

Soil Mapping and Advisory Services
Botswana

SOILS AND LAND SUITABILITY
FOR ARABLE FARMING OF
SOUTH-EAST DISTRICT



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Of South-East District

Gaborone, 1989

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Of South-East District

by

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Food and Agricultural Organization of the United Nations
United Nations Development Programme
Government of Botswana

Gaborone, 1989

The conclusions given in this report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of this project.

The definitions employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal or constitutional status of any country, territory or sea area or concerning the delimitation of frontiers.

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ABSTRACT

This report presents the results from soil surveys carried out in South East District at a 1:100 000 scale. Chapter 1 describes the environmental aspects, in Chapter 2 the soils and their classification is discussed, while in Chapter 3 a qualitative rating of the suitability of the lands in South East District is given. Two maps accompany this report.

1 GENERAL DESCRIPTION OF THE AREA

1.1 LOCATION, POPULATION AND COMMUNICATIONS

1.1.1 Location

The survey area is the South East district in Botswana, bordering the Republic of South Africa to the south and to the east, Kweneng and South district to the west, and Kgatleng district to the north. The area is covered by two standard 1:250 000 soil map sheets discussed elsewhere (Lobatse sheet in Mafoko, 1989 and Gaborone sheet in Moganane, 1989), and is located between coordinates $24^{\circ}24'5$ and $25^{\circ}26'5$ and $25^{\circ}29'E$ and $26^{\circ}08'E$ (Figure 1).

The mapped area covers approximately 8200 km^2 , mainly consisting of Hardveld, but includes some alluvial areas. The district capital is Ramotswa and the district contains the country capital, Gaborone.

1.1.2 Population

The total population of the study area was about 110 000 according to the 1981 population and housing census. Assuming an annual increase of 2.5% this figure will stand at about 170 000 by the end of 1989. The main centres in the area include Gaborone, the capital city of Botswana, with about 60 000 people (1981 census), Ramotswa, the district's capital, with a population of 13000 and Lobatse with a population of 19000, besides there are numerous villages and settlements scattered throughout the district. The proximity of two major centres could mean that actual population figures are much higher due to an accelerated migration influx especially in Gaborone and vicinity.

1.1.3 Communications and Infrastructure

i) Air Transport : the main landing port in the area is the Sir Seretse Khama International Airport situated 13 km north of Gaborone. In Lobatse there is an air field for small planes.

ii) Railways : there is only one rail line crossing the whole district from south to north. This is the main line that crosses Botswana from South Africa through to Zimbabwe. The total length of this railway line in the district is about 130km.

iii) Roads : the main tarmac road runs north-south parallel to the railway line and two major centres (Gaborone and Lobatse) are located on it. Secondary tarmac roads going to Tlokweng, Ramotswa, Pioneer Gate, Mmankgodi and Kanye connect with the main road. In addition several all weather gravel roads exist in the area.

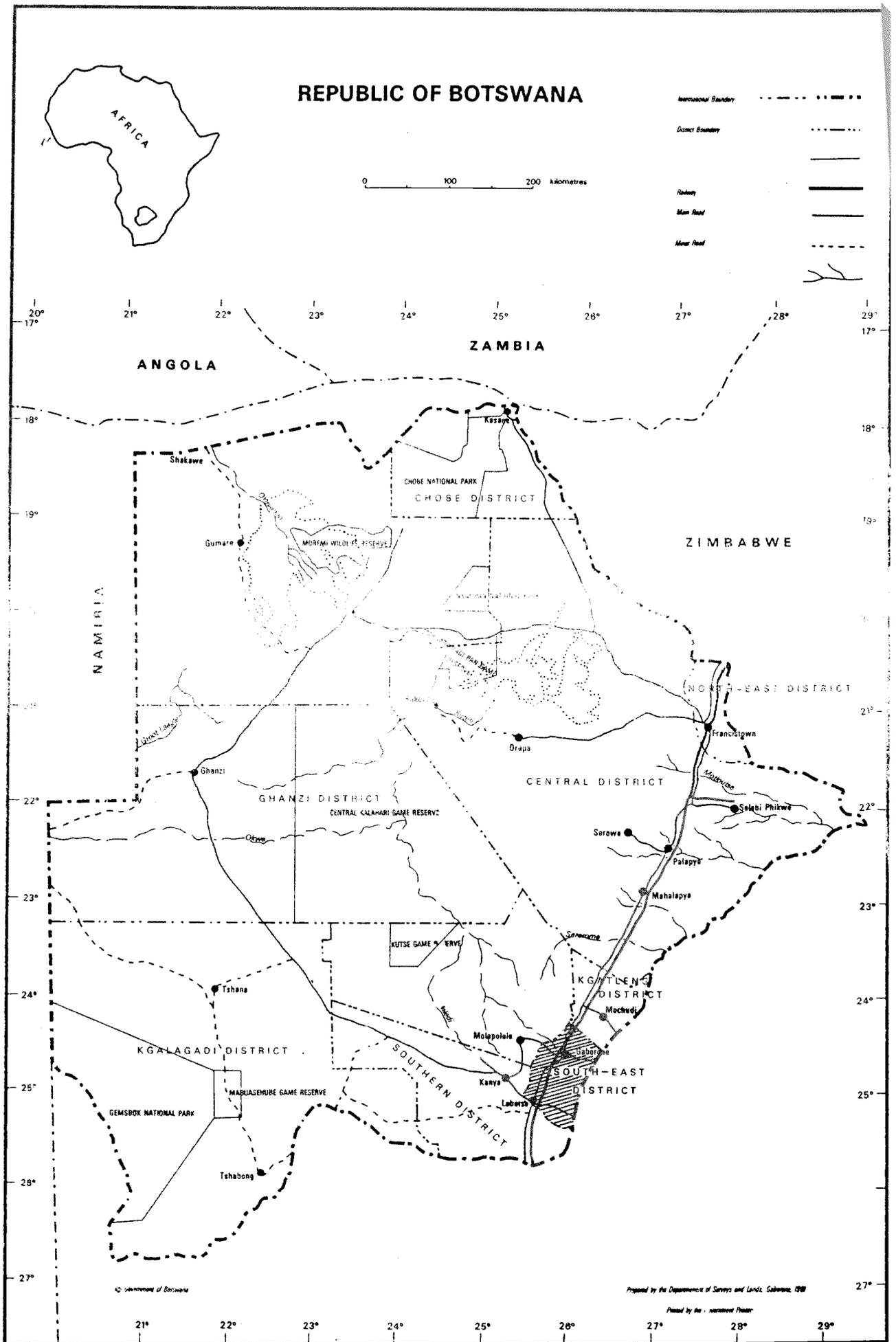


Figure 1 : Location Map of South-east District 2

1.2 CLIMATE

1.2.1 Introduction

Several climatic stations with long term rainfall records are located in South East district. Only one synoptic station where other climatic parameters are measured (Gaborone) is within the study area. A summary of climatic data is given in Table 1 and Table 2. The main climatic factor influencing agricultural production in the zone are discussed below.

1.2.2 Rainfall and Potential Evapotranspiration

The mean total annual rainfall ranges from 475 to 575mm (Table 1). The coefficient of variation of the annual rainfall is between 25 and 30% according to Bhalotra (1984).

The distribution of this rainfall throughout the year is as follows: 47% falls in summer, 40% in autumn, 11% in spring and only 2% during the winter months, hence nearly 90% of the rain is concentrated between October and March. January is, in general, the wettest month of the year. As in summer the potential evapotranspiration is also highest and reaches values in the range of 155-165mm/month, the effectiveness of the rainfall is greatly diminished.

Based on the mean rainfall and potential evaporation data, the humidity regime is South East District could be described as semi arid monsoon (Papadakis, 1970).

For agricultural purposes these mean data are not very useful, and an analysis on a year to year basis has to be made, paying particular attention to the variability in the onset dates and the length of the growing season.

FAO (1978) estimates that, as a rule, the rainy season and the growing period starts when rainfall (P) exceeds half the PET. A humid period occurs when P exceeds full PET, while the rainy seasons ends when P falls again below half PET. Taking into account a maximum of 100mm stored soil moisture, the growing period ends when the soil is completely dry. On this basis, four types of growing periods can be distinguished (Figure 2). The length of this growing season is an important parameter in the evaluation of the climate for rainfed agriculture. Most food crops require at least a 90 day long growing period with at least one humid month. A second parameter that directly influences the on-farm planning of agricultural operations, is the reliability of the onset date of the growing season, as this factor will determine the practical feasibility of rainfed farming.

These factors were analyzed for Lobatse climatic station which has complete rainfall records over 65 years.

The results are presented in Figure 3 and Table 3 and are summarized as follows:

- very severe moisture stress for crops occurs when there is no growing season, or when the growing season is intermediate, or if there is a normal growing period of very short duration (less than 60 days).

In Lobatse, this is the case in 32 seasons out of 63 or in about one year out of two.

Table 1

MEAN MONTHLY RAINFALL AND POTENTIAL EVAPOTRANSPIRATION (mm)
IN CLIMATIC STATIONS OF SOUTH EAST DISTRICT

Month	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Climatic Station													
Gaborone	97	83	69	43	13	4	3	4	15	44	66	88	524
Kgale	109	71	54	51	12	3	1	3	12	41	75	84	509
Ramotswa	94	66	56	51	10	2	1	3	14	42	68	74	477
Moeding	110	86	79	57	12	2	0	4	24	41	71	90	578
Lobatse	101	87	69	47	14	7	4	3	17	44	72	92	552
Hildevale	107	74	67	82	16	8	2	4	10	39	70	66	505
GaboronePET	161	131	124	86	63	39	43	82	123	158	156	165	1331

Table 2

MEAN MONTHLY CLIMATIC PARAMETERS FOR GABORONE

Month	J	F	M	A	M	J	J	A	S	O	N	D
Climatic Station												
Mn Minimum T(°C)	19.7	19.0	18.0	13.1	7.6	4.0	3.6	6.5	11.9	15.5	17.5	18.4
Mn Maximum T(°C)	32.6	31.2	31.1	27.2	24.6	22.2	22.3	25.5	29.1	30.7	31.2	32.1
Relative Humidity (%)	55	56	57	58	53	50	47	41	36	41	46	49
Sunshine % (n/N)	63	65	66	72	84	80	91	88	80	73	66	62
Windspeed (m/sec)	1.2	1.0	0.9	0.8	0.9	0.8	0.9	1.1	1.4	1.6	1.4	1.3
Rg(cal/cm ² day)	550	528	470	416	375	325	367	427	481	533	551	551

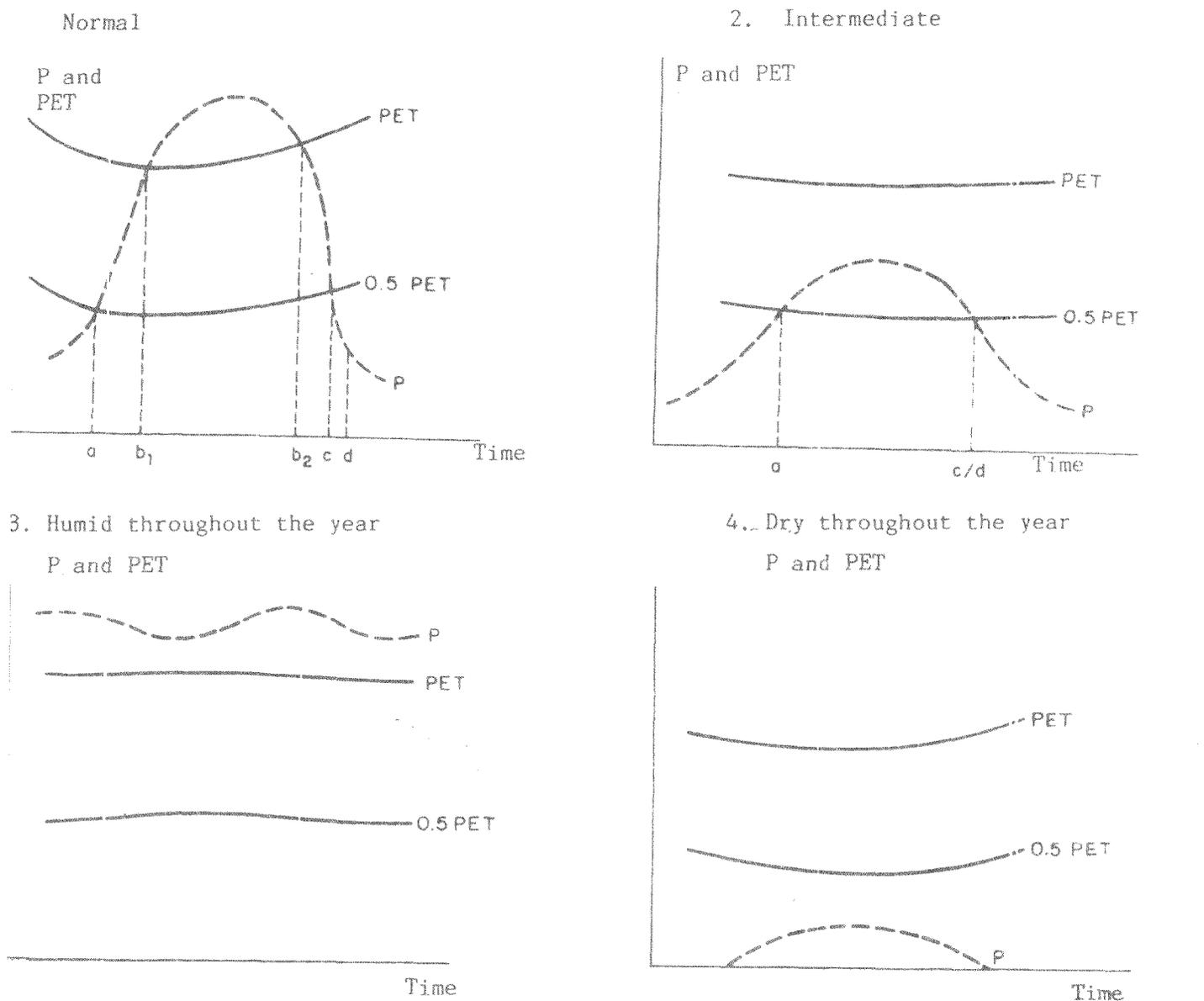


Figure 2 : : Examples of the four types of growing period (FAO, 1978)

a : Start of the rainy season and of the growing period d : End of the growing period

b₁ and b₂: Start and end of humid period P : Rainfall

c : End of the rainy season. PET: Potential Evapotranspirati

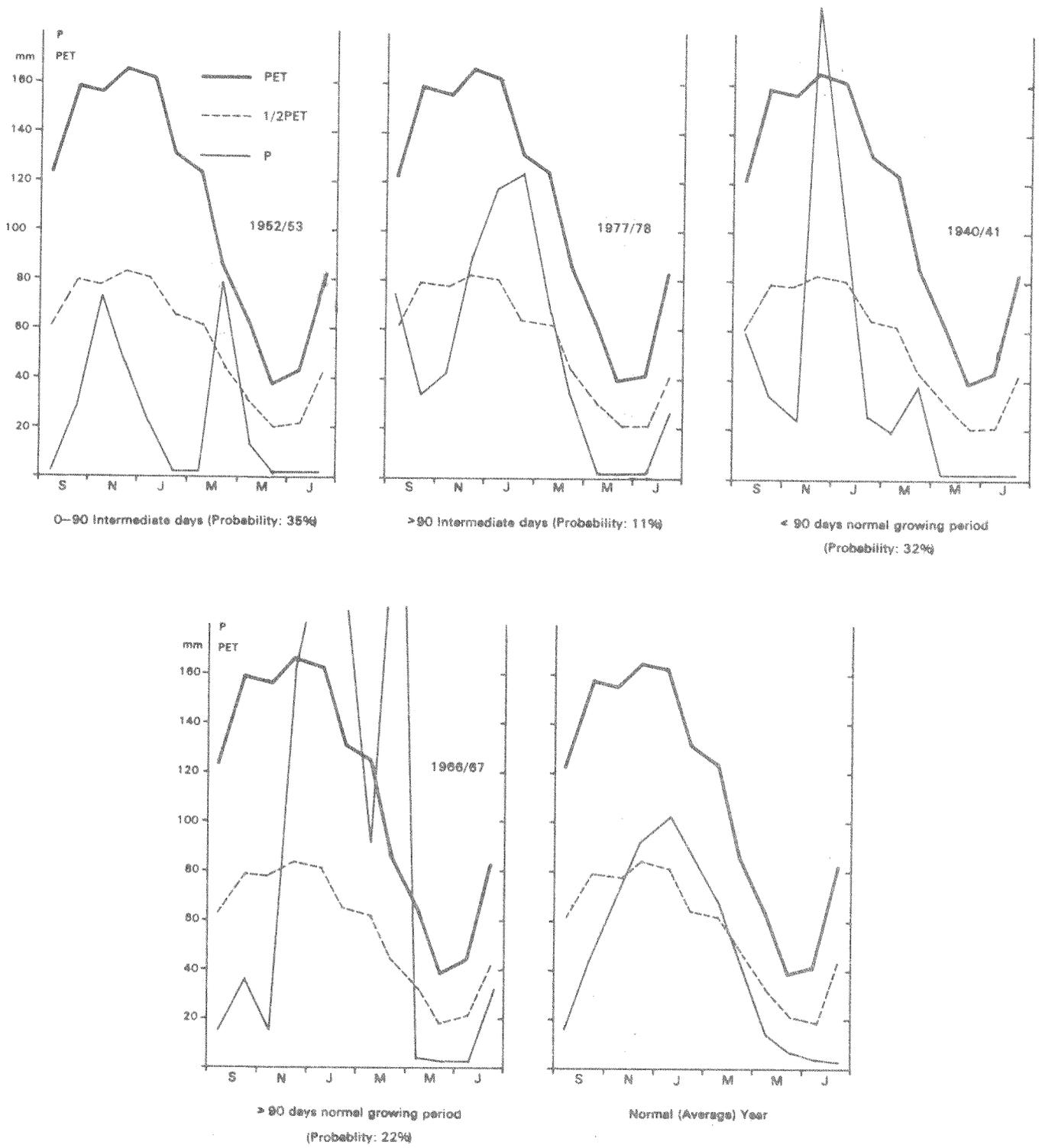


Figure 3: Rainfall versus Potential Evapotranspiration in Lobatse

Table 3

LENGTH, TYPE AND ONSET DATE OF THE GROWING SEASONS IN LOBATSE (1921 - 1987)

Length	Type	Onset Month								Total
		O	N	D	J	F	M	A	M	
0	Completely Dry	-	-	-	-	-	-	-	-	1
30 - 60	Intermed.	1	1	4	3	0	0	1	0	10
60 - 90	Intermed.	0	2	2	3	3	1	0	0	11
90 - 120	Intermed.	0	1	1	1	2	0	0	0	5
120- 150	Intermed.	0	0	1	0	0	0	0	0	1
180- 210	Intermed.	0	1	0	0	0	0	0	0	1
Subtotal	Intermed.	1	5	8	7	5	1	1	0	28
30 - 60	Normal	0	0	0	0	2	1	0	0	3
60 - 90	Normal	1	0	3	5	2	5	1	0	17
90 - 120	Normal	0	0	1	3	2	0	0	0	6
120- 150	Normal	0	0	1	2	0	1	0	0	4
150- 180	Normal	0	1	2	0	0	0	0	0	3
180- 210	Normal	0	0	1	0	0	0	0	0	1
Subtotal	Normal	1	1	8	10	6	7	1	0	34
Grand Total		2	6	16	17	11	8	2	0	63

- severe moisture stress occurs when the normal growing period is between 60 and 90 days. In Lobatse this happens in 17 years out of 63 or in about one year out of four.

