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to extend to J.M.S.

From Whom ....

Place ....

Date ....

**SUBJECT.**

*Colonel Kennel*

*Connected Papers.*

**MINUTES.**



CIRCULAR.



4701/21

Downing Street,

16th March, 1921.

Sir,

With reference to Viscount Milner's Circular despatch of the 11th of June, 1919, I have the honour to transmit for your information, copies of the First Annual Report of the Colonial Research Committee, and to invite your attention to the summary in Appendix I of the position of research work in the Colony or Protectorate under your government.

Cmd. 1144.

I have the honour to be,

Sir,

Your most obedient, humble servant,

(for the Secretary of State),

L. S. AMERY.

The Officer Administering  
the Government of

4701/21.

4701/21

FIRST ANNUAL REPORT  
OF THE  
COLONIAL RESEARCH  
COMMITTEE,

For the period ended 31st December, 1920.

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Presented to Parliament by Command of His Majesty.  
*February, 1921.*

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FIRST ANNUAL REPORT  
OF THE  
COLONIAL RESEARCH COMMITTEE,

For the period to the 31st December, 1920.

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*Origin of the Grant in Aid of Colonial Research.*—At a time when Parliament had lately made increased provision for research in this country, the attention of the Secretary of State for the Colonies was called to the need for the extension of the application of research to the development of the economic resources of the Colonies and Protectorates, and for the assistance of the smaller Colonies and Protectorates in this matter by means of financial help towards carrying out researches which they could not afford.

The Committee on Commercial and Industrial Policy after the War had pointed out that a large number of raw materials were either not produced at all within the Empire or were produced on a scale altogether incommensurate with the requirements of the Empire. The Secretary of State was of opinion that much of this deficiency could be supplied by the tropical Colonies if their great potential resources were adequately developed; and that one of the most sure and speedy agents in such development was undoubtedly scientific investigation. In support of this view the following instance was given. One of the conspicuous examples of material produced to an insufficient extent within the Empire, to which the Committee on Commercial and Industrial Policy had called attention, was bauxite, the ore of aluminium. At that time the Empire was almost entirely dependent on foreign countries for its supply of this ore, and there was good reason to anticipate that it would be increasingly difficult to obtain adequate supplies from those countries.

Extensive deposits of bauxite had long been known to exist in India, but, owing to the cost of transport, these deposits were not likely to be made available to meet the needs of the United Kingdom. Aluminium in the metallic state and in its compounds is essential to a number of important British industries, and it was important that an alternative supply of the raw material should be found within the Empire. Investigations by Professor J. B. Harrison, C.M.G., the Director of Science and Agriculture in British Guiana, had resulted in the discovery of extensive deposits of bauxite in that Colony, some of which are situated very conveniently for the shipment of the ore. Major Kitson, the Director of the Geological Survey of the Gold Coast, had also discovered valuable deposits in that Colony, though they were not so favourably situated for export as those in British Guiana. Some of the deposits in the latter Colony were already being worked.

This was a solitary instance, but it was regarded as typical, and it could be supported by many others drawn from different parts of the Empire.

But, apart from the introduction of new industries, the Secretary of State was impressed by the enormous amount of damage done to the existing industries in the Colonies by destructive agencies of various kinds, such as animal and plant diseases and insect pests. The scale on which this destruction takes place is well illustrated by the following extract from a despatch from the Acting Governor of the East Africa Protectorate, now the Kenya Colony :—

“ More scientific and progressive methods must be adopted in dealing with stock diseases in native reserves if the future welfare of the stock industry is to be secured. It would be difficult to estimate the annual loss from the ravages of stock diseases in native reserves, but if it were placed at the low estimate of 12 per cent. it would easily represent a sum of approximately one million pounds per annum ”

Mr. Long, who was at the time Secretary of State, regarded investigation into these diseases and pests as apt to prove exceptionally fruitful, because many of the diseases and pests were widely distributed and scientific discoveries which were made in one Colony could often be utilised in others.

Mr. Long approached the Treasury in the matter, and the Lords Commissioners agreed to place on the estimates of the United Kingdom a grant for the assistance of the poorer Colonies and Protectorates in conducting the necessary researches. Instalments of the funds for this purpose have since been voted by Parliament. The conditions of the grant have been slightly varied from their original form. The present intention is that Parliament shall be asked to vote a sum of £100,000 in all. £1,000 has been voted for 1919/20 and £10,000 for 1920/21. The vote proposed in 1921/22 will be £10,000, and those proposed in subsequent years are not to exceed £20,000 each.

*Conditions of the Grant.*—The grant is made on the understanding that, in the administration of the funds, the Secretary of State will utilise, as far as possible, the services of existing agencies, and will co-operate with such bodies as the Imperial Mineral Resources Bureau and the Department of Scientific and Industrial Research. It is contemplated that the expenditure should proceed on the lines of supplementing, where necessary, the funds of the Colonial or Protectorate Governments immediately concerned, and that, when practicable, conditions should be imposed in order that expenditure on researches which produce results of economic value may be recovered from the industries which benefit by them. It was agreed that the Treasury should not be asked to sanction expenditure in addition to the proposed grant for any purpose falling within its scope, and that care should be taken to avoid any duplication of work or conflict of policy with bodies subsidised from public funds for assisting in or advising upon the economic development of the Empire. It was also agreed that, if any part of the grant were devoted to research into disease, it was desirable that the co-operation of the Medical Research Council should be secured. It was arranged that a report on the utilisation of the grant should be presented annually to Parliament.

*The Colonial Research Committee.*—The Secretary of State decided to entrust the administration of the grant to a Committee, which took the name of the Colonial Research Committee. The first Chairman was the Right Honourable Austen Chamberlain, M.P., who resigned his post upon his appointment to be Chancellor of the Exchequer and never actually took up the duties. He was succeeded as Chairman by Mr. (now Sir Halford) Mackinder, M.P. The other members of the Committee are now, and have been from its inception, the two Assistant Under-Secretaries of State who deal with the Colonies and Protectorates, Sir Herbert Read and Mr. G. E. A. Grindle; and a representative of the Department of Industrial Research. Sir Frank Heath, the Secretary of that Department, is its representative, but Mr. Abbott, one of the Assistant Secretaries, has acted on several occasions as deputy for Sir Frank Heath.

*Policy and Methods.*—At its first meeting, on the 10th of April, 1919, the Committee considered the general question of the policy and methods which they would adopt. It appeared to the Committee that their activities might ordinarily be employed in three ways:—

- (1) By the employment of officers to conduct investigations under the supervision of the Committee.
- (2) By grants in aid of Colonial revenues or other funds, to be expended, usually by Colonial Governments, upon researches which had been approved by the Committee.
- (3) In the case of Colonies whose financial position was such that they were themselves able to defray the necessary expenses, the Committee would endeavour to encourage research by means of enquiries, information and suggestions.

As a preliminary step, the Committee decided to recommend that despatches should be sent to all the Colonies and Protectorates drawing attention to the need for a review of the activities carried on by, or on behalf of, the Colonial or Protectorate Governments in scientific research and economic exploration, and for the consideration of all promising schemes either for new work of this description, or for adding to or widening the scope of work already in progress. In the case of Colonies and Protectorates which are likely to be eligible for participation in the research grant, particulars of the grant were added, with a request that the Officer Administering the Government should send any proposals which he would wish to be laid before the Committee in connection with the grant. These despatches are reprinted in Appendix I.



The Committee expressed its willingness to consider in the meantime such proposals as could be put before it in a sufficiently complete form either by the Colonial Office or by Colonial officers on leave in this country. Prior to the receipt of replies to these despatches the Committee found it possible to take definite action in regard to two such matters only, namely, a proposal made by the Governor of the Bahamas for the investigation of sponge, and a proposal made by the Colonial Office and the Ministry of Agriculture and Fisheries jointly for the preparation of a report upon Colonial fishes.

Having regard to the temporary nature of the grant for Colonial research, the Committee decided that they could not undertake any responsibility for the maintenance, as distinguished from the equipment, of any permanent institution. For various reasons, among which the danger of overlapping with the work of other agencies was prominent, the Committee are for the present regarding purely medical questions as beyond their scope. It is otherwise when such questions have a directly commercial aspect as in the case of fish poisoning hereafter referred to, which constitutes a bar to the establishment of an export trade in fish. The Committee regards veterinary matters as falling within its purview.

In the consideration of agricultural subjects the Committee were assisted by Sir David Prain, C.M.G., F.R.S., the Director of the Royal Gardens, Kew. Generally speaking, the Colonial Governments support agricultural research from their own funds, particularly such research as is immediately called for in connection with outbreaks of fungus diseases and insect pests. Moreover the Imperial Government already defrays the cost of the Imperial Department of Agriculture for the West Indies, which conducts a number of researches useful to the agriculture of the West Indies as a whole, and particularly to the Leeward and Windward Islands. A note on the activities of this Department will be found in Appendix II. Accordingly, the agricultural questions which it is appropriate for the Committee to entertain resolve themselves into those of financial assistance to the poorer Colonies, and of handling a few special problems which concern more than one Colony or have proved too difficult for the unaided resources of a single Colony.

In the consideration of proposals for geological and mineralogical investigations, the Committee were assisted by Dr. J. W. Evans, F.R.S., the Adviser to the Colonial Office in regard to minerals other than petroleum and coal. Apart from the proposals laid before the Committee, a large amount of work of this class is being carried out by the more prosperous Colonies from their own resources and several extensions of this work are in contemplation. A number of references to the subject will be found in Appendix II.

The Committee has benefited by the advice of a number of other officers and private individuals, among whom they desire specially to mention Sir Sidney Harmer, F.R.S., Director of the British Museum (Natural History), who attended a discussion on fish poisoning and has kindly consented to supervise the sponge investigations, and Professor Stanley Gardiner and Mr. J. O. Borley, O.B.E., of the Ministry of Agriculture and Fisheries, who advised the Committee upon fishery questions.

The Committee has had abundant proof of the difficulty which exists in obtaining the services of suitably qualified men to conduct investigations, and accordingly welcomes the appointment of a Committee under the chairmanship of Lord Chalmers to deal with the question of increasing the supply of such men, and looks forward to co-operating with that Committee in various ways. The difficulty has been especially felt as regards mycologists, entomologists, and economic botanists.

The following are particulars of the principal proposals received from the Colonies and considered by the Colonial Research Committee.

#### EAST AFRICA.

With regard to the East African Colonies and Protectorates, the Committee has hitherto been approached only on behalf of Nyasaland, but it may be expected that applications on behalf of others will shortly be received. The Committee considered the proposals made by Nyasaland of which particulars are given in Appendix II. They were favourably disposed to the proposals for the purchase of laboratory equipment, and for the supply of boring apparatus to be used in a search for coal and water. The Protectorate has been informed that the Committee will be prepared to recommend a grant for these expenses amounting to £2,000 or £3,000 upon the receipt of a detailed list of the apparatus required. The Committee



suggested that the question of experimental work with a view to the production of industrial alcohol should be referred to the Department of Scientific and Industrial Research.

#### EASTERN COLONIES.

The Committee has been but little concerned with the larger Colonies and Dependencies in this group, namely, Ceylon, Hong Kong, the Straits Settlements and the Federated Malay States, which are on so considerable a scale that they are able to conduct all necessary researches out of their own resources. The only proposals from an Eastern Colony which have been dealt with by the Committee are those of Seychelles.

#### SEYCHELLES.

Particulars of the researches desired by this Colony will be found in Appendix II. Sir David Prain was asked for his observations in the matter, and replied that it was clear that the services of a competent mycologist were urgently required in the Islands, and that those of an entomologist were at least desirable. Sir David Prain added that, in the event of its being found impossible to provide salaries for both the suggested officers, it would be advisable to employ, if such a man could be found, a well-qualified agricultural pathologist, competent to deal fully with mycological questions, and at the same time sufficiently, if partially, with those entomological questions that call for solution. The man selected should, in addition, know enough about matters connected with the soil to be able to take a broad view of pathological questions generally.

The Committee recommended that a grant of £1,200 should be made to cover the expenses of the employment of such an officer for a period of one year, provided that the Colonial Government gave an assurance that the expenditure would be refunded if that officer's researches resulted in any discovery of marked economic value to the local agricultural industries.

The Committee also considered a suggestion, which the local Government were inclined to press, to the effect that the fisheries were capable of considerable development and ought to be made the subject of expert investigation. Upon this subject the Committee had the benefit of the advice of Professor Gardiner who had visited the Colony and had trawled in its waters. He stated that the marine banks were coral banks less than 30 fathoms in depth, and were incapable of supporting a large fish population. He found no evidence and saw no probability of the existence of fish in commercial quantities. In these circumstances the Committee decided that they could not recommend that any further action should be taken in the matter.

#### MEDITERRANEAN.

The only question relating to these Colonies which has been specifically referred to the Committee is that of the development of the wine industry in Cyprus and Malta. This question was considered at a meeting which was attended by Mr. P. F. Chaplin, Mr. L. R. M. Chaplin and Lord Blyth. Mr. P. F. and Mr. L. R. M. Chaplin gave an account of the present position of the wine industry in Cyprus, with which they had been long and closely connected. They considered that the area under cultivation could easily be extended and that the extension could be made upon areas which are at present uncultivated and accordingly without detriment to any other crop. When they were asked in what way they thought that the Government of Cyprus could give further assistance to the industry, they considered that it would be useful if the members of the Agricultural Department, who already gave instruction in wine cultivation to the peasants, could be enabled to devote more time to this work, and they thought it advisable that the Agricultural Department should obtain the services of a man who had had experience of wine cultivation in other countries and could give the present instructors the advantage of his experience.

The Committee were of opinion that the suggestions of Mr. P. F. and Mr. L. R. M. Chaplin were matters for the attention of the Colonial Government.

The Committee accepted a proposal that a suitable officer should be employed to make enquiries regarding wine production in foreign Mediterranean countries,

with a view to ascertaining points which might be of value particularly to Malta and Cyprus, but also to other parts of the Empire. They decided to recommend a grant of £300 towards the expenses of this work on the understanding that the balance of the expenses would be defrayed by the Government of Malta, and that the results of the enquiry would be made available not only for Malta, but also for Cyprus and the Empire generally. The total cost of the work was estimated at £600.

It was at first contemplated that Dr. John Borg should be employed on this mission, but the Government of Malta did not find it possible to spare his services, and the officer finally selected for it is Mr. Paul Borg, Plant Pathologist in Malta, who is a qualified chemist.

#### WEST AFRICA.

The West African Colonies, with the possible exception of the Gambia, are on so considerable a scale, and at present so prosperous, as to be ineligible for participation in the grant. The Committee has received no application from any of these Colonies.

#### WEST INDIES.

##### BAHAMAS.

At a meeting, at which the then Governor of the Bahamas, Sir W. L. Allardyce, K.C.M.G., was present, the Committee considered a memorandum by him upon the need for the investigation of sponge in the Bahamas, with special reference to the question of the possibility of extending its cultivation, which was widely practised in Florida and had lately been shown to be practicable in the Colony. A full summary of the memorandum is printed in Appendix II. The Committee decided to recommend that a Research Officer for sponge should be employed, and that he should be principally stationed in the Bahamas, although it was hoped that the results of his work would be valuable elsewhere in the West Indies, and also to Colonies in other parts of the Empire. The grant contemplated was £4,500, spread over three years. Effect has been given to these proposals. On the recommendation of Sir Sidney Harmer, Mr. L. R. Crawshay, of the Marine Laboratory, Plymouth, has been appointed Research Officer for Sponge. He left this country in May, 1920, to take up his duties, and has furnished a preliminary report on the steps which he is taking to set up a laboratory in the island of Abaco. The Committee have approved of an additional grant of £600 for the establishment of this laboratory, and the Colonial Legislature has voted £100 a year towards the general expenses of the investigation.

##### BRITISH HONDURAS.

*Forestry.*—British Honduras originated as a settlement of mahogany cutters, and the mahogany industry continues to be the most important in the Colony. In 1919 the Secretary of State drew the attention of the Governor to the facts that the Colony was not in possession of the services of any scientifically trained forester, and that its forests had not been examined by such an officer for upwards of 30 years. It was pointed out that, in the absence of further expert investigation, it was not possible to evolve a satisfactory policy for the conservation and utilisation of the forests.

The Secretary of State suggested that, in the first instance, a trained forest officer should be employed to make a survey of the extent and present condition of the forests in sufficient detail to enable the available supplies of mahogany and other kinds of timber to be calculated. In this connection he suggested that it would be well to study the conditions of the natural reproduction of mahogany trees, and the question of the advisability of artificial planting, which was little practised if at all. He added that there also appeared to be scope for the study of the diseases, pests and other causes which led to the production of inferior wood, and, in particular, of the possibility of devising protective measures against the Tereido worm.

As secondary objects of the enquiry, the Secretary of State suggested the consideration of the possibility of establishing an export trade in timber of kinds other than those already exported, and of introducing into the Colony new forest industries, such as the making of wood pulp or the destructive distillation of wood.

The Governor concurred generally in the suggestions of the Secretary of State, and the Legislative Council agreed to vote a sum not exceeding \$4,000 to defray the expenses of the visit of an experienced forest officer.



The Director of the Royal Botanic Gardens, Kew, advised that it would not be possible to make an adequate investigation in less than 12 months, and it was found necessary to offer a salary of £900 a year in order to obtain the services of a suitable officer. Apart from salary, travelling expenses would be heavy, and it became clear that the work could not be carried out for \$4,000. It was represented to the Committee that, having regard to the exceptionally heavy expenditure in which the Colony had been involved, owing to the war, to a serious fire at Belize, which destroyed the public offices and to other causes, it was not in a position to meet the extra cost, and the Committee agreed to recommend that the cost should be defrayed from the Research Grant up to a maximum of £1,000, which was approximately the equivalent of \$4,000 at the current rate of exchange.

Mr. C. Hummel, who was a fully trained forest officer and had formerly been employed in the Forestry Department of the Federated Malay States, was selected to undertake the investigation, and embarked for the Colony in July, 1920.

*Panama Disease of Bananas.*—This disease, which has had devastating effects on the banana industry in the greater part of Central America, has appeared in the Stann Creek valley, where it threatens the banana plantations with extinction. It is due to the presence in the soil of a vegetable organism known as a *Fusarium*. The disease has already received considerable study, but no remedy has been found, and the only measures in force against it are designed to check its spread by means of quarantining infected areas.

The disease has also entered Jamaica, but apparently in a less virulent form. In that Colony quarantine measures have hitherto proved fully effectual in preventing it from spreading, but the Stann Creek valley, in British Honduras, is liable to floods, which carry the disease, and quarantine has proved of little avail.

Great efforts have been made by the United Fruit Company of Boston, U.S.A., to find a variety of banana which is immune to the disease and is also suitable for commercial cultivation. Varieties are known which are highly resistant or altogether immune, but while some of these are suitable for local use they are unfit for export owing to bad keeping qualities or other defects.

The Committee is in communication with the Director of the Royal Gardens, Kew, the Imperial Commissioner of Agriculture, and the Colonial Governments concerned, with a view to arriving at a conclusion upon the question whether the prospect of success is sufficient to justify expenditure upon further experiments.

*Minerals.*—The Committee were advised that the mineral resources of British Honduras were little known, but that there were possibilities that mineral oil or bauxite might be discovered in the more recent rocks which occupy most of the area, and that gold or other minerals might occur in the older beds which underlie them and outcrop in the interior. The Committee were also advised that in any case it was desirable that the Colony should be prospected and examined geologically for the sake both of the mineral resources that might be disclosed and of the assistance that might be rendered to agricultural development. The Legislative Council of the Colony were in full accord regarding the need for investigation, but had been unable to proceed for lack of sufficient funds. The Committee was of opinion that a suitable officer should be employed upon a general geological and mineralogical examination of the Colony during a period of three years, at an estimated total expenditure of about £4,800, inclusive of salary, the cost of apparatus, travelling and incidental expenses. The Committee recommended that one-half of this sum should be paid from the Research Grant, provided that the Colony undertook to pay the other half. The Colony has since given this undertaking.

It was necessary to require a high physical standard in the candidates for this employment, which involves a rough life in the bush. As a result two selected candidates were rejected by the medical adviser, involving considerable delay. However, an Australian candidate, Mr. Ower, has now been appointed and will shortly proceed to England to confer with the Petroleum Department, the Imperial Mineral Resources Bureau and the Colonial Office regarding his programme and methods of work.

#### JAMAICA.

This Colony is interested in the question of Panama disease of bananas which is dealt with under the head of British Honduras.



