B horizon and/or deep and intricate dissection by run-off channels or gullies.

(7) Parent Material

IGNEOUS ROCKS	GROUP SYMBOL	PARENT MATERIAL/SYMBOL
Granite	GR	Granite, Granite. Porphyry (Gr) Gneissic Granite (Gn), Granodiorite (Gd), Pegmatite (Peg).
Diorite	AD	Diorite (Di), Andesite (An), Migmatite (Mig).
Gabbro	GA	Basalt (Bk), Dolerite (Do).
Ultra Basic	UB	Dunite (Du), Peridotite (Pr), Pyroxenite (Py), Serpentinite (Se).

Figure 3.3.2 CRITERIA for CLASSES I to IV
for
THE NORMAL CROPPING AREAS in NATURAL REGIONS II & III

Produced by - PLANNING BRANCH, Department of Conservation and Extension.



ANNEX B-2 CULTIVATED LAND

It is confirmed from the District Agricultural Extension Worker (Cartographic) that the classified areas in the Table 2.1.1 Land Capability Classification were measured on the aerial photographs at 1:25,000 scale.

Table B.1 "Comparison of Arable Land" show some differences in figures between each measurement.

In Table B.1 Column [A] "W. Dev. Plan was filled by the corresponding figures of land class I and II in the above table, column [B] "Land Cap.Map" was taken from the Land Capability Map attached on "the Ward Development Plan for ward No. 3 Nyakomba, July 1989", planimetering by the study team, column [C] " 1:5,000 Maps" planimetered the cultivated land from the 1:5,000 Topographic Maps provided by JICA, and [D] "Planted Area" was the data provided by AGRITEX, NYANGA office.

Table B.1 Comparison of Arable Land

Village No.	Name	Arable Land W. Dev. Plan [A]	Arable Land Land Cap. Map [B]	Cultivated Land 1:5,000 Map. [C]	Cultivated Land Planted Area [D]
1.	Nyatsawe	367	314	N.A	N.A
2.	Nyakomba	186 (13.6)	144 (11.4)	237.9 (17.0)	225.4 (19.7)
3.	Choo	290 (21.2)	193 (15.3)	206.5 (14.8)	201.6 (17.7)
4.	Nyachere	402 (29.3)	383 (30.3)	360.3 (25.8)	254.9 (22.3)
5.	Nyamanika	228 (16.6)	319 (25.2)	332.7 (23.8)	220.9 (19.4)
6.	Mwarazi	264 (19.3)	225 (17.8)	259.5 (18.6)	238.7 (20.9)
Total (1-6)		1,737	1,578	N.A	N.A
" (2-6)		1,370 (100)	1,264 (100)	1396.9 (100)	1141.7 (100)

Note: figures in parentheses are showing the percentage against (2 - 6)

It is possible that the following points may differ.

1) figures in column [A] and [B] may include un-cultivated land such as farm roads, homesteads, bush or woodlots, drainage, grasslands etc. which were difficult to deduct on the aerial photographs at 1:25,000 scale.

2) [A] and [B] may have considerable differences in the corresponding figures from the same village. The boundaries betwee each village varing.

3) Village boundaries denoted in the Land Capability Map were referred to at the site with the Extension Worker and farmers, even though some minor differences appeared among farmer's information, these boundaries were used on the planimetering of 1:5,000 scale map.

4) The measuring of cultivated lands on the 1:5,000 scale map has carefully deducted the areas for roads, homesteads, bush or woodlot, drainage and canal routes, grasslands etc. However, contour dikes and ditches markig the boundary of farm plots were not excluded. These areas are estimated at about 5% of the cultivated areas.

5) Cultivated areas measured on the 1:5,000 maps include river side cultivation areas which are occasionally inundated by the heavy flooding of the Gairezi river and/or the Nyakomba river, and the cultivated areas reclaimed are in Land Class VI. About 60ha of lands in Class VI, situated north east of the Nyakomba village adjacent to the Nyachere and the Choo villages, are newly reclaimed cultivation areas, but are natural bush areas seen on the map. These newly reclaimed lands are added as the cultivated land in column[C].

6) In comparing column [C] and [D], the cultivated area of Nyachere and Nyamanhika differe very much in figures from the same village.

According to the above considerations, the figures described in column [D] as the planted area of 5 villages in total 1,142ha are used as the net cultivation area of the project.

ANNEX C

LAND USE

ANNEX C LAND USE

C-1 LABOUR AND DROUGHT INPUT

Table C.1 LABOUR AND DROUGHT INPUT (per hectare)

C-2 LABOUR AND POWER REQUIREMENT PER HECTAR

Table C.2 LABOUR AND POWER REQUIREMENT PER HECTARE

C-3 CROPPING CALENDER AND INPUT REQUIREMENT

ANNEX C LAND USE

C-1 LABOUR AND DROUGHT INPUT

Table C.1 LABOUR AND DROUGHT INPUT (per hectare)

Operation	Operational Input (ha/hr)	(ha/hr)	Labour days (days)	Drought Power (days)	Tractor w/Drivr (hrs)
1. Ploughing					
(1) Draught Power					
4-ox plough + 2 workers	0.04	24.61	8.20	16.40	-
(2) Tractor					
60ps(45kw) + 2 Disk Plough	0.23	4.44	-	-	4.44
2 Disking					
(1) Draught Power					
4-ox tooth harrow + 2 worker	0.24	4.10	1.36	2.73	-
(2) Tractor					
60ps + Disk harrow	0.90	1.11	-	-	1.11
3. Row Making					
(1) Hand					
* Cotton, Sugar beans, Maize etc,	0.05	19.23	3.21	-	-
* Onion	0.03	38.46	6.41	-	-
(2) Draught Power					
Oxen + row maker + 2 worker					
* Cotton, Sugar beans, Maize etc,	0.35	2.86	0.95	0.95	-
* Onion	0.18	5.72	1.91	1.91	-
(3) Tractor					
Not applied					

Operation	Operational Input (ha/hr)	(ha/hr)	Labour days (days)	Drought Power (days)	Tractor w/Drivr (hrs)
4. Ridging (Tobacco only)					
(1) Draught Power					
2-ox plough + 1 worker	0.04	24.61	4.10	8.20	-
(2) Tractor + by hand					
60ps + single row ridges	0.33	3.00	-	-	3.00
hand	-	-	1.00	-	-
5. Fertilizer					
(1) Hand					
*Cotton	0.14	30.84	5.14	-	
*Sugar beans, Maize onion and groundnuts	0.22	25.57	4.26	-	
*Tobacco (before ridging)	0.09	10.96	1.83	-	-
*Wheat	0.50	8.16	1.37	1.21	-
6. Planting					
* Cotton - by hand	0.06	15.69	2.62	-	-
-covering by oxen, drag-harrow and	0.35	2.86	0.48	0.95	-
-covering by hand	0.05	19.85	3.31	-	-
* Sugar beans					
-marking station, planting & covering by hand	0.03	31.04	5.17	-	-
* Maize					
-Check row, marking station, planting & covering by hand	0.03	31.85	5.31	-	-
* Wheat					
-broad cast by hand	0.19	5.19	0.87	-	-
-harrowing by oxen	0.27	3.63	0.61	1.21	-
* Tobacco - transplanting (8hrs)					
-by hand, buckets and cup	0.006	168.00	21.00	-	-
* Onion - transplanting					
-by hand	0.005	201.52	25.19	-	-
* Groundnuts					
-by hand	0.018	55.96	9.33	-	-

Operation	Operational Input (ha/hr)	(ha/hr)	Labour days (days)	Drought Power (days)	Tractor w/Drivr (hrs)
7. Herbicides (Cotton, Maize)					
-Napsack sprayer	0.08	12.32	2.05	-	-
8. Thinning (Cotton, Sugar beans Onion)					
-by hand	0.03	30.78	5.13	-	-
9. Topdress Fertilizing					
(1) Hand					
* Cotton	0.19	20.88	3.48	-	-
* Sugar beans, Maize, Onion & Groundnuts	0.27	15.64	2.60	-	-
* Wheat	0.22	4.53	0.76	-	-
* Tobacco	0.19	20.88	3.48	-	-
10. Interculture, cultivation and/or weed control					
(1) Hand	0.012	80.77	13.46	-	-
(2) Draught Power					
(i) oxen + in-row by hand	0.12	8.22	1.37	2.74	-
	0.05	19.85	3.31	-	-
(ii) ox-cultivator	0.07	13.73	2.29	2.29	-
(3) Tractor					
Tractor 60ps + in-row	0.87	1.15	-	-	0.19
by hand	0.05	19.85	3.31	-	-
11. Pest and Disease Control					
-Napsack sprayer	0.08	12.32	2.05	-	-
12. Re-ridging, (Tobacco)					
-by hand	0.012	81.26	13.54	-	-
13. Topping & Suckering					
-by hand	0.022	45.36	7.56	-	-

Operation	Required Labour days Dry Land (Days)	Irrigation (Days)
14. Harvesting (8hours working per day)		
(1) Cotton		
Average Production	1.5ton/ha	2.0ton/ha 2.5ton/ha
(i) Picking and Transport	42.86	57.14 71.34
(ii) Dry/Bagging	3.00	4.00 5.00
Total	45.86	61.14 76.43
(2) Suger beans		
Average Production	1.0ton/ha	1.70ton/ha
(i) Pull or cut beans	12.32	12.32
(ii) Transport beans to homestead and stack	2.22	2.89
(iii) Thrash, winnow and bag by hand	13.00	16.90
Total	27.54	32.11
(3) Maize		
Average Production	2.5ton/ha	5.0ton/ha
(i) Reap and transport, off the plant, direct to ox-cart	8.43	10.13
(ii) Cut, heap and transport stalks after harvest. by hand & ox-cart	4.10	4.10
(iii) Shelling by hand	22.01	25.15
(iv) Winnow and grade by hand	1.73	2.26
(v) Bag, weight and store	3.71	4.88
Total	39.98	46.52
(4) Wheat		
Average Production	-	3.5ton/ha
(i) Reap & Transport by hand		54.87
(ii) Threshing and bagging by hand		20.29
(iii) Winnowing by hand		2.16
Total		77.32

Operation	Required Labour days Dry Land (Days)	Irrigation (Days)
(5) Tobacco		
Average Production	1.8ton/ha	2.2ton/ha
(i) Reaping, tying and barn loading (loose leaf)	44.60	51.14
(ii) Curing (Air-cured)	11.03	11.03
(iii) Barn unloading, grading and bailing	29.67	35.60
(iv) Stalk destruction	3.30	3.30
Total	88.60	101.07
(6) Onion		
Average Production	-	30ton/ha
(i) Lift & windrow by hand		29.70
(ii) Load, unload and store		3.46
(iii) Removal from store		4.15
(iv) Clean onions, grade and fill pockets		22.85
(v) Weight and tie pockets		4.15
Total	-	64.31
(7) Groundnuts		
Average Production	-	3.0ton/ha
(i) Loosen nuts by oxen + plough + worker		4.43
(ii) Lift nuts by hand		4.05
(iii) Transport nuts to homestead and stalk by ox-cart + 2 workers		5.79
(iv) Picking nuts using beater bars		41.52
(v) Winnow and bagging by hand		1.38
Total		57.17

Operation	Required Input per tonne		
	Ox-cart (hrs)	Tractor (hrs)	Pick-up (hrs)
15. Marketting/Transport			
Distance (farm road 1.0km + Local trafic road 4.0km)			
(1) Present Condition			
4-ox cart, 500kg/time	14.3 (2days)		
(2) Irrigation Scheme			
2-ox cart, 500kg/time	11.3 (2days)		
Tractor-cart, 1000kg/time	-	4.0	-
Pick-up, 1000kg/time	-	-	3.5

C-2 LABOUR AND POWER REQUIREMENT PER HECTAR

Table C.2 LABOUR AND POWER REQUIREMENT PER HECTARE

Name of Crop : COTTON Condition : Irrigation (1)

Operation	Required Input per ha			Remarks
	Labour (days)	Oxen (days)	Tractor (hours)	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
Oxen, row maker	0.95	0.95	-	
Fertilizer/Planting				
by hand, covering by oxen	8.24	0.95	-	
Herbicides				
Napsack Sprayer	2.05	-	-	
Thinning				
by hand	5.13	-	-	
Topdress Fertilizer				include
by hand (2 times)	6.96	-	-	weeding
Interculture				
Oxen + in-row by hand	4.68	2.74	-	
Weed control				
4 times	31.60	2.74	-	1 Oxen + inrow 1 hand (full) 2 hand (half)
Pest and Disease Control				
8 times by Napsack sprayer	16.40	-	-	
Harvesting				
picking/dry/bagging	76.43	5.00	-	
Irrigation (Overhead)	10.00	-	-	
Others	8.00	1.49	-	
Total	180.0	33.0		

Name of Crop : MAIZE　　Condition : Irrigation

(2)

Operation	Required Input per ha			Remarks
	Labour (days)	Oxen (days)	Tractor (hours)	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
Oxen, row maker	0.95	0.95	-	
Fertilizer/Planting				
by hand	9.57	-	-	
Herbicides				
Napsack Sprayer	2.05	-	-	
Topdress Fertilizer				
by hand	2.60	-	-	
Interculture (2 times)				
Oxen + in-row by hand	9.36	5.48	-	
Weed control (2 times)				
by hand	26.92	-	-	
Pest and Disease Control				
by Napsack sprayer	2.05	-	-	
Harvesting				
Reap/shell/bagging	46.52	5.00	-	
Irrigation (Overhead)	10.00	-	-	
Others	5.42	1.44	-	
Total	125.0	32.0		

Name of Crop : TABACCO　　Condition : Irrigation　　(3)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Seed Bed (Nursary)	20.00	-	-	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Ridging				
2-ox plough	4.10	8.20	-	
Soil Fumigation				
handgun	3.24	-	-	16.85hr/ha
Fertilizer/Transplanting				
by hand	22.83	-	-	
Topdress Fertilizer				
by hand, 3 times	10.44	-	-	
Re-ridging				
by hand	13.54	-	-	
Topping & Suckering				
by hand	7.56	-	-	
Weed control				
2 times by hand	26.92	-	-	
Pest and Disease Control				
3 times by Napsack sprayer	6.15	-	-	
Harvesting				
Reap/cure/grade/bailing	101.07	2.50	-	
Irrigation (Overhead)	10.00	-	-	
Others	9.59	1.17	-	
Total	245.0	31.0		

Name of Crop : SUGAR BEANS Condition : Irrigation

(4)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
Oxen, row maker	0.95	0.95	-	
Fertilizer/Planting				
by hand	9.43	-	-	
Thinning				
by hand	5.13	-	-	
Topdress Fertilizer				
by hand	2.60	-	-	
Weed Control				
2 times by hand	16.00	-	-	8ld/one time
Pest and Disease Control				
by Napsack Sprayer	2.05	-	-	
Harvesting	32.11	3.00		
Irrigation (Overhead)	10.00			
Others	4.17	0.92		
Total	92.0	24.0		

Name of Crop : WHEAT　　Condition : Irrigation

(5)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Fertilizer/Planting				
by hand, broadcast and harrow by oxen	2.85	1.21	-	
Topdress Fertilizer				
by hand	0.76	-	-	
Weed Control				
2 times by hand	4.00	-	-	2ld/one time
Harvesting				
Reap/Thresh/Winnow/ bagging	77.32	3.50	-	
Irrigation (Overhead)	10.00	-	-	
Others	5.51	1.16	-	
Total	110.0	25.0		

Name of Crop : ONION　　Condition : Irrigation

(6)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Seed Bed	10.00	-	-	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
oxen, row maker	1.91	1.91		
Fertilizer/Transplanting				
by hand	25.19	-	-	
Topdress Fertilizer				
by hand	2.60	-	-	
Weed control				
4 times, by hand	40.38	-	-	2time is full 2time is half
Pest and Disease Control				
Napsack sprayer	2.05	-	-	
Harvesting				
Lift/windrow/grade/pocket	64.31	10.00	-	
Irrigation (Overhead)	10.00	-	-	
Others	4.00	1.96	-	
Total	170.00	33.0		

Name of Crop : GROUNDNUTS Condition : Irrigation

(7)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Fertilizer/Planting				
by hand	10.28	-	-	
Topdress Fertilizer				
by hand	2.60	-	-	
Weed Control				
2 times by hand	13.46	-	-	
Pest and Disease Control				
2 times, by Napsack sprayer	4.10	-	-	
Harvesting				
Reap/Stack/Pick/Bagging	57.17	3.00	-	
Irrigation (Overhead)	10.00	-	-	
Others	2.83	0.87	-	
Total	110.0	23.0		

Name of Crop : COTTON Condition : Dryland

(8)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
Oxen, row maker	0.95	0.95	-	
Fertilizer/Planting				
by hand, covering by oxen	8.24	0.95	-	
Herbicides				
Napsack Sprayer	2.05	-	-	
Thinning				
by hand	5.13	-	-	
Topdress Fertilizer				include
by hand (1 times)	3.48	-	-	weeding
Interculture				
Oxen + in-row by hand	4.68	2.74	-	
Weed control				
3 times	24.87	2.74	-	1 Oxen + inrow 1 hand (full) 1 hand (half)
Pest and Disease Control				
5 times by Napsack Sprayer	10.25	-	-	
Harvesting				
Picking/dry/bagging	61.14	4.00	-	
Others	4.65	1.49	-	
Total	135.0	32.0		

Name of Crop : MAIZE/SUNFLOWER Condition : Dryland

(9)

Operation	Required Input per ha			Remarks
	Labour (days)	Oxen (days)	Tractor (hours)	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Row making				
Oxen, row maker	0.95	0.95	-	
Fertilizer/Planting				
by hand	9.57	-	-	
Herbicides				
Napsack Sprayer	2.05	-	-	
Topdress Fertilizer				
by hand	2.60	-	-	
Inter-culture (1 times)				
Oxen + in-row by hand	4.68	2.74	-	
Weed control				
by hand	26.92	-	-	
Pest and Disease Control				
by Napsack sprayer	2.05	-	-	
Harvesting				
Reap/shell/bagging	39.98	4.00	-	
Others	6.64	1.18	-	
Total	105.0	28.0		

Name of Crop : TABACCO　　Condition : Dryland

(10)

Operation	Required Input per ha Labour (days)	Oxen (days)	Tractor (hours)	Remarks
Seed Bed (Nursary)	20.00	-	-	
Plough/Disking				
4-ox, plough/harrow	9.56	19.13	-	
Ridging				
2-ox plough	4.10	8.20	-	
Soil Fumigation				
Handgun	3.24	-	-	16.85hr/ha
Fertilizer/Transplanting				
by hand	22.83	-	-	
Topdress Fertilizer				
by hand, 2 times	6.96	-	-	
Re-ridging				
by hand	13.54	-	-	
Topping & Suckering				
by hand	1.89	-	-	
Weed control				
2 times by hand	26.92	-	-	
Pest and Disease Control				
2 times by Napsack sprayer	4.10	-	-	
Harvesting				
Reap/cure/grade/bailing	88.60	4.00	-	
Others	8.26	1.67	-	
Total	210.0	33.0		

Annex C-3 CROPPING CALENDER AND INPUT REQUIREMENT

Fig. C.3.1 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; COTTON (Irrigation)

(1)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																					200 days
Germination																																					
Plough/Disking																																					
Row/Fertilizer/Planting																																					
Herbicides																																					
Thinning																																					
Topdress Fertilizer																																					2 times
Interculture																																					
Weed Control																																					5 times
Pest and Disease Control																																					weekly 5-8 times
Harvesting (Pick)																																					
Harvesting (Dry/Bag)																																					
Irrigation																																					
Input per 100 Hectare — Farmers (Persons/10days)	556	1138	660	176	295	335	477	733	910	919	678	554	554	554	554	546	378	290	1125	2036	2158	1648	628	98												18000
Draught Power (ox) (Herds/10days)	956	1052	95	10	10	10	10	21	128	219	158	65	17	10	10	10	10	24	70	83	83	83	83	83												3300
Tractor (Hours/10days)																																					

Fig. C. 3. 2 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; MAIZE (Irrigation)

(2)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																				140 days
Germination																																				
Plough/Disking																																				
Row/Fertilizer/Planting																																				
Herbicides																																				
Topdress Fertilizer																																				
Interculture																																				2 times
Weed Control																																				
Pest and Disease Control																																				1 time if necessary
Harvesting (Peap)																																				
Harvesting (Shell/Bag)																																				
Irrigation																																				
Input per 100 Hectare: Farmers (Persons/10days)	1218	741	112	133	889	1912	1311	300	146	146	147	29	29	385	1200	1308	952	952															590			12500
Input per 100 Hectare: Draught Power (ox) (Herds/10days)	1010	55	7	11	144	273	144	12	8	8	8	8	8	133	258	133	8	8															964			3200
Input per 100 Hectare: Tractor (Hours/10days)																																				

Fig. C. 3. 3 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; TOBACCO (Irrigation)

(3)

Description \ Month	Oct E	Oct M	Oct L	Nov E	Nov M	Nov L	Dec E	Dec M	Dec L	Jan E	Jan M	Jan L	Feb E	Feb M	Feb L	Mar E	Mar M	Mar L	Apr E	Apr M	Apr L	May E	May M	May L	Jun E	Jun M	Jun L	July E	July M	July L	Aug E	Aug M	Aug L	Sep E	Sep M	Sep L	Remarks
Operation																																					
																																				130 days
Germination																																				
Seed bed (Nursary)																																				
Plough/Disking																																				
Fertilizer/Ridging																																				
Soil Fumigation																																				
Transplanting																																				
Topdress Fertilizer																																				3 times
Re-ridging																																				
Topping and Suckering																																				topping/10% flowering
Weed Control																																				2 times
Pest and Disease Control																																				
Harvesting (Reap)																																				2-3 times
Harvesting (Cure/Grade)																																				
Irrigation																																Nursary				
Input per 100 Hectare — Farmers (Persons/10days)	100	100	100	758	1978	1352	620	1195	1700	1625	873	579	455	308	974	1700	1700	1400	1164	800	800	720	620	620	600						210	410	410	210	210	209	24500
Draught Power (ox) (Herds/10days)				1162	1366	215	10	10	10	10	10	10	10	20	50	50	50	50	30		10	10	10	7													3100
Tractor (Hours/10days)																																				

