Moçambique

THE PROVISIONAL SOIL MAP OF MOÇAMBIQUE

by

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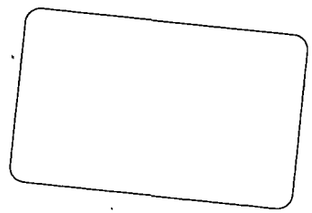

Abstract of the *Proceedings of the 2nd Inter-African Soils Conference,* [redacted] pages 1459 - 1468, document nº 115

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SUMMARY

The presentation of the Provisional Soil Map of Mozambique is introduced by a description and maps of the altitudinal zones, the geological and lithological constitution, the climatological regimes and the phyto-geographical regions.

The Provisional Soil Map (scale 1:2,000,000) is based on surveys carried out in different districts; catenary and non-catenary complexes were used as soil mapping units.

The legend of the map is briefly explained; some characteristic features of certain soils are pointed out or discussed.

A provisional classification of the soils of Mozambique, as yet based only on their morphology, is presented.

RÉSUMÉ

CARTE PROVISOIRE DES SOLS DU MOZAMBIQUE

La présentation d'une carte provisoire des sols du Mozambique est précédée par la description et des cartes hypsométriques, géologiques et des compositions lithologiques, des climats et des régions phytogéographiques.

La carte provisoire des sols (échelle 1/2.000.000) est basée sur des prospections effectuées dans différents districts et des complexes caténaires et non-caténaires furent utilisés comme unités cartographiques.

La légende de la carte est expliquée et des caractéristiques de certains sols sont soulignées ou discutées.

Une classification des sols du Mozambique, basée encore provisoirement sur la composition lithologique, est présentée.

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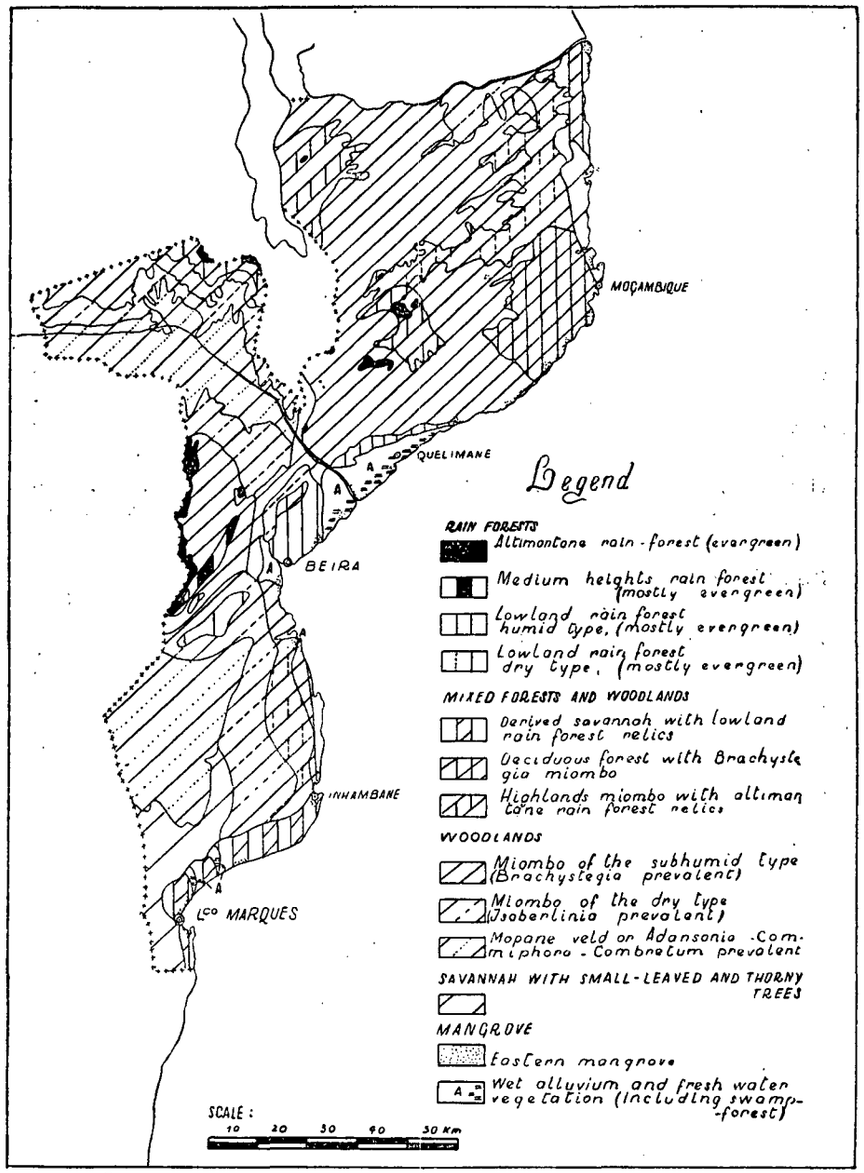