## LEEWARD ISLANDS.

Having regard to the information supplied by the Governors of the Leeward and Windward Islands, of which some account is given in Appendix II, the Committee decided to recommend that a suitably qualified officer should be employed upon a general geological and mineralogical examination of these Colonies during a period of three years, at an estimated total expenditure of about £3,600, inclusive of salary, the cost of apparatus, travelling and incidental expenses. The Committee recommended that one-half of this sum should be paid from the research grant, provided that the Colonies concerned undertook to pay the other half. The Colonies have since given the necessary undertaking. Mr. K. W. Earle, M.Sc., F.G.S., late of the geological staff of University College, London, has been appointed Government Geologist for this mission, and left for the West Indies in December, 1920, after a short preliminary course of special study in the methods of petroleum prospecting, which was arranged with the co-operation of the Petroleum Department and included a visit to British oil borings. He will be attached to the Imperial Department of Agriculture for the West Indies and, after a short stay at the headquarters of that Department in Barbados, will proceed first to the Virgin Islands and next to Dominica.

## WINDWARD ISLANDS.

See under Leeward Islands. It is anticipated that the Government Geologist will make an examination of the Windward Islands in 1922.

## OTHER COLONIES.

## FALKLAND ISLANDS.

The fishery possibilities of the area between the Falkland Islands and the main line are dealt with under the head "Fisheries."

## ST. HELENA.

The proposals received from this Colony are given in Appendix II.

In regard to minerals, the Committee considered that there was little prospect that any valuable result would be attained by geological investigations, but that the matter should be borne in mind when any suitable geologist was available.

The Committee agreed with the Governor that agriculture afforded the best prospect for the successful employment of a grant. They were, however, unable to undertake responsibility for the maintenance of a permanent institution such as the proposed botanic station. The Committee thought it advisable that an agricultural expert should be sent to the Colony, preferably from the Cape, to enquire into the possibility of extending and improving cultivation in the Island, and particularly how far it could be made self-supporting in regard to food supplies. A grant of £500 was recommended for the purpose.

Arrangements have since been made with the Government of the Union of South Africa for Mr. W. G. Mason, Director of Training Farms, and formerly Principal of the School of Agriculture, Elsinberg, to visit the Colony for a period not exceeding two months.

## FISHERIES.

The matters brought before the Committee in regard to fisheries proved to be so far general in character that it would be inconvenient to deal with them all under the geographical headings.

The Committee considered the question whether it was possible usefully to take measures for the development of fisheries in any Colony upon a considerable scale. Upon the advice of the Ministry of Agriculture and Fisheries, supported by the Colonial Office, the Committee arranged for the preparation of a report on the fishes of the Colonies as a preliminary step. This task was entrusted to Mr. C. Tate Regan, F.R.S., and his report has been printed in the miscellaneous series of Colonial Reports and presented to Parliament in September, 1920, as [Cmd. 958]. A grant of £70 was made to defray the cost of the report.

The Committee were advised that, before any steps could be taken for the development of fisheries on a large scale in a marine area, it was essential to consider such matters as the method of treatment of the fish caught; the possibility of marketing fish in sufficient quantities; the provision of suitable labour for the fishing vessels and factories; and the supply of tinsplate, and of fuel and marine stores for the steamers employed. The marketing of fresh fish in large quantities necessitated not only a population sufficiently large to consume the fish, but also a somewhat high development of railway transport in the consuming countries. If the result of a preliminary examination of the economic conditions and biological circumstances of the marine area in question was sufficiently favourable, the next step was to provide for the examination of actual trawling conditions. This involved the employment of a trawler of full commercial size for a period of at least a year. The cost of the upkeep of such a trawler might roughly be put at £15,000 a year. At the present time, trawlers of the Lord Mersey type, which had been used in the war, could be obtained for about £30,000, but later on it might be necessary to build a special vessel, in which case this sum would probably be greatly exceeded.

More detailed information in regard to the economic conditions which are necessary for the establishment of a fishery upon a large scale will be found in a note by Mr. Borley, printed as Appendix 17 to the report of the Inter-Departmental Committee on Research and Development in the Dependencies of the Falkland Islands, published in April, 1920, as [Cmd. 657].

The Committee have had under consideration various localities which have been brought to their notice, but in their present report they content themselves with drawing attention to the area lying between the Falkland Islands and the continent of South America. This area amounts to 250,000 square miles, and could probably support two hundred trawlers.

The Committee considered that the employment of an experimental trawler was beyond their present means, but they desired to give publicity to the matter in their report in order that it might receive full consideration by the fishing interests in this country and the Dominions.

The population of the Falkland Islands is only 2,000, and is already fully employed, mainly in pastoral industry. It will, therefore, be understood that but little local labour would be forthcoming for any fishery enterprise.

The Committee considered a number of proposals for the investigation of fisheries, received from various Colonies, but did not feel justified in taking any action upon them at present. Reference to one of these proposals is made under the head of Seychelles.

Among the collateral questions brought before the Committee was that of the further investigation of cases of poisoning due to eating certain tropical fish. It was explained that the cases referred to were sporadic cases of poisoning due to eating fish which was in general wholesome, and that it was clear that the ill effects could not be attributed merely to putrefaction. Fish poisoning of this kind had long been known in the West Indies and had also been reported from the Pacific, Federated Malay States and other places, all in the tropics. It was of course impossible for any large industry to be established in species of fish suspected of being occasionally poisonous in circumstances not yet known.

After considerable discussion it was decided that the importance of the matter did not at present warrant the employment of a special vessel for the investigation. The Committee intend to consider further whether there is any prospect that useful work could be done by means of the employment of an individual as a research officer.

## FINANCIAL.

Accounts of the receipts and expenditure in connection with the Grant in Aid of Colonial Research are given in Appendix III.

While the actual expenditure of the Committee amounts only to £1,012 3s. 9d. it has incurred liabilities more or less definite for further expenditure estimated at about £15,500, payment of which will be spread over several years. A number of Colonies which are eligible for participation in the grant, particularly some of the East African Colonies and Protectorates, have not yet submitted any definite proposals.

## THE GREATER COLONIES.

These Colonies do not participate in the grant, but the Committee think that the summaries of replies from them which are given in Appendix II will be found of considerable interest, as affording a brief account of the principal researches which are in progress and the more important directions in which new investigations are required. The Committee regret that from several Colonies of this class no replies have yet been received, and they trust that the Governments of those Colonies will see their way to supply information regarding local needs and activities in the sphere of research, which can be included in the next report and will serve to complete the review of the position of the Colonies in this matter.

The Committee are impressed with the magnitude of the research work which remains to be done in many directions, and particularly in the domains of geology, mineralogy and forestry.

H. J. MACKINDER,

*Chairman.*

E. R. DARNLEY,  
*Secretary.*

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 APPENDICES.

I.—Despatches to the Colonies and Protectorates.

II.—Annotated summary of replies to the despatches, arranged under the following heads:—

East Africa.  
Eastern Colonies.  
Mediterranean.  
West Africa.  
West Indies.  
Other Colonies.

III.—Accounts of receipts and expenditure, and estimate of liabilities.

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## APPENDIX I.

## DESPATCHES TO THE COLONIES AND PROTECTORATES.

*The passage marked A was sent only to the more prosperous Colonies and Protectorates; and that marked B only to the less prosperous Colonies and Protectorates, for whose benefit the grant is intended.*

Downing Street,  
11th June, 1919.

SIR,

At the close of the prolonged struggle of the last four years, and having regard to the depletion of raw materials which has been caused and to the vast financial responsibilities which have been left behind, it is evidently more than ever necessary that the economic resources of the Empire in general should be developed to the uttermost, and I wish to suggest to you that the time is particularly opportune for a review of the activities carried on by or on behalf of your Government in scientific research and economic exploration, and for consideration of all promising schemes, either for new work of this description or for adding to the efficiency or widening the scope of work already in progress.

2. Apart from activities of a primarily scientific nature, such as research in oceanography and meteorology, the field to be reviewed may be very wide and should not be regarded as entirely economic in character. The main portion of the possible field of research may broadly be divided into enquiries relating to sources of mechanical power, agriculture and forestry, geology and minerals, and marine products. In most of these provinces the desirable enquiries may be classified, it is true, without any precise line of demarcation, into enquiries directed to an economic or other practical end which is in sight from the first, and enquiries where the practical aim, though real, is less immediately obvious. I am decidedly of opinion that the latter class of enquiries ought by no means to be neglected, and that if they are well chosen it may be expected that in the long run they will be even more fruitful in results of practical value than enquiries of the former class. The latter class of enquiry, however, demands a scientific staff with higher qualifications, and can scarcely be attacked effectually by a small Colony acting by itself. In such cases possible combination with other Colonies similarly situated should be considered.

3. It is becoming more and more clear that there is scarcely any industry which can develop or even maintain its position without the aid of scientific research, and that it is sound policy that such research should be liberally provided for in the budgets of the firms engaged, although it is frequently necessary that those firms should combine to finance a central research association, or at least closely co-operate in research work in order to cover the whole ground and avoid overlapping. With some assistance from the Imperial Treasury a good deal is being done in this country on these voluntary lines. There will no doubt be certain Colonial firms who can best participate by contributing to the research associations of their industries in this country. But the usual method in the Colonies is for research to be carried on by the scientific departments of the Government, and financed out of the ordinary revenue and out of taxes on particular industries, while a subsidiary but important method is that of contribution to institutions for research and the like, usually situated for convenience in this country, some official, such as the Bureau of Entomology and the new Bureau of Mycology, and some unofficial, such as the research associations referred to above which are organised under the auspices of the Department of Scientific and Industrial Research.

4. Broadly, I would ask you to consider the position of any important industries in the Colony, on whose behalf no research work is at present carried on, and whether this state of affairs does not call for action on the part of the Colonial Government. I would particularly direct your attention to those raw materials required for Imperial trade or defence which are produced within the Empire either in inadequate quantities or not at all, such as flax, hemp, medium stapled cotton, the lighter timbers, ores of aluminium and copper, phosphate rock, potash and mineral oil. The question of the possible establishment or extension of fishing industries for export is also worth attention.

5. The Committee on Commercial and Industrial Policy after the War drew special attention to this question of raw materials in paragraph 122 of their final report [Cd. 9035]. Much of the existing deficiency can be supplied by the tropical Colonies and Protectorates if their great potential resources are adequately developed, and one of the most sure and speedy agents in such development is undoubtedly scientific investigation. The War has furnished a striking instance of the correctness of this view. One of the conspicuous examples of material produced to an insufficient extent within the Empire, to which the Committee called attention, was bauxite, the ore of aluminium. At the present time this country is almost entirely dependent on foreign sources of supply, and there is reason to apprehend that these will remain both costly and insufficient. Aluminium is essential to a number of British industries, and the position would be serious if alternative sources of supply had not been found within the Empire. The scientific investigations of the Director of the Geological Survey of the Gold Coast have recently resulted in the discovery of a very large deposit of the mineral in that Colony, and it is hoped that arrangements can be made which will enable it to be worked on a paying basis. Valuable deposits of bauxite have also been found in British Guiana, and are now being developed. Other deposits in the same Colony are now under investigation. If these enterprises are successful, the position of the British industries in question will be greatly strengthened.

This is a solitary instance, but it is typical, and could, if necessary, be supported by others drawn from different parts of the Empire. There can indeed be no doubt that a sound and adequate scheme of scientific investigation would be of the utmost value in developing the resources of the Colonies.

6. Another example of the need of research is furnished by the destructive agencies of various kinds, such as animal and plant diseases, insect pests, etc., which are responsible at the present time for an enormous amount of damage in the Colonies. Such damage can literally be assessed in millions of pounds. Valuable work in this sphere has already been done and continues to be done in many parts of the Empire, but there is undoubtedly great scope for extended research. Such work is likely to prove exceptionally fruitful, since many of these destructive agencies are widely distributed, and scientific discoveries which have been made in one Colony can often be utilised elsewhere. The scale on which this destruction takes place is well illustrated by a recent despatch from the Acting Governor of the East Africa Protectorate reporting that "more scientific and progressive methods must be adopted in dealing with stock diseases in native reserves if the future welfare of the stock industry is to be secured. It would be difficult to estimate the annual loss from the ravages of stock diseases in native reserves, but if it were placed at the low estimate of twelve per cent. it would easily represent a sum of approximately one million pounds per annum."

7. In Colonies and Protectorates whose financial resources are small, such as the one under your government, there has hitherto often been great difficulty in finding the means to carry out investigations in themselves very desirable. I am glad to be able to inform you that, for the benefit mainly of such Colonies and Protectorates, I have obtained the consent of the Lords Commissioners of the Treasury to the provision of a liberal grant of £20,000 a year from the Estimates of the United Kingdom for 1919-20 and the four following years, to be expended in stimulating scientific research with a view to developing the economic resources of the Colonies and Protectorates. This grant, if it is duly voted, will be administered by a small Committee, to be known as the Colonial Research Committee, which will work in co-operation with the Department of Scientific and Industrial Research, the Imperial Mineral Resources Bureau, the Universities, particularly those of industrial districts, and other existing institutions. In the first instance, the members of the Committee will be Mr. H. J. Mackinder, M.P. (Chairman), two Assistant Under Secretaries of State for the Colonies, and Sir Frank Heath, the Secretary of the Department for Scientific and Industrial Research. The grant, liberal though it is, is evidently insufficient for a large number of researches, and the Committee will have to content itself with selecting for investigation a few of the most promising of the subjects which may be brought to its notice.

**A** [It may sometimes be the case that a research may be required which would be chiefly in the collective interests of the Empire or in the interests of some part of it other than the part in which the research would be carried out. If it were convenient that such a research should be undertaken by a Colonial Government, the fact that that Government is prosperous would not debar it from participating in the grant.]

8. To the whole question of research and investigation raised by this despatch I attach the greatest possible importance, and I trust that you will give it your personal consideration, in consultation with your scientific and economic officers and with suitable members of the unofficial community, and that you will then furnish me with a brief review of the present position of affairs, and with an account of the further steps which in your judgment should be taken in the near future.

**B** [You should also send in time to arrive by the end of November next particulars of any proposals which you may wish to be laid before the Committee in connection with the grant for 1919-20. It would be well that you should not omit any appropriate research of which the need can be foreseen, since but few researches can be completed in one year, and accordingly the grants for years subsequent to 1919-20 may be to some extent hypothecated by the Committee's first decision. If you are ready to make any particular proposal at once, such proposal should be sent in advance of the general review, and as soon as possible.]

9. There is no objection to the publication of this despatch.

I have the honour to be,

Sir,

Your most obedient, humble servant,

MILNER.

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## APPENDIX II.

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This Appendix consists of a summary of the replies received to the despatches printed in Appendix I, and gives a brief review of the principal researches which are being carried on by the Colonial Governments out of their own resources. In some cases notes have been added giving particulars of measures adopted since the dates of the replies, and other supplementary information.

### EAST AFRICA.

#### KENYA COLONY.

The greater part of the Governor's reply is quoted below:—

"The subject of research is, of course, a very extensive one, but it has, to some extent, been covered by the Report of the Economic Commission, published at Nairobi in 1919. I have now consulted the heads of the various Departments principally concerned and the following remarks are a brief indication of the existing position, though they are in no way exhaustive.



The resources of the country may be roughly divided into three heads.

- (a) Native labour supply.
- (b) Minerals and means of generating mechanical energy.
- (c) Agricultural and pastoral possibilities.

As regards (a) there can be no doubt that the question of the native labour supply is one of the most important problems with which we are at present confronted. In connection with native administration generally considerable progress has been made. A Chief Native Commissioner has been appointed and an organisation sketched out for separating the native reserves for administrative purposes from the areas where white settlement is predominant. Legislation has been introduced for registration and also for the control of squatters on European Farms.

(b) Minerals.—In this direction a considerable amount of investigation has already taken place and it seems improbable that there are any deposits of the more valuable ores on a commercial scale in the Protectorate. Mica and graphite have been worked experimentally, but have not proved payable. Soda at Lake Magadi is being extracted by a company and exported.

Minerals which it would probably be worth while to investigate are baryta, manganese, diatomaceous earths and bituminous shales. The possibilities of salt manufacture have been treated in a monograph by Mr. Hobley and the subject might be pursued further. The production of cement seems, also, a practical proposition, as there are undoubtedly deposits of suitable limestone and a plentiful supply of this material would assist the development of the Protectorate enormously.

Generally speaking, the carrying out of further topographical surveys is recommended and the extension of the Mineral Research Department. The activities of the Colonial Government in this direction have necessarily been curtailed through lack of funds.

As far as East Africa is concerned the sources of mechanical power resolve themselves, for all practical purposes, into wood and water, neither coal nor oil having been discovered in payable quantities. Wood has been somewhat wastefully employed in the past for the generation of energy and an extended application of water-power is very desirable. Many estates are now making use of it, both in the way of turbines and of plant for the production of electricity, and this tendency is on the increase. The Acting Director of Public Works is of opinion that no unit or group of units exists large enough to justify its consideration by Government from the point of view of public utility. A Government Hydraulic Engineer has recently been appointed to consider the question of water supply, its conservation and utilisation both for power-production and irrigation. It is very probable that much might be done by sinking bores in suitable places. Investigation is also required into the possibility of treating the effluents from sisal, coffee, and flax factories by filtration or other means so as to render them innocuous.

The Analytical Department occupies a position midway between the sub-divisions (b) and (c) of this enquiry. Considerable progress has been made in the examination of rocks, minerals, and soils, and researches have been instituted into the effect of environment upon the anatomy and physiology of plants. A greatly increased staff, both in the Analytical Laboratory itself and for investigation in the field, is however required for the prosecution of this important investigation. A section devoting itself to meteorology and climatology should also be formed and attached to the Department. At present the only meteorological officer belongs to the agricultural staff.

The Government has not neglected the agricultural possibilities of the Colony. On the practical side we have experts in coffee, pig and dairy products, horticulture, cereals, flax and tobacco. There is an Economic Plants Division and there are experimental farms at Mazeras, Kibos, Kabete and Naivasha, while a fifth farm is shortly to be established on the Uasin Gishu Plateau. On the scientific side there is a Division of Entomology and a Mycologist. All these services, particularly the latter, could however be greatly extended, were funds available, as the field of investigation is a very wide one. The creation of a separate division of scientific botany is advocated.

The same remarks apply to the sphere of veterinary activities. It has long been recognised that the stock industry is one of our most important and valuable assets and considerable sums of money have been spent upon it. A well-equipped laboratory has been established at Kabete and much useful work has been done in connection with the diseases of cattle and other animals and the preparation of preventive sera. The Colony has also supplied large quantities of the latter to neighbouring Governments. The possibilities in this direction are however infinite, and further expenditure and increased staff would enhance the value of the institution and produce even greater results. On the practical side there is a similar need. To prevent the spread of disease and to encourage the development of an export and cold storage trade, the stock industry requires more supervision and control than the Department, short-handed as it is, can exercise at present.

In the domain of forestry the work so far accomplished has been mainly of a conservative nature. Considerable areas have been demarcated and measures taken to prevent destruction by native encroachment or external agencies, such as fire. The energies of the Department have, however, necessarily been directed mainly to the supervision of cutting operations and the control of wasteful exploitation. So far local demands have absorbed all available supplies, and there is still such a shortage of seasoned timber that large quantities have to be imported. There are prospects, however, of an export trade in pencil cedar (*Juniperus procera*) and bamboo pulp for paper-making.

The Conservator is anxious to extend his experiments in methods of forest regeneration, and presses for the establishment of a Bureau of Forest Research at an estimated expenditure of £3,000 initial and £1,500 recurrent. There is no doubt that such an institution would be extremely useful."

*Note.*—It may be remarked that immediate development is confined within narrow limits by the scarcity of labour. The Economic Commission draw special attention in their report to the need for more vigorous measures to cope with preventable diseases among the native population.

#### NYASALAND.

The Governor reported that the recent appointment of a Geologist had enabled the Protectorate Government to proceed with a more extensive investigation than had been possible in the past. The Geologist had completed his enquiry and report on mica, and would next give his attention to coal deposits, and to lime, clays and earth suitable for the manufacture of cement.



The Governor considered that the principal needs of the Protectorate in the nature of research were as follows:—

- (1) Laboratory equipment for agricultural and veterinary research, including the analysis of soils, manures, etc., entomological and mycological work, and veterinary bacteriology.
- (2) The provision of boring plant for the further investigation of minerals, particularly coal, and for water boring in order to enable natives to settle on areas which are now comparatively arid and to bring them under cultivation.
- (3) Plant for experimental work in the manufacture of industrial alcohol.
- (4) The purchase and importation of animals for the improvement of stock.
- (5) Expert advice on the development of water power in the Protectorate.