- a slight to no moisture stress is expected when the normal growing period is more than 90 days. In the study area, this situation occurs in 14 seasons out of 63, or in about one year out of four.

- the onset month of the growing season is generally January or December, both months having equally a chance of about one in four. In eight seasons the rains started earlier than December and in twenty one seasons (one year out of three), the rains came in February or later.

- the combination of the rather unreliable onset month of the rains and the fact that only in one year out of four the rainfall is sufficient to assure a good yield, indicates that rainfed agriculture in this area remains a risky enterprise as only marginal yields are expected in most years.

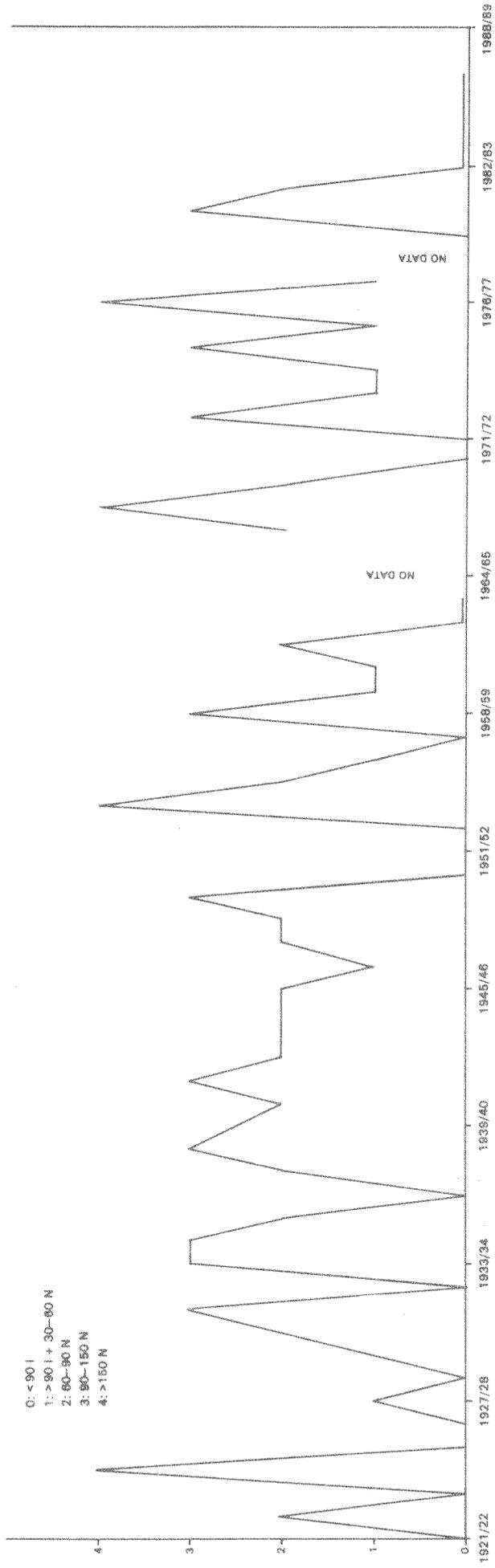
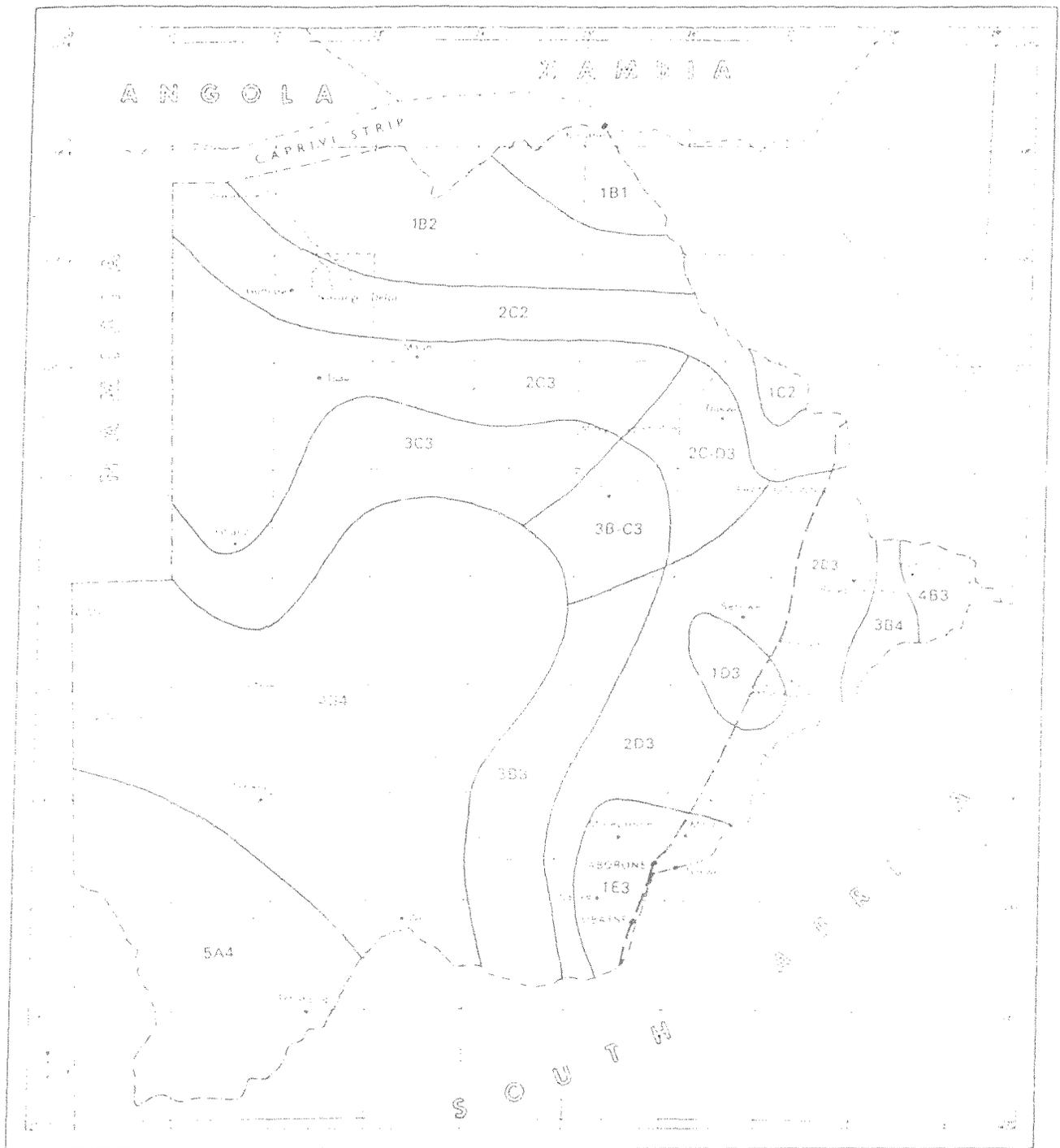


Figure 4. Rating of growing seasons versus time in Lobatse



Length of Season		Number of Dry Days within the Season	Length of Humid Period				
Duration (days)	Frequency (%)		Duration (days)	Frequency (%)			
1	101-120	75-100	A	0-10	1	41-60	75-100
2	81-100	75-100	B	11-20	2	20-40	50-74
3	61-80	75-100	C	21-30	3	20-40	25-49
4	41-60	75-100	D	31-40	4	20-40	<25
5	41-60	50-74	E	41-50			

Figure 5 : Agro - climatic zones in Botswana

Figure 4 gives a time series of the rating of the growing season on a scale of 0 (very severe moisture stress) to 4 (no or slight moisture stress) for the period 1921 - 1987. Note the consecutive unfavourable conditions during the periods 1925 - 1929/30, 1950/51 - 1952/53 and 1982/83 - 1986/87.

The above analysis was confirmed by a more general study on the agroclimate of Botswana (Dambe, 1987) presented in Figure 5. The whole of South East District falls within zone 1E3, with an average length of the season (normal and intermediate combined) of 101 to 120 days. Within this season, between 41 and 50 days are dry, while the length of the humid period is only between 20 and 40 days with a high variability.

1.2.3 Temperature

The mean monthly minimum and maximum temperatures for the Gaborone climatic stations are presented in Table 2. The mean maximum temperature ranges from a low in June (22.2°C) to a high in January (32.6°C). The mean minimum temperature ranges from a low in July (3.6°C) to a high in January (19.7°C). Frost may occur from April to September. The extreme minimum temperature measured was -6.5°C.

Based on the summer and winter temperatures, the temperature regime can be described as "subtropical", with relatively cool winters and warm summers (Papadakis, 1970). This temperature regime is suitable for a wide range of crops, including winter and summer cereals, but excluding equatorial crops, coffee, tea, and frost sensitive perennials such as sugarcane.

1.2.4 Other climatic parameters

The relative humidity of the air is low to moderate, with an annual average of 49%, the highest humidity occurs in the rainy season, from January to April (55 to 58%), the lowest humidity occurs at the end of the dry period in September (36%).

The sunshine percentage (in %, as actual over possible) is high to very high. It is lowest during the period November to March (60 - 65%) and highest in winter, reaching 91% in August.

The windspeeds are generally low to moderate, the highest occur in the period August to January when they are between 1 and 1.5m/sec.

1.2.5 Soil Climate

Climatic parameters are considered in soil classification, particularly in the Soil Taxonomy (Soil Survey Staff, 1975, 1987).

The soil moisture regime of the area is considered to be ustic, which means that in most years the soil is dry in some or all parts for 90 or more cumulative days and is moist in some parts for more than 180 cumulative days or continuously moist for 90 days. Based on an average year these moist conditions may occur between December and April.

the temp at 60cm depth is much more important.

The soil temperature at 60cm is 23°C or more, and the difference between mean summer and mean winter soil temperatures is about 11°C. This corresponds with a hyperthermic soil temperature regime in Soil Taxonomy.

1.2.6 Conclusions

The climate of the study area can be classified as Low Tierra Fria with a subtropical temperature regime and a monsoon semi arid humidity regime (Papadakis, 1970)

Although the temperature regime of the area is suitable for a large range of crops, the rainfall analysis indicates that years with very severe moisture stress occur in one year out of two. Only in one year out of four are good moisture conditions present for crop growth, while the onset month of the growing season varied from year to year and can be as early as October and as late as April, hampering the planning of agricultural operations. Given these rainfall characteristics, rainfed agriculture in the area is bound to be a risky enterprise.

The soil temperature regime is hyperthermic and the soil moisture regime is considered ustic for soil classification purposes

1.3 GEOLOGY

The hardveld, in which the whole survey area is located, belongs to the ancient African shield or a Gondwana erosion surface. The stratigraphy of South East District comprises the Archean and Lower Proterozoic eras.

1.3.1 The Archean era (2500 million years and older)

This era includes rocks which are mainly Gaborone granite of the Basement Complex. Blue grey fragmented felsites and agglomerates of the Kanye formation occur west of Ramotswa and south of Gaborone and Lobatse. Amphibolite intrusives occur east of Gaborone, near the border with South Africa.

1.3.2 The Proterozoic era (1200-2500 million years)

This era includes the Ventersdorp, the Transvaal and the Waterberg supergroups.

The Ventersdorp supergroup: is an acid volcanic group of early Proterozoic age, and contains the Lobatse volcanic group in the area with greywacke, felsic porphyry, tuff and agglomerates.

The Transvaal supergroup: is also of early Proterozoic age and has a large lithological variety. In South East District banded ironstone shale, sandstone, and quartzites occur in the area around Ramotswa and to the south of it.

The Waterberg supergroup: occurs in the area between Mokgosi and Otse with shale clast conglomerates and red sandstones. Chest and dolomite clast conglomerates occur just north of Otse.

1.4 GEOMORPHOLOGY AND HYDROGRAPHY

1.4.1 Geomorphology

Geomorphological units have been described using a land form system (Bawden and Stobbs, 1963). In South East District six major land systems occur (Figure 6, Table 4) of which three are of minor extent in the area. (The Barolong plain in the southernmost part of the district, the Lotlakane plain, and the Mmathete plain which extends in the southwest corner of the district). Three land system units are important in South East district:

The Hildavale Plateau: this is a gently undulating plateau developed on various rock with many pediments, subtending the Kanye hills that are located north of it. It stretches from the Kanye hills through Gathwane to Hildavale. Soils are often shallow and the vegetation is mixed, but mainly consist of a low tree savanna.

The Lobatse complex: this unit dominates South East District south of Gaborone, where it takes two different landforms:

a/ broad gently undulating valleys with small hills pediments and piedmonts. A combination of shallow, reddish brown acid soils and vertisols occur. The dominant vegetation is an open tree savanna.

b/ rugged steep hills with shallow soils and rock exposed at the surface. On this landscape hill communities of tree savanna occurs.

The Metsemotlaba Plain: this unit is dominant north and east of Gaborone, and takes two forms that mainly differ through the underlying geology:

a/ Gently undulating plain with occasional kopjes on Gaborone granite. Soils are brownish to reddish, medium to heavy textured, and vertisols occur in depressions. This unit is by far the most important one.

b/ Gently undulating plain with occasional hills that is limited to the area north east of Zeerust where basic igneous rocks occur (amphibolite). Both landforms carry a mixed, mainly low, tree savanna.