Fig. C. 3. 4 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; SUGAR BEANS (1) (Irrigation)

(4)

Description \ Month	Oct E	Oct M	Oct L	Nov E	Nov M	Nov L	Dec E	Dec M	Dec L	Jan E	Jan M	Jan L	Feb E	Feb M	Feb L	Mar E	Mar M	Mar L	Apr E	Apr M	Apr L	May E	May M	May L	Jun E	Jun M	Jun L	July E	July M	July L	Aug E	Aug M	Aug L	Sep E	Sep M	Sep L	Remarks
Operation																																					
																																					90 days
Germination																																					
Plough/Disking																																					
Row/Fertilizer/Planting																																					
Thinning																																					
Topdress Fertilizer																																					after flowering
Weed Control																																					2 times
Pest and Disease Control																																					1 time if necessary
Harvesting (Pull/Stack)																																					
Harvesting (Thrash/Bag)																																					
Irrigation																																					
Input per 100 Hectare: Farmers (Persons/10days)															633	1153	673	195	685	795	608	695	375	71	1150	1470	697										9200
Input per 100 Hectare: Draught Power (ox) (Herds/10days)															957	1003	48	10	10	10	10	10	10	10	150	150	22										2400
Input per 100 Hectare: Tractor (Hours/10days)																																					

Fig. C. 3. 5 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; SUGAR BEANS (2) (Irrigation)

(5)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																					90 days
Germination																																					
Plough/Disking																																					
Row/Fertilizer/Planting																																					
Thinning																																					
Topdress Fertilizer																																					
Weed Control																																					2 times
Pest and Disease Control																																					
Harvesting (Pull/Stack)																																					
Harvesting (Thrash/Bag)																																					
Irrigation																																					
Input per 100 Hectare: Farmers (Persons/10days)																						633	1153	673	195	685	795	608	695	375	71	1150	1470	697	9200		
Draught Power (ox) (Herds/10days)																						957	1003	48	10	10	10	10	10	10	10	150	150	22	2400		
Tractor (Hours/10days)																																					

Fig. C. 3. 6 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; WHEAT (1) (Irrigation)

(G)

Description \ Month	Oct E	Oct M	Oct L	Nov E	Nov M	Nov L	Dec E	Dec M	Dec L	Jan E	Jan M	Jan L	Feb E	Feb M	Feb L	Mar E	Mar M	Mar L	Apr E	Apr M	Apr L	May E	May M	May L	Jun E	Jun M	Jun L	July E	July M	July L	Aug E	Aug M	Aug L	Sep E	Sep M	Sep L	Remarks
Operation																																						
Germination																																					120 days
Plough/Disking																																					
Fertilizer/Planting																																					
Topdress Fertilizer																																					
Weed Control																																					
Harvesting (Reap/Thrash)																																					
Harvesting (Winnow/Bag)																																					
Irrigation																																					
Input per 100 Hectare: Farmers (Persons/10days)																					608	750	273	140	200	280	280	216	140	140	40	40	1440	3840	2430	173	11000
Draught Power (ox) (Herds/10days)																					967	1026	71	10	10	10	10	10	10			70	175	115	16	2500	
Tractor (Hours/10days)																																					

Fig. C. 3. 7 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; WHEAT (2) (Irrigation)

(7)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																					120 days
Germination																																					
Plough/Disking																																					
Fertilizer/Planting																																					
Topdress Fertilizer																																					
Weed Control																																					
Harvesting (Reap/Thrash)																																					
Harvesting (Winnow/Bag)																																					
Irrigation																																					
Input per 100 Hectare: Farmers (Persons/10days)	1440	3840	2430	173																					608	750	273	140	200	280	290	216	140	140	40	40	11000
Input per 100 Hectare: Draught Power (ox) (Herds/10days)	70	175	115	16																					967	1026	71	10	10	10	10	10	10				2500
Input per 100 Hectare: Tractor (Hours/10days)																																					

Fig. C. 3. 8 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; ONION (Irrigation)

(8)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																				180 days
Germination																																				
Seed bed (Nursary)																																				
Plough/Disking																																				
Row/Fertilizer/Planting																																				
Topdress Fertilizer																																				
Weed Control																																				4 times
Pest and Disease Control																																				1 time (if necessary)
Harvesting (Lift/Windrow)																																				
Harvesting (Grade/Pocket)																																				
Irrigation													Nursary																								
Input per 100 hectare: Farmers (Persons/10days)	871												210	420	210	110	1176	2830	140	605	735	735	605	595	595	595	405	123	85	90	90	85	70	20	2365	3235	17000
Input per 100 hectare: Draught Power (ox) (Herds/10days)	6												10	10	10	10	1923	201	10	10	10	10	10	10	10	10	10	10	10					510	510	3300
Input per 100 hectare: Tractor (Hours/10days)																																				

Fig. C. 3. 9 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; GROUND NUTS (Irrigation)

(9)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
																																				120 days
Germination																																					
Plough/Disking																																					
Fertilizer/Planting																																					
Topdress Fertilizer																																					before flowering
Weed Control																																					3 times
Pest and Disease Control																																					2 times (every 2 weeks
Harvesting (Lift/Stack)																																					
Harvesting (Pick/Bag)																																					
Irrigation																																					
Input per 100 Hectare: Farmers (Persons/10days)		1076	1148	120	121	365	455	635	535	455	155	70	70	20	1442	1445	1445	1443																		11000
Input per 100 Hectare: Draught Power (ox) (Herds/10days)		1913	15	10	10	7									300	15	15	15																		2300
Input per 100 Hectare: Tractor (Hours/10days)																																					

Fig. C. 3. 10 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; COTTON (Dry Land)

(10)

Description \ Month	Oct E	Oct M	Oct L	Nov E	Nov M	Nov L	Dec E	Dec M	Dec L	Jan E	Jan M	Jan L	Feb E	Feb M	Feb L	Mar E	Mar M	Mar L	Apr E	Apr M	Apr L	May E	May M	May L	Jun E	Jun M	Jun L	July E	July M	July L	Aug E	Aug M	Aug L	Sep E	Sep M	Sep L	Remarks
Operation																																					
																																					200 days
Germination																																					
Plough/Disking																																					after rain
Row/Fertilizer/Planting																																					
Herbicides																																					
Thinning																																					
Topdress Fertilizer																																					
Interculture																																					
Weed Control																																					3-4 times
Pest and Disease Control																																					5 times weekly
Harvesting (Pick)																																					
Harvesting (Dry/Bag)																																					
Input per 100 Hectare: Farmers (Persons/10days)		336	705	710	429	170	210	310	328	530	600	550	426	360	360	360	360	290	260	677	1160	1660	1440	880	344	45										13500
Input per 100 Hectare: Draught Power (ox) (Herds/10days)		633	700	705	65	10	15	20	40	95	125	125	59	35	35	35	35	30	15	39	80	110	100	60	20	14										3200
Input per 100 Hectare: Tractor (Hours/10days)																																					

Fig. C. 3. 11 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; MAIZE / SUNFLOWER (Dry Land)

(11)

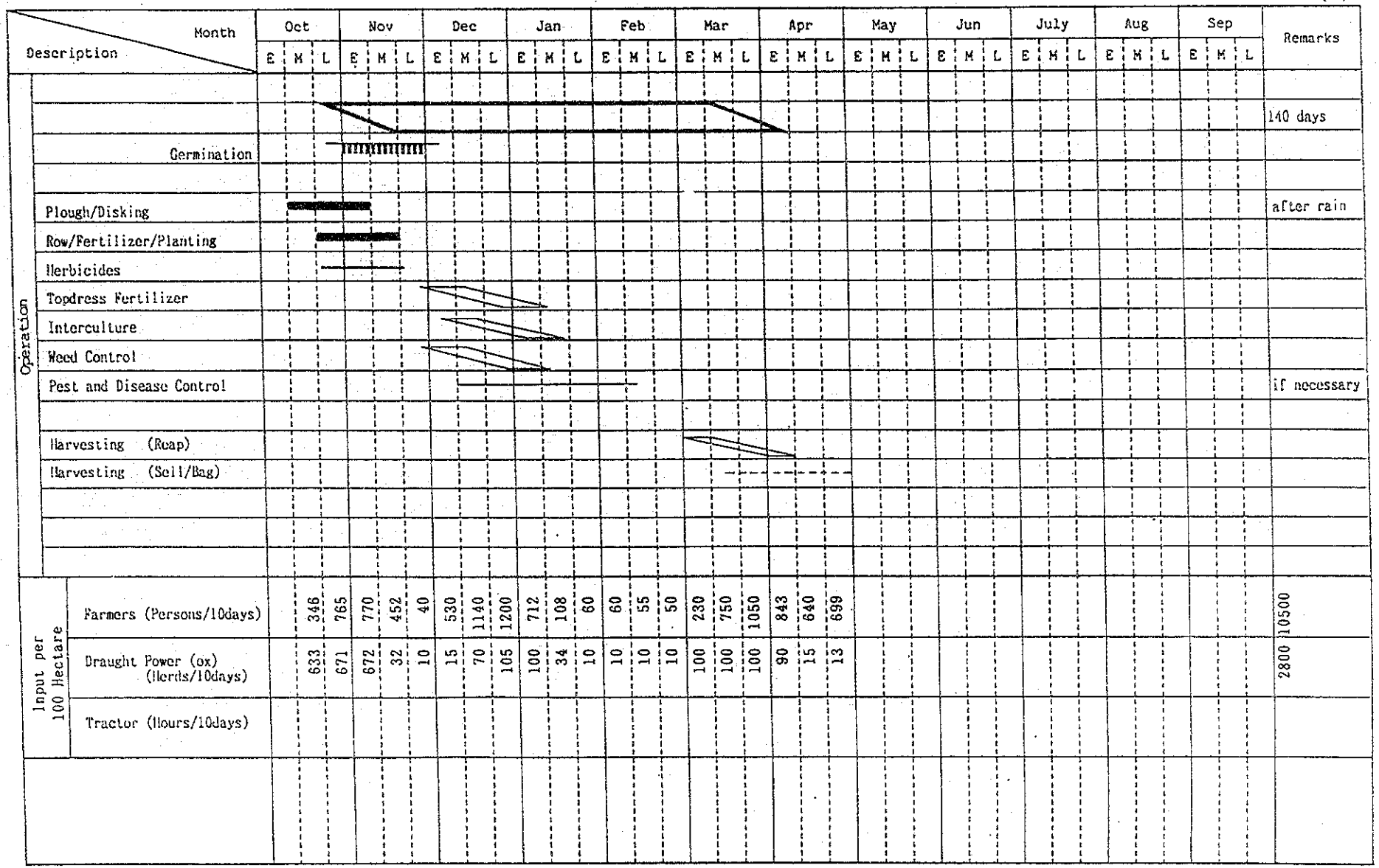


Fig. C. 3. 12 CROPPING CALENDAR AND INPUT REQUIREMENT Name of Crop; TOBACCO (Dry Land)

(12)

Description \ Month	Oct			Nov			Dec			Jan			Feb			Mar			Apr			May			Jun			July			Aug			Sep			Remarks
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	
Operation																																					
Germination																																				130 days
Seed bed (Nursary)																																				
Plough/Disking																																				
Fertilizer/Ridging																																				
Soil Fumigation																																				
Transplanting																																				
Topdress Fertilizer																																				2 times
Re-ridging																																				
Topping and Suckering																																				Lopping/10% flowering
Weed Control																																				2 times
Pest and Disease Control																																				2-3 times
Harvesting (Reap)																																				
Harvesting (Cure/Grade)																																				
Input per 100 Hectare: Farmers (Persons/10days)	100	100	100	758	1978	1350	535	1075	1455	1370	621	299	197	219	810	1460	1460	1210	1000	660	660	570	470	470	449						204	404	404	204	204	204	21000
Input per 100 Hectare: Draught Power (ox) (Herds/10days)				1162	1366	220	15	15	15	15	15	15	15	30	70	80	90	70	60	15	15	5	5	5	2											3300
Input per 100 Hectare: Tractor (Hours/10days)																																				

ANNEX D

AGRICULTURE

ANNEX D AGRICULTURE

Table D.1.1 CROP PRODUCTION PER YEAR BY VILLAGE (t)

Crops	Production by Village					Total Production
	Nyakomba	Choo	Nyachere	Nyamanhika	Mwarazi	
1 Maize	367.9	270.3	388.0	356.5	360.2	1,742.9
2 Cotton	136.0	106.7	127.5	130.5	165.4	666.1
3 Tobacco	2.600	-	-	5.260	6.278	14.138
4 Wheat*	-	-	-	-	-	-
5 Sugar beans**	0.142	0.690	2.548	0.182	0.146	3.708
6 Sugar beans*	-	-	-	-	-	-
7 Soyabeans	0.534	-	-	-	-	0.534
8 Groundnuts	0.420	-	1.195	0.280	0.416	2.311
9 Sunflower	4.318	7.146	11.260	4.662	7.339	34.725
10 Coffee	5.317	-	-	-	-	5.317

Note : 1) * = Winter crop, 2) ** = Late summer crop, and
3) Source = AGRITEX 1985-86 to 1987-88.

Table D.1.2 AVERAGE YIELD BY VILLAGE (kg/ha)

Crops	Average Yield by Village					Average Yield
	Nyakomba	Choo	Nyachere	Nyamanhika	Mwarazi	
1 Maize	2.930	2.470	2.760	2.870	2.970	2.800
2 Cotton	1.555	1.267	1.350	1.533	1.605	1.462
3 Tobacco	917	-	-	933	973	941
4 Wheat*	-	-	-	-	-	-
5 Sugar beans**	1.062	1.084	1.065	1.111	1.099	1.084
6 Sugar beans*	-	-	-	-	-	-
7 Soyabeans	1.138	-	-	-	-	1.138
8 Groundnuts	600	-	640	610	630	620
9 Sunflower	908	1.013	1.023	940	930	963
10 Coffee	1.085	-	-	-	-	1.085

Note : 1) * = Winter crop, 2) ** = Late summer crop, and
3) Source = AGRITEX 1985-86 to 1987-88.

Table D.2.1 NUMBER OF FAMILY (1988)

Village	Family			Farm Work			Other	Children	
	Male	Female	Total	Male	Female	Total	work	Over 10	Under 10
Nyakomba	5.0	3.9	8.9	1.3	2.0	3.3	1.0	2.6	2.0
Choo	3.1	3.9	7.0	0.9	1.8	2.7	1.4	1.8	1.1
Nyachere	2.9	4.1	7.0	0.9	1.5	2.4	1.0	2.3	1.3
Nyamanhika	3.9	3.6	7.5	0.9	1.8	2.7	0.5	2.3	2.1
Mwarazi	3.8	3.6	7.4	0.4	1.6	2.0	0.8	1.9	2.6
Average	3.74	3.82	7.56	0.88	1.74	2.62	0.94	2.18	1.82
Over 2ha	4.40	3.94	8.34	0.92	2.02	2.94	1.28	1.98	2.14
Under 2ha	3.12	3.76	6.88	0.82	1.46	2.28	0.66	2.38	1.56

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.2 LAND AND LAND USE (1987-88)

Village	Own Land (ha)					Land use/year(ha)		Rent	Rentout
	Farm land	Gorden	Fruit trees	Home stead	Total	One crop	2or3 Crops /Follow	(ha)	(ha)
Nyakomba	2.46	0.04	0.02	0.26	2.78	2.51	0	0.05	0
Choo	2.04	0.06	0.03	0.26	2.39	2.04	0	0	0
Nyachere	2.44	0.04	0.03	0.36	2.87	2.40	0	0.06	0.10
Nyamanhika	2.24	0.03	0.02	0.34	2.63	2.24	0	0	0
Mwarazi	2.23	0.06	0.04	0.26	2.59	2.28	0	0.05	0
Average	2.28	0.05	0.03	0.30	2.66	2.29	0	0.03	0.02
Over 2ha	3.09	0.04	0.03	0.29	3.45	3.09	0	0	0
Under 2ha	1.47	0.05	0.03	0.30	1.85	1.49	0	0.06	0.04

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.3 MAIZE PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yield (t/ha)	Price (Z$/ha)
Nyakomba	0.96	2.436	430	1.389	246	1.031	182	0.016	3	176.19	2.465	434
Choo	0.96	2.274	409	1.178	212	1.086	195	0.009	2	179.45	2.508	450
Nyachere	1.13	3.391	604	1.825	325	1.545	276	0.021	4	178.00	2.954	526
Nyamanhika	1.14	2.819	500	1.830	325	0.981	174	0.008	1	177.00	2.443	433
Mwarazi	1.06	3.696	651	2.544	448	1.146	202	0.006	1	176.00	3.425	603
Average	1.05	2.923	519	1.753	311	1.158	206	0.012	2	177.33	2.759	489
Over 2ha	1.32	3.701	657	2.623	466	1.066	189	0.013	3	177.47	2.754	488
Under 2ha	0.78	2.146	380	0.884	156	1.251	222	0.012	2	177.19	2.766	490

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) Qty. = Quantity, and 3) Source = JICA questionnaires, 1989.

Table D.2.4 COTTON PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yield (t/ha)	Price (Z$/ha)
Nyakomba	0.90	1.579	1254	1.579	1254	0	0	0	0	793.75	1.654	1314
Choo	0.50	0.700	559	0.700	559	0	0	0	0	798.21	1.407	1124
Nyachere	1.02	1.543	1259	1.543	1254	0	0	0	0	811.91	1.575	1274
Nyamanhika	0.90	1.373	1095	1.373	1095	0	0	0	0	797.50	1.531	1222
Mwarazi	0.85	1.794	1435	1.794	1435	0	0	0	0	800.00	2.120	1696
Average	0.83	1.398	1120	1.393	1120	0	0	0	0	800.27	1.657	1326
Over 2ha	1.09	1.921	1543	1.921	1543	0	0	0	0	802.51	1.755	1406
Under 2ha	0.57	0.865	690	0.865	690	0	0	0	0	797.92	1.556	1243

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) Qty. = Quantity, and 3) Source = JICA questionnaires, 1989.

Table D.2.5 SUGAR BEANS PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price	Qty. (t)	Price	Qty. (t)	Price	Qty. (t)	Price		Yilek (t/ha)	Price (Z$/ha)
Nyakomba	0.50	0.800	360	0.690	311	0.070	32	0.040	18	450.00	1.600	720
Choo	0.20	0.170	71	0	0	0.160	67	0.010	4	419.45	0.850	357
Nyachere	—	—	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	0.50	0.850	383	0.800	360	0	0	0.050	23	450.00	1.700	765
Average	0.40	0.607	271	0.497	224	0.077	33	0.033	15	439.82	1.383	614
Over 2ha	0.50	0.825	372	0.745	336	0.035	16	0.045	21	450.00	1.650	743
Under 2ha	0.20	0.170	71	0	0	0.160	67	0.010	4	419.45	0.850	357

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers.
2) Qty. = Quantity, and 3) Source = JICA questionnaires, 1989.

Table D.2.6 TOBACCO[AIR-CURED] PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yilek (t/ha)	Price (Z$/ha)
Nyakomba	0.50	0.840	4200	0.840	4200	0	0	0	0	500.00	1.680	8400
Choo	—	—	—	—	—	—	—	—	—	—	—	—
Nyachere	—	—	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—	—	—
Average	0.50	0.840	4200	0.840	4200	0	0	0	0	500.00	1.680	8400
Over 2ha	0.50	0.840	4200	0.840	4200	0	0	0	0	500.00	1.680	8400
Under 2ha	—	—	—	—	—	—	—	—	—	—	—	—

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.7 GROUNDNUTS PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yilek (t/ha)	Price (Z$/ha)
Nyakomba	0.20	0.100	65	0	0	0.080	52	0.020	13	650.00	0.500	325
Choo	0.30	0.150	89	0	0	0.135	80	0.015	9	594.42	0.565	336
Nyachere	0.30	0.260	158	0	0	0.235	143	0.025	15	606.45	0.900	546
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—	—	—
Average	0.27	0.170	104	0	0	0.150	92	0.020	12	616.96	0.655	402
Over 2ha	0.30	0.175	105	0	0	0.160	96	0.015	9	600.44	0.690	416
Under 2ha	0.27	0.190	116	0	0	0.167	102	0.023	14	616.96	0.683	419

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) Qty. = Quantity, and 3) Source = JICA questionnaires, 1989.

Table D.2.8 SUNFLOWER PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yilek (t/ha)	Price (Z$/ha)
Nyakomba	0.45	0.335	141	0.315	132	0	0	0.020	8	419.45	0.750	315
Choo	0.43	0.247	104	0.234	98	0.003	1	0.010	4	421.14	0.593	249
Nyachere	0.45	0.383	161	0.370	155	0	0	0.013	5	419.45	0.868	364
Nyamanhika	0.50	0.400	168	0.380	159	0	0	0.020	8	419.45	0.800	336
Mwarazi	0.40	0.330	138	0.310	130	0	0	0.020	8	419.45	0.830	348
Average	0.45	0.339	142	0.322	135	0.001	0.20	0.017	7	419.79	0.768	322
Over 2ha	0.54	0.417	175	0.398	167	0.001	0.40	0.018	7	419.45	0.770	323
Under 2ha	0.30	0.209	88	0.199	84	0	0	0.010	4	421.42	0.722	304

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) Qty. = Quantity, and 3) Source = JICA questionnaires, 1989.

