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**AN ASSESSMENT OF THE IRRIGATION SUITABILITY
OF THE SOILS OF MIA MOJA AND MATANYA FARMS
(LAIKIPIA DISTRICT)**

by
F. M. Shitakha

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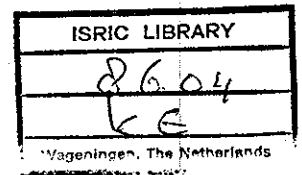
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1 INTRODUCTION

Following a request from the Provincial Irrigation Unit, Rift Valley Province, soil investigations were carried out on Mia Moja and Matanya farms in Laikipia District. The purpose of the soils study was to assess the irrigation suitability of the soils on both farms. A quick soil survey, indicating major soil patterns and with emphasis on drainage, soil depth, texture and sodicity/salinity, would give ample information on which decisions for irrigation development could be based.

A field trip was made in the first week of December, 1985. Fieldwork was executed in collaboration with Messrs. P.Mainga and B. Ita.

2 THE ENVIRONMENT

2.1 Location

Mia Moja Farm

This farm is situated approximately 2km south-west of Timau on the Nanyuki - Timau road in Laikipia District. The farm has long times been under irrigation with water from Kitaloswani river. The scheme covers approximately 400 ha. The coordinates are $0^{\circ}10'N$ and $37^{\circ}13'E$. The altitude is approximately 2100 m a.s.l.

Matanya

Matanya Estate is approximately 30km south-west of Nanyuki town in Laikipia District. Approximately 500 ha are earmarked for irrigation. The coordinates are $0^{\circ}90'S$ and $36^{\circ}74'E$. The altitude is approximately 1860 m a.s.l.

2.2 Climate

The nearest and the most representative meteorological station is Nanyuki Railway Station (EAMD No. 89.37/022), which has over 30 years of rainfall and temperature records and over 10 years of evaporation records. The station is situated 15 km to the north-east of Mia Moja farm and 30 km to the south-west of Matanya estate.

The rainfall pattern is unimodal, with the highest peak in April though with some fluctuations during the low rainfall season. March-May may be considered as wet months; although by definition August-November excluding September may also be included in this category. Mean annual rainfall is in the order of 800 mm.

Mean temperatures are moderately high. The mean maximum and minimum temperatures are 23.5°C and 8.6°C respectively.

The mean annual evaporation (E_o) is about 1700 mm whereas potential evapotranspiration (E_t), estimated as $2/3 E_o$, is 1133 mm. It is clear that E_t which is equal to the crop water requirement is greater than rainfall in all the months except for the April-May and October, November periods.

Based on the rainfall and evaporation data, the r/E_o is 0.47, which places this area into Agro-climatic zone IV.

2.3 Geology and physiography

Mia Moja Farm

The soils of the area are primarily developed from fissile basalt (Shackleton, 1946).

Physiographically, the area consists of a flat-topped to gently undulating (slopes 1-3%) ridge/plateau between two rivers. The highest point is situated 140m above the valley bottom of the Kitaloswani river. Slopes are gradually increasing (varying between 3 and 10%) on either side of the ridge. The width is approximately one kilometer. Some depressions without an outflow are found on the central part of the ridge; they are seasonally waterlogged.

Matanya Estate

The geology of this area and its surroundings consist of volcanic rocks, mainly basaltic lavas from which are derived the black soils of the Laikipia plains.

The area lies in the volcanic plateaus with relief varying from very gently undulating to gently undulating (slopes 0-3%). The valleys have slopes of 3-5%.

2.4 Water supply and quality

Mia Moja Farm

Water from the perennial Kitaloswani river has for a long time been used for irrigating Mia Moja farm. There are no data on flow measurements. An analysis of a water sample collected during the fieldwork indicates low salinity and low sodium hazard according to the U.S. Salinity Laboratory Standards (Richards et al., 1954). Analytical data of the water sample can be found in table 1.

Matanya Estate

Water for this scheme will be drawn from the perennial Burguret river. No discharge figures are available. The water quality is good as shown in table 1.

Table 1. Analytical data of two river water samples

River	Kitaloswani	Burguret
pH	6.6	6.4
Electr. conduct (micromhos/cm)	80	45
Na ⁺ (me/l)	0.43	0.26
K ⁺ "	0.07	0.05
Ca ⁺⁺ ""	0.20	0.10
Mg ⁺⁺ "	0.10	0.10
CO ₃ ⁻ "	nil	nil
HCO ₃ ⁻ "	0.70	0.40
Cl ⁻ "	0.20	0.15
SO ₄ ⁻ "	nil	0.01
SAR	1.57	1.16

3 THE SOILS

3.1 Working methods

No previous soils information of the two sites at a reasonable detail was available.

Water from the Kitali Swani

Soil data was collected through augerings which were made to a depth of 1.2m (soil depth permitting). Soil texture, colour, depth and drainage were recorded. At all observation sites pH and electrical conductivity of a 1:2.5 soil/water extract were determined.

