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**Somali Democratic Republic
National Refugee Commission**

United Nations High Commissioner for Refugees

Farjano Settlement Project Land Evaluation

**ADDENDUM
SOIL MOISTURE RETENTION RESULTS**

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Date: 19th July, 1985

Our Ref: 1392/1/1

Your Ref:

Mr. E.Q. Blavo,
The Representative,
United Nations High Commissioner for Refugees,
P.O. Box 2925,
Mogadishu,
Somali Democratic Republic.

Dear Sir,

Farjano Settlement Project
Land Evaluation

Further to our letter of 26th April, 1985 and our report for the Farjano Settlement Project, April 1985, please find enclosed twenty copies of the addendum covering the soil moisture retention results. We apologise for the delay in presenting this information which was due to the very long testing times required for the heavy clay soils.

The addendum comprises the following:

- (i) Section 4.6.3 : Analytical and Field Data.
This section supersedes the section 4.6.3 bound into the April 1985 report.
- (ii) Table 4.7 : Soil Moisture Retention Properties.
New table.
- (iii) Table 4.8 : Soil Moisture Characteristics.
An amended version of Table 4.7 in the April 1985 report.
- (iv) Figures 4.3, 4.4 and 4.5 : Soil Moisture Characteristics.
New figures.
- (v) Appendix C : Soil Profile Descriptions.
Amended/completed descriptions for profiles 1, 2, 4, 7, 10, 11, 12 and 16.

Continued/2...

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Mr. E.Q. Blavo

19th July, 1985

We should like to record our thanks and appreciation for the co-operation we have received from your staff in Mogadishu and from the Somali Authorities in carrying out this assignment.

Yours faithfully,
Sir M. MacDonald & Partners Limited



J.F. Robson

encs.

4.6.3 Analytical and Field Data

In the Farjano study area intact soil cores were taken from principal horizons of representative soils. In view of the extremely dry state of the soils it was necessary to pre-wet the profiles, and allow them to drain for some two days, so as to reach an approximate state of field capacity. Results of field soil moisture investigations on C1 soils are given in Table 4.8. Analytical data are given in Table 4.7 and Appendix C.

The available water capacity (AWC) is defined as the proportion of soil water available to sustain plant life and is taken as the difference between suctions at 0.1 and 15 bars. The easily available water capacity (EAWC), taken as the difference between 0.1 and 1.0 bars, is important in assessing available water for vertisols, due to the unequal availability of water at higher suctions. The water held between 0.0 and 0.1 bar, the aeration porosity is also considered to be important for assessing available water capacities in Somali vertisols (HTS 1978, 1979). This water may not be easily available, however, due to anaerobic effects on plant roots in pores.

Results from previous studies on the Lower Shabeelle floodplain (HTS 1979) showed that most of the water in vertisols is held in the less available AWC range (1 to 15 bars). The EAWC accounts for less of the total AWC in the vertisols than on levee and upper coverplain soils.

From Table 4.7 it is clear that the soils of the Farjano area exhibit similar properties in general. Available water is higher in the profile, especially in the heavy clays of the old channels and coverplains. In the vertisol clays however, approximately 20 to 30% of this water is held in the EAWC range, and is a limiting factor to storage and later release of moisture. Site PM 11 appears to be anomalous, probably due to the substantial presence of CaCO₃ concretions, which give the clay a more open sandier texture.

The moisture release curves (Figures 4.3 and 4.4) show that for the clay soils the amount of water released in the EAWC range (0.1 to 1.0 bar) is small in most cases, and at permanent wilting point (15 bar) there may be still up to 40% moisture, but in an unavailable form. Field experiments that compared air dried and oven dried weights of moisture samples confirmed substantial differences. In the more loamy textured soils a greater part of the soil water is released between 0.1 and 1.0 bar. These factors have been used to classify the soils for both irrigated and rainfed agriculture.

Results of the field soil moisture investigations, carried out as an attempt to quantify moisture storage in the soils, have been correlated with the analytical data from PM 25, since all the sites measured were in the same mapping unit. For PM 25 itself soil moisture down to 0.5 m lies above 1.0 bar and is insufficient to support any growth. Deeper in the profile soil moisture is in the middle of the EAWC range. This is an encouraging result since this soil lies under dense secondary *Acacia sp* thicket, where moisture extraction must be substantial. It suggests that tree growth on these soils could be successful, provided that species are adopted which have root systems capable of penetrating deeply into the heavy clays. For arable crops root systems may be unable to do this and the moisture reserves could remain untouched, though in a steady state that would benefit rapid replenishment of horizons above.