Table D.2.9 RAPOKO [FINGER MILLET] PRODUCTION AND ITS USE (1987-88)

Village	Planted area (ha)	Production		Sale		Family use		Seed		Unit price (Z$/t)	Average	
		Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)	Qty. (t)	Price (Z$)		Yilek (t/ha)	Price (Z$/ha)
Nyakomba	—	—	—	—	—	—	—	—	—	—	—	—
Choo	0.30	0.220	66	0	0	0.210	63	0.010	3	296.00	0.900	264
Nyachere	0.70	0.450	130	0	0	0.430	124	0.020	6	288.00	0.730	211
Nyamanhika	0.35	0.185	54	0.090	26	0.045	14	0.050	15	294.00	0.520	153
Mwarazi	0.50	0.353	101	0.220	63	0.115	33	0.018	5	288.00	0.725	209
Average	0.46	0.302	88	0.078	22	0.200	59	0.025	7	291.50	0.719	209
Over 2ha	0.58	0.343	100	0.078	22	0.239	70	0.027	8	293.50	0.613	180
Under 2ha	0.28	0.253	73	0	0	0.243	70	0.010	3	288.00	1.028	296

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.10 INPUT MATERIALS FOR MAIZE (1987-88)

Village	Planted area (ha)	Seed		Compound D		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.96	27	33.18	156	89.84	81	48.51	2.188	21.85	3.38	10.75
Choo	0.96	26	31.63	75	43.13	63	37.31	2.188	21.88	9.63	7.38
Nyachere	1.13	27	33.79	131	75.47	75	44.78	2.063	20.63	0.88	7.75
Nyamanhika	1.14	25	34.72	106	61.09	72	42.91	3.813	38.13	3.50	13.13
Mwarazi	1.06	31	38.27	219	125.78	91	54.10	2.875	28.75	1.56	10.50
Average	1.05	27	34.32	137	79.06	76	45.52	2.625	26.25	3.79	9.90
Over 2ha	1.32	33	41.66	175	100.63	85	50.75	3.500	35.00	6.85	11.95
Under 2ha	0.78	22	26.97	100	57.50	68	40.30	1.750	17.50	0.73	7.85

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.11 INPUT MATERIALS FOR COTTON (1987-88)

Village	Planted area (ha)	Seed		Compound L		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.90	27	5.64	163	105.98	81	48.51	1.250	12.50	101.38	7.00
Choo	0.50	14	3.00	93	60.56	82	49.04	0.714	7.14	72.43	9.00
Nyachere	1.02	28	5.95	142	92.40	100	59.70	0.917	9.17	97.17	8.17
Nyamanhika	0.90	21	4.33	150	97.83	88	52.24	2.313	23.13	119.38	10.50
Mwarazi	0.85	25	5.25	200	130.44	100	59.70	1.250	12.50	119.38	9.50
Average	0.83	23	4.83	150	97.44	90	53.84	1.289	12.89	102.00	8.83
Over 2ha	1.09	29	5.99	189	122.83	117	69.90	1.733	17.33	114.80	9.55
Under 2ha	0.57	18	3.68	109	70.66	62	36.82	0.850	8.50	90.25	8.23

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.12 INPUT MATERIALS FOR SUGARBEANS (1987-88)

Village	Planted area (ha)	Seed		Compound D		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.50	40	18.00	100	57.50	0	0	2.000	20.00	10.00	0
Choo	0.20	20	8.38	0	0	0	0	0	0	0	3.00
Nyachere	—	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	0.50	50	22.50	50	28.75	50	29.85	1.000	10.00	30.00	17.00
Average	0.40	37	16.29	50	28.75	17	9.95	1.000	10.00	13.33	6.67
Over 2ha	0.50	45	20.25	75	43.13	25	14.93	1.500	15.00	20.00	8.50
Under 2ha	0.20	20	8.38	0	0	0	0	0	0	0	3.00

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.13 INPUT MATERIALS FOR TOBACCO [AIR-CURED] (1987-88)

Village	Planted area (ha)	Seed		Compound B		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.50	0.005	10.00	400	289.20	0	0	0	0	0	0
Choo	—	—	—	—	—	—	—	—	—	—	—
Nyachere	—	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—	—
Average	0.50	0.005	10.00	400	289.20	0	0	0	0	0	0
Over 2ha	0.50	0.005	10.00	400	289.20	0	0	0	0	0	0
Under 2ha	—	—	—	—	—	—	—	—	—	—	—

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.14 INPUT MATERIALS FOR GROUNDNUTS (1987-88)

Village	Planted area (ha)	Seed		Compound L		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.20	20	45.00	50	32.61	0	0	0	0	0	3.00
Choo	0.30	15	33.75	0	0	0	0	0	0	0	1.50
Nyachere	0.30	25	56.25	50	32.61	0	0	0	0	0	1.50
Nyamanhika	—	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—	—
Average	0.27	20	45.00	33	21.74	0	0	0	0	0	2.00
Over 2ha	0.30	15	33.75	50	32.61	25	14.93	0	0	0	0
Under 2ha	0.27	23	52.50	17	10.87	0	0	0	0	0	3.00

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.15 INPUT MATERIALS FOR SUNFLOWER (1987-88)

Village	Planted area (ha)	Seed		Compound D		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	0.45	18	7.34	0	0	0	0	0	0	0	8.50
Choo	0.30	8	2.22	13	7.19	0	0	0	0	0	4.25
Nyachere	0.45	11	4.72	0	0	13	7.49	0.500	5.00	0	2.25
Nyamanhika	0.50	20	8.38	0	0	0	0	0	0	0	17.00
Mwarazi	0.40	20	8.38	50	28.75	0	0	2.000	20.00	0	6.00
Average	0.42	15	6.21	13	7.19	3	1.50	0.500	5.00	0	7.60
Over 2ha	0.52	17	6.79	10	5.75	0	0	0.400	4.00	0	6.30
Under 2ha	0.24	7	2.49	13	7.19	9	4.98	0.334	3.30	0	5.75

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.16 INPUT MATERIALS FOR RAPOKO [FINGER MILLET] (1987-88)

Village	Planted area (ha)	Seed		Compound D		A/N		Manure		Pesticde	Agri mackinery
		Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (kg)	Price (Z$)	Qty. (t)	Price (Z$)	(Z$)	(Z$)
Nyakomba	—	—	—	—	—	—	—	—	—	—	—
Choo	0.30	8	2.22	13	7.19	0	0	0	0	0	4.25
Nyachere	0.70	18	5.04	0	0	0	0	1.000	10.00	0	3.00
Nyamanhika	0.35	18	5.15	0	0	25	14.93	0	0	0	8.50
Mwarazi	0.25	8	2.16	31	17.97	0	0	0	0	3.75	5.13
Average	0.40	13	3.64	11	6.29	6	3.72	0.250	2.50	0.94	5.22
Over 2ha	0.58	17	4.91	16	8.99	6	3.73	0	0	1.88	5.44
Under 2ha	0.28	8	2.18	13	7.19	0	0	1.000	10.00	0	5.75

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers,
2) A/N = Ammonium nitrate, 3) Qty. = Quantity, and
4) Source = JICA questionnaires, 1989.

Table D.2.17 LABOUR INPUT FOR MAIZE (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.96	26.25	0	26.25	187.50	0	187.50	213.75	0	213.75
Choo	0.96	38.50	0	38.50	213.13	0	213.13	251.63	0	251.63
Nyachere	1.13	29.38	32.50	61.88	183.75	15.25	199.00	213.13	47.75	260.88
Nyamanhika	1.14	30.38	2.75	33.13	232.50	0	232.50	262.88	2.75	265.63
Mwarazi	1.06	31.13	0	31.13	215.00	7.13	222.13	246.13	7.13	253.25
Average	1.05	31.13	7.05	38.18	206.38	4.47	210.85	237.50	11.53	249.03
Over 2ha	1.32	38.45	13.00	51.45	243.75	4.00	247.75	282.20	17.00	299.20
Under 2ha	0.78	23.80	1.10	24.90	169.00	4.95	173.95	192.80	6.05	198.85

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.18 LABOUR INPUT FOR COTTON (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.90	26.25	0	26.25	256.25	0	256.25	282.50	0	282.50
Choo	0.50	23.14	0	23.14	177.43	0	177.43	200.57	0	200.57
Nyachere	1.02	33.33	38.33	71.66	267.33	30.33	297.66	300.66	68.66	369.32
Nyamanhika	0.90	22.88	2.75	25.63	236.00	2.50	238.50	258.88	5.25	264.13
Mwarazi	0.85	25.13	0	25.13	223.38	0	223.38	248.51	0	248.50
Average	0.83	26.15	8.22	34.37	232.08	6.57	238.65	258.23	14.79	273.02
Over 2ha	1.09	32.45	15.33	47.78	286.78	6.40	293.18	319.23	21.73	340.96
Under 2ha	0.57	19.82	1.10	20.92	179.08	6.73	185.81	198.90	7.83	206.73

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.19 LABOUR INPUT FOR SUGAR BEANS (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.50	15.00	0	15.00	180.00	0	180.00	195.00	0	195.00
Choo	0.20	18.00	0	18.00	56.00	0	56.00	74.00	0	74.00
Nyachere	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—
Mwarazi	0.50	15.00	0	15.00	90.00	0	90.00	105.00	0	105.00
Average	0.40	16.00	0	16.00	108.67	0	108.67	124.67	0	124.67
Over 2ha	0.50	15.00	0	15.00	135.00	0	135.00	150.00	0	150.00
Under 2ha	0.20	18.00	0	18.00	56.00	0	56.00	74.00	0	74.00

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.20 LABOUR INPUT FOR TABACCO [AIR-CURED] (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.50	15.00	0	15.00	360.00	0	360.00	375.00	0	375.00
Choo	—	—	—	—	—	—	—	—	—	—
Nyachere	—	—	—	—	—	—	—	—	—	—
Nyamanhika	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—
Average	0.50	15.00	0	15.00	360.00	0	360.00	375.00	0	375.00
Over 2ha	0.50	15.00	0	15.00	360.00	0	360.00	375.00	0	375.00
Under 2ha	—	—	—	—	—	—	—	—	—	0

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.21 LABOUR INPUT FOR GROUNDNUTS (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.20	7.00	0	7.00	20.00	0	20.00	27.00	0	27.00
Choo	0.30	6.50	0	6.50	41.00	0	41.00	47.50	0	47.50
Nyachere	0.30	12.50	—	12.50	75.00	15.00	90.00	87.50	15.00	102.50
Nyamanhika	—	—	—	—	—	—	—	—	—	—
Mwarazi	—	—	—	—	—	—	—	—	—	—
Average	0.27	8.67	0	8.67	45.33	5.00	50.33	54.00	5.00	59.00
Over 2ha	0.30	8.50	0	8.50	53.50	0	53.50	62.00	0	62.00
Under 2ha	0.27	9.33	0	9.33	48.33	10.00	58.33	57.66	10.00	67.66

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.22 LABOUR INPUT FOR SUNFLOWER (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	0.45	30.00	0	30.00	180.00	0	180.00	210.00	0	210.00
Choo	0.43	16.57	0	16.57	100.71	0	100.71	117.29	0	117.29
Nyachere	0.45	16.25	0	16.25	80.00	0	80.00	96.25	0	96.25
Nyamanhika	0.50	15.00	0	15.00	90.00	0	90.00	105.00	0	105.00
Mwarazi	0.40	12.00	0	12.00	80.00	0	80.00	92.00	0	92.00
Average	0.45	17.96	0	17.96	106.14	0	106.14	129.10	0	124.10
Over 2ha	0.54	21.05	0	21.05	108.75	0	108.75	129.80	0	129.80
Under 2ha	0.30	13.00	0	13.00	86.67	0	86.67	99.67	0	99.67

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.23 LABOUR INPUT FOR RAPOKO [FINGER MILLET] (1987-88)

Village	Planted area (ha)	Plough labour			Labour (Except plough)			Total labour		
		Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)	Family (Z$)	Hirde (Z$)	Total (Z$)
Nyakomba	—	—	—	—	—	—	—	—	—	—
Choo	0.30	14.25	0	14.25	109.25	0	109.25	123.50	0	123.50
Nyachere	0.70	22.50	0	22.50	150.00	15.00	165.00	172.50	15.00	187.50
Nyamanhika	0.35	10.50	0	10.50	70.00	0	70.00	80.50	0	80.50
Mwarazi	0.50	15.00	0	15.00	100.00	0	100.00	115.00	0	115.00
Average	0.46	15.56	0	15.56	107.31	3.75	111.06	122.87	3.75	126.62
Over 2ha	0.58	16.63	0	16.63	122.12	0	122.12	138.75	0	138.75
Under 2ha	0.28	16.25	0	16.25	100.00	15.00	115.00	116.25	15.00	131.25

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D.2.24 FRUITS AND VEGETABLES PRODUCTION (1987-88)

Village	Fruits					Vegetables				
	Planted area (ha)	Yield (kg)	Family use (%)	Sale (%)	Sale price (Z$)	Planted area (ha)	Yield (kg)	Family use (%)	Sale (%)	Sale price (Z$)
Nyakomba	0.066	47	93	7	22.00	0.058	37	93	7	9.88
Choo	0.018	115	100	0	0	0.016	103	96	4	16.38
Nyachere	0.034	58	96	4	25.00	0.061	92	90	10	11.25
Nyamanhika	0.058	156	87	13	26.25	0.042	126	86	14	12.50
Mwarazi	0.065	202	81	19	29.75	0.052	99	87	13	20.38
Average	0.048	116	91	9	20.60	0.046	91	90	10	14.08
Over 2ha	0.051	134	90	10	16.10	0.053	116	88	12	19.05
Under 2ha	0.056	97	92	8	25.10	0.039	67	94	6	9.10

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D. 2.25 LIVESTOCK PRODUCTION AND ITS USE (1987-88)

Village	Cattle				Goat				Pig				Chicken			
	No.	Family Use (%)	Sale (%)	Sale Price (Z$)	No.	Family Use (%)	Sale (%)	Sale Price (Z$)	No.	Family Use (%)	Sale (%)	Sale Price (Z$)	No.	Family Use (%)	Sale (%)	Sale Price (Z$)
Nyakomba	9.5	99.5	0.5	37.50	3.9	100.0	0	0	3.5	100.0	0	0	12.1	92.9	7.1	5.63
Choo	5.4	100.0	0	0	3.5	85.0	15.0	22.50	1.0	100.0	0	0	18.8	80.0	20.0	59.75
Nyachere	5.9	96.3	3.7	100.00	4.0	100.0	0	0	2.5	83.3	16.7	20.00	9.9	91.3	8.7	10.00
Nyamanhika	9.1	100.0	0	0	6.0	100.0	0	0	1.3	100.0	0	0	17.6	75.0	25.0	54.69
Mwarazi	5.3	100.0	0	0	3.5	100.0	0	0	1.4	100.0	0	0	17.9	95.0	5.0	9.38
Average	7.0	99.2	0.8	27.50	4.2	97.0	3.0	4.50	1.9	96.7	3.3	4.00	15.3	86.8	13.2	27.89
Over 2ha	8.7	99.8	0.2	15.00	5.7	95.0	5.0	9.00	2.2	90.0	10.0	8.00	20.4	75.7	24.3	47.88
Under 2ha	5.4	98.5	1.5	40.00	2.7	100.0	0	0	1.7	100.0	0	0	10.2	97.5	2.5	2.50

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D. 2.26 LIVESTOCK FEEDING (1987-88)

Village	Cattle				Goat				Pig			
	No.	Grazing (%)	Stover (%)	Concentrated Feed (%)	No.	Grazing (%)	Stover (%)	Concentrated Feed (%)	No.	Grazing (%)	Stover (%)	Concentrated Feed (%)
Nyakomba	9.5	93.4	5.3	1.3	3.9	99.9	0	0.1	3.5	60.0	0	40.0
Choo	5.4	93.1	3.8	3.1	3.5	100.0	0	0	1.0	10.0	5.0	85.0
Nyachere	5.9	96.6	3.3	0.1	4.0	100.0	0	0	2.5	36.7	16.7	46.6
Nyamanhika	9.1	89.4	6.3	4.3	6.0	99.8	0.2	0	1.3	29.4	4.4	66.2
Mwarazi	5.3	89.1	5.9	5.0	3.5	95.5	3.0	1.5	1.4	37.5	0	62.5
Average	7.0	92.3	4.9	2.8	4.2	99.1	0.6	0.3	1.9	34.7	5.2	60.1
Over 2ha	8.7	90.2	5.7	4.1	5.7	98.2	1.2	0.6	2.2	25.4	12.3	62.3
Under 2ha	5.4	94.6	4.1	1.3	2.7	99.9	0.1	0	1.7	50.9	0.2	48.9

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D. 2.27 HOUSEHOLD EXPENDITURE (1987-88)

Village	Food (Z$)	Houseing (Z$)	Clothing- (Z$)	Education (Z$)	Fuel (Z$)	Medical (Z$)	Others (Z$)	Total (Z$)
Nyakomba	1560.00	36.25	300.00	193.13	19.38	9.47	18.75	2136.98
Choo	955.50	29.88	227.50	178.25	22.53	25.88	81.38	1490.92
Nyachere	1092.00	20.75	318.75	369.13	16.98	13.13	7.50	1838.24
Nyamanhika	1397.50	60.63	287.50	544.13	20.23	11.31	27.88	2349.18
Mwarazi	1917.50	68.75	425.00	550.13	27.08	16.25	30.00	3034.71
Average	1384.50	43.25	411.75	366.95	21.24	15.21	27.10	2170.00
Over 2ha	1541.80	61.85	366.00	456.55	24.90	16.13	41.05	2508.28
Under 2ha	1227.20	24.65	257.50	277.35	17.57	14.29	13.15	1831.71

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

Table D. 2.28 NON-AGRICULTURAL INCOM (1987-88)

Village	Labour (Z$)	Service (Z$)	Business (Z$)	Others (Z$)	Rent out (Z$)	Gift (Z$)	Total (Z$)
Nyakomba	212.50	30.00	0	0	0	20.00	262.50
Choo	315.00	35.00	0.63	88.75	0	31.25	470.63
Nyachere	11.25	31.25	0	0	0	55.00	97.50
Nyamanhika	62.50	17.50	0	8.75	0	12.50	101.25
Mwarazi	0	150.00	725.00	75.00	0	15.00	965.00
Average	120.25	52.75	145.13	34.50	0	26.75	379.38
Over 2ha	39.50	43.00	250.00	58.00	0	37.00	427.50
Under 2ha	201.00	62.50	40.25	11.00	0	16.50	331.25

Note : 1) Over 2ha = Average of large farmers, Under 2ha = Average of small farmers, and
2) Source = JICA questionnaires, 1989.

ANNEX E

IRRIGATION AND DRAINAGE

ANNEX E IRRIGATION AND DRAINAGE

Table E.4.6.1 CALCULATION OF MONTHLY MEAN ET。

Month	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Total
ETO (mm/day)	6.55	5.5	4.62	4.44	4.3	4.3	3.92	3.42	2.95	3.23	4.3	5.25	52.78
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
ETO (mm/month)	203.1	165.0	143.2	137.6	120.4	133.3	117.6	106.0	88.5	100.1	133.3	157.5	1,605.6

Table E.4.6.2 Kc VALUES OF CROPS BY GROWING STAGES

Crops	Growing Stages			
	Initial	Crop development	Mid-season	Late
Cotton	0.40	0.8	1.2	0.65
Sugar beans 1	0.49	0.83	1.15	0.25
Sugar beans 2	0.56	0.84	1.15	0.25
Maize 1	0.40	0.79	1.15	0.6
Wheat 1	0.53	0.83	1.15	0.2
Wheat 2	0.56	0.85	1.15	0.2
Tobacco				
Groundnut				
Onion	0.49			
Potato	0.52	0.79	1.05	0.90
Cabbage	0.52	0.77	1.05	0.90

Table E.4.6.3 COEFFICIENT OF CORRECTED ETO FOR PEAK DEMAND

Item / Crops	C	ETC mm/day			Depth readily available soil water Sa x P x D			
					mm/m		m	mm
		D	J	F				
Cotton	1.09	5.6	5.5	5.2	160	0.65	1.2	124.8
		J.	A.					
Sugarbeans 2	1.12	3.4	3.3		-do-	0.45	0.6	43.2
		N	D					
Maize 1	1.15	5.1	5.5		-do-	0.60	0.7	67.2
		M.	A.					
Sugarbeans 1	1.19	3.0	4.1		-do-	0.45	0.6	43.2
		A.	S.					
Wheat 2	1.06	5.0	4.5		-do-	0.55	1.2	105.6
Tobacco					-do-	0.35	1.0	56.0
		J.	J.					
Wheat 1	1.06	2.9	3.8		-do-	0.55	1.2	105.6
		J.	A.					
Onion	1.12	3.5	4.0		-do-	0.25	0.5	20.0
		N.	D.					
Groundnut	1.16	5.4	4.8		-do-	0.45	0.8	57.6
		M.	J.					
(Cabbage)	1.13	3.2	3.2		-do-	0.45	0.5	36.0

Table E.4.6.4 MEAN Kc VALUE PER MONTH BY CROPS

Crops	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.
Cotton	0.35	0.73	1.21	1.23	1.21	0.91	0.33					
Sugar beans 1						0.7	1.05	0.85				
Sugar beans 2									0.72	1.05	0.76	
Maizl.	0.41	0.93	1.18	0.94	0.37							
Wheat 1.								0.51	0.98	1.17	0.6	
Wheat 2.	0.13								0.33	0.88	1.17	0.86
Tobacco												
Onion						0.46	0.61	0.93	1.07	1.07	0.94	0.67
Groundnut	0.35	0.76	1.05	1.06	0.62							
Cabbage						0.56	1.01	1.07	0.89			

Table E.4.6.6 MONTHLY RAINFALL (Nymaropa Irrigation Station ; LAT :LAT=17.52 S LONG=32.57 E ALT=840m GRID VR 9525)

