NO P 6

REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE—NATIONAL AGRICULTURAL LABORATORIES

KENYA SOIL SURVEY

REPORT OF A VISIT TO THE EXPERIMENTAL AREA OF THE ISHIARA IRRIGATION SCHEME.

By

H.M.H. Braun and N.N. Nyandat

Dec. 1972.

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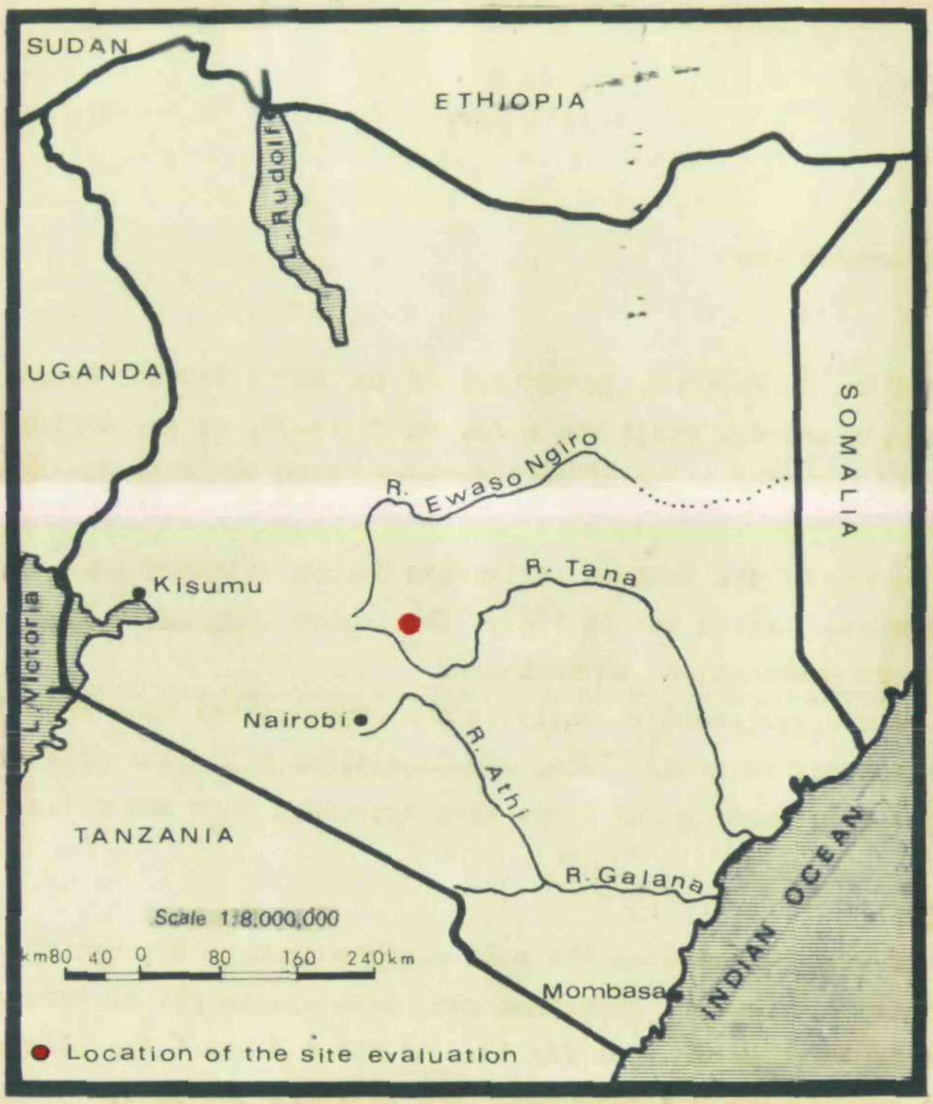
SUDAN
ETHIOPIA
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R. Athi
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R. Galana
INDIAN OCEAN
Scale 1:8,000,000
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Mombasa
Location of the site evaluation

Kenya Soil Survey Project
S113/I/JK/WGS - 12/1/73

Site Evaluation No. 6.

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CONTENTS:

INTRODUCTION:

At the request of Mr. E. Forsund, Agronomist of the Mbere Special Rural Development Programme, a one-day visit was made, on 28-11-72, to the Ishiara Irrigation Scheme, to investigate reported signs of soil deterioration possibly due to salinity and/or alkalinity.

A detailed soil survey of the Ishiara Irrigation Scheme situated 40Km East of Embu on road to Meru was carried out in 1969. The report (Oswaggo & Nyandat, 1970) includes some recommendations on drainage.