*Note.*—The Colonial Research Committee have offered financial assistance to the Government of the Protectorate, as stated in the body of the report.

#### SOMALILAND.

No reply to the despatch has been received from this Protectorate.

#### TANGANYIKA TERRITORY.

The Acting Administrator reported that the possibilities of the country as a producer of fibre, cotton, copra, coffee, wheat, maize and other cereals, beans, potatoes, timber, cattle and sheep, hides and skins, and probably of minerals, were very great. Mr. Hollis considered however that it would be premature for him to ask for a grant in order to stimulate scientific research until a decision had been arrived at in regard to the policy to be followed in the Territory and the manner in which the development of the natural resources of the country must be undertaken, and until a staff of scientific officers had been provided.

Mr. Hollis drew special attention to the importance of combating the spread of rinderpest and other cattle diseases, and for this purpose he advocated the re-opening of the former German laboratory at Mpapua and the establishment of a strong veterinary department. The existing supply of cattle was believed to number 2,000,000 head.

*Note.*—The recommendation that a veterinary department should be established has been approved and the department is now being constituted. The Chief Veterinary Officer and his Deputy and most of the other officers have already been appointed.

A geologist has been engaged and proceeded to the Territory at the end of 1920.

#### UGANDA.

The Governor reported that the most important subject in which scientific investigation had yet to be developed was that of the mineral resources in the Protectorate. From the preliminary examinations which the geologist, who was appointed only in 1919, had been able to undertake, it appeared that the possibilities in this direction were very promising.

The Governor considered that efforts should be made to utilise, for the manufacture of paper, the enormous tracts of elephant grass and papyrus which were found in most districts. There had been much correspondence on this subject, and the real impediment was the cost of transport to England. The Governor thought that if paper could be manufactured locally, it would find a ready market in the neighbouring British territories, South Africa, and possibly India.

The Governor understood that it was improbable that the cultivation of flax would meet with any great success in the Protectorate, but he intended that experiments should be undertaken. He thought that sisal hemp offered greater possibilities, as there were large areas which appeared from a cursory examination to be similar to those on which this product was successfully cultivated in the Kenya Colony. Every effort would be made to increase the area cultivated in cotton.

The Governor entirely agreed that research into the diseases of plants and animals should be extended, and as regards the latter he had asked that the Chief Veterinary Officers of the Kenya Colony and Uganda should prepare a comprehensive scheme while on leave. In connection with next year's estimates a request would be made for further staff for the Agricultural and Veterinary Departments.

The Governor remarked that the question of the development of the water power which was available at the Ripon Falls and elsewhere required careful consideration. The matter had been reported upon by Mr. J. McBlain, Electrical Engineer in the Public Works Department at Nairobi.

The Governor added that he proposed to appoint a Commission to consider the steps to be taken to ensure the sound and systematic development of the Protectorate.

*Note.*—This Commission was appointed under the title of the Uganda Development Commission, and an extract from its report is appended.

*Coffee.*—“ It is estimated that the acreage under Arabian coffee on Europeans' plantations is slightly over 21,000. The quality generally is excellent, and commands a high price in London markets. The progress of the industry will be realised from the fact that in 1918-19, in spite of great difficulties through shortage of labour, restrictions on imports into the United Kingdom, scarcity of shipping and prevalence of pests, 54,311 cwts., valued at £106,009, were exported, being 8·5 per cent. of the total exports. In 1914-15, which may be regarded as the last year in which normal conditions obtained, the acreage was 14,386, and the exports 21,101 cwts., valued at £41,000. The present acreage, when in full bearing, should yield 4,000 tons a year, or one-third of the consumption of the United Kingdom.

“ A certain amount of coffee, chiefly *Coffea robusta*, is grown by natives, but the crop at present receives very little attention. The Government Botanist informs us that these gardens are hot-beds of disease.

“ The industry generally is a valuable one, and deserves every assistance. We do not consider that the permanent appointment of an officer to advise on it is necessary, but we recommend that arrangements should be made for a gentleman possessing practical knowledge of the cultivation of

the crop to visit the Protectorate at intervals and to inspect the plantations. The information which he would be able to supply with regard to the best methods of tilling, planting, pruning and the preparation of the berry for export would be very helpful.

*Rubber.*—“ The acreage under Para Rubber (*Hevea brasiliensis*) on European Plantations is estimated at 11,255, but the area available for tapping is still small owing to the considerable proportion of trees planted in recent years. The export of plantation rubber for the year 1918-19 was 253,063 lbs., valued at £12,893, being an increase of 108,336 lbs. over the previous year, and an increase in value of £2,928. The crop is also under cultivation by natives in certain districts.

“ We have had the evidence of a gentleman who has experience as a rubber planter in Sumatra and the Federated Malay States, and in his view the future of rubber in the Buganda Province is assured, provided that the industry receives proper assistance while still in its infancy. He regards the soil as superior to that of the Federated Malay States, the configuration of the land as almost ideal, and the risk from disease as small, owing to the fact that the areas under cultivation were originally grass, not forest, land. The rainfall certainly is less, but tapping on alternate days will compensate for this. He also thinks that trees will grow here quite as quickly as in Sumatra.

*Cotton.*—“ Cotton is the principal product of the Protectorate, and is grown almost entirely by natives. The quality is good, and commands a high price in the Liverpool market. In 1918-19 slightly over 31 per cent. was obtained as the lint percentage by one ginning firm in the Eastern Province.

“ The area under cultivation during the present season is estimated at 155,000 acres, or 20,000 acres in excess of last year. The crop for last season was approximately 35,000 bales, or about 9,000 bales more than in the previous season. For the current season a crop of at least 50,000 bales is expected.

*Sisal.*—“ Sisal has been proved to grow satisfactorily in Buganda, and we believe that there are large areas in which it could be cultivated with success. The indigenous bowstring hemp and Ramie fibre should also be exploited.

*Cocoa.*—“ Experiments in cocoa have not been very promising, but we think that they should be continued. In particular, we advocate the use of different varieties of seed and investigation into the suitability of different localities.

*Miscellaneous Crops.*—“ Much more can be done with rice and wheat, and also with sugar and tobacco and tea. The prospects of all these crops are favourable, and they will repay attention. Quinine and cocaine might also be tried. In addition, large areas are suitable for maize, beans, peas, millet, simsim, groundnuts and other oil seeds, all native products, and the provision of cheap rates on the Uganda Railway, whereby export could be undertaken with profit, would result in an enormous increase of the acreage under cultivation. The reclamation of the swamps would provide large areas suitable for rice and sugar.

“ Efforts should be made to revive the export of chillies, which in 1910-11 exceeded £20,000 in value.

*Fruit.*—“ We recommend the introduction of more suitable fruit trees, such as peaches, Japanese plums, mangoes, mangosteens and litchis.

*Paper.*—“ Excellent paper has been made from elephant grass. It is possible that the enormous areas of papyrus (*Cyperus papyrus*) in the lakes and swamps could be profitably utilised for this purpose.

*Silk.*—“ Before the War a foreign firm was engaged with considerable success in the cultivation and export of silk cocoons from the Bredilia tree, and investigations would probably be repaid.

*Plant Diseases.*—“ We are informed that the climate of the country in general is admirably suited to agriculture, and that plant diseases are far more rare than in other tropical countries.

*Agricultural Staff.*—“ The staff of the Agricultural Department requires strengthening. We have already dealt with the question of advisers on coffee and rubber, but more officers with a practical training in agriculture, and others for research work, are needed. For instance, a plant-breeding expert is essential, and most of his work could be carried out on the existing Government plantations.

*Government Plantations.*—“ Until more officers are available, the country will not receive full benefit from these plantations. They should be of great value if more experiments are undertaken in the cultivation of fresh products and in the selection of the best seed. Pamphlets should be issued from time to time containing the results of such experiments, with details regarding the cost of production as compared with other countries, and advice as to the most suitable localities for each product, and the best methods of preparing it for export. Practical demonstrations of the cultivation and preparation of crops should also be given periodically at convenient centres. No experiment should be abandoned without the fullest consideration, even though at first it may appear unlikely to succeed.

*Agricultural Bulletin.*—“ We believe that an Agricultural Bulletin, issued quarterly or half-yearly, would be much appreciated, and a special feature of the Annual Report of the Department should be advice regarding the pests, diseases, practical cultivation, preparation and marketing of plantation crops.

*Industrial Alcohol.*—“ The possibility of the local manufacture of industrial alcohol should be thoroughly investigated.

*Agricultural Farms for Natives.*—“ We have already mentioned the training of natives in agriculture. We suggest that it might be useful if one or two small agricultural farms were established for the purpose of demonstrating to the native the proper methods of cultivation. Agricultural shows for native crops and industries would also be of help.

*Principal Forests.*—“ The principal forests are the Mabira forest, the Budongo forest, the Bugoma forest, the Kibale forest, and the Tero forest.

*Timber to be exploited.*—“ Generally speaking, the timber of the Protectorate is not sufficiently valuable to export, but it is well worth exploiting, and there is much that can be used locally in place of imported timber. For instance, the Tero forest is computed to contain 5,209,667 cubic feet of timber, most of which is *Podocarpus milanjanus*, commonly known as the yellow wood of South Africa. In the Budongo and Bugoma forests the predominant species is ironwood, which could be Africa. In the Budongo and Bugoma forests the predominant species is ironwood (*Olea hochstetteri*), which could be used for railway sleepers and heavy construction work, while in the former there is much valuable mahogany.

*Area of Forest Land.*—“ The total area of forest land in the Protectorate belonging to the Crown may be stated as about 1,500 square miles, and there are some 60 varieties of timber which can be used for general purposes ranging from hard to soft woods.”

Since the date of the Uganda Development Commission's report, the approval of the Treasury has been given to a loan, spread over four years, for the development of the resources of the Protectorate and for measures intended to improve the health and well-being of the native inhabitants and to train them in agricultural and industrial occupations.

A mycologist has been appointed and the veterinary and geological staff are being largely increased. The services of two experts have been obtained to advise the planters in matters of coffee and rubber cultivation, and it is hoped shortly to obtain the advice of another expert in regard to the forest policy of the Protectorate.

Tenders have been invited for the development of the water power of the Ripon Falls.

### ZANZIBAR.

The Acting British Resident reported as follows:—

“ (1) The main industry in Zanzibar is agriculture and the principal products are cloves and coconuts. A very large portion of the productive area of the islands is already planted up with one or the other, and although there is no doubt that other products, such, for instance, as sugar, would, and indeed, before the Arabs found it more remunerative to grow cloves, actually did thrive well, the facts that apparently cloves cannot be grown in any other part of the world as successfully as in this Protectorate, that the demand for them is certainly increasing, and that the available labour is hardly sufficient to meet existing needs, lead me to think that Zanzibar should concentrate its energies on maintaining and developing this industry and not attempt to branch out into new lines.

“ (2) Fortunately the clove suffers from no disease and it is fairly certain that the sudden death of grown trees in certain areas is due to the organic conditions of the soil. The trees are attacked to some extent by a parasitic growth, somewhat resembling mistletoe, and known as ‘Kirukia,’ but this is easily removed and the legislation embodied in the Plantations Preservation Decree, 1913, under which its presence on any plantation is made an offence, has proved effectual. Now that the European staff of the Agricultural Department has been strengthened it is proposed to take the regeneration of the trees seriously in hand, and experiments will also be made in their improvement horticulturally. The question of distillation of the oil locally, which would effect a large saving in freight, is also under consideration.

“ (3) The coconut industry has received a considerable amount of attention within recent years. Many thousands of new trees have been planted both by Government and private owners and the Government has assisted the latter by supplying seedlings at a cheap rate.

“ (4) Zanzibar copra is of a very poor quality, and it is doubtful whether much improvement can be made until some cheap method of artificial drying is adopted. A new drying plant is now on order for the Government and upon the results of its working further action will depend.

“ (5) The coconut suffers to some extent from the ravages of the rhinoceros beetle, which attacks the young shoots of the tree, but this scourge is not serious and is kept fairly well in hand by the Agricultural Department.

“ (6) The distillation of coconut oil locally is carried on, but only on a very small scale, the difficulty being the utilisation of waste products.

“ (7) The chief obstacle to progress in the production of both copra and cloves is the fact that the bulk of the profit goes to the middleman. This question is being dealt with.

“ (8) The climatic conditions are unsuitable to the cultivation of flax, hemp and cotton, but it is possible that, with a systematic collection of coconut husks and introduction of machinery, the coir fibre industry might be developed. At present the methods in vogue for producing this fibre do not appear to leave a sufficient margin of profit to attract the outlay of capital.

“ (9) The breeding of cattle is heavily handicapped by the prevalence of East Coast Fever, and it is estimated that about 25 per cent. of the calves succumb to this disease. Two cattle-dips have recently been constructed under Dr. Aders' supervision and it is intended gradually to extend the dipping system so as eventually to embrace the principal cattle areas.

“ Trypanosomiasis, although not of the most virulent type, is also widely prevalent and causes considerable loss to owners of live-stock.

“ Dr. Aders has for some time past been engaged on work in connexion with preventive measures against this disease, and it may be hoped that, when the scheme for the establishment of a Government Stock Farm is complete, it will be possible both to improve the class of local cattle and to deal more effectually with the diseases which interfere with successful breeding.

“ (10) So far as I am aware no geological survey of these islands has ever been made, and although there is no reason to suspect that they contain any minerals of value, it is obviously important that the question should be scientifically investigated. In view of the satisfactory state of Zanzibar finances, I do not feel justified in suggesting that the cost of such investigation should be met from the Imperial grant, and propose to apply for permission to insert a sum sufficient to cover the cost of such a survey in the Estimates for 1920.



" (11) Although these waters abound in fish of great variety, it is very doubtful whether their edible qualities are such as to warrant the inauguration of any scheme for export.

" (12) A few Chinamen have for some years been engaged in the collection and export to the East of *Bêche de Mer*, considerable quantities of which are found on the extensive coral reefs. I do not, however, anticipate that the industry is likely to develop on a large scale.

" (13) Good results would be more likely to accrue from the development of pearl fishing. The pearl oyster is found in the southern waters of both islands and small pearls are frequently brought in by the native fisherman. A concession for pearl fishing was granted to a European some 15 years ago, but the fact that he was not very successful may probably be attributed more to his lack of experience and of proper outfit than to lack of pearls.

" (14) I have the honour to propose that a small Department be formed, which might be called the Bureau of Science, under the control of Dr. Aders, who at present holds the post of Economic Biologist; that it should be the duty of this Department to pursue scientific research in all branches affecting the Protectorate, and that it should work in conjunction with the various Imperial scientific bureaux, keeping in close touch also with the scientific Departments of sister Colonies and Protectorates on this coast. The new Department would undertake most of the work now done by Dr. Aders in connexion with the Health Department and would carry out all investigations required by the Agricultural or any other Department which needed its assistance."

## EASTERN COLONIES.

### CEYLON.

No reply to the despatch has been received from this Colony.

### FEDERATED MALAY STATES.

The High Commissioner forwarded a full report by the Chief Secretary.

Sir Edward Brockman said that the Federated Malay States were fortunate in having considerable credit balances, and were thus in a position to undertake research work without financial anxiety.

The two great industries in the country are rubber growing and tin mining, and there is a tendency to confine investigations to problems connected with these two industries.

As regards mechanical power, the main source of such power a few years ago was wood, and the destruction of forests for firewood has been immense and has had to be checked. Coal has been found in Selangor and is being worked on a satisfactory scale. The Selangor coal is of a highly inflammable nature and cannot be used for bunkering. It is, however, the intention of the colliery owners to erect briquetting plant, and if this is successful it will enable the coal to be exported. Coal deposits in the State of Perlis are now being investigated. Water power is used to a limited extent. One of the needs in the way of research is to survey thoroughly all the rivers and streams in British Malaya, and in connection with this systematic observations of the rainfall are absolutely necessary.

Oil has not yet been found in the Federated Malay States, but there is reason to believe that in Brunei there is a large and accessible oil field.

As regards agriculture, the Government of the Federated Malay States has made very liberal provision for agricultural research in so far as the staff of scientific officers is concerned, and, but for the war, that staff would have been a strong one. The research carried out by the Department of Agriculture has included research of the fundamental character to which the Secretary of State has drawn special attention.

Although rubber is the chief agricultural product and receives most notice, rice, coconuts, and other products are not neglected. A coconut estate has been purchased by Government for research purposes. The African oil palm and the castor oil plant are now engaging attention.

Systematic investigation as to rainfall is of importance to agriculture as well as in connection with water power, and it is proposed to enlarge the Meteorological Department.

A scheme has been approved for the establishment of studentships for research in tropical agriculture and provision has been made for one such studentship in 1920. In the first instance a scholar will be selected from Cambridge, but subsequently from Oxford, Edinburgh, Trinity College, Dublin, and the Imperial College of Science.

As regards forestry, the activities of the Forest Department in the past have been mainly devoted to securing the forests against depredation and to creating new reserves, and in this respect Sir Edward Brockman considers that all that is necessary is being done. Little actual research has been undertaken. The translation of a standard work on the economic plants of Netherland India has been begun, and it is hoped that, when this has been completed, it may be possible with the assistance of other Departments to publish a work on the commercial products of the Malay Peninsula similar in character to Sir George Watt's "Commercial Products of India." A book is in preparation giving a detailed account of the Malayan commercial timbers and their present and possible future uses, and it is proposed to publish an account of the principal minor forest products, which already have a commercial value and would probably find new markets if more were known of them. A concession has been granted for the manufacture of acetic acid by the distillation of wood.

In regard to minerals, the Geological Department was established in 1903 and has been engaged on economic geological work and on a systematic geological survey. Until 1912 the staff consisted of one geologist only. Since that date it has been gradually increased, until it now consists of two geologists and two chemists. A further increase is under consideration. About one-third of the Malay Peninsula has been surveyed geologically, and it is regarded as desirable that the survey of the Federated Malay States should be completed, and that surveys of the Straits Settlements, including

Labuan and Brunei, and the Protected Malay States should then be undertaken. The limited staff has made research work on a large scale impossible, but with the assistance of the Imperial Institute a great deal has been done to help the mining community in the identification of mineral specimens and rocks, in estimating their value, and by furnishing advice as to the occurrence of ore in individual mines and as to prospecting.

The Government Geologist advocates research on the following lines when time and personnel permit:—

- (a) Search for minerals of economic value, such as tantalite, thorite, uranium minerals and monazite, in the heavy impurities separated from tin-ore, and the treatment of those already known.
- (b) Experimental work on electro-magnetic separation of minerals found in local concentrates.
- (c) Experimental work on the manufacture of carbide, Portland cement and lime-sand bricks from local products.
- (d) Experimental work on the utilisation of silt from tailings-dumps and rivers for the manufacture of bricks, tiles, pottery and cement.
- (e) Collection of potash from ashes of forest timber used for the production of power by miners.
- (f) Experimental work on raw materials for glass manufacture which occur in tailings-dumps, etc.

The question of deep boring has been mooted from time to time and there is a difference of opinion as to whether it is worth while to undertake such boring. It is proposed to carry out investigations into the methods of tin-ore saving on alluvial mines, lode mines, and dredges. There has been a steady decrease in the output of tin and it is desired to conserve this valuable metal and to prevent unnecessary waste. In the past much tin has been left in the land owing to careless working.

So far as is known at present, wolfram, scheelite and kaolin are the only other minerals of economic value.

Hitherto it has not been possible to obtain the services of a suitable man as Inspector of Fisheries and the fisheries have been under the superintendence of the Director of Museums. The Director does not anticipate that any great development can be made in the fishing industry of Malaya beyond increasing the supply for local purposes and improving the means of distribution. Most of the waters are unsuitable for trawling and on the East Coast fishing is impossible or hazardous for four months in the year.

The Museums Department is engaged upon a fauna of the Malay Peninsula; one volume on the Reptilia and Batrachia has already been published, and the material for two others, namely, that on the Mammalia and that on the Birds, is practically complete. A work on the flora is already in hand; work on ethnography and ethnology has been in operation for some years.

Sir Edward Brockman remarks that, in connection with research, the great difficulty the Government has had to face is the question of providing and maintaining an adequate staff of trained men. The experience of the Government in the past has been a most unfortunate one. Many posts could not be filled, and many officers left the Government service for commercial employment.

The question of the co-ordination of research work is under consideration and it has been suggested that a central research institute should be established at Kuala Lumpur.

#### HONG KONG.

No reply to the despatch has been received from this Colony.