Fig 4 A VEGETATION SKETCH OF MOÇAMBIQUE
ACCORDING TO THE SYSTEM PROPOSED BY THE A.E.F.A.T FOR THE RE-MAPPING OF THE MAJOR VEGETATION REGIONS OF AFRICA BY J.GOMES PEDRO AND L.A.GRANDVAUX BARBOSA

sandy soils of the coastal belt, by dots; the alluvial soils, by green and the halomorphic soils by violet.

The following classification of the soils of Mozambique, already described (9), with some modifications, is still in its provisional stage, since it was based only on the morphology of the soils.

A. — Leached soils (Pedalfers)

1. Red ferralitic soils, without or with iron concretions (laterite may occur).
2. Orange, pale-orange and yellow ferralitic soils, without or with iron concretions (laterite may occur).
3. Reddish brown, brown and yellowish brown ferralitic soils, without or with iron concretions (laterite may occur).
4. Grey ferralitic soils generally with iron concretions (laterite may occur).
5. Macondes soils.
6. Urrongas red soils.
7. Inhaminga soils.
8. Coastal sand belt soils.

B. — Non-leached soils (Pedocals)

1. Tropical black and grey earths.
2. Guijá grey soils.
3. Tropical chestnut soils.
4. Tropical brown, greyish brown and reddish brown soils.

C. — Calcimorphic soils

D. — Halomorphic soils

E. — Hydromorphic soils

1. Bog soils.
2. Machongos.
3. Vlei soils.
4. Dambos soils.
5. Bottom clays.

F. — Lithosols

G. — Regosols

H. — Alluvial soils

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The following five altitudinal zones (Fig. 1) can be considered in Mozambique (5) : *low zone*, from 0 to 200 m, occupying over 40 % of the area of Mozambique, with more or less smooth plains and gently undulating areas predominating; *subplanaltic and low planaltic zone*, with an elevation ranging from 200 to 500 m, comprising nearly 30 % of the total area, transitional to the following so-called plateau zones; *median planaltic zones*, elevation ranging from from 500 to 1000 m, undulating to moderately rolling country, covering about 1/4 of the territory; *high planaltic zone*, elevation ranging from 1000 to 1500 m, rolling to moderately steep, and; *mountainous zone*, hilly country, with heights above 1500 m. The two latter zones cover a very small area, 4 % and 0.2 %, respectively.

The land surface rises up from the Indian Ocean to the mountains, on the border, through the above mentioned zones. The rising is gradual save for some exceptions, and specially near the Chimanimani hills where the Great Manica Escarpment occurs.

The planaltic zones correspond mainly to the granitic-gneis -sic basement and constitute a more or less dissected peneplain, with a gently undulating to rolling topography, *inselbergs* emerging as relics of the old relief.

An account of the lithological constitution of the Province is given in Fig. 2.

Patches of primitive systems are scattered through the granitic-gneissic part of the country; its main rocks are crystalline limestones, gneisses, quartzites, mica schists and a variety of schists.

Granites and gneisses, the mineral composition of which varies considerably, cover about 2/3 of the area of Mozambique.

Under volcanic rocks Stormberg basalts are mainly considered, but other eruptive rocks occur as well, such as for instance, rhyolites.

Within non-calcareous sedimentary rocks, sands, clays, alluvia, shales, and wide a variety of sandstones, are included.

The annual average precipitation is shown in Fig. 3 (1).

Three zones with different meteorological regimes can be found in Mozambique : the Northern Zone, with a monsoonal type, the rains falling with the NE monsoon; the Southern Zone, with an anti-cyclonic regime and depressions of intermediate latitudes, tropical type, the rains falling on the passage of the depressions; and a Central Zone, where the two above mentioned overlap, the rains showing a maximum which can be explained by the association of the monsoon and cyclonic rains.

The mean annual rainfall ranges from 272.2 mm (Pafúri) to 2,125.1 mm (Muobede).

