

TECHNICAL REPORT No. 10

R E S T R I C T E D

ENVIRONMENTAL CONDITIONS NECESSARY FOR PROFITABLE OIL PALM
CULTIVATION WITH SPECIAL REFERENCE TO THE DEVASTATED COCOA
AREA IN THE CENTRAL DENSU BASIN

By

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ENVIRONMENTAL CONDITIONS NECESSARY FOR PROFITABLE OIL
PALM CULTIVATION WITH SPECIAL REFERENCE TO THE
DEVASTATED COCOA AREA IN THE CENTRAL DENSO BASIN

(A copy of the original report dated 1952)

Environmental conditions in the major oil
palm growing regions

The principal oil palm producing countries are Sierra Leone, south and south-eastern Nigeria, and the Belgian Congo in Africa, and Malaya and eastern Sumatra in the East Indies.

Rainfall

Sierra Leone.- The rainfall on the coastal strip is very high, about 150 inches a year, but decreases towards the interior to about 100 inches at Daru and 90 inches at Kabala. There are two seasons -- a wet season April to November, and a dry, November to March. Practically all the rain falls during the seven to eight months of the wet season and at the end of the dry season plants suffer from lack of moisture.

Nigeria (Oil palm regions).- A rainfall of over 60 inches is stated (Faulkner and Mackie) to be necessary for oil palm but most Nigerian oil palm is grown under annual rainfalls ranging from 75 to about 120 inches. Dry months (with less than 4 inches on the average) range from two to five.

Belgian Congo (Oil palm regions).- In the absence of maps showing distribution of oil palm production in the Congo, rainfall under which this crop is grown can only be based on personal observation which suggests that it occurs under rainfalls of 60 inches and over. Dry months range from none to five.

Malaya.- Rainfalls range from 65 to 150 inches. Dry months none, one or two.

Eastern Sumatra.- Rainfalls range from 70 to 150 inches; dry months none or one.

Examples of average annual precipitations at selected stations in the main oil palm growing regions are given in Table 1.

It will be noted that in the areas in the East, the occurrence of a dry season, i.e. months with an average rainfall of less than 4 inches is hardly evident at all. The rainfall in the Leverage region is much lower than at the other stations. Since the end of the War, the plantations in this area have experienced trouble which may in part be climatic.

STATION	No. of years of observation	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
<u>SIERRALEONE</u>														
Freetown	-	<u>0.35</u>	<u>0.26</u>	<u>1.15</u>	<u>2.59</u>	10.75	19.80	34.51	36.19	29.90	11.86	5.58	<u>1.53</u>	152.47
Batkanu	-	<u>0.03</u>	<u>0.36</u>	<u>1.14</u>	<u>3.89</u>	10.41	14.91	20.96	21.77	18.06	16.29	10.84	<u>1.21</u>	119.87
<u>NIGERIA</u>														
Benin City	38	<u>0.78</u>	<u>1.29</u>	<u>3.75</u>	6.72	8.38	12.29	11.80	8.42	12.16	9.52	<u>3.08</u>	<u>0.59</u>	78.78
Port Harcourt	31	<u>1.27</u>	<u>2.40</u>	5.09	7.33	10.03	13.31	12.57	13.25	15.13	10.79	5.72	<u>1.92</u>	98.81
Calabar	39	<u>1.60</u>	<u>2.96</u>	6.27	7.81	12.55	16.07	18.40	16.97	16.98	13.35	7.40	<u>1.87</u>	120.53
<u>BELGIAN CONGO</u>														
Yangambi	10	<u>3.81</u>	4.02	5.66	5.12	6.96	4.57	6.02	7.32	6.06	9.64	6.57	6.00	71.48
+Port Francqui	10	4.84	4.61	5.19	6.14	<u>3.66</u>	<u>0.67</u>	<u>0.55</u>	<u>2.01</u>	5.91	7.91	8.15	9.25	58.93
<u>MALAYA</u>														
Malacca	48	<u>3.93</u>	<u>3.74</u>	4.94	7.38	6.80	7.90	7.85	10.34	8.75	10.15	8.68	6.52	86.98
Kuala Lumpur	58	<u>6.68</u>	<u>6.18</u>	9.20	10.73	8.48	5.07	4.13	6.31	7.33	11.09	10.19	9.53	94.92
Kuatan	40	15.55	8.51	8.79	6.33	6.59	5.66	5.61	5.75	7.88	10.39	14.18	22.77	118.01
<u>EASTERN SUMATRA</u>														
Rengat	39	7.88	6.85	8.11	6.46	6.58	4.13	<u>3.90</u>	4.97	5.98	8.07	9.21	7.83	81.97
Palembang	52	11.53	9.49	12.24	11.18	7.40	4.68	<u>3.78</u>	4.17	4.53	8.11	10.63	13.15	100.69