The other sampled profiles show that under fallow and cultivated conditions soil moisture is depleted at the surface but is substantial at depth (Figure 4.5). Correlating the field data with the analytical framework provided by PM 25

suggests that the moisture content of most of these additional sites is, at depth, in a saturated state. Field evidence does not support this however, and it is more likely to be within the EAWC range. Ideally each site monitored for soil moisture should have bulk density and moisture tension data, as at PM 25. Time precluded moisture monitoring at the other analysed sites, but it is recommended that monitoring be extended to these sites.

Replenishment of the soil moisture profile depends on the efficiency of the fallowing system to receive and store water. For example, given a rainfall of 400 mm and the suggested fallowing efficiency of 25%, only 100 mm will be stored. Although the AWC of the profile is high in the clays, much of this will be unaffected by cropping as it is in the higher tensions. The 100 mm thus should have a substantial effect on replenishment of soil water in the lower parts of the AWC and EAWC ranges. Successive dry years however will deplete the reservoir such that it will be replenished only with sustained rainfall. Thus the system as a whole remains delicate and crop failures can occur despite careful moisture conservation.

TABLE 4.7

Soil Moisture Retention Properties

Profile Nr	Soil unit	Sampled depth (cm)	Representative horizon (cm)	Aeration porosity (%)	AWC (% vol)	Available water in horizon (mm)	Available water in profile (mm/m)	EAWC (% vol)	Easily available water in horizon (mm)	Easily available water in profile (mm/m)	EAWC as % of AWC (profile) (%)
PM 1	A2	5-10	0-30	7.8	37.5	112		11.4	34		
		35-40	30-90	6.0	32.6	196	336	7.1	43	80	23.8
		105-110	90-120	3.2	28.4	28		2.9	3		
PM2	B1	5-10	0-25	18.2	48.0	120		10.8	27		
		30-35	25-100	1.4	29.9	75	332	6.1	15	70	21.1
		65-70	25-100	2.5	27.3	137		5.5	28		
PM8	E	2-7	0-20	17.8	39.0	78		26.7	53		
		25-30	20-100	9.0	30.9	247	325	20.1	160	213	65.6
PM10	D1	5-10	0-20	18.8	27.6	55		10.9	22		
		30-35	20-40	10.9	25.6	51		4.9	10		
		70-75	40-100	2.8	39.4	236	342	12.4	50	82	23.6
PM11	A1	0-5	0-5	10.5	36.3	15		12.9	5		
		35-40	5-40	2.5	15.8	57		8.0	29	56	39.6
		70-75	40-100	1.4	11.5	69	141	3.6	22		
PM20	C2	5-10	0-15	2.0	35.6	53		5.0	8		
		30-35	15-55	0.9	21.5	86		4.9	20		
		60-65	55-102	3.5	26.0	117	256	4.5	20	48	18.7
PM25	C1	0-20	0-20	12.2	40.0	80		12.0	24		
		25-30	20-50	3.4	27.1	81		7.1	21		
		55-60	50-110	6.9	34.4	172	333	5.6	28	73	22.0

Notes: (1) AWC = Available water capacity. Moisture retained between 0 (for vertisols) or 0.1 and 15 bar.

(2) EAWC = Easily available water capacity. Moisture retained between 0.1 and 1.0 bar.

(3) Aeration porosity. Moisture retained between 0 and 0.1 bar.

(4) Available water in profile calculated as follows: Summation of each horizon gives total in profile. Horizon amount is Bulk Density x (% wt FC - %wt PWP) x Horizon thickness in mm/100.

(5) Easily available water in profile similar:

Bulk density (% wt 0.1 bar - % wt 1 bar) x horizon thickness in mm/100.