Along the year there are two well defined periods : the wet season, from November or December to March or April, and the dry season from April or May to October or November; April is the transition month from the rainy to the dry period, and October or November the transition from the dry to the wet season.

Almost all the rain, from 78 % to 99 % of the annual total, according to regions, falls during the wet period, the dry season being practically rainless.

Frequency indices show a very high rainfall intensity.

The average annual temperature is always very high. July is the month of lowest mean temperature (15.3°C in Vila Cabral, 24.1°C in Nacala). The highest average temperatures coincide with the rainy months, the warmest being : October in the Tete district (22.7 to 30.9°C); November or December in Niassa, Zambézia and Beira district (20.8 to 29.9°C); and January or February in the Sul do Save (23.1 to 28.9°C).

According to the Thornthwaite classification nine types of climate are represented in Mozambique, varying from arid, tropical, rain defficient all year round (EA'd) to humid, mesothermal, and humid, tropical, both with winter rain defficiency (BA'w and BB'w).

General vegetation is shown in Fig. 4, sketched by J. G. Pedro and L. A. Grandvaux Barbosa, according to the system proposed by the *Association pour l'Étude Taxonomique de la Flore de l'Afrique Tropical* for the re-mapping of the major vegetation regions of Africa.

The Provisional Soil Map of Mozambique in the Scale 1:2.000.000, now presented, is based on the surveys carried out in the Sul do Save, Niassa, Zambézia, Tete and Beira districts, at the scale of 1:1.000.000 (2, 6, 7, 8 and 11).

A Preliminary Soil Map, at the scale of 1:4.000.000, was shown at the Fourth International Congress of Soil Science, in Amsterdam (9).

