# SOME IMPRESSIONS OF OIL PALM CULTIVATION IN AFRICA [1])

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## INTRODUCTION

At the beginning of 1956 I paid a visit to some of the most important oil palm regions of Africa, viz. the Ivory Coast, Nigeria and the Belgian Congo, through the courtesy of the A.V.R.O.S. (General Association of Rubber Planters on the East Coast of Sumatra).

What particularly impressed me during this visite was the vast potential of man-power, land and capital employed in Africa for the purpose of improving the cultivation of the oil palm.

And especially as regards the Belgian Congo, not only to cultivate the oil palm, but to develop the country as a whole. Considering, for example, the transport difficulties and shortage of labour it is impossible not to admire what is now being done in this region.

The research stations I visited, i.e. those at LA ME, Ivory Coast (I.R.H.O.) [2]), BENIN, Nigeria (W.A.I.F.O.R.) [3]), YANGAMBI, Belgian Congo (I.N.E.A.C.) [4]) and YALIGIMBA, Belgian Congo (Unilever Research Dept.) [5]), have altogether at least 30 scientifically-trained staff and at least 1200 hectares of experimental gardens, soon to be definitely increased by 600 hectares (500 belonging to the I.N.E.A.C.). This does not include the specialists working on the oil palm in Paris and Brussels, the physiologists, soil scientists, statisticians, etc., who at Yangambi constitute the auxiliary staff in the oil palm section (and in the other sections as well), the research station at Dabou, Ivory Coast (2000 hectares) and the trial fields at Yaligimba and other estates. At a rough estimate the production area benefiting from this staff is not more than 250 000 hectares, and probably not more than 200 000.

Except for the basic work undertaken by BEIRNAERT (I.N.E.A.C.) hardly any of this research got under way or was even begun until after the last war, and this should be borne in mind when enquiring into the actual results of this sizeable investment of this sizeable investment of energy.

To date it does not appear as though any fundamentally new contributions have been made, with the possible exception of the growth and flowering studies and related agricultural experiments carried out by the W.A.I.F.O.R. But the research programmes show a good deal of promise, particularly as regards breeding research (including the "Expérience Internationale"). Africa appears to be hard at work making up its great, one might almost say traditional leeway in production per hectare compared to Sumatra. Much of this lag was and still is the result of substantially poorer soil and climatic conditions, and in this respect it will never be possible to close the gap; it can certainly

1) Received for publication October 16, 1956.
2) Institut de Recherches sur les Huiles et Oléagineux.
3) West African Institute for Oil Palm Research.
4) Institut National pour les Etudes Agronomiques du Congo Belge.
5) I include in this summary the I.R.H.O. Research Station at POBE, Dahomey, although it was not visited by me.

be said, however, that taking conditions into account there has been marked progress during the past 15 years.

The following statistics will illustrate this in a more specific manner.

It should be explained that the figures are in respect of good, fully-grown plantations under the conditions normally prevailing in Africa and Sumatra (viz. not the conditions in Sumatra during the war and most of the succeeding period).

The production reported for *Dura* × *Pisifera* plantations is naturally only an estimate, but is based on known production figures for the first years.

| | | Africa | Sumatra |
|---|---|---|---|
| Yield per hectare of pre-war plantations | bunches | 6 tons | 22 tons |
| | oil | 1 ton | 3.7 tons |
| Yield per hectare of post-war D × P plantations | bunches | 15 tons | 25 tons |
| | oil | 3.5 tons | 5.7 tons |

When it is remembered that "normal conditions" in Africa has always meant no fertilisers and a fairly rough native cover vegetation between the rows, the new material there must certainly be regarded as capable of yielding up to 17 tons of bunches, or 4 tons of oil per hectare after the introduction of better cultural practises. (Work is now being done in this direction, and has already been successful in part).