TABLE 4.8

Soil Moisture Characteristics, 12th/13th February 1985

Soil site	Soil unit	Land use		Percent soil moisture at depth				Comments
				5-10 (cm)	25-30 (cm)	50-55 (cm)	80-85 (cm)	
PM 36	C1	Cowpeas in der 1984	% wt	9.5	15.7	18.6	20.4	Crop was total failure, yet moisture remains in subsoil. Moisture stress greatest in January/February.
			% vol	17.2	33.8	41.3	46.9	
PM 37	C1	Weed free fallow since end of gu 1984	% wt	12.7	18.6	18.8	19.3	Suggests that profile received considerable water in der 1984.
			% vol	23.0	40.0	41.7	44.4	
PM 25	C1	Dense acacia thicket (B3-d) bare surface	% wt	8.7	15.1	15.8	15.5	Shows that tree roots utilising moisture throughout profile.
			% vol	15.8	32.5	35.1	35.7	
PM 4	C1	Cleared land (R5)	% wt	10.0	14.0	14.8	20.9	Surface horizons depleted of water by grasses and herbs, but considerable moisture at depth.
			% vol	18.1	30.1	32.9	48.1	
M 283	C1	Fallow since end of gu 1984	% wt	8.3	18.8	19.9	20.7	Surface horizon dry from evaporation, and poor weeding was noticeable. Good storage below. Has received der 1984 rainfall totalling 113 mm. Equivalent to 25 mm at 25% fallow efficiency.
			% vol	15.0	40.4	44.2	47.6	
M 292	C1	Weed free fallow since end of gu 1984	% wt	10.1	15.2	19.5	20.3	Shows similar storage to M 283, but has received total rainfall approximately 723 mm since fallow started. Equivalent to 180 mm at 25% fallow efficiency.
			% vol	18.3	32.7	43.3	46.7	

Note: Sample taken in field and immediately weighed, then air dried for 4 hours and oven dried for 4 hours. Overnight oven drying was impractical.

Bulk density values from PM 25 have been used to calculate percent volume soil moisture for the additional soil moisture sites, since all the sites belong to the same soil mapping unit.

