than the present most undesirable system does, and he said R10 per head might fairly be reckoned upon as the maximum advance, to put coolies upon the estates from a District North of Madras, and the labour being permanent, the advances would be recoverable; whereas at present he believed the outstandings on some estates amounted to quite as much per head of available labour, and were practically irrecoverable. It was, therefore, proposed that a subscription list should be again circulated to provide funds to send a delegate to the Congested Districts of Madras.—Moved from the chair, and carried *nem con.*

Delegates to Ootacamund and Bangalore.—A debt having been incurred in sending a delegate to Ootacamund and a sum being required to send a delegate to the conference at Bangalore, Mr. Miller proposed and Chairman seconded:—That the funds to meet delegates' expenses to Ooty, or elsewhere, be collected from members on a basis of tax, on cultivated area.—Mr. Berry argued that although it was most important that Travancore was represented at the late Deputation to H.E. Lord Wenlock, he did not approve of the Chairman of the Travancore Planters' Association's action in sending a delegate, knowing there were no funds of the Association in hand to meet the expenses. He said it was a bad precedent as there was no limit to such action.—Mr. Knight replied that it was a case for prompt action, and after reference to their Secretary, Mr. J. S. Valentine, only time remained to telegraph the name of delegate. He also communicated with Peermaad Planters' Association which cordially agreed to pay a share of the expense, and approved of a Delegate being sent. The motion was then agreed to.

With a vote of thanks to the Chairman the meeting terminated. (Signed.) H. M. Knight, Chairman.

## TEA CULTIVATION AND MANUFACTURE:

We call attention to Mr. Hughes' fuller review (see below) of Mr. Kelway-Bamber's new book on tea, which is full of discriminating criticism and suggestiveness. It will be seen that Mr. Hughes is by no means wedded to indiscriminate manuring. He recognizes cases where manuring is almost superfluous where there is a sufficiency of organic matter, or as in dark peaty soils where at most a little lime is required; while in other cases again some castor-cake or cattle-dung may well be applied. It is for each tea garden proprietor to decide for himself according to his returns and circumstances; but in so deciding, there can be no doubt that he will get valuable aid both from Mr. Kelway-Bamber's book and Mr. John Hughes' review of the same.

## MR. KELWAY-BAMBER'S NEW BOOK; ANALYSES OF INDIAN TEA SOILS.

By John Hughes, Agricultural Chemist.)

Nearly 40 pages of the above work are devoted to a consideration of the Chemical and Physical properties of soils upon which tea was being grown, and a great number of analyses are given in order to represent the greatly varying quality of the soils upon which the tea shrub could be grown. Unfortunately these analyses are not set forth in definite tabulated form, some of the results being given for the soil in its natural wet state, others in the air-dried condition, while some represent the perfectly dry soil. In order therefore to allow of better comparison the following 27 analyses have been calculated into the perfectly dry state, and give the proportions of the four chief constituents of plant food per cent. The variations are certainly very great and one can easily understand that the natural fertility of these soils must vary *accordingly.*

The great deficiency of lime is perhaps one of the most striking features of these tea soils, for, with a few exceptions the amount of lime present is reduced to a mere trace, the *surface* generally being poorer than the *subsoil*:—

Indian Tea Soils (Pages 59 to 75)