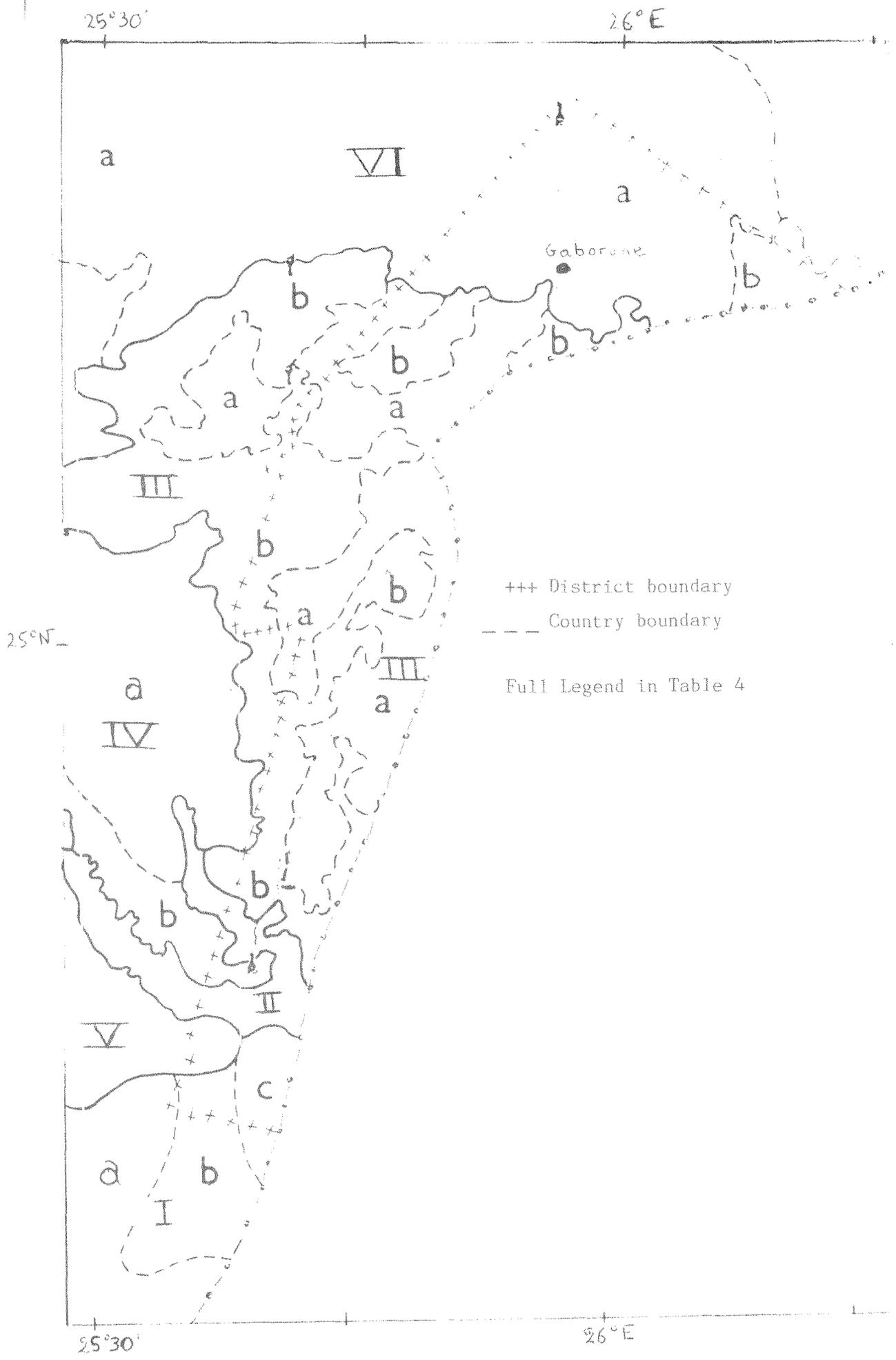


Figure 6 : Geomorphological units in South East district (after Bawden and Stobbs, 1963)

Table 4

DESCRIPTION OF GEOMORPHOLOGICAL UNITS IN SOUTH EAST DISTRICT ^{1/}

Symbol	Land System name		Landform Description
I	Barolong Plain	a	Gently undulating plain with broad flat fossil valleys over basement complex.
		b	Gently undulating plateau over granite, standing above (a) and (c).
		c	Nearly flat low lying basin over Lobatse volcanic group.
II	Hildavale Plateau		Gently undulating plateau on various rock types. Many pediments.
III	Lobatse Complex	a	Broad gently undulating valleys with small hills, pediments and piemonts.
		b	Rugged, steep sided hills.
IV	Lotlhakani Plain	a	Undulating plain with occasional kopjes
		b	Pediment plain in zone of scarp retreat. Frequent kopjes.
V	Mmathete Plain		Gently undulating plain with broad flat fossil valleys.
VI	Mestemotlaba Plain	a	Gently undulating plain with occasional kopjes on Gaborone granite.
		b	Gently undulating plain with occasional hills on basic igneous rocks.

1/ After Bawden and Stobbs, 1963

1.4.2 Hydrography

South East District is covered by a dense network of small rivers of which the Kalabeng, the Metsemashwane, the Taung, the Tsklane and the Lobatse rivers are the main ones south of Gaborone.

The Notwane river drains eastwards in the Limpopo, its overall drainage pattern is sub parallel with all tributaries joining in from the west and none from the east. This is probably due to the general north east inclination of the Mestemotlaba plain which inhibits water to flow from the south or southeast, or lithological differences may exist on the western and eastern side of this river.

Most rivers in the area are deeply incised and narrow and have narrow strips of alluvial plains along their beds.

1.5 NATURAL VEGETATION

A comprehensive study of vegetation in south east Botswana was carried out by Timberlake (1980) at a 1:500 000 scale. Five units were identified based on species composition and designated A to E. They were further subdivided into twenty one vegetation types.

In South East District, only three of the main units and six of the vegetation types occur, these are summarized in Table 5

Table 5

MAIN VEGETATION TYPES IN SOUTH EAST DISTRICT

Vegetation Unit	Vegetation Structure	Species
Hardveld woodland and tree savanna (B)	B4: <i>Acacia erubescens</i> tree savanna	<i>Acacia erubescens</i> , <i>A. gerardii</i> , <i>Rhus leptodictya</i> , <i>Acacia robusta</i> , <i>Boscia foetida</i> , <i>Petophorum africanum</i> , <i>Boscia albutrinca</i> .
	B5: <i>Terminalia sericea</i> tree and shrub savanna	<i>Terminalia Sericea</i> <i>Acacia fleckii</i> , <i>Peltophoumapicanum</i> , <i>Boscia albutrinca</i> , <i>Combretum zeyhori</i> ,
	B6: <i>Rhus leptodictya</i> tree savanna	<i>Rhus Leptodictya</i> , <i>Acacia karoo</i> , <i>A. tortillis</i> , <i>Peltophorum africanum</i> , <i>Ziziphus mucronata</i> , <i>Taschonantes Camphorates</i>
	B7: <i>Rhus foncea</i> - <i>Acacia</i> karoo savanna	<i>Rhus lancea</i> , <i>Acacia karoo</i> , <i>A. caffra</i> , <i>Rhus leptodictya</i> , <i>Ziziphus mucronata</i> , <i>Taschonantes comphorates</i>
Woodland hill communities (C)	C1: <i>Croton gratissimus</i> woodland	<i>Croton gratissimus</i> , <i>Combretum apiculatum</i> , <i>Pappea capensis</i> , <i>Combretum molle</i> , <i>Xumenia americana</i>
Thicket and Shrub savanna (D)	D1: <i>Acacia tenuispina</i> shrub savanna	<i>Acacia tenuispina</i> <i>A. mellifera</i> , <i>A. tortilis</i>

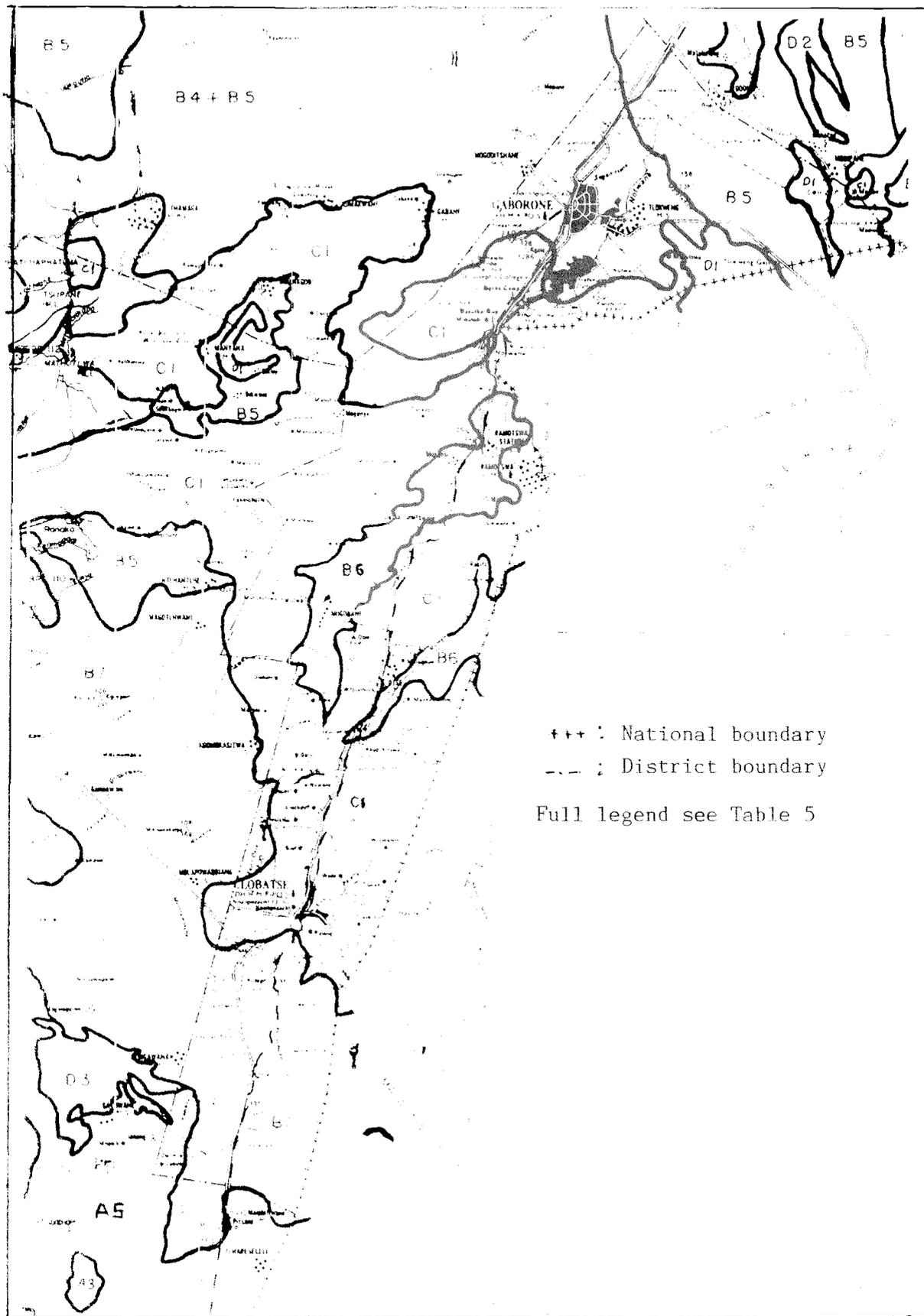


Figure 6 : Natural Vegetation of South East District (after Timberlake, 1980)

In relation to the geomorphological units described in section 1.4, there is a definite link between the gently undulating Metsemotlaba plain on Gaborone granite and the occurrence of a B4-B5 vegetation. Woodland hills communities dominate the steep hills of the Lobatse complex and the Hildavale plateau. The broad, gently undulating valleys of the Lobatse complex have dominantly a B6 vegetation. The *Acacia tenuispina* shrub savanna is dominant on the basic igneous rocks of the Metsimotlaba plain.

1.6 LAND USE

1.6.1 Land Tenure System

The three mainland tenure systems in Botswana are the tribal or communal, the freehold and the Stateland. The tribal or communal land is owned by different tribes throughout the country and its administration is through the tribal land boards under the authority of the land act. The freehold land is owned by an individual or a group of people who have exclusive control over its use. The Stateland is that which is owned by the state and is designated stock free, for example, towns, national parks, game and forest reserves.

All the categories of land tenure are present in the survey area. The city of Gaborone is one example of a stateland. Most, if not all the arable farming communities are within the freehold land tenure category, they are concentrated around Lobatse township in the South East District and practice both crop farming and livestock grazing. Although livestock is a secondary agricultural activity in most of the District it makes use of the tribal or communal lands.

1.6.2 Major Land use types

The major land use type in the survey area is freehold arable agriculture (with sorghum as the main crop) combined with communal grazing. Small scale commercial grazing is practiced on some farms in the vicinity of Gaborone.

2 SOILS

2.1 INTRODUCTION

The soil map of South East District (scale 1:1000 000) is based on information from satellite imagery, black and white aerial photographs, existing field information (mainly soil profile descriptions) from the 1:250 000 soil survey of the Lobatse sheet and Gaborone sheet (Mafoko 1989; Moganane, 1989) and some additional fieldchecks.

For the photo interpretation runs 8 to 20 of South East Block 1/81A (scale 1:50 000; May, 1982) were used. Satellite imagery interpretation is based on a SPOT, multi spectral colour print (scale 1:50 000; May 1986).

Soils have been described according to the guidelines for soil profile descriptions (Rommelzwaal and Van Waveren, 1988) and analyzed according to the standard procedures (Breitbart, 1988).

Descriptions and analytical data of representative profiles are listed in Appendix 1.

2.2 THE SOIL LEGEND

The mapping units are described according to the General Legend of Botswana (Rommelzwaal, 1988). This legend has the following three elements:

1. Major grouping into main units according to parent material,
2. Soil Classification according to the Legend of the Soil map of the world (FAO/UNESCO, 1974),
3. Subdivision into soil units according to further soil characteristics, such as (i) physiographic position, slope and drainage; (ii) colour, depth, texture; (iii) phases such as lithic, petroferric, petrocalcic and sodic.

The legend for the Soil Map of South East District comprises only parts of the general legend.

2.2.1. Main Units

In South East District the following main units occur:

- A - Soils on alluvial deposits; such as valley floors and fluvial terraces with adjacent lower foorslopes, depressions.
- B - Soils on basic igneous and metamorphic rocks: minor main unit on dolerite and gabbro.
- D - Soils on fine grained sedimentary rocks: Major main unit in central South East District. On shales, dolomite, siltstones, greywackes.
- G - Soils on acid igneous and metamorphic rocks : Dominant main unit in the Gaborone area and south of Lobatse. On granites, felsic volcanics, felsites.
- R - Soils on steep hills, ridges and escarpments: important main unit south of Ramotswa. On various rocktypes.

S - Soils on coarse grained sedimentary rocks: mainly in colluvium derived from sandstones and quartzites. Minor main unit.

2.2.2 Soil Classification

In addition to the FAO classification, soils are classified according to the USDA Soil Taxonomy (1975). Based on the available chemical data it is assumed that (i) all non-analysed soils have subsoils with a base saturation (PBS) of 50% or more, (ii) Non calcic and non gleyic Luvisols have a cation exchange capacity (CEC), corrected for Organic Carbon, of less than 24 meq/100gr clay in at least some subhorizon of the argillic B.

It should be noted than in the classification of the soils, the '>50% PBS' criterion to distinguish the Luvisols from the Acrisols is not followed strictly. If soil analysis shows a PBS just below 50%, but within the range of the standard error of the determination, for only one of the samples taken from the Bt horizons(s) and with PBS of all other samples above 50%, the soil is classified as a Luvisol/Alfisol.

Soil moisture regime is considered to be ustic, except for soils that show evidence of water saturation throughout the profile (aquic soil moisture regime).
The soil temperature regime is hyperthermic.

2.3 DESCRIPTION OF THE MAPPING UNITS

A SOILS ON ALLUVIAL DEPOSITS

- A1** **FAO:** Pellic Vertisol, partly sodic phase (1974, 1988)
ST : Typic Pellustert
Description: Deep to very deep, poorly to imperfectly drained, dark grayish brown to very dark gray clay.
Topography: Flat to almost flat.
Occurrence: Depressions east of Gaborone and South of Lobatse, near Hildavale. In association with A30a and A4b on slightly higher area (with less clayey soils) A4b becomes dominant
Characteristics: When the soils dry out deep cracks develop from the surface and the clods become extremely hard. The subsoils are generally strongly calcereous, often with soft carbonate nodules and/or soft powdery lime. In places the soils might be sodic. However no laboratory data are available to confirm this.
- A4** **FAO:** Calcaric Cambisol (1974, 1988)
ST : Fluventic Eutrochrept
Description: Moderately deep to very deep, imperfectly to moderately. Well drained, dark grayish brown to brown sandy loam to sandy clay. Flat to slightly undulating.
Profile: R-0011
Occurrence: Somewhat better drained parts of the valley floors of Taun

river and tributaries. In complex with A31a on poorly drained sites.
Characteristics: Calcereous soils with a distinctive textural differentiation within the profile due to sedimentation.

- A4b** **FAO:** Calcic Cambisol (1974)
Haplic Calcisol (1988)
ST : Typic Ustochrept
Description: Moderately deep to very deep, imperfectly to moderately well drained, dark grayish brown to brown, clayloam to clay. Flat to slightly undulating.
Occurrence: See A1
Remarks: No laboratory data available.
- A6** **FAO:** Solodic Planosol (1974) Stagnic Solonetz (1988)
ST : Typic Haplaqualf
Description: Deep to very deep, poorly to imperfectly drained, pale brown to light gray loamy sand to sandy loam topsoils abruptly overlying dark yellowish brown to dark (grayish) brown, sandy clay to clay subsoils.
Topography: Flat to almost flat.
Occurrence: Poorly drained parts of valley floors of Peleng river (close to Lobatse Estates Office). In complex with A7. Minor mapping unit
Remarks: No laboratory data available. Profile characteristics suggest a considerable sodium content.
- A7** **FAO:** (Calci-) Gleyic Luvisol, partly sodic phase (1974, 1988)
ST : Aquic Haplustalf, Typic Ochraqualf
Description: Deep to very deep, poorly to imperfectly drained, dark gray to grayish brown sandy clayloam to clay.
Topography: Flat
Profile: L0053
Occurrence: Marginally drained parts of valley floors. Often in association with A9 and A11, the latter two occurring at the better drained, higher parts of the valley floors.
Remarks: Chemical analysis of L0053 (located in valley floor south of Kgomokasitwa) shows a high sodium content.
- A9** **FAO:** Calcic Luvisol (1974, 1988)
ST : Typic Haplustalf
Description: Deep to very deep, imperfectly moderate. Well drained, yellowish brown to dark grayish brown sandy clayloam to clay. Flat to slightly undulating
Topography: Flat to slightly undulating.
Profile: R-0004
Occurrence: Valley floors and adjacent lower footslopes. Often in association with A11 (mainly on lower footslopes) or A7 (on poorly drained valley floors)
Remarks: Subsoils are in places strongly calcereous and contain soft powdery lime, or soft carbonate nodules (Calcic horizon).