It might be argued against such a presentation of the facts that a much greater measure of progress in Africa compared to Sumatra was only to be expected, seeing that production in Africa had been on a far lower level and could thus be more readily increased, and in a more spectacular way. But even making allowance for the chief causes of this lower level which do not apply to Sumatra (except for soil and climate factors which cannot be controlled), viz. the continual sterility of about 25 % of the palms and the lack of or impossibility of applying rational manuring or tending the soil, the yield of fruit bunches is still double.

This is now chiefly owing to a continuous selection by means of which it has been possible to find well-adapted palms in what is a comparatively unfavourable environment.

It is quite easy to understand, then, why Sumatra has not been able to make the same progress during this period. It is clear that its far higher pre-war level of production and plantation management compared to Africa does not permit of any extensive improvements, and furthermore general conditions since 1940 have not been conducive to adequate agricultural research and the restoration of the estates to their former desirable state.

### Research

All over Africa research is mainly concerned with selection and manuring. This is only logical since in these regions, which compared to Sumatra are on the whole less favourable for oil palms, the primary concern is to find suitable planting material and supply deficiences of the soil.

The W.A.I.F.O.R. has also done very valuable work in the field of physiological research (growth and flowering studies).

1 *Selection*

As indicated earlier in the introduction, remarkable results have already been obtained in selection work, particularly at LA ME and YANGAMBI. I need only refer to the average yield per palm of more than 100 kg. of fruit bunches from 4 plantings of *tenera* x *dura* (442 palms in all) during the first year of the "Expérience Internationale" at LA ME. The best planting (260 palms) produced by crossing a LA ME *tenera* with a Deli *dura* (from Dabou, an Ivory Coast estate, chiefly planted with Deli *duras*) actually yielded an average of 125 kg. of fruit bunches per palm. The oil to bunch content of the *teneras* was 23.9 % and that of the *duras* 17.9 %. In the same year the *teneras* and *duras* from three *tenera* x *tenera* crosses in this trial gave an average yield of bunches per palm of over 80 kg., which must be accounted an outstanding result, particularly under the conditions prevailing.

At POBE the French also have a limited number of *pisiferas* which despite being poor producers (although much of this is due to unfavourable soil and climatic conditions) are valuable for breeding purposes on account of their comparative fertility.

The fruit to bunch percentage is in the region of 40 (in one case 28). The *tenera* (Yang.) x Deli *dura* (Mal.) crosses also put up an excellent performance in the "Expérience Internationale" at YANGAMBI; during the first year of bearing the yields from some of these plantings averaged as much as 70 kg. of bunches per palm, and there were palms here which produced nearly 200 kg. without fertilizers ! But even these results are inferior to the yields from the same type of cross at LA ME. It seems to me likely that this was largely owing to the *dura* parent palm used. On the Ivory Coast it had, in fact, been selected from a very large, 20–25-year old D. *dura* plantation of 1,500 hectares, and this is a guarantee that it will be better able to adapt itself than the *dura* selected in Malacca. How important this adaption is to the oil palm may be seen, for example, from the behaviour of *Deli duras* all over Africa ; in many respects they were inferior to their African counterparts. This conclusion is also confirmed by the poor results obtained with Yangambi planting material in the Leverville district, some 1,000 km. further south-west, where the soil and climate is more unfavourable. In view of the yields obtained from a 500 hectare plantation of *dura* x *pisifera* at the Binga (N. Congo) estate, the I.N.E.A.C. are counting on at least 8 tons of pulp per hectare per annum, or 3.7 tons of oil, from crosses of the best *duras* with *pisiferas* from the best *tenera* x *tenera* plantings. This estimate is based on unmanured soils and the usual primitive husbandry. But as I mentioned above, under bettered conditions I believe this material should be capable of yielding up to about 4 tons of oil per hectare.

2 *Soil and Manuring*

During the initial stages the solution of the many soil and manuring problems in the Congo proved a somewhat more difficult task. Although the oil palm has many deficiency characters nearly all over Africa, it took a long while to eliminate these or increase production by means of rational manuring. The use of fertilisers often produced the wrong result. It seems, however, that the research in question has now reached the turning point.

