Land settlement projects and agricultural development: An analysis of development factors and processes based on four case studies in Ghana, Libya and Saudi Arabia.

Speetzen, Heinrich

LAND SETTLEMENT PROJECTS AND AGRICULTURAL DEVELOPMENT

An Analysis of Development Factors and Processes based on four Case Studies in Ghana, Libya and Saudi Arabia

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VOLUME II (APPENDIX)

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C O N T E N T S

Page

PART FOUR

Tauorga Oasis, Libya

L I S T O F M A P S A N D D I A G R A M S

PART ONE

FAISAL SETTLEMENT PROJECT, HARADH, SAUDI ARABIA

Cropping area for the lambs to be fattened

The number of lambs to be fattened each year from 1.6 ha. will be:

365 x 0.6 kg. hay

219.0 x 5 (to obtain the quantity of green alfalfa)

1,095.0 kg. of green alfalfa

+ 730.0 kg. of green alfalfa (2 x 365)

1,825.0 ÷ 2 = 913.0 kg. of green alfalfa. This is the portion for the ewe.

5 kg. of green alfalfa (hay and green) x 80 = 400 kg. of green alfalfa per lamb.

40 kg. of green alfalfa consumed during growing period.

That is, 1,353 kg. of green alfalfa are necessary per lamb. Thus, 160 tons are enough to feed 118 lambs.

Demand for maize (sorghum) for a daily ration of 0.5 kg. silage:

365 x 0.5

182.5 kg. ÷ 2 = 91.25 kg. (ewe portion per lamb)

10. 00 kg. (during growing period)

40.00 kg. (0.5 kg. x 80 days)

141.25 kg. per lamb

141.25 kg. x 118

16,667.5 kg. of silage are necessary for 118 lambs.

Assuming a wastage of 30 per cent, 16,000 kg. are available from an area of 0.6 ha.

Demand for a daily ration of 0.25 kg. of barley.

365 x 0.25 kg.

91.25 kg. ÷ 2 = 45.63 kg. (ewe proportion per lamb)

20.00 kg. (0.25 kg. x 80 fattening days)

65.63 kg. of barley per lamb

65.63 kg. x 118

7,744.34 kg. of barley are necessary for 118 lambs to be fattened.

Table No. 1

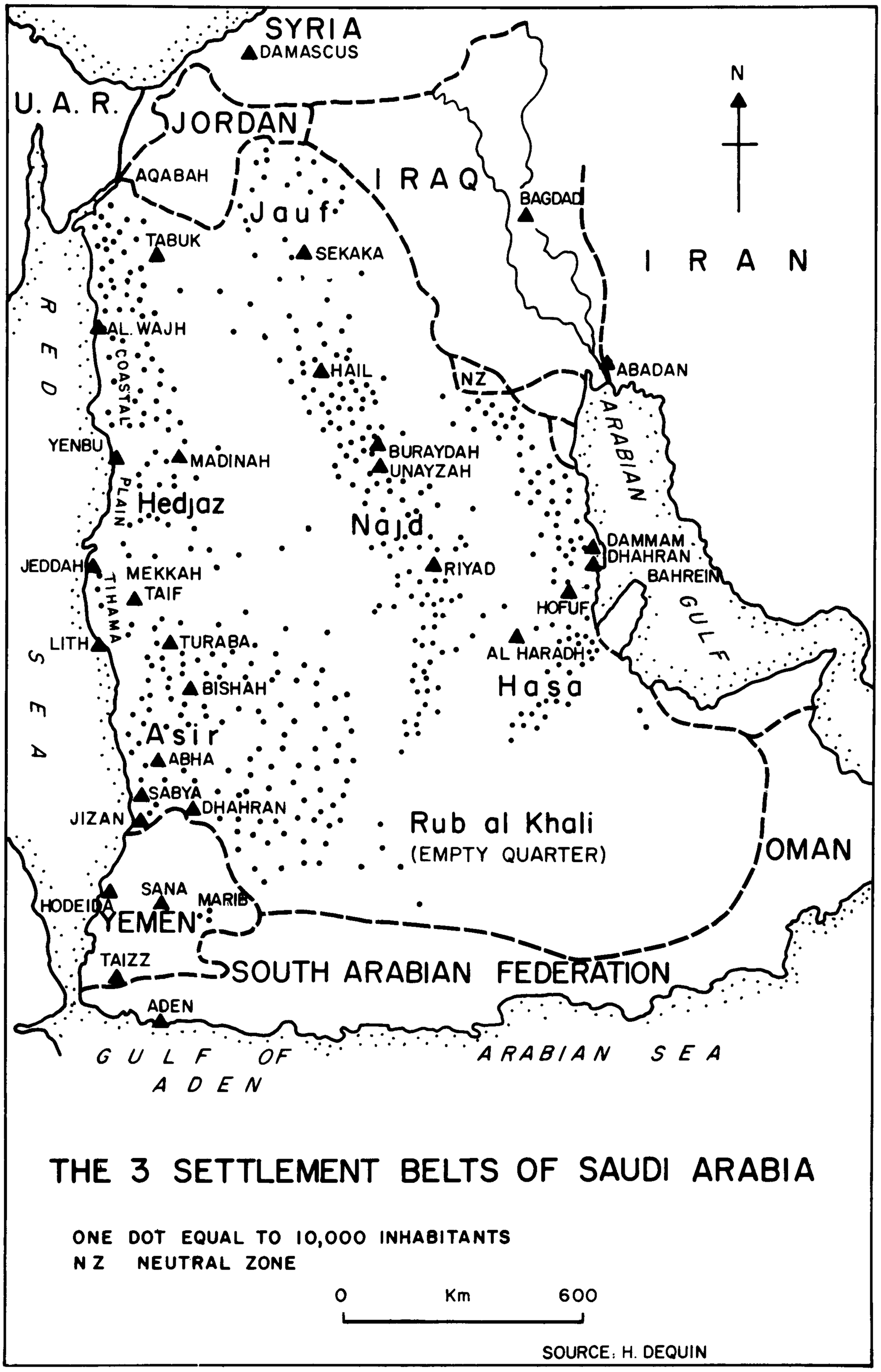
Pattern of expenditure for cash crops

Hectares	Crop	Amount/ha.	SR/unit	SR/area
0.3	Barley			
	Seeds	120 kg.	0.70	25.20
	Fertilizer	500 kg.	0.52	78.00
	Plant protection	24 SR	-	7.20
	Machine costs	87 SR	-	26.10
	Water	1,833 cu.m.	0.10	183.30
				319.80
0.4	Potatoes			
	Seeds	1,200 kg.	1.40	672.00
	Fertilizer	600 kg.	0.52	124.80
	Plant protection	60 SR	-	24.00
	Machine costs	87 SR		34.80
	Water	4,126 cu.m.	0.10	412.60
				1,268.20
0.6	Onions			
	Seeds	5 kg.	140.00	420.00
	Fertilizer	600 kg.	0.52	187.20
	Plant protection	40 SR	-	24.00
	Machine costs	87 SR	-	52.20
	Water	7,308 cu.m.	0.10	730.80
				1,414.20

Hectares	Crop	Amount/ha.	SR/unit	SR/area
0.3	Garlic			
	Seeds	1,000 kg.	3.50	1,050.00
	Fertilizer	600 kg.	0.52	93.60
	Plant protection	20 SR	-	6.00
	Machine costs	87 SR	-	26.10
	Water	3,653 cu.m.	0.10	365.30
				1,541.00
0.2	Vegetables			
	Seeds	100 SR*	-	20.00
	Fertilizer	600 kg.	0.52	62.40
	Plant protection	60 SR	-	12.00
	Machine costs	87 SR	-	17.40
	Water	1,937 cu.m.	0.10	193.70
				305.50
0.2	Cucumber and melons			
	Seeds	3 kg.	28.00	16.80
	Fertilizer	500 kg.	0.52	52.00
	Plant protection	60 SR	-	12.00
	Machine costs	87 SR	-	17.40
	Water	2,087 cu.m.	0.10	208.70
				306.90

* 100.00 SR is the average price

Hectares	Crop	Amount/ha.	SR/unit	SR/area
0.2	Okra			
	Seeds	10 kg.	10.00	20.00
	Fertilizer	600 kg.	0.52	62.40
	Plant protection	60 SR	-	12.00
	Machine costs	87 SR	-	17.40
	Water	1,793 cu.m.	0.10	179.30
				291.10