#### MAURITIUS.

The Governor reported that Mauritius was almost purely a sugar producing Colony, that every possible effort had for many years past been made by the local Department of Agriculture to foster the principal industry, and that a great deal of valuable research work had been done in that direction. The Governor added that efforts were also made to encourage other enterprises, but that the profits derived from the cultivation of the sugar cane were so large that it was almost impossible to induce any landowner to take a practical interest in any other production.

The Governor enclosed a report from the Director of Agriculture upon investigations in progress and proposals for further research. As regards the sugar industry, the investigations in progress are the breeding and trying out of new varieties of cane and experiments on manuring canes. Investigations into the use of implements and tractors in cane cultivation and into the irrigation of cane plantations appeared desirable. There was also a decided need for the better organisation of proper research in relation to sugar manufacturing questions, both in relation to problems of an engineering character and also to the chemistry of sugar manufacture. The production of power alcohol from exhausted molasses offered a most important and promising field for research.

In regard to other industries, previous experience with cotton in Mauritius had not been encouraging; there may, however, be possibilities in certain districts, as shown by recent experiments. Rodrigues also offers a considerable opportunity for experiments in cotton.

The Director considered that there was a large and important field for research into marine resources. No facilities at present exist for such research work.

As regards minerals, the Director considered that the field for investigation appeared limited, but that no definite opinion could be expressed as it was almost unexplored. He thought that some research was certainly desirable.

*Note.*—The question of a geological survey is being pursued.

As regards sugar, experiments are being carried out to test the suitability of nitrate of ammonia as a manure for the canes. The Colonial Government are considering whether it would be useful to co-operate with or participate in the activities of the British Empire Sugar Research Association. Enquiries are being made as to suitable types of motor tractor for ploughing.

Provision will be made in the 1921-22 estimates for the employment of a mycologist in the Agricultural Department.



## SEYCHELLES.

The Governor appointed a Committee, on which both officials and planters were represented, to consider the Secretary of State's despatch, and forwarded the Committee's report and, subsequently, some further observations by the Committee.

The Committee stated that no sources of mechanical power existed in the Colony.

In regard to agriculture the Committee drew special attention to the need for the investigation of the pests and diseases affecting the coconut palm and vanilla, of which the cultivation constituted the principal local industries. For this purpose they considered that two scientific assistants should be appointed, one with a knowledge of applied mycology and agricultural chemistry and the other with a knowledge of applied entomology. The Committee regarded the appointment of a mycologist as of primary importance. The Committee also recommended the erection of mycological and entomological laboratories; the formation of an experimental plot with a complete set of spraying pumps, flame throwers, etc., and a supply of various insecticides; and the building of a conservatory for the culture of vanilla under cover, which was regarded as essential for the study of the various diseases attacking the plant.

The Curator of the Botanical Gardens added the following list of pests and diseases requiring investigation:—

- |  |   |                          |
|--|---|--------------------------|
| 1. Leaf bitten disease.                    | } | Affecting coconut palms. |
| 2. Bud rot disease.                        |   |                          |
| 3. Stem bleeding disease.                  |   |                          |
| 4. Root diseases.                          |   |                          |
| 5. Black beetle disease.                   |   |                          |
| 6. Melitomma disease.                      |   |                          |
| 7. Scale insect disease.                   |   |                          |
| 8. Calospora fungus disease.               | } | Affecting vanilla.       |
| 9. Root toxins.                            |   |                          |
| 10. Fungus diseases affecting rubber.      |   |                          |
| 11. " " " breadfruit.                      |   |                          |
| 12. " " " bananas.                         |   |                          |
| 13. Nematode worms affecting ground crops. |   |                          |

The Curator remarked that the production of vanilla about twenty years ago averaged more than fifty tons yearly, but is now reduced to less than ten tons, mainly through diseases, and that the coconut crop is gradually declining, the average crop per tree being only twelve nuts per annum. The Curator thought that successful preventive measures against diseases might ultimately result in a gain of Rs. 400,000 annually on the value of the vanilla crop, and Rs. 1,000,000 on the coconut crop.

As regards geology and minerals, the Committee stated that phosphate had been worked, that laterite had been found, and that there was a possibility that good bauxite might occur. They recommended that a mineralogical survey of the principal islands should be undertaken.

As regards marine industries, the Committee thought there were great possibilities of the extension of fishing industries and that it was desirable to consider the question of re-starting the whaling industry, which was abandoned at the beginning of the war.

*Note.*—The Colonial Research Committee do not see their way at present to provide for a mineralogical survey. The other action taken by the Committee in regard to the Colony is stated in the body of the report.

## STRAITS SETTLEMENTS.

The Governor reported that, after consulting his advisers, he was of opinion that there was little scope for the development of research in the Straits Settlements.

The only research Department confined to the Colony is that of the Botanical Gardens, and its activities will be utilised and extended as far as possible.

The Government Analyst gives a considerable amount of advice and assistance to the public on various industrial questions, either directly or remotely connected with chemistry and mineralogy, but the Governor does not think it feasible to convert this Department into one of research.

The Agricultural and Forests Departments of the Malay Peninsula are mainly concerned with the Federated Malay States and are dealt with under that heading.

In the Colony there are few industries of any great external importance, and for many years to come the main object of any industrial research there will be to provide for the Colony's own internal needs. At the present moment there are projects on foot for the encouragement of brickmaking, cement manufacture and glass making, in all of which industries the demand is urgent, but the supply is either lacking or entirely insufficient.

There are also the large industries of rubber planting, rubber manufacture, coconut oil manufacture and pineapple canning, which are of Imperial importance. For these, the scheme of research now contemplated in conjunction with the Rubber Growers' Association will doubtless be of great assistance, and the Governor is sure that the Colony will be glad to join with the Federated Malay States in the enterprise.

In addition, it is possible that the manufacture of gambier, citronella and castor oil, and the growth of fibres might be fostered, but the Governor considers that without a guaranteed price it will be difficult to induce planters to invest much capital in such industries.

The present supply of fish is not more than sufficient for local demands. There are plenty of sponges to be found, but the quality is poor.

The Colony has been fairly thoroughly prospected for minerals, but it should be included in a geological survey of the whole peninsula.



## MEDITERRANEAN.

### GIBRALTAR.

Neither of the despatches was sent to this Colony.

### MALTA.

The Governor appointed a Committee to consider the Secretary of State's despatch, and the following proposals were made by the Committee:—

As regards agriculture, the Committee pointed out that the development of the Colony depended in a great measure on that of the water supply, and recommended that steps should be taken to complete the geological survey of the Maltese islands, to carry out works in search of water for irrigation purposes, and to utilise as far as practicable the surface water that now flows to the sea and is wasted.

The Committee suggested that greater use should be made of seaweed for manuring purposes.

The Committee considered that the cultivation of cotton should be extended and the product improved as regards the length of fibre; that the cultivation of sisal as a fibre producer should be encouraged; and that figs and prickly pears should be planted more extensively and their fruit be utilised for the production of alcohol.

The Committee stated that Maltese goats are remarkably good milkers, but are, unfortunately, subject to a specific fever. They recommended that this disease should be further studied, with a view to its complete eradication.

The Committee remarked that Maltese donkeys were well-known for their fine size and hardiness, but were threatened with extermination. The Committee strongly recommended that steps should be taken for reviving the industry of donkey breeding.

The Committee also advised that a local Bureau of Entomology, Ornithology and Mycology should be instituted.

With regard to marine products, the Committee thought that the fisheries, sponge, and coral industries were capable of development. They pointed out that there were abundant local supplies of salt which could be employed in fish preserving.

It is proposed to establish a Department of Agriculture and a Department of Fisheries, and the Committee considered that many of the matters mentioned in their Report might be investigated under the direction of these Departments.

As regards geology and minerals, reference has already been made to the recommendation of the Committee that the geological survey of the islands should be completed. The Committee thought it not improbable that deep boring would show that natural gas and mineral oils were lying at a workable depth. There were also deposits of clay containing aluminium, of limestone which might prove suitable for the manufacture of lime and cement, and of phosphates.

*Note.*—A plant pathologist has since been appointed; and investigations of improved methods of wine manufacture are being made with the help of a grant of £300 from the Colonial Research Committee.

### CYPRUS.

The Chief Secretary furnished a full report of which an abstract is appended.

Mr. Stevenson remarks that Cyprus is primarily an agricultural country and that the majority of the people are employed on the land, about half the total area of the island being under cultivation. Of the remainder about one-third consists of "forest" and about one-fourth is susceptible of cultivation.

As regards natural sources of mechanical power, these are scanty in Cyprus. Streams are small and seldom perennial and are subject to irrigation rights. Wind power is used for driving air-motors to raise sub-soil water for irrigation purposes.

Some prospecting has been undertaken for mineral oil, but up to the present without commercial result.

The activities of Government in fostering the staple industry of agriculture have, in the main, been of a practical character. Modern agricultural machinery and tools are being introduced, with which useful demonstrations are given and which, when their value and utility are realised by the villagers, will, it is hoped, in time supplant the primitive types now in vogue. Much practical instruction is given by the officers of the Agricultural Department throughout the country in agriculture in all its branches. An entomological laboratory has been established with the object of combating the numerous insect and fungoid pests which every year cause heavy loss, especially to carobs. Some original research work has been done and several insects new to science have been discovered and reported on. A chemical laboratory, with a qualified analyst, has also been established, at which useful work in connection with the analysis of soils, water and chemical manures has been carried out. Tests with regard to the germination of seeds are conducted at this laboratory.

The principal agricultural products of Cyprus are cereals (wheat, barley, oats, vetches), carobs, olives, wine, silk, cotton, fruit and vegetables. Of these the most important to the island are the cereals, upon which it is dependent for its food supply. A large number of wells have been sunk from which the water is raised by air-motors, or wheels turned by animals, for use in the irrigation of potatoes and other vegetable crops.

The carob is ubiquitous in Cyprus. The fruit is exported mostly to England and also to France and Egypt. It is an important ingredient in cattle cakes, and is also a substitute for chocolate; it affords spirits, and sweetmeats are made from it. Pests and diseases incidental to carobs have been combated with some effect by the Agricultural Department. Mr. Stevenson thinks that a great extension could be given to this tree.

The olive tree is also ubiquitous; it thrives extremely well and is capable of great extension. Wooden presses are chiefly used to extract the oil. Both the method of gathering the fruit and the process of oil extraction are defective. A good deal can be done to encourage better methods by importing modern oil extraction machines for sale on easy terms, and this subject is engaging attention.

The chief fruits grown in Cyprus are the orange, mandarin, lemon, pomegranate, apricot, kaisha, plum, fig, grape, also apple, pear, quince, loquat (Japanese medlar), cherry, banana (mainly along the coast), water melon, sweet melon and date palm.

The growing of vines and the manufacture of wines and spirits constitute a leading industry. The value of the wine exported in 1917 was £78,451, and that of the spirits £22,173. Cyprus is almost the only country in the Levant which has hitherto been free from phylloxera. Mildew (*Oidium*) is prevalent, and sulphuring is now being more generally practised. There is scope for considerable improvement in the methods used for cultivation and fermentation, and the whole subject of the wine industry receives constant attention in the Agricultural Department.

Raisins constitute an important product, and the quantity exported in 1917 was 70,624 cwt., valued at £90,040.

During the Venetian occupation (1489-1570) Cyprus exported annually from seven to fifteen million pounds of raw cotton. The scarcity caused by the American Civil War gave a stimulus to production. In 1866 over 2,000,000 lbs. were exported. Since then the production has declined, especially during Turkish times, largely owing to the destruction of aqueducts, Venetian wells, etc., and to the practice of taxing cotton in the field before it was picked, causing considerable delay and detriment to quality. This practice was abandoned in 1890, and a tax has since been levied on exported cotton only. The species chiefly grown is *Gossypium herbaceum*. A full account of Cyprus cotton will be found in a Report on the Agricultural Resources of Cyprus, by Professor Wyndham Dunstan, F.R.S., Director of the Imperial Institute, which was published in 1905. There is a well equipped little cotton factory at Famagusta and excellent cotton fabrics are woven in various parts of the Island. Cotton is exported principally to Greece. Freight charges and lack of direct steamers prevent its shipment to England and check its export to France. There should be a good opening for machinery for extracting cotton seed oil, and this matter is under consideration.

Some hemp is grown, and there is a proposal to introduce rope making machinery.

Cyprus silks were famous throughout the middle ages, and there is still an important export of cocoons to France. These cocoons are reeled in France and Italy and the silk is largely sold to England. It would be of advantage to reel the silk in Cyprus and sell the finished product direct to England. Freight and the lack of direct transport prevent the marketing of cocoons in England. Mr. Stevenson thinks that there is an undoubted future for this industry if it is conducted on proper lines.

Tobacco growing is in an experimental stage.

Sesame is a recognised crop. Aniseed, coriander seed, white cumin seed, black cumin seed, chick peas, and broom corn are among the more generally grown minor crops.

There is scope for much improvement in the fodder crops grown, and the Agricultural Department has successfully introduced several fodder plants and grasses from outside the Colony.

With regard to essential oils, origanum oil, rich in the antiseptic constituent carvacrol, is produced by distillation from species of *Origanum*, which grow wild in the forests. Otto of roses of a high quality has recently been produced by distillation. Samples have been sent to the Imperial Institute, which reports that the constituents of the Cyprus oil agree closely with those recorded for Bulgarian otto of roses. There seems to be a good future for this trade.

Native tanneries exist in large numbers and make use of local sumac and pine bark. The question of extracting tannin from the bark of certain indigenous wattles is under consideration.

Cyprus bees have more than a local reputation, and there is a considerable export of queen bees.

The Forest Department is principally engaged in re-forestation of depleted areas, but has also been investigating the question of the production of pyroligneous acid and tar by the destructive distillation of wood. It is proposed to introduce a distillation plant similar to those employed in the Forest of Dean.

As regards geology and minerals, the following books have been published:—

- (1) "A treatise on the Geology of Cyprus," by Mr. Albert Gaudry (Paris, 1862). An English translation was published by Messrs. Harrison & Sons among the Papers of the Geological Society of France, Second Series, Volume VII.
- (2) "The Geology of Cyprus," by C. V. Bellamy, late Director of Public Works in Cyprus, and A. J. Jukes Brown (W. Brendon & Sons, 1905).

Owing to the lack of any suitably qualified officer, it has not been possible for the Government of Cyprus to undertake any serious geological research.

Terra umbra has been found in fair quantities, and before the War there was some export trade in it. Salt is found in large quantities, but the market for export is limited. Copper and pyrites exist and considerable prospecting work for these minerals is now being carried out by private enterprise. There are large deposits of asbestos, which are now being worked.

As regards marine products, sponge fishing has been carried on round the coasts of Cyprus by fishers from the Greek islands, who pay a percentage of their takings in kind to the Government. The native Cypriot has not taken to this industry, being deterred by the discomforts incidental to the work.

Mr. Stevenson reports that there appears to be plenty of fish in the sea round the coasts, but that the fishermen are few, timid, and unenterprising. Their equipment is poor and no large catches of fish are made.

With regard to medical research, Mr. Stevenson reports that little original work has been done. Effectual practical measures have been taken against malaria with excellent results. The establishment of a bacteriological laboratory is a pressing need which Mr. Stevenson expects to be able to meet at an early date.



## WEST AFRICA.

## GAMBIA.

The Governor forwarded, without remark, an extract from the minutes of the Executive Council, which merely stated that, while the Secretary of State's despatch of the 11th June, 1919, had been read with interest, the Government were unable to suggest any special direction in which money could be usefully expended in that small colony at the present time, and that the Governor agreed to this view.

## GOLD COAST

In this case the report is furnished by the Acting Governor.

The Gold Coast have an interesting scheme, which appears to be unique among the colonies, for the establishment of a local research bureau which could collect and collate information gleaned from the geological, agricultural, veterinary, forestry, chemical, botanic, mycological and entomological branches of the Government Departments, and study it in relation to its economic and commercial uses. This suggestion is due to Captain H. J. Gwyther, M.C., Assistant Secretary for Works, and he has furnished a detailed scheme for the work of the proposed bureau. The matter is still under consideration.

Until very recently scientific research in this colony was practically confined to the efforts of two officers of the Geological Survey, and to such limited investigations as could be made by one Mycologist and one Entomologist in the Agricultural Department, by one Veterinary officer, and by the Inspecting Chemist attached to the Medical and Public Works Departments in connection with the purification of the Accra and Secondee water supplies. During the last year (1920) steps have been taken, or proposals made, to strengthen the Departments not only for their normal duties, but expressly for such research and economic exploration as the Secretary of State has enjoined. Thus the Geological Survey Department has been doubled and a further increase has been sanctioned, a large increase in the Scientific Branch of the Agricultural Department has been proposed and now only awaits the approval of the Secretary of State and the securing of the necessary officers, the enlargement of the Veterinary Department has been approved, a Hydraulic Engineer's branch of the Public Works Department has been created for the investigation of water supplies and sources of hydro-electric power, two engineering chemists have been added to the staff of the Public Works Department, and the Forestry Department is in process of being re-established with a view to the preservation and development of the Colony's forests. The foundations are thus being laid for much more extensive research than has been attempted in the past.

As regards the development of the Colony's agricultural resources, the Governor has already established a large experimental sisal plantation on the plains outside Accra, which are otherwise practically uncultivated; and when he last visited the plantation considerable progress had been made and the Superintendent was very optimistic about the success of the experiment. Systematic attempts are being made to grow rice and coconuts in new areas and on scientific lines, a cassava plantation is about to be established with a view to experiments being made in the local production of motor fuel, and negotiations are in progress which may result in the establishment of a sugar industry in the Elmina district of the Central Province. The Governor is much interested in the development of the researches of the Northern Territories in the matter of ground nuts, shea butter, cattle, etc.

As regards mineral resources, the recent strengthening of the Geological Survey Department will enable the exploration of the Colony for minerals to be more vigorously pushed; but there is general agreement that the available labour is insufficient for the proper working of the minerals already known, and that for this reason the practical value of additional discoveries will be much decreased.

In this connection the Acting Governor adds that possibly the research which is most urgently needed at the present time is medical and sanitary research designed to conserve and increase the population.

It has also been suggested that the local fishing industry requires scientific study, but with a view to the preservation of the industry in the hands of natives, and not for the introduction of fishing enterprise from outside the Colony.

The Director of Public Works suggests the appointment of an engineering chemist to make experiments in the destructive distillation of wood, from which charcoal, tar, acetic acid and methyl alcohol can be obtained; also the making of experiments with limestone for the production of lime locally, and with local clay for brick-making. He further suggests experiments with a view to producing wood pulp and to ascertaining whether there is any local plant from which alcohol can be obtained in sufficient quantities.

The suggestions which have been set out seem to be the most important of those received; it has been necessary to omit a number of suggestions apparently of minor importance.

*Note.*—The large increase in the Agricultural staff has been sanctioned and a number of officers have already been selected; and a number of appointments have also been made by the Forestry Department. Difficulty has been found in obtaining veterinary officers and chemists. A very large Survey Department has been created, as it is considered that adequate maps are a condition precedent to economic development in many directions.

## NIGERIA.

No reply to the despatch has been received from Nigeria.



## SIERRA LEONE.

The Governor furnished a report of which the salient feature was the opinion that it is absolutely necessary to take steps to educate the native population in the adoption of less wasteful methods of agriculture. The local custom is to exploit fresh land at frequent intervals; the limit of the supply of fresh land is nearly reached; and it will be necessary to adopt ordinary farm methods which maintain the fertility of the area cultivated. Foodstuffs are scarce, and the education of the people in this matter should be pushed on as fast as possible.

Palm kernels are the principal export of the Colony, but they fetch a smaller price than palm kernels exported from Lagos. The lower price is due to faulty cracking and cleaning. An ordinance has been passed to establish a system of inspection for the prevention of the export of inferior produce.

Sierra Leone produces rice, kola, limes and piassava of a very high quality, and good oranges, cocoa, rubber, ginger and coconuts. There are also many unstudied trees that yield good oil, notably *Pentaclethra macrophylla* and the native po-yok.

The Governor remarks that the obvious policy for the Colony is to develop to the full its known agricultural resources and to make a study of the possibilities of the rest. For the latter purpose a large area is available at Jala, which is being developed into a botanic garden as well as an experimental station. This station should be specially useful in the study of local oil-bearing trees.

For the development of the known agricultural resources, and apart from education, the Governor relies on (a) the distribution of seed for the encouragement of native planting; (b) the establishment of small model farms at different centres; and (c) the opening of economic plantations. This last, the most important in his opinion, is hampered by lack of funds and trained personnel.

For the time being the best results are being obtained in the production of cocoa. A cocoa station has been established in the Northern Sherbro District and is doing good work, but improved methods are necessary in fermentation.