+ Nearest station available to Leverville.

Table 1. Mean monthly rainfall of typical stations in the world's main oil palm producing countries.

Soils

The oil palm, occurring in areas of heavy rainfall, has soils that are typically weathered to great depths. The soils are usually very highly acid (pH 4-5) and generally very low in plant nutrients. The oil palm, however, is able to absorb its food supplies from a very dilute nutrient medium since it has a very extensive, widely and deeply spreading root system. I have seen oil palm roots extending downwards to 40 feet at Yangambi in the Belgian Congo. Many of the typical oil palm soils are derived from unconsolidated sediments (Nigeria, Belgian Congo, and Eastern Sumatra) whilst similar soils form a belt along the Coast in Sierra Leone. Deeply weathered, consolidated rocks give rise to soils supporting oil palm in Sierra Leone and Malaya. In Malaya (and Eastern Sumatra ?) oil palm has been planted on a plantation scale on acid peats of varying depth that overlie undrained coastal clays. Such plantings have not been successful.

The typical oil palm soil is a medium sandy loam to a light sandy clay, red to yellow-brown in colour and extending downwards, with little change for 50, 100 or even a great many more feet. Judging from the results of oil palm cultivation in Sumatra, the optimum climate would appear to be one in which few if any months receive on the average less than 4 inches precipitation. If dry spells do occur the great depth of the typical oil palm soil provides a sufficient moisture reservoir to tide this deep-rooting crop over the period of deficient rainfall.

Environmental conditions in the devastated cocoa area in the centre of the Densu basin

Rainfall

The average monthly rainfall for Suhum, Koforidua, Mangoase and Nsawam is given in Table 2 (p.4).

It will be noted that the annual rainfall of all of these stations is below 60 inches. In the case of Nsawam the average annual rainfall is even below 50 inches. The dry season contains 5 to 6 months.