FIGURE 4.3 SOIL MOISTURE CHARACTERISTIC CURVES

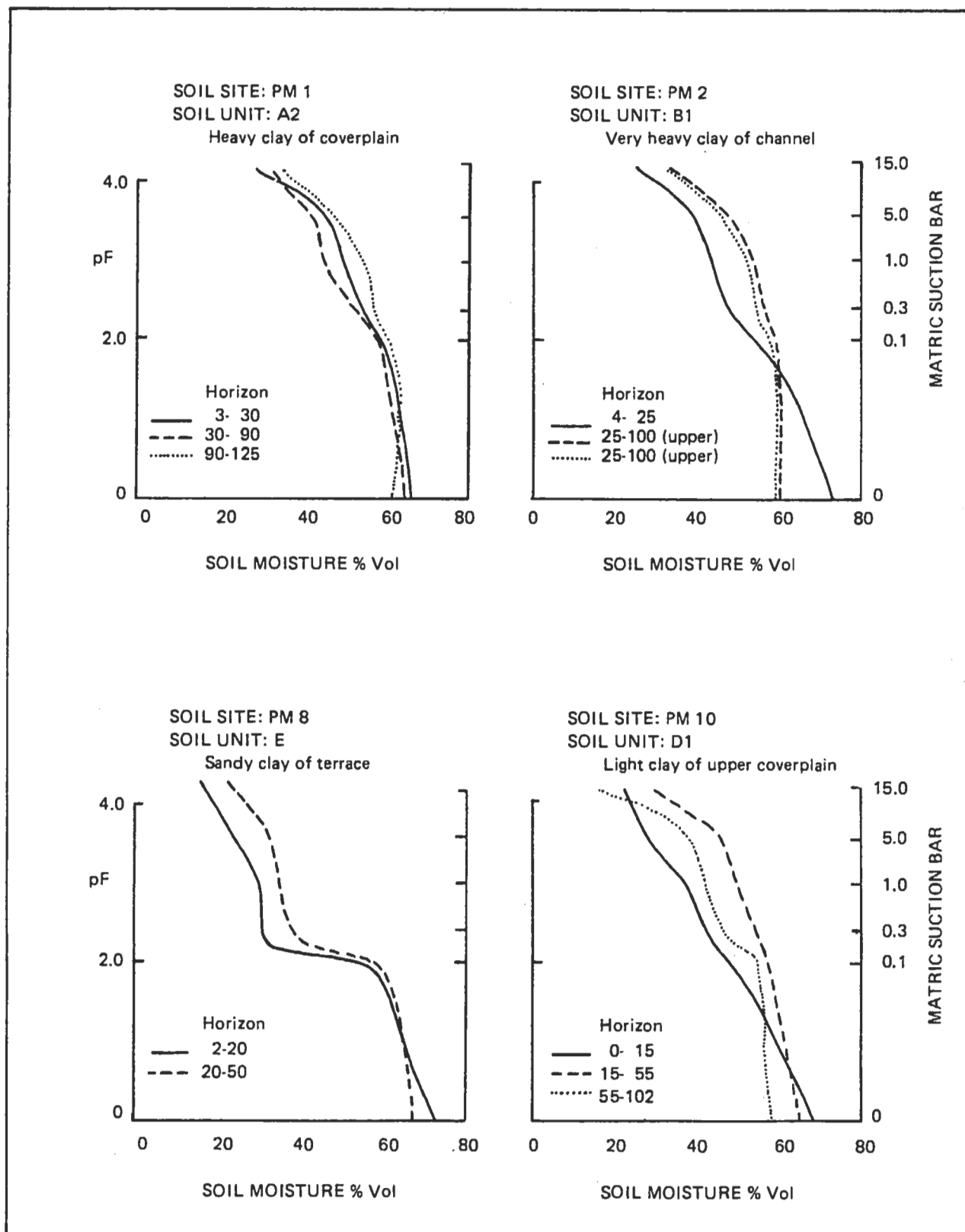


FIGURE 4.4 SOIL