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Total
1971/72	19.0	106.1	144.7	387.4	130.3	157.9	47.0	32.1	-	-	0.3	-	1,024.8
1972/73	19.2	31.2	78.6	114.2	123.4	27.1	29.6	-	-	1.9	0.7	-	425.9
1973/74	13.2	201.3	187.3	268.1	454.6	256.7	33.4	67.0	-	10.6	2.0	1.6	1,495.8
1974/75	1.3	100.9	345.7	249.7	247.9	17.3	36.7	0.8	-	-	0.8	-	1,001.1
1975/76	8.0	80.8	165.8	216.8	427.3	222.9	9.5	9.0	-	-	-	-	1,140.1
1976/77	46.9	13.8	192.4	136.5	270.5	187.3	1.0	-	-	3.4	-	18.4	870.2
1977/78	-	195.5	255.6	333.5	173.8	280.7	25.0	0.5	-	9.0	-	-	1,273.6
1978/79	23.0	66.5	*	*	*	*	*	*	*	*	*	*	(89.5)
1979/80	10.5	85.1	93.6	110.4	246.5	83.0	42.8	-	0.4	-	-	38.2	710.5
1980/81	27.2	51.2	357.0	272.6	425.4	114.6	160.3	-	-	3.2	-	-	1,411.5
1981/82	23.5	123.2	158.0	239.5	234.7	44.0	22.7	-	-	-	-	-	845.6
1982/83	101.1	16.9	63.9	73.5	160.1	49.0	4.0	3.5	7.0	9.0	-	-	488.0
1983/84	5.5	17.9	145.2	41.8	217.4	100.2	47.4	-	-	-	-	19.4	594.8
1984/85	28.4	96.8	198.3	445.8	188.5	372.1	16.3	-	8.5	-	-	4.1	1,358.8
1985/86	39.6	175.3	317.8	452.2	94.4	61.8	43.9	-	-	-	-	-	1,185.0
1986/87	48.8	24.6	201.9	170.7	61.7	42.5	3.6	-	-	-	4.1	-	557.9
1987/88	15.3	63.5	199.4	165.8	336.4	271.0	44.6	10.5	8.4	3.5	-	-	1,113.4
1988/89	95.8	67.5	79.5	173.3	379.7	56.1	19.0	10.7	-	-	7.7	-	889.3
													(89.5)
Total	526.3	1,518.1	3,184.7	3,851.8	4,172.6	2,344.2	586.8	134.1	24.3	40.6	15.6	81.7	16,391.3
Average	29.2	84.3	187.3	226.6	245.4	137.9	34.5	7.9	1.4	2.4	0.9	4.8	955.9

Table E.4.6.7 CALCULATION OF DEPENDABLE RAINFALL

1.Year	2.R:mm/given month							3.Rm:sequence						
	OCT	NOV	DEC	JAN	FEB	MAR	APR	OCT	NOV	DEC	JAN	FEB	MAR	APR
1971/72	19.0	106.1	147.7	387.4	130.3	157.9	47.0	101.1	201.3	357.0	452.2	454.6	372.1	160.3
1972/73	19.2	31.2	78.6	114.2	123.4	27.9	29.6	95.8	195.5	345.7	445.8	427.3	280.7	47.4

1. Year	2. R:mm/given month							3. Rm:sequence						
	OCT	NOV	DEC	JAN	FEB	MAR	APR	OCT	NOV	DEC	JAN	FEB	MAR	APR
1973/74	13.2	201.3	187.3	268.1	454.6	256.7	33.4	48.8	175.3	317.8	387.4	425.4	271.0	47.0
1974/75	1.3	100.9	345.7	249.7	247.9	17.3	36.7	46.9	123.2	255.6	333.5	379.7	256.7	44.6
1975/76	8.0	80.8	165.4	216.8	427.3	222.9	9.5	39.6	106.1	201.9	272.6	336.4	222.9	43.9
1976/77	46.9	13.8	192.4	136.5	270.5	187.3	1.0	28.4	100.9	199.4	268.1	270.5	187.3	42.8
1977/78	0	195.5	255.	333.5	173.8	280.7	25.0	27.2	96.8	198.3	249.7	247.9	157.9	36.7
1978/79	23.0	66.5						23.5	85.1	192.4	239.5	246.5	114.6	33.4
1979/80	10.5	85.1	93.6	110.4	246.5	83.0	42.8	23.0	80.8	187.3	216.8	234.7	100.2	29.6
1980/81	27.2	51.2	357.0	272.6	425.4	114.6	160.3	19.2	67.5	165.8	173.3	217.4	83.0	25.0
1981/82	23.5	123.2	158 0	239.5	234.7	44.0	22.7	19.0	66.5	158.0	170.7	188.5	61.8	22.7
1982/83	101.1	16.9	63.9	73.5	160.1	49.0	4.0	15.3	63.5	145.2	165.8	173.8	56.1	19.0
1983/84	5.5	17.9	145.2	41.8	217.4	100.2	47.4	13.2	51.2	144.7	136.5	160.1	49.0	16.3
1984/85	28.4	96.8	1983	445.8	188.5	372.1	16.3	10.5	31.2	93.6	114.2	130.3	44.0	9.5
1985/86	39.6	175.3	317.8	452.2	94.4	61.8	43.9	8.0	24.6	79.5	110.4	123.4	42.5	4.0
1986/87	48.3	24.6	201.9	107.7	61.7	42.5	3.6	5.5	17.9	78.6	73.5	94.4	27.1	3.6
1987/88	15.3	63.5	199.4	165.8	336.4	271.0	44.6	1.3	16.9	63.9	41.8	61.7	17.3	1.0
1988/89	95.8	67.5	79.5	173.3	379.7	56.1	19.0	0	13.8					

4. Rm						
OCT	NOV	DEC	JAN	FEB	MAR	APR
10.1	14.2	18.9	21.3	21.3	19.3	12.7
9.8	14.0	18.6	21.1	20.7	16.8	6.9
7.0	13.2	17.8	19.7	20.6	16.5	6.9
6.8	11.1	16.0	18.3	19.5	16.0	6.7
6.3	10.3	14.2	16.5	18.3	14.9	6.6
5.3	10.0	14.1	16.4	16.4	13.7	6.5
5.2	9.8	14.1	15.8	15.7	12.6	6.1
4.8	9.2	13.9	15.5	15.7	10.7	5.8
4.8	9.0	13.7	14.7	15.3	10.0	5.4
4.4	8.2	12.9	13.2	14.7	9.1	5.0
4.4	8.2	12.6	13.1	13.7	7.8	4.8
3.9	8.0	12.0	12.9	13.2	7.5	4.4
3.6	7.2	12.0	11.7	12.7	7.0	4.0
3.2	5.6	9.7	10.7	11.4	6.6	3.1
2.8	5.0	8.9	10.5	11.1	6.2	2.0

5. m : number	6. Fa:plotting position
1	5
2	11
3	16
4	21
5	26
6	32
7	37
8	42
9	47
10	53
11	58
12	63
13	68
14	74
15	79

4. Rm							5. m : number	6. Fa: plotting position
OCT	NOV	DEC	JAN	FEB	MAR	APR		
2.3	4.2	8.7	8.6	9.7	5.2	1.9	16	84
1.1	4.1	8.0	6.5	7.9	4.2	1.0	17	89
0	3.7						18	95

Notes:
- Tabulate rainfall totals for given period (line 2)
- Arrange data in descending magnitude and give rank number m (lines 3 and 5)
- Tabulate plotting position Fa using 100 m / (N + 1), N is total data number, m is rank number with m = 1 for the highest value (line 6)
- Prepare vertical scale and plot rainfall according to Fa position on log-nomal probability paper (fig. E·4·6·3)

Table E.4.6.8 CROP WATER AND IRRIGATION REQUIREMENTS - NYAKOMBA (1)

Item		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARKS
Mean ETO mm		203.1	165.0	143.2	137.6	120.4	133.3	117.6	106.0	88.5	100.0	133.3	157.5	1,605.6	
Mean rainfall mm		29.2	84.3	187.3	226.6	245.4	137.9	34.5	7.9	1.4	2.4	0.9	4.8	955.9	
Estimated 80% dependable rainfall mm		4.8	30.1	102.0	108.2	125.4	38.4	9.0	0	0	0	0	0	417.9	
Effective dependable rainfall at p-80 mm		Refer to attached table					0	0	0	0	0				
Mean ETcrop mm/month															
Cotton		47.4	120.5	173.3	169.2	145.7	121.3	38.8						816.2	
Sugar beans 2										63.7	105.1	101.3		270.1	
Maize		83.3	153.5	169.0	129.3	29.7								564.8	
Sugar beans 1							93.3	123.5	90.1					306.9	
Wheat 2		8.8								31.3	88.1	156.0	135.5	419.7	
Tobacco			60.0	100.0	215.0	73.0	52.0							500.0	
Wheat 1									54.1	86.7	117.1	81.3		349.2	
Maize		83.3	153.5	169.0	129.3	29.7								564.8	
Onion							20.4	71.7	98.6	94.7	107.1	125.3	52.8	570.6	
Groundnuts		23.7	125.4	150.4	145.9	48.0								493.4	
Wheat 2		8.8								31.3	88.1	156.0	135.5	419.7	
(Cabbage)								(65.9)	(107.1)	(94.7)	(59.4)			(327.1)	Alternative crop with onion
Corrected ETC for peak demand mm/month															
Cotton	c=1.09	47.4	120.5	188.9	184.4	158.8	121.3	38.8						860.1	
Sugar beans 2	c=1.12									63.7	117.7	113.5		294.9	
Maze	c=1.15	83.3	176.5	194.9	135.8	29.7								620.2	
Sugar beans 1	c=1.19						93.3	147.0	70.9					311.2	
Wheat 2	c=1.06	8.8								31.3	88.1	165.4	143.6	437.2	
Tobacco			60.0	100.0	215.0	73.0	52.0							500.0	
Wheat 1	c=1.06								54.1	91.9	124.1	81.3		351.4	
Onion	c=1.12						20.4	71.7	98.6	94.7	120.0	140.3	52.8	598.5	
Groundnuts	c=1.16	23.7	125.4	174.5	169.2	48.0								540.8	
Wheat 2	c=1.06	8.8								31.3	88.1	165.4	143.6	437.2	
(Cabbage)	c=1.13							65.9	121.0	107.0	59.4			(362.7)	

Item		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARKS
Net irrigation requirement Using effective dependable rainfall for 1 ha under cultivation mm/month															
Cotton	30%	13.2	28.6	31.4	30.5	19.5	27.2	9.2						159.6	
Sugar beans 2	30%									19.1	35.3	34.1		88.5	
Maize	30%	24.1	45.3	34.8	18.5	1.7								124.4	
Sugar beans 1	30%						20.5	41.6	21.3					83.4	
Wheat 2	30%	2.2								9.4	26.4	49.6	43.1	130.7	
Tobacco	30%		12.2	11.3	39.2	0	10.9							73.6	
Wheat 1	30%								16.2	27.6	37.2	24.4		105.4	
Maize	5%	4.0	7.6	5.8	3.1	0.3	0							20.8	
Onion	5%						0.7	3.3	4.9	4.7	6.0	7.0	2.6	29.2	
Groundnuts	5%	1.1	4.9	5.0	5.0	0								16.0	
Wheat 2	5%	0.4								1.6	4.4	8.3	7.2	21.9	
(Cabbage)	5%							(3.0)	(5.6)	(5.4)	(3.0)			(17.0)	
et irrigation requirement mm/month/ha		45.0	98.6	88.3	96.3	21.5	59.3	54.1 (3.0)	42.4 (5.6)	62.4 (5.4)	109.3 (3.0)	123.4	52.9	853.5 (17.0)	
ross irrigation requirement mm/month/ha (Ea;0.65)		69.2	151.7	135.8	148.2	33.1	91.2	83.2	65.2	96.0	168.2	189.8	81.4	1,313.0	
rrigation supply requirements 1000 m³															
Block A	115 ha	79.6	174.5	156.2	170.4	38.1	104.9	95.7	75.0	110.4	193.4	218.3	93.6	1,510.1	
A-1	10 ha	6.9	15.2	13.6	14.8	3.3	9.1	8.3	6.5	9.6	16.8	19.0	8.1		
A-2	105 ha	72.7	159.3	142.6	155.6	34.8	95.8	87.4	68.5	100.8	176.6	199.3	85.5		
Block B	128 ha	88.5	194.2	173.8	189.7	42.4	116.8	106.5	83.5	122.9	215.3	242.9	104.2	1,680.7	
B-1	38 ha	26.3	57.6	51.6	56.3	12.6	34.7	31.6	24.8	36.5	63.9	72.1	30.9		
B-2	19 ha	13.1	28.8	25.8	28.2	6.3	17.3	15.8	12.4	18.2	32.0	36.1	15.5		
B-3	71 ha	49.1	107.8	96.4	105.2	23.5	64.8	59.1	46.3	68.2	119.4	134.7	57.8		
Block C	140 ha	96.8	212.3	190.1	207.6	46.4	127.8	116.5	91.2	134.4	235.6	265.7	114.0	1,838.4	
C-1	46 ha	31.8	69.7	62.5	68.2	15.2	42.0	38.3	30.0	44.2	77.4	87.3	37.4		
C-2	47 ha	32.5	71.3	63.8	69.7	15.6	42.9	39.1	30.6	45.1	79.1	89.2	38.3		
C-3	47 ha	32.5	71.3	63.8	69.7	15.6	42.9	39.1	30.6	45.1	79.1	89.2	38.3		

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARKS
Block D	203 ha	140.5	308.0	275.7	300.8	67.2	185.2	168.9	132.3	194.9	341.4	385.3	165.2	2,665.4	
D-1	122 ha	84.4	185.1	165.7	180.8	40.4	111.3	101.5	79.5	117.1	205.2	231.6	99.3		

	D-2	81 ha	56.1	122.9	110.0	120.0	26.8	73.9	67.4	52.8	77.8	136.2	153.7	65.9	
Block	E	94 ha	65.0	142.6	127.7	139.3	31.1	85.7	78.2	61.3	90.3	158.1	178.4	76.5	1,234.2
	E-1	43 ha	29.7	65.2	58.4	63.7	14.2	39.2	35.8	28.0	41.3	72.3	81.6	35.0	
	E-2	51 ha	35.3	77.4	69.3	75.6	16.9	46.5	42.4	33.3	49.0	85.8	96.8	41.5	
Total		680 ha	470.4	1,031.6	923.5	1,007.8	225.2	620.4	565.8	443.3	652.9	1,143.8	1,290.6	553.5	8,928.8

Table E.4.6.8.2 CALCULATION OF NET IRRIGATION REQUIREMENTS USING EFFECTIVE DEPENDABLE RAINFALL AT P=80%

Month	Items	Cotton	Sugar beanss 2	Maize	Sugar beans 1	Weat 2	Tobacco	Weat 1	Onion	Groundnuts
OCT	1. ETC mm/month	47.4	-	83.3	-	8.8	-	-	-	23.7
	2. R P-80 mm/month	4.8		4.8		4.8				4.8
	3. Corrected R P-80 mm/month	3.2		3.2		1.6				1.6
	4. Re mm/month	3.2		3.2		1.6				1.6
	5. P. Sa. D mm	124.8		67.2		105.6				57.6
	6. C	1.04		0.98		1.03				0.956
	7. ReC=Re. C mm/month	3.3		3.1		1.6				1.5
	8. IRQ=ETC-ReC	44.1		80.2		7.2				22.2
NOV	1 ETC mm/month	120.5	-	176.5	-	-	60.0	-	-	125.4
	2. RP-80 mm/month	30.1		30.1			30.1			30.1
	3. Corrected Rp-80 mm/month	30.1		30.1			30.1			30.1
	4. Re mm/month	24.1		26.0			20.7			27.2
	5 p. Sa. D mm	124.8		67.2			56.0			57.6
	6. C	1.04		0.98			0.932			0.956
	7. ReC= Re. C mm/month	25.1		25.5			19.3			26.0
	8. IRQ= ETC-ReC	95.4		151.0			40.7			98.2

Month	Item	Cotton	Sugar beans 2	Maize	Sugar beans 1	Tobacco	Onion	Groundnuts
Dec	1. ETC mm/month	188.9	-	194.9	-	100.0		174.5
	2. RP-80 mm/month	102.0		102.0		102.0		102.0
	3. Corrected RP-80 mm/month	102.0		102.0		102.0		102.0
	4 Re mm/month	79.5		79.8		67.1		78.9

	5. P. Sa. D mm	124.8	67.2	56.0	57.6
	6. C	1.04	0.98	0.932	0.956
	7. ReC = Re. C mm/month	84.2	78.8	62.5	75.4
	8. IRQ = ETC - ReC mm/month	104.7	116.1	37.5	99.1
Jan	1. ETC mm/month	184.4	135.8	215.0	169.2
	2. RP-80 mm/month	108.2	108.2	108.2	108.2
	3. Corrected RP-80 mm/month	108.2	108.2	108.2	108.2
	4 Re mm/month	79.5	75.7	90.4	72.4
	5. P. Sa. D mm	124.8	67.2	56.0	57.6
	6. C	1.04	0.98	0.932	0.956
	7. ReC = Re. C mm/month	82.7	74.5	84.3	69.2
	8. IRQ = ETC - ReC mm/month	101.7	61.6	130.7	100.0
Feb	1. ETC mm/month	158.8	29.7	73.0	48.0
	2. RP-80 mm/month	125.4	125.4	125.4	125.4
	3. Corrected RP-80 mm/month	125.4	85.1	90.4	80.6
	4 Re mm/month	90.2	24.7	56.0	53.2
	5. P. Sa. D mm	124.8	67.2	56.0	57.6
	6. C	1.04	0.98	0.932	0.956
	7. ReC = Re. C mm/month	93.8	24.2	84.3	50.5
	8. IRQ = ETC - ReC mm/month	65.0	5.5	0	0

		Cotton	Sugar beans 1	Tobacco	Onion	Cabbage
Mar	1. ETC mm /month	121.3	93.3	52.0	20.4	
	2 RP-80 mm/month	38.4	38.4	38.4	38.4	
	3 Corrected RP-80 mm/month	38.4	38.4	24.8	12.4	
	4 Re mm/month	29.3	28.2	17.0	8.0	
	5 P.Sa.D mm/month	124.8	43.2	56.0	20.0	
	6 C	1.04	0.89	0.932	0.73	
	7 Re.C= Re.C mm/month	30.5	25.1	15.8	5.0	
	8 IRQ=ETC - ReC mm/month	90.8	68.2	36.2	14.6	
Apr	1. ETC mm /month	38.8	147.0		71.7	65.9
	2 RP-80 mm/month	9.0	9.0		9.0	9.0
	3 Corrected RP-80 mm/m	9.0	9.0		9.0	9.0
	4 Re mm/month	8.0	8.0		8.0	8.0
	5 P.Sa.D mm/month	124.8	43.2		20.0	36.0
	6 C	1.04	0.89		0.73	0.85
	7 Re.C= Re.C mm/month	8.3	7.1		5.0	6.8
	8 IRQ=ETC- ReC mm/month	30.5	139.9		65.9	59.1

Note; ETC: Monthly mean crop water requirement , RP-80; Estimated 80% dependable rainfall, Re; Effective rainfall, p.Sa; available soil water, C: Storage factor as related to effective storage, IRQ; Net irrigation requirement

Table E.4.6.3 CROP WATER AND IRRIGATION REQUIREMENTS - NYAKOMBA (2)

Item		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARKS
Mean ETO mm		203.1	165.0	143.2	137.6	120.4	133.3	117.6	106.0	88.5	100.0	133.3	157.5	1,605.6	
Mean rainfall mm		29.2	84.3	187.3	226.6	245.4	137.9	34.5	7.9	1.4	2.4	0.9	4.8	955.9	
Estimated 50% dependable rainfall mm		23.0	75.7	182.0	216.1	225.0	116.6	28.1	0	0	0	0	0	866.8	
Effective dependable rainfall at p-50 mm		Refer to attached table					0	0	0	0	0				
Mean ETcrop mm/month															
Cotton		47.4	120.5	173.3	169.2	145.7	121.3	38.8						816.2	
Sugar beans 2										63.7	105.1	101.3		270.1	
Maize		83.3	153.5	169.0	129.3	29.7								564.8	
Sugar beans 1							93.3	123.5	90.1					306.9	
Wheat 2		8.8								31.3	88.1	156.0	135.5	419.7	
Tobacco			60.0	100.0	215.0	73.0	52.0							500.0	
Wheat 1									54.1	86.7	117.1	81.3		349.2	
Maize		83.3	153.5	169.0	129.3	29.7								564.8	
Onion							20.4	71.7	98.6	94.7	107.1	125.3	52.8	570.6	
Groundnuts		23.7	125.4	150.4	145.9	48.0								493.4	
Wheat 2		8.8								31.3	88.1	156.0	135.5	419.7	
(Cabbage)	(Alternative with onion)							(65.9)	(107.1)	(94.7)	(59.4)			(327.1)	
Corrected ETC for peak demand mm/month															
Cotton	c=1.09	47.4	120.5	188.9	184.4	158.8	121.3	38.8						860.1	
Sugar beans 2	c=1.12									63.7	117.7	113.5		294.9	
Maize	c=1.15	83.3	176.5	194.9	135.8	29.7								620.2	
Sugar beans 1	c=1.19						93.3	147.0	70.9					311.2	
Wheat2	c=1.06	8.8								31.3	88.1	165.4	143.6	437.2	
Tobacco			60.0	100.0	215.0	73.0	52.0							500.0	
Wheat1	c=1.06								54.1	91.9	124.1	81.3		351.4	
Onion	c=1.12						20.4	71.7	98.6	94.7	120.0	140.3	52.8	598.5	
Groundnuts	c=1.16	23.7	125.4	174.5	169.2	48.0								540.8	
Wheat2	c=1.06	8.8								31.3	88.1	165.4	143.6	437.2	
(cabbage)	c=1.13							65.9	121.0	107.0	59.4			(362.7)	