Rice is the staple food of the people, and its export is prohibited.

The Governor remarks that no copra, limes or oranges are being exported at present, and but little rubber. He points out that it is impossible to develop an export trade in these articles without the establishment of plantations producing on a scale sufficient to ensure the minimum supply required for the purpose. He advocates the establishment of such plantations as regards limes and coconuts, but anticipates difficulty in securing the services of successful managers.

As regards mineral resources, the Colony has recently established a Geological Department. The Governor remarks that the discovery of marble or of beds of good clay or kaolin might have far-reaching effects, and that in the meantime much has been done towards successful brick-making.

Geological examination of the Colony is in progress.

Water-power is not lacking to drive turbines, if necessary, but the great difference in the volume of water in a river in the wet and dry seasons limits the water possibilities, except in the case of a few large rivers.

Cattle-rearing takes place to a limited extent all over the country, and extensively in the Koinadugu District.

In the matter of fisheries an experiment is about to be made in the use of small trawl nets. More attention is being given to the question of boat-building; and it is hoped that a special class in that subject will ultimately be formed at the Sir Alfred Jones Trade School.

*Note.*—The services of two Indian rice experts have been obtained to instruct the natives in improved methods of cultivation. A forestry expert is shortly to visit the Colony, who will, it is hoped, assist in solving the problem of carrying on agriculture without destroying the forests. The geologist reports that there is little prospect of mineral discoveries, the strata being remarkably uniform and barren.

## WEST INDIES.

## BAHAMAS.

In 1919 Sir William Allardyce, the then Governor, who was on leave, took the opportunity of drawing the attention of the Colonial Research Committee to the position of the sponge industry, and the need for further scientific investigation, with a view to placing the cultivation of artificial sponge upon a commercial footing. Sir William Allardyce attended a meeting of the Committee and furnished a memorandum, from which the following is an extract:—

“There are in the Bahamas hundreds of square miles of ‘mud’ admirably adapted to the growth of various kinds of sponge. For many decades millions of sponges have been fished for and removed annually. Existing methods are extremely wasteful and result in hundreds of thousands of sponges being brought to the Nassau Exchange which are of little or no value. Only a very small percentage of those procured by the spongers consists of marketable sponges; far and away the larger proportion has, after purchase, to be carefully sorted and clipped. ‘Clippings’ and inferior sponges are to be met with in enormous heaps in various parts of the city and its outskirts, while many hundreds of cartloads are thrown on the ground annually and allowed to rot as manure.

“The successful artificial cultivation of sponge has been conclusively demonstrated, both at the Sponge Chase Farm, Florida, and in the Bahamas. On the eve of my departure from Nassau, at the end of March, the Secretary of the Marine Products Board informed me that the Caretaker at the Ferry Experimental Farm, Exuma, had just reported that the sponges had made a wonderful growth, some of those first planted having a diameter of from 8 to 10 inches, and that in some cases they had completely overgrown the cement discs on which they were planted and attached themselves to the bottom, thereby showing that six-inch discs are too small. From this alone it would appear that the Colony has got beyond the experimental stage so far as the general question is concerned, *i.e.*, whether sponges can or cannot be propagated artificially; but the services of a marine biologist are, nevertheless,

urgently required, and especially of one who has made a speciality of the growth and life of the sponge."

Sir William Allardyce contemplated that the selected officer should devote his attention mainly to studying the growth and life of the various varieties of sponge, to advising upon the best methods of increasing the output of wool and velvet sponge, to investigating the rates of growth of the different species, to studying their natural enemies, to advising upon the restoration of old sponge beds and to the question whether Mediterranean varieties could advantageously be introduced.

No other proposals of importance were received from the Colony.

*Note.*—The action taken by the Committee in regard to sponge is stated in the body of the report. Apart from sponge, sisal or Bahamas hemp is by far the most important product of the Colony. The value of the exports of this commodity in 1918 was £129,000. The sisal is produced mainly by peasant growers upon a large number of small islands, and the industry presents the practical problem of finding an inexpensive type of hand decorticator which can be used near to the places where the sisal was grown. The machines hitherto tried have proved unsatisfactory.

The Colony also exports tomatoes, both raw and canned, valued at £13,000 in 1918, and canned pine-apples, valued at £7,500.

The Colonial Research Committee have advised the Colony to establish a permanent Agricultural Department, which should include a laboratory, and would deal with the sisal, tomato, pine-apple and other agricultural industries.

#### BARBADOS.

The Governor forwarded a report from the Director of Agriculture, Mr. John R. Bovell.

Mr. Bovell stated that the only activities of a scientific character which were being carried on by the Department of Agriculture were in connection with sugar cane and cotton. As regards sugar cane, the principal matters of investigation were the relative values of new seedling canes, the manurial requirements of the principal local variety of cane, the values of various kinds of cane cuttings, the damage due to the attacks of the moth borer, the root borer (*Diaprepes abbreviatus*, Linn.), and the brown hard-back (*Phytalus smithi*, Arrow).

The work on cotton consisted of the improvement of the indigenous and exotic cottons by selection and hybridization. An improved type of Sea Island cotton has been produced, which it is hoped will be able to compete with some of the best cotton of St. Vincent and St. Kitts. The improved cotton is being extensively cultivated in 1920.

Mr. Bovell considers that the following are the principal matters into which research could advantageously be undertaken:—

- (1) (a) The storage of fodder and other crops for use in time of scarcity.
- (b) The preservation of fish for use in time of scarcity.
- (c) The generation of electricity by air motors for lighting and for industrial purposes.
- (d) The investigation of the apparent disinclination to work on the part of the peasant, for the purpose of ascertaining whether this disinclination is in any way due to want in their diet of any essential ingredients, such as vitamins or animal fats, or to the effects of hook-worm (ankylostomiasis), from which, in a test made a few years ago, over 60 per cent. of those examined in some districts of the island were found to be suffering.
- (2) With regard to the storage of fodder crops, at the present time the cost of food for the animals, which have been for many years imported from Canada and the United States, is so high that some of the dairymen are disposing of their cattle; and the supply of milk, which was very small in the past, is likely to be still less. For the preservation of succulent food for animals the following are necessary:—
  - (a) Silos.
  - (b) Investigation into a means applicable to the small grower, whereby seeds may be kept in the tropics free from insect pests.
- (3) As regards the preservation of fish for use in times of scarcity: before the War sometimes when there were large catches quantities of fish were sold very cheaply, and these fish could have been preserved if some method applicable for the preservation of fish in the tropics was available.
- (4) With reference to the generation of electricity for lighting and industrial purposes, Mr. Bovell points out that for many months of the year the trade winds blow with fair regularity, and that it should be possible, by the installation of air motors and storage batteries to supply a great deal of electricity for lighting and industrial purposes, the baking of bread, and the cooking of food, etc. This would be especially valuable in Barbados, as, owing to the dense population, large quantities of coal and wood have to be imported for cooking purposes. At the present time he understands that wood for cooking purposes is selling retail at a penny a pound.

The Governor remarks that the public in Barbados is so deeply interested in the production of cane sugar that research in any other direction makes little appeal to them. He reported that he was asking the House of Assembly to make provision for the erection of an experimental silo, and that exploration for mineral oil was being vigorously carried on by the British Union Oil Company with encouraging prospects.

#### BRITISH GUIANA.

The Governor forwarded a memorandum by Professor Harrison, the Director of Science and Agriculture.

Professor Harrison draws attention to the considerable possibilities of the water power of the Colony, and expresses the opinion that this subject requires to be reported upon by a recognised authority of very high standing. The position is that a preliminary examination and report has been made and that the flow of water in the rivers in the neighbourhood of the principal falls is being ascertained by means of automatic gauges. Until the data which the gauges will afford are available it is not proposed to take any further action.



Under the heading of agriculture, Professor Harrison points out that the extension of practical knowledge with regard to the sugar cane, its selection and cultivation, and especially the mechanical drainage and tillage of sugar cane lands, is now being well provided for by a scheme of research supported jointly by the Government and the planters. He thinks that when this scheme is in active operation the Colony will have an organisation for practical sugar research which will be unexcelled by any other of the smaller colonies.

Professor Harrison considers that enquiries into the improvement of the yields of rice by the production of new strains and by modifications of cultural methods call for extension, and that the methods of cultivation of coffee and especially of cleaning and curing the berries require improvement. Central co-operative curing houses for coffee are urgently required in some districts.

In Professor Harrison's view this Colony is so extensive in its lines of possible development and so different from the British West Indian Islands that it must depend mainly on its own scientific staff for the continuance and extension of agricultural research.

With reference to forestry, Professor Harrison remarks to the effect that the Forestry Officer has been so fully occupied with matters of routine administration that he has had little time for special scientific or economic work. The question of the utilisation of lighter timbers has been almost entirely neglected.

As regards fisheries, Professor Harrison thinks that the question of the extension of the local fishing industry is worthy of attention. A good deal of scientific knowledge has been obtained relating to the fishes of the Colony, but no energetic attempts have been made for their utilisation.

Under the heading of mineral resources, Professor Harrison remarks that the Colony is known to possess gold, diamonds, bauxite, kaolin, and iron and manganese ores. He regards its geological structure as unfavourable for the occurrence of copper ore, phosphate rock, potash, or mineral oil.

*Note.*—Very important deposits of bauxite have been found. They are now being worked by one company, and it is probable that another will shortly enter the field. The deposits were discovered by Professor Harrison himself, and this valuable discovery affords a good example of commercial results achieved through the scientific work of officers of high training and ability.

The quantity of bauxite in sight is so large in proportion to the world's demand that there appears to be no occasion to search for further deposits.

Private enterprise has lately been engaged in prospecting for mineral oil. No oil has been found, and from the report of the geologists employed it appears unlikely that any exists.

The Governor is inclined to think that there is a good prospect of payable mica being found in the Colony.

Labour is insufficient for existing industries, and the scope for new industries is limited to such as promise exceptionally good returns. The Colony is as large as Great Britain, but its population is only 300,000. The population is nearly all located in the coastal strip, and the interior is practically undeveloped.

#### BRITISH HONDURAS.

*Note.*—British Honduras did not reply to the despatch, but sent independent despatches upon several research matters. The questions of forestry and mineral investigations are dealt with in the body of the report. It may be added that the Colonial Government engaged at its own expense Mr. W. R. Dunlop, of the Imperial Department of Agriculture, Barbados, to make a full enquiry into the agricultural position of the Colony and to report upon the agricultural policy which he would recommend for adoption. Mr. Dunlop's reports will shortly be published by the Imperial Department. It seems probable that, as a result of Mr. Dunlop's visit, a permanent agricultural department will be established in the Colony.

#### JAMAICA.

The Governor gave the following particulars of matters which he regarded as requiring immediate attention from the research point of view.

(a) The banana industry is threatened by Panama disease of bananas, the causative agent of which has been shown to be a species of *Fusarium* which infects the soil and invades healthy banana plants.

The local Department of Agriculture devised in 1912 a system of quarantine which subsequent experience has shown to be an effective means of controlling an outbreak of this disease. Under this method, which is enforced by law, all healthy plants within a radius of a chain from any infected plant are cut down and treated with caustic lime, the diseased plants are burnt with fire, and the whole area is fenced round and placed in quarantine.

Research work is needed in order to solve the following problems:—

- (1) Is the *Fusarium* commonly found in most of the banana soils of the Island identical with the causative agent of Panama disease?
- (2) Are there conditions of soil in which a non-virulent form of *Fusarium* in the soil may become active and capable of infecting healthy banana plants?
- (3) What period of time must elapse before infected land can again grow healthy bananas?

(b) Jamaica has started a promising industry in the production of dried bananas, the latter being known as "evaporated bananas," or as "banana figs."

Immediate research work is needed with respect to the several causes which bring about decay, deterioration and discoloration of these products.

Local observations have made some progress in this direction: it has been verified that various flies and moths, if given access to the dried bananas before they are picked, serve to infect the material and to engender larval maggots therein. Inadequate packing when exposed to infection by weevils on coastal boats or at wharves, where these insects are prevalent, also results in damage. Moulds also have proved troublesome in some cases.



The discoloration of the dried banana on keeping has been found to be a source of disadvantage to the successful marketing of the product.

(c) In Jamaica there are three factories which produce a considerable amount of leather, but their operations are not on a scale sufficient to enable them to finance a central research association such as is mentioned in the third paragraph of the Secretary of State's despatch. These factories require to be kept in touch with the latest technical developments.

(d) Cattle in Jamaica suffer grievously from ticks. The Colonial Government contemplates making the use of cattle dip compulsory. Successful extermination of the tick is, however, uncertain unless and until the life history of the silver tick (*Amblyomma cajanense*, Fab.) and the tropical horse-tick (*Dermacentor nitens*, Neum.), and the period for which each stage of these two species can survive without access to a host, have been determined. In this case, the minimum periods between dippings of infected stock and for quarantining infected pastures for successful tick eradication are dependent on the facts above mentioned.

(e) Jamaica holds a unique position in that the pimento tree (*Pimenta officinalis*, Lind.) is indigenous to the country and also grows plentifully therein.

Recently it has been discovered that pimento leaves from Jamaica yield an essential oil, which contains 89 per cent. of phenols, consisting of practically pure eugenol, from which vanillin, the essential ingredient of vanilla, can be produced. The yield of this oil obtained by the Imperial Institute from dried pimento leaves sent from Jamaica was 2.9 per cent., equal to one pound of oil from 70 pounds of the green leaves. This oil was valued in London in September, 1919, at 14s. per pound. Vanillin was then selling at 80s. per pound. In this case the problem is to find out how most economically to obtain eugenol. Secondly, how to obtain vanillin most economically. Thirdly, how to obtain (economically) a tanning extract from pimento. The local Department of Agriculture is studying these problems but the Department's work can only be on a strictly limited scale.

In regard to less pressing matters the Governor referred to correspondence indicating the Colony's anxiety to bring about the establishment of an agricultural university for the West Indies, and to other correspondence regarding a proposal for the revision of the geological survey.

*Note.*—The question of Panama disease of bananas is engaging the attention of the Colonial Research Committee in consultation with the Colonial Governments concerned, namely, the Governments of Jamaica and British Honduras, and the Imperial Department of Agriculture for the West Indies and the Director of the Royal Gardens, Kew.

In regard to leather, it has been suggested to the Governor that the local leather manufacturers might join the British Leather Manufacturers Research Association.

The Governor has been furnished with expert advice in regard to the question of ticks.

An industrial chemist has been added to the staff of the local Department of Agriculture and is at present principally employed in studying the question of the preparation of phenols for the production of eugenol and vanillin.

A geological survey of Jamaica was carried out about sixty years ago, but suffered in completeness and uniformity of treatment owing to the death of the Director during its progress. During the subsequent period considerable advances have been made in geological science, and it is desirable that full advantage should be taken of these. The matter is of special importance in connection with the study of the underground water supply. Accordingly proposals are being made with a view to the revision of the survey.

#### LEEWARD ISLANDS.

The industries of these Islands are mainly agricultural, and the necessary researches in connection with them are carried out under the supervision of the Imperial Department of Agriculture, to which reference is made under a separate head at the end of the West Indian section.

In Dominica, Montserrat and St. Kitts, and especially in the first-named, there are many rivers and waterfalls suitable as sources of mechanical power. These are not, however, of very great magnitude. At present they are not utilised, except to a limited extent for electric lighting in St. Kitts and Dominica.

In regard to minerals, small quantities of galena and baryta spar are found in Antigua, and copper sulphide frequently occurs in the heavier rocks of the south-west district, but no minerals are known to exist in payable quantity. An inferior type of mixed iron and aluminium phosphates is mined in Redonda. High-grade deposits of calcium phosphate occurs in Barbuda; these were formerly mined, but mining has been abandoned, probably owing to the expenses of transport.

In St. Kitts-Nevis, sulphur occurs in crystals in the volcanic crater in St. Kitts, and also in two small deposits in Nevis, at Pinneys and at the Farm. The hot baths in Nevis are noted for their healing properties, and it is possible that their waters may be found to be radio-active.

In Dominica, hot sulphurous springs in which crystals of sulphur are deposited occur at the Boiling Lake, the spring of Soufrière, in the south, and the springs at Wotton Waven, east of Roseau. Iron also occurs, and it is possible that manjak or asphalt may exist. Manganese is known in pockets.

In Montserrat, gypsum is found, and a little sulphur.

In the Virgin Islands, copper and molybdenum occur in limited quantities in Virgin Gorda. The mine was originally worked for copper, and 170 tons, valued at £20 per ton, were shipped in 1841, but shortly afterwards operations ceased. Within the last three or four years the tailings at the mouth of this mine have been worked for molybdenite and a limited quantity exported. It is not improbable that other minerals of commercial value exist in payable quantities in the Virgin Islands.

In Dominica attention was drawn to the poor physical condition of the peasantry and to the need of co-operative factories to assist the peasants in preparing the lime crops for market.

*Note.*—As stated in the body of the report, the Colonial Research Committee have made provision for the engagement of a geologist to make an examination of the mineral resources of the Leeward Islands.

## TRINIDAD.

The Secretary of State's despatch was considered by a Committee of the Board of Agriculture, whose report is appended almost in extenso.

Trinidad and Tobago, in common with all the other British West Indian Colonies, are mainly dependent on agriculture for their economic welfare.

"In tropical agriculture there is a great field for continuous research work, both upon immediately practical problems and others which may lead to practical developments. A large amount of useful research work has been and is being carried out, chiefly by officers of Government Agricultural Departments, but progress is necessarily retarded owing to most of the officers having also administrative duties. Scientists visiting the West Indies, or otherwise taking a special interest in the work, often express surprise that so much has been accomplished in spite of this obvious heavy handicap. It is an urgent necessity that this condition of affairs should be improved, and that additional resources in men and money should be available for the prosecution of research work of vital importance to the West Indies and to the Empire as a whole.

"It is difficult to provide these funds locally, and in the West Indies there are no universities or other endowed seats of learning to assist in research as in the United Kingdom. The chief agricultural products, including in this term timber and stock, are sugar, cacao, fruits (bananas, citrus, &c.), coconuts and copra, lime juice, cotton, coffee, rice, spices (nutmegs, &c.), tobacco, timber and stock.

"The conditions under which they are produced, and also their diseases and pests, are more or less similar throughout the West Indies, and many of the problems awaiting investigation would, when solved, bear results of practical importance to several of the Colonies. For these reasons one central research institute would be the most economical and efficient means of providing for the agricultural development of these colonies, and Trinidad appears to possess advantages and facilities which indicate it as a site of such a central institution. In the days before the War, the whole British West Indies (British Guiana, Trinidad and Tobago, Windward Islands, Leeward Islands and Jamaica) exported agricultural products to the value of about £11,762,000, of which over one quarter of the whole came from Trinidad and Tobago. More recent figures for all the colonies are not immediately available, but the proportion is probably substantially the same now. Trinidad and Tobago also produces on a commercial scale a much larger variety of the chief West Indian products than any other West Indian Colony. In 1918 the value of the chief products were:—

	£
Sugar and products ... ..	1,547,085
Cacao ... ..	1,014,981
Coconuts, copra, &c. ... ..	224,099
Live stock and skin ... ..	31,041

"Other advantages possessed by the Colony for the prosecution of research work are the existence of botanic gardens and experiment stations, stock farms, River Cacao Estate, St. Augustine Estate (sugar), &c., all forming part of the equipment of the Department of Agriculture. In these, with the additional assistance already referred to, increased research activity could more easily be developed than by the establishment of entirely new centres.

"The Colony is also the only one in the West Indies in which there is already a trained Forest Officer, who has under his care large areas of Government Forest Reserves and Plantations.

"The geographical position of the Colony is convenient, and it is free from hurricanes and serious earthquakes.

"For these reasons the Committee recommends that a Central Agricultural Research Institute for the West Indies is the most urgent necessity, and that Trinidad offers the most favourable site."

The Governor concurred in the report of the Committee.

Note.—It has now been decided to proceed with the establishment of an Agricultural College in Trinidad, and it is intended that the Imperial Department of Agriculture should be transferred to Trinidad and should be located in the neighbourhood of the college. These measures should meet the need to which the Committee draw attention.

It may be added that in this Colony there is an important oil industry.

## WINDWARD ISLANDS.

## GENERAL.

The industries of the Windward Islands are almost entirely agricultural, and the researches necessary in connection with these industries are carried out under the supervision of the Imperial Department of Agriculture, to which reference is made under a separate head at the end of the West Indian section.

As stated in the body of the report, the Colonial Research Committee have made provision for the engagement of a geologist to make an examination of the mineral resources of the Windward Islands.