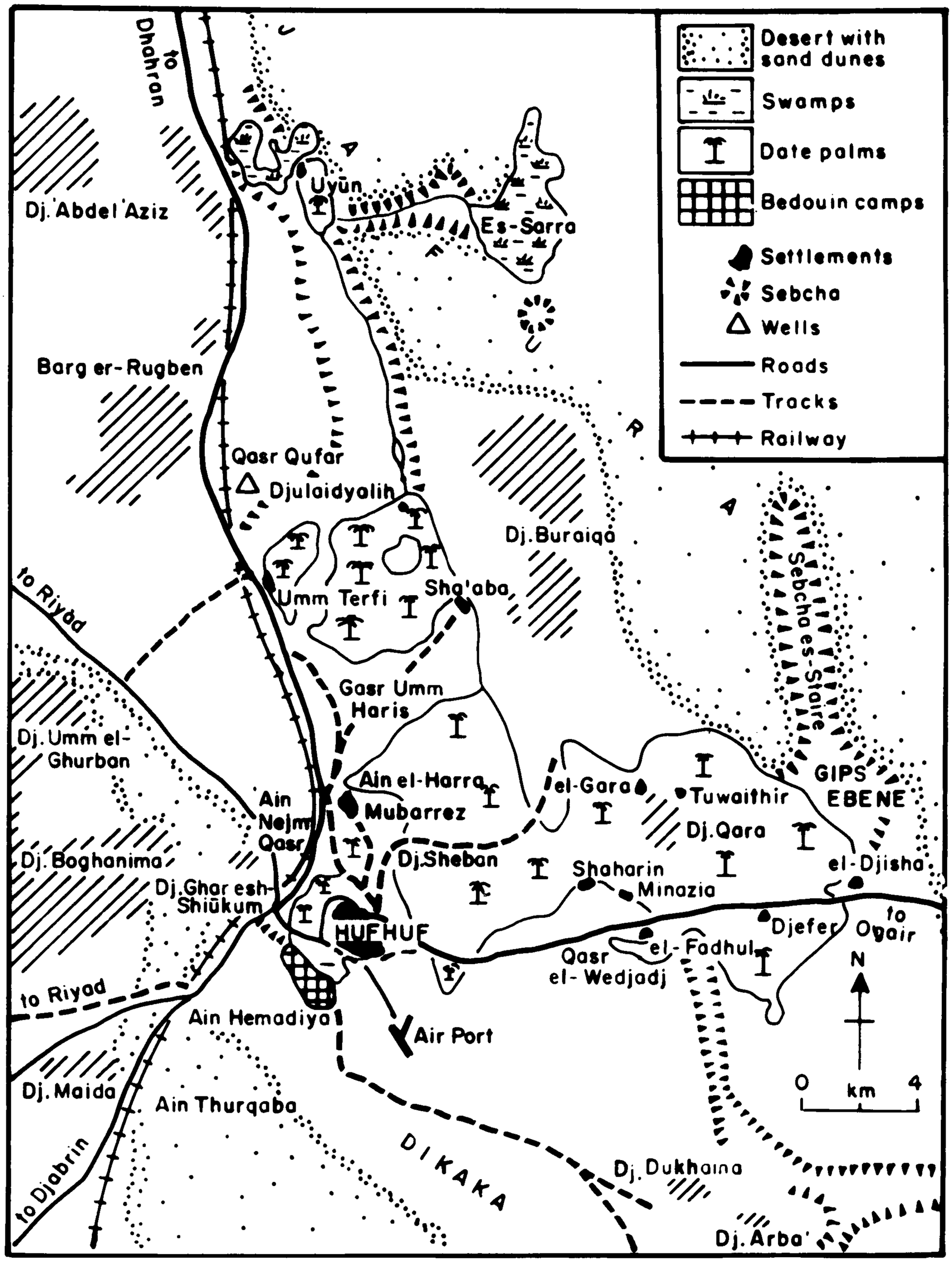

SYRIA
DAMASCUS
U. A. R.
JORDAN
AQABAH
IRAQ
BAGDAD
N
IRAN
Jauf
TABUK
SEKAKA
RED SEA
AL WAJH
COASTAL PLAIN
HAIL
NZ
ABADAN
ARABIAN GULF
YENBU
MADINAH
BURAYDAH
UNAYZAH
Hedjaz
Najd
DAMMAM
DHAHRAN
BAHREIN
JEDDAH
MEKKAH
TAIF
TIHAMA
RIYAD
HOFUF
LITH
TURABA
AL HARADH
BISHAH
Hasa
Asir
ABHA
SABYA
DHAHRAN
JIZAN
Rub al Khali
(EMPTY QUARTER)
OMAN
HODEIDA
SANA
MARIB
YEMEN
TAIZZ
SOUTH ARABIAN FEDERATION
ADEN
GULF OF ADEN
ARABIAN SEA
THE 3 SETTLEMENT BELTS OF SAUDI ARABIA
ONE DOT EQUAL TO 10,000 INHABITANTS
N Z NEUTRAL ZONE
0 Km 600
SOURCE: H. DEQUIN

Map No. 1

P A R T T W O

AL HASSA OASIS, SAUDI ARABIA

AL HASSA OASIS



Source: F. S. Vidal

Map No. 1

Table No. 1

Names of the owners and sizes of the farms in Flah 1[1]

	Name	Size in ha.
1.	Wakf land	0.222
2.	Hukumah land	0.085
3.	Ibrahim Hassan Khalifa	0.369
4.	Assayd Khalifa Ali	0.164
5.	Matouk Saad al Khanfoush	0.134
6.	Ibrahim Saif al Mutaweh	0.250
7.	Jassem Eissa Hussein	0.159
8.	Saleh Eid Jumaiah	0.194
9.	Wakf land	0.313
10.	Matouk Saad al Khanfoush	0.220
11.	Saleh al Ghanem	0.098
12.	Ibrahim Ali	0.297
13.	Ahmed al Huwaishel	0.207
14.	Saleh al Ghanem	0.095
15.	Taher Mohammed al Shuwaiween	0.168
16.	Ali Ahmed al Kufail	0.047
17.	Mohammed Hussein al Yussef	0.063
18.	Ahmed Marsouk	0.240
19.	Abdullah Asfour	0.433
20.	Ali Hassan Salim	0.043
21.	Taher Said	0.110
22.	Ahmed al Ghanem	0.053
23.	Ahmed al Salim	0.140
24.	Mohammed al Dubavan	0.040
25.	Abdullah Asfour	0.271
26.	Mohammed Hussein al Kattan	0.263

	Name	Size in ha.
27.	Abdullah Abu Auwais	0.035
28.	Ahmed Hassan Kathem	0.105
29.	Hukumah land	0.055
30.	Taher Said	0.192
31.	Ben Nathan	0.016
32.	Abdullah Matawah	0.465
33.	Hukumah land	0.135
34.	Ibrahim Saif	0.222
35.	Wakf land	0.055
36.	Eissa al Mudarah	0.227
37.	Wakf land	0.592
38.	Wakf land	0.027
39.	Wakf land	0.083
40.	Ali Suaiween	0.155
41.	Abdahrahman ben Sarrar	0.064

Table No. 2

Names of the owners and sizes of the farms in F1ah3[2]

	Name	Size in ha.
1.	Wakf land	0.244
2.	Khalifa Ali	0.865
3.	Hussein Ali	0.177
4.	Taher Mohammed Shuaiween	0.024
5.	Mohammed Hassan Yussef	0.060
6.	Sons of Mohammed Eissa	0.253
7.	Awad Hassan Ibrahim	0.134
8.	Hamed Hassan	0.071
9.	Ahmed Hassan Ibrahim	0.103
10.	Ahmed al Hussein	0.118
11.	Hussein al Kathem	0.017
12.	Ahmed al Kathem	0.024
13.	Ahmed al Hassan	0.079
14.	Sheikh Abdullah al Mubarrak	0.944
15.	Hamed al Hugaili	0.140
16.	Hukumah land	1.808
17.	Fahed ben Sarrar	0.667
18.	Saleh al Mubarrak	0.017
19.	Wakf land	2 palm trees
20.	Sons of Fahed al Mubarrak	0.766
21.	Saleh al Ghanem	0.085
22.	Saleh al Markazi	0.071
23.	Taher Abu Khushein	0.124
24.	Mohammed al Saheeh	0.050
25.	Saad ben Saheeh	0.058

	Name	Size in ha.
26.	Abu Ibshait and partners	0.015
27.	Yussef Abdulassis al Rithe*	0.185
28.	Mohammed al Ali*	1.307
29.	Hussein al Ghanem*	0.783

* These farmers live in Al Taraf - all the others live in Al Jafer.