Contain in the perfectly dry state the following:—

| No. | District. | | Nitrogen. | Potash. | Phosphoric Acid. | Lime |
|---|---|---|---|---|---|---|
| 1 | Dam Dam in the Dooars | surface | ·283 | 1·02 | ·09 | ·07 |
| | do do | subsoil | ·156 | ·30 | ·07 | ·16 |
| 2 | do do | surface | ·300 | 1·91 | ·09 | ·17 |
| | do do | subsoil | ·110 | ·71 | ·05 | ·15 |
| 3 | From another district in the Dooars | surface | ·107 | ·54 | ·10 | ·06 |
| | do do | subsoil | ·082 | ·41 | ·05 | ·06 |
| 4 | do do | surface | not done | 1·40 | ·17 | 1·57 |
| 5 | Nowgong (Assam) | do | ·571 | ·81 | not done | trace |
| 6 | do do | do | ·208 | ·41 | ·56 | trace |
| 7 | do do | do | ·211 | not done | ·52 | ·30 |
| 8 | Jorehaut do | do | ·336 | ·28 | ·02 | ·01 |
| 9 | do do | do | ·360 | ·22 | ·01 | ·01 |
| 10 | do do | do | ·988 | ·13 | ·11 | ·45 |
| 11 | Hailakandy (Cachar) | do | ·181 | 1·85 | ·24 | ·14 |
| | do do | subsoil | ·118 | ·71 | ·08 | ·15 |
| 12 | North Cachar | surface | ·051 | ·20 | ·04 | trace |
| 13 | do do | do | ·107 | ·31 | ·16 | trace |
| 14 | Central Cachar | do | ·102 | ·21 | ·20 | ·06 |
| 15 | do do | do | ·980 | ·56 | ·50 | ·07 |
| 16 | do do | do | ·137 | ·27 | ·49 | trace |
| 17 | do do | do | ·322 | ·40 | ·35 | trace |
| 18 | do do | do | ·507 | ·41 | ·34 | ·03 |
| 19 | Kurseong (Darjeeling) | do | ·440 | 2·50 | ·27 | ·25 |
| 21 | Kangra | do | ·057 | not done | ·12 | ·38 |
| 23 | Chota-Nagpore | do | ·164 | ·41 | ·24 | ·01 |
| 24 | do do (1) | do | ·131 | not done | ·20 | ·01 |
| | do do (2) | do | ·173 | do | ·18 | ·06 |

There is a great variation in the potash, from 2·50 per cent. in specimen 19 Darjeeling, to ·13 in specimen 10 Jorehaut, Assam, in which Mr. Bamber remarks that tea did not flourish, though he ascribes the failure rather to the excess of nitrogen than to the deficiency of potash.

It would be interesting to know whether these figures for the potash represent the quantities dissolved out by acid, or obtainable only by fusion; and if by the former process whether the soil was treated with acid in its natural state or after calcination at a moderate heat.

Phosphoric acid appears to be nearly as scarce as lime and where the figures rise to over ·50 (½ per cent.) we are told that most of the phosphoric acid was combined with iron and alumina forming an insoluble Phosphate.

In the case of No. 6 soil, however, which contains ·56 we are informed that tea had been grown for years and was *doing well*, so that it is quite possible that in the presence of sufficient organic matter and a favourable climate as regards moisture and heat, the phosphoric acid may be much more available than might otherwise be concluded.

Relatively compared, phosphoric acid is much more easily dissolved and rendered available as plant food than potash. In other words the vegetable acids resulting from the decomposition of organic matter are a much better solvent of phosphates than of potash compounds; so that provided the soil contains naturally a good supply of phosphoric acid, it is only necessary to apply an organic manure such as castor cake, or cattle dung in order to render such phosphoric acid available.

As regards the figures for nitrogen a glance at the tabulated results at once shows what a great variation exists; the higher figures being indicative of dark peaty soils very hygroscopic and retentive of moisture and capable of being rendered with careful treatment valuable tea gardens.

On soils such as that represented by specimen 15 the application of lime would certainly be attended with beneficial results as it would remove that sourness and acidity which act like a poison to certain plants.

These analyses of soils are accompanied with interesting notes from which planters may gather many useful hints and practical information as to the composition of soils best adapted to tea.

Tea must be remarkably hardy and capable of adapting itself to a great variety of soil and climate to grow as it does, and apparently to flourish under the varied circumstances referred to in Mr. Bamber's book.

Again as to the benefit of manuring, the authorities quoted appear to hold in many cases very strong and opposite views. The author himself opens the subject with the following statement, page 79:—"The use of manures for tea appears to have been long understood and employed by the Chinese and Japanese, manuring being the most important operation in the cultivation of tea with the latter, although in the interior of Japan where fertilising material may be scarce and transport costly, a great extent is cropped without much being returned to the soil."

Again:—"It is also stated that the Chinese restrict their area of tea (green?) cultivation rigidly to the amount of manure available, their principle being, that without continuous manuring there can be no continuous harvest."

Further on we find the following—"According to Ball (Cultivation and Manufacture of Tea) the Chinese used to water their tea bushes in dry weather with water in which rice had been washed, and manure them often with manure in a liquid state, or with the dung of silk worms."

This treatment probably refers to "Green" and not to "Black" tea as the Chinese generally agree that the latter is not manured being more fragrant when unmanured.

"The inferior Hyson teas known to the Chinese as 'Hill Tea' and the common Singh or Twankay shrubs receive no manure, beyond the grass and weeds, which twice a year are hoed up and placed about the roots to rot."