## GRENADA.

The growing of cocoa is the predominant industry in this Colony, and the value of the cocoa exported amounts to three-quarters of the total exports. Other exports of importance are nutmegs, mace, cotton and limes.

Considerable efforts have been made to cope with thrips, black blight and *Diplodia* in cocoa, but these pests continue to cause much damage.

The Governor recommended that investigations should be undertaken to ascertain whether mineral oil, bauxite or copper existed in the Island in commercial quantities.



## ST. LUCIA.

Apart from the coaling business of the port of Castries, this Colony is entirely agricultural, and the Administrator reported that its undeveloped natural resources would not appear to justify the expenditure of any large sum in exploring them, and that any financial aid which might become available for research would probably prove more productive if employed in other parts of the Empire, where there are greater prospects of success.

The Administrator added that St. Lucia could assist in building up the general prosperity of the Empire by rendering the Colony more productive; and that this is being done with the aid of the Imperial Department of Agriculture and the good work performed by the local Agricultural officers.

No valuable minerals are known to exist in St. Lucia.

## ST. VINCENT.

The Administrator reported that there were no important industries in St. Vincent on whose behalf research work was not already carried on, and that the chief industries, namely, cotton, arrowroot and sugar, were under the care of the Imperial Department of Agriculture. The soil and climate of the Colony are not specially suitable for other agricultural products, and the Agricultural Superintendent is unable to suggest any subject for special investigation in addition to the industries mentioned, which are already well cared for.

St. Vincent produces the finest quality of long staple Sea Island cotton, and Mr. S. C. Harland, a scientific investigator of high attainments, was engaged from 1917 to 1920 on special research work under the auspices of the Department of Scientific and Industrial Research, which is now being continued by Mr. D. P. Montague.

The Administrator stated that, so far as he was aware, no geological investigation at St. Vincent and its dependencies had ever been made, except by American scientists in connection with the Soufrière volcano. He considered that such an investigation was certainly advisable.

A specimen of clay received from St. Vincent was found to contain bauxite. It appears to have been taken from the small island of Balliceaux, but its origin cannot be identified with certainty.

Since 1917 a Greek subject has carried on a sponge fishery from the islands of Union and Canouan in the St. Vincent Grenadines.

A whaling industry was established in the island of Bequia, nine miles south of St. Vincent, about 1870, and is still carried on during the five months from January to May. The average annual catch does not now exceed 12 or 15 whales, but it was formerly much greater. The decrease is described as due to the inexperience of the present generation. The older men, who were trained in American whalers, have now died out.

*Note.*—The Colonial Research Committee has made provision for the geological examination of St. Vincent, and for enquiry into the sponge fishery. The question whether the prospects of the whaling industry are such as to justify investigation by an expert on the spot is under consideration.

## IMPERIAL DEPARTMENT OF AGRICULTURE.

A copy of the despatch of the 11th June, 1919, was sent to the Imperial Commissioner of Agriculture for the West Indies. The Commissioner reported that, in so far as matters of research came within the scope of the activities of the Imperial Department in relation to such subjects as crops and their attendant pests and diseases, it was desirable that they should, for the most part, be dealt with as matters of the ordinary concern of the Department, since it was seldom that any matter of this kind could be dealt with as a separate entity. Sir Francis Watts stated that through the Department of Scientific and Industrial Research provision had already been made for investigations concerning cotton, and that this work was proceeding satisfactorily. He also referred to the arrangements which had been made for investigations concerning sponges, and recommended the proposal, to which effect has since been given, for the employment of a geologist for the purpose of a general examination of the islands of the Windward and Leeward group.

The only new suggestion made by Sir Francis Watts was one for the appointment of an economist to be attached to the Imperial Department in order to investigate the conditions under which the agricultural industries of the West Indian Colonies were carried on. It was pointed out that labour difficulties were prominent in practically every island and that emigration threatened to make them worse. Sir Francis Watts considered that the reasons for the failure of the labouring population to maintain their numbers and to provide a surplus were partly medical and partly economic, and that their study appeared to be a practical and legitimate subject for scientific research. Something had already been done in regard to the medical aspect, but very much more remained to be done in order to ensure the putting into practice of the precepts of modern teaching. Intelligent application of this teaching was absolutely essential to secure a healthy and virile population in these Colonies, and it was to the neglect of this that many of the present troubles were due. Sir Francis Watts added that the economic aspect of the matter had never received systematic, expert study.

*Note.*—The Colonial Research Committee considered this proposal, but were of opinion that it went beyond the scope of the Committee, and accordingly could not entertain it.

The replies received from the Windward and Leeward Islands will be better understood if a short account is given of the position of the Imperial Department of Agriculture. This institution was established in 1898 on the recommendation of the West India Royal Commission of 1896-7, and its expenses are defrayed wholly from Imperial funds.

The work of the Department is to aid in the maintenance and supervision of the botanic and experiment stations in the Windward and Leeward Islands, to deal with questions from those Colonies involving agricultural research, and to give assistance in agricultural matters to any of the other West Indian Colonies when it is requested to do so, and as far as its means permit.

The personnel of the Department consists of a clerical staff and the following senior officers:—The Imperial Commissioner, an entomologist, a mycologist, an economic botanist, an agricultural chemist, and a scientific assistant. The duties of the scientific assistant are chiefly connected with the publica-



tions of the Department. These publications are the "Agricultural News," which is a fortnightly popular review with a wide circulation in the tropics, the "West Indian Bulletin," which is a quarterly scientific journal dealing specially with research, pamphlets dealing with special subjects, and progress reports on sugar cane experiments, the work of the botanic stations, and agricultural education.

The geologist to whom reference has been made is temporarily attached to the Department.

The greater part of the work of the Department is connected with the Windward and Leeward Islands, but the other West Indian Colonies frequently avail themselves of its assistance. The services of the Commissioner have lately been utilised in the Bahamas for general advice, and in Jamaica for advice in regard to a proposed new central sugar factory, and officers of the Department lately visited Trinidad in connection with entomological problems, and British Honduras for the purpose of reporting fully upon the local agricultural situation.

## OTHER COLONIES.

### BERMUDA.

The Governor reported as follows:—

"These islands contain no natural source of mechanical power other than wind and tide, and their area is so limited that development in agriculture and forestry must necessarily be of a minor character. It is highly improbable that any raw material of great economic value can be produced here in any appreciable quantity. There are no minerals. Development of marine products and fisheries offers certain possibilities. In this direction commercial organization is perhaps required rather than scientific research. In these circumstances, the Bermuda Government does not propose to make any claim for the assistance of the Colonial Research Committee at present, but should further possibilities of development be brought to light the matter may be re-opened at a later date."

### FALKLAND ISLANDS.

The Acting Governor, Colonel St. Johnston, drew attention to the large quantities of peat and kelp found in the Colony, and to the possibility that minerals or mineral oils might be found in payable deposits. He remarked that in 1916 it was considered that the manufacture of potash from kelp would not be profitable, but he thought that, having regard to the change in values and to the many by-products of the industry, such as iodine, bromine, sodium carbonate and phosphate of lime, the matter was worth re-consideration at the present time. He pointed out that the mineral possibilities of the Colony had never yet been thoroughly investigated, but that it seemed probable that oil might be found in the sandstone and slate formation, overlaid by peat, which existed in the Colony. He added that in both the Colony and the Dependencies there were sufficient traces of copper and other minerals to warrant further research.

Colonel St. Johnston also referred to a separate despatch which he had written with regard to afforestation in the Colony. This subject is dealt with in the appended note.

*Note.*—Enquiries were made in regard to the utilisation of kelp as suggested by the Acting Governor, but the Committee were advised that, under present conditions, it would certainly not be remunerative to undertake the extraction of potash or other products from this material. Enquiries have also been made respecting the possibility of finding a company which would be prepared to work the peat deposits, but so far without success.

As regards afforestation, the Colony is at present almost treeless, and a large number of somewhat desultory attempts to grow trees have been rewarded only by the growth of a few small shrubby specimens, hardly any of which reach twenty feet in height. Colonel St. Johnston took a great interest in the problem of afforestation, and discussed the matter with the Director of the Royal Gardens, Kew, before embarking for the Colony. Colonel St. Johnston later forwarded a report indicating that it was reasonably probable, although far from certain, that modern methods of afforestation would be successful. In consequence of this report, and after further consultation with the Director, an experienced young Scotch forester was selected and proceeded to the Colony in November, 1920, in order to make a determined and systematic attempt to establish woodlands. He took out with him a supply of young trees.

There has never been any official geological examination of the Falkland Islands. Although the Colony has been visited by several geologists, their published reports are based on investigations of very limited scope, and it is possible that valuable minerals remain undiscovered in the Colony. For example, Karroo beds exist which are similar to formations in South Africa, Brazil and India, which have yielded coal and other hydro-carbons. In these circumstances, it has been thought worth while to arrange for a more complete enquiry, and a geologist, Mr. H. A. Baker, D.Sc., has been engaged for a term of three years, and left for the Colony at the same time as the forester.

The principal industry of the Colony is sheep-farming. There are about 700,000 sheep spread over an area of about 7,000 square miles; that is to say, it is found that upon an average six acres are required to carry one sheep. It seems likely that in the future some of the lands which are now useless could be drained and planted with grass, and that the grasses of the existing pasture land could be improved. Some sections have already been improved sufficiently to enable one sheep to be supported on each 1½ acres. This matter is for the present being left to private enterprise.

There is in South Georgia and in the South Shetlands, dependencies of the Falkland Islands, the finest whaling area in the world, and its production has of late years exceeded that of all the other whaling areas in the world combined. A Committee was appointed in 1918 to consider the question of the preservation of the whaling industry by the better regulation of the fishing, and the possibility of the development of other industries in the Dependencies. Besides the islands already mentioned, these Dependencies include Graham Land, the South Orkney and the South Sandwich Islands. The report of the Committee was presented to Parliament in April, 1920 [Cmd. 657]. The Committee recommended the employment of two vessels in research in the Dependencies during

a considerable term of years. This recommendation would involve expenditure quite beyond the resources of the Colonial Research Committee, but it is hoped that it may be found possible to provide for the employment of at least one vessel in this work, by means of funds obtained from export duties on whale oil, which have already been increased for the purpose. Enquiries are now being made as to the present cost of building the proposed vessels. No definite decision has yet been reached in the matter.

The possibilities of the waters between the Falkland Islands and the mainland as a fishery area are referred to in the body of the report.

#### FIJI.

The Governor forwarded a full memorandum by Mr. C. H. Knowles, Superintendent of Agriculture.

Mr. Knowles indicated the principal directions in which research was actually proceeding. There is a Government Entomologist for the study of insect pests in plants. There is an Agricultural Chemist, who is engaged *inter alia* in the systematic study of the soils of the Island. The principal other investigations are into improvements in the methods of drying copra and the effects of the growth of moulds on copra. The Government employed a mining adviser in 1910-1911.

As regards suggestions for new work, or the extension of work already in progress, Mr. Knowles reported, under the head of mechanical power, that there were falls in Fiji of large volumes of water descending considerable distances and that their possible use for power purposes merited investigation. It was, perhaps, unfortunate that no large falls existed in close proximity to places where power was required, but it was possible that industries might be established in the neighbourhood of such sources of power. Further, electric current was capable of being conveyed long distances with little loss, and, having regard to the high rainfall of the wet zones, the possibility should not be overlooked that a reserve of power might be created by constructing a dam across the mouth of an elevated valley having a sufficient catchment area. Localities specially worthy of investigation were the Nuku falls in the Waimanu district, some falls on land between Natewa and Buca Bays, and the lake on the high mountain of Taviuni.

Under the head of general agriculture Mr. Knowles drew attention to the importance of compiling proper statistics relative to each agricultural industry, which would enable an accurate estimate to be made of progress year by year.

As regards the sugar cane industry, Mr. Knowles remarked that this was the main industry of the Colony, and was entirely in the hands of the Sugar Refining Company, which maintained in the Colony and in Australia a scientific staff engaged in investigating the many problems presented by sugar growing and manufacture.

As regards the coconut industry, Mr. Knowles wrote as follows:—

"The chief island of the group, Vitilevu, is not a place where coconuts give satisfactory crops, owing to the destructive agency of the small leaf-moth *Levuana iridescens*, whose larvæ eat away the undersides of coconut leaves and prevent the palm from bearing proper crops. The investigation of remedies for combating this pest, capable of application under field conditions, is one of great importance, not only in regard to the island of Vitilevu, but for the coconut districts generally, which would, it is assumed, be reduced to the low level of Vitilevu as copra-producing districts should the moth become established in them. Large areas of excellent coconut land exist in Vitilevu which are not at present used for other purposes, and if the ravages of the moth were eliminated the large numbers of coconut palms now growing on them would provide a considerable amount of copra immediately, besides forming the nuclei of considerable coconut plantations. Investigations as to the best methods of cultivating the palms, the proper selection of seed, the best planting distance to use, the best treatment for the soil previous to planting, the determination as to whether the characters of the different varieties of the coconut are constant, etc., are by all means to be recommended."

Mr. Knowles also drew attention to the need of experiment in methods of drying copra. Sun drying has proved uncertain and hot air dryers are now being tried.

As regards the banana industry, Mr. Knowles considered that enquiry was needed as regards methods of improving crops, cheapening production, eliminating the losses caused by the banana borer *Cosmopolites sordida* and the "Cabbage disease," improvements in packing, and devising some satisfactory means of utilising surplus and waste bananas, such as by the manufacture of banana flour or other products.

The losses caused by the two diseases mentioned amount to a considerable sum in the course of a year. In connection with the depredations of the borer, the Government Entomologist paid a special visit to Java and, as a result, introduced into Fiji a natural enemy, *Plæsius javanus*. Further consignments of this insect have been received more recently. So far no effects are noticeable which can be ascribed to the work of this insect, and further investigation into the possible control of the borer is desirable.

The rubber industry is stated to present few problems beyond one, which affects all Fijian industries, namely, shortage of labour.

The rice industry is in the hands of small settlers, who are slow to take advantage of improved methods of dealing with their crops in the fields, and who, as a rule, cultivate such small patches and regard their own labour as of such little value that suggestions for the improvement of their methods of cultivation are of little use. There is no doubt that, if modern methods of cultivation were introduced, the industry is capable of extension even to the scale necessary to attract the attention of European planters. The use of seed drills for planting, strippers or reapers and binders and threshing machines for harvesting the grain, thus eliminating most of the expensive handwork, offers possibilities which deserve careful investigation.

The introduction of better varieties of seed is a matter which needs attention, but trials on an enlarged scale would be desirable if facilities existed for carrying them out.

Relative to cotton, during the operations at Lautoka Experimental Station sea island cotton was found to thrive very well under the conditions in the dry zone. Its cultivation, however, has not been taken up either by the small settler, to whom it would appear to be well adapted, or by the larger planters. The chief difficulty in the case of the latter is the fact that cotton cultivation does



not afford regular employment to the labourers during the whole year. Mr. Knowles considered that this product would appear to offer a good opportunity for successful cultivation on a large scale, but only when the number of small settlers becomes sufficient to make it possible to adopt some co-operative scheme under European supervision, and when the needs of the Colony in regard to the other products generally cultivated by the small settlers have been fully met. A high grade of sea island cotton requires unremitting care in seed selection and is not a product which can be left entirely to the individual efforts of small settlers. The cultivation of short staple cotton would probably be impracticable unless a market much nearer than Europe could be found.

A large number of minor crops are grown in Fiji and some of these will be capable of extension. The principal minor crops are sisal hemp, maize, castor oil, mustard seed, pea nuts, tobacco, pigeon peas, coffee, cocoa, limes, and food crops such as yams and taro.

Mr. Knowles considers that investigation is most certainly required into the methods of dealing with noxious weeds, and particularly those infecting grazing land, such as *Clidemia hirta* and quava, the former of which has spread to a considerable area of valuable land and entails great expense for its removal.

The Colony produces large quantities of molasses, and could grow a vast amount of such starchy material as cassava. Accordingly the manufacture of alcohol for commercial purposes from such materials would appear to be an industry eminently suitable for introduction into Fiji.

Under the head of Forestry, Mr. Knowles suggests the investigation of the questions of extracting rubber from *Alstonia plumosa*, and tanning material from Doga bark, and of obtaining ivory nuts and starch from *Metroxylon vitiensis*; and the examination of timbers as to their fitness for various purposes including use as paper pulp material, etc.

With regard to geology and minerals, Mr. Knowles reports as follows:—

“Indications of the presence of gold have been found in several parts of the group. So far, the metal has only been found in various creeks, and the reefs from which alluvial gold has come have not yet been located. Copper from one district has attracted attention and ore showing excellent analysis has been examined at the Imperial Institute. Pieces of coal have been found in one of the creeks of Vitilevu under circumstances which have suggested the possibility of a seam occurring somewhere in the neighbourhood, and thin seams have been found elsewhere (*see* the Mining Adviser's Report). I have myself seen particles of sand rising from the bed of a creek in Vitilevu to the surface, and, on reaching it, sinking again. This suggests that they were carried to the surface through being attached to or surrounded by globules of oil.

I think that these definite indications are worthy of investigation, while, at the same time, bearing in mind the illustration given by the Secretary of State in paragraph 5 of the despatch, it is highly desirable that a general mineralogical survey should be made of the whole Colony. The possibility of finding some material suitable for use in making cement should not be overlooked.”

As regards marine products, Mr. Knowles states that the waters of the group possess valuable stores of pearl, pearl shell, trocas shell, and sponges, and that the fish might provide material for a large industry.

The Agricultural Department in Fiji is being reorganised upon a larger scale, and the amount of research work done by the Department may be expected to increase.

In forwarding Mr. Knowles' report, the Governor remarked that an Entomologist was at present engaged in investigating at Tahiti the possibility of introducing into Fiji a parasite to prey upon the insect pest which had done great damage to the cotton growing industry, that a rice mill had been established at Suva, and that an Ordinance had been drafted to provide for the collection of returns of cultivated land and details of the crops under cultivation. The Governor regarded the citrus fruit industry as being among the most promising of all local agricultural possibilities.

The Governor stated that he did not intend at that time to submit any concrete proposals based upon Mr. Knowles' suggestions, but that he would again address the Secretary of State on the subject when the organisation of the Agricultural Department had been finally decided upon.

*Note.*—The cultivation of sea island cotton is engaging the attention of the Government and a supply of seed is being obtained from St. Vincent.

The practicability of manufacturing alcohol from molasses was recently under the consideration of a Committee, on which the Fiji Department of Agriculture and local planters were represented. The report of the Committee was favourable to the project, but there are certain difficulties in the way of obtaining control of a sufficient proportion of the local supply of molasses. A report on the subject was sent recently to the Department of Scientific and Industrial Research, who were asked for further particulars with regard to the quantity of molasses which would allow the economical manufacture of alcohol at any one place. The Department of Scientific and Industrial Research have replied that two experts left England on the 22nd October, 1920, for Fiji, to investigate the possibility of producing power alcohol in that Colony.

#### ST. HELENA.

The Governor reported as follows:—

“In accordance with the last paragraph of your despatch under reply, I have consulted suitable members of the official and unofficial community, and the balance of their opinions appears to be in favour of directing any such research towards the development of the possible mineral, as opposed to agricultural, resources of the island. Although such minerals as are known to exist, for example manganese ore, phosphates and aragonite, have already been reported on unfavourably from an economic point of view, it is argued that a thorough geological survey of the island might disclose the existence of other more precious minerals, such as diamonds. With this object in view, it has been suggested that the services of Mr. A. E. Kitson, the Director of the Geological Survey of the Gold Coast, might be obtained for three months, if possible, in order to make a thorough geological survey of the island.

Whilst admitting the possible value of such a survey, I am personally inclined to think that a less speculative and more profitable investment of any funds that may be forthcoming for the purpose would be in the development of the agricultural resources of the Colony. As to the nature of these resources, which are already ascertained, I cannot do better than invite a close perusal of the report



by Sir Daniel Morris (Report upon the present position and prospects of the agricultural resources of the Island of St. Helena, written in 1884, and reprinted in 1906 as Cmd. 3248). Of all the various recommendations made in that report, the only one which has received serious attention is that dealing with the cultivation of and extraction of fibre from the New Zealand flax. This industry has succeeded beyond all expectation, and has provided the Colony with a valuable and much needed article of export. The ease with which the crop is cultivated, and the abnormally high prices obtained for fibre during the last few years have given an enormous impetus to planting, with the result that other agricultural pursuits have been correspondingly neglected. This is to be regretted in so far as it diminishes the capacity of the island to be self-supporting. As it is, a large proportion of the money earned by the export of fibre is used to pay for imported foodstuffs, many of which could be produced locally if the agricultural resources of the island were properly developed and utilised. "But" (to quote from Sir Daniel Morris' Report) "the people require to be shown what those resources are; they need to be taught how to use those resources aright, and they require to be assisted and encouraged while so engaged."