Table No. 3[3] Springs and their output

Name of spring	Output in cu.m./sec.	Adjacent area
Ain al Khudud	3.500	F1
Ain al Hagl	2.900	F1
Ain Hueire	0.217	F1
Ain Aseimi	0.086	F1
Ain Umm Freech	0.135	F1
Ain Umm Save	0.084	F1
Ain Guedab	0.084	F1
Ain al Amarah	0.030	F1
Ain Ta' Adhid	0.437	F1
Ain Rasibe	0.320	F1
Ain Buhadji	0.140	F1/P1
Ain Umm al Lif	0.200	F1/P1
Ain Manah	0.400	F1/P1
Ain al Luwaimi	0.580	F1/P1
Ain Talib	0.052	F1/P1
Ain Barabir	0.915	F1/P1
Ain Umm Dalli	0.130	F1
Ain Bsetina	0.140	F1
Ain al Jaburiyah	0.030	F1
Ain Mushaitiyah	0.042	F1
Ain Sable	0.048	F1
Ain Khannur	0.064	F1
Ain Jauhariyah	0.685	F2
Ain al Harrah	0.540	F3/P4
Ain Mansur	0.620	F4
Ain Umm Ahabah	1.495	F5

Name of spring	Output in cu.m./sec.	Adjacent area
Ain Sumbor	0.400	F6
Ain Sedide	0.155	F6
Ain Abu Nasser	0.300	F6
Ain Hagege	0.095	F6
Ain Huweirrah	0.430	P2
Ain Bahlah	0.350	F7
Ain Nasser	0.230	F2
Ain Buhauriyah	0.250	P3

Table No. 4[4]

No. OF CANAL	LENGTH OF CANAL IN km.
Z1.1	0.165
Z1.2	0.833
Z1.3	0.328
Z1.4	1.373
Z1.4.1	0.101
Z1.5	0.109
Z1.6	-
Z1.6.1	-
Z6.1	0.843
Z6.1.1	0.204
Z6.1.2	0.052
Z4	1.061
Total	5.812

Table No. 5[5]

No. OF CANAL	LENGTH IN km.
F1	19.670
F1.1	22.889
F1.1.1	4.040
F1.1.2	10.466
F1.2	8.531
F1.3	8.038
F1.4	4.287
F1.5	3.503
F2	21.386
F3	6.441
F4	7.281
F5	17.184
F5.1	3.762
F6	6.269
F6.1	2.252
F7	2.880
F2-F5	2.709
Total	151.588

Table No. 6

No. OF CANAL	No. OF CANALS	LENGTH OF CANALS IN km.^{6}
F1aa-F1bc	28	28.829
F1.1aa-F1.1bf	31	26.526
F1.1.1aa-F1.1.1ae	5	5.146
F1.1.2aa-F1.1.2am	13	7.808
F1.2aa-F1.2am	13	22.464
F1.3aa-F1.3am	13	11.245
F1.4aa-F1.4ag	7	9.622
F1.5aa-F1.5ag	7	7.260
F2aa-F2ay	24	18.918
F3aa-F3ac	3	2.250
F4aa-F4ag	7	12.854
F5aa-F5ay	24	30.636
F5.1aa-F5.1ak	10	8.046
F6aa-F6ah	8	5.911
F6.1aa-F6.1ac	3	3.108
F7aa-F7ad	4	7.770
P1a-P1h	8	21.640
P2a-P2m	10	14.230
P3a-P3c1	3	4.613
P4a-P4m	12	23.846
Total	233	208.393

Table No. 7[7]

No. OF CANAL	LENGTH IN km.
D1	53.044
D1.1	7.549
D1.2	5.242
D1.3	2.960
D1.4	6.416
D1.5	3.364
D1.6	2.538
D1.7	2.210
D2	28.248
D2.1	4.440
D2.2	14.247
D2.2.1	3.177
D2.2.2	2.363
D2.3	0.983
D3	6.500
Total	143.281

Table No. 8[8]

No. OF CANAL	No. OF CANALS	LENGTH IN km.
D1aa-D1ce	47	45.477
D1.1aa-D1.1ah	6	7.952
D1.2aa-D1.2am	10	6.981
D1.3aa-D1.3ae	5	4.621
D1.4aa-D1.4ai	9	9.103
D1.5aa-D1.5ae	5	5.901
D1.6aa-D1.6af	5	4.416
D1.7aa-D1.7ac	3	3.394
D2.aa-D2bd	27	29.119
D2.1aa-D2.1af	6	4.762
D2.2aa-D2.2aq	16	21.841
D2.2.1aa-D2.2.1ad	4	4.849
D2.2.2aa-D2.2.2ai	9	7.643
D2.3aa-D2.3ac	3	5.713
D3aa-D3ak	10	12.541
Total	165	174.313

Diagram No. 1

MONTHLY DAILY MEAN TEMPERATURES (2·00m. ABOVE SOIL SURFACE)