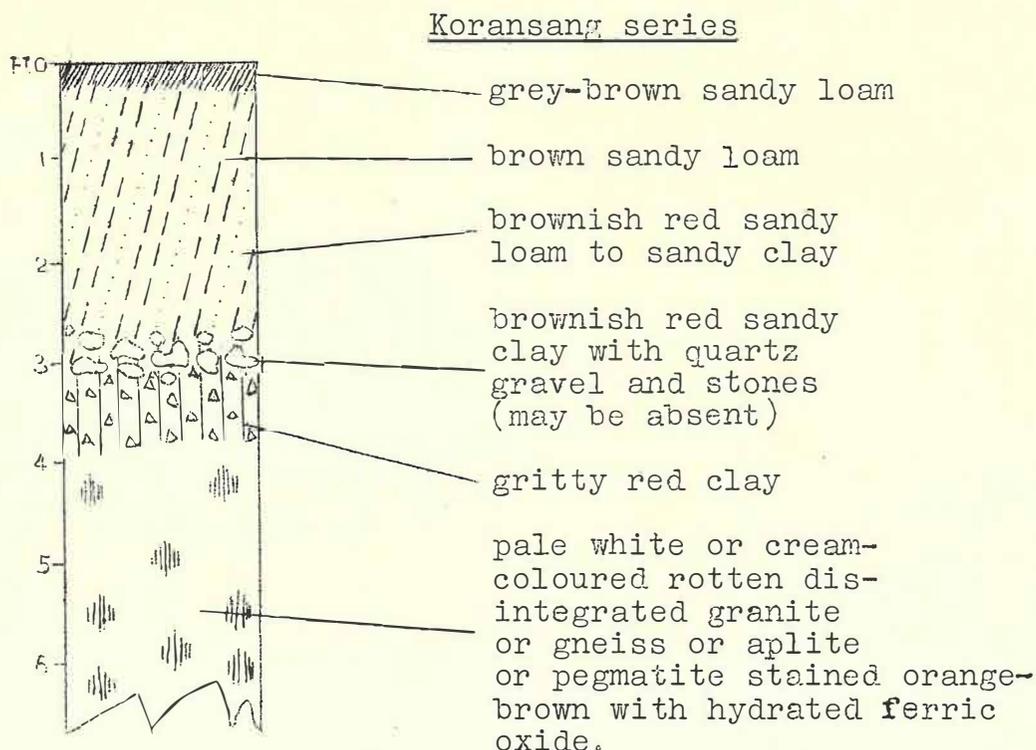
Soils

The red and brown upland soils of the 'devastated area' are in general shallow; deep soils, i.e. those where thorough weathering extends to over 6 feet occur only in small scattered patches. The average depth of soil to rotten bedrock is about $3\frac{1}{2}$ feet, but in many places very much shallower soils occur, e.g. 18 inches or less. Oil palm roots manage to enter the rotten bedrock but those that do are not very many and they do not penetrate very far.

STATION	No of years of observa- tion.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
SUHUM	13	<u>1.38</u>	<u>2.98</u>	6.24	4.81	7.33	9.04	<u>3.55</u>	<u>2.27</u>	5.00	4.00	<u>3.27</u>	<u>2.23</u>	55.10
KOFORIDUA	12	<u>1.30</u>	<u>3.73</u>	5.16	4.41	6.96	8.87	<u>3.34</u>	<u>2.61</u>	5.85	5.03	<u>3.79</u>	<u>2.13</u>	53.18
MANGOASE	10	<u>0.60</u>	<u>2.90</u>	4.77	5.40	6.87	6.86	<u>2.73</u>	<u>2.21</u>	4.24	7.03	5.38	<u>1.76</u>	50.75
NSAWAM	21	<u>0.73</u>	<u>2.01</u>	4.59	4.52	6.81	8.61	<u>2.65</u>	<u>1.90</u>	4.04	5.46	4.52	<u>1.98</u>	47.82

Table 2. Average monthly rainfall for stations in the Densu basin (in ins.)

A typical soil of this region has the following profile:-



Owing to the fact that these soils are shallow, and weathering, disintegrating rock is near the surface, they are relatively well supplied with nutrients. The topsoil is neutral or only slightly acid and the sub-soil is only moderately acid.

These soils are definitely droughty and this is one of the reasons, besides virus disease, that cocoa has failed on them.