For these reasons I am strongly of opinion that any grant which it may be possible to obtain for the purpose of developing the resources of this Colony should be devoted towards the establishment of a botanical garden for the promotion of improved methods of agriculture and the development of the numerous industrial plants already in the island, on the lines suggested by Sir Daniel Morris. Although it may be doubted whether, in view of its geographical position and its limited area, this island will be able to produce any other article of export, it is certain that the introduction of improved methods of agriculture would enable it to be less dependent on imported foodstuffs, and in proportion to make more profitable use of the proceeds of its one available export."

*Note.*—The recommendations of the Committee and an account of the action taken in regard to the Colony will be found in the body of this report. The fisheries of St. Helena received considerable attention about ten years ago, but with little success. For information on this subject, reference should be made to the Report on the Fisheries of St. Helena by Mr. J. T. Cunningham, published in 1910 as [Cd. 4998].

## APPENDIX III.

### ACCOUNTS OF RECEIPTS AND EXPENDITURE TO 31ST DECEMBER, 1920, AND ESTIMATE OF LIABILITIES ON THAT DATE.

#### *Receipts.*

	£	s.	d.
Grant in Aid of Colonial Research for 1919-20 ... ..	1,000	0	0
Instalment of Grant in Aid of Colonial Research for 1920-21 ...	1,000	0	0
	2,000	0	0

#### *Expenditure.*

	£	s.	d.
Bahamas and West Indies: sponge investigations ... ..	802	16	9
Leeward and Windward Islands: geological investigations ...	139	7	0
General: preparation of Report on the Fishes of the Colonies	70	0	0
	1,012	3	9
Total expenditure ... ..	1,012	3	9
Balance in hands of Crown Agents for the Colonies ...	987	16	3
	2,000	0	0

#### *Liabilities.*

	£	s.	d.
Grants definitely approved ... ..	12,370	0	0
Grants approved upon conditions not yet fulfilled ... ..	4,200	0	0
	16,570	0	0
Less actual expenditure ... ..	1,012	3	9
Net liabilities ... ..	15,557	16	3

## Colonial Research.

### Activities in the Straits And F.M.S.

A very interesting and instructive document has just become available to the public by the issue of the first annual report of the Colonial Research Committee for the period ended December 31, 1920, says the L. and C. Express. We may remind our readers that the object of the Committee is to aid researches which may lead to economic developments, and the investigation of animal and plant diseases and insect pests. It is designed specially to help smaller Colonies and Protectorates whose funds are insufficient to allow them to carry out investigations. As a preliminary, the Committee decided to recommend that despatches should be sent to all the Colonies and Protectorates, drawing attention to the need for a review of the activities carried on by, or on behalf of, the Colonial or Protectorate Governments in scientific research and economic exploration, and for the consideration of all promising schemes, either for new work of this description, or for adding to, or widening the scope of, work already in progress. The replies received are very informative, and indicate that, with a wise allocation of the grants which the Committee has at its disposal, very valuable work is likely to be achieved in developing the assets of the Empire.

#### Rubber and Tin.

So far as the Eastern Colonies are concerned, possessions like Hongkong, the Straits Settlements, and the F.M.S. are on so considerable a scale that they are able to conduct all necessary researches out of their own resources. While no reply to the despatch of the Committee had been received from Hongkong, a full report was sent concerning the F.M.S. by Sir Edward Brockman, the Chief Secretary, and the Governor of the Straits Settlements also sent a despatch. The F.M.S. report indicates that the local Government is fully alive to the importance of research work, and is making investigations in a number of directions, but more particularly in regard to problems connected with the two great industries of rubber growing and tin mining. With regard to mechanical power, coal, which has been found in Selangor, and water power to a limited extent is gradually supplanting the use of wood for this purpose, and, although oil has not yet been found in the F.M.S., there is reason to believe that in Brunei there is a large and accessible oilfield. As regards agriculture, the Government has made very liberal provision for agricultural research, and, although rubber receives most attention, rice, coconuts, and other products are not neglected. It is

proposed to enlarge the Meteorological Department, since a systematic investigation as to rainfall is of importance to agricultural as well as in connection with water power. A scheme has also been approved for the establishment of studentships for research in tropical agriculture. Details are also furnished of the activities undertaken in regard to forestry and minerals. It is interesting to note that it is in contemplation to publish a work on the commercial products of the Malay Peninsula, while a volume is in preparation giving a detailed account of the Malayan commercial timbers and their present and possible future uses. It is also proposed to publish an account of the principal minor forest products, which already have a commercial value, and would probably find new markets if more were known of them.

The Geological Department of the F.M.S. has already accomplished much good work. About one-third of the Malay Peninsula has been surveyed geologically, and it is regarded as desirable that the survey of the F.M.S. should be completed, and that surveys of the Straits Settlements, including Labuan and Brunei and the Protected Malay States, should then be undertaken. It is proposed also to carry out investigations into the methods of tin ore saving on alluvial mines, lode mines, and dredges. There has been a steady decrease in the output of tin, and it is desired to conserve this valuable metal and to prevent unnecessary waste. In the past much tin has been left in the land owing to careless working.

#### Co-Ordination.

Finally, the question of the co-ordination of research work is under consideration, and it has been suggested that a central research institute should be established at Kuala Lumpur. As regards the Straits Settlements, the Governor reports that after consulting his advisers, he is of opinion that there is still scope for the development of research in the Colony. The only Research Department is that of the Botanical Gardens, and its activities will be utilised and extended as far as possible. There are few industries of any great external importance, and for many years to come the main object of any industrial research in the Colony will be to provide for its own internal needs. At the present moment there are projects on foot for the encouragement of brick-making, cement manufacture, and glass-making, in all of which industries the demand is urgent, but the supply is either lacking or insufficient. There are also the large industries of rubber planting, rubber manufacture, coconut oil manufacture, and pineapple canning, which are of Imperial importance. For these, the scheme of research now contemplated in conjunction with the Rubber Growers' Association will doubtless (says the Governor) be of great assistance, and he gives the assurance that the Colony will be glad to join with the F.M.S. in the enterprise.

Minute paper No. ....

Sheet No. ....



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be used if required.

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No Minutes should be written on this page. A separate half-sheet to  
be used if required.

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From Whom ....

Place ....

Date .....

**SUBJECT.**

*Certification of work*

*Connected Papers.*

**MINUTES.**



247/19

1919  
15th, September/19

Scientific Research

Sir,

I have the honour to acknowledge the receipt of your letter No. 4686/19 of the 23rd. August, 1919, and of its enclosure on the subject of the extension of scientific research.

2. In chapter III of my annual report for 1918 I have reviewed the position up to the end of 1918 from the point of view of the forest department. During the current year work has been done on the local timbers; a correspondence course of instruction in timber identification has been published; a card index of the vernacular names of Malayan trees has been begun; the herbarium timber collections have been considerably extended; and a further considerable mass of miscellaneous information has been received and awaits compilation.

3. So much remains to be done that it would give full employment for many years to a far greater number of properly qualified men than we can hope at present to secure, and I can only indicate roughly what steps should be taken in the near future.

4. In my opinion one of the most important tasks to be undertaken is the collection in a convenient form of all available information on the local forest economic products. Much of this information is buried in the records of the department a great deal more is to be found in foreign especially Dutch publications. The translation of the standard work on the Economic Plants of the Dutch Indies has now been begun, and when this has been completed it should be possible with the additional information collected locally and with the assistance of other technical departments to publish a comprehensive work on the Commercial Products of the Malay Peninsula similar in character to Sir George Watt's Commercial Products of India" If full advantage

is to be taken of Dutch scientists, not only in sylvicultural but in other branches of research, one or more whole-time Dutch translators would seem to be required.

5. In addition to the publication suggested above we are in urgent need of a book giving a detailed account of the Malayan commercial timbers and their present and possible future uses. Such a book is now in course of preparation. It is also in contemplation to publish an account of the <sup>Principal</sup> principal minor forest products which already have a commercial value and would probably find markets if more were known of them.

6. Thirdly, we require urgently to know with some degree of exactness what our forests contain and how they can be most profitably exploited. A proposal has already been made by the Railway Department to engage two trained foresters with a knowledge of up-to-date logging methods to report on the supplies of timber available for railway purposes, but there is work for others if they can be found.

7. Fourthly, a ~~MMMMMM~~ detailed study is required of the distribution, habits, and sylviculture of our principal timber trees. Little work of this kind has yet been done except in the mangrove swamps, and no results have yet been published.

8. Fifthly, a systematic scheme should be worked out for testing the strengths of the Malayan timbers, and for ascertaining their durability under varying conditions both in their natural state and treated with preservatives. The work alone would give almost full employment to one officer for several years.

9. The foregoing are examples (others might be given) of researches requiring for the most part the services of trained officers, and the amount of work that can be done depends, as I have already indicated, entirely on the number of each officers who are available. For administrative reasons it is generally inconvenient to appoint a large number of officers to a small department at one time, but, if good men are obtainable, and if the inconvenience likely to arise is considered of minor importance, work can be found for them at once without any difficulty. If a good salary is offered I have little doubt that a fair number



number of men will be forthcoming, and if a single fully manned forest department for the whole peninsula is gradually created the inconvenience I have referred to will be avoided.

10. Reference must now be made to the sciences auxiliary to forestry proper, amongst which may be included botany, chemistry, entomology, and even engineering. In India the forest department has at its research institute at Dehra Dun a staff of botanists, chemists and entomologists with well equipped laboratories, and there are one or more forest engineers in the service of the different local governments. I doubt however whether the time is yet ripe to establish such laboratories purely for research connected with forestry. The Malay Peninsula is a small country and economy and convenience seem to point to the desirability of centralizing research in sciences of wide application in a single institute so constituted that the services of the research officers will be freely available to all. Later developments may necessitate partial departmentalisation, but not, I think, for many years, and even then departmentalisation might perhaps be within the central institute.

II. It should be a general <sup>Principle</sup> that the Federated Malay States and the Straits <sup>Straits</sup> Settlements should work together for, in no other way can duplication be avoided. From the point of view of the need for Economic research the Colony is negligible in comparison with the Federated Malay States. The Institute should therefore be at Kuala Lumpur, which is centrally situated. Singapore is unsuitable if only for the reason that there would be difficulty in finding room for the necessary buildings, I advocate the immediate removal of all systematic botanical work from Singapore to Kuala Lumpur, together with the herbarium (for which I believe a new building is to be erected) and the botanical library. The only arguments I have heard for continuing the present inconvenient arrangement are:-

- (I) that the Colony would not agree to the proposed change;
- (II) that it is convenient for the Director to be near the Singapore botanical and economic Gardens;



- III that Singapore is convenient for the passing scientists;
- IV that the herbarium should be near the university; and
- V that it would be better for the Federated Malay States to ~~MM~~ to have their own systematic botanist and herbarium.

As regards (I) I believe the Colony has never been asked. (II) seems unimportant as the assistant Director in Singapore can look after the Singapore Gardens under the general supervision of the Director in the same way as the Penang Gardens are now managed. Moreover there is room for the development of the public Gardens in Kuala Lumpur and far more land near Kuala Lumpur than near Singapore for the extension of the experimental economic Gardens. The passing scientists is not worth consideration; the real scientist, who <sup>alone</sup> ~~alone~~ matters, will not object to the short additional journey to Kuala Lumpur. I am not competent to express an opinion on (IV) but I have heard it suggested that Singapore is not an ideal site for a university and I think it is perhaps open to argument whether a university of Malaya in Kuala Lumpur would not be preferable to a Raffles College in Singapore. (V) seems to involve a totally unnecessary duplication of work. The forest and Agricultural Departments must always have small reference herbaria, but there is no need for two botanical departments.

12. In conclusion I would make the following suggestions of a general nature:-

- (a) All research work should as far as possible be according to programme, both in order to prevent overlap and the ~~MM~~ sacrifice of the general good to research officers' individual fancies and in order to secure co-operative between the different departments.
- (b) In India there is a board of Scientific Advice. I do not know precisely what its functions are, but it might be worth while to make enquiries and to secure copies of recent records of their proceedings. The establishment of an advisory board might prove useful here.
- (c) the central research institute ~~MM~~ should include a

well stocked library containing books of general scientific interest and especially such books as are not required for daily reference and do not find a place in the smaller departmental libraries. There should also be a reading room well supplied with the better scientific technical periodicals.

I have etc.

Sd. C. Cubitt

Com. of Forests.

the Under Secretary

Kuala Lumpur

F. M. S. Museums

September 16th, 1919

Dear Cubitt,

Thank you very much for your letter of September 15th, covering your scheme of Scientific research for the Forest Department.

With much of it of course I am in no way concerned and am not competent to express an opinion.

Commencing at paragraph 10 however, I think that the formation of a central scientific Institute at the present date is an Utopian idea which would not work in practice and which would result in far less work being turned out with a given expenditure than is at present the case. It has not in practice worked in India, where to a large extent each department has its own specialist staff. There would be continual wrangling between departments as to priority of interests. To take the case of entomology alone, there is ample work here for an Agricultural Entomologist, A forest Entomologist, and a Systematic entomologist the work in each case being on different planes. If all this work was committed to a central institution, the Director of Agriculture for instance would not be best pleased if he was informed that an indent by him for an urgent piece of work would have to wait while another research was being concluded for the Forest Department, or vice versa. Yet this would inevitable happen in practice.

With paragraph 11 I am in agreement in theory; in practice it is I think quite out of the question. As regards to your five points.

(I) It may be taken as certain that there would be bitter opposition in Singapore to the project.

(II) There is not the slightest necessity for botanical research as such to be connected with the upkeep of botanical gardens such as exists at Singapore.

(III) I agree with your view.



(IX) This view will be urged with great force in Singapore.

(V) I have myself urged that the F.M.S. should have their own Systematic Botanist and Herbarium but I have not on that ground advocated the abolition of the Singapore Office.

There is ample work in the country for two men but even if there is not there is no reason why the Singapore appointment should not be allowed to lapse when the present <sup>incumbent</sup> reaches pensionable age.

I agree with you that forest and agricultural departments ~~MMMM~~ should have one small special herbaria and I further think that there should be a forest Botanist and an Economic Botanist. But there should be also be a Systematic botanist and his department as in many other countries should form part of the Museums, where machinery for collecting and housing and dealing with collections already exists. I have the ~~MM~~ support of the highest botanical authority in stating that not more than twenty five per cent of the flora has the slightest bearing on Forestry and therefore I think that with this phase (i.e. Systematic Botany) we are more directly concerned than you

As regards I2.

(a) I am not sure that this would not have a very deadening effect and there are many practical difficulties in the way. The idea looks well on paper but who is to be the authority to draw up the programme?

(b) I have had long discussions on the subject of the Indian Board of Scientific Advice with a member of that board with the idea of suggesting to Government the introduction of a similar body here. My informant tells me that the board is of no practical use in that it is clothed with no authority and that its work is mainly concerned with the record of scientific work done in India and the expression of pious opinions.

To be any real use the board would have to be clothed with plenary authority. In this country it could only be ~~MMMMMM~~ composed of the heads of the various technical and scientific departments.

The country is too small for the operations of such a board which would not carry sufficient weight to enforce a policy on a department with which the head of that department did not agree, unless the individual was weak and as such unfitted for the appointment.

(c) I agree that the formation of a central reference library is an urgent necessity; correspondence between myself and the Chief Secretary has already been taken place. I believe that a preliminary vote has been placed on the 1920 Estimates

Yours very truly,

Sd. H. C. Robinson

Ngem<sup>th</sup>.

Ag. C.F.

My best thanks for letting me see this. I know Mr. Cubitt's views, and I think he knows mine. I scarcely think he clearly appreciates mine. His I regard as the natural result of his position, - as very logical to it. It would clearly be greatly to his interest that the scientific work of my Department should be in Kuala Lumpur; and equally it would be to my advantage that his work should be centred in Singapore. Equally clearly I recognise the advantages of my position in Singapore, in my entrenched camp sixty years old: he does not because he looks at the Herbarium work only. Make me a garden in Kuala Lumpur as rich in possibilities as the one I have in Singapore, and I can weigh in the opposite scales of the balance the advantages of

in favour of  
Singapore

in favour of  
Kuala Lumpur

contiguity to the (planned)  
University college

contiguity to the Forest  
Department  
contiguity to the Agricultural  
Department

my position on the high road

perhaps with the advantage falling to Kuala Lumpur? But in no case can I consent to the divorcing of work of dry leaves and flowers from work on the plant in life.

Mr. Cubitt lays no stress on such a proposal; but Mr. Robinson does; and to him I would direct the question - the Herbarium at Why did Kew much the younger, leave the Botany Section of the ~~Natural History~~ British Museum such an enormous distance behind if it were not for its live interest? He will not be able to answer it. He may remember that the Royal Commission of 1899 sat on the proposal to remove the South Kensington collections to Kew, but not on a proposal to remove the Kew collections to South Kensington. Salary complications were the chief cause of the Commission <sup>effecting</sup> / ~~doing~~ nothing.

Both Mr. Cubitt and Mr Robinson raise the question of the control of work. They refer to the Board of Scientific



Advice in India. As I was a member of that Board from its first year to 1912, my opinion of its scanty value may be recorded here: its annual report is good; its half-yearly meetings a drag only. Contact between departments which might overlap, and goodwill are the only reasonable means for preventing overlapping. A board with plenary authority is a clumsy pistol, which I suppose would be put into the hands of a Government Assistant Secretary to comfort him in quandaries. The Secretary to the Government of India in the Department controlling the scientific and industrial departments is the head of the Indian board of Scientific Advice, and every member of the Board has direct access to him without using the Board.

Lastly may I say that there is no reason for two botanic departments in the Peninsula as far as I am concerned.



It is requested that the following number be quoted in the reply to this letter.

No. 5 in 419/21.

OFFICE OF CONSERVATOR OF FORESTS.  
F. M. S. & S. S.

KUALA LUMPUR, 26th July, 19 21.

My dear Burkill,

After drafting the enclosed letter I was asked by the Under Secretary what I had done in the matter. This therefore makes it easy to raise the whole question again. As promised, however, I send you my draft before despatch. Eaton is in almost complete agreement with me; so is Foxworthy. I don't know about Robinson. Eaton is adding a memorandum, and I suggest you might do the same. Of course, if I have misrepresented you, I will amend the draft.

Yours sincerely,

*Mr. Burkill  
please take a copy  
of the draft  
from*

To,

I. H. Burkill, Esq.,

Director of Botanic Gardens,

Singapore.

Botanic Gardens,

Singapore,

5th. August, 1921.

Dear Cobbitt,

In the enclosed you do misrepresent me slightly: but if you substitute "Gardens" for "Economic Gard in line 4 of your para 2, you will not.

2. If you agree to alter that, you will have to alter your para 4, which could read -

it had been decided to abolish the Economic Garden in Singapore, and this so lessens the importance of the Gardens in Singapore, reducing their area to one half, that Mr. Burki I understand, would not oppose the transfer of himself and the Singapore herbarium to Kuala Lumpur if a proper botanic garden were instituted there. He makes this proviso because he greatly objects to a divorce of the study of plants in herbarium specimens from a study of plants alive. He was asked for a piece of the Tassek Glugor Forest Reserve in Province Wellesley ..... etc.

3. I am not with you in saying that the Agricultural Department is the proper guardian of the Economic Garden. There is a difference between a garden and a plantation which in the conditions of our life is fundamental. All of us who have the means, cultivated gardens round our houses for the sake of their amenities, be it flowers or be it fruit. With such matters an economic garden is concerned. Some citizens are planters, and grow stuff for disposal on profit, and an economic plantation is of concern to them. The plantation has the Agricultural Department for its proper guardian; but I consider the Gardens Department the proper guardian of the real economic garden as I would constitute it. Unfortunately our Singapore "Economic garden" as regards ~~rub~~ rubber had become a plantation. Common sense would enable a Director of Agriculture and a Director of Gardens to find a line which neither allows overlapping nor things to slip.



You suggested that I should add a memo and I have done so.

I have official notification that the Raffles Memorial College is to be built in the Economic Garden, and my immediate concern is to save my valuable material. For that purpose I want a permanent place for them, be it near Kuala Lumpur or in Pasok Gligor, and I want it without delay. Therefore I may be quite unable to wait for the proposals in your letter to go through.

I am ready to run up to K.L. to see people if I can do good thereby.