Problems have been experienced recently in the experimental area when due to high rainfall the soil got swamped. Under dry conditions salt-like cristals had been observed on the soil surface and fears were expressed that the soils had turned saline.

SALINITY/ALKALINITY:

No signs of salt were observed at the soil surface perhaps because the soil was in a moist condition. Several augerings were made and in all of them groundwater was found within 150cm depth (see fig 1). At sites 3 and 6 the electrical conductivity of the groundwater was measured. The readings obtained, 150 and 200 micromho respectively, indicate that the groundwater is non-saline. Electrical conductivity was also measured in two suspensions (1:5) of soil surface samples at site 3. The readings of 130 and 150 micromho indicate that the soil surface is non-saline. A pH value of 5.3 was found in these suspensions which suggests that the soils are also non-alkaline. At site 4 soil samples were collected for salinity/alkalinity analysis in the laboratory.

For further confirmation of the non-salinity/alkalinity of the soils it would be useful to perform some measurements in the dry season.

GROUNDWATER TABLE:

As indicated in fig 1 the depth of the groundwater table decreases from 150cm near the irrigation canal to 25cm. near the lower part of the experimental area.

In adjacent fields, belonging to private farmers, similar groundwater levels were observed. It is thought that over-irrigation and possibly also seepage from the main irrigation canal, combined with the absence of a drainage system have caused a gradual rise of the groundwater table which is believed to be deep under non-irrigation conditions. With abundant rainfall in October and November the ground water table has risen up to the soil surface.

SOIL PERMEABILITY.

In the augering holes made there was very little increase in the water level with time which indicates that the permeability of the soils is moderate. However it appears from the observed groundwater levels that the soils are not permeable enough enough to obtain an adequate natural drainage.

SOIL DEPTH:

In several augerings rock or rock fragments were reached at a depth of 190 cm. or more. At site 6 mottling and iron/manganese concretions were found at 100 cm depth which indicates that variations in groundwater level also occured under natural conditions in the recent or distant past.

CONCLUSIONS AND RECOMMENDATIONS:

From the field observations and measurements it appears that the soils are non-saline and non-alkaline. The major problem affecting the growth of plants seems to be the high water table which occurs after heavy rain (but which can also occur through over-irrigation). The installation of an artificial drainage system seems necessary to get rid of the excess water. Two alternative ways of lay-out and construction are suggested for drainage-experimental purposes:

(a) The installation of a sub-surface drain at a depth of at least 120cm in between the irrigation ditches. This drain should end in an open drain at the lower end of the experimental field to discharge the water in the natural gully (see fig. 2). As no tile drainage material or mole drainage equipment seems available, a temporary solution would be to dig a 30cm wide trench, fill the bottom with 30cm of twigs and put the soil back on top (see fig 4).

(b) The installation of an open drain. Because the irrigation ditches are only 20 to 30 m apart, such an open drain in-between the irrigation ditches would make the fields too narrow for mechanised cultivation. It is therefore suggested to transform one of the irrigation ditches into an open drain by digging it out till at least 120cm depth (as a consequence this drain cannot be used for irrigation any more).

This open drain should end in the gully (fig 3) and should have embarkments on both sides (fig 5).

With either method chosen some perforated groundwater standpipes (or auger holes) should be installed for regular checking and recording of groundwater levels. The suggested sites of the standpipes are indicted in figures 2 and 3. A possible seepage from the main irrigation canal could not be investigated because this canal was dry at the time of our visit. When the groundwater level in the standpipes near the main irrigation canal increases substantially after flow in the canal has resumed then the subsurface or open drain should have an extension parallel to the main irrigation canal (indicated with a dotted line in figs 2 and 3).

If the drainage trial described above proves successful then the system should be extended to the whole scheme.

REFERENCES:

Oswaggo, O. and Nyandat, N.N. (1970): "Soils of Ishiara Irrigation Scheme" Mimeogr. 29p + map; Ministry of Agriculture, Nairobi.

fig 1: Schematic section showing the depths of groundwater on 28/11/1972

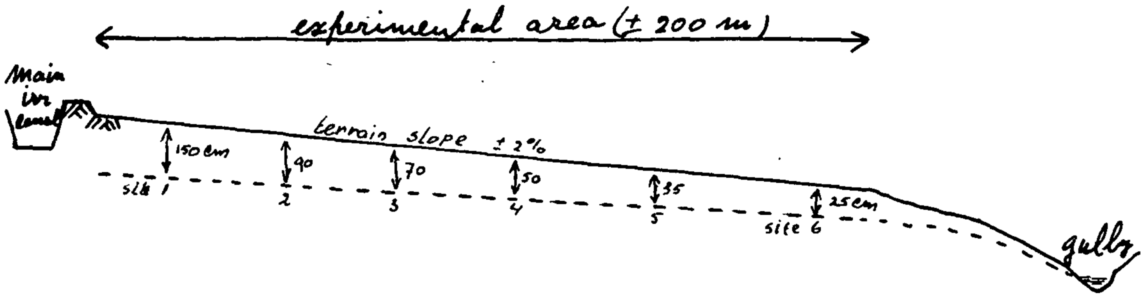

fig 2: Layout of sub-surface drain and groundwater standpipes (=o)