Suitability of the 'devastated area' for productive oil palm cultivation

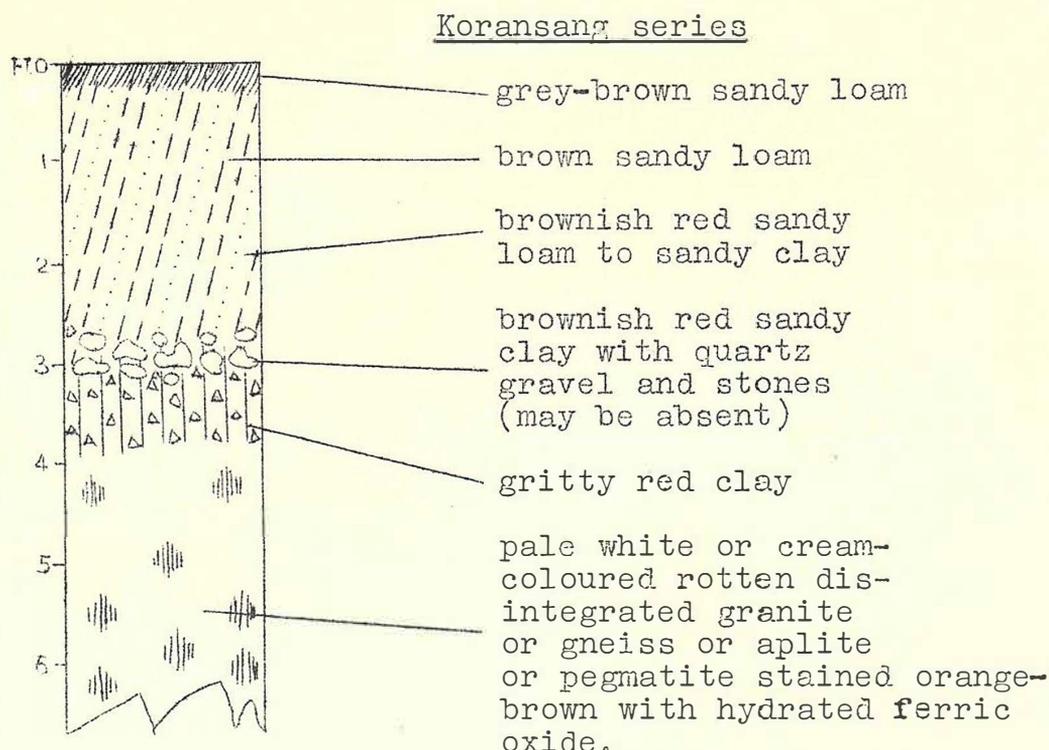
The soils of the 'devastated area' have neither the rainfall nor the depth of typical, successful oil palm soils elsewhere. The lack of rain is accentuated by their shallowness and small moisture retaining powers. This interaction between amount of rain and depth of soils is important.

Further, with the relatively low rainfall of the 'devastated area' the precipitation will fluctuate widely from year to year and some years will be very dry indeed, cf. Table 3 (p.6).

Such droughty years can have a permanently injurious effect on perennials growing on shallow soils.

The superior nutrient status of these middle Densu soils compared with that of the oil palm soils of the major producing areas in no way makes up for their relatively droughty character and the relatively low rainfall they receive. They cannot be recommended for large-scale oil palm production.

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	NSAWAM 1929	MANGOASE 1932	SUHUM 1948	KOFORIDUA 1941
JAN	0.00	0.01	0.00	0.00
FEB.	0.20	2.64	4.90	4.87
MAR.	1.77	2.10	2.40	4.73
APRIL	1.23	4.73	2.25	3.37
MAY	4.49	7.19	5.92	6.08
JUNE	3.99	8.20	8.02	7.26
JULY	4.18	0.26	1.55	0.98
AUG.	1.67	0.49	1.06	0.96
SEPT.	0.56	1.88	1.50	3.15
OCT.	2.66	4.74	6.29	5.67
NOV.	4.49	3.16	3.71	3.47
DEC.	1.35	3.19	0.00	0.08
TOTAL	35.70	38.59	37.63	40.62
No. of dry months.	9	8	8	7

Table 3. Rainfall of dry years in the Densu basin (ins.).

At present most of the soils of the 'devastated area' are under secondary bush and cut-over secondary forest in which oil palms are a conspicuous feature. In fact, oil palm grows in the area like a weed. There is no evidence, however, that a successful industry can be based on such a weed growth.

The Gold Coast early in its development abandoned oil palm as its main economic crop in favour of cocoa. It is suggested this was largely due to the fact that sufficiently deep soils receiving sufficient rain were not available in the Colony on a sufficient scale to support an oil palm industry, such as would successfully compete with the same industry in neighbouring Colonies.

The organization of palm oil production

It should be noted that cultivation of oil palms and the production of palm oil on a plantation basis in the East Indies and elsewhere have been more successful than in British West Africa where peasant methods are employed. This has been due to the greater care given the palms and the greater discipline maintained, resulting in getting the cut fruit to the mills with the least possible delay.