Item		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARKS
Net irrigation requirement using effective dependable rainfall for 1 ha under cultivation mm/month															
Cotton	30%	11.1	19.3	14.9	10.7	5.7	11.9	3.4						76.9	
Sugar beans 2	30%									19.1	31.5	30.4		81.0	
Maize	30%	21.7	32.6	19.8	2.5	1.3								77.9	
Sugar beans 1	30%						7.5	36.7	21.3					65.5	
Wheat 2	30%	0.3								9.4	26.4	46.8	40.7	123.6	
Tobacco	30%		4.6	2.0	21.1	6.2	2.5							36.4	
Wheat 1	30%								16.2	26.0	35.1	24.4		101.7	
Maize	5%	3.6	5.4	3.3	0.4	0.2	0							12.9	
Onion	5%						0	2.9	4.9	4.7	5.4	6.3	2.6	26.8	
Groundnuts	5%	0.4	3.3	2.5	3.3	0.2								9.7	
Wheat 2	5%	0								1.6	4.4	7.8	6.8	20.6	
(Cabbage)	5%							(2.6)	(5.4)	(4.7)	(3.0)			(15.7)	
Net irrigation requirement mm/month/ha		37.1	65.2	42.5	38.0	13.5	21.9	43.0	42.4	60.8	102.8	115.7	50.1	633.0	
								(2.6)	(5.4)	(4.7)	(3.0)			(15.7)	
Gross irrigation requirement mm/month/ha (Ea;0.65)		57.1	100.3	65.4	58.5	20.8	33.7	66.2	65.2	93.5	158.2	178.0	77.1	974.0	
Irrigation supply requirements 1000 m^3															
Block A	115 ha	65.7	115.3	75.2	67.3	23.9	38.8	76.1	75.0	107.6	181.9	204.7	88.7	1,120.2	
A-1	10 ha	5.7	10.0	6.5	5.9	2.1	3.4	6.6	6.5	9.4	15.8	17.8	7.7		
A-2	105 ha	60.0	105.3	68.7	61.4	21.8	35.4	69.5	68.5	98.2	166.1	186.9	81.0		
Block B	128 ha	73.0	128.4	83.7	74.8	26.7	43.1	84.8	83.5	119.7	202.5	227.8	98.6	1,246.6	
B-1	38 ha	21.7	38.1	24.9	22.2	7.9	12.8	25.2	24.8	35.5	60.1	67.6	29.3		
B-2	19 ha	10.8	19.1	12.4	11.1	4.0	6.4	12.6	12.4	17.8	30.1	33.8	14.6		
B-3	71 ha	40.5	71.2	46.4	41.5	14.8	23.9	47.0	46.3	66.4	112.3	126.4	54.7		
Block C	140 ha	79.9	140.3	91.5	81.9	29.2	47.1	92.7	91.2	130.8	221.6	249.3	107.9	1,363.4	
C-1	46 ha	26.3	46.1	30.1	26.9	9.6	15.5	30.5	30.0	43.0	72.8	81.9	35.5		
C-2	47 ha	26.8	47.1	30.7	27.5	9.8	15.8	31.1	30.6	43.9	74.4	83.7	36.2		
C-3	47 ha	26.8	47.1	30.7	27.5	9.8	15.8	31.1	30.6	43.9	74.4	83.7	36.2		

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	REMARK
Block D	203 ha	116.0	203.6	132.8	118.8	42.2	68.4	134.4	132.3	189.8	321.1	361.4	156.6	1,977.4	
D-1	122 ha	69.7	122.4	79.8	71.4	25.4	41.1	80.8	79.5	114.1	193.0	217.2	94.1		
D-2	81 ha	46.3	81.2	53.0	47.4	16.8	27.3	53.6	52.8	75.7	128.1	144.2	62.5		
Block E	94 ha	53.7	94.3	61.5	55.0	19.5	31.7	62.3	61.3	87.9	148.7	167.3	72.5	915.7	
E-1	43 ha	24.6	43.1	28.1	25.2	8.9	14.5	28.5	28.0	40.2	68.0	76.5	33.2		
E-2	51 ha	29.1	51.2	33.4	29.8	10.6	17.2	33.8	33.3	47.7	80.7	90.8	39.3		
Total	680 ha	388.3	681.9	444.7	397.8	141.5	229.1	450.3	433.3	635.8	1,075.8	1,210.5	524.3	6,623.3	

Table 8.4.6.9.2 CALCULATION OF NET IRRIGATION REQUIREMENTS USING EFFECTIVE DEPENDABLE RAINFALL AT P=50%

Month	Items	Cotton	Sugar beans 2	Maize	Sugar beans 1	Wheat2	Tobacco	Wheat1	Onion	Groundnuts
OCT	1. ETC mm/month	47.4	-	83.3	-	8.8	-	-	-	23.7
	2. R P-50 mm/month	23.0		23.0		23.0				23.0
	3. Corrected R P-50 mm/month	15.3		15.3		7.7				23.0
	4. Re mm/month	10.0		11.3		7.7				17.5
	5. P. Sa. D mm	124.8		67.2		105.6				57.6
	6. C	1.04		0.98		1.03				0.956
	7. ReC=Re. C mm/month	10.4		11.1		7.9				16.7
	8. IRQ=ETC-ReC	37.0		72.2		0.9				7.0
NOV	1 ETC mm/month	120.5	-	176.5	-	-	60.0	-	-	125.4
	2. RP-50 mm/month	75.7		75.7			75.7			75.7
	3. Corrected Rp-50 mm/month	75.7		75.7			75.7			75.7
	4. Re mm/month	54.1		69.1			48.1			63.2
	5 p. Sa. D mm	124.8		67.2			56.0			57.6
	6. C	1.04		0.98			0.932			0.956
	7. ReC= Re. C mm/month	56.3		67.7			44.8			60.4
	8. IRQ= ETC-ReC	64.2		108.8			15.2			65.0

Month	Item	Cotton	Sugar beans 2	Maize	Sugar beans 1	Tobacco	Onion	Groundnuts
Dec	1. ETC mm/month	188.9	-	194.9	-	100.0		174.5
	2. RP-50 mm/month	182.3		182.3		182.3		182.3
	3. Corrected RP-50 mm/month	182.3		182.3		182.3		182.3
	4 Re mm/month	134.0		131.5		100.0		130.0
	5. P. Sa. D mm	124.8		67.2		56.0		57.6
	6. C	1.04		0.98		0.932		0.956
	7. ReC = Re. C mm/month	139.4		128.9		93.2		124.3
	8. IRQ = ETC - ReC mm/month	49.5		66.0		6.8		50.2
Jan	1. ETC mm/month	184.4		135.8		215.0		169.2
	2. RP-50 mm/month	216.1		216.1		216.1		216.1
	3. Corrected RP-50 mm/month	216.1		216.1		216.1		216.1
	4 Re mm/month	143.2		130.1		155.4		107.7
	5. P. Sa. D mm	124.8		67.2		56.0		57.6
	6. C	1.04		0.98		0.932		0.956
	7. ReC = Re. C mm/month	148.9		127.5		144.8		103.0
	8. IRQ = ETC - ReC mm/month	35.5		8.3		70.2		66.2
Feb	1. ETC mm/month	158.8		29.7		73.0		48.0
	2. RP-50 mm/month	225.0		225.0		22504		225.0
	3. Corrected RP-50 mm/month	225.0		150.0		225.0		150.0
	4 Re mm/month	134.9		25.9		56.0		46.0
	5. P. Sa. D mm	124.8		67.2		56.0		57.6
	6. C	1.04		0.98		0.932		0.956
	7. ReC = Re. C mm/month	140.3		25.4		52.2		44.0
	8. IRQ = ETC - ReC mm/month	65.0		4.3		20.8		4.0

		Cotton	Sugar beans 1	Tobacco	Onion	Cabbage
Mar	1. ETC mm /month	121.3	93.3	52.0	20.4	
	2 RP-50 mm/month	116.6	116.6	116.6	116.6	
	3 Corrected RP-50 mm/month	116.6	116.6	75.3	38.7	
	4 Re mm/month	78.5	76.9	46.8	20.4	
	5 P.Sa.D mm/month	124.8	43.2	56.0	20.0	
	6 C	1.04	0.89	0.932	0.73	
	7 Re.C= Re.C mm/month	81.6	68.4	43.6	20.4	
	8 IRQ=ETC - ReC mm/month	39.7	24.9	8.4	0	
Apr	1. ETC mm /month	38.8	147.0		71.7	65.9
	2 RP-50 mm/month	28.1	28.1		28.1	28.1
	3 Corrected RP-50 mm/m	28.1	28.1		28.1	28.1
	4 Re mm/month	26.3	26.2		20.1	16.1
	5 P.Sa.D mm/month	124.8	43.2		20.0	36.0
	6 C	1.04	0.89		0.73	0.85
	7 Re.C= Re.C mm/month	27.4	23.3		14.7	13.7
	8 IRQ=ETC- ReC mm/month	11.4	122.4		57.0	52.2

Note; ETC: Monthly mean crop water requirement , RP-50; Estimated 50% dependable rainfall, Re; Effective rainfall, p.Sa; available soil water,
C: Storage factor as related to effective storage, IRQ; Net irrigation requirement

Table 6.4.6.10 CALCULATION OF DEPTH OF IRRIGATION APPLICATION (d) d=(p.Sa).D/Ea

Crop	Month	Soil Texture	ETcrop mm/day	Rooting Depth D m	Application Efficiency (Ea)	Available Soil water (Sa)mm/m 2/	Fraction of Available Soil Water(p) 1/	Readily Available Soil Water(p.Sa) mm/m	(p.Sa).D mm	Depth of Irrigation (d) mm
Sugar beans 2	JUL	Fine	4.2	0.6	0.65	160	0.45	72.0	43.2	66.5
	AUGg	texture soil	5.5	-do-	-do-	-do-	-do-	-do-	-do-	-do-
Wheat 2	Jul	-do-	4.0	1.2	-do-	-do-	0.55	88.0	105.6	162.5
	Aug	-do-	5.2	-do-	-do-	-do-	-do-	-do-	-do-	-do-
Wheat 1	Jul	-do-	4.0	-do-	-do-	-do-	-do-	-do-	-do-	-do-
	Aug	-do-	5.2	-do-	-do-	-do-	-do-	-do-	-do-	-do-
Onion	Jul	-do-	3.4	0.5	-do-	-do-	0.25	-40-		
	Aug	-do-	5.1	0.5	-do-	-do-	-do-	-do-	90	-do-

1/ Numeric of Available soil water (Sa) is determined from the result of measure of soil water holding capacity as follows:
Sa : (36% - 20%) x 1000mm = 16% x 1000mm = 160 mm/m
where 36% = measured soil moisture percentage in the field at 24 hours after irrigation (refer to table
20% = restricted moisture percentage for crops in fine textured soil.

2/ Numerics of fraction of available soil water (P) are derived from Table 39 in FAO IRRIGATION AND DRAINAGE PAPER 24 revised 1977.

Table E.4.6.11 CALCULATION OF STREAM SIZE(q) AND SUPPLY DURATION FOR FIELD SCHEDULES

Crop	Month	Irrigation Area	Intake Rate mm/m	Depth of Irrigation(d) mm	Irrigation Duration(i) days	Land Slope %	Irrigation Method	Length of Furrow m	Spacing m
Sugar	Jul	A - E	6.5	66.5	10	1.0	furrow	100	4.5
beans 2	Aug	-do-	6.5	66.5	8		-do-	100	4.5
Wheat2	Jul	-do-	6.5	81.25	13		-do-	100	5.0
	Aug	-do-	6.5	81.25	10		-do-	100	5.0
Wheat 1	Jul	-do-	6.5	81.25	13		-do-	100	5.0
	Aug	-do-	6.5	81.25	10		-do-	100	5.0
Onion	Jul	-do-	6.5	30.8	6		-do-	16.7	1.0
	Aug	-do-	6.5	30.8	4		-do-	16.7	1.0

Crop	Month	Irrigation Area	Average Flow per Furrrow l/s	Stream Size (q) l/second	Supply Duration (t) hr	Area Irrigated per day	Irrigation Hour hr/day
Sugar beans 2	Jul	A - E	2.1	4.2	4.0	0.3	
	Aug		2.1	4.2	4.0	0.3	11.0
Wheat 2	Jul		2.26	6.78	5.0	0.3	11.0
	Aug		2.26	6.78	5.0	0.3	10.0
Wheat 1	Jul		2.26	6.78	5.0	0.3	10.0
	Aug		2.26	6.78	5.0	0.3	10.0
Onion	Jul		0.6	3.0	0.24	0.05	1.44
	Aug		0.6	3.0	0.24	0.05	1.44
Wheat 2	Jul		0.63	1.89	3.0	0.05	6.0
	Aug		0.63	1.89	3.0	0.05	6.0

Note: Field sizes are as follows;

Plot a, b, c ; 100m by 30m = 0.3 ha
d, e ; 16.7m by 30m = 0.05 ha

Table E.4.6.12 CALCULATION OF PEAK IRRIGATION SUPPLY DEMAND

Irrigation Area	Rotation Block	Peak Demand 1 plot(l/sec)	Peak Demand per ha	Irrigation Rotation day	Total Stream Size l/sec	Irrigation Supply per 1 time l/sec	Irrigation Acreage per 1 time ha	Irrigation Hour per 1 day hr
A = 115 ha	Type-I a:(30%)							
	34.5 ha	4.2	14	8	483	60	4.3125	11.0
	b:(30%)							
	34.5 ha	6.78	22.6	10	780	78	3.45	10.0
	c:(30%)							
	34.5 ha	6.78	22.6	10	780	78	3.45	10.0
	Type-IId:(5%)							
	5.75 ha	1.89	6.3	4	36	9	1.4375	1.44
	e:(5%)							
	5.75 ha	2.4	8.0	10	46	5	0.575	6.0
Total						230		
B 128 ha	Type-I a:(30%)							
	38.4 ha	4.2	14.0	8	538	67	4.8	11.0
	b:(30%)							
	38.4 ha	6.78	22.6	10	868	87	3.84	10.0
	c:(30%)							
	38.4 ha	6.78	22.6	10	868	87	3.84	10.0
	Type-IId:(5%)							
	6.4 ha	1.89	6.3	4	40	10	1.6	1.44
	e:(5%)							
	6.4 ha	2.4	8.0	10	51	5	0.64	6.0
Total						256		
C 140 ha	Type-1 a:(30%)							
	42 ha	4.2	14.0	8	588	74	5.25	11.0
	b:(30%)							
	42 ha	6.78	22.6	10	949	95	4.2	10.0
	c:(30%)							
	42 ha	6.78	22.6	10	949	95	4.2	10.0
	Type-IId:(5%)							
	7 ha	1.89	6.3	4	44	11	1.75	1.44

Irrigation Area	Rotation Block	Peak Demand 1 plot(l/sec)	Peak Demand per ha	Irrigation Rotation	Total Stream da Size l/sec	Irrigation Supply per 1 time l/sec	Irrigation Acreage per 1 time ha	Irrigation Hour per 1 day hr
	Type-IIe:(5%)							
	7 ha	2.4	8.0	10	56	6	0.7	10.0
Total						281		
D 203 ha	Type-I a:(30%)							
	60.9 ha	4.2	14.0	8	853	107	7.6125	11.0
	b:(30%)							
	60.9 ha	6.78	22.6	10	,376	138	6.09	10.0
	c:(30%)							
	60.9 ha	6.78	22.6	10	,376	138	6.09	10.0
	Type-IId:(5%)							
	10.15 ha	1.89	6.3	4	64	16	2.54	1.44
	e:(5%)							
	10.15 ha	1.89	8.0	10	81	8	1.02	10.0
Total						407		
E 94 ha	Type-I a:(30%)							
	28.2 ha	4.2	14.0	8	394	49	7.05	11.0
	b:(30%)							
	28.2 ha	6.78	22.6	10	637	64	2.82	10.0
	c:(30%)							
	28.2 ha	6.78	22.6	10	637	64	2.82	10.0
	Type-IId:(5%)							
	4.7 ha	1.89	6.3	4	30	8	1.175	1.44
	e:(5%)							
	4.7 ha	2.4	8.0	10	38	4	0.47	10.0
Total						189		
Grand Total 680 ha						1,363		

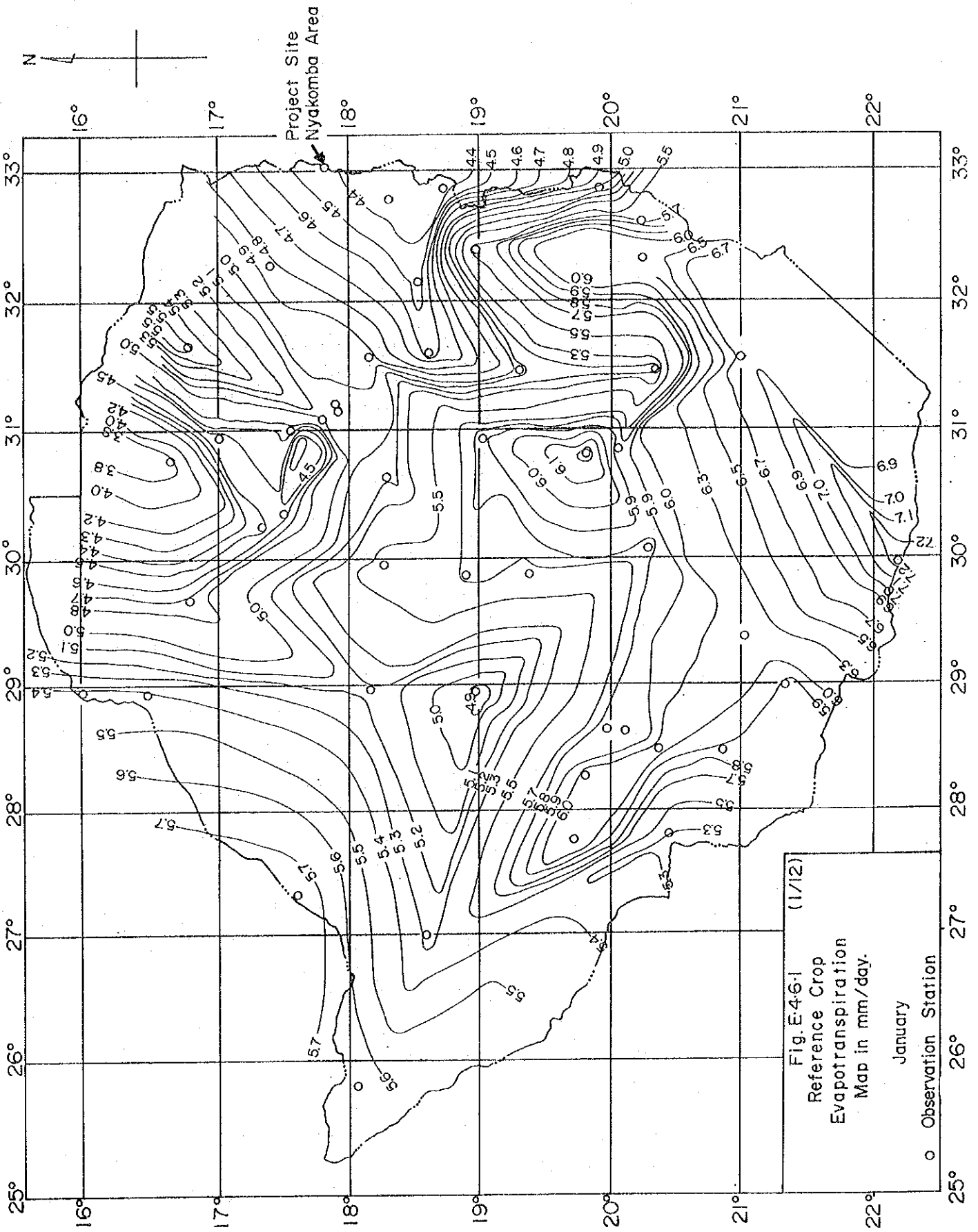

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Fig. E-46-1 (1/12)
Reference Crop
Evapotranspiration
Map in mm/day.
January
o Observation Station

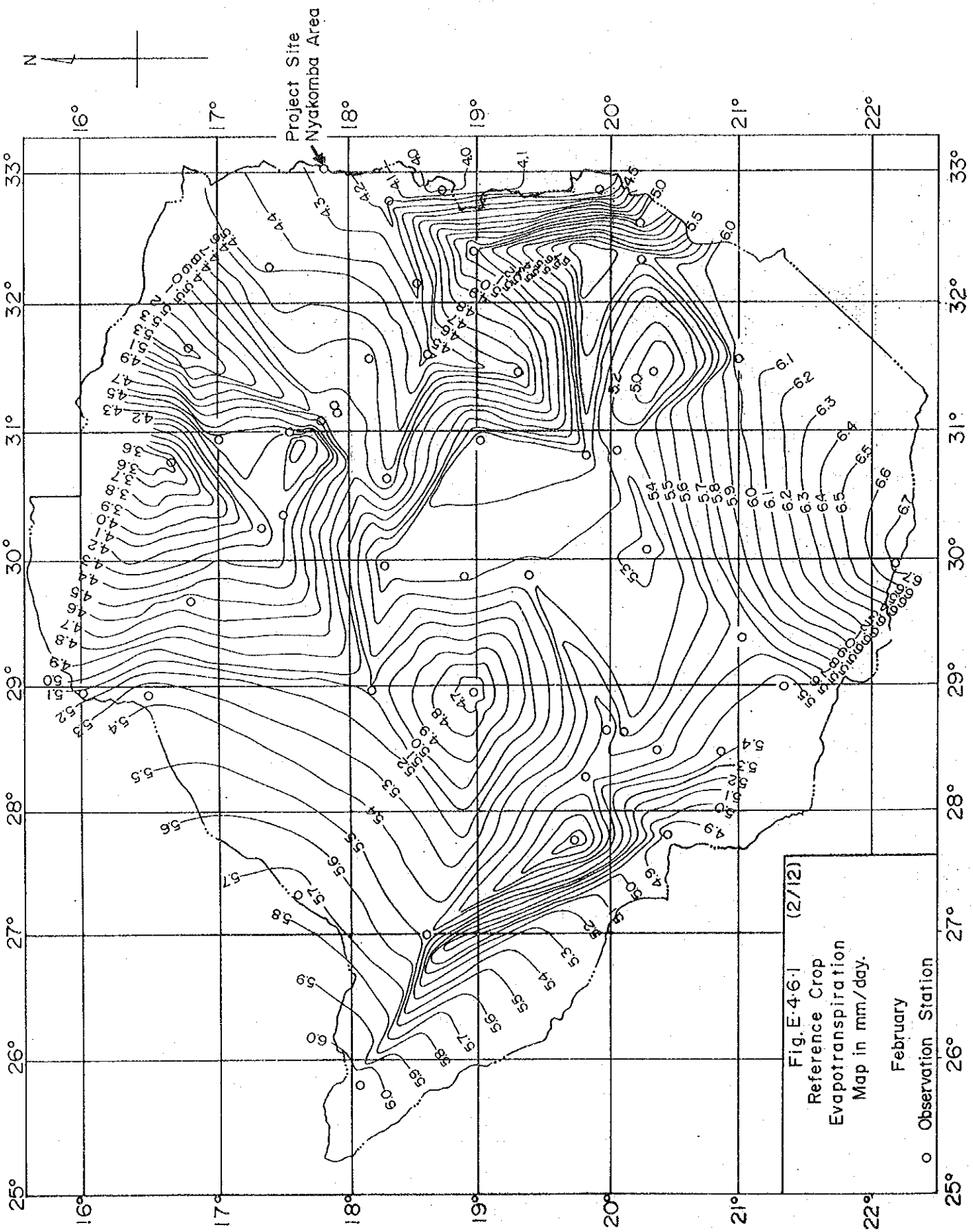
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Fig. E·4·6·1 (2/12)
Reference Crop
Evapotranspiration
Map in mm/day.
February
o Observation Station