AGRARMETEOROLOGICAL STATION SOURCE LEICHTWEISS INSTITUTE BRAUNSCHWEIG Appendix: 43

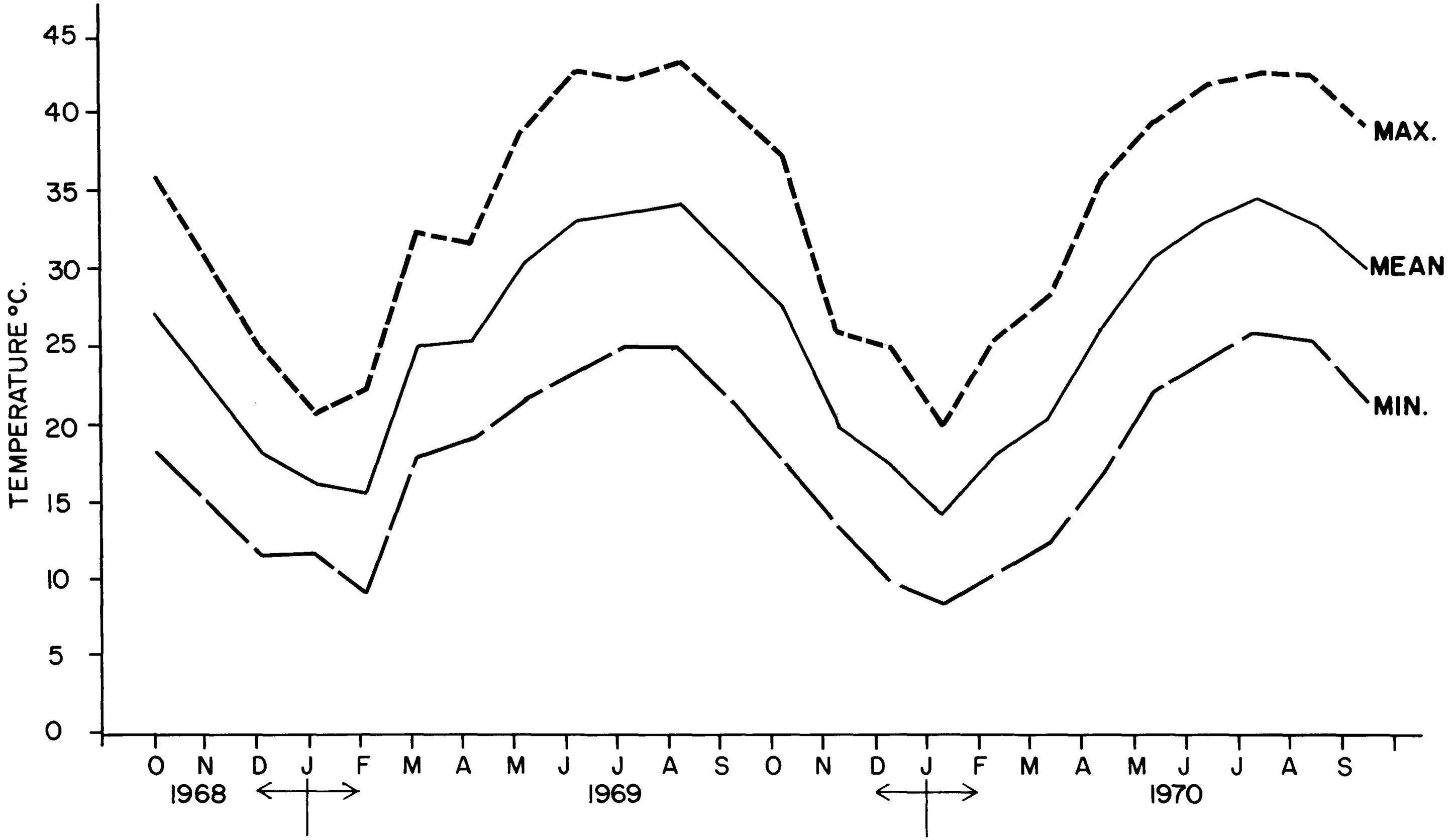
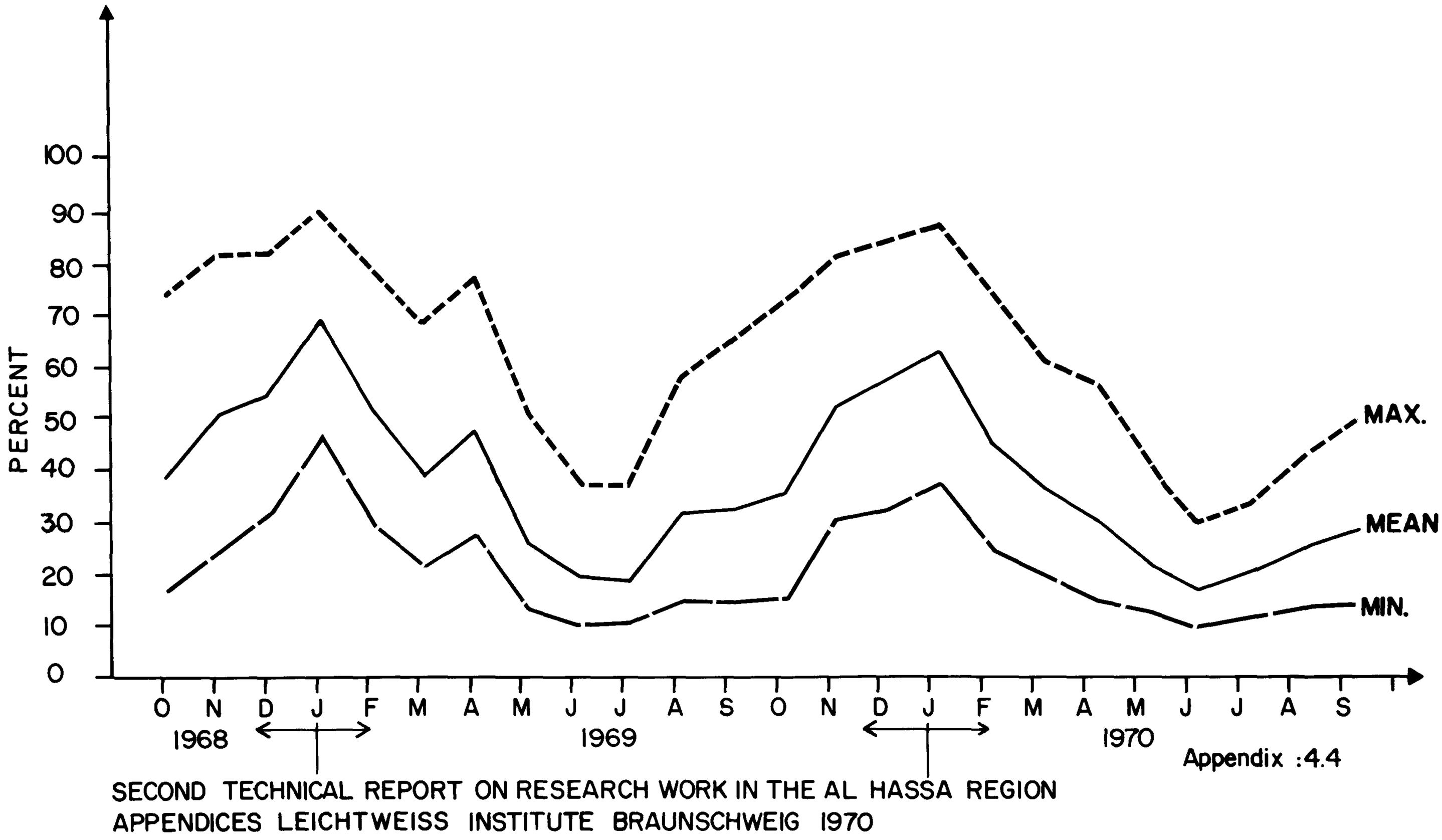


Diagram No. 2

MONTHLY DAILY MEAN HUMIDITY OF THE AIR

AGRARMETEOROLOGICAL STATION



Appendix :4.4

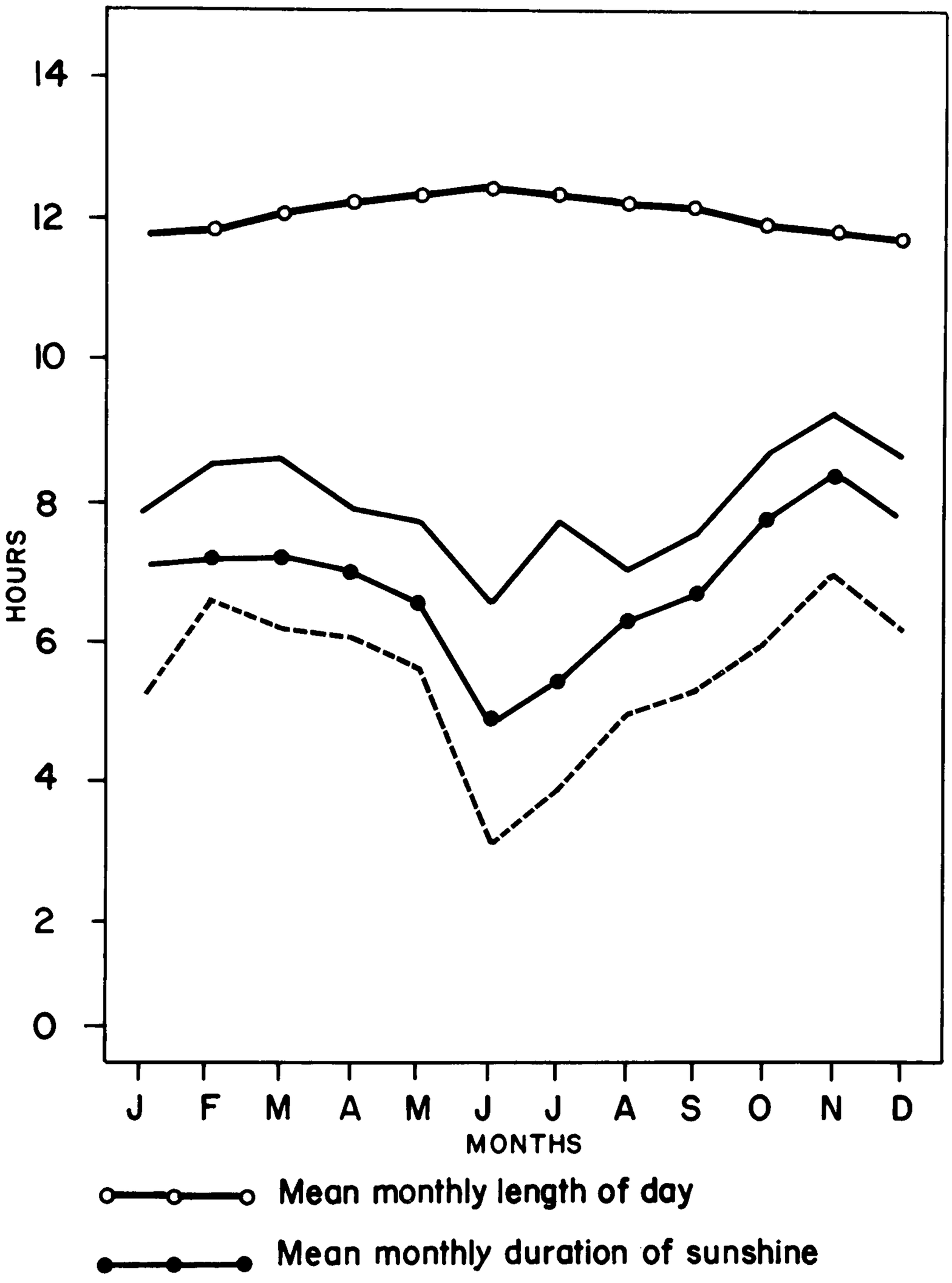
SECOND TECHNICAL REPORT ON RESEARCH WORK IN THE AL HASSA REGION
APPENDICES LEICHTWEISS INSTITUTE BRAUNSCHWEIG 1970

