

**GOLD COAST DEPARTMENT OF SOIL AND LAND-USE SURVEY**

**CONFERENCE PAPER**

**THE NEED FOR MANURING COCOA IN THE GOLD COAST  
IN ORDER TO MAINTAIN AND AUGMENT THE LEVEL OF  
PRODUCTION**

**By**

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The present position regarding the area of the Gold Coast at one time covered by closed forest and climatically suitable for the profitable production of cocoa is as follows :-

		approx. sq. miles
(1)	Area climatically suited to closed forest and covered by this before settlement and the introduction of cocoa ... ..	31,000
(2)	Area at present under forest reserves in closed forest zone (all of this is not necessarily untouched forest) ...	5,590
(3)	Area at present under unreserved closed forest ... ..	5,260
(4)	Area at present under bearing cocoa (calculated on the conservative assumption of an average yield of 3 cwt. per acre) ... ..	2,700
(5)	Area at present under food farms, bush fallow, young, unbearing cocoa and cocoa that has failed for various reasons ... ..	17,450
(6)	Total of 2, 3, 4 and 5 above ...	31,000

It is important to realise that the closed forest area of the Gold Coast was unexploited for agricultural purposes - except around the edges - prior to the introduction of cocoa in the latter part of the nineteenth century. It was not even used for food farming but only for hunting, and the collection of Funtumia rubber, cola nuts and oil palm fruits (again mainly around the edges). As a consequence of the Gold Coast farmers' method of establishing cocoa, food farming and cocoa planting entered the closed forest area together. It can be assumed, therefore, that over the greater part of the 17,450 square miles now mainly under food farms and bush fallows cocoa establishment was attempted at some time - often more than once - and that for various reason the crop failed to become established or after establishment died out as a result of unfavourable environmental conditions or the attacks of pests and diseases. This conclusion is supported by the finding of scattered and abandoned cocoa trees amongst the bush fallow during the course of my department's surveys. It is obvious, too,

I think, that no farmer in his right mind would clear virgin forest and make a food farm and not put in cocoa seed or seedlings at the same time, as it would cost him hardly anything in either labour or money. The fact that so much land has at one time or another been tried for cocoa and the latter not become established gives some idea of the result that may be expected by the planting-up of the remaining 5,260 square miles of unreserved forest.

It is highly important that the forest reserves remain untouched: they serve three purposes :-

- (1) They protect the watersheds and ensure the safety of town and village water supplies.
- (2) They are calculated under proper management to ensure supplies of local timber for constructional purposes. It would be absurd and uneconomic if the Gold Coast ever had to import large supplies of timber.
- (3) They are also calculated to supply a very large proportion of the country's fuel. An enormous quantity of timber is annually consumed as firewood and charcoal.

As the unreserved forest diminishes there will be, indeed there already are, vehement demands for the reserves to be released for cocoa farming. This just must not be allowed to take place and will be quite unnecessary if the Gold Coast people learn to cultivate their cocoa instead of producing it by exploiting the fertility built up by the forest.

According to up-to-date calculations made by the Forestry Department, it appears that exploitation of the remaining areas of unreserved forest has increased since the second world war from an annual rate of about 270 square miles to over 700 square miles. This means that in seven or more years there will be no unreserved forest remaining. This exploitation is for both timber and agricultural purposes, including cocoa planting. Timber extraction aids agricultural exploitation by providing access roads.

It is well known in the Gold Coast that, using traditional methods, it is difficult or impossible to establish cocoa economically on land that has previously been exploited. The same point was brought out for Western Nigeria in Mr. A.V. Gibberd's paper read at the 1951 Cocoa Conference. Even were cocoa established on such land, its yield could not be expected to equal that of cocoa established on land just cleared from untouched closed forest.

The reason for the latter statement is that under humid closed forest conditions the plant nutrients are concentrated in the top few inches of soil built up and maintained by the tropical forest. Once the forest is gone, the nutrients it accumulated go too. This is because the nutrients in the topsoil are maintained in circulation by the forest trees: leaves, branches, flowers and fruit from these continually fall to the ground and there decay, whilst the roots immediately absorb the plant foods set free and convey them back to the trunks and branches to be used in the production of fresh growth. Once the tall luxuriant forest is destroyed, it is replaced by vegetation with far less bulk not needing so much in the way of nutrients and the excess of these accumulated by the forest disappears. These excess nutrients are not so much lost by lateral erosion as washed downwards into the groundwaters and then out to sea with the drainage. This process takes place very rapidly when cocoa fails from some cause or other and is then replaced by annual foodcrops and bush fallows. It takes place just as surely, however, when cocoa is successfully established and remains in production for several decades. A well maintained cocoa farm has a closed canopy of cocoa under the trees that were left to provide shade at planting, and subsequent weeding precludes any further growth of trees excepting those which produce economic products such as oil palms, avocado pears or oranges. Like cocoa, forest trees are subject to pests, diseases and old age, so that in time the shade trees left at establishment die and fall and are never replaced. The result is that in due course an old cocoa farm consists of cocoa interspersed with a taller growth of oil palms and scattered fruit trees. Such a vegetative covering is not equivalent to the great mass of material comprising virgin forest and does not annually require the same amount

of nutrients for its maintenance, so the excess of these available when the forest was first thinned and planted is lost in the manner already described.

All the time that a cocoa farm has been in bearing, nutrients have been removed every year in the crop, exported abroad and never replaced. The loss, therefore, is two-fold. The loss from exported beans should not be overlooked, for it is in the beans that nutrients are stored in relatively large quantities to assist the seedling in its early growth. Approximately eight million tons of cocoa beans have been exported from the Gold Coast since the industry started, so it can well be understood that the losses from this source have been considerable, amounting to the nutrients contained in nearly one million tons of sulphate of ammonia, six hundred thousand tons of super-phosphate of lime and three hundred thousand tons of sulphate or muriate of potash.