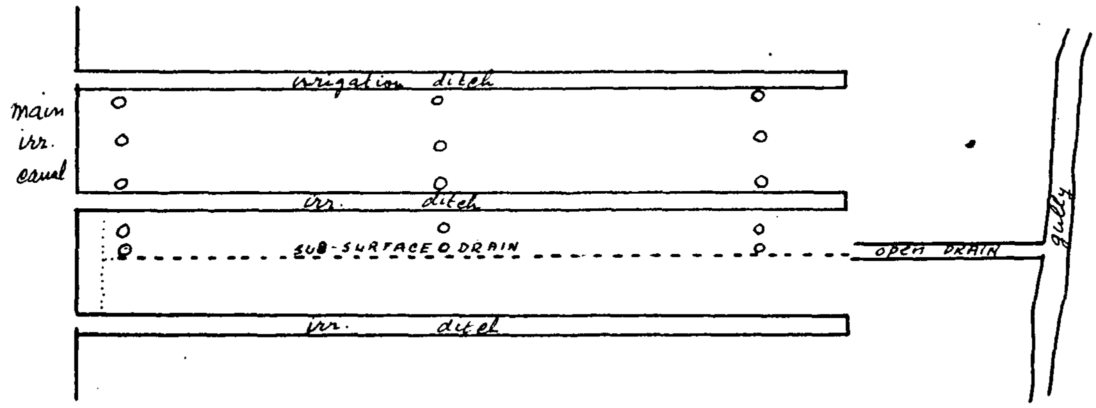

fig 3: Layout of open drain and groundwater standpipes (=o)

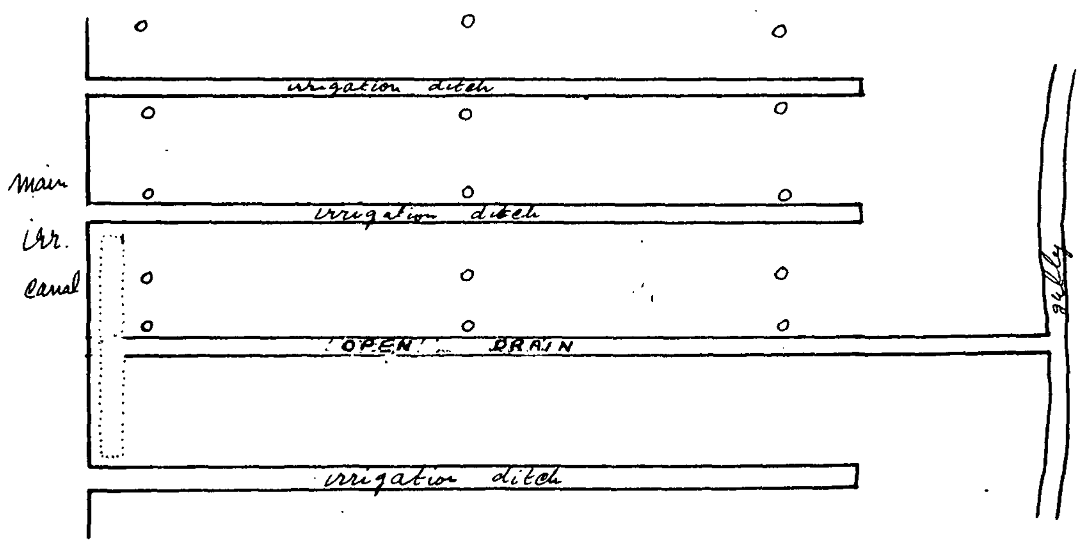

fig 4: Design of sub-surface drain

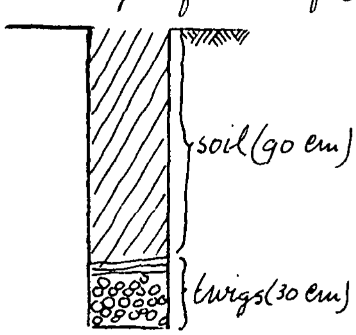

fig 5: Design of open drain