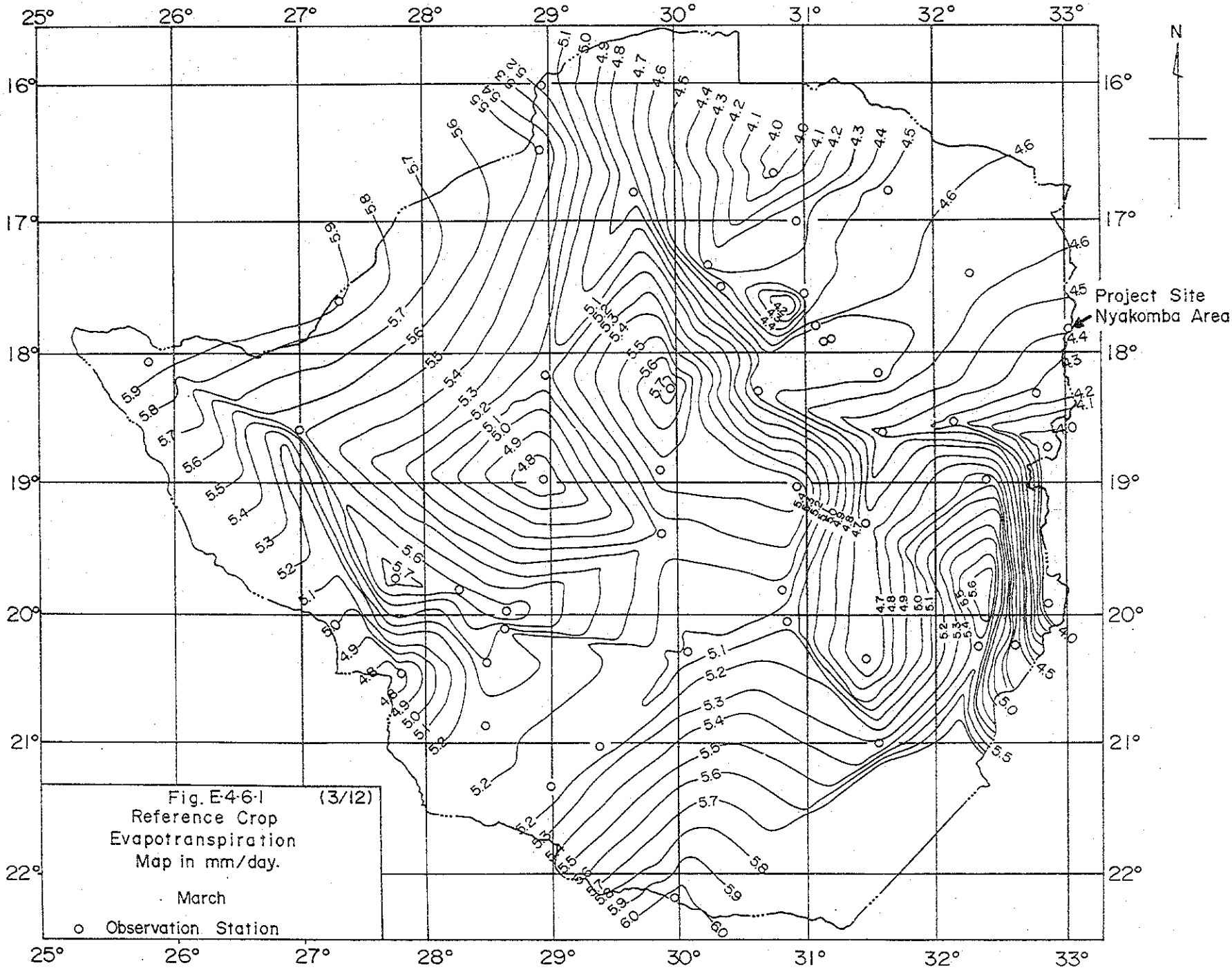
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Fig. E-4-6-1 (3/12)
Reference Crop
Evapotranspiration
Map in mm/day.
March
o Observation Station

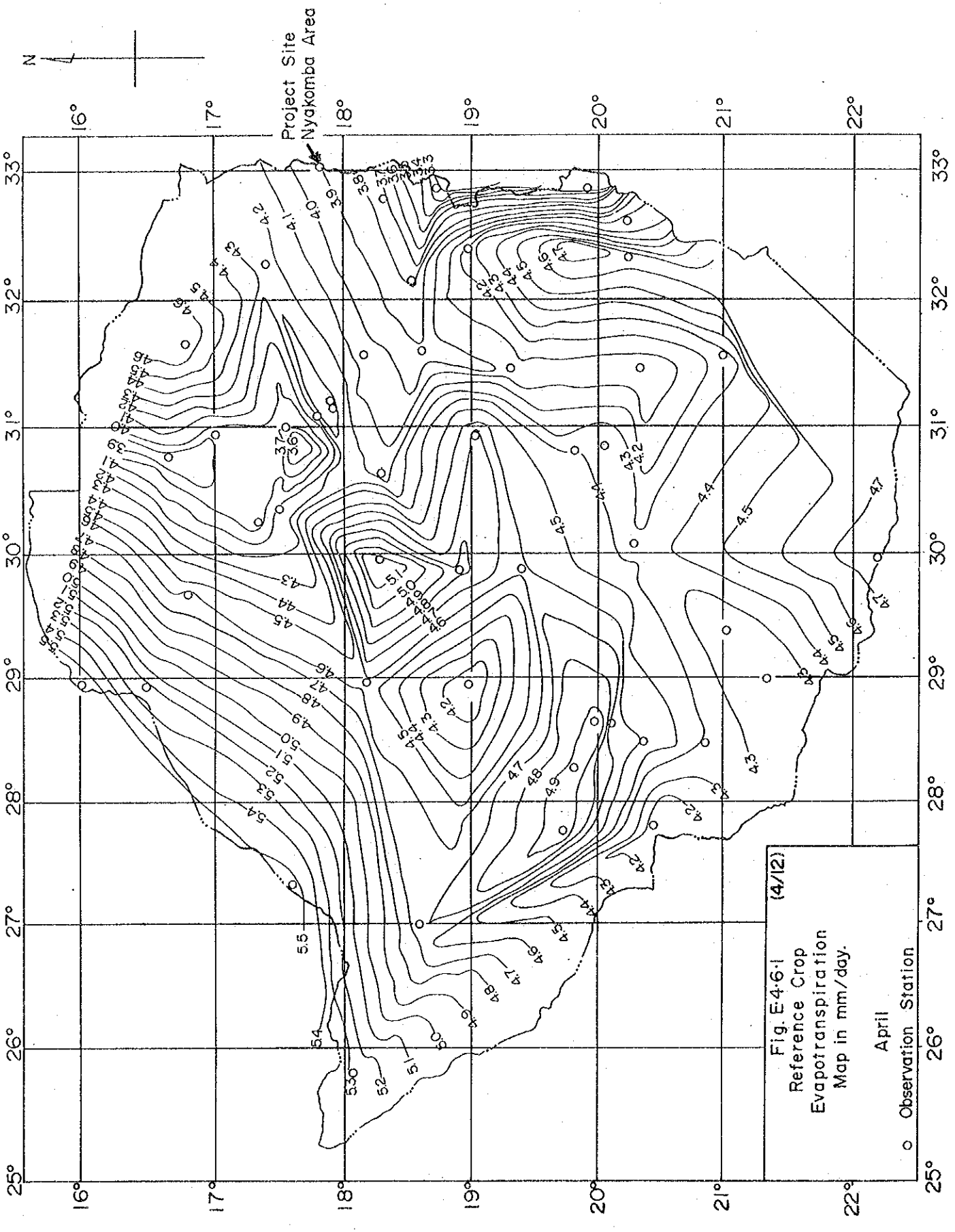
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Fig. E·4·6·1 (4/12)
Reference Crop
Evapotranspiration
Map in mm/day.
April
○ Observation Station

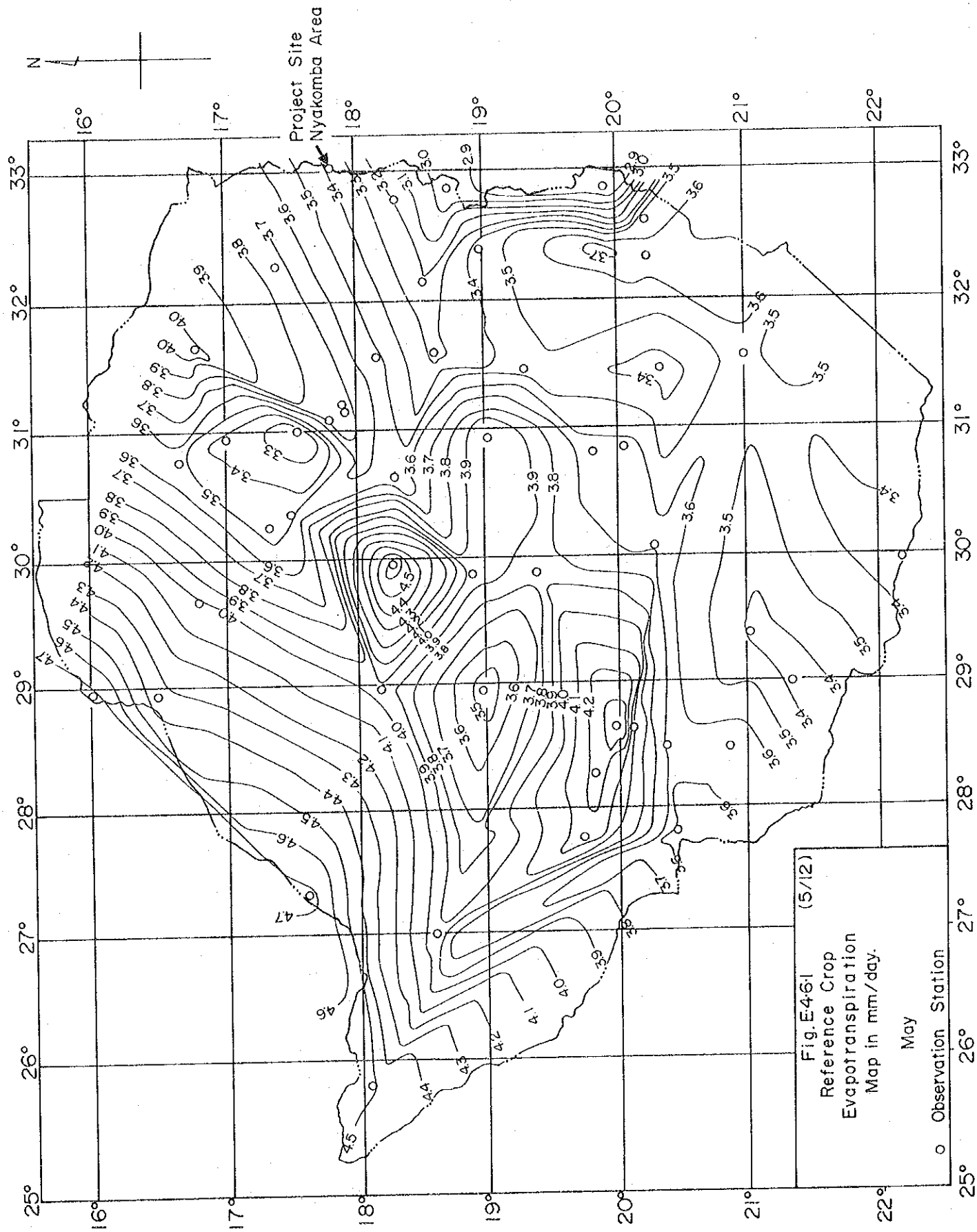
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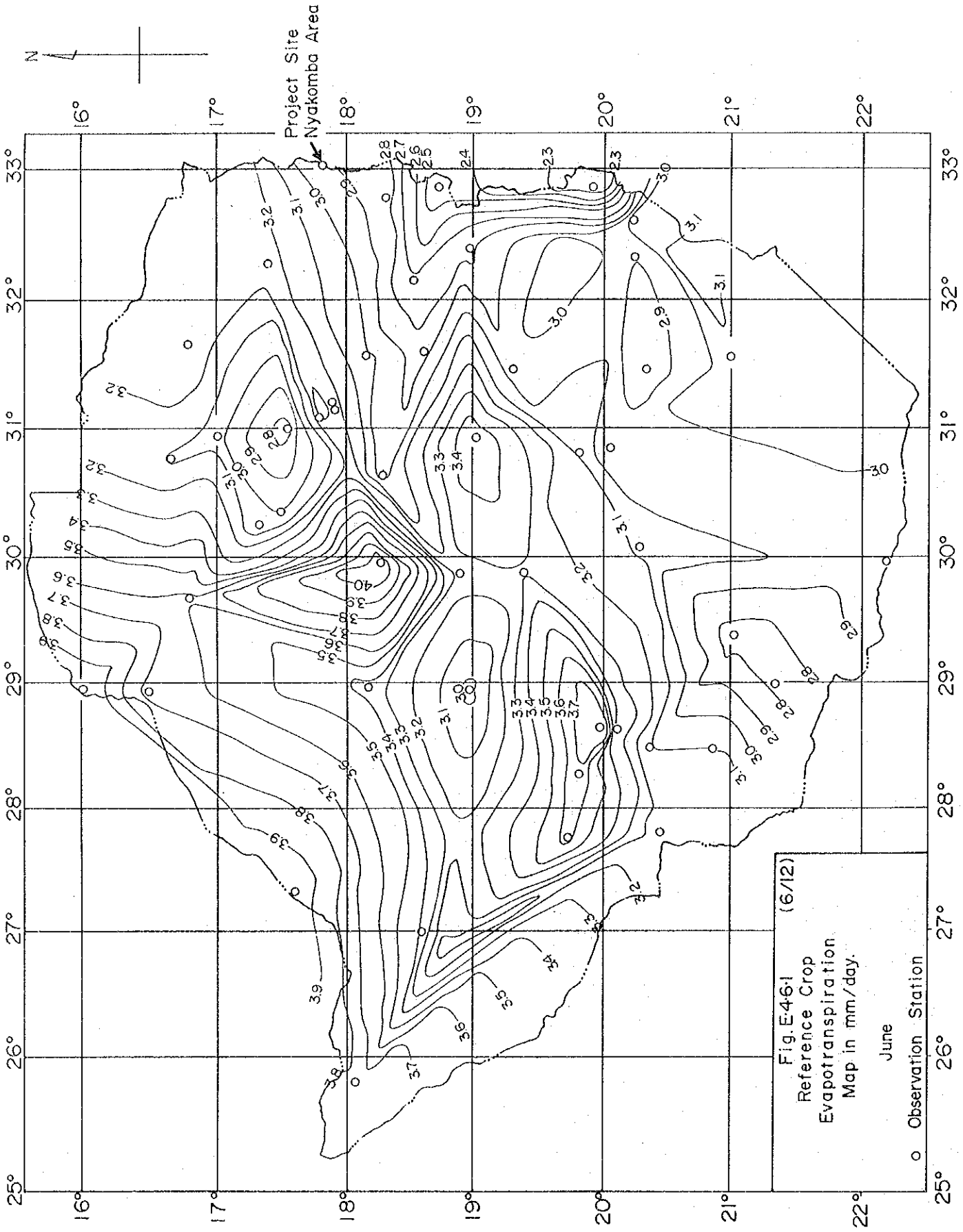
Fig. E-4-6-1 (5/12)
Reference Crop
Evapotranspiration
Map in mm/day.
May
o Observation Station


Project Site
Nyakomba Area
N
16°
17°
18°
19°
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21°
22°
25°
26°
27°
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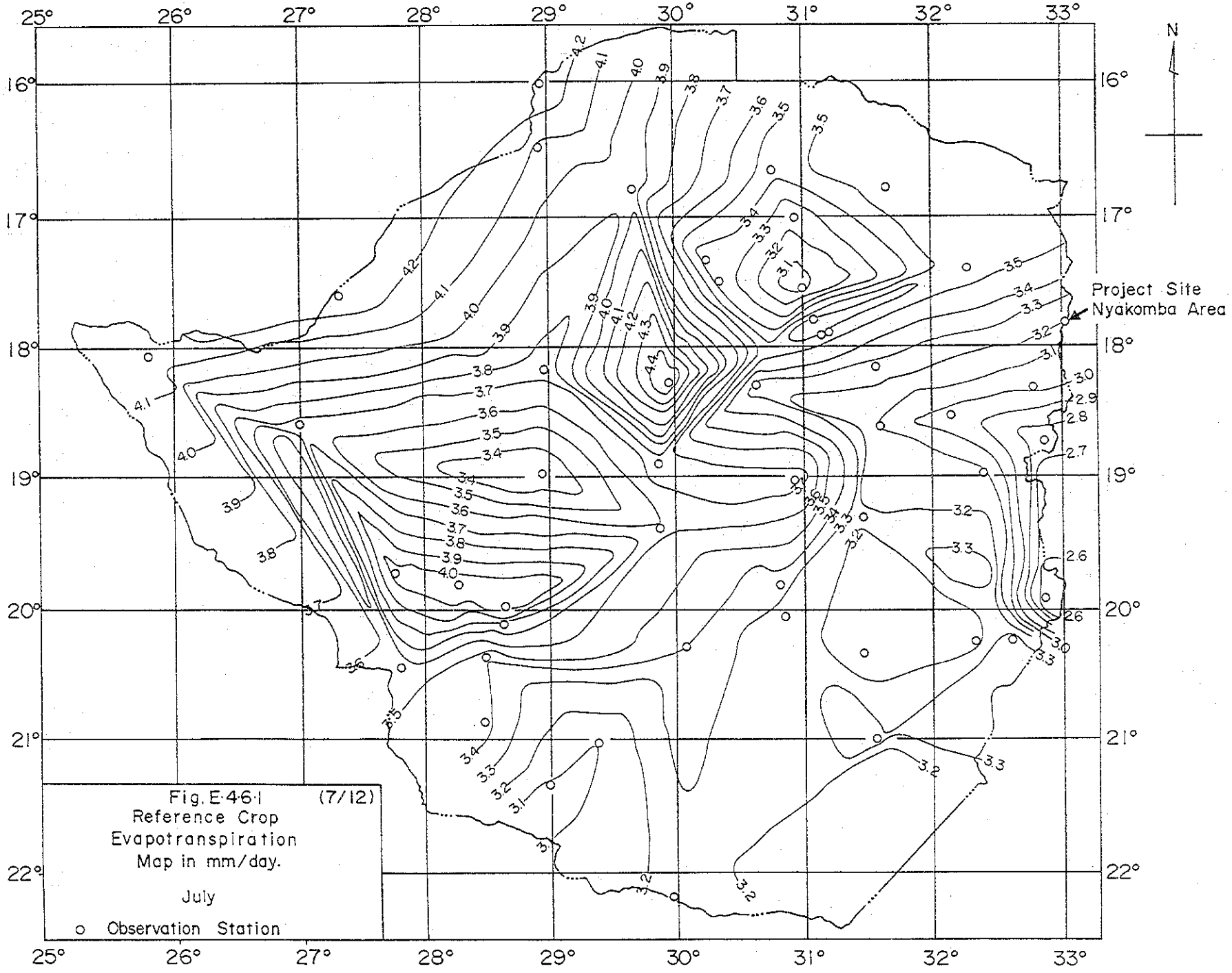
32°
33°
Fig. E-4-6-1 (6/12)
Reference Crop
Evapotranspiration
Map in mm/day.
June
o Observation Station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N
Project Site
Nyakomba Area
Fig. E-4-6-1 (7/12)
Reference Crop
Evapotranspiration
Map in mm/day.
July
o Observation Station

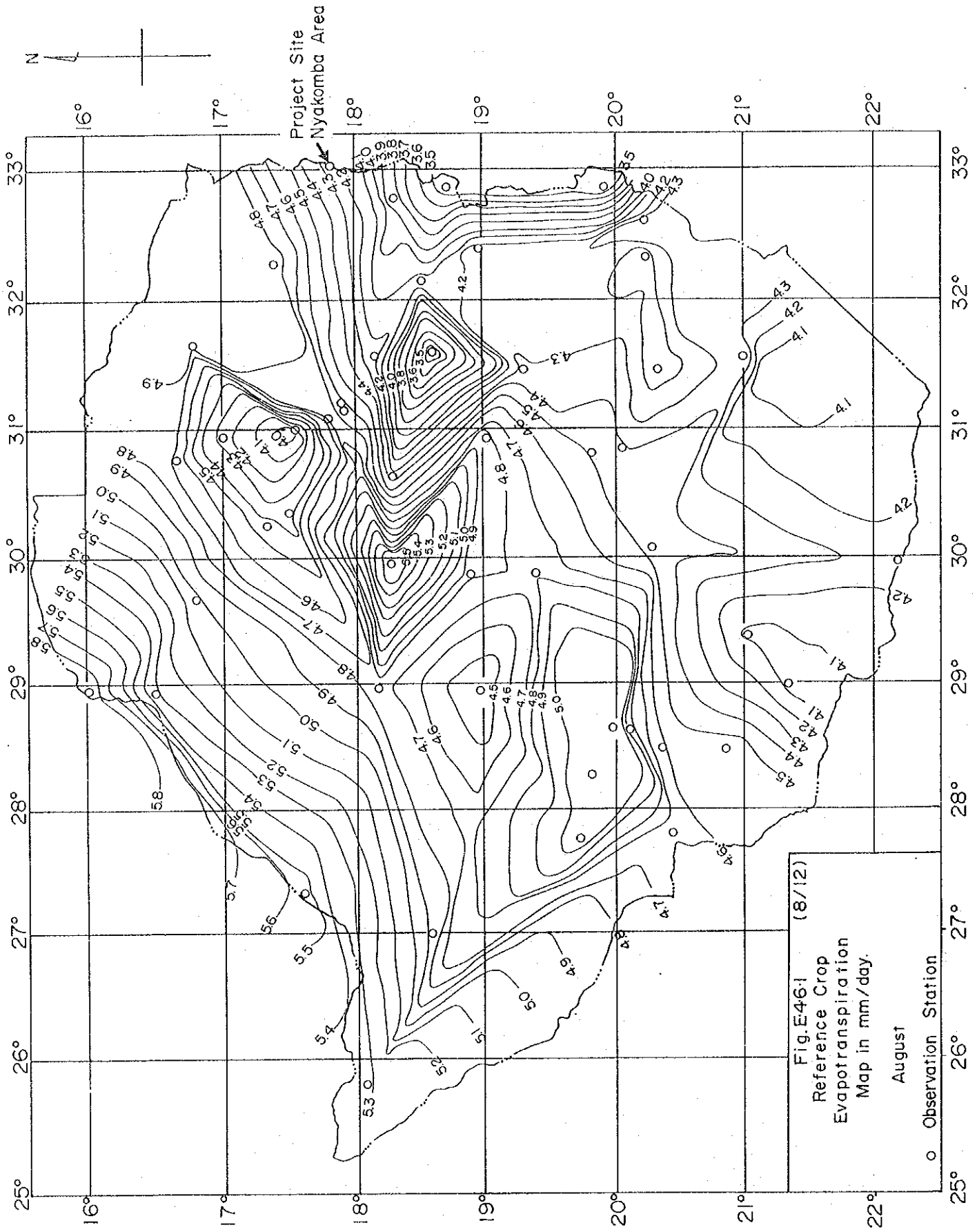
N
Project Site
Nyakomba Area
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Fig.E46-1 (8/12)
Reference Crop
Evapotranspiration
Map in mm/day.
August
o Observation Station

