

Book Review.

THE OIL PALM (*Elaeis guineensis* Jacq.).

C. W. S. HARTLEY, Longmans, Green & Co., London, 1967. 692 pp. \$Aust.12.00.

This is by far the most valuable general book on the oil palm to appear so far, and it should become a standard text for all concerned with the crop. The author spent most of his time in Africa, particularly as Director of the West African Institute for Oil Palm Research, which was one of the most important research centres for the crop. However, he has travelled widely in all the major oil palm growing areas in West and Central Africa, Malaysia, Indonesia, and South and Central America, frequently advising on research programmes and he is regarded as one of the foremost authorities.

It is this world-wide approach which is of particular interest. There have been several quite good books published in Malaya recently, but these do apply particularly to Malayan conditions.

Two of the most interesting and useful chapters are "The Oil Palm and its Environment" and "Factors Affecting Growth, Flowering and Yield". The characteristics of the environment in each of the present and potential growing areas is discussed in relation to its effects on oil palm growth and yield, and this is most useful to workers in a new country such as Papua and New Guinea. The emphasis in this work has been on Africa, where more detailed studies have been carried out, and where there are more clear-cut environmental variations, but available information from other countries is also reviewed.

It seems that the oil palm is well adapted to surviving in marked seasonal climates, as it has a very efficient mechanism regulating the stomatal opening, and hence water loss. If soil moisture drops below the level required for normal transpiration, the stomata close and the palm almost ceases growing, and hence suffers little damage. This means though, that yields fluctuate widely under such conditions and are less than under more even climates. In West Africa, yields are related to rainfall, and to 'effective sunshine' or only the sunshine received when soil moisture is adequate for growth.

A useful test has been developed to show when soil moisture is limiting transpiration and growth and uses a range of alcohol/water mixtures to test the degree of opening of the leaf stomata. A higher proportion of alcohol reduces the surface tension of the mixture, and hence increases its ability to penetrate smaller stomatal openings. This test has been used to show the effects of different soil types and rainfall regimes and also the effect of different ground covers on palm growth. With a severe dry season, a pueraria cover competed strongly for moisture and markedly reduced palm growth compared to either bare soil or a maize crop.

Under very wet conditions, as in Colombia where they have areas with 250 inches of rain and only 1,250 hours of sunshine per year, yields are much better than in West Africa, and it seems that low sunshine does not have as great an effect as low rainfall on yields. There is also difficulty with the method of recording sunshine—the standard Campbell-Stokes recorder only records bright sunshine, whereas in wet climates a large proportion of the incoming radiation usable by palms may be under conditions of light cloud. On the other hand, under hazy, dusty conditions in the West African dry season, the recorder may burn 6 to 7 hours per day, but radiation is not high.

Low winter temperatures in higher latitudes, as in Honduras (15 degrees N), have a similar effect to a dry season, and there 90 per cent. of the crop is harvested in six months of the year. At higher altitudes near the equator, yields can be reduced over the whole year, as in the Congo Basin, or in Sumatra above 1,500 ft., where palms may take a year longer to come into bearing also.

There is a marked contrast between Asian and African oil palm areas. In the former, there is a largely uniform climate, but abrupt changes occur in parent material and the derived soils (which are, however, mainly clay types). In Africa there are vast areas of sandy soils from similar parent materials, but with marked climatic changes. Conditions in parts of America seem to be rather more similar to New Britain, and in Ecuador, palms are being planted on young volcanic ash soils with buried organic

horizons, and under a high rainfall. Our conditions correspond closely to this.

A full discussion is given of work on the effects of climate on sex ratio, and hence yield cycles. In seasonal climates, the optimum sex ratio may only coincide with optimum conditions every three years. The sex ratio seems to vary when the balance of photosynthetic assimilation and uptake of water and nutrients is upset, as in a period of low light intensity or soil moisture stress, or with heavy pruning.

The selection and breeding chapter starts with an interesting account of early selection work. The best work was done in the Congo and resulted from careful prospection amongst the palm groves for good fruit types, and then a sound breeding programme based on this material. The work was of a high standard, and it was eventually realized that the *tenera* palm was a hybrid, and all the sterile palms appearing in plantations established with *tenera* progeny were part of a segregating generation. This led to the discovery of the mechanism of inheritance of shell thickness and to commercial *tenera* production.

One particular *tenera* type developed had excellent fruit characters, and gave rise to the Sumatran *tenera* SP540, which in turn is the basis of much of the Sumatran and Malayan commercial seed today, including that being planted in Papua and New Guinea. This line has also excelled in America, so has shown its worth under widely differing conditions.

Modern breeding methods and the programmes undertaken in various countries are discussed. For some time, the emphasis was on programmes similar to that used for maize hybridization, where large numbers of lines are inbred and tested for combining abilities, and the best crosses are used as hybrids. It was realized though, that this was not really suitable for a perennial such as the oil palm, where each individual occupies such a large space. Ideas turned more towards animal breeding methods, where a parent can be both performance and progeny tested, and

then used for breeding purposes for many years. Often both the parent and its progeny are being used concurrently.

The sections on practical oil palm growing have similar content to books published in Malaya, with a somewhat wider perspective.

In the nutrition section, some work is discussed showing that the minimum number of palms to be sampled for chemical analysis to detect a given difference in levels (say 5 per cent.), varies widely between different nutrients. Also, the best leaf for sampling varies—the 17th is best for N, P, Ca, but the first for Mg and K. An intelligent approach to leaf sampling should be used, and the arbitrary methods now in use closely examined.

A large number of fertilizer experiments have shown that responses are generally small in young palms, unless they are replants or on very poor soil. Large quantities of fertilizers however, can be needed later on. Very small increases in yield, even if not statistically significant in some trials, can be very profitable in high yielding areas.

One chapter is devoted to intercropping, which may be desirable, particularly on smallholdings, while waiting for palms to come into bearing. In the early years, production of annual crops such as maize can be quite successful, and not detrimental to the main crop if precautions such as fertilizing are taken. Cattle grazing is another form of intercropping, and has been mainly tried in America. With a slightly wider palm spacing to give better pasture growth, and with careful management, the combination could be very productive. Cattle would need to be kept out of young areas unless the palms could be protected.

Most diseases and pests are discussed although it is inevitable that we shall have some different ones to contend with in Papua and New Guinea. New pests are appearing in America, and of note is 'Red Ring', a nematode condition similar to the coconut disease of the same name found there.

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