MOISTURE CHARACTERISTIC CURVES

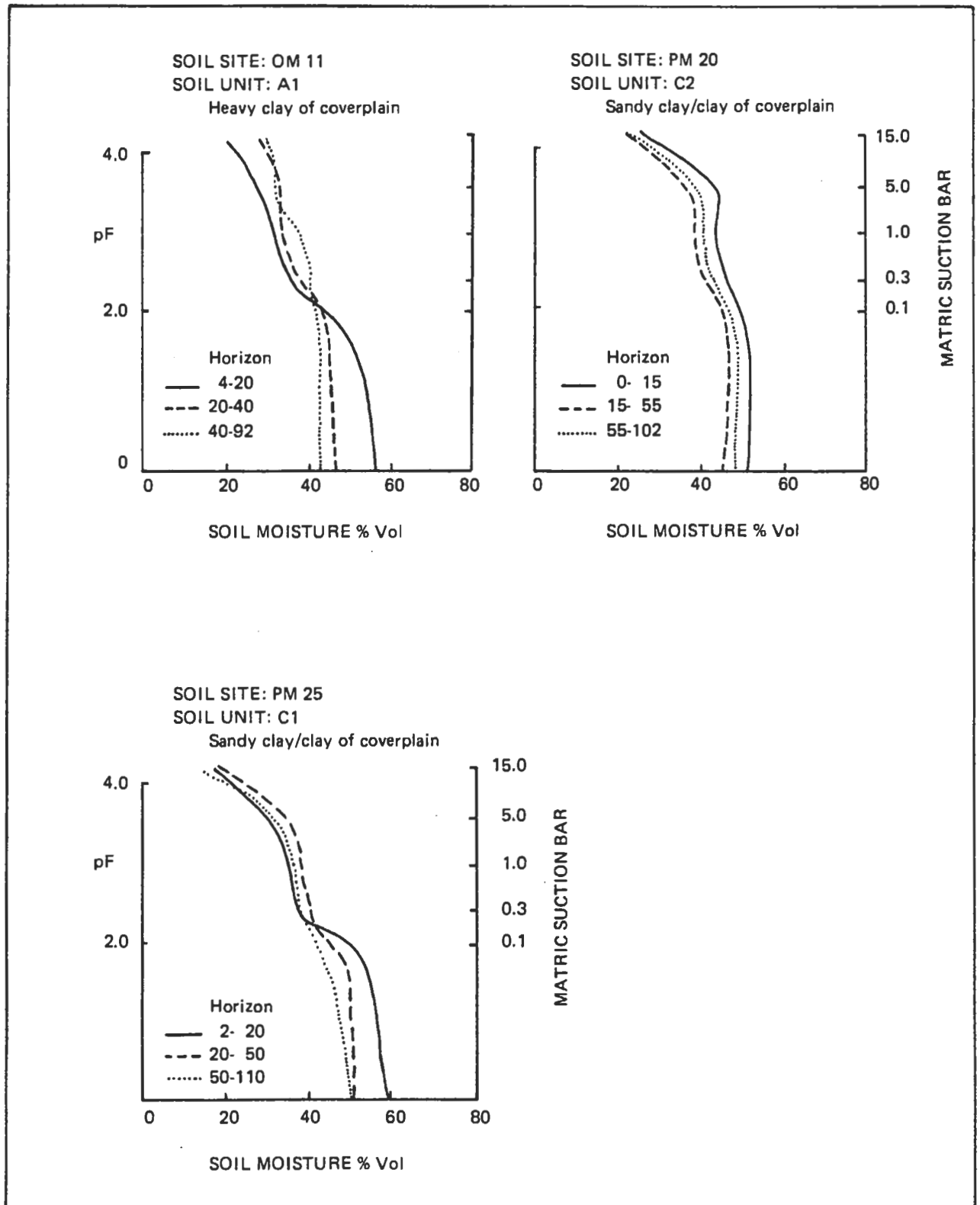
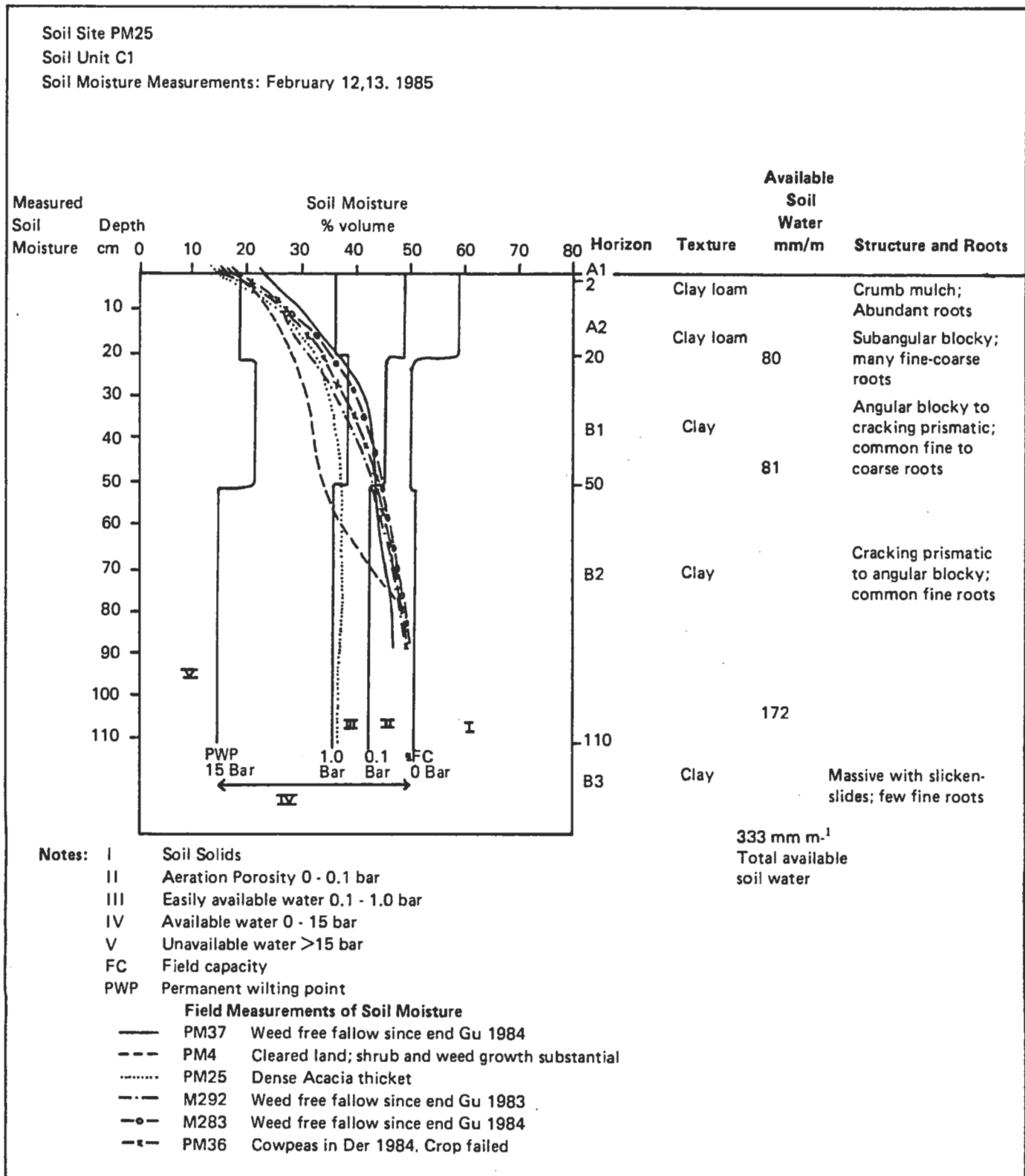