Beneath the thin, fertile surface soil of the forest are tens and tens of feet, often much over a hundred feet, of practically sterile, highly weathered earth; unweathered or little weathered rock, from which plant roots might extract nutrients, is far beyond the reach of vegetation and crops. Our analyses show this plainly. In fact, this state of affairs is not confined to the Gold Coast but is characteristic of all the moist tropics. Soil scientists have laboured this point for decades but it has rarely been appreciated by laymen and optimistic colonial developers.

The great asset of the Gold Coast closed forest zone is not its fertile soils - which are ephemeral - but its moderately moist climate with a distinct but not too severe dry season, which is undoubtedly ideal for economic cocoa production. Many of the soils are structurally quite unsuited for bearing cocoa once the forest has gone but considerable areas of soil are physically very suited for this purpose, although after the destruction of their forest covering they will need fertilisation for economic yields.

Fertilisation is not just a question of importing artificial fertilisers and spreading them around the trees.

Fertilisers wrongly applied can cause no increases in yield at all or may even depress yields, and they are expensive. Economic manuring depends upon finding out what the cocoa tree needs for paying increases in yield when growing on particular soils under specific climatic conditions. Such investigations take years - especially with perennials such as cocoa. The task is by no means as easy as with annual crops such as wheat, sugar beet, cotton and corn, or even with semi-perennials such as sugar-cane. With such crops and with the prevailing methods of experimentation, reliable results can be obtained within a few years. Cocoa would not even be yielding by then. Further, and this is of extreme importance, I do not believe that the methods of field experimentation suited to annual crops and semi-perennials are altogether suited to a long-lived perennial such as cocoa. Any mature trees experimented with at present have not only inherently different yielding qualities due to their genetical make-up, but they have a long history of mishaps affecting their productive powers, e.g. past capsid attacks, past droughts, past mechanical injuries from falling boughs, etc. This makes the obtaining of uniform plots very difficult. In addition, cocoa trees take up much more room than small annuals and hence the plots have to be large in size. Since the soil pattern in areas of residual soil overlying very diverse rocks such as occur in the Gold Coast is extremely variable, the ensuring of soil uniformity within the individual plots and the experimental area as a whole is extremely difficult, if not impossible. In cocoa country one is not dealing with extensive uniform expanses of alluvium as is frequent with many tropical crops. A further difficulty in manurial experimentation with traditionally planted cocoa is, of course, the great bulk of associated vegetation which, naturally enough, competes with the cocoa tree for the fertilisers added to the soil.

I firmly believe, and I think Belgian research workers agree with me, that we must evolve a technique of experimentation with cocoa so that we can explore its manurial requirements on particular soils not only on a few experimental stations but over the whole area devoted to the crop, as has so successfully been done with sugar-cane in

in the West Indies and elsewhere. This in itself is an initial task of some magnitude.

It is a great mistake to imagine that the information regarding fertiliser requirements of cocoa growing on the particular soils of experimental plots can be used unaided to determine the nutrients that should be added to cocoa elsewhere under commercial production. As stated already, fertilisers are expensive, and if economic results are to follow their application careful chemical control of their use is essential. Such chemical control must be exercised by field-to-field analyses of the nutrient contents of the surface soil. Such soil analyses are, however, purely arbitrary determinations and cannot be employed as a guide to manuring until the data they yield have been calibrated by carefully conducted fertiliser trials.

Chemical control of manuring is beyond the means of the individual peasant even with a technical department of government to assist him. It is something that can only be applied by well organised, large-scale units of production employing their own soil chemists and agronomists, as is the case with the highly successful sugar-cane and pineapple plantations of other parts of the tropics. Thus it should be evident that re-organisation of the small-farmer economy of the Gold Coast is just as essential for the maintenance of the fertility of the cocoa lands as it is for the efficient control of those peasant pestilences swollen shoot, black pod and capsids. Re-organisation for the latter and other purposes has been most strongly urged at this conference.

The position in the Gold Coast as I see it is this. During the 1920's cocoa farming reached the maximum production that circumstances permitted, say 250,000 to 300,000 tons per annum. As unfavourable environmental conditions, pests and diseases killed out the earlier established cocoa, the deficiency was made up by fresh plantings in untouched forest coming into bearing. This process will continue until the untouched forest is exhausted and then decline in production will set in as established cocoa dies out from various causes and there is no fresh forest land on which cocoa can be planted to replace it.

This decline will continue until cocoa is left only on relatively small areas where soil and climatic conditions are such that it will produce economically without proper cultivation. The only way that this decline can be arrested is by the Gold Coast people learning to cultivate their cocoa instead of letting the trees exploit fertility for which the farmers have not been responsible. This cultivation must go far beyond disease and pest control or even attempts by plant breeders to find varieties or clones that will yield highly despite what the farmer does or does not do! The trees must be fed. A crop which in the Gold Coast produces a raw product worth over £70 million a year is worth this attention.

The points I have raised are, I consider, matters of great urgency not only for the Gold Coast but for all interested in the cocoa trade, since the Gold Coast as a producer of raw beans would be very difficult, if not impossible, to replace. Further, it is not in the Gold Coast alone that growers of cocoa have neglected the manuring of the crop in favour of exploiting the fertility accumulated by the fast-disappearing tropical forest. Thorough research into the fertiliser requirements of cocoa lands is long overdue if the growing world demand for raw cocoa is to be met at a reasonable price. A raw product valued throughout the tropics at £200 million a year not only demands such investigations but can well afford them.

JKO.