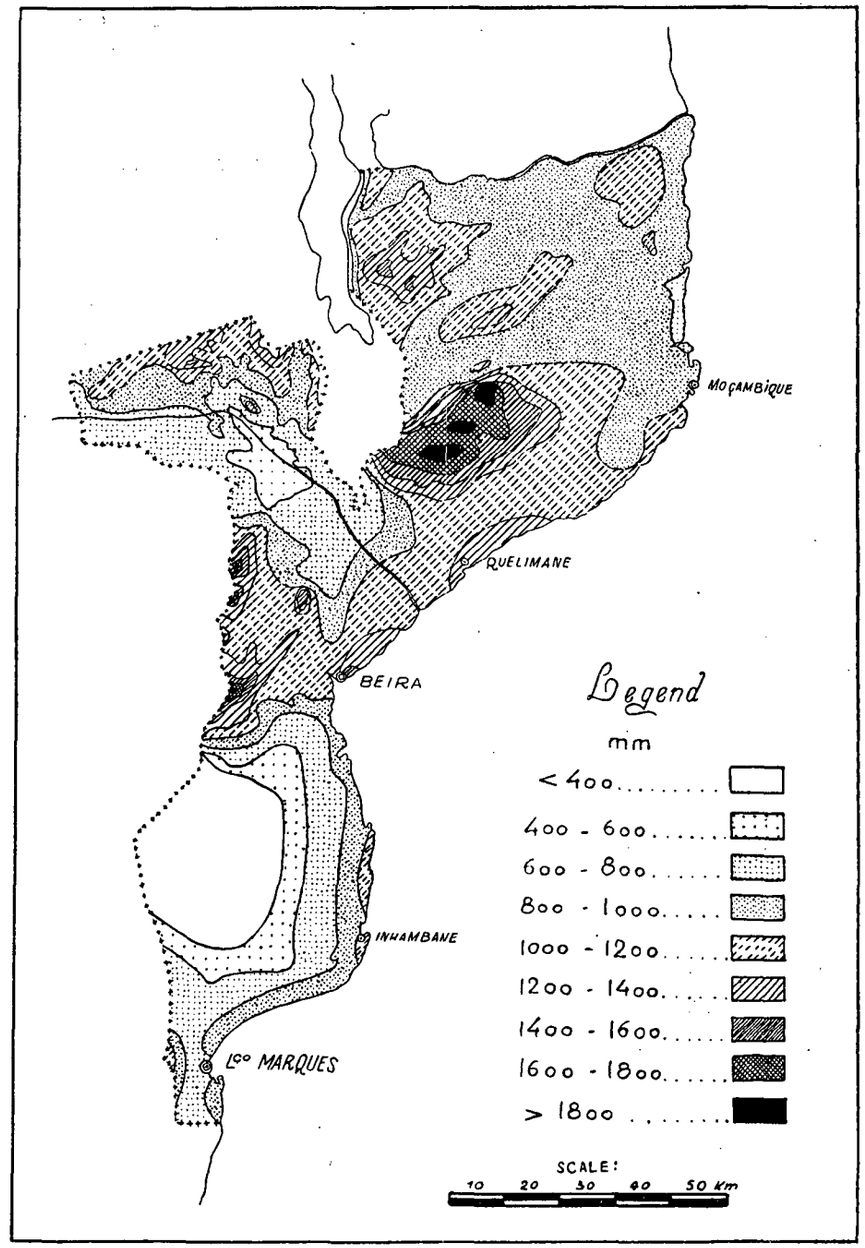

Fig 3. RAINFALL OF MOÇAMBIQUE
(AZEVEDO, 1)

The pedocalic soils of Mozambique occur, as a rule, in the areas of the non-catenary complexes, with low rainfall (less than 800 mm per annum), over parent materials derived from calcareous or lime rich sedimentary rocks, and under a predominant vegetation of *Acacia - Dalbergia - Spirostachys - Milletia - Combretum - Commiphora* deciduous, sometimes shrubby savannahs or yet *Acacia - Lonchocarpus - Sclerocarya - Setaria - Andropogon* savannahs with thorny deciduous shrubs of *Dichrostachys - Albizzia - Acacia - Commiphora* (12).

They are sometimes associated with other soils, namely the Guijá grey soils in the Guijá and Maxaíla complexes, the brown and reddish brown soils in the Maxaíla, Alto Limpopo and Chemba complexes, the black earths and brown soils in the Lower Shire complex. Sometimes they predominate in certain areas : the black earths near Quissanga and Porto Amelia, and the chestnut soils in Lúrio.

The non-ferralitic soils are, as a rule, shown in the map by the vertical hachurings.

The soils derived from non-calcareous sedimentary rocks are generally sandy in texture, namely the Macondes soils, the Inhaminga soils, the regosols of Machaze and Maxaíla, the coastal belt soils and others.

Calcareous sedimentary rocks give birth either to pedocalic or calcimorphic soils. Red ferralitic soils are however found over the crystalline limestones of the primitive systems (Corrane, Namapa, Balama, Chiure, etc.).

Over basaltic rocks, in well drained areas of humid regions such as Namialo-Metocheria, Naguema, Muchelia, Boila, Namaacha, etc., are found red soils associated with very dark grey soils (in bottom lands), both ferralitic with low to high amounts of iron concretions.

Red and black clays in catenary association are developed in the semi-arid regions of Moamba and Baixo Mossurize, over Stormberg basalts. Red and black clays, as a rule, show no iron concretions; lime nodules generally occur in the black clays.

The brown soils of semi-arid regions of Tete, Chemba and Alto Limpopo show lime concretions in the lower horizons. This is also true speaking of the brown soils of Lower Shire, but as one gets close to the granitic-gneissic areas, still under the same climate and similar landscape, brown soils occur with similar features but in which no lime concretions are seen. These brown soils are provisionally named non-calcareous brown soils (6).

In the Provisional Soil Map the hydromorphic soils are represented by blue coloured lines, exception being made as to the catenary grey soils and bog soils of Chimanimani, shown by grey and violaceous lines, respectively; the lithosols, by interrupted lines; the