FIGURE 4.5 SOIL MOISTURE CHARACTERISTICS: SOIL SITE PM25



APPENDIX C

SOIL PROFILE DESCRIPTIONS

Methods of Description

In this appendix 17 profile descriptions of 14 soil units are described. The method of description follows the principles of the FAO Guidelines (1968). Soil classifications are according to the FAO/UNESCO legend (1974) and Soil Taxonomy of the USDA (1975). In the detailed profile descriptions soil colours are according to the Munsell colour notations and are given in the slightly moist state. The dry colour state is also given for any surface mulch or crust. Field electrical conductivity measurements, calibrated against laboratory assessments, are given for a number of profiles. Detailed laboratory chemical and physical data are given opposite the descriptions. Locations of profiles are measured approximately from the Government rest house at Sablaale. Elevations are also approximate, in metres above sea level.

Description 1: PM 11

A. Information on the Site

Soil Mapping Unit: A1	FAO Classification: Chromic Vertisol
Date of Examination: 19 January 1985	USDA Classification: Chromic Chromustert
Location: 12 km ESE Sablaale	Author: R.N. Munro
Landform unit: Lower coverplain (LC)	
Elevation: Ca 50 m asl	
Land use: Livestock browsing	
Slope: <1%	
Microrelief: Moderately undulating U2	
Vegetation: open mixed bushland with <i>Acacia nilotica</i> , and <i>Thespesia danis</i>	

B. Information on Soil

Parent Material: Old calcareous alluvium of Shabeelle River
Drainage - Profile: Moderate
Drainage - Site: Slow draining during rainy season
Moisture Condition in Profile: Dry to 120; very slight moist below
Flood hazard: Only in exceptionally wet years
Depth to ground water: not encountered
Surface features: surface mulch (10YR 5/2 dry) obscures cracking
Evidence of erosion: none

C. Brief Description of Profile

Deep dark brown clay profile with surface mulch, over hard prismatic structured subsoil. Small patches of sand are insufficient to place in soil unit Cl. Analysis show higher sand content than expected, and this is thought due to presence of fine concretions of sand particle size.

D. Profile Description

Horizon	Depth (cm)	Description
A1	0 - 5	Very dark greyish brown (10YR 3/2) clay loam; surface mulch; strong fine crumb; dry and loose; strongly calcareous; many shell and CaCO ₃ concretions. abrupt smooth to
A2	5 - 40	Very dark greyish brown (10YR 3/3) Clay; moderate fine to coarse sub-angular blocky; dry slightly hard; strongly calcareous; many very fine pores, many fine medium roots; common horizontal and few vertical cracks; gradual wavy to
B1	40-92	Dark brown (10YR 3/3) Clay; moderate medium coarse prismatic breaking to moderate medium coarse angular blocky; few prominent vertical cracks, many small vertical and horizontal cracks; dry and extremely hard; common small hard CaCO ₃ concretions; strongly calcareous; common fine and medium roots; diffuse to
B2	92-135	Dark brown (10YR 3/3) Clay; moderate medium coarse prismatic; few vertical cracks 3 cm wide to base of profile; slickenslides within peds; common hard and soft CaCO ₃ concretions; few patches fine sand on faces.