- A11** **FAO:** Ferric Luvisol (1974)
Haplic Lixisol/Ferric Luvisol (1988)
ST : Oxic Paleustalf
Description: Moderately deep to very deep, moderately well to well drained, red to strong brown sandy loam to sandy clay. Almost flat to undulating.
Occurrence: Mainly in higher parts of valley floors and floodplains. Often in association with A9 and A7. South of Lobatse found in association with A34. In the complexes with A7 and A9, the latter are found in the lower parts.
Remarks: No laboratory data available.
- A13a** **FAO:** Chromic Luvisol (1974)
Rhodi-chromic Luvisol (1988)
ST : Udic Haplustalf
Description: Moderately deep to deep, moderately well drained, dark red to strong brown, massive, sandy clayloam to sandy clay.
Topography: Flat to slightly undulating.
Profile: R-0007
Occurrence: On alluvial terrace, next to Notwane dam.
Characteristics: Deep to very deep alluvial soil, weak to very weak structure changing to massive in the lower subsoil.
- A31a** **FAO:** Eutric Gleysol (1974, 1988)
ST : Typic Haplaquept
Description: Deep to very deep, imperfectly to poorly drained, (very) dark gray sandy clayloam to clay.
Topography: Flat
Profile: R-0015
Occurrence: Poorly drained parts of the valley floor (Taung river), in association with A4
Remarks: On the map a vertic variant (A30a) is recognized which no longer is retained in the Soil legend of Botswana.
- A34** **FAO:** Eutric Regosol, shallow petric phase (1974, 1988)
ST : Lithic Ustorthent
Description: Shallow to moderately deep, well to somewhat excessively drained, dark brown to reddish brown, loamy sands to sandy loams. Flat to slightly undulating.
Occurrence: Recent valley floors in hilly areas. Stony to very stony soil. Also in association with A9 and/or A11.
Remarks: No laboratory data available.

B SOILS ON BASIC IGNEOUS AND METAMORPHIC ROCKS

- B3** **FAO:** Chromic Luvisol (1974, 1988)
ST : Ultic Haplustalf
Description: Moderately deep to deep, moderately well to well drained, red to strong brown, sandy loam to clayloam.
Topography: Almost flat to undulating (on dolerite)

Profile: R-0020

Occurrence: A single large mapping unit on dolerite east of Notwane siding.

Remarks: Soils show a clear clay increase.

B11 **FAO:** Ferric Luvisol (1974, 1988)

ST : Kanhaplic Paleustalf

Description: Very deep, well drained, dark brown to strong brown, sandy clayloam to sandy clay.

Topography: Almost flat to undulating (on gabbro)

Profile: G-0518

Characteristics: Soils show a clear clay increase with depth, subsoils are slightly hard to hard when dry.

Remarks : previously classified as B3a and as such on the map.

D SOILS ON FINE-GRAINED SEDIMENTARY ROCKS

D1A **FAO:** Eutric Regosol petric, partly lithic phase (1974, 1988)

ST : Lithic Ustorhent

Description: Very shallow to moderately deep, well drained, yellowish brown to reddish brown, sandy loam to clayloam. Undulating to hilly.

Occurrence: On low ridges and erosional slopes in undulating terrain. In complex with R on steeper ridges around Ramotswa. On lower slopes in complex with D7 or D7d.

Characteristics: Soils are often stony to very stony and due to their physiographic position and weakly developed soil structure, very susceptible to erosion (without sufficient grasscover). Aloe species common.

Remarks: No Laboratory data available.

D2 **FAO:** Ferric Luvisol, petric or partly petroferric phase (1974, 1988)

ST : Kanhaplic Haplustalf

Description: Moderately deep, well drained, yellowish red to brown sandy loams.

Topography: Flat to undulating.

Occurrence: Minor soil unit found on steeper, erosional slopes formed in dolomitic rock. Associated with D10 (on footslopes)

Remarks: no laboratory data available.

D2a **FAO:** Ferric Luvisol, petric or partly petroferric phase (1974, 1988)

ST : Kanhaplic Paleustalf

Description: As D2, but clayey.

Occurrence: As D2, but on shales.

Remarks: No laboratory data available. Note that this unit has not been retained in the General Soil Legend of Botswana.

D7 **FAO:** Ferric Luvisol, partly petric or petroferric phase (1974, 1988)

ST : Kanhaplic Paleustalf

Description: Massive, moderately deep to deep, moderately well drained,

yellowish brown to yellowish red sandy loam to clayloam.

Topography: Flat to slightly undulating.

Profile: L-0008.

Occurrence: On lower pediment slopes formed in quartzites or sandstones. Associated with D7d in areas with a mixed lithology, and with D1a on steeper slopes.

Characteristics: Soils show a distinctive clay increase with depth. Sub-soils are very hard when dry, topsoils are soft and susceptible to surface crusting.

Remarks: On the map a clayey variant is recognized (D7d), no longer retained in the Soil Legend of Botswana

D7a **FAO:** Orthic Luvisol (1974)
Haplic Luvisol (1988)

ST : Typic Haplustalf

Description: Massive, deep, imperfectly to moderately well drained, dark brown to yellowish-brown, sandy clay to clay.

Topography: Flat to almost flat.

Occurrence: Lower pediment slopes formed in Marls. In association with D7 in areas with mixed lithology

Remarks: Homogeneous clayey soils, very hard when dry. No laboratory data available.

G SOILS ON ACID IGNEOUS AND METAMORPHIC ROCKS

G1a **FAO:** Eutric Regosol, lithic phase (1974)
Eutric Leptosol (1988)

ST : Lithic Ustorthent

Description: Very shallow to shallow, moderately well to somewhat excessively drained, grayish brown to yellowish-red, sand to sandy clayloam.

Topography: Undulating to rolling.

Profile: L-0091

Occurrence: On Gaborone Granite Complex and felsic volcanics of the Lobatse Volcanic Group. Mainly on steeper erosive slopes in the Lobatse area and upper pediment slopes in the Gaborone area, or in areas with many rock outcrops. Often found in complex with G1c and/or G2d or R.

Characteristics: Stony shallow soils on rock and in places on petroferic material. Often with Aloe species. Without sufficient grasscover susceptible to erosion, surface crusting and Acacia tortilis subsp. heterocantha encroachment.

G1d **FAO:** Calcaric Regosol, shallow petric phase (1974, 1988)

ST : Typic Ustorthent

Description: As G1c

Occurrence: On Gaborone Granite Complex. Associated with (former) drainage channels, around Hildavale station. In complex with G2d and G1a

Characteristics: Moderately to strongly calcareous soils, sometimes with petrocalcic horizon. Without sufficient grass cover, susceptible to erosion and surface crusting. With Acacia hebeclada (stolonifera).

Remarks: No laboratory data available.

- G2d** **FAO:** Ferric Luvisol petric or petroferric phase (1974, 1988)
ST : Kanhaplic Paleustalf
Description: Moderately deep, moderately well to well drained, grayish brown to red, sandy loam to sandy clayloam.
Topography: undulating.
Occurrence: On Gaborone Granites and on felsic volcanics of the Lobatse Volcanic Group. Mainly on lower erosive slopes. On steeper erosive slopes also found in complex with G1a and G1c and/or G1d.
Remarks: No laboratory data available.
- G2f** **FAO:** Ferric Luvisol petric or petroferric phase (1974, 1988)
ST : Oxidic Paleustalf
Description: As G2d but sandy clay to clay.
Profile: R-0024.
Occurrence: East of Kgomokasitwa on felsites and agglomerates of the Gaborone Granite Complex, west of Hildavale in complex with G1d-1a.
- G10b** **FAO:** Ferric Luvisol(1974)
Haplic Lixisol (1988)
ST : Oxidic Paleustalf
Description: Deep to very deep moderately well to well drained, strong brown to red sandy loam to sandy clayloam.
Topography: Flat to almost flat.
Profile: G-0901.
Occurrence: On Gaborone Granites. In the northern part of South East District.
Characteristics: Deep soils on (almost) flat plains. Due to physiographic position less susceptible to erosion (without sufficient grasscover). Compared to G2a/f less frequent occurrence of ironstone.
Remarks: formerly classified as G10c and as such on the map.

R VERY SHALLOW SOILS ON STEEP HILLS, RIDGES AND ESCARPMENTS

Occurrence: On various rocktypes, large mapping unit in Ramotswa and Lobatse areas.
Remarks: Not suitable for any kind of arable land use.

S SOILS ON COARSE GRAINED SEDIMENTARY ROCKS

- S10** **FAO:** Arenic-ferric Luvisol (1974, 1988)
ST : Kanhaplic Paleustalf
Description: Deep to very deep, well to somewhat excessively drained, red to yellowish red, loamy fine sand over sandy loam.
Topography: Flat to undulating.
Profile: L0004.
Occurrence: In colluvial slopes derived from quartzitic rock or sandstone, for instance colluvial slopes of Otse hill. Minor mapping unit.
Remarks: No laboratory data available.

3 LAND EVALUATION

3.1 INTRODUCTION

Following a request from the government, a land evaluation for improved traditional dryland farming for South East District was carried out at a scale 1:100.000 . The land evaluation is primarily based on soil and climatic qualities.

The land evaluation can be considered as the first step in the so called 'two stage approach'. It is a physical classification, since no socio-economic factors have been included. The suitability classes merely give a qualitative indication of a certain soil unit, as compared to other units. The yield figures, given in section 3.6 are only indicative.

All the soil units on the map were given a suitability rating according to a system of land evaluation for arable farming in Botswana (Rhebergen, 1988).

It has to be mentioned that not from all the mapping units soil chemical data were available. Therefore some ratings had to be inferred using analytical data from similar soils in adjacent areas.

3.2 DESCRIPTION OF THE LAND USE TYPE

Improved Traditional Dryland Farming

<u>Produce:</u>	Sorghum, Maize, Millet, Groundnuts, Peas, Beans, Sunflower
<u>Yields:</u>	500 - 600 kg/ha (grains)
<u>Market orientation:</u>	Firstly subsistence; sale of surplus
<u>Size of holding:</u>	10 ha; total area planted depends on amount and distribution of rainfall
<u>Capital intensity:</u>	Moderate
<u>Labour intensity:</u>	Moderate
<u>Credit facilities:</u>	Government controlled institutions (e.g. ARAP, ALDEP schemes)
<u>Farm Power:</u>	Oxen, Donkeys, Mules
<u>Technical knowledge:</u>	Good knowledge of modern farming practices, related to non-mechanized dryland farming

<u>Management practices:</u>	Winter ploughing, early planting, row planting, improved seeds, modest use of fertilizer/manure, insecticides, use of planter and inter-row cultivator, contour ploughing, adequate crop protection against pests, proper storage of harvest
<u>Infrastructural-requirements:</u>	Advisory services; depots for sale of supplies (fertilizer, seeds) and storage of produce
<u>Land tenure system:</u>	Communal

The Land Use Type, as described above, can be considered as a farming system. A farming system is a specific way of farming, according to well defined key characteristics i.e. produce, market orientation, management (cropping system, technology, cultural practices), labour- and capital intensity etc. In the farming system, selected for South East District, sorghum is considered as the main crop. Maize has been selected as an additional food crop and Dolichos lablab as a fodder crop.

3.3 INFORMATION ON DOLICHOS LABLAB

Dolichos lablab can be used for supplementary feed during the dry season, after mixing with crop residues. The ratio in which it should be fed to the animals is 1:2 or 1:3 (Dolichos:Crop residues+whatever is available from grazing and browsing).

It is a high quality food and contains 15-20% crude protein of the total dry matter (sorghum stubble has 5-6% of crude protein) and the whole plant is palatable.

Dolichos is an annual leguminose and as such it has the ability of fixating nitrates. Therefore it is very suitable to be included in a farming system, since it will at least maintain the N-level of the soil.

Dolichos is drought resistant. During the dry spells in the growing season, it will stop growing but will stay green and keep its nutritive value.

It has to be harvested before the first frost. In South East District this is around mid-May.

Under the present climatological circumstances in Botswana, Dolichos can give yields of 2-3 tons/ha, under reasonable management.

8 oxen need for the last 3 months of the dry season roughly 3 tons of dry matter. This means that 1 ha. planted under Dolichos can supply the required ratio.

3.4 LAND QUALITIES AND RATINGS

The different mapping units have been rated for the following land qualities.

Edaphic- and Agro-Climatic Suitability

- c correct temperature regime, day length and air humidity.
- f absence of damaging floods
- g adequacy of conditions for germination
- m moisture availability
- n nutrient availability
- o oxygen availability in the root-zone
- r adequacy of foothold for roots
- t absence of toxic substances

Management and conservation suitability

- a accessibility
- e resistance to soil erosion
- p absence of pests and diseases
- w workability

The ratings are correlated with suitability classes, for the important crops of the land utilization type, under consideration for South East District (Sorghum, Maize, Dolichos lablab).

3.5 LAND SUITABILITY CLASSIFICATION

The reader is referred to the land suitability map for definitions of the S classes.

The land suitability subclasses, as indicated on the map, refer to the suitability of the soil units for sorghum. The suitability for maize can generally be considered as one class lower as compared to sorghum, while the suitability for Dolichos lablab is generally one class higher.

The following yield figures, for sorghum and maize, can be considered as a rough quantification of the suitability classes given to the different mapping units, under improved traditional dryland farming with good management (DLFRS 1985, Rhebergen 1988).

<u>Suitability class</u>	tons/ha.	
	<u>Sorghum</u>	<u>Maize</u>
S1	> 1.6	> 2
S2	1.2-1.6	1.5-2
S3	0.8-1.2	1-1.5
S4	0.4-0.8	0.5-1
N	< 0.4	< 0.5

Seasonal cultivation of land, classified as **S4**, will over a long period not be profitable in terms of money. However part of this land is used and will be used.

Economic reasons do not play a role, or only a minor one. Very low yields are justified on subsistence level. Also considerations such as employment justify strongly reduced crop yields.

Land which is rated as **N** can not give such an output/yield that it covers the input costs.

The land quality 'workability' was only considered for stony soils, not for the consistency of the topsoil, since tractors are available to most farmers under the ALDEP and ARAP schemes.

3.6 Description of the climatic zone

Botswana is divided into agro-climatic zones, which are based on the length of the growing season, length of the humid period and the number of dry days in the growing season

According to Figure 5 South East District falls within the climatic zone with code **1e3**.

The length of the growing season is 101-120 days. This occurs with a 75-100% probability, meaning at least 3 out of 4 years.

During this growing season there is a 50% chance of 41-50 dry days and a 25-49% chance of a humid period with a length of 20-40 days (see figure 1).

Considering the amount and reliability of rainfall in the South East District, a further subdivision of the climatic zone **1e3** could be made (see Table 6).

The hilly area south of Otse (Lobatse subzone), constitutes the slightly higher rainfall zone and has slightly better climatic conditions for dryland farming compared to the Gaborone subzone (see land suitability map).

If a certain soil unit occurs in both subzones and its moisture availability ranges between **S3** and **S4**, the unit in the south is given the higher rating (**S3**), while the same unit in the north (around Gaborone) is given the lower rating (**S4**).

Table 6.

FREQUENCY OF THE OCCURRENCE OF A HUMID PERIOD DURING THE FIRST GROWING PERIOD.

Gaborone	29 %
Kgale	32 %
Ramotswa	37 %
Lobatse	43 %

3.7 REMARKS ON THE SUITABILITY CLASSIFICATION OF THE MAPPING UNITS

For the ratings for the different soil units see Appendix 2.

For the moisture availability rating for the soil units see Appendix 3.

If certain mapping units are complexes or associations of several soil units, the suitability of the components was determined and the average, according to the occurrence in the complex or association, was given as the final suitability class.

A: Soils on Alluvial Deposits

All the A units occurring in river valleys have been considered as water receiving. Where A units occur on plains (**A1**, **A9**, **A11**) they are considered as normal sites for the determination of the moisture availability. (e.g. **A9** in a river valley is classified as **S3m**, while on the plain the same unit is classified as **S4m**).

A11 on the plain, in the Lobatse sub-zone, was classified as **S3m**.

B: Soils on Basic Igneous and Metamorphic Rocks

Comparing units, **B3** and **B11**, (former **B3a**), the first one was given the higher rating for moisture availability, since the topsoil is coarse textured and generally not capped, massive, compacted or cemented. This unit has a flat topography. Therefore no correction was applied for the runoff.

D: Soils on Fine Grained Sedimentary Rocks

Units **D1a** and **D2a** are rated 5-6 for moisture availability. This is not important for the suitability for sorghum, since both are not suitable. It only affects the suitability for Dolichos.

In general these soils are not suitable. They are shallow and stoney or/and occur in sloping areas.

Units **D7** and **D10** were given different ratings for the different sub-zones.

G: Soils on Acid Igneous and Metamorphic Rocks

In general these soils were considered as occurring on watershedding sites.

G1c and **G1d** units occurring in the Lobatse sub-zone can be given a suitability of **S4** on the less steeper parts, i.e. slopes less than 3%.

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APPENDIX 1

SELECTED REPRESENTATIVE SOIL PROFILE DESCRIPTIONS AND ANALYTICAL DATA

Profile	Unit	FAO (1974) Classification
R0011	A4	Calcaric Cambisol
L0053	A7	Gleyic Luvisol
R0004	A9	Calcic Luvisol
R0007	A13a	Chromic Luvisol
R0015	A31a	Eutric Gleysol
R0020	B3	Chromic Luvisol
G0518	B11	Ferric Luvisol
L0902	D5b	Ferric Luvisol
L0008	D7	Ferric Luvisol
L0091	G1a	Eutric Regosol, lithic phase
R0024	G2f	Ferric Luvisol, petric phase
G0901	G10b	Ferric Luvisol
L0004	S10	Arenic Ferric Luvisol

All other profiles are available from the National Soil Database, Ministry of Agriculture, Gaborone.