Some years ago Huilever Congo Belge were the first to achieve important

results with phosphate in the north of the Congo. It was found quite feasible to apply up to 10 kg of natural phosphate at once to each palm. Potash deficiency is predominant in West Africa, and here, too, the same kind of heavy single dressing is being applied with success. There is also a great deficiency of potash and magnesium in the Leverville district of the Congo and further south, but here it is not the old plantations that are manured but only the very young ones. Moreover care has to be exercised in the use of phosphate fertilisers as here and there they will soon induce boron deficiency. The latter is cured by applying 40 g. of borax per palm; in many cases this results in a 20 % increased yield. In Africa, which generally has more marked seasons than Sumatra, the period at which fertilisers should be applied is possibly more important than was originally believed. The W.A.I.F.O.R. has had a number of interesting experience in this respect. A fertiliser trial in which a comparison was made between the effect at the beginning and end of the wet season of a waste pericarp fibre dressing, a waste + N.P.K. dressing, and an N.P.K. dressing, proved, among other things, that the complete dressing applied at the beginning of the wet season was the most favourable, and least favourable when applied at the end.

Intercropping has a particularly good effect on oil palms especially during the wet season. During the first years a young plantation is in bearing it was found that opening by burning was less beneficial than opening without burning. Subsequently the effect was reversed and during the 4 years succeeding there was even a progressively better effect produced by burning. During the last 2 years, however, the differences were again nil. In the whole burning has hitherto been found to be more favourable than not burning.

### 3 *Physiological research*

All these results can now be explained by BEIRNAERT's theory (viz. that the balance between assimilates and minerals determines sex to the extent that an alteration in this balance to the advantage of the assimilates is said to promote the formation of female inflorescences) and by the results of a physiological investigation carried out by BROEKMANS of the W.A.I.F.O.R. The latter found that the sunshine conditions influence the sex-ratio of the inflorescences (the ratio between the number of female inflorescences and the total number of inflorescences) about two years later. Thus the dry season favours the formation of female inflorescences, but the rainfall is then a minimum factor. This explains why BROEKMANS also found a high positive correlation between the rainfall in the dry season and the sex-ratio about two years later. The beneficial effect of intercropping in the wet season would therefore be due to the fact that it results in mineral nutrients being drawn from the soil at a period of reduced assimilation. The balance in the palm is thereby altered to the advantage of the assimilates, and this promotes the formation of female inflorescences. Consequently this also explains why manuring increases production towards the end of the wet season when the ratio of assimilates to minerals is already low in itself. Opening an area by burning first results in a large supply of minerals which have a disturbing effect on the said balance. Later on, however, the greatly impoverished soil apparently favours this balance more than soil of which the vegetation has not been burned and which

only obtained a gradual supply of minerals by a process of slow decomposition. We are thus led to infer from all this that the fairly poor African oil palm soils are nevertheless relatively too rich during the wet season, and also that the oil palm suffers from a lack of sunshine in large parts of Africa, this being reflected in a low sex-ratio.

Lack of light in the rainy season is further emphasised by manuring at this period, and may be partly neutralised by reducing the fertility of the soil. It is not yet known what elements are specially significant in this connection, but nitrogen probably plays an important role.

### Cultural practices

Having regard to the object of my tour I spent more time on the European estates than on the native holdings which are most important for Africa itself. I visited a commercial estate in Nigerai, the Leverville district near Kikwit (S.-W. Congo), and a number of estates in the north-east of the Belgian Congo.

#### *Soil tending*

One is immediately struck by the soil tending which by Deli standards is usually very extensive. This is no doubt partly due to local shortage of labour. The undergrowth, which is very miscellaneous and comprises many weeds, including grasses, is in many cases more than 3 feet high, often more than man-high, and occasionally includes entire small trees. On soils so poor in themselves there is bound to be an enormous competition between roots and palms, and a vast amount of evaporation from such a vegetative cover. What this means in a climate with fairly marked periods of drought is easy to imagine. Moreover, with some exceptions there is still to-day little, if any use of fertilisers on the bearing plantations of many estates. (This does not apply to young plantations).