PART THREE

AVU KETA, GHANA

Diagram No. 1

MEAN MONTHLY DURATION OF SUNSHINE ADA 1956-65



SOURCE: WAKUTI AVU KETA

Diagram No. 2

LONG TERM MAXIMUM AND MINIMUM TEMPERATURE. KETA 1946 1966

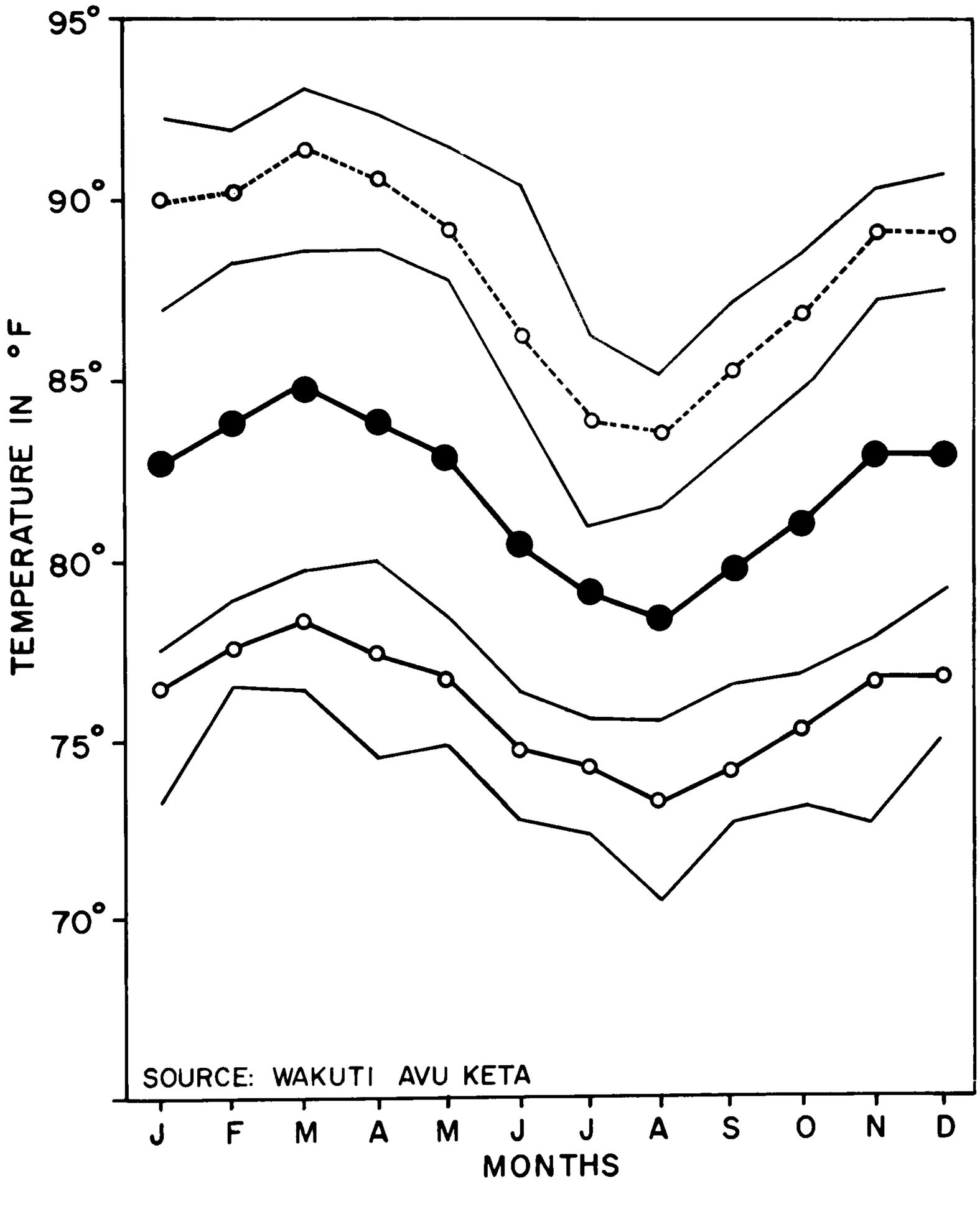
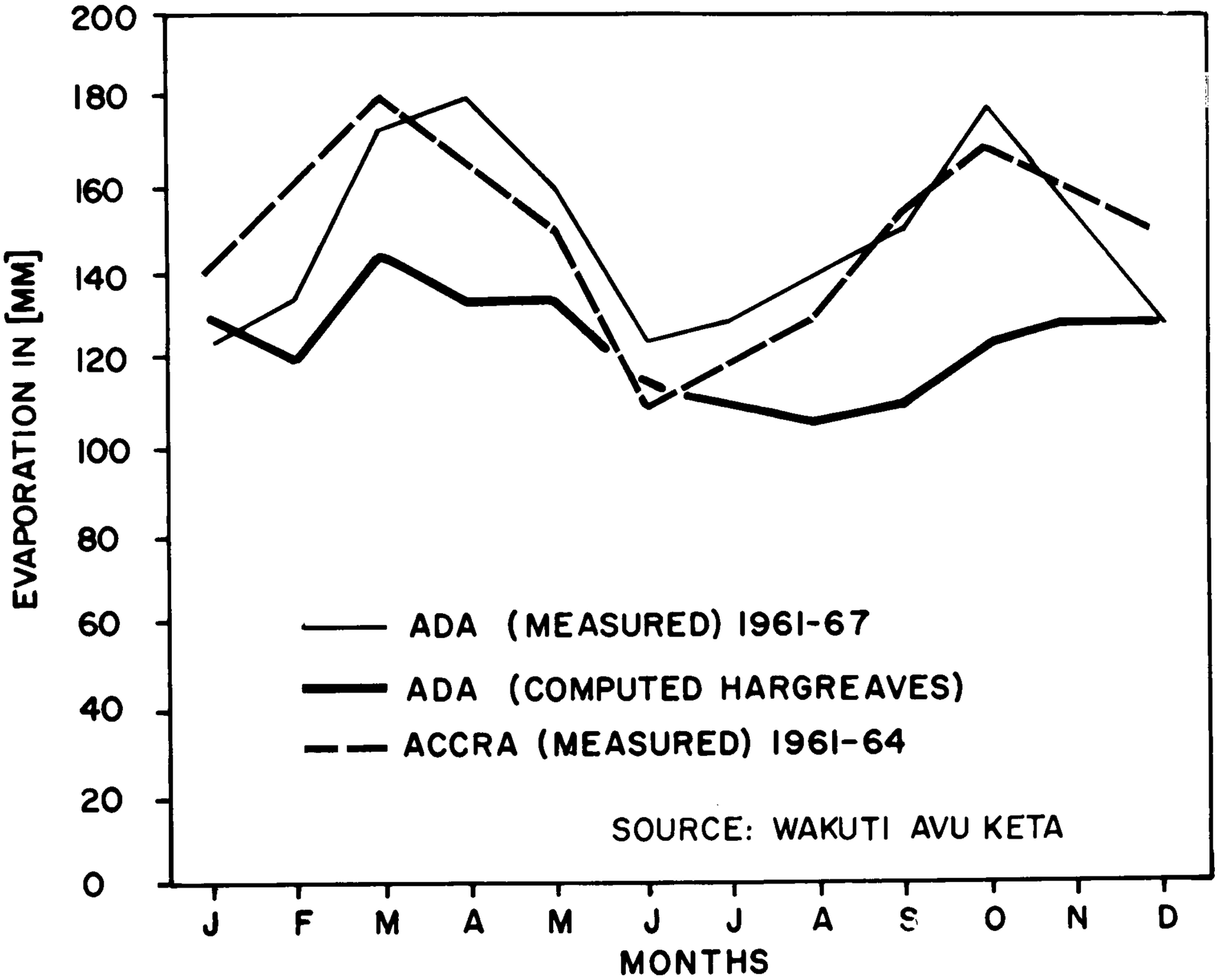
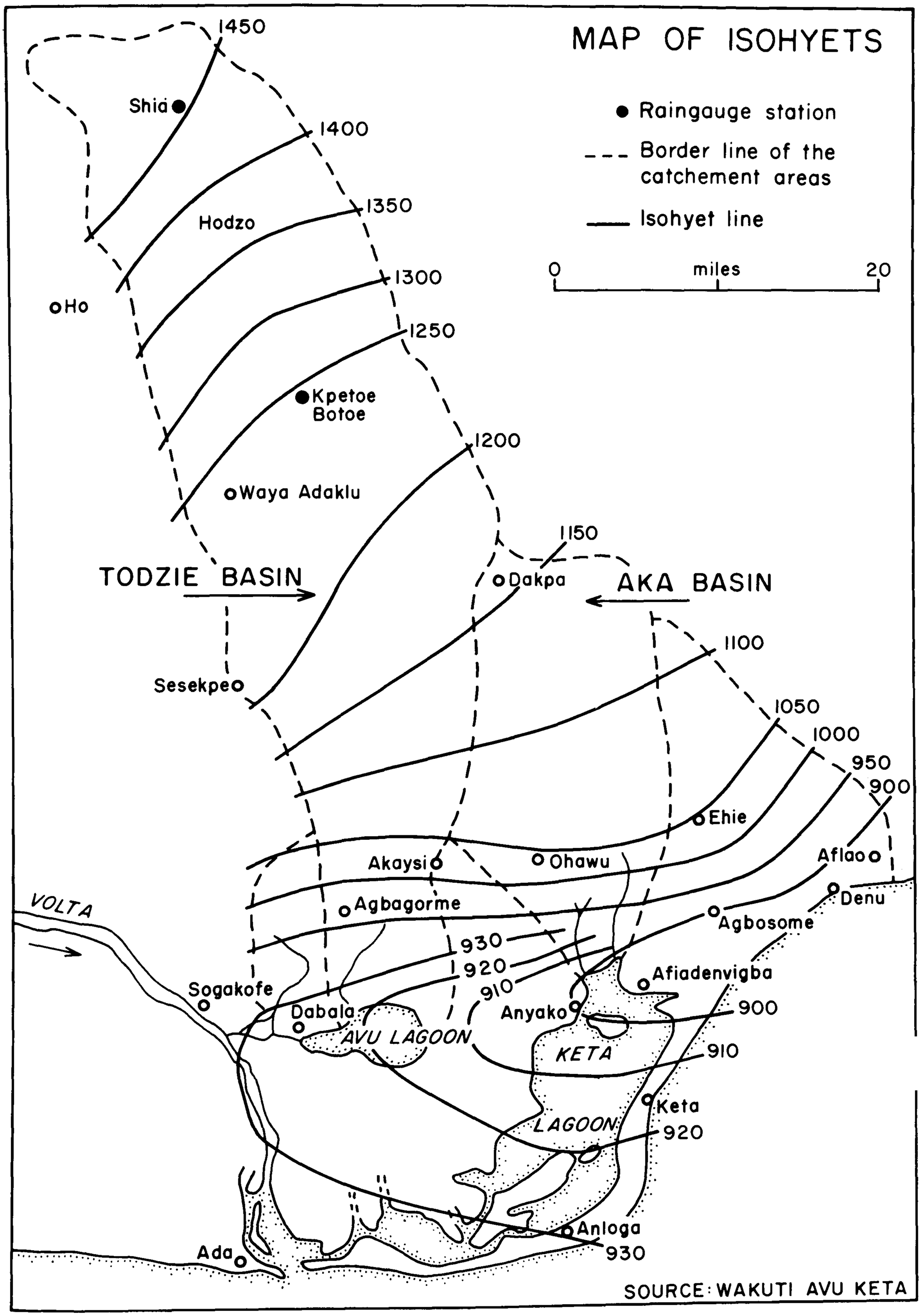