PROFILE No. 1

SITE No. PM11

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 μ m	SILT 50-2 μ m	CLAY <2 μ m			
A12	0-20	53	12	35	Sci	0.47	0.62
A2	20-40	46	12	42	Sc	0.66	0.55
B1	60-80	43	10	47	C	0.73	1.25
B2	95-115	40	10	50	C	1.66	1.50

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
8.9	1513	1.04	7.6	35.8	6.2	0.65	2.63	24.9
0	588	0.61	7.7	33.3	6.2	0.85	2.01	27.6
			7.8	35.8	11.3	1.56	0.98	32.2
			8.2	35.5	13.7	3.26	1.11	33.5

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
42	3	Cl	71	1.95	1.8	0.88	18.9	12.0
42	3	C	66	2.05	1.9	1.16	7.0	8.3
51	5	C	69	2.39				
61	10	C	67					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
57.7	47.2	37.1	34.3	29.6	21.5	A2/ 5-10
47.4	44.9	38.5	36.9	35.9	31.6	A2/ 30-35
43.5	42.1	39.2	38.5	35.1	33.0	B1/ 70-75

N.B. Bulk densities are for same depths as soil moisture tensions

PROFILE No. 2

SITE No. PM1

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 µm	SILT 50-2 µm	CLAY <2 µm			
A12	0-20	32	29	39	CI	0.77	0.6
B1	30-45	28	18	54	C	0.87	0.87
B1	60-75	25	21	54	C	1.29	1.5
B2Y	100-120	23	26	51	C	6.20	5.0

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
3.4	1093	0.74	7.9	39.7	7.5	1.0	2.19	39.2
1.8	616	0.65	8.3	37.8	15.1	1.77	1.28	36.6
			8.4	38.4	15.0	3.61	1.41	40.0
			8.3	51.6	17.8	1.25	1.39	39.3

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
44	3	CI	100	1.73	3.0	0.64	28.0	14.2
46	5	C	68	1.82	2.7	0.64	6.8	12.0
60	9	C	74	1.92				
63	3	C	77					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
66.1	58.3	53.1	50.2	47.4	28.5	A2/ 5-10
64.8	58.8	52.4	46.1	43.5	32.2	B1/ 35-40
63.9	60.7	57.0	53.9	49.5	35.5	B2/05-110

N.B. Bulk densities are for same depths as soil moisture tensions

PROFILE No. 4

SITE No. PM2

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 μ m	SILT 50-2 μ m	CLAY <2 μ m			
A12	0-20	24	24	52	C	0.52	0.88
B1	30-60	21	18	61	C	0.82	1.15
B1	90-95	21	18	61	C	1.58	1.85
B2	110-125	23	15	62	C	1.51	1.5

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
1.2	1205	0.93	7.9	43.3	4.3	0.65	2.78	38.3
0	560	0.49	8.1	43.4	10.0	1.13	1.71	34.6
			8.1	41.3	12.0	1.29	1.62	35.0
			8.2	45.8	13.0	1.34	1.62	33.9

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
48	2	C	74	1.40	2.7	0.66	12.2	10.0
53	3	C	57	1.97	2.1	1.40	6.4	14.6
54	4	C	57	1.95				
59	4	C	55					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
72.0	53.8	46.8	43.0	40.0	23.9	A2/ 5-10
60.5	59.1	56.3	53.0	48.3	30.5	B1/ 30-35
60.0	57.5	54.6	52.1	47.6	32.6	B1/ 65-70

N.B. Bulk densities are for same depths as moisture tensions

PROFILE No. 7

SITE No. PM25

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 µm	SILT 50-2 µm	CLAY <2 µm			
A12	0-20	44	19	37	Cl	0.81	0.68
B1	20-40	40	10	50	C	0.81	1.05
B2	60-80	42	8	50	C	1.98	1.5
B3	110-130	39	9	52	C	0.45	1.7

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
3.1	1541	2.36	7.6	36.9	3.7	0.66	1.58	32.9
0	532	0.53	7.9	33.8	6.2	0.87	2.24	26.1
			8.0	35.8	8.3	1.18	1.35	23.8
			8.0	37.8	8.5	1.19	2.84	30.9

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
45	0.2	Cl	89	1.81	1.6	1.10	23.6	9.6
46	3	C	52	2.15	2.0	0.30	5.3	8.3
56	5	C	48	2.22				
54	4	C	59					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
58.8	49.1	38.2	37.1	32.9	18.8	A12/ 0-5
49.0	45.6	40.6	38.5	36.3	21.9	B1/ 25-30
49.3	42.4	38.4	36.9	33.7	14.9	B2/ 55-60