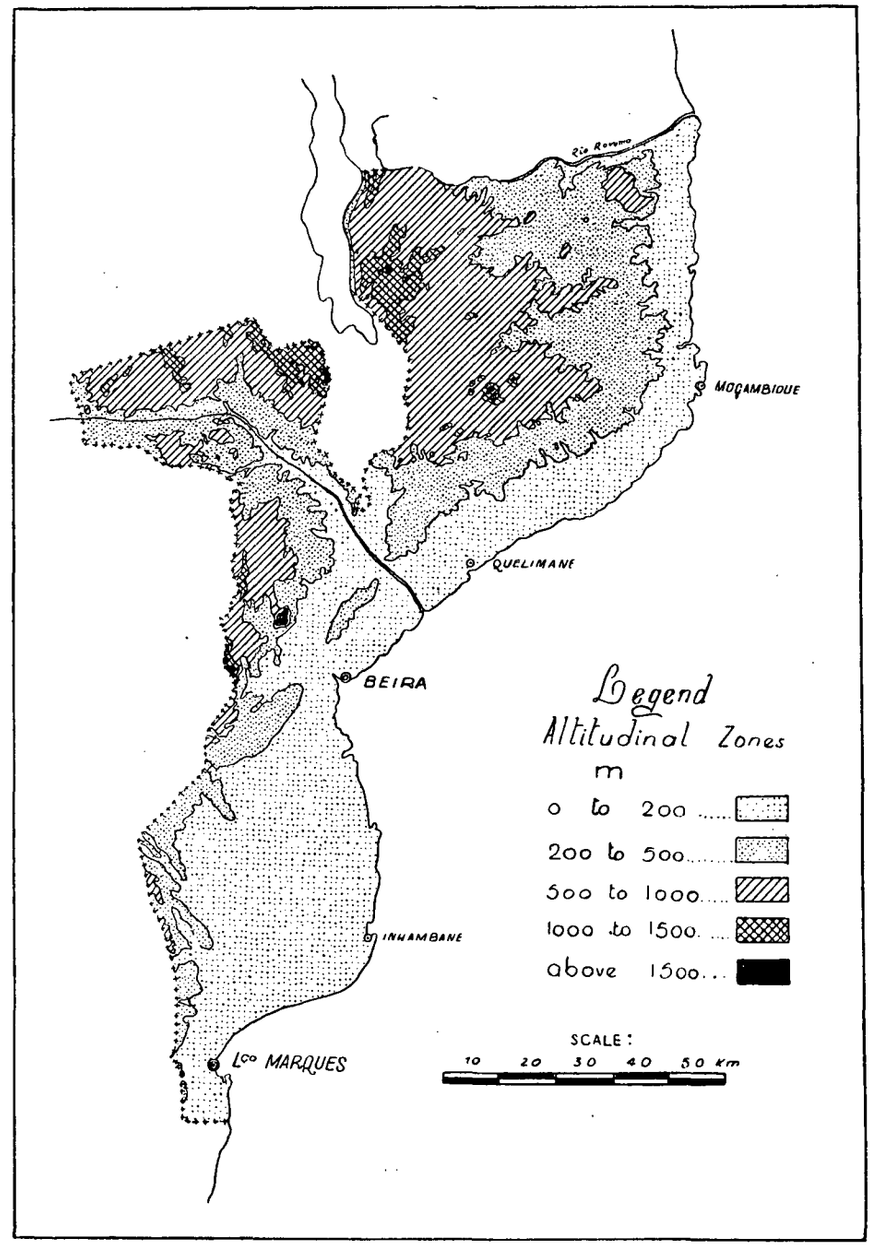

Fig 1. ALTITUDINAL ZONES OF MOÇAMBIQUE

Catenary and non-catenary complexes were used as soil mapping units.

Catenas predominate in the granitic-gneissic, planaltic region, under gently undulating to rolling slope. The soils are associated topographically as follows : red soils on high, well drained areas; orange and pale-orange soils, on slopes; yellow soils bordering the depressions; and grey soils in the depressions.

In some places, such as, for instance, in Balama, a catenary succession of red, reddish brown, brown, yellowish brown and grey soils is found.

Catenary sequences are found all over the above mentioned regions, under a rainfall higher than 1,000 mm, and a mean annual temperature lower than 25°C, sometimes even lower than 20°C. Vegetation intimately follows the soil catenary sequence; on the red soils *Brachystegia-Isoberlinia* woodland predominates, gradually changing to *Terminalia-Combretum* savannas, on yellow and grey soils (12).

Soil catenas were mapped using coloured lines, red, orange, yellow and grey, equally spaced and the frequency of which on the map is directly related to the frequency of each soil category in the the field. As an example, one sees in the Provisional Soil Map that the Metonia catena was mapped using a higher frequency of red lines than the Metarica catena.

This not only means that in the Metonia region there are more red soils than in the Metarica region, but also that red soils predominate over orange, yellow and grey soils in the Metonia region, the opposite being true with regard to the Metarica region.

The soils of the planaltic zones are, with a few exceptions, ferralitic and the presence or absence of iron concretions and/or laterite is shown in the map by diagonal and horizontal lines, respectively.

Whereas in the granitic-gneissic, humid, mesothermal to tropical plateau the characteristic soil association is the catena, in the subplanaltic and low areas it is the non-catenary complex. In the first case the topography and in the second case the parent material are the main factors of soil differentiation.