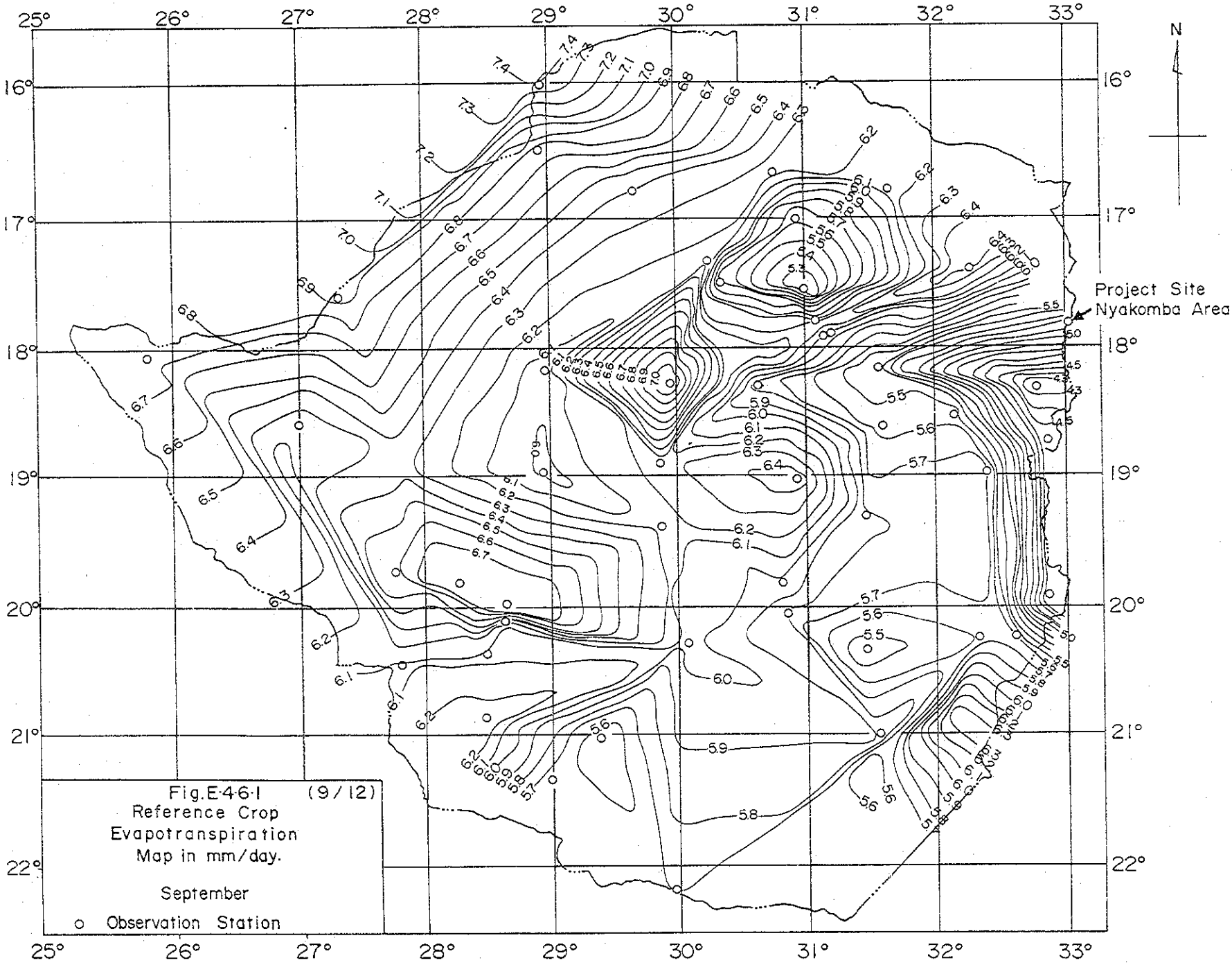

Fig.E-4-6-1 (9/12)
Reference Crop
Evapotranspiration
Map in mm/day.

September

o Observation Station

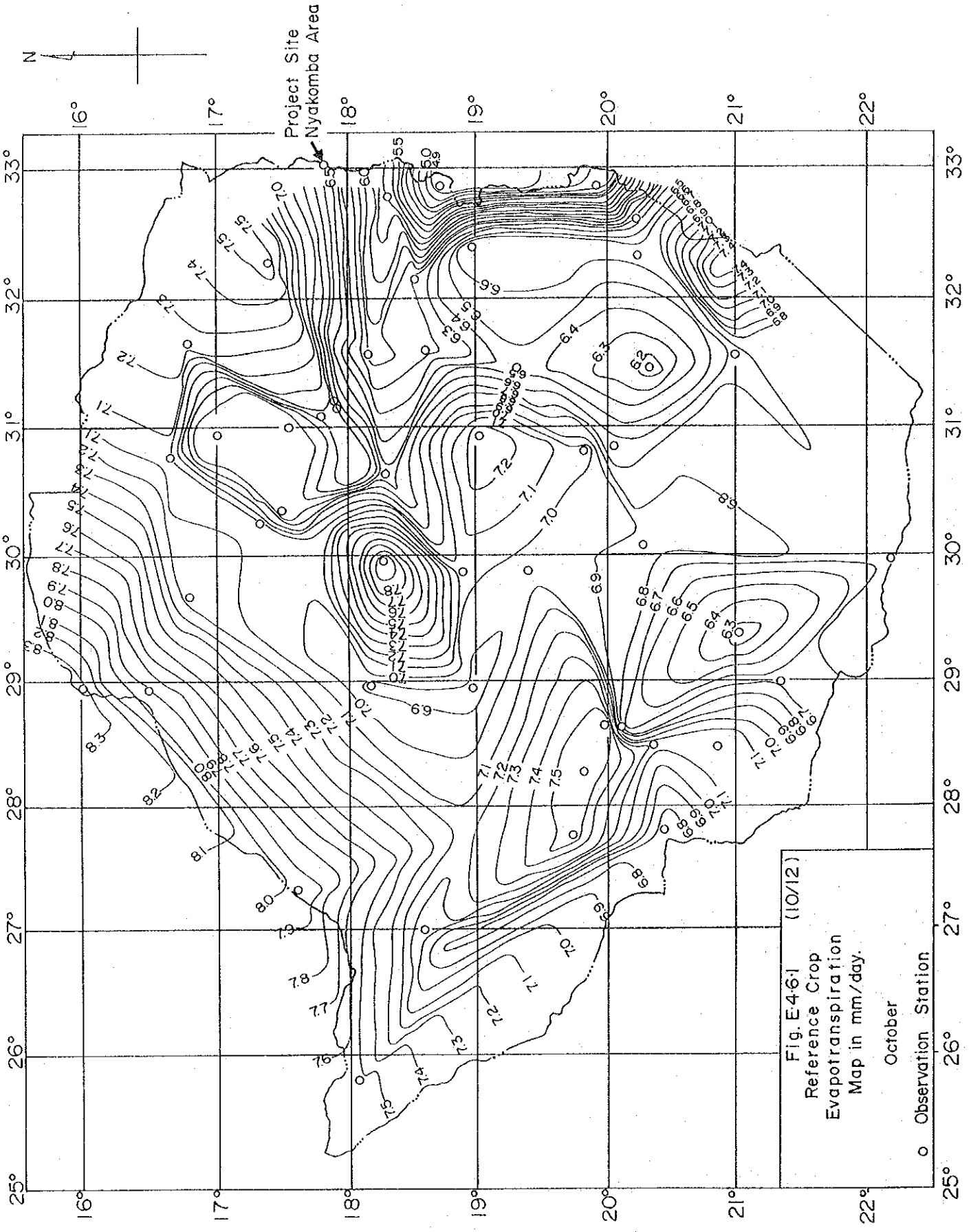
N
Project Site
Nyakomba Area
16°
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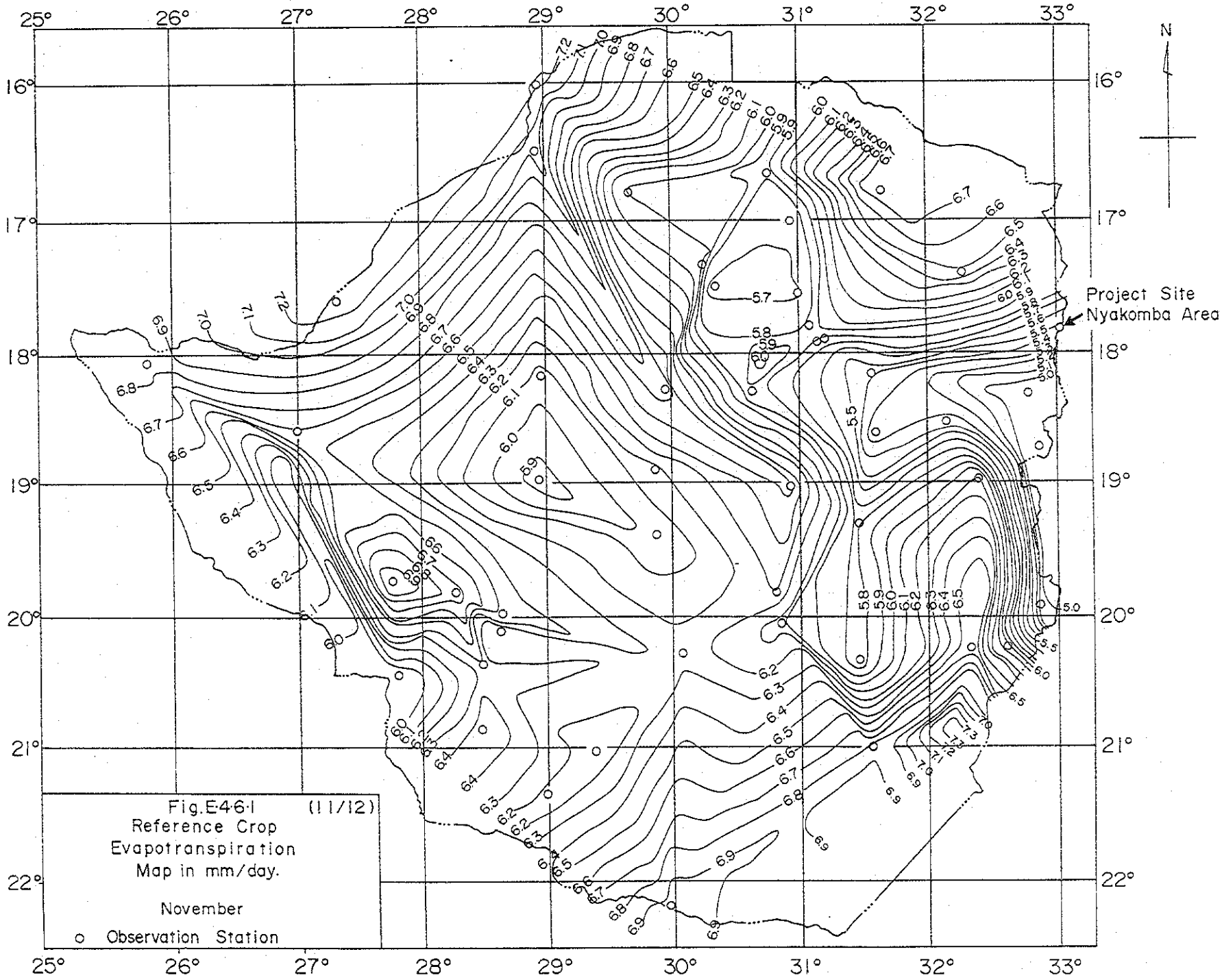
Fig. E-4-6-1 (10/12)
Reference Crop
Evapotranspiration
Map in mm/day.
October
o Observation Station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N
Project Site
Nyakomba Area
Fig. E-4-6-1 (11/12)
Reference Crop
Evapotranspiration
Map in mm/day.
November
o Observation Station

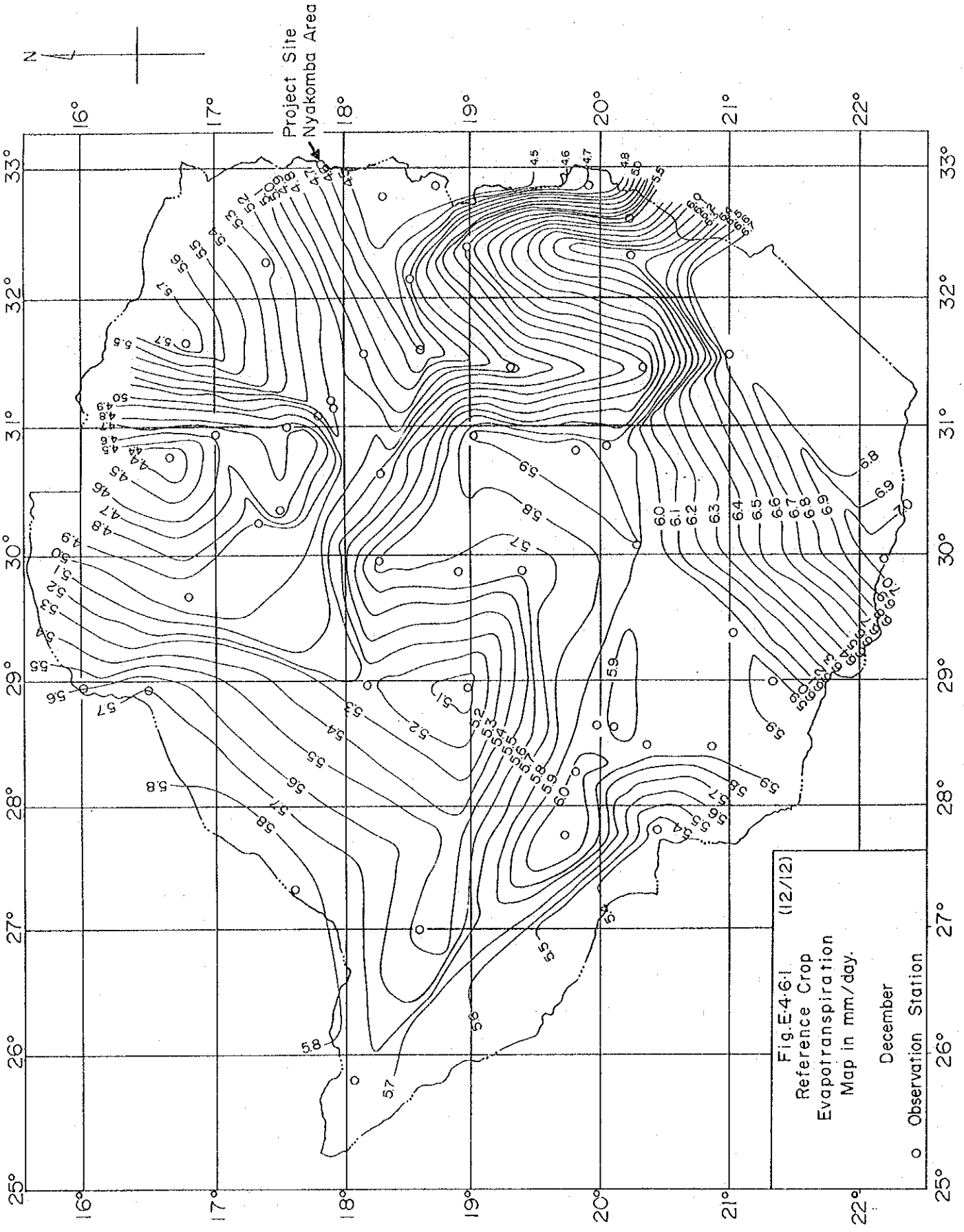
Project Site
Nyakomba Area
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Fig.E-4-6-1 (12/12)
Reference Crop
Evapotranspiration
Map in mm/day.
December
o Observation Station