SOIL PROFILE DESCRIPTION

SHEET : 2425D4
 LOCATION : 8km SW Ramotswa (Tang river).
 AUTHOR(S) : A.Remmelzwaal B.G.Moganane
 CLASSIFICATION FAO: Calcaric Cambisol(1988) Calcaric Cambisol (1974)
 ST : Fluventic Eutrochrept
 LANDFORM : alluvial plain
 TOPOGRAPHY: almost flat
 SURF. CHAR: slight sealing, no cracks, nil evidence of salt,
 LAND USE: traditional dryland farming
 SPECIES : Trees -
 : Shrubs -
 : Grasses/forbs-
 PARENT MATERIAL: alluvium
 MOIST. COND:
 SURF. STONES: none
 EROSION : nil

GRID : LC-771-461
 COORD: 24-53-47-S 25-47-01-E
 DATE : 14/08/85
 LAND ELEMENT : flood plain
 MICRO TOPOGRAPHY: uneven
 VEGETATION: Nil

AGRO CLIM.ZONE: IE3
 ELEVATION : 1036 m
 SMR: ustic
 POSITION: lower part
 SLOPE : 1 - %
 GRASSCOVER:

ROCK TYPE:
 ROCK OUTCROP: none
 GEOL.UNIT: Transvaal supergroup
 DRAINAGE :
 HUMAN INT: nil

REMARKS: Profile A 100 mtrs from gully; probably higher up less sand intercalated (sand 2 BC already wedging out)

SAMPLES: A: 0 - 20 B: 30 - 50 C: 50 - 70

- A 0 - 25 cm 10YR 3.5/3 (moist) and 10YR 5.5/3 (dry), clay, moderate fine subangular blocky falling apart into moderate medium granular structure, hard, non calcareous, few insect activity, common fine roots, abrupt smooth boundary.
- 2BC 25 - 50 cm 10YR 4/4 (moist) and 10YR 6.5/4 (dry), fine sandy loam, very weak very coarse prismatic falling apart into massive structure, hard, slightly calcareous, very few fine roots, abrupt wavy boundary.
- 3B 50 - 70 cm 10YR 3/2 (moist) and 10YR 5.5/3 (dry), clay, weak fine and medium subangular blocky structure, very hard, slightly calcareous, very few fine roots, abrupt wavy boundary.
- 4C 70 - 80 cm 10YR 4/3 (moist) and 10YR 6/4 (dry), fine sand, massive structure, very hard, slightly calcareous, no roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0011

SAMPLE	DEPTH	pH	EC	P	C	Ca	Mg	K	Na	PBS	Particle size (weight %)					CEC	CECclay	MEIH	PRETR			
		H2O	CaCl2	ppm	weight %	meq/100gr soil	meq/100gr soil	meq/100gr soil	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSl	fSl	Clay	meq/100gr			
A	0 20	6.8	6.2	0.0	11	0.4	25.6	12.4	5.0	1.1	0.1	73	0	0	1	5	10	12	24	47	51	H
B	30 50	7.4	6.5	0.0	4	0.1	8.2	5.2	1.9	0.2	0.0	89	0	0	0	29	42	13	5	12	64	?
C	50 70	6.9	6.4	0.0	2	0.2	21.1	13.2	4.8	0.4	0.1	88	0	0	0	4	9	12	27	47	43	?

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

PART-SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

Profile: L 0053 Unit: A07 Status: 2

SHEET : 2525b1
 LOCATION : 6km S of Kgomokasitwa.
 AUTHOR(S): T.D.Mafoko K.Kgatlwane
 CLASSIFICATION FAO: Calcic-Gleyic Luvisol(1988) Calcic Gleyic Luvisol (1974) sodic phase
 ST : Aquic Haplustalf

GRID : LC-626-189
 COORD: 25-08-35-S 25-38-10-E
 DATE : 08/05/84

ACRO CLIM.ZONE: 1E3
 ELEVATION : 1189 m
 SMR: ustic

LANDFORM :
 TOPOGRAPHY: undulating
 SURF. CHAR: strong sealing, no cracks, nil evidence of salt,
 LAND USE:

LAND ELEMENT :
 MICRO TOPOGRAPHY:

POSITION: lower slope
 SLOPE : 3 - %

VEGETATION:

GRASSCOVER:

SPECIES : Trees -
 : Shrubs -
 : Grasses/forbs-
 PARENT MATERIAL: alluvium
 MOIST. COND: dry 0 - 20 , moist 20 - 150 cm
 SURF.STONES: none
 EROSION : strong sheet erosion and strong rill erosion

ROCK TYPE: felsic volcanics

GEOLOG. UNIT:

ROCK OUTCROP: none

DRAINAGE : poorly drained

HUMAN INF: nil

REMARKS: Augering from 85cm

SAMPLES: A: 0 - 20 B: 30 - 50 C: 80 - 100 D: 130 - 150

- A 0 - 20 cm 10YR 3/3 (moist) and 10YR 4/3 (dry), clay loam to sandy clay loam, strong medium and coarse subangular blocky structure, extremely hard, continuous thin cutans, common fine pores, non calcareous, many fine roots, clear smooth boundary.
- Btn 20 - 50 cm 10YR 3/3 (moist), many mottles, clay loam to sandy clay loam, strong medium and coarse subangular blocky structure, very firm, patchy thin cutans, few fine pores, moderately calcareous, many fine roots, clear smooth boundary.
- Btrnk1 50 - 110 cm 10YR 4/4 (moist), clay loam to sandy clay, very firm, few fine pores, frequent calcareous white soft segregations, strongly calcareous, common fine roots, clear smooth boundary.
- Btrnk2 110 - 170 cm 10YR 5/4 (moist), sandy clay loam, frequent calcareous white soft segregations, non calcareous, no roots, abrupt boundary.
- R 170 cm +

STANDARD SOIL ANALYSIS RESULTS

PROFILE: L 0053

SAMPLE	DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)					CECclay	METH	PRETR				
		H2O CaCL2	mS/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	meq/100gr							
A	0 20	7.9	6.9	0.0	1	0.5	20.9	0.8	4.1	0.3	3.0	39	5	11	11	14	13	10	28	67		H	
B	30 50	8.3	7.9	0.0	1	0.4	21.9	23.3	6.3	0.2	10.2	100	8	12	9	11	10	10	9	31	65		H
C	80 100	8.6	8.1	0.0	1	0.1	20.7	26.7	5.3	0.2	9.9	100	5	10	9	11	11	12	9	34	60		H
D	130 150	8.7	8.1	0.0	1	0.1	20.6	25.1	5.4	0.2	9.9	100	6	10	9	11	10	13	10	31	65		H

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

PART. SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

Profile: R 0004 Unit: A09 Status: 2

SHEET : 2425D4
LOCATION : 3km N of Ramotswa.
AUTHOR(S) : A. Remmelzwaal B.C. Moganane
CLASSIFICATION FAO: Calcic Luvisol (1988) Calcic Luvisol (1974)

ST : Typic Haplustalf
LANDFORM : alluvial plain
TOPOGRAPHY: flat
SURE. CHAR: slight sealing, no cracks, nil evidence of salt,
LAND USE: no apparent management system
SPECIES : Trees - Acacia mellifera (dom.) Acacia tortilis subs. heteroantha Boscia albitrunca
: Shrubs -

: Grasses/forbs-
PARENT MATERIAL: alluvium
MOIST. COND: dry 0 - 110 cm
SURE. STONES: none
EROSION : nil

REMARKS: Auguring from 80cm, few pedocubules in Bt

SAMPLES: A: 0 - 20 B: 25 - 45 C: 60 - 80

A 0 - 20 cm 2.5Y 3.5/1.5 (moist) and 2.5Y 4.5/1.5 (dry), sandy clay loam, weak coarse subangular blocky structure, hard, common fine and medium pores, very few soft calcareous white nodules, slightly calcareous, common roots, gradual smooth boundary.

Bt 20 - 50 cm 2.5Y 4/1.5 (moist) and 2.5Y 5/1 (dry), sandy clay, weak coarse subangular blocky structure, hard to very hard, patchy moderately thick cutans, few fine and medium pores, few soft calcareous white nodules, moderately calcareous, few roots, clear smooth boundary.

Btk 50 - 90 cm 2.5Y 5/2 (moist) and 2.5Y 6/2 (dry), clay, very weak coarse subangular blocky structure, hard to very hard, patchy moderately thick cutans, frequent medium soft calcareous white nodules, strongly calcareous, no roots,

GRID : LC-824-548
COORD: 24-49-07-S 25-50-17-E
DATE : 12/08/85

LAND ELEMENT :
MICRO TOPOGRAPHY: even
VEGETATION: dense savanna

ROCK TYPE:
ROCK OUTCROP: none

GEOLOG. UNIT: Transvaal supergroup
DRAINAGE : imperfectly drained
HUMAN INF: nil

AGRO CLIM. ZONE: 1E3
ELEVATION : 1089 m
SMR: ustic

POSITION: intermediate part
SLOPE : - 1 %
GRASSCOVER:

Soil Survey of Botswana FAO/BOT/85/011

print date: 03/05/89

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0004

SAMPLE	DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)						CECclay	METH	PRETR		
		H2O CaCL2	mS/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	meq/100gr						
A	0 20	7.9 7.3	0.0	1	0.2	16.7	22.5	3.6	1.0	0.1	100	6	14	13	15	13	8	6	25	63		H
B	25 45	8.0 7.4	0.0	1	0.1	20.4	23.8	3.9	0.6	0.1	100	7	14	11	14	11	8	4	31	64		H
C	60 80	8.3 7.5	0.0	0	0.3	18.4	58.7	5.6	0.4	0.2	100	6	10	9	13	11	8	8	35	49		H

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

SHEET : 2425D4
 LOCATION : Notwane siding.
 AUTHOR(S) : A. Remmelzwaal B.G. Moganane
 CLASSIFICATION FAO: Rhodi-Chromic Luvisol(1988) Chromic Luvisol (1974)
 ST : Udic Rhodustalf
 LANDFORM : plain
 TOPOGRAPHY: flat
 SURF. CHAR: no sealing, no cracks, nil evidence of salt,
 LAND USE: traditional dryland farming
 SPECIES : Trees -
 : Shrubs -
 : Grasses/forbs -
 PARENT MATERIAL: alluvium over in situ weathered
 MOIST. COND: dry 0 - 120 cm
 SURF. STONES: none
 EROSION : nil
 REMARKS: Pit for powerline structure
 SAMPLES: A: 0 - 20 B: 25 - 45 C: 60 - 80 D: 120 - 140
 GRID : LC-823-602
 COORD: 24-46-13-S 25-50-13-E
 DATE : 12/08/85
 AGRO CLIM.ZONE: 1E3
 ELEVATION : 1006 m
 SMR: ustic
 LAND ELEMENT :
 MICRO TOPOGRAPHY: even
 VEGETATION: Nil
 POSITION: intermediate part
 SLOPE : 0 - 1 % straight
 GRASSCOVER:
 ROCK TYPE: dolerite
 ROCK OUTCROP: none
 GEOL. UNIT: Transvaal supergroup
 DRAINAGE : moderately well drained
 HUMAN INF: ploughing

Ap 0 - 20 cm 5YR 4/6 (moist) and 5YR 3/6 (dry), sandy loam, weak fine to coarse subangular blocky structure, soft to slightly hard, few fine pores, non calcareous, common roots, clear smooth boundary.
 Bt1 20 - 45 cm 2.5YR 3/6 (moist) and 2.5YR 4/6 (dry), sandy loam to sandy clay loam, very weak coarse and very coarse subangular blocky structure, slightly hard, patchy thin cutans, few fine pores, non calcareous, few roots, gradual smooth boundary.
 Bt2 45 - 90 cm 2.5YR 3/6 (moist) and 2.5YR 4/6 (dry), sandy clay loam, massive structure, hard, patchy thin cutans, few fine pores, very few fine and medium quartz rock fragments, non calcareous, few roots, abrupt wavy boundary.
 C1 90 - 150 cm 2.5YR 3/6 (moist) and 2.5YR 4/6 (dry), sandy clay loam, massive structure, hard, weakly cemented, very frequent fine and medium rounded quartz and very frequent fine and medium rounded shale rock fragments, few iron-manganese nodules, non calcareous, no roots, abrupt wavy boundary.
 2C 150 - 200 cm very hard, very frequent fine and medium rounded quartz and frequent fine and medium dolerite rock fragments,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0007

SAMPLE DEPTH	pH	EC	P	C	Ca	Mg	K	Na	PBS	Particle size (weight %)				CECclay	MEH	PRETR							
										weight %	meq/100gr soil	vcS	cS				mS	fS	vsS	csi	fsl	Clay	meq/100gr
A	0	20	6.0	5.8	0.0	5	0.1	5.2	2.8	0.8	0.4	0.0	77	7	16	20	20	14	7	5	12	41	?
B	25	45	6.7	6.1	0.0	1	0.1	6.9	4.3	1.3	0.2	0.0	84	5	12	17	20	14	7	4	20	32	H
C	60	80	7.2	6.7	0.0	1	0.1	8.6	6.3	1.8	0.1	0.0	95	9	15	16	15	12	7	4	23	35	H
D	120	140	7.8	7.0	0.0	1	0.1	9.7	7.7	2.2	0.2	0.0	100	16	10	12	10	9	6	6	31	30	H

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

PART-SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

Profile: R 0015 Unit: A31a Status: 2

SHEET : 2425D3
 LOCATION : 2km N of Mogobane dam.
 AUTHOR(S) : A. Nemeelzwaal B.G. Moganane
 CLASSIFICATION FAO: Eutric Gleysol (1988) Eutric Gleysol (1974)
 ST : Typic Haplaquept

AGRO CLIM. ZONE: 1E3
 ELEVATION : 1064 m
 SMR: aquatic

LANDFORM : alluvial plain
 TOPOGRAPHY: flat
 SURF. CHAR: slight sealing, no cracks, nil evidence of salt,
 LAND USE: traditional grazing
 SPECIES : Trees -
 : Shrubs -
 : Grasses/forbs-

GRID : LC-683-402
 COORD: 24-57-05-S 25-41-45-E
 DATE : 14/08/85
 LAND ELEMENT : flood plain
 MICRO TOPOGRAPHY: uneven
 VEGETATION: Nil

POSITION: lower part
 SLOPE : 0 - %
 GRASSCOVER:

PARENT MATERIAL: alluvium
 MOIST. COND: dry 0 - 10 , moist 10 - 50 , wet 50 - 150 cm
 SURF. STONES: none
 EROSION : slight sheet erosion and slight accumulation by water

ROCK TYPE:
 ROCK OUTCROP: none

GEOLOGICAL UNIT: Transvaal supergroup
 DRAINAGE : poorly drained
 HUMAN INF: nil

REMARKS: Augering from 80cm, Watertable at 150cm, annually flooded. Litter and plant remains deposited. Whole profile low bulk density.

SAMPLES: A: 0 - 10 B: 15 - 35 C: 40 - 50 D: 50 - 60 E: 60 - 80 F: 130 - 150

- Bc 0 - 10 cm 10YR 4/3 (moist) and 10YR 6/3 (dry), clay, moderate platy structure, very hard, common fine and common coarse pores, non calcareous, common roots, abrupt smooth boundary.
- 2B1 10 - 40 cm 10YR 3/1 and 10YR 5/3 mottled (moist), clay, weak very coarse subangular blocky structure, very hard very firm, common fine and medium pores, non calcareous, common roots, clear smooth boundary.
- 2B2 40 - 50 cm 10YR 3/1 and 7.5YR 5/6 mottled (moist), clay, very weak subangular blocky structure, very hard firm, many fine and medium pores, non calcareous, few roots, clear smooth boundary.
- 2C1 50 - 60 cm 10YR 4/1 (moist), common medium faint diffuse mottles, clay, strongly coherent massive structure, slightly plastic, common fine and medium pores, non calcareous, few roots, abrupt smooth boundary.
- 2C2 60 - 80 cm 10YR 4/1 (moist), common coarse faint diffuse brown mottles, sandy loam, single grain structure, slightly plastic, few fine and medium pores, non calcareous, very few roots, diffuse boundary.
- 2C3 80 - 150 cm 10YR 4/2 (moist), sandy loam, slightly plastic, non calcareous, no roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0015

SAMPLE DEPTH	pH	H2O CaCL2	EC mS/cm	P ppm	C weight %	Ca meq/100gr soil	Mg	K	Na	PBS %	Particle size (weight %)					CECclay meq/100gr	METH	PRETR			
											CEC	vcS	cS	mS	fS				vs	cSi	fSi
A 0 10	7.4	6.6	0.0	5	1.1	24.8	18.1	4.0	1.1	0.2	94	0	2	23	24	5	2	12	31	66	?
B 15 35	7.8	6.9	0.0	2	0.5	27.3	21.7	5.7	0.7	0.4	100	0	0	0	0	1	13	22	64	39	?
C 40 50	8.1	7.0	0.0	1	0.4	24.7	19.5	5.1	0.5	0.4	100	0	0	0	0	1	14	40	45	52	?
D 50 60	8.3	7.1	0.0	4	0.2	6.3	5.1	1.4	0.2	0.2	100	0	0	4	36	31	14	6	9	62	?
E 60 80	8.0	7.2	0.0	1	0.0	27.3	20.1	5.6	0.6	0.5	98	0	0	1	5	7	10	26	52	52	?
F 130 150	8.2	6.6	0.0	3	0.1	6.2	3.5	1.1	0.2	0.4	84	0	0	3	40	31	14	4	9	67	?