Aerial photographs at a scale of 1:50,000 and topographical maps at the same scale were used for discerning major landforms.

It should be pointed out that this type of soil survey does not allow for a systematic mapping of important soil characteristics. Only major soil patterns can be distinguished.

3.2 Description of the soils

Mia Moja Farm

The soils of this survey area are quite homogenous. They are deep and the texture is uniformly clay. The colours are dark red (2.5 YR 3/6) to strong brown (7.5 YR 5/6) and they are well drained. The topsoils are moderately acid to strongly acid (pH 5.5 - 6.0). The electrical conductivity of a 1:2.5 soil/water extract is very low in the topsoil. Values of less than 0.2 mmhos/cm are recorded. The topsoils are non-saline and non-sodic. The subsoils are moderately acidic with pH ranges between 5.0 and 5.6. The deeper horizons have an electrical conductivity of less than 0.2 mmhos/cm and hence are free from soluble salts.

Soils in the depressions are deep, dark greyish brown (5 YR 3/3), imperfectly drained, firm clays. The pH of the topsoil ranges between 4.5 and 5.1 and the electrical conductivity of the subsoil is about the same as that of the topsoil.

Matanya Estate

The soils of this farm are deep, dark yellowish brown to very dark greyish brown (10 YR 3/4 - 10YR 3/2), friable clay. They are well drained. The soils contain calcium carbonate concretions and soft powdery lime as is evident with HCl reaction.

The pH of the topsoil ranges between 6.0 and 7.1 and the electrical conductivity is below 0.2 mmhos/cm. The subsoil has about the same pH and electrical conductivity as the topsoil.

3.3 Soil fertility

Composite topsoil (0-30 cm) samples were taken from the two survey areas for fertility analysis. The appraisal should be considered a general one due to the limited number of samples analysed. The analytical data on the available nutrients are presented in table 2.

The soils of Mia Moja show a soil reaction that varies from slightly acid (6.0-6.4 pH) to slightly alkaline (7.0-7.4 pH). These soils are sufficiently supplied with basic plant nutrients such as calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), phosphorus (P), nitrogen (N) and manganese (Ma) except a low N- content in sample 8. This can be corrected by applying N-containing fertilizers.

The soils of Matanya are sufficiently supplied with basic plant nutrients except P and N deficiencies are notable in a few soils (samples nos 4 and 7). A low organic matter content of these same soils has been shown by the low % C determined. In view of this, it is recommended that P and N-containing fertilizers be applied to these soils to improve their status.

Table 2 Available nutrients (0-30 cm)

Area	Mia Moja Farm				Matanya Estate									
	7	8	9	14	1	2	3	4	5	7	9	9	10	
Observation No.	7	8	9	14	1	2	3	4	5	7	9	9	10	
Lab. No. .../85	10944	10945	10946	10947	10432	10933	10934	10935	10936	10937	10938	10939±	10940	
pH	7.4	6.2	6.0	7.4	6.9	6.7	7.1	6.7	6.6	6.7	6.9	6.9	7.0	
Na ⁺ (me/100g)	0.34	0.42	0.13	0.32	0.63	0.41	0.35	0.48	0.-0	0.17	0.37	0.24	0.60	
K ⁺ "	0.53	0.64	1.00	1.28	0.98	0.79	3.40	1.21	1.16	0.93	1.35	1.50	0.75	
Ca ⁺⁺ "	3.6	4.0	6.4	13.2	10.3	14.9	12.3	4.7	3.5	4.7	13.1	6.5	6.9	
Mg ⁺⁺ "	2.4	2.4	3.0	3.3	4.6	3.7	3.5	1.7	1.9	3.5	2.0	2.0	1.4	
Mn ⁺⁺ "	1.38	0.42	0.68	0.30	0.66	0.49	0.49	0.68	0.71	0.77	0.62	0.79	0.39	
P (ppm)	19	22	22	32	13	31	394	17	22	13	22	69	19	
N (%)	0.27	0.19	0.23	0.39	0.26	0.16	0.27	0.18	0.16	0.22	0.24	0.23	0.14	
C (%)	2.04	1.40	2.29	3.15	2.01	1.07	1.05	1.15	0.91	1.28	1.89	1.37	0.98	

4. SUITABILITY FOR SURFACE IRRIGATION

Table 3 gives the suitability for surface irrigation for the two schemes.

Table 3. Tentative land suitability for irrigated agriculture (surface irrigation) of the soils of Mia Moja and Matanya Farms.

Area	Suitability	Major Constraints
Mia Moja (flat to gently undulating)	Suitable	None
Mia Moja (undulating to rolling)	Marginally suitable	Slopes on either side of ridge
Matanya	Suitable	None

Mia Moja Farm does not have any soil constraints. However, the slopes on either side of the ridge make that part of the farm marginally suitable for surface irrigation.

The Matanya Farm does not have major soil constraints and is therefore assumed to be suitable for surface irrigation.

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