#### *Diseases and plagues*

The literature is full of descriptions of diseases and plagues to which the oil palm is subject in Africa, and this creates the involuntary impression that in this part of the world the state of health of the *Elaeis guineensis* leaves a good deal to be desired. As a matter of fact the situation is far from being so desperate. The most important diseases are Wilt (*Fusarium oxysporum*) and nutritional diseases. *Ganoderma* stem rot occurs relatively infrequently, the number of palms affected being estimated at less than ½ %. This disease is chiefly regarded as a symptom of old age and hardly ever occurs among palms less than 25 years old. (*Ganoderma* is practically unknown among the native holdings). Patch Yellow is also of minor importance: possibly 1 %. *Armillaria mellea,* which frequently occurred in the Congo some years ago, has now entirely disappeared there (i.e. on oil palms); in Nigeria this honey fungus has never been observed. *Rhinoceros* beetles and weevils occur but not to any injurious extent, probably because large plots of dying and dead palms are not seen together in the immediate neighbourhood of new young plantations, as is nowadays the case on the east coast of Sumatra (interplantings). Moreover the same applies to *Ganoderma.* Certain troublesome nursery diseases are known to occur, e.g. Blast, *Anthracnosis* and *Cercospora.*

All things considered it would seen as though the reports made by WARDLAW, who has paid regular visits to Africa for the past 10 years, give too gloomy a picture of the state of health of the oil palm in Africa, especially as many of the pathological conditions occurring were directly caused by or associated with nutritional disturbances which can, in fact, be remedied.

*Yields*

Yields naturally vary from one region to another and also depend on a great many factors. To give some idea we can, however, quote the following approximate average bunch yields in tons per hectare for the Ivory Coast, Nigeria (Western Region), Leverville (Belgian Congo), and North-East Congo respectively. These are 6–7, 6–7.5, 3–5, 8–9.

The low yields in the Leverville district are chiefly due to the very poor soils unimproved by proper cultural practices (unless the situation has now been changed) and the unfavourable climate (insufficient and badly distributed rainfall). In the north there is more soil of better quality and a more evenly distributed precipitation of at least 1800 mm.

*Clearing, Replanting*

Huilever Congo Belge are now carrying out an extensive planting programme, mainly by forest clearance. This is a compulsory scheme performed under a tripartite agreement between the Government, the inhabitants, and the H.C.B. If a certain planting programme is not completed within a given period the H.C.B. forfeits its rights in the area concerned. Since 1953 about 1300 hectares of new plantations have been laid down, and a further 400–500 hectares will be added before 1959. Thereafter another 500–700 hectares are being planned. The total since 1953 is 2300–2500 hectares.

In the north some 3300 hectares have been planted on various estates since 1953 (to June 1956) including 300 hectares replanted. Commencing in 1958, a further annual 700 hectares of forest have to be cleared and 200 hectares replanted in this area.

*Native holdings*

The oil palm is just as important in Africa as the coconut is in Indonesia, but it occurs in a different way, i.e. in palm groves or natural plantations, and also in native holdings.

The palm forests mainly consist of *duras* of which the annual yield is not more than 2 tons of bunches per hectare with an oil content of only 12 %. In the native holdings, however, the *teneras* are as well represented as the *duras* and yield rather more bunches, although the average oil yield is only 17 %. Usually much of the material utilised by the processing plants comes from the native holdings; in some cases, as in the Leverville district, for example, it even amounts to 80 to 85 % of the total capacity. Here a distinction is made between natural palm groves belonging to the natives and those which are the property of the H.C.B. The H.C.B. estates occupy a productive area of some 6700 hectares, the H.C.B.'s natural palm groves some 45 000 hectares, while the native palm groves are estimated at about 40 000 hectares. In addition there are about 180 to 200 native plantations producting some 80 tons of fruit a month. The H.C.B. has 10 plants for processing all these crops.