As opposed to the above we find the following:—"Colonel Money speaks of manuring having been carried on with great success in Chittagong, and says he was struck with the frequency and abundance of the flushes and the strength and flavour of the tea, and that although manuring was condemned by Chinese as having a tendency to spoil the flavour of teas, it was greatly approved of by the Calcutta brokers and the manured tea fetched high prices in the market."

As a fitting comment to the above we find on page 83 this statement:—"There seems to be a widespread opinion that it will never pay to apply manure to tea, because if once commenced, it will always have to be continued at intervals, or the plants will deteriorate more than ever." Again:—"Many planters especially in Assam hold the opinion that manuring is not required, as the outturn of some of the oldest gardens is stated not to have diminished since the gardens were first planted from 20 to 30 years ago."

"This opinion is held by Dr. Berry White, who states in lecture on the Indian Tea Industry in 1887, that manure was used to some extent both in Assam and Chittagong; and certainly in the North West Provinces, and the Kangra Valley; but in nearly all these cases they were not virgin soils but had been used by the ryots before to grow crops of rice and dhall. In such places ordinary farmyard manure was very useful and he had known it to treble the crop."

Now in reference to these strongly expressed views surely with the tabulated results of the 27 analyses before us, we can readily understand that the character and composition of the soil must be taken into consideration before arriving at any practical conclusion as to the economy of manuring. Soils naturally rich in the important constituents of plant food, as many of these specimens are and at the same time possessing a physical character capable of retaining such constituents, will continue to yield good crops under favourable seasons for a great many years in succession, the actual amount of crop depending on the weather experienced. On the other hand poor sandy soils of a porous character, and with a low retentive power will naturally require some help in the form of manure, and such help must be continued if the crop returns are to be kept up. The success and permanency of a tea garden depends upon the soil, situation, season, and the skill devoted to the cultivation of the shrub and the subsequent treatment of the green leaf.

These analyses, therefore, furnish a useful and practical standard with which to compare those of tea soils from Ceylon and other tea-producing centres.

## THE LATE OUTBREAK OF CATTLE DISEASE AT CEYLON GOVERNMENT DAIRY.

Mr. A. Lye, the Colonial Veterinary Surgeon in his report on this subject to the Director of Public Instruction says with regard to the last imported Dairy Stock that he purchased these cows (twenty-three one of which was drowned in Kurachi owing to the boat having been capsized) in Kurachi on December 12th and 13th, and left Bombay per ss. "Culna" with them on December 22nd and arrived in Colombo on December 31st, all animals being healthy; and on the same day he handed them over to the Superintendent. Five out of the eight sick cows died, the first-named from diarrhœa and weakness consequent on the exposure they were subjected to, through not having been landed on their arrival, and the two last of abortion, which is not an uncommon cause of death. These cows were sufficiently quarantined, and the *post-mortem* examinations made on two of them showed that none of them suffered from or died of murrain. Regarding the old dairy stock he says that disease first showed itself amongst these cows on January 14th, on which date two were reported off their food. He prescribed for them, and they were reported well on the following morning. On the 17th January these two cows were again reported sick, as also another which recovered the others dying.

The chief symptoms which had exhibited themselves in these patients were acute diarrhœa and rise of temperature, and he was of opinion that the disease had assumed an infectious form, as under certain conditions bowel complaints would do. One recovered, and after the second day the most urgent symptoms of the two were accute congestion of the lungs, which was the immediate cause of death in each case. On making a *post-mortem* examination on one he found the faintest lesion in the intestines, which might possibly have led him to suspect murrain but as there was an absence of all other indications which would point to murrain, and as similar lesions are found in dysentery, he formed no definite opinion on that point. The other died the following day, and the *post-mortem* appearances did not present any indications of a suspicious character. Six cows were reported sick on the 24th January, six on the 25th January, two on the 28th January, and three on the 31st January, besides which sixteen calves at various dates during that period were admitted to the infirmary. Of the above seventeen cows he was successful in saving eleven; of the sixteen calves eight recovered. Two buffaloes died on the 24th and 27th January respectively and he then reported: "The diseases now appears to be identical with that known in Ceylon as murrain." These were the first animals which died of murrain.—On the 8th day of February he accidentally learnt that murrain had broken out amongst the cattle belonging to the Superintendent, and located on the premises. He