The non-catenary complexes are shown in the map by vertical coloured lines. In the Maxaíla region, for instance, sandstones, of a calcareous, ferruginous and silicious nature, give birth to pedocalic grey and brown soils, red and yellow sandy soils, and grey sandy soils, respectively. They are represented by black, light brown, red, yellow and grey vertical lines. As the yellow and grey sandy soils are predominant in the region, the Maxaíla soil complex was represented in the map by a series of 1 black, 2 light brown, 1 red, 3 yellow and 3 grey vertical lines.

This method of mapping soils on a broad scale map seems very useful. It gives a quick and clear idea of the different soils present in a certain area, and of their relative importance.

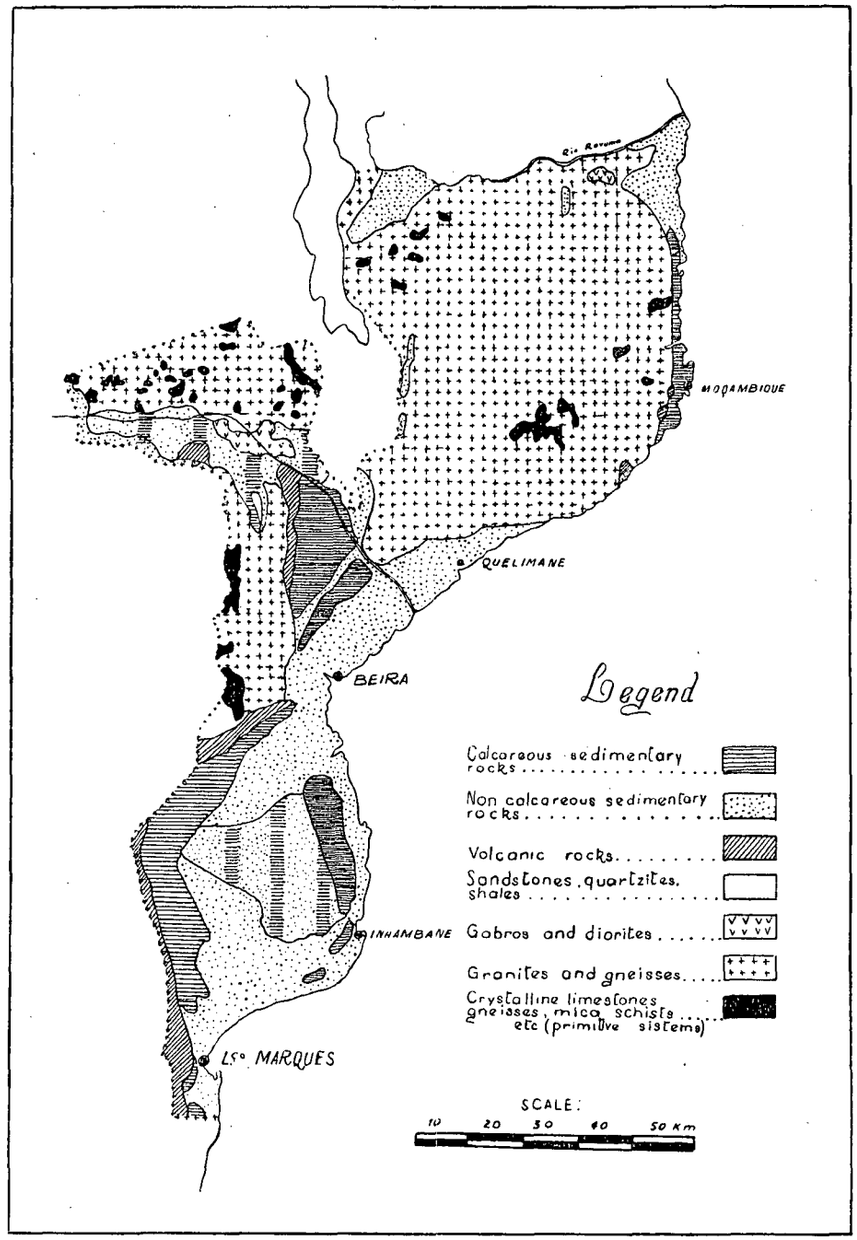

Fig 2. LITHOLOGY OF MOÇAMBIQUE
(BASED ON ESBOÇO GEOLÓGICO E LITOLÓGICO, 1949, SERVIÇOS DE GEOLOGIA DE MOÇAMBIQUE)