Diagram No. 3

MEAN MONTHLY EVAPORATION




MAP OF ISOHYETS
Raingauge station
Border line of the catchement areas
Isohyet line
0 miles 20
1450
1400
1350
1300
1250
1200
1150
1100
1050
1000
950
900
930
920
910
900
910
920
930
Shia
Hodzo
Ho
Kpetoe
Botoe
Waya Adaklu
TODZIE BASIN
AKA BASIN
Dakpa
Sesekpe
Ehie
Akaysi
Ohawu
Aflao
Denu
Agbagorme
Agbosome
VOLTA
Afiadenvigba
Sogakofe
Dabala
Anyako
AVU LAGOON
KETA
Keta
LAGOON
Anloga
Ada
SOURCE: WAKUTI AVU KETA

Map No. 1

PART FOUR

TAUORGA OASIS, LIBYA

Map No. 1

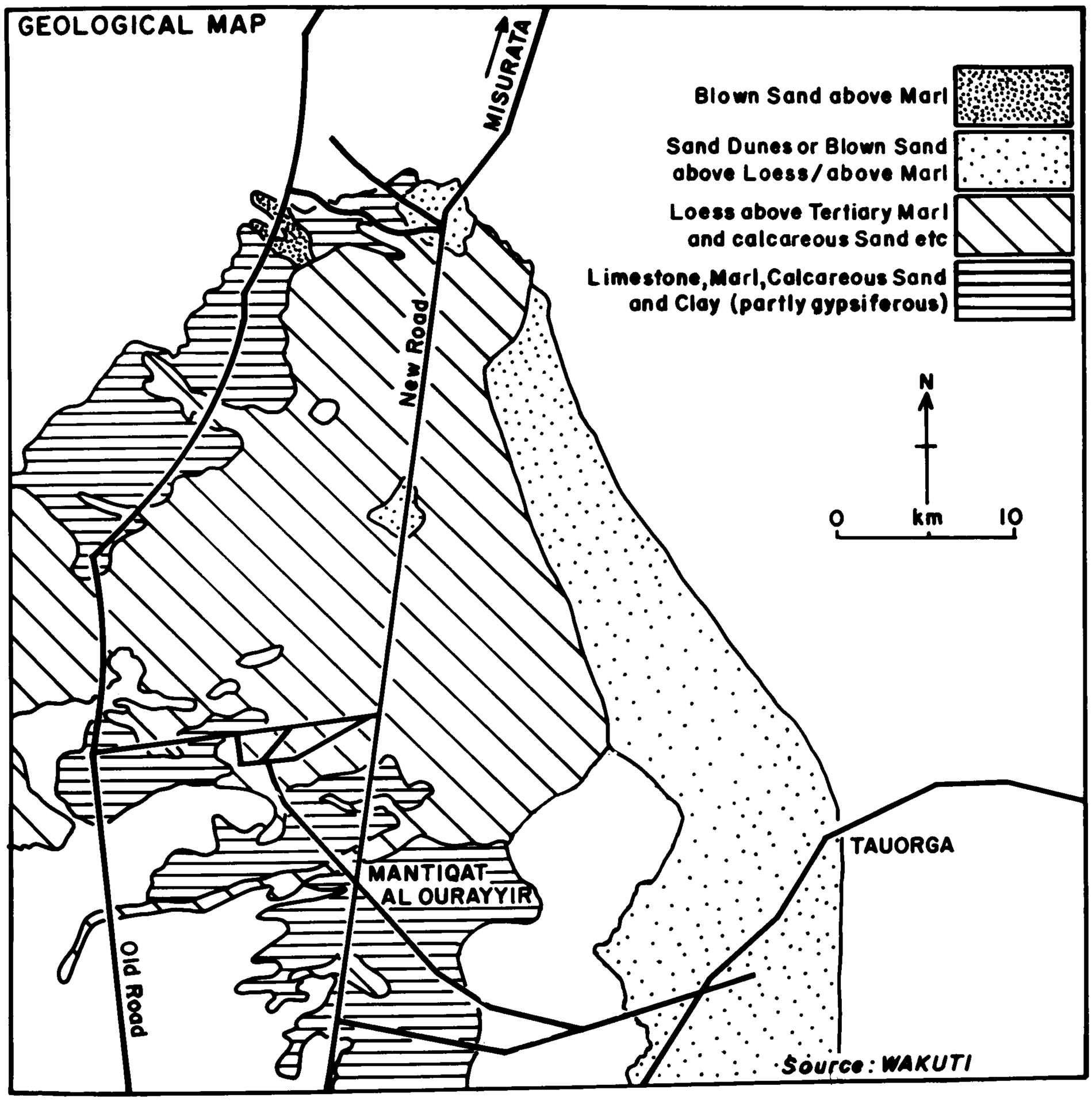
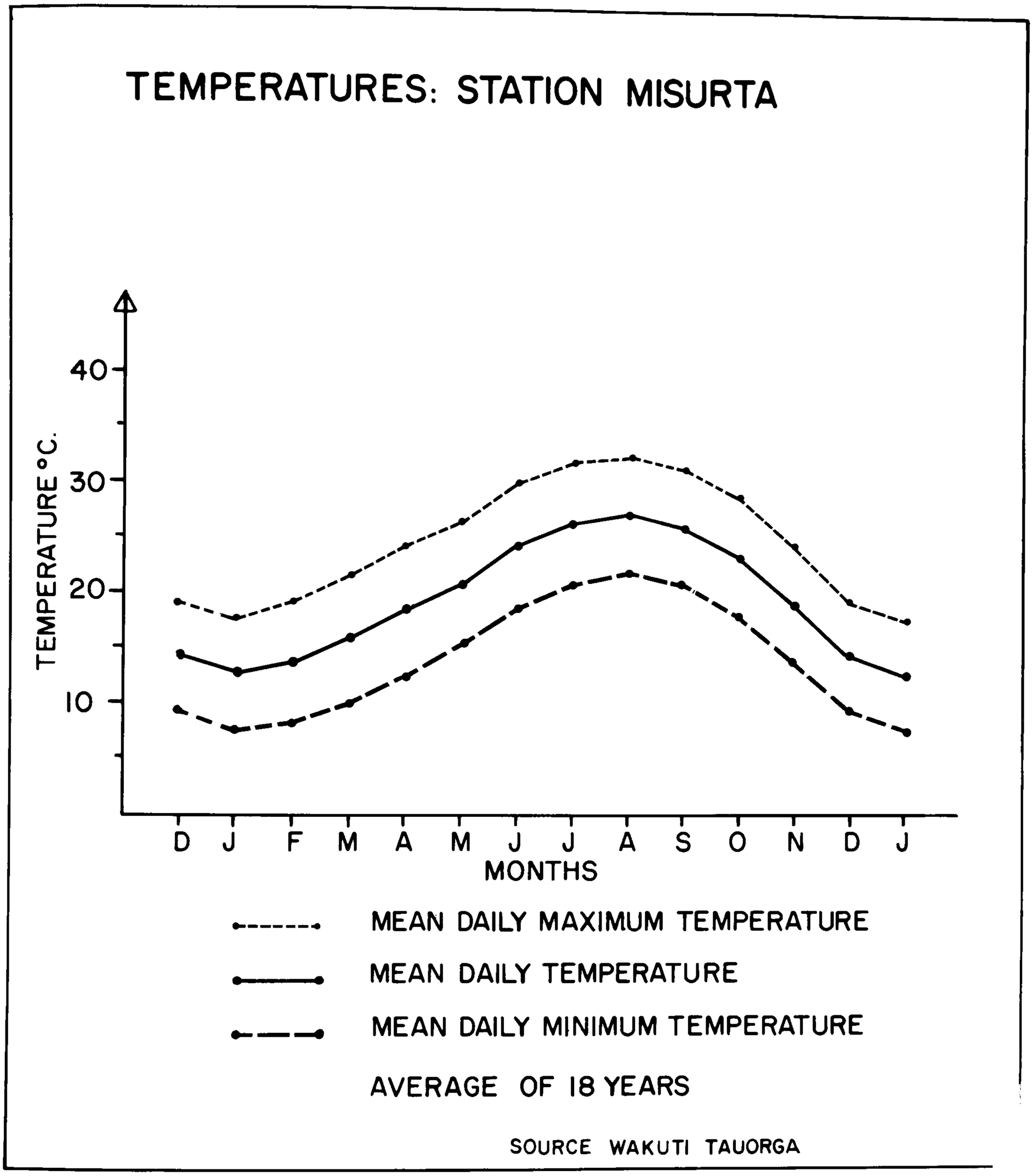
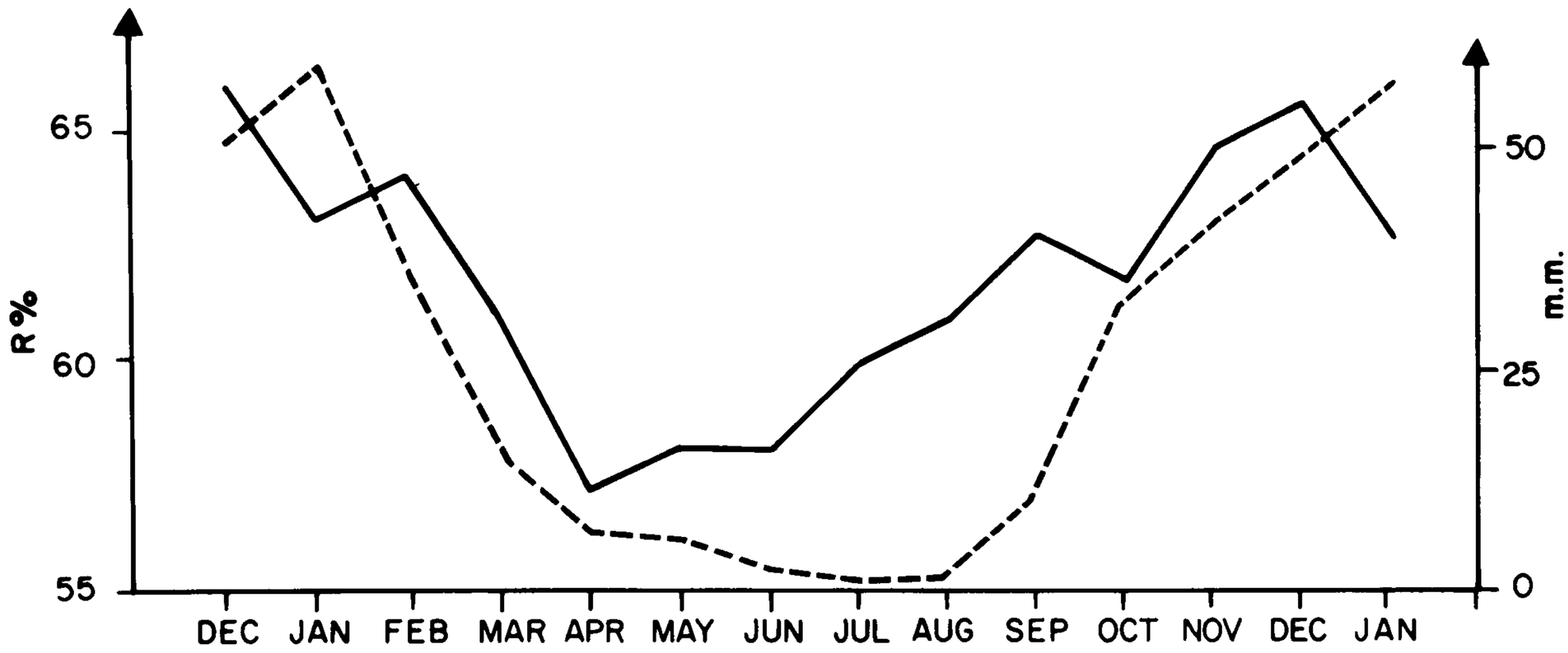

GEOLOGICAL MAP
MISURATA
New Road
Old Road
MANTIQAT AL OURAYYIR
TAUORGA
Blown Sand above Marl
Sand Dunes or Blown Sand above Loess / above Marl
Loess above Tertiary Marl and calcareous Sand etc
Limestone, Marl, Calcareous Sand and Clay (partly gypsiferous)
N
0
km
10
Source : WAKUTI