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

PART-SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

SHEET : 2425D3
 LOCATION : Metsmaswane,
 AUTHOR(S): A.Remmelzwaal A.Cavaliere-Parzanese C.L.Ketlogetswe
 CLASSIFICATION FAO: Chromic Luvisol(1988) Chromic Luvisol (1974)
 ST : Ultic Haplustalf

LANDFORM : plain
 TOPOGRAPHY: almost flat
 SURF. CHAR: slight sealing, no cracks, nil evidence of salt,
 LAND USE: traditional dryland farming
 SPECIES : Trees - Acacia fleckii (dom.) Acacia tortilis subs. heterocantha Combretum imberbe
 : Shrubs -
 : Grasses/forbs-

PARENT MATERIAL: in situ weathered
 MOIST. COND: dry 0 - 150 cm
 SURF. STONES: none
 EROSION : slight sheet erosion

REMARKS: Augering from 100cm

SAMPLES: A: 0 - 15 B: 20 - 45 C: 50 - 70 D: 110 - 130 E: 135 - 150

A 0 - 15 cm 7.5YR 3/4 (moist) and 7.5YR 4/4 (dry), loamy sand, massive structure, soft, common fine and few medium pores, non calcareous, few roots, clear smooth boundary.

Bt1 15 - 40 cm 7.5YR 3/5 (moist) and 7.5YR 4/5 (dry), sandy loam, very weak very coarse subangular blocky structure, slightly hard, patchy thin cutans, common fine and few medium pores, non calcareous, few roots, clear smooth boundary.

Bt2 40 - 80 cm 7.5YR 4/6 (moist) and 7.5YR 5/7 (dry), sandy clay loam, very weak very coarse subangular blocky structure, slightly hard, broken thin cutans, common fine and few medium pores, very few fine rock fragments, non calcareous, common termite/ant activity, very few roots, gradual smooth boundary.

Bt3 80 - 135 cm 7.5YR 4/7 (moist) and 7.5YR 5/7 (dry), common fine faint diffuse reddish mottles, sandy clay, very weak very coarse subangular blocky structure, slightly hard friable, broken thin cutans, common fine and few medium pores, very few fine rock fragments, non calcareous, common termite/ant activity, very few roots, abrupt boundary.

Ccs 135 - 150 cm 7.5YR 4/4 (moist) and 7.5YR 5/4 (dry), sandy clay loam to sandy clay, very frequent medium hard manganeseiferous black nodules, non calcareous, very few fine roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0020

SAMPLE	DEPTH	pH	H2O CaCL2	EC	mS/cm	P	C	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	CECclay	MEIH	PRETR
						ppm	weight %	meq/100gr soil	%	%	%	%	%	%	%	%	%	%	meq/100gr							
A	0	15	4.9	4.3	0.0	1	0.1	4.3	1.1	0.7	0.2	0.0	0.0	47	6	20	26	19	13	3	4	10	39	H		
B	20	45	5.2	4.7	0.0	2	0.1	5.7	1.3	1.3	0.2	0.0	0.0	49	2	10	21	22	18	6	4	17	31	H		
C	50	70	5.0	4.6	0.0	1	0.2	8.3	1.4	1.8	0.2	0.0	0.0	41	2	12	25	17	13	6	3	23	33	H		
D	110	130	4.7	4.3	0.0	1	0.1	6.2	1.4	1.8	0.1	0.0	0.0	53	6	13	22	15	11	5	4	24	24	H		
E	135	150	4.9	4.7	0.0	1	0.1	4.3	0.6	1.5	0.1	0.0	0.0	51	9	11	20	15	11	7	7	21	18	H		

Soil Survey of Botswana YAO/BOT/85/011

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

Print date: 03/05/89

SOIL PROFILE DESCRIPTION

SHEET : 2426C1
 LOCATION : 2 km South of Modipe hill.
 AUTHOR(S): B.G.Mogane C.I.Ketlogetswe
 CLASSIFICATION FAO: Ferric Luvisol(1988) Ferric Luvisol (1974)
 ST : Kanhaplic Haplustalf
 LANDFORM : plain
 TOPOGRAPHY: almost flat
 SURF. CHAR: moderate sealing, no cracks, nil evidence of salt,
 LAND USE: no apparent management system
 SPECIES : Trees - Acacia erubescens (dom.) Combretum imberbe
 : Shrubs - Dichrostachys cinerea (dom.) Acacia tortilis subs. heterocantha
 : Grasses/Forbs-
 PARENT MATERIAL: in situ weathered
 MOIST. COND: dry 0 - 160 cm
 SURF. STONES: none
 EROSION : slight sheet erosion

GRID : MC-148-715
 COORD: 24-40-10-S 26-09-20-E
 DATE : 06/06/85
 LAND ELEMENT : not applicable
 MICRO TOPOGRAPHY: hummocks
 VEGETATION: open savanna
 ROCK TYPE: basic igneous/metamorphic
 ROCK OUTCROP: none
 AGRO CLIM.ZONE: 1E3
 ELEVATION : 1029 m
 SMR: ustic
 POSITION: intermediate part
 SLOPE : 0.5 - 1 % straight
 GRASSCOVER:
 GEOL.UNIT: Intrusives
 DRAINAGE : well drained
 HUMAN INF: nil

REMARKS: Augering from 80cm

SAMPLES: A: 0 - 15 B: 20 - 40 C: 60 - 80 D: 140 - 160

- A 0 - 15 cm 10YR 3/3 (moist) and 10YR 5.5/3 (dry), sandy clay loam, weak coarse subangular blocky structure, slightly hard, few fine pores, non calcareous, few burrows, few fine and few medium roots, gradual smooth boundary.
- Bt1 15 - 40 cm 7.5YR 3/2 (moist) and 7.5YR 4.5/4 (dry), sandy clay loam, weak very coarse subangular blocky structure, slightly hard, patchy thin cutans, few coarse pores, non calcareous, few burrows, common fine and common medium roots, clear smooth boundary.
- Bt2 40 - 85 cm 7.5YR 4/6 (moist) and 7.5YR 5/7 (dry), many fine distinct clear red mottles, sandy clay, weak very coarse subangular blocky structure, hard, patchy thin cutans, few fine pores, non calcareous, few fine and few medium roots, gradual boundary.
- Bt3 85 - 120 cm 7.5YR 4/6 (moist) and 7.5YR 5/7 (dry), few fine distinct clear red mottles, sandy clay to clay, non calcareous, no roots, clear boundary.
- Bt4 120 - 160 cm 10YR 5/8 (moist) and 10YR 7/8 (dry), sandy clay, non calcareous, no roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: G 0518

SAMPLE	DEPTH	pH	H2O CaCL2	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	CECclay	MEIH	PRETR
			meq/100gr soil	mS/cm	ppm	weight %	meq/100gr soil	%	%	%	%	%	%	%	%	%	%	meq/100gr						
A	0 15	5.9	5.0	0.0	3	0.3	7.0	2.8	1.8	0.2	0.0	69	3	11	13	19	14	7	3	30	19	H	0	
B	20 40	6.2	5.6	0.0	1	0.2	8.9	3.4	2.7	0.2	0.0	71	3	12	12	19	14	6	4	30	27	H	0	
C	60 80	6.4	5.5	0.0	1	0.1	10.9	3.8	3.5	0.2	0.0	69	3	10	9	13	10	4	4	46	23	H	0	
D	140 160	6.9	6.1	0.0	1	0.0	10.8	2.8	2.8	0.5	0.4	60	2	7	9	14	13	8	6	40	27	H	0	

Soil Survey of Botswana FAO/BOT/85/011

Print date: 03/05/89

PART-SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

Profile: L 0902 Unit: D05b Status: 1

SHEET : 2525B1
 LOCATION : 2km East of Lobatse,
 AUTHOR(S) : A.B.Price M.D.Mays A.Remmelzwaal
 CLASSIFICATION FAO: Haplic Acrisol(1988) Ferric Luvisol (1974)
 ST : kaodic Paleustalf ; coarse loamy mixed hyperthermic
 LANDFORM : pediment
 TOPOGRAPHY: gently undulating
 SURF. CHAR: no sealing, no cracks, nil evidence of salt,
 LAND USE: traditional grazing
 SPECIES : Trees - Acacia karroo (dom.) Acacia tortilis subs. heterocantha
 : Shrubs -
 : Grasses/forbs -
 PARENT MATERIAL: colluvium
 MOIST. COND: dry 0 - 150 cm
 SURF. STONES: none
 EROSION : moderate sheet erosion

GRID : LC-690-082
 COORD: 25-14-40-S 25-41-45-E
 DATE : 12/04/86

AGRO CLIM.ZONE: 1E3
 ELEVATION : 1215 m

SMR: ustic
 POSITION: lower slope
 SLOPE : 3 - % straight
 GRASSCOVER: 10 - 30 %

LAND ELEMENT : not applicable
 MICRO TOPOGRAPHY: even
 VEGETATION: dense tree savanna

ROCK TYPE: dolomite
 ROCK OUTCROP: none
 GEOL.UNIT: Transvaal supergroup
 DRAINAGE : well drained
 HUMAN INF: nil

REMARKS: USDA Fedon no.15. Excursion site FAO EASC meeting 1-4-87. According to field texture, the clay increase is marginal for a Bt.

SAMPLES: A: 0 - 5 B: 5 - 30 C: 30 - 60 D: 60 - 90 E: 90 - 120 F: 120 - 150

- A 0 - 5 cm 5YR 3/4 (moist) and 5YR 4/6 (dry), sandy loam, weak fine and medium subangular blocky structure, slightly hard friable, non sticky non plastic, common very fine and fine pores, non calcareous, common very fine and fine roots, clear smooth boundary.
- Bt1 5 - 33 cm 5YR 3/4 (moist) and 5YR 4/6 (dry), sandy loam, weak coarse subangular blocky structure, slightly hard friable, non sticky non plastic, broken thin clay and sesquioxides cutans on pedfaces, common very fine and fine pores, non calcareous, common fine and medium roots, diffuse wavy boundary.
- Bt2 33 - 64 cm 2.5YR 3/4 (moist) and 2.5YR 4/6 (dry), sandy loam, weak very coarse subangular blocky structure, slightly hard friable, non sticky non plastic, broken thin clay and sesquioxides cutans on pedfaces, few very fine and fine pores, non calcareous, few very fine and fine roots, diffuse wavy boundary.
- Bt3 64 - 150 cm 2.5YR 3/4 (moist) and 2.5YR 4/6 (dry), sandy loam, weak very coarse subangular blocky structure, slightly hard friable, non sticky non plastic, broken thin clay and sesquioxides cutans on pedfaces, few very fine and fine pores, non calcareous, few very fine and fine roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: L 0902

SAMPLE	DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)					CECclay	METH	PRETR				
		H2O CaCl2	ms/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	meq/100gr							
A	0 5	5.8	4.9	0.0	2	0.8	3.3	1.3	0.4	0.4	0.0	64	1	17	11	17	20	9	6	18	1		
B	5 30	5.9	5.2	0.0	2	0.4	3.8	1.6	0.6	0.7	0.0	76	2	13	9	19	20	6	8	22	10		
C	30 60	6.3	5.6	0.0	2	0.2	3.3	1.7	0.6	0.6	0.0	88	7	17	10	17	17	6	4	22	11		
D	60 90	6.6	5.7	0.0	2	0.2	3.7	1.3	0.6	0.4	0.0	62	5	13	9	17	19	8	4	25	12		
E	90 120	6.8	6.0	0.1	2	0.2	3.6	1.5	0.8	0.4	0.0	75	12	17	11	16	14	6	5	20	14		
F	120 150	6.7	5.9	0.1	2	0.1	3.8	1.5	0.7	0.3	0.0	66	12	12	8	16	18	6	4	24	14		

Soil Survey of Botswana FAC/BGT/85/011

Print date: 26/05/89

PART-SIZE DETERMINATION METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

Profile: L 0008 Unit: D07 Status: 3

SHEET : 2525B2
 LOCATION : 6.5 km SE Ootse.
 AUTHOR(S) : T.D.Mafoko
 CLASSIFICATION FAO: Haplic Acrisol(1988) Ferric Luvisol (1974)
 ST : Oxic Paleustalf
 LANDFORM : plain
 TOPOGRAPHY: undulating
 SURF. CHAR: no sealing, no cracks, nil evidence of salt,
 LAND USE: dryland farming
 SPECIES : Trees - *Feltophorum africanum* (dom.) *Pappaea capensis*
 : Shrubs - *Tarchonanthus camphoratus* *Ziziphus mucronata*
 : Grasses/forbs-
 PARENT MATERIAL: colluvium
 MOIST. COND: dry 0 - 160 cm
 SURF. STONES: none
 EROSION : nil

GRID : LC-769-252
 COORD: 25-05-05-S 25-46-45-E
 DATE : 24/01/84

AGRO CLIM.ZONE: IE3
 ELEVATION : 1097 m
 SMR: aridic to ustic

LAND ELEMENT :
 MICRO TOPOGRAPHY: even
 VEGETATION: savanna
 POSITION: slope
 SLOPE : - % convex
 GRASSCOVER:

ROCK TYPE: shale
 ROCK OUTCROP: none
 GEOL.UNIT: Transvaal supergroup
 DRAINAGE : well drained
 HUMAN INF: nil

REMARKS: Augering from 100 cm. Classification: Boundary case between Acrisols and Luvisols, PBS in Bt1 just below 50%. Alternative classification Haplic Acrisol

SAMPLES: A: 0 - 20 B: 20 - 40 C: 80 - 100 D: 130 - 150

- Ah 0 - 20 cm 10YR 5.5/4 (moist) and 10YR 4.5/4 (dry), loamy sand, very weak fine and medium subangular blocky structure, slightly hard, common fine pores, non calcareous, many fine roots, clear smooth boundary.
- Bt1 20 - 40 cm 10YR 4/6 (moist) and 10YR 5/6 (dry), sandy loam, weak medium and coarse subangular blocky structure, slightly hard, patchy cutans, few fine pores, non calcareous, few fine roots, clear smooth boundary.
- Bt2 40 - 110 cm 7.5YR 4/6 (moist) and 7.5YR 5/8, sandy clay loam, weak medium and coarse subangular blocky structure, hard, broken moderately thick cutans, few fine pores, non calcareous,
- Bt3 110 - 160 cm 7.5YR 4/6 (moist) and 7.5YR 5/6 (dry), few distinct mottles, sandy clay loam, hard, non calcareous,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: L 0008

SAMPLE	DEPTH	pH	H2O CaCL2	EC	mS/cm	P	ppm	C	weight %	CEC	Ca	Mg	K	Na	PBS	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	CECclay	meq/100gr	MEIH	PRETR
A	0	20	5.5	4.7	0.0	2	0.4	5.0	1.1	0.4	0.2	0.3	40	0	17	40	19	8	4	4	8	42	42	H				
B	20	40	5.3	4.7	0.0	1	0.3	4.4	1.1	0.4	0.2	0.3	45	0	17	37	16	6	3	4	16	20	20	H				
C	80	100	4.7	4.3	0.0	1	0.3	7.7	2.3	1.8	0.2	0.3	60	0	14	31	12	5	3	5	31	21	21	H				
D	130	150	5.0	4.7	0.0	1	0.2	8.6	3.0	2.1	0.2	0.3	65	0	14	29	11	5	4	3	33	24	24	H				

Soil Survey of Botswana FAO/BOT/85/011

Print date: 26/05/89

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PART-SIZE DETERMINATION PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

SHEET : 2525B3
 LOCATION : 5.5 km NW Pitsane.
 AUTHOR(S) : T.D.Mafoko
 CLASSIFICATION FAO: Eutric Leptosol(1988) Eutric Regosol (1974) lithic phase
 ST : Lithic Ustorthent
 LANDFORM : plain
 TOPOGRAPHY: almost flat
 SURF. CHAR: no sealing, no cracks, nil evidence of salt,
 LAND USE: no apparent management system
 SPECIES : Trees -
 : Shrubs - Acacia tortillis subs. heterocantha (dom.) Acacia erioloba Rhus lancea
 : Grasses/forbs-
 PARENT MATERIAL: in situ weathered
 MOIST. COND: dry 0 - 30 cm
 SURF. STONES: none
 EROSION : nil

GRID : LB-698-76
 COORD: 25-25-25-S 25-34-25-E
 DATE : 15/08/84
 LAND ELEMENT : not applicable
 MICRO TOPOGRAPHY: even
 VEGETATION: dense shrub savanna
 Grewia flava
 ROCK TYPE: felsite
 ROCK OUTCROP: none

AGRO CLIM.ZONE: IE3
 ELEVATION : 1311 m
 SMR: ustic
 POSITION: slope
 SLOPE : 2 - %
 GRASSCOVER:
 GEOL.UNIT: Basement complex
 DRAINAGE : well drained
 HUMAN INT: nil

REMARKS:

SAMPLES: A: 0 - 20

A 0 - 30 cm 7.5YR 4/4 (moist) and 7.5YR 5/6 (dry), sandy loam, very weak medium and coarse subangular blocky structure, slightly hard, common pores, frequent medium rock fragments, non calcareous, common fine roots, gradual smooth boundary.