N.B. Bulk densities are for the same depths as moisture tensions

PROFILE No. 10

SITE No. PM20

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 μ m	SILT 50-2 μ m	CLAY <2 μ m			
A1	0-20	47	14	39	Sc	0.39	0.35
B1	20-40	38	12	50	C	0.82	0.95
B2	60-80	38	10	53	C	1.73	1.5
B3Y	102-120	35	10	55	C	2.26	2.0

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
5.3	1121	0.70	7.9	39.4	4.7	0.83	1.83	30.6
0.3	420	0.47	8.0	38.2	9.3	1.03	1.01	31.7
			8.0	39.7	13.3	1.45	1.02	34.7
			8.1	40.1	15.2	1.71	1.47	33.5

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
47	3	C	78	1.94	2.1	1.18	9.1	11.6
49	3	C	83	2.22	1.6	0.48	6.3	10.2
55	4	C	66	2.15				
59	5	C	61					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
50.1	48.1	45.2	43.1	43.5	26.6	A1/ 5-10
45.1	44.2	40.6	39.3	36.6	23.5	B1/ 30-35
48.4	44.9	42.1	40.4	38.7	22.4	B2/ 60-65

N.B. Bulk densities are for the same depths as moisture tensions

PROFILE No. 12

SITE No. PM10

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 μ m	SILT 50-2 μ m	CLAY <2 μ m			
AB1	0-20	42	30	28	CI	0.75	0.55
B2	20-40	38	24	38	CI	0.49	0.45
B3	40-65	30	25	45	C	2.79	1.75
B4Y	100-120	27	30	43	C	7.96	6.5

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
5.5	1289	0.82	7.7	40.7	7.8	0.69	2.34	30.3
2.0	813	1.06	8.4	34.3	11.7	1.54	1.13	33.3
			8.3	32.5	12.7	0.80	1.09	37.0
			8.3	54.2	15.5	14.3	1.08	35.2

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
45	2	CI	108	1.45	1.9	0.76	15.8	6.0
47	3	C	88	1.94	2.0	0.72	7.8	7.2
59	2	C	82	2.00				
58	41	C	82					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
68.0	49.2	41.8	38.3	33.5	21.6	AB1/5-10
66.5	55.6	54.5	50.8	47.3	30.1	B2/ 30-35
58.0	55.2	46.8	42.8	39.9	15.8	B3/ 70-75

N.B. Bulk densities are for same depths as moisture tensions

PROFILE No. 16

SITE No. PM8

HORIZON	DEPTH (cm)	SOIL PARTICLES %			TEXTURAL GROUP	EC (LAB) mmhos/cm	EC (FIELD) mmhos/cm
		SAND 2000-50 µm	SILT 50-2 µm	CLAY <2 µm			
A12	0-2	58	8	38	Sci	0.65	0.2
B1	20-40	49	7	44	Sc	0.65	0.7
BK2	50-65	52	4	44	Sc	0.85	0.85
B3	100-120	53	3	44	Sc	0.45	0.5

Avail P (ppm)	Total N (ppm)	Organic Carbon %	pH	EXCHANGEABLE CATIONS (me/100g)				CEC me/100g
				Ca	Mg	Na	K	
0	1009	0.87	7.0	23.0	4.3	0.67	2.18	25.4
0	448	0.40	8.1	26.2	6.8	0.69	1.42	25.2
			8.0	24.1	6.3	0.82	1.47	28.2
			8.0	20.2	4.7	0.94	1.82	25.3

Sat'n %	ESP	Field Tex.	CEC 100g/clay	BULK DENSITY gm/cm ³	AV'ABLE MICRONUTRIENTS (ppm)			
					Cu	Zn	Mn	Fe
65	4	Sci	67	1.49	1.6	0.42	20.8	16.6
43	3	Sc	57	1.69	1.4	0.48	7.8	6.2
42	3	Sc	64					
40	4	Sc	57					

SOIL MOISTURE TENSIONS (bars) % volume						HORIZON & DEPTH (cm)
0	0.1	0.3	1.0	5	15	
72.9	55.1	28.6	28.6	22.5	16.2	A2/ 2.7
65.4	56.6	38.2	35.7	33.1	24.8	Bt ₁ /25-30

N.B. Bulk densities are for the same depths as moisture tensions