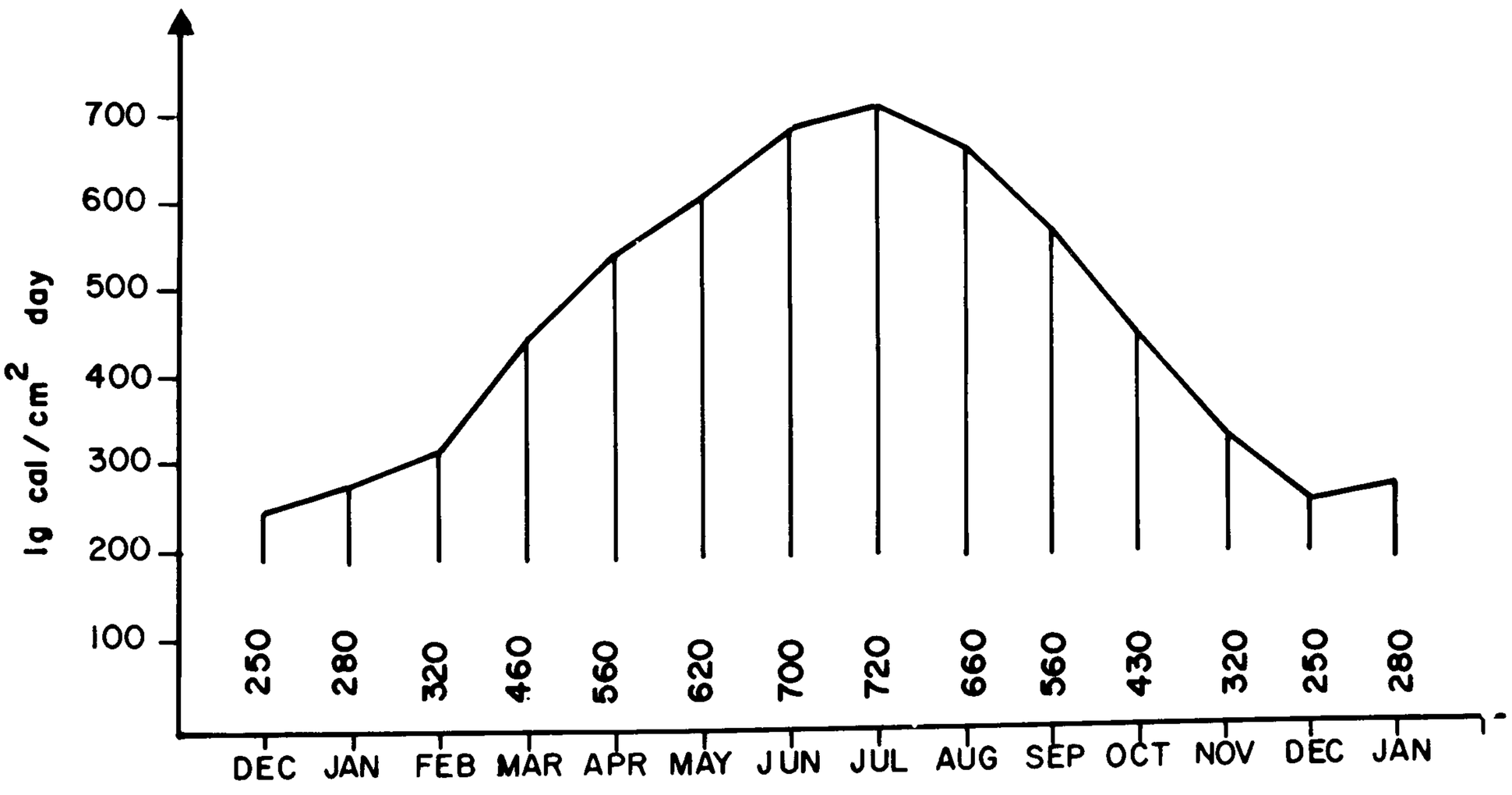
Diagram No. 1


TEMPERATURES: STATION MISURTA
TEMPERATURE °C.
40
30
20
10
D J F M A M J J A S O N D J
MONTHS
MEAN DAILY MAXIMUM TEMPERATURE
MEAN DAILY TEMPERATURE
MEAN DAILY MINIMUM TEMPERATURE
AVERAGE OF 18 YEARS
SOURCE WAKUTI TAUORGA

RAINFALL AND HUMIDITY: STATION MISURATA



SOLAR RADIATION Ig(incal/cm day on the horizontal surface of MISURATA SOURCE: WAKUTI TAUORGA



Diagrams Nos. 2 and 3

Table of chemical water analysis (Tauorga Springs)

Table No. 1

SAMPLE No.		A	B	2	3	4	5	6	7	8	9	11	13	14	15	17	50
Temperature °C.		31°	32°	20.5°	18°	-	20°	30°	34°	-	20°	-	21°	21°	22°	39°	-
Specific conductance micromhos at 25°C.		4200	-	5000	4200	4600	2700	2300	2700	5650	3350	5200	4600	6200	3740	-	5400
pH		7.4	6.95	7.2	7.4	7.2	7.3	7.0	7.4	7.0	7.0	7.0	7.0	7.0	7.0	6.65	7.0
Total hardness as $CaCO_3$	ppm	1333.8	1157	1469.2	1229.6	1578.6	708.6	781.5	890.9	1240	1042	1464	1448.4	1891.2	1026.4	1187	1995.4
Tot. diss. solids	ppm	2940.0	2790	3284	2680	3228.0	1720	1542	1700	3746	2250	3610	3458	4446.0	2510	3997	5170.0
SiO_2	ppm	24.0	-	24.0	16.0	8.0	2.0	14.0	32.0	16.0	12.0	8.0	8.0	14.0	6.0	-	18.0
Ca	ppm	292.0	292.0	298.0	250.0	330.0	152.0	154.0	182.0	258.0	194.0	266.0	262.0	358.0	184.0	292.0	424.0
Mg	ppm	147.1	104.0	176.3	147.1	183.4	80.3	96.1	106.3	144.7	135.0	194.6	193.3	242.0	137.4	104.0	227.4
Ng	ppm	494.2	-	563.8	455.0	481.0	302.0	218.4	211.8	878.2	413.8	683.9	641.4	816.1	514.0	-	1033.8
K	ppm	32.8	-	32.8	37.5	29.7	52.4	46.9	45.0	65.7	16.4	41.0	32.8	40.7	32.8	-	48.9
HCO_3	ppm	296.5	103.0	263.5	568.5	214.7	222.0	353.8	268.4	716.0	178.5	147.6	191.5	244.0	219.6	143.0	231.8
CO_3	ppm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL	ppm	914.9	957.0	1007.0	836.9	858.1	439.7	361.7	432.6	1482.2	978.7	1198.4	1113.4	1446.8	1099.3	1880.0	1773.0
SO_4	ppm	864.1	811.0	1045.2	592.6	1221.3	539.9	493.8	538.2	539.9	420.5	1150.5	1116.8	1418.0	436.2	520.0	1552.2
NO_2	ppm	0.004	-	0.05	0.6	0.025	0.02	0.016	0.01	0.016	0.02	tr.	tr.	tr.	tr.	-	tr.
NO_3	ppm	20.7	-	11.5	13.8	13.8	20.7	tr.	20.7	tr.	tr.	8.0	8.0	8.0	tr.	-	17.2
Fe	ppm	tr.		tr.	tr.	tr.	tr.	tr.	tr.	-	-	-	-	-	-	-	-

Table No. 2

Classification of ground-water according to J. R. Jones[2]

CLASS	CHLORIDE (Cl ppm)	SULPHATE (SO_4 ppm)	TOTAL DIS. SOLIDS ppm	SPEC. CONDUCTIVITY MICROMHOS AT 25°C.
Good	less than 250	less than 250	less than 1,000	less than 1,600
Fair	250-800	250-800	1,000-1,500	1,600-2,500
Poor	800-1,500	600-1,200	1,500-3,500	2,500-6,000
Brackish	1,500-3,500	1,200-2,500	3,500-6,000	6,000-10,000
Salty	more than 3,500	more than 2,500	more than 6,000	more than 10,000

R E F E R E N C E S

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1. H. Speetzen, Notes on Flah, (unpublished, Hofuf, 1970)

2. Ibid.

3. WAKUTI, Final Completion Report for Supervision of the Execution of the Al Hassa Irrigation and Drainage Project, (Zug, 1972), pp. 41-42

4. Ibid., p. 44

5. Ibid., p. 46

6. WAKUTI, Final Design for the Project of Improving Irrigation and Drainage in the Region of Al Hassa, Saudi Arabia, Explanation Report, (Siegen, 1964), pp. 43-45

7. WAKUTI, Completion Report, p. 74

8. Ibid., p. 75

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1. WAKUTI, Study on the Tauorga Irrigation Project, (Siegen, 1965), Appendix No. 2

2. Ibid., p. 47

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1. WAKUTI — Study on the Tauorga Irrigation Project, Siegen, Germany, 1965