Cmo 30 cm + very frequent hard iron-manganese nodules, non calcareous, no roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: L 0091

SAMPLE	DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)					CECclay	METH	PRETR			
		H2O CaCL2	mS/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	meq/100gr						
A	0 20	6.0 5.2	0.0	2	0.6	4.9	2.5	0.8	0.7	0.0	82	8	14	11	27	19	7	3	11	22		H

Soil Survey of Botswana FAO/BOT/85/011

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

Print date: 03/05/89

SOIL PROFILE DESCRIPTION

SHEET : 2425D4
 LOCATION : 3km from main road Lobatse, Gaborone.
 AUTHOR(S): A. Remmelzwaal A. Cavaliere-Parzanese C.I. Kerlogatswe
 CLASSIFICATION FAO: Ferric Luvisol (1988) Ferric Luvisol (1974) petric (skeletic) phase
 ST : Oxic Haplustalf
 LANDFORM : pediment
 TOPOGRAPHY: undulating
 SURF. CHAR: no sealing, no cracks, nil evidence of salt,
 LAND USE: no apparent management system
 SPECIES : Trees - Combretum apiculatum Acacia erioloba Acacia tortilis subs. heterocantha
 : Shrubs -
 : Grasses/forbs -
 PARENT MATERIAL: colluvium
 MOIST. COND: dry 0 - 60 cm
 SURF. STONES: none
 EROSION : moderate sheet erosion
 REMARKS: 100 mtrs from road, disturbed surface. Soil in complex with very strong-shallow petric regosols.
 SAMPLES: A: 0 - 10 B: 20 - 40 C: 40 - 60

GRID : LC-771-553
 COORD: 24-48-50-S 25-47-05-E
 DATE : 28/11/85
 SMR: ustic
 POSITION: slope
 SLOPE : 4 - %
 GRASSCOVER: < 10 %
 GEOL. UNIT: Transvaal supergroup
 DRAINAGE : well drained
 HUMAN INF: nil

A 0 - 20 cm 10YR 3/4 (moist) and 10YR 5/3.5 (dry), sandy clay loam, massive falling apart into very weak subangular blocky structure, hard, many fine and common medium pores, non calcareous, common, few roots, clear smooth boundary.
 Bt1 20 - 40 cm 7.5YR 4/4 (moist) and 7.5YR 5/4 (dry), common medium faint diffuse brownish mottles, sandy clay, very weak coarse and very coarse subangular blocky falling apart into very weak medium subangular blocky structure, hard, patchy moderately thick cutans, few fine and medium pores, non calcareous, common termite/ant activity, few roots, gradual smooth boundary.
 Bt2 40 - 60 cm 7.5YR 4/4 (moist) and 7.5YR 5/4 (dry), many prominent clear reddish mottles, sandy clay, very weak coarse and very coarse subangular blocky falling apart into very weak medium subangular blocky structure, hard, patchy moderately thick cutans, few fine and medium pores, very few fine rock fragments, frequent medium hard iron-manganese black nodules, non calcareous, common termite/ant activity, few roots, clear wavy boundary.
 Cms 60 cm + partly cemented, few fine and medium rock fragments, frequent coarse hard iron-manganese black nodules, non calcareous, no roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: R 0024

SAMPLE DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)				CECclay	METH	PRETR					
	H2O CaCL2	mS/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fS	vfS	csi	fsl	Clay	meq/100gr							
A	0 10	5.3 4.7	0.0	2	0.2	10.4	3.4	1.7	0.1	0.0	50	1	3	7	11	7	19	19	33	29		H
B	20 40	5.2 4.5	0.0	1	0.2	8.6	4.1	2.4	0.1	0.1	78	2	7	12	18	12	4	18	28	28		H
C	40 60	5.8 5.0	0.0	1	0.4	10.2	6.2	3.2	0.1	0.0	93	2	6	9	14	11	9	11	39	22		H

Soil Survey of Botswana FAG/BOT/85/011

Print date: 03/05/89

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

SOIL PROFILE DESCRIPTION

SHEET : 242502
 LOCATION : Sebele, Agricultural Research Center.
 AUTHOR(S) : A.B.Price M.D.Mays A.Remmelzwaal
 CLASSIFICATION FAO: Haplic Lixisol(1988) Ferric Luvisol (1974)
 ST : kandic Paleustalf ; fine loamy mixed hyperthermic
 LANDFORM : plain
 TOPOGRAPHY: almost flat
 SURF. CHAR: slight sealing, no cracks, nil evidence of salt,
 LAND USE: improved trad. dryland farming, crops: maize, beans
 SPECIES : Trees -
 : Shrubs -
 : Grasses/forbs-
 PARENT MATERIAL: in situ weathered
 MOIST. COND: dry 0 - 097, slightly moist 097 - 180 cm
 SURF. STONES: none
 EROSION : moderate sheet erosion

GRID : LG-929-826
 COORD: 24-33-40-S 25-56-40-E
 DATE : 12/04/86

AGRO CLIM.ZONE: IE3
 ELEVATION : 1015 m

SMR: ustic
 POSITION: intermediate part
 SLOPE : - 1 % straight

LAND ELEMENT : interfluve
 MICRO TOPOGRAPHY: even
 VEGETATION: Nil

GRASSCOVER:

ROCK TYPE: granite
 ROCK OUTCROP: none

GEOL.UNIT: Gaborone granite
 DRAINAGE : well drained
 HUMAN INF: ploughing

REMARKS: USDA Pedon no.16 (Typic Haplargid). Excursion site FAO EASC meeting 1-4-87.

SAMPLES: A: 0 - 10 B: 12 - 30 C: 35 - 50 D: 55 - 95 E: 95 - 125 F: 125 - 155 G: 155 - 180

- Ap 0 - 11 cm 10YR 3/3 (moist) and 10YR 4/4 (dry), sandy loam (15% clay), weak medium subangular blocky falling apart into weak fine granular structure, slightly hard very friable, non sticky non plastic, few very fine pores, non calcareous, common fine and medium roots, field pH: 5.5, abrupt wavy boundary.
- A 11 - 33 cm 10YR 3/3 (moist) and 10YR 4/3 (dry), sandy loam (18% clay), weak medium and coarse subangular blocky structure, hard very friable, non sticky non plastic, few very fine pores, non calcareous, common fine and medium roots, field pH: 5.5, clear wavy boundary.
- Bt1 33 - 51 cm 7.5YR 3/4 (moist) and 7.5YR 4/6 (dry), sandy clay loam (22% clay), weak coarse subangular blocky structure, hard friable, sticky slightly plastic, broken thin cutans on pedfaces and broken thin cutans random, few very fine pores, non calcareous, very few very fine and fine roots, field pH: 6.0, diffuse wavy boundary.
- Bt2 51 - 97 cm 5YR 3/4 (moist) and 5YR 4/6 (dry), sandy clay loam (28% clay), weak coarse subangular blocky structure, hard friable, sticky slightly plastic, broken thin cutans on pedfaces and broken thin cutans random, few very fine pores, non calcareous, few fine and medium and few coarse roots, field pH: 6.0, diffuse wavy boundary.
- Bt3 97 - 180 cm 5YR 4/6 (moist) and 5YR 5/6 (dry), sandy clay loam (30% clay), weak coarse subangular blocky structure, very hard friable, sticky slightly plastic, broken thin cutans on pedfaces and broken thin cutans random, few very fine and fine pores, non calcareous, few fine and medium roots, field pH: 6.0, abrupt smooth boundary.
- Chc 180 - 190 cm extremely hard, cemented,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: G 0901

SAMPLE	DEPTH	pH	EC	P	C	CEC	Ca	Mg	K	Na	PBS	Particle size (weight %)				CECclay	MEIH	PRETR				
		H2O CaCl2	mS/cm	ppm	weight %	meq/100gr soil	%	vcS	cS	mS	fs	vfS	cSi	fSi	Clay	meq/100gr						
A	0 10	5.9 4.5	0.0	3	0.2	3.9	1.9	0.6	0.4	0.0	74	7	29	20	18	8	2	2	15	21	H	0
B	12 30	5.9 4.5	0.0	3	0.2	4.7	2.2	0.6	0.4	0.0	68	7	27	19	18	9	2	2	17	23	H	0
C	35 50	5.9 4.8	0.0	3	0.2	4.7	1.8	1.1	0.4	0.0	70	7	21	21	21	11	2	3	19	21	H	0
D	55 95	5.6 4.7	0.0	2	0.2	4.5	1.5	1.8	0.4	0.0	82	9	23	21	18	8	2	2	23	16	H	0
E	95 125	5.8 4.7	0.0	2	0.2	6.4	1.4	2.2	0.4	0.0	62	6	12	17	21	13	3	2	26	22	H	0
F	125 155	5.6 4.7	0.0	1	0.2	6.9	1.4	2.6	0.4	0.0	64	8	17	15	18	11	2	2	27	23	H	0
G	155 180	4.8 4.5	0.0	0	0.1	5.1	1.2	2.1	0.4	0.0	73	10	20	17	17	10	2	2	22	21	H	0

Soil Survey of Botswana FAO/BOT/85/011

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

Print date: 26/05/89

SHEET : 2525B2
 LOCATION : 2 km SE Otse.
 AUTHOR(S) : T.D.Mafoko A.Hemmelzwaal K.Kgatlwane
 CLASSIFICATION FAO: Arenic-Ferric Acrisol(1988) Arenic Ferric Luvisol (1974)
 ST : Oxic Paleustalf
 LANDFORM : hill
 TOPOGRAPHY: undulating
 SURF. CHAR: slight sealing, no cracks, nil evidence of salt,
 LAND USE: improved trad. dryland farming, crops: sorghum
 SPECIES : Trees - Terminalia sericea (dom.) Acacia tortillis subs. heterocantha Acacia mellifera
 : Shrubs - Ziziphus mucronata
 : Grasses/forbs-
 PARENT MATERIAL: colluvium
 MOIST. COND: dry 0 - 190 cm
 SURF. STONES: none
 EROSION : slight sheet erosion

REMARKS: PBS around 50%, alternative classification:Arenic-Ferric Acrisol
 SAMPLES: A: 4 - 17 B: 30 - 50 C: 80 - 100

Ah 0 - 17 cm 7.5YR 3/4 (moist) and 7.5YR 4/4.5 (dry), loamy sand, very weak subangular blocky structure, slightly hard, common very fine pores, non calcareous, abundant very fine and fine roots, clear smooth boundary.
 Bt1 17 - 70 cm 5YR 3/5 (moist) and 5YR 4/5 (dry), sandy loam, very weak subangular blocky structure, slightly hard, patchy thin cutans, common very fine pores, non calcareous, fine roots, gradual smooth boundary.
 Bt2 70 - 190 cm 4YR 3/6 (moist) and 4YR 4/6 (dry), sandy loam, very weak medium and coarse subangular blocky structure, slightly hard, patchy thin cutans, common very fine pores, non calcareous, few fine roots,

STANDARD SOIL ANALYSIS RESULTS

PROFILE: L 0004

SAMPLE	DEPTH	pH	EC	P	C	Ca	Mg	K	Na	PBS	Particle size (weight %)							CEC	METH	PRETR		
		H2O	mS/cm	ppm	weight %	meq/100gr soil	meq/100gr soil	meq/100gr soil	meq/100gr soil	%	vcS	cS	mS	fS	vfS	cSi	fSi	Clay	meq/100gr			
A	4 17	5.5	4.5	0.0	1	0.5	5.2	0.5	0.2	0.5	0.3	29	0	13	27	25	16	7	4	8	40	H
B	30 50	4.7	4.1	0.0	1	0.3	2.8	0.5	0.2	0.2	0.3	43	1	18	30	18	13	6	3	12	13	H
C	80 100	5.1	4.4	0.0	1	0.2	2.8	0.6	0.4	0.1	0.3	50	2	20	28	17	10	5	3	15	14	H

Soil Survey of Botswana FAO/BOT/85/011

METHOD: H = Hydrometer Method, P = Pipette Method, * = Not Known
 PRETREATMENT: O = Organic Matter, F = Free Iron Oxides, C = Carbonates, S = Soluble Salts N = None

Print date: 26/05/89

APPENDIX 2

LAND SUITABILITY CLASSIFICATION SHEETS

Table 1

LAND SUITABILITY CLASSIFICATION SHEET

location: Notwane dam, alluvial terrace

agro-climatic zone: Gaborone

author: J. Huesken

remarks: FAO : chromic Luvisol
ST : Udic Haplustalf
minor mapping unit

SOIL SURVEY BOTSWANA BOT/85/011

sheet: Gaborone date: 21/1/88

mapping unit: A13a

site characteristics: alluvial terrace

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig.			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S1	S1	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	3	S2	S2	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m			

RECOMMENDED IMPROVEMENTS

POTENTIAL LAND SUITABILITY							
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Table 2

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: S.E.W., East of Gaborone South of Lobatse

sheet: Gaborone date: 18/1/88

agro-climatic zone: Gaborone

mapping unit: A13a

author: J. Huesken

site characteristics: in depressions and lower part of complex

remarks: FAO : Pellic Vertison, partly sodic

ST : Typic Pellustert

in association with A30a and A4b, which are on higher positions

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	6	N2	N2	S4			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	2-3	S2	S3	S2			
workability	w	4	S4	S4	S4			
adequacy of topography	xI xII xIII	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S3f,m o			

REMARKS

Workability not taken into account. Moisture availability rating is given for normal site. See also A1 in Appendix B

POTENTIAL LAND SUITABILITY								
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Table 3

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED Valley floors Taung river & Tributaries

sheet: Gaborone date: 18/1/88

agro-climatic zone: Gaborone

mapping unit: A13a

author: J. Huesken

site characteristics: Better drained parts of valley floors

remarks: FAO : Calcic Cambisol
ST : Fluventic Eutrochrept
in association with A31a

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch oa S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	2	S2	S2	S2			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	2	S1	S2-3	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1-2	S1	S1	S1			
absence of toxic substances	t	2	S1	S2	S1			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3m	S4m	S2e,f ,m			

REMARKS Moisture availability rating for normal sites is 3, for water receiving sites is 1-2. Workability is not taken into consideration (see report P95)

POTENTIAL LAND SUITABILITY								
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Table 4

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED East of Gaborone

sheet: Gaborone date: 18/1/88

agro-climatic zone: Gaborone

mapping unit: A4b

author: J. Huesken

site characteristics: alluvial terrace

remarks: FAO : Calcic Cambisol
 ST : Typic Ustrochrept
 in association with A1 and A30

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	2	S2	S2	S2			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	6	N2	N2	S4			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	2	S1	S2	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	2	S1	S2	S1			
workability	w	2	S2	S2	S2			
adequacy of topography	^x _I ^x _{II} ^x _{II}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S4m			

RECOMMENDED IMPROVEMENTS

POTENTIAL LAND SUITABILITY								
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Table 5

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, valley floors Peleng River

sheet: Gaborone date: 18/1/88

agro-climatic zone: Gaborone

mapping unit: A6

author: J. Huesken

site characteristics: poorly drained parts of valley floor

remarks: FAO : Solodic Planasol
ST : Typic Haplaqualf
in association with A7

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	Maize	Douch os S1	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	5	N2	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	3	S2	S4	S2			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	3	S3	S4	S3			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S3f, m t			

RECOMMENDED IMPROVEMENTS

POTENTIAL LAND SUITABILITY								
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Table 6

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, valley floors south of Gabs sheet: Gaborone date: 19/8/88

agro-climatic zone: Gaborone

mapping unit: A7

author: J. Huesken

site characteristics: marginally drained parts of valley floors

remarks: FAO : Gleyic Luvisol, partly sodic
 ST : Aquic Haplustalf
 in association with A9 & A11

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	Maize	Douch	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	3	S3	S4	S2			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	3	S2	S4	S2			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	4	S4	N2	S3			
workability	w	4	S4	S4	S4			
adequacy of topography	XI XII XII	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4t	N2t	S3f,t			

REMARKS Moisture availability rating is given for water receiving sites
 Workability is not taken into consideration (see report P95)

POTENTIAL LAND SUITABILITY								
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Table 7

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, valley floors and lower footslopes

sheet: Gaborone date: 21/1/88

agro-climatic zone: Gaborone

mapping unit: A9

author: J. Huesken

site characteristics: Better drained parts of valley floors

remarks: FAO : Gleyic Luvisol, partly sodic
ST : Typic Haplustalf
in association with A11 or A7 or A34

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradiit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3-4	S3/S4	S4/N2	S2/S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	2	S1	S2-3	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	4	S4	S4	S3			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3fm/ S4n,t	S4mt/ N2m	S2/ S3t,m	- Valleys - Plain		

REMARKS Rating 3 is given for moisture availability in river valleys (see also Appendix B).

POTENTIAL LAND SUITABILITY								
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Table 8

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, valley floors, lower foot-slopes

sheet: Gaborone date: 21/1/88

agro-climatic zone: Gaborone

mapping unit: All

author: J. Huesken

site characteristics: higher parts association

remarks: FAO : Ferric Luvisol
ST : Oxic Paleustalf
in association with A7, A9 and A34 (South of Lobatse)

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch or S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	2	S2	S2	S2			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	XI XII XII	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3m	S4m	S2m			

REMARKS Moisture availability rating is given for river valley's and Lobatse Sub-Zone. See also Appendix B.