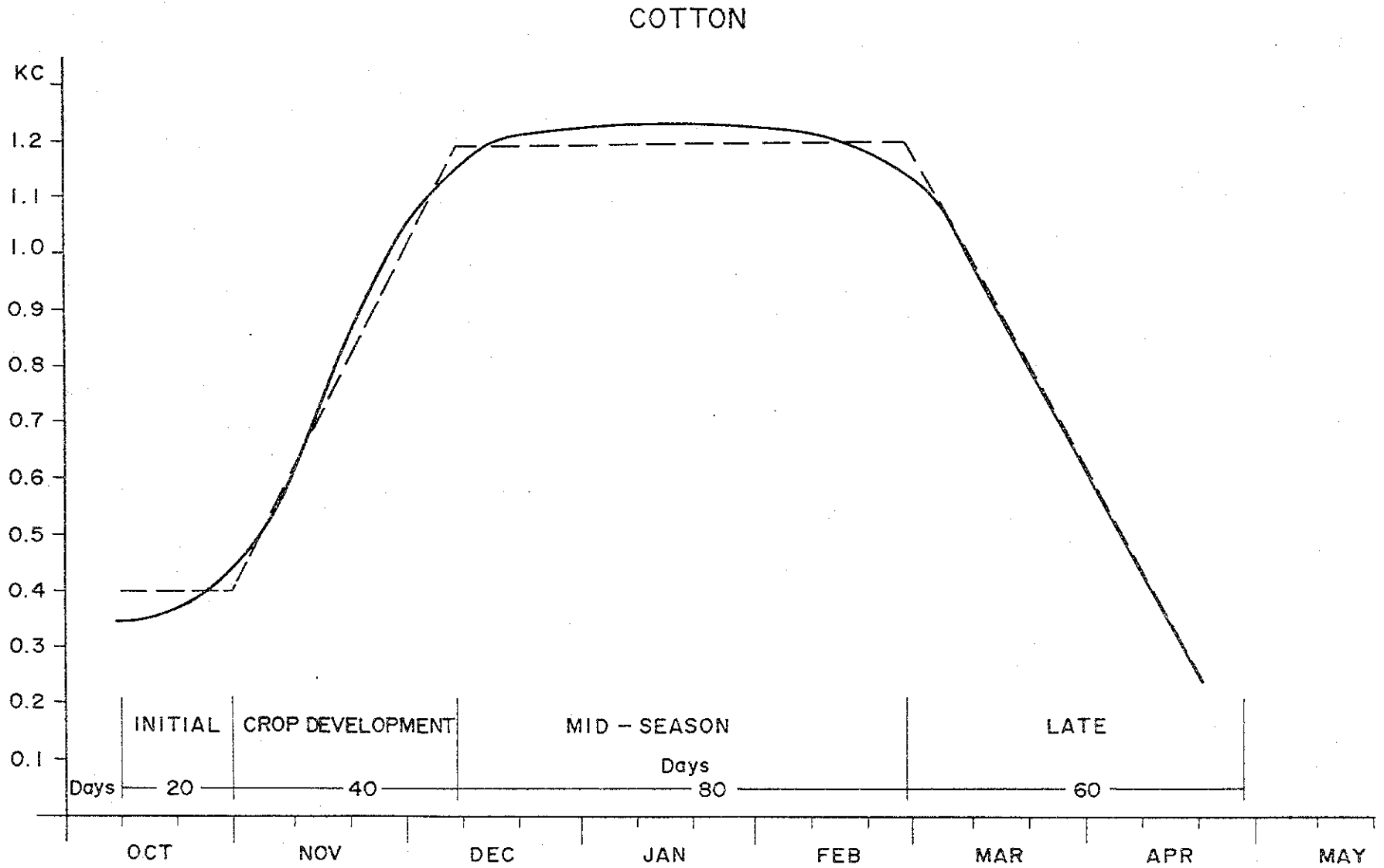


Fig.E-4-6-2 KC CURVE

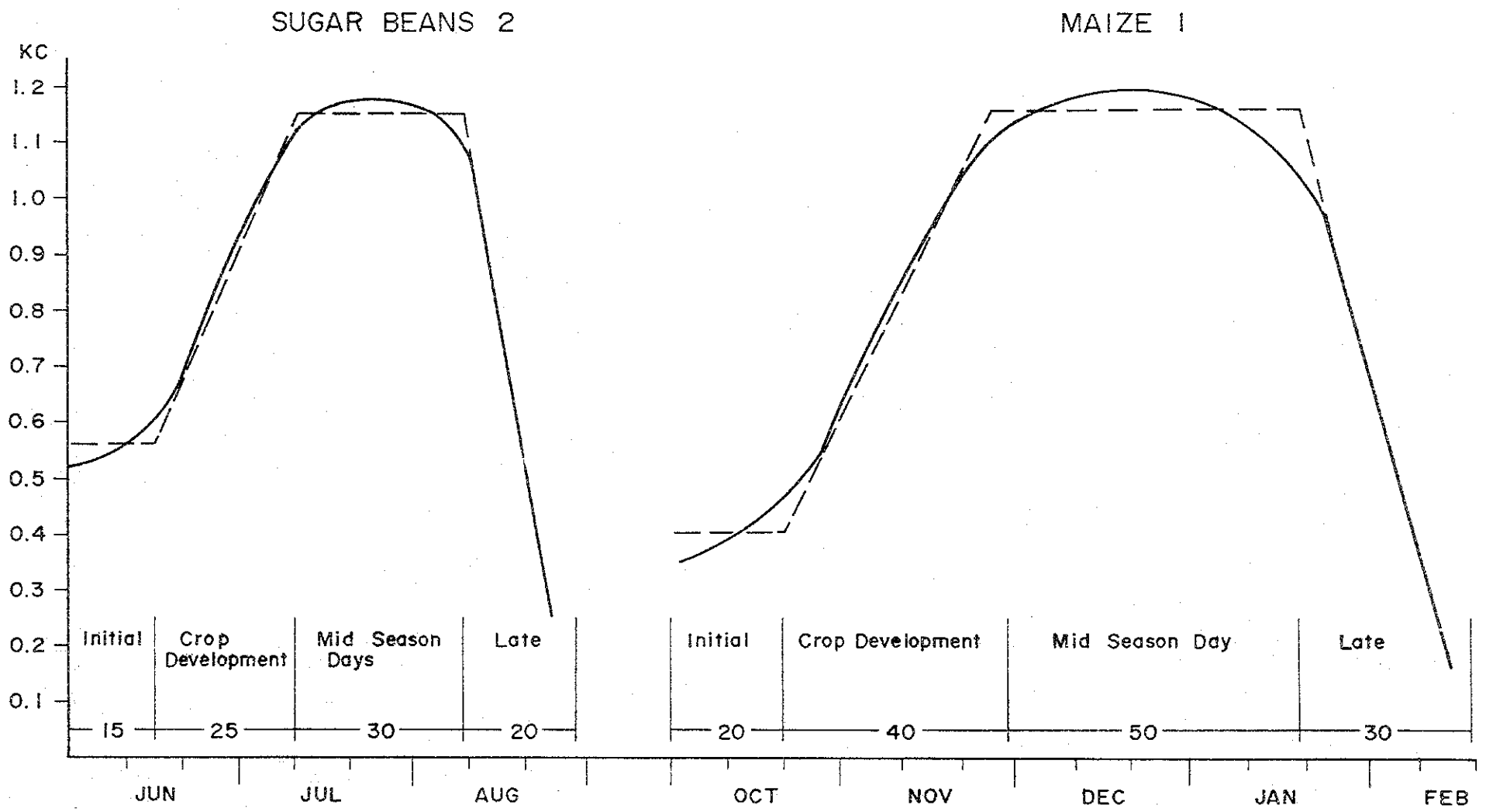


Fig. E-4-6-2 KC CURVE

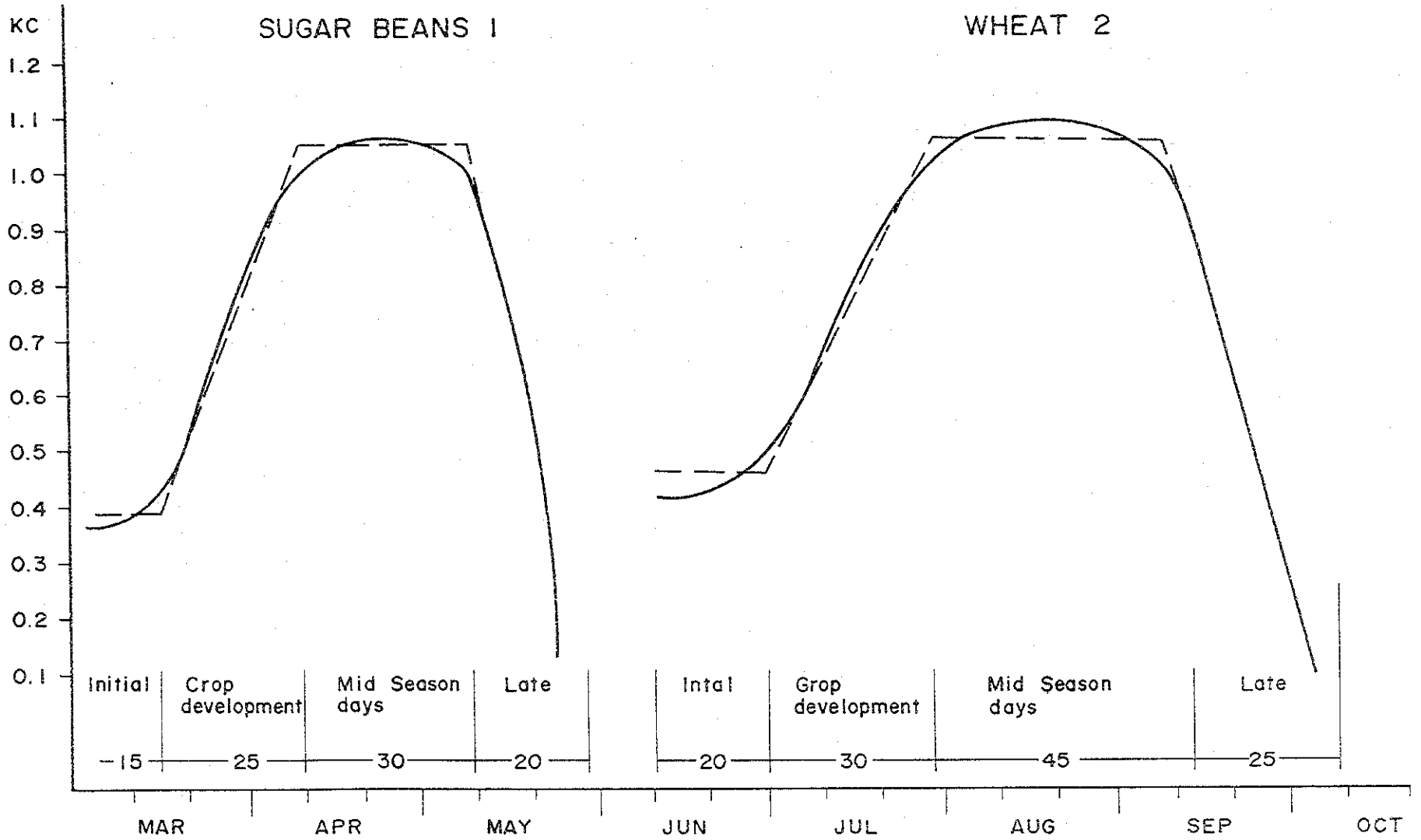


Fig.E-46-2KC CURVE

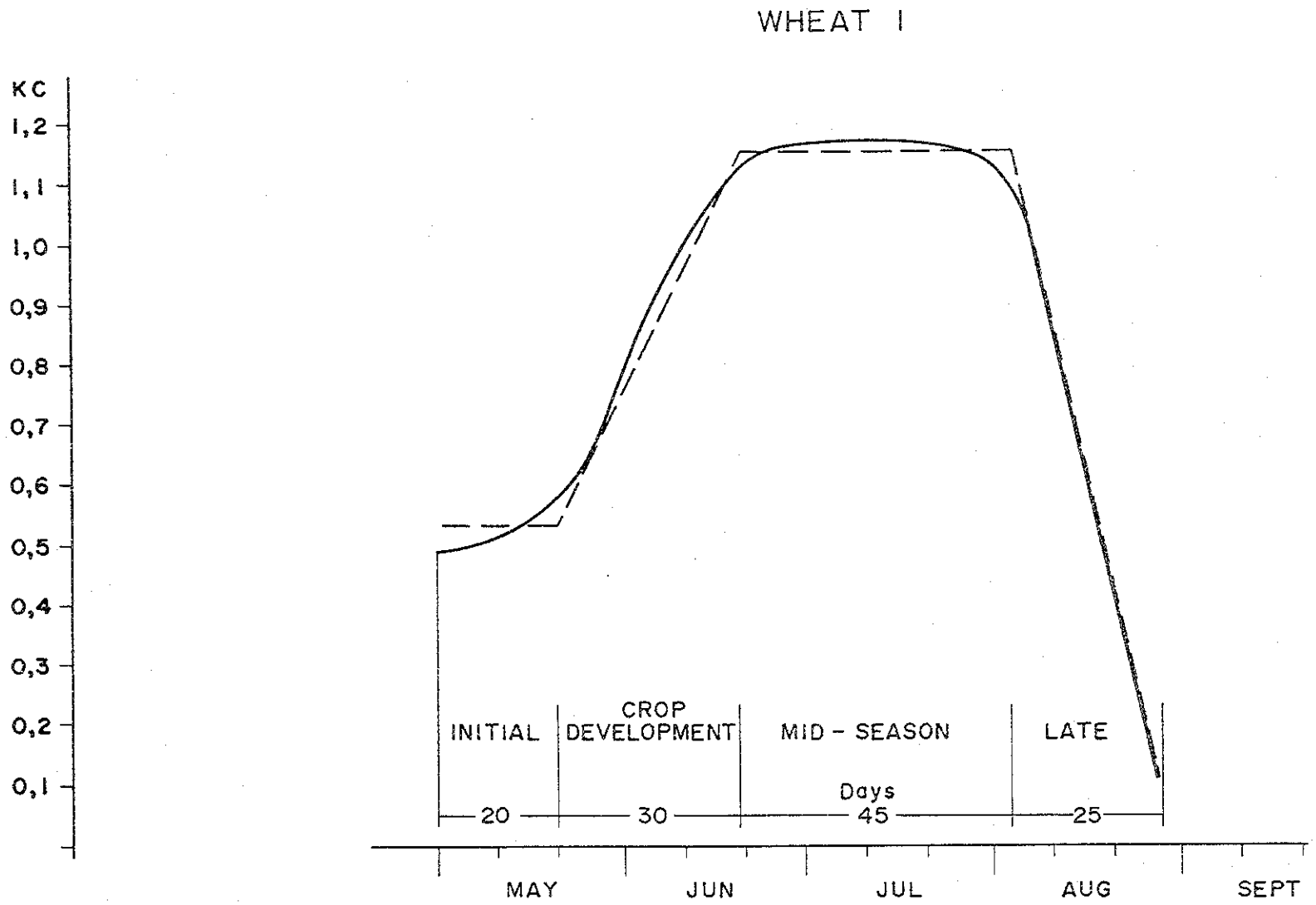
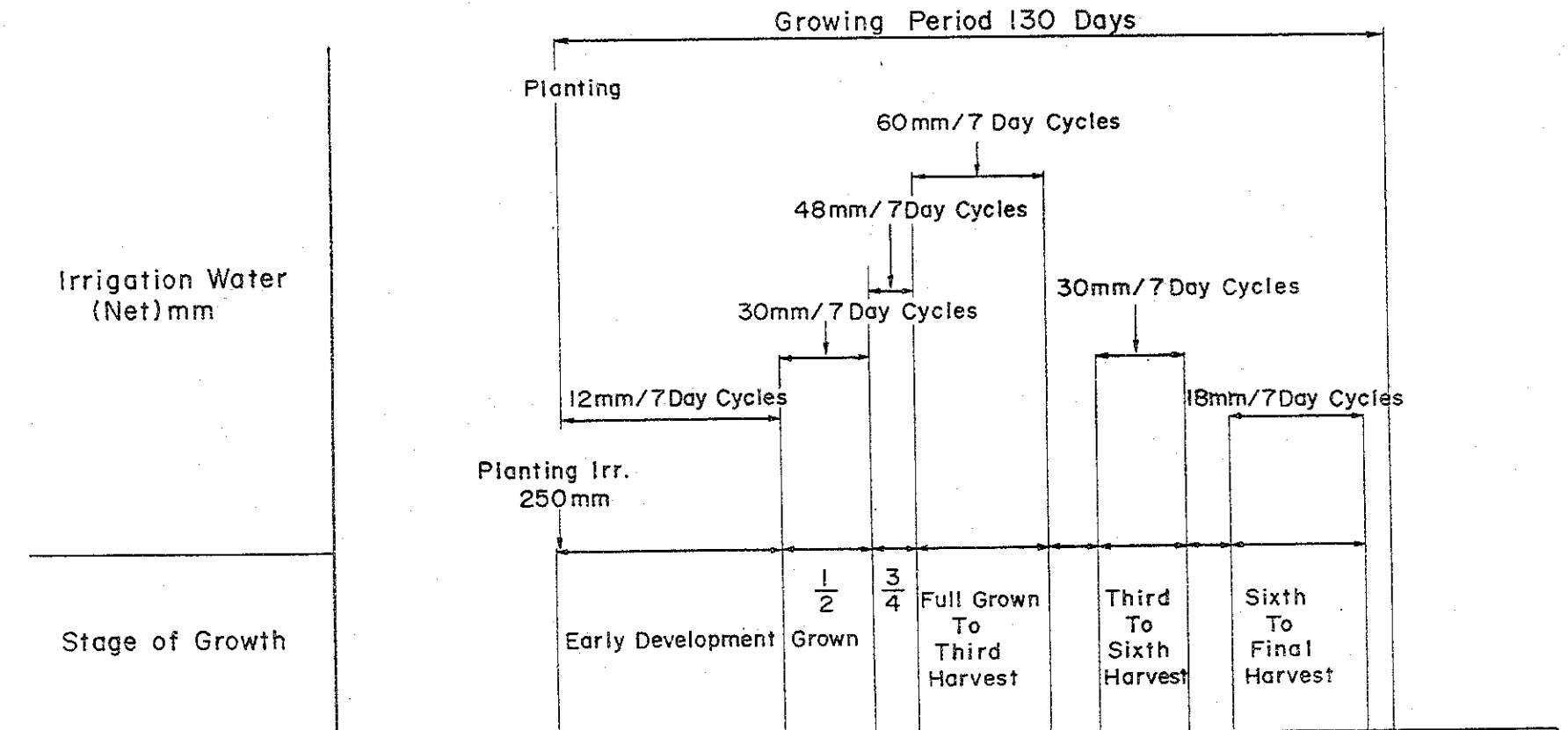


Fig. E-46-2 KC CURVE

WATER REQUIREMENT OF TOBACCO



	NOV	DEC	JAN	FEB	MAR
Water Requirement mm/mmth	60	100	215	73	52

DATA SOURCE: TOBACCO RESEACH BOARD
BURLEY RECOMMENDATIONS TBR 1979/1
AGRITEX-TOPO

Fig. E·4·6·2

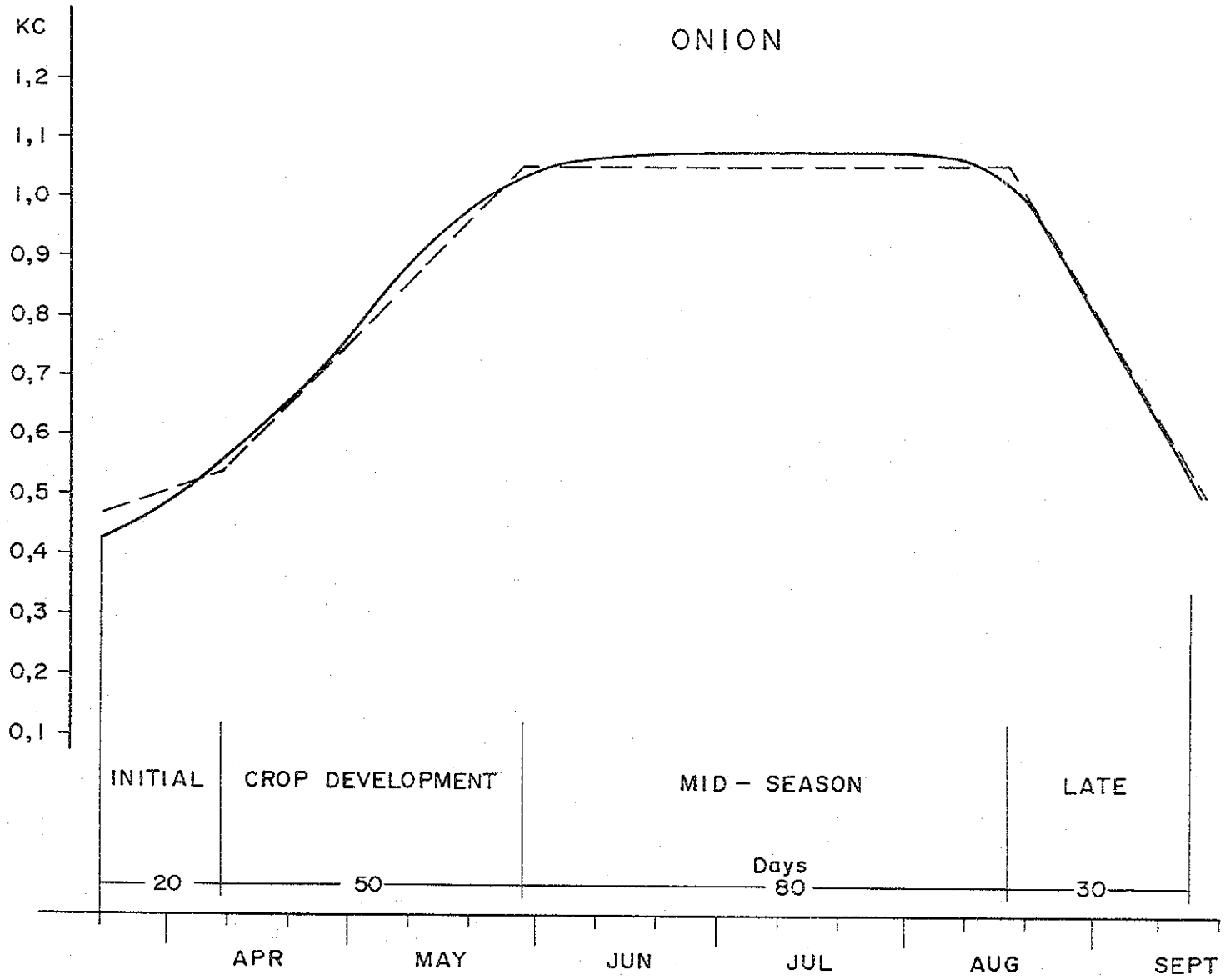


Fig.E-4-6-2 KC CURVE

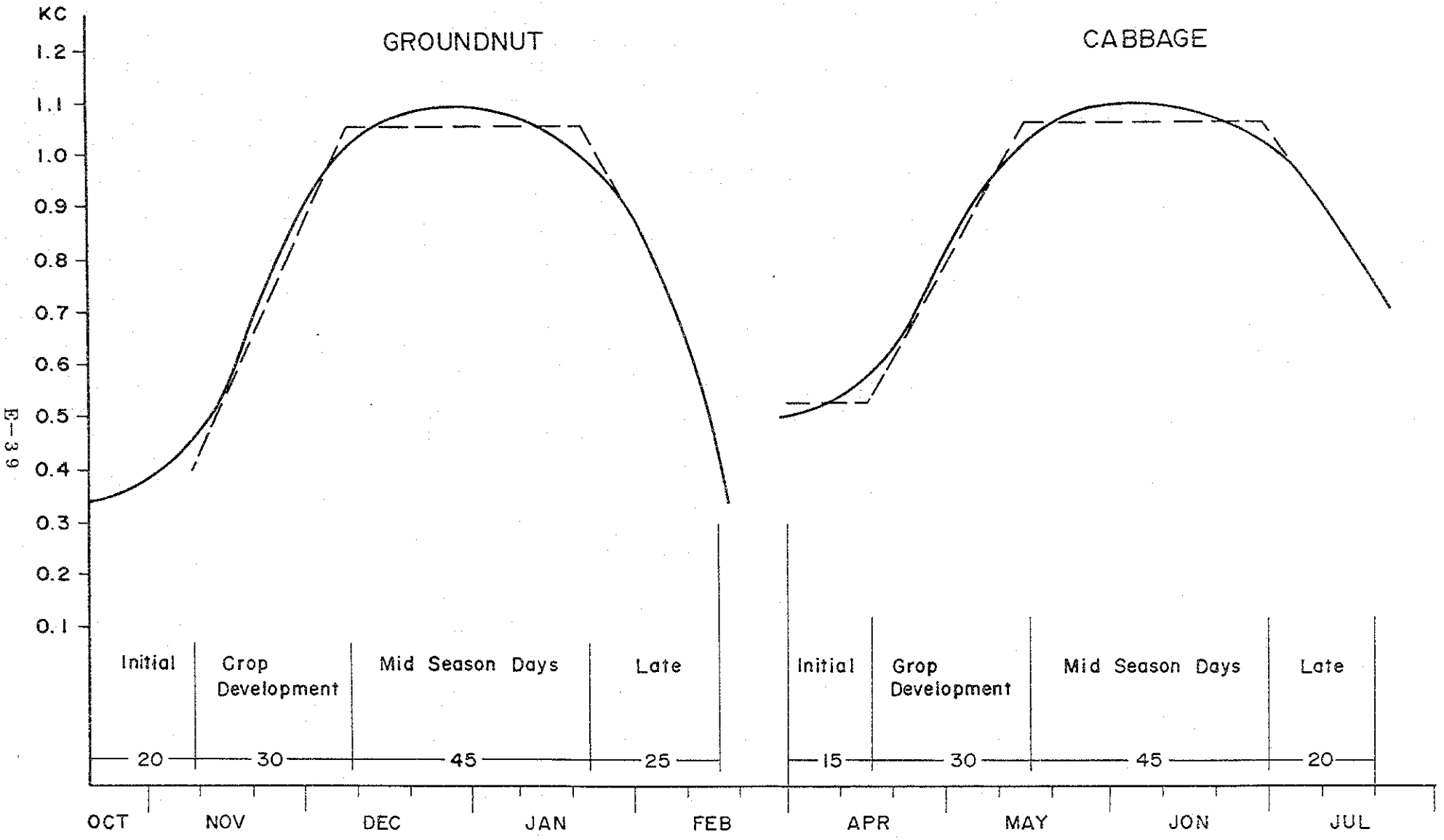


Fig. E-4-6-2 KC CURVE