POTENTIAL LAND SUITABILITY								
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Table 9

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, East of Gaborone

sheet: Gaborone date: 22/11/88

agro-climatic zone: Gaborone

mapping unit: A30a

author: J. Huesken

site characteristics: lower and intermediate parts of association

remarks: FAO : Vertic Calcic Gleysol
ST : Vertic Haplaquept
in association with A1& A4b

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	Maize	Douch	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	1	S1	S1	S1			
oxygen availability	o	3-4	S3	S4	S3			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	3	S3	S3	S3			
workability	w	4	S4	S4	S4			
adequacy of topography	X _I X _{II} X _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3o, f, m			

REMARKS

POTENTIAL LAND SUITABILITY

Table 10

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANABOT/85/011

location: SED, valley floors Taung river

sheet: Gaborone date: 22/1/88

agro-climatic zone: Gaborone

mapping unit: A31a

author: J. Huesken

site characteristics: lower, poorly drained sites of valley floors

remarks: FAO : Eutric Gleysol (partly sodic)
ST : Typic Haplaquept
in association with A4

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize		Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	3-4	S3	S4	S3			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1-2	S1	S1	S1			
workability	w	3	S3	S3	S3			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3f,m,o	S4m,o	S3f,o			

REMARKS Workability has not been considered, see report Pg5.

POTENTIAL LAND SUITABILITY								
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Table 11

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, valley floors in undulating rolling areas sheet: Gaborone date: 19/8/88

agro-climatic zone: Gaborone

mapping unit: A34

author: J. Huesken

site characteristics: shallow to moderately deep soils, stony to very stony

remarks: FAO : Eutric Regosol, shallow

ST : Lithic Ustorthent

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch OS S1	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S1			
absence of damaging floods	f	3	S3	S3	S3			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S2			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	3	S3	S3	S3			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	3	S3	S3	S3			
adequacy of topography	x-I x-II x-III	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m, f w			

REMARKS

POTENTIAL LAND SUITABILITY

Table 12

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, East of Notwane Siding

sheet: Gaborone date: 24/8/88

agro-climatic zone: Gaborone

mapping unit: A7

author: J. Huesken

site characteristics: marginally drained parts of valley floors

remarks: single large mapping unit
 FAO : Chromic Luvisol
 ST : Ultic Haplustalf

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradiit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3m	S4m	S2m, n e			

REMARKS

POTENTIAL LAND SUITABILITY

Table 13

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, East of Gaborone

sheet: Gaborone date: 19/8/88

agro-climatic zone: Gaborone

mapping unit: B11

author: J. Huesken

site characteristics:

remarks: FAO : Ferric Luvisol
ST : Oxic Paleysoil
(former B3a unit)

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	2	S2	S2	S2			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{II}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m			

REMARKS Moisture availability rating is given for water receiving sites
Workability is not taken into consideration (see report P95)

POTENTIAL LAND SUITABILITY								
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Table 14

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, undulating terrain

sheet: Gaborone date: 24/1/88

agro-climatic zone: Gaborone

mapping unit: Dla

author: J. Huesken

site characteristics: shallow soils
in undulating terrainremarks: FAO : Eutric Regosol
petri, partly lithic
ST : Lithic Ustorthent
complex with R,D7D7d

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch OS	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damag- ing floods	f	1	S1	S1	S1			
conditions of germination	g	2	S2	S2	S2			
moisture availability	m	5-6	N2	N2	S4			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	3	S3	S3	S3			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	4	S4	S4	S4			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S4m,w			

REMARKS

POTENTIAL LAND SUITABILITY								
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Table 15

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, on steeper slopes

sheet: Gaborone date: 25/2/88

agro-climatic zone: Gaborone

mapping unit: D2

author: J. Huesken

site characteristics: on steeper slopes in dolomitic rocks

remarks: FAO : Ferric Luvisol
petric or partly
petroferric
ST : Oxic Haplastalf
Associated with D10

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	2	S2	S2	S2			
moisture availability	m	6	N2	N2	S4			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S4m			

REMARKS

POTENTIAL LAND SUITABILITY

Table 16

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, undulating terrain

sheet: Gaborone date: 25/1/88

agro-climatic zone: Gaborone

mapping unit: D2a

author: J. Huesken

site characteristics: on steeper slopes on shales

remarks: FAO : Ferric Luvisol
 petric or petroferric phase
 ST : Oxic Haplustalf
 in association with D10

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	2	S2	S2	S2			
moisture availability	m	5-6	N2	N2	S4			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	3	S3	S3	S3			
adequacy of topography	X _I X _{II} X _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S4m			

REMARKS

POTENTIAL LAND SUITABILITY								
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Table 17

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, lower slopes

sheet: Gaborone date: 19/8/88

agro-climatic zone: Gaborone

mapping unit: D7

author: J. Huesken

site characteristics: lower slopes

remarks: FAO : Ferric Luvisol
 partly petric or petroferric phase
 ST : Oxic Paleustalf
 in association with D1a and D7a soil is massive

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	Maize	Douch OS S1	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	2	S2	S2	S2			
moisture availability	m	3-4	S3/S4	N2/S4	S3/S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	X _I X _{II} X _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m/ S3m	N2/ S4m	S3/S2 e.g,m n		Gaborone Lobatse	

REMARKS: Moisture availability rating 3 in Lobatse sub-zone 4 in Gaborone sub-zone

POTENTIAL LAND SUITABILITY								
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Table 18

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED

sheet: Gaborone date: 26/1/88

agro-climatic zone: Gaborone

mapping unit: D7d

author: J. Huesken

site characteristics: lower pediment slopes

remarks: FAO : Ferric Luvisol,
partly petric or petroferric
ST : Oxic Paleustalf
in association with D7

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damag- ing floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m			

REMARKS Moisture availability rating is given for water receiving sites
Workability is not taken into consideration (see report P95)

POTENTIAL LAND SUITABILITY

Table 19

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED

sheet: Gaborone date: 25/1/88

agro-climatic zone: Gaborone

mapping unit: D7a

author: J. Huesken

site characteristics: lower pediment slopes in Marcs

remarks: FAO : Orthic Luvisol
ST : Typic Haplustalf

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	3	S3	S3	S3			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	2	S1	S2-3	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	3	S3	S3	S3			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3g,m			
REMARKS Workability not considered (see report Pg 5)								
POTENTIAL LAND SUITABILITY								

Table 20

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, west and south of Ramotswa

sheet: Gaborone date: 26/1/88

agro-climatic zone: Gaborone

mapping unit: D9

author: J. Huesken

site characteristics: lower footslopes,
transitional to alluvial depositsremarks: FAO : Calcic Luvisol
ST : Typic Paleustalf
Minor unit

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	Maize	Douch os	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damag- ing floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	2	S1	S2	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	XI XII XIII	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m			

REMARKS Moisture availability rating is given for water receiving sites
Workability is not taken into consideration (see report P95)

POTENTIAL LAND SUITABILITY								
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Table 21

LAND SUITABILITY CLASSIFICATION SHEET SOIL SURVEY BOTSWANA BOT/85/011
 location: SED, between Ramotswa and Lobatse sheet: Gaborone date: 26/1/88
 agro-climatic zone: Gaborone mapping unit: D10
 author: J. Huesken site characteristics: Footslopes in Dolomite
 remarks: FAO : Ferric Luvisol
 ST : Oxic Paleustalf

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch OS S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3-4	S3/S4	S4/N2	S2-3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3m/ S4m	S4m/ N2m	S2/ S3m		Lobatse Gaborone	
REMARKS	Moisture availability rating 3 in Lobatse Sub-zone 4 in Gaborone sub-zone							
POTENTIAL LAND SUITABILITY								

Table 22

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, around Lobatse & Gaborone

sheet: Gaborone date: 28/1/88

agro-climatic zone: Gaborone

mapping unit: G1a

author: J. Huesken

site characteristics: shallow soils on undulating to rolling terrain

remarks: FAO : Eutric Regosol, lithic phase
ST : Lithic Ustorthent often in complex with G1c/G2d or R

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch OS S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	4	S4	S4	S4			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	6	N2	N2	S4			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	3	S3	S3	S3			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	3	S3	S3	S3			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S4m			
REMARKS								
POTENTIAL LAND SUITABILITY								

Table 23

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED around Lobatse and Gaborone

sheet: Gaborone date: 28/1/88

agro-climatic zone: Gaborone

mapping unit: G1c

author: J. Huesken

site characteristics: stony shallow soils on undulating to rolling terrain

remarks: FAO : Eutric Regosol,
shallow petric
ST : Lithic Ustorthent
always in complex with G1c

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	Maize	Douch	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4-5	S4/N2	N2	S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m/ N2m	N2m	S3e		Lobatse Gaborone	
REMARKS	See Appendix B.							
POTENTIAL LAND SUITABILITY								

Table 24

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED, around Hildavale

sheet: Gaborone date: 28/1/88

agro-climatic zone: Gaborone

mapping unit: G1d

author: J. Huesken

site characteristics:

remarks: FAO : Ferric Luvisol
ST : Oxic Paleystalf
(former B3a unit)

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch or S1	Sorg.	crop Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4-5	S4/N2	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	4	S4	S4	S4			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m,t/ N2m	N2m	S4t	----- Lobatse ----- Gaborone		

REMARKS See Appendix B.

POTENTIAL LAND SUITABILITY								
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Table 25

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED

sheet: Gaborone date: 29/1/88

agro-climatic zone: Gaborone

mapping unit: G2d

author: J. Huesken

site characteristics:

remarks: FAO : Ferric Luvisol,
petric or petroferric
ST : Oxidic Paleysoils
in complex with G1a and G1c and/or G1d

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	Maize	Douch	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	5	N2	N2	S3			
nutrient availability	n	2	S1	S2	S1			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	X _I X _{II} X _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S3e,m			

REMARKS See Appendix B.

POTENTIAL LAND SUITABILITY								
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Table 26

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED East of Kgomokasitwa

sheet: Gaborone date: 29/1/88

agro-climatic zone: Gaborone

mapping unit: G2f

author: J. Huesken

site characteristics:

remarks: FAO : Ferric Luvisol,
petric or petroferric phase
ST : Oxic Paleustalf
West of Hildavale in complex with G1d-1a

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	3	S3	S3	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	5	N2	N2	S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	2	S2	S2	S2			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	2	S2	S2	S2			
adequacy of topography	x _I x _{II} x _{II}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			N2m	N2m	S3e,m			

REMARKS

POTENTIAL LAND SUITABILITY								
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Table 27

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: Northern Part of SED

sheet: Gaborone date: 28/1/88

agro-climatic zone: Gaborone

mapping unit: G6a

author: J. Huesken

site characteristics:

remarks: FAO : Ferric Luvisol,
partly petroferric phase
ST : Oxic Paleustalf

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig. improved traditional dryland farming			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	crop Maize	Douch os S1	crop Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S1			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	1	S1	S1	S3			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	3	S3	S4	S2			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-				
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S3m	S4m	S2m,m			

REMARKS See Appendix B.

POTENTIAL LAND SUITABILITY

Table 28

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED Otse Hill

sheet: Gaborone date: 06/2/88

agro-climatic zone: Gaborone

mapping unit: S10

author: J. Huesken

site characteristics:

remarks: FAO : Arenic Ferric Luvisol
ST : Oxic Paleustalf

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig.			LAND USE TYPE: tradit molapo		LAND USE TYPE:
			Sorg	Maize	Douch	Sorg.	Maize	
accessibility	a	1	S1	S1	S1			
correct temp. regime	c	2	S2	S2	S2			
soil drainability	d	N/A	-	-	-			
resistance to erosion	e	2	S2	S2	S2			
absence of damaging floods	f	1	S1	S1	S1			
conditions of germination	g	1	S1	S1	S1			
moisture availability	m	4	S4	N2	S3			
nutrient availability	n	3	S2	S3	S2			
oxygen availability	o	1	S1	S1	S1			
absence of pests	p	1	S1	S1	S1			
availability of water of good quality	q	N/A	-	-	-			
foothold for roots	r	1	S1	S1	S1			
absence of toxic substances	t	1	S1	S1	S1			
workability	w	1	S1	S1	S1			
adequacy of topography	x _I x _{II} x _{III}	N/A	-	-	-			
adequacy of flooding	y	N/A	-	-	-			
land drainability	z	N/A	-	-	-			
CURRENT LAND SUITABILITY			S4m	N2m	S3m			

RECOMMENDED IMPROVEMENTS

POTENTIAL LAND SUITABILITY								
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Table 29

LAND SUITABILITY CLASSIFICATION SHEET

SOIL SURVEY BOTSWANA BOT/85/011

location: SED

sheet: Gaborone date: 6/2/88

agro-climatic zone: Gaborone

mapping unit: R

author: J. Huesken

site characteristics: Very shallow soils on steep ridges and escarpments

remarks: Not suitable for any kind of arable farming.

LAND QUALITY	CDE	RTNG	LAND USE TYPE: large sc. irrig.			LAND USE TYPE: tradic molapo		LAND USE TYPE:
			Sorg	Maize	Douch os	Sorg.	Maize	
accessibility	a							
correct temp. regime	c							
soil drainability	d							
resistance to erosion	e							
absence of damaging floods	f							
conditions of germination	g							
moisture availability	m			N				
nutrient availability	n							
oxygen availability	o							
absence of pests	p							
availability of water of good quality	q							
foothold for roots	r							
absence of toxic substances	t							
workability	w							
adequacy of topography	X _I X _{II} X _{III}							
adequacy of flooding	y							
land drainability	z							
CURRENT LAND SUITABILITY								

REMARKS

POTENTIAL LAND SUITABILITY

APPENDIX 3 : CALCULATION OF MOISTURE AVAILABILITY RATING

CALCULATION OF MOISTURE AVAILABILITY RATING

	SOIL UNITS	AWHC	INFILT CORREC	CLIMATIC ZONE			TEXT CORREC	FINAL RATING
				NORM	W. REC	W. SHED		
A1	Pellic Vertisol, clay > 60%	1	3		2-3		4-5	
A4	Calcaric Cambisol, (f)SL-SC (silty clay)	2	3	3	1-2		3(1-2)	
A4b	Calcic Cambisol CL-C	2	3	4			6	
A6	Solodic Planasol LS-SL Over	5	5	5			5	
A7	Gleyic Luvisol SCL-C<60%	2	3	4	2-3		3	
A9	Calcic Luvisol SCL-C<60%	2	3	4	2-3		3-4*	
A11	Ferric Luvisol SL-SC	2-3	3-4	4	2-3		3-4*	
A13a	Chromic Luvisol SCL-SC	2	3	4			4	
A30a	Vertic Calcic Gleysol SC-C<60%	2	3	4			4	
A31a	Eutric Gleysol SCL-SC<60%	2	3		2-3		3	
A34	Eutric Regosol LS-SL	3-4	4-5		2-3		3	
					3-4		4	

8 * Remarks

- A1 Unit East of Gaborone (A1-4b-30a) has been given rating 5, while A1 in south of SED has been rated 4 since the latter can be considered as more water receiving and better sub zone.
- A4 If normal site rating 3, If water-receiving site rating 1-2
- A9 Rating 4 given for plains next to Ramotswa River Valleys are rated 3
- A11 Rating 4 given for plain south east of Lobatse, rating 3 for river valley's and in Lobatse Sub-Zone.

CALCULATION OF MOISTURE AVAILABILITY RATING

	SOIL UNITS	AWHC	INFILTRAT	CLIMATIC ZONE		TEXT CORREC	FINAL RATING
				NORM	W.REC		
B							
B11	Ferric Luvisol SCL-SC	2	3	4		--	4
D1a	Eutric Regosol SL-CL	3-4	4-5		5-6	--	5-6*
D2	Ferric Luvisol. Petric, part petro ferric SL	4	5		6	--	6
D2a	Ferric Luvisol Petric, part petro ferric C	3	4		5	(6)	5-(6)*
D7	Ferric Luvisol petric, part petro ferric SL-C	2	2-3	3-4		--	3-4*
D7a	Orthic Luvisol, part petroferric massive SC-C	2	3	4		--	4
D7d	Ferric Luvisol, petric/ petroferric massive SC-C	2	3	4		--	4
D9	Calcic Luvisol, SCL-SC	2	3	4		--	4
D10	Ferric Luvisol, SL-SCL	2	2-3	3-4		--	3-4*

* Remarks

- D1a For S class it is not important whether 5 or 6 is given (only for Dolichos). Soil is N2 for arable farming.
- D2a Whether or not texture correction, soil is not suitable
- D7 Rating 3 in Lobatse sub-zone, rating 4 in Gaborone sub-zone
- D10 See D7

CALCULATION OF MOISTURE AVAILABILITY RATING

SOIL UNIT	AWHC	INFILTRAT CORRECT.	CLIMATIC ZONE			TEXT CORREC	FINAL RATING
			NORM.	W. REC	W. SHED		
G1a Eutric Regosol Lithic S-S	5	5			6	6	
G1c Eutric Regosol Shallow Petric S-S-L	4	4	4		5	4-5*	
G1d Calcaric Regosol Shallow Petric S-S-L	4	4	4		5	4-5*	
G2d Ferric Luvisol petric or petro ferric SL-SCL	3	3			5	5	
G2f Ferric Luvisol Petric or Petroferric SC-C	2-3	3-4			5	5	
G10c Ferric Luvisol partly petroferric SL-SCL	2	2	3			3	
S10 Arenic Ferric Luvisol Lfs-SL	3	3	4			4	

* Remarks:

- G1c Topography is almost Flat to rolling. Less steeper sites can be rated as 4. Steeper is water shedding, rated 5. In Lobatse sub-zone on less steeper parts, these soils might be very marginally suitable.
- G1d See G1c, also toxic component
- G10c In general average clay percentage 718%, topsoil is coarse textured, therefore no infiltration correction.
- S10 May be changed to d5a or D11 in final report.

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