Sincerely yours,

Clear  
copy please  
to duplicate

MEMO.

(1) It has been suggested that botanic work should be centralised upon Kuala Lumpur.

(2) The Director of Museums has endeavoured to make a beginning of it <sup>by</sup> an endeavour to start a herbarium, <sup>in</sup> rivalry of the Singapore herbarium.

The Malay Peninsula is not big enough for two herbaria, and the one which Mr. Robinson proposes cannot compete with the Singapore herbarium unless advantaged enormously by administrative support. Mr. Robinson is undoubtedly relying on that; and his reliance is warranted by the almost complete surrender of interest in ~~botanic~~ <sup>man</sup> research ~~made~~ <sup>which</sup> by the Colonial Government in their report to the Colonial Research Committee (vide the First Annual Report of the Committee p. 19).

Mr. Robinson's bid for a herbarium is however quite unjustified from the scientific side: on the one hand it does an injustice to Botany by causing its direction by a Zoologist; and on the other hand it does an injustice by splitting herbarium botany from the rest of the science, ~~and so is doubly injurious to progress.~~ Herbarium material

<sup>being</sup> is nothing but records for preservation, ~~and~~ the man who does not <sup>Examine when he can</sup> ~~look at~~ the living plant rather than the record <sup>or at ~~the~~ living related plants</sup> is looked down on by the true scientist; <sup>and with reason for</sup> ~~while at the same~~ <sup>herbarium</sup> it is easy to see that the greatest advances in Botany have come from institutions such as Kew where the living ~~plant~~ is studied, ~~not~~ <sup>along with</sup> herbarium material.

I consider that no proposal for transferring the Singapore herbarium to Kuala Lumpur should come up apart from a proposal to establish a <sup>local</sup> botanic garden under the same charge.

I have already outlined a scheme for a string of gardens down the Peninsula under a Gardens Department and have ~~also~~ laid it for discussion before Mr. Lewton-Brain and Mr. Barnard, with whom were also Dr. Foxworthy, Mr. Bunting and Mr. Milsom; and the only way in which I depart from the scheme is that I <sup>much</sup> am more ready to

agree to the centre of administration for the series being  
the proposed Kuala Lumpur garden, *than I was*.

The changes will take some years; ~~and~~ it is doubtful if  
they can be brought about so rapidly that I should ever reside  
permanently in Kuala Lumpur.

*JMS*



no. 2 in 419/21.

8 Sept 1921

Sir,

In further reply to your letter No. 6, 3366/21 of the 12th, July 1921 on the subject of the centralisation of all systematic botanical work in Kuala Lumpur, I have the honour to inform you that I showed my reply to your letter No. 4686/19 of the 23rd. August 1919 to the Director of ~~MINISTRY~~ Museums and Fisheries (Mr. Robinson) who, with reference to para: II of my reply stated his views as follows:-

"I have myself urged that the F.M.S. should have their own systematic botanist and herbarium, but I have not on that ground advocated the abolition of the Singapore office. There is ample work in the country for two men, but even if ~~there~~ is not, there is no reason why the Singapore appointment should not be allowed to lapse when the present incumbent reaches ~~the~~ pensionable age".

I believe Mr. Robinson's idea is that, whatever may happen to Mr. Burkill's appointment, the Federated Malay States systematic botanist will in the course of a few years be able to build up a herbarium which will render the Federated Malay States entirely <sup>(in)</sup> dependent of the collections at Singapore a suggestion with which I totally disagree. If ~~the~~ the Singapore appointment lapses Mr. Robinson's scheme will on Mr. Burkill's retirement, fall into line with mine, but in any case Mr. Robinson's scheme contemplates a ~~total~~ totally unnecessary duplication of work.

2. About a year ago Mr. Barnard showed the papers to Mr. Burkill whose chief objection to my proposal was that it would divorce "work on dry leaves and flowers from work on the plant in life". In other words, he ~~objected~~ objected to being taken away from his economic gardens. He added however ✓

"Make me a garden in Kuala Lumpur as rich ~~as~~ in possibilities as the one I have in Singapore, and I can weigh in the opposite scales of the balance the advantages

in favour of  
Singapore

in favour of  
Kuala Lumpur

Contiguity to the  
(planned) university  
College

Contiguity to the Forest  
Department

My position on the  
high road.

Contiguity to the Agrtic-  
ultural Department.

perhaps with the advantage falling to Kuala Lumpur."

3. It is perfectly evident that the Straits Settlements with an area of about 1,500 ~~square~~ square miles, cannot ~~possibly~~ <sup>possibly</sup> have the same botanical interest in a matter of this sort as the Federated Malay States with an area of about 28,000 square miles or as a territory of almost double that extent, if, as I hope Kuala Lumpur becomes the centre of research for the whole Malay Peninsula. It is probable that the great bulk of the material in Singapore herbarium is from the Federated Malay States, but in any case there is, as stated on page 19 of the first annual report of the Colonial Research Committee "little scope for the development of research in the Straits Settlements", and any objection to the transfer of the botanical staff and herbarium from Singapore to Kuala Lumpur would, as Mr. Bernard says "be founded principally on sentiment and could not be logically supported".

4. I understand that it has now been decided to abolish the Economic Gardens in Singapore; consequently Mr. Burkill's main objection to my proposals falls to the ground. I have recently discussed the matter with him and I believe he would no longer oppose the transfer of himself and the Singapore herbarium to Kuala Lumpur if suitable arrangements can be made for the continuation of his economic work. He has asked for a piece of the Tassek Glugor Forest Reserve, in Province Wellesley, and I have no doubt that he can have it; but, for reasons which will appear ~~later~~ <sup>later</sup>, it would probably be more convenient to choose a site within easy reach of the Agricultural Department.

5. Bearing then in mind that the Singapore herbarium needs be rehoused, that Mr. Burkill retires in about four years ~~and~~ and that the Singapore ~~economic~~ economic gardens are to be abandoned I suggest -



- (i) that the Singapore herbarium be removed to Kuala Lumpur as soon as suitable accommodation can be provided for;
- (ii) that Mr. Burkill be Director in independent charge of the purely scientific botanical work of such economic gardens as may be established in the Peninsula, the botanical and public gardens at Singapore, Penang and Kuala Lumpur and ~~possibilities~~ possibly grounds attached to the residences of the Governor, Sultans, Chief ~~Magistrates~~ Secretary and Residents.
- (iii) that a sufficient number of assistants (or curators) be appointed. Probably three or four would be needed one of whom assistants should be a cryptogamic botanist. The systematic botanist asked for by Mr. Robinson should I think, be on Mr. Burkill's staff, for I feel sure he ~~will~~ would do much work at first under the advice and guidance of a botanist of long experience with a knowledge of the country;
- (iv) that on the retirement of Mr. Burkill the economic gardens be transferred to the agricultural department, and the botanical officers (either under the Director of Museums, or preferably, I think, under a Director of their own) be responsible only for the purely scientific botanical work including the herbarium) and for the botanical, public and high officials gardens mentioned in para: 5 (ii)

6. These proposal, if carried into effect, seem to have the following advantages:-

- (i) They bring the herbarium to the natural centre of botanical research.
- (ii) They provide for Mr. Burkill (with his peculiar knowldeg-of economic gardening) till his retirement.
- (iii) They provide for the effective supervision of the work of the proposed Federated Malay States systematic botanist.
- (iv) They provide for the eventual transfer of the economic gardens <sup>to</sup> the Agricultural Department.
- (v) They free the Agricultural Department of the charge of the public gardens in Kuala Lumpur which is



really outside the legitimate scope of its work.

(vi) They prevent the overlap which is inevitable under Mr. Robinson's scheme.

I have etc.

DRAFT.

Fair Copy signed by

5-12-25

To

~~Sir,~~  
Mr. Cubitt

~~Dear~~ Many thanks for  
 your telegram. I propose  
 to leave Singapore on Saturday  
 afternoon for Pat Swettenham,  
 to search for tubes of  
 a steamer in the Klang  
 water catchment just on Sunday  
 & to proceed to Kuala Lumpur  
 on Sunday afternoon. I  
 shall be very grateful for  
 your hospitality. The  
 enclosed note embodies  
 the intention as it  
 stands & I hope to see  
 you soon.  
 Sincerely yours  
 JMS

DRAFT.

Fair Copy signed by

To

It has been proposed that  
 all Scientific names work  
~~should be done for the Peninsula~~  
 should be done in Kuala  
 Lumpur and the proposal  
 intends the Ministry and  
 Agricultural Departments  
 which would refer questions  
 to the Botanic Department.  
 This necessary to  
~~the Executive~~  
 the greatest common  
 good in the parallel  
 progress of the three  
 departments. At present  
 the Botanic Department  
 is located in Singapore,  
 and the others in Kuala Lumpur



11

There is also in Kuala Lumpur the beginnings of what should not be - namely an attempt to construct a rival Botanic Department (partial only) at the Museum. It should not be because (1) the Malay Peninsula is not big enough to support two official Botanical departments engaged in the study of (what the Kuala Lumpur department does) the geographic distribution of the plants of the Peninsula and (2) the Singapore department has such an enormous backlog that the Kuala Lumpur department, without nursing from it, can never get anywhere.

An amalgamation of the two is very desirable.

~~Concerning amalgamation. The~~  
The best position for the centre for work,

DRAFT

Fair Copy signed by

To

SIR,

Kuala Lumpur has been  
visited.

~~Botany is not the study~~

Botany is not the study of  
herbarium specimens, not the  
study of the distribution of  
plants, but the study of  
plants. However has a  
Centre for its study developed

with out the means of  
cultivating plants.

The Botanic Department of  
the S.S. & F.M.S. should  
be fully equipped.

My view is that if  
Kuala Lumpur can be fully equipped  
it can be fully equipped in Kuala  
Lumpur. It can be  
equipped there: but the



Said

Financial position is not to be

promising enough: ~~subject~~ This does not  
preclude playing against a time when the position  
~~is not~~ it may ~~be~~ <sup>is again satisfactory</sup>  
and

is possible to drive a  
means of carrying <sup>in the uncertainty</sup> on

the great advantage of all  
these departments.

It is found necessary to  
maintain in Singapore and

in many a garden  
herbarium alongside the

investigation herbarium. This

consists of one or two sheets of

each plant in cultivation

and a for reference to keep right

the plants named <sup>of the cultivated or selected plants</sup> as right.

It would <sup>be</sup> possible to maintain

a great herbarium and an

apothecary herbarium <sup>in</sup>

Kuala Lumpur <sup>of a similar sectional nature</sup> by systematic

using say Mr. Anderson's services

for the curating; and then at  
the same time he <sup>should</sup> be



DRAFT.

Fair Copy signed by

To

SIR,

on the Staff of the Botanic  
Department, able to work <sup>also</sup> ~~at the~~  
Singapore.

It is not intended to  
be little in any way, the

Excellent collecting done  
of the Staff of the Museum  
in Kuala Lumpur. <sup>and</sup> What

is said above is intended  
to bear out on the

Administrative side of the  
Narrative of results.

1923.

The Committee met on <sup>Mo</sup> Friday Dec 10th at 2.30 p.m. in the Office of the Conservator of Forests:-

Present, Mr. G.E.S. Cubitt, Conservator of Forests  
Mr. A.S. Haynes, Secretary for Agriculture  
Mr. I.H. Burkill, Director of Gardens, S. } members

and as visitors, E. H.C. Robinson, Director of Museums, F.M.S.  
Dr. F.V. Foxworthy, Forestry Research Officer

The Committee agreed that Systematic Botany <sup>cannot</sup> be considered apart from Botany as a whole, and that therefore the reference to them namely the centralisation of systematic Botanic work in Kuala Lumpur

becomes the centralisation of Botanic work in Kuala Lumpur. Botany for the purpose ~~being~~ defined as possessing the several sides developed in the Botanic Gardens, Singapore. The Committee consequently discussed the creation of a central Botanic department in Kuala Lumpur, vice Singapore.

The Committee decided:-

(1) that there is not room for two Botanic departments in the Peninsula

(2) that the gradual removal of the centre from Singapore to a location in the closest possible contiguity with the departments of Forestry and Agriculture is desirable.

(3) that rapid development is not to be expected, as financially scarcely possible, as well as because trees take time to grow, and a garden time to make: The time that development will require should be ~~carefully~~ taken into consideration <sup>to</sup> is weighed ~~against the desirability~~ against the desirability of waiting upon financial grounds.

(4) that if the proposed change ~~is~~ be adopted, execution might commence with the diversion of progressive planting from Singapore to Kuala Lumpur; but the ~~excellence~~ excellence of the Singapore Gardens should not be allowed to fall until that of the Kuala Lumpur Gardens begins to surpass it.

(5) that ultimately the relation of the Singapore Gardens to the centre of the department would be as that of the Waterfall Gardens Penang is now.

<sup>words</sup> (ix) It will be necessary to effect the changes suggested, to find land, to design a garden, and to commence planting according to plan. After a time it will be necessary to build a Herbarium ~~case~~ building (this will not be before a new one is demanded in Singapore) offices and work-rooms. About the same time rough gardening would give way to full development, that the Public may enjoy the Botanic Garden as ~~a common~~ such institutions, for recreation.

(are commonly enjoyed, also)

DRAFT.

Fair Copy signed by

To

*[Faint handwritten text, possibly a name and address]*

Since ~~it is necessary~~ necessary  
with your draft, and I cannot  
suggest the ~~whole~~ <sup>of them</sup> for the  
~~reason~~ <sup>reason</sup>

*[Extensive handwritten notes and corrections in the left margin, including "You refer to...", "Now what...", "is a draft copy of...", "which you referred to me...", "I have...", "I should not..."]*



which could not be agreed to here  
I will take the points in  
turn.

"(1) That the Singapore Hortarium  
be removed to Kuala Lumpur

accommodated in Kuala Lumpur  
can be provided. Both my view  
and the Government's view are

accommodated in Kuala Lumpur, but

being  
the centre of the Department.

is a word to be deleted

(iv) to be deleted

to be deleted

to be deleted

the position of an explanatory note.

This is a supplementary note as a

Singapore cannot. These being a

difference between the clauses.

I suggest altering the last

sentences as indicated.

I would have faircopied them  
whenever, if I had been aware of what you

DRAFT.

Fair Copy signed by

To

SIR,

sent to Government in your  
 letter referred to: but as it is  
 I am obliged to take the course  
 of sending the papers back in  
 as a special condition.

Yours sincerely  
Ans.

28 in C.F. 419/21.

Office of Conservator of Forests,  
F.M.S. & S.S.  
Kuala Lumpur, 24th January 1924.



Dear Burkill,

I send you my 419/21.

2. (2), (6), and (7) were sent to the Under Secretary, F.M.S. on 8th September, 1921, and on the same date a copy of (2) was sent to you, but you appear not to have received it.

3. Your first objection I suggest should be met by my pencil correction in line 6 of paragraph 3 of the draft report. I fancy something more than a subordinate will be wanted at Singapore, and I suggest "with a competent European in charge of each, the officer at Penang being a subordinate." If however you think subordinates are enough at both places I agree to your proposal.

4. As regards the economic gardens I suggest an addition at the end of paragraph 3 of the draft report.

5. With the addition of the words "quarters and" in paragraph 3 of the draft report your remarks on "suitable accommodation" are perhaps met.

6. I have no objection to the Penang Garden being a botanic garden. I did not fully realise its importance. But will not Kuala Lumpur be able to grow what you can't grow in Singapore?

7. I agree to the alteration in the last sentence of the draft report.

8.

I.H.Burkill Esq.,

Director of Gardens,  
Singapore.



8. It seems to me we are in agreement, and if you will let me have a revised edition of the whole report as you would like it, I have no doubt Haynes will fall into line.

Yours sincerely,

A handwritten signature in cursive script, appearing to be 'C. L. ...', written in dark ink.

GENERAL.

31 in C.F. 419/21.



Office of Conservator of Forests,  
F.M.S. & S.S.

Kuala Lumpur, 28th January 1924.

Sir,

I have the honour to refer you to your correspondence No. G. 3366/21 and to submit for the information of the Chief Secretary and for favour of communication to <sup>the</sup> Colonial Secretary, Singapore, five copies of the report by the Committee appointed to enquire into the centralization of botanical research.

I have the honour to be,

Director of Botanical  
Gardens, Singapore.

Sir,

Your obedient servant,

For information,

2. The report was dated  
28th January, 1924.

Conservator of Forests,  
F.M.S. & S.S.

28.1.24. Cons: of Forests,  
F.M.S. & S.S.

The Under Secretary to Govt., F.M.S.,

Kuala Lumpur.

VD/PJJ.

This appears  
to be a copy  
of the report  
as finally  
amended.

Hunt

5/2/61.

B1.54/53



# MEMORANDUM

---

To

The Committee met on Monday the 10th. December 1923 at 2.30 p.m. in the office of the Conservator of Forests, those being present being

Mr. C.E.S. Cubitt, Conservator of Forests.	)	Members of Committee
Mr. A.S. Haynes, Secretary for Agriculture	)	
Mr. I.H. Burkill, Director of Gardens S.S.	)	
Mr. H.C. Robinson, Director of Museums F.M.S.	)	Visitors
Dr. F.W. Foxworthy, Forest Research Officer	)	

2. The Committee agreed that systematic botany should not be considered apart from botany as a whole, and that therefore the centralisation of systematic botanical work involved also the centralisation of all purely botanical research, including the study of living plants. It was also agreed that there was not room for two botanical departments in the Peninsula and that the gradual removal of the centre of botanical work from Singapore to a place in close contiguity with the Forest and Agricultural Departments was desirable.

3. The Committee recognised that financial considerations <sup>being</sup> might prevent immediate action ~~being~~ taken and would probably prevent rapid development, but agreed that the scheme outlined by Mr. Cubitt in his letter no. 2 in 419/21 dated 8.9.21 was generally acceptable and should be gradually worked up to on the following modified lines:-

The Gardens at Singapore and Penang would be maintained as branch gardens for the study of living plants ~~and in the second place as a local pleasure resort~~ and in the second place as a local pleasure resort with a thoroughly competent European in executive charge of each while at the same time the garden at Kuala Lumpur would be extended and developed on the lines of the Botanical Gardens at Singapore. When, in the not very distant future, the time arrives to replace the herbarium at Singapore, which is already becoming crowded, a new herbarium and the necessary quarters and offices would be built

at Kuala Lumpur, to which place the headquarters of all botanical work would be transferred. With abandonment of the economic gardens at Singapore economic work by the botanical department ceased.

4. The Committee considered also the question of the botanist attached to the Museums Department, and was of opinion that it was hopeless and useless to attempt to set up in Kuala Lumpur a general herbarium to compete with that at Singapore. It was in favour of transferring the F.M.S. botanist of the Museums Department to the Botanical Department of the Straits Settlements, but to retain his services in the F.M.S. where he would be employed under the supervision of Mr. Burkill but at the cost of the B.M.S., in filling gaps in the collections in Singapore and perhaps in starting work on the botanical gardens in Kuala Lumpur. Pending the re-organisation of the botanical department this would constitute a contribution of the F.M.S. towards botanical research of which <sup>the F.M.S.</sup> is really in greater need than the Colony.



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The Gardens at Singapore and Penang would be maintained as branch gardens for the study of living plants ~~with a view to their being developed as local pleasure resorts~~ and in the second place as a local pleasure resort with a thoroughly competent European in executive charge of each while at the same time the garden at Kuala Lumpur would be extended and developed on the lines of the Botanical Gardens at Singapore. When, in the not very distant future, the time arrives to replace the herbarium at Singapore, which is already becoming crowded, a new herbarium and the necessary quarters and offices would be built

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C.F. 419/21.

Office of Conservator of Forests,  
F.M.S. & S.S.  
Kuala Lumpur, 24th March 1924.

Dear Burkill,

The Colonial Secretary wants us to indicate exactly what alterations and additions to the Estimates would be required in the immediate future ~~if~~ development of botanical research proceeds on the lines of our report. Also whether the Museums botanist, who leaves on completion of three years' service will have to be replaced immediately.

I expect to be in Singapore for 3 or 4 days in the second week in April. Will it be convenient for you to discuss this matter then?

Yours sincerely,



I.H. Burkill Esq.,  
Director of Gardens,  
Singapore.

VD/PJJ.



(2,000-7/22.)



As. 2000

Botanic Gardens, Singapore,

STRAITS SETTLEMENTS.

Tampin March 27<sup>th</sup>, 1924.

It is requested that the following number be quoted in the reply to this letter.

No. ....

Dear Curitt,

In answer to your C.F. 419/21 of 24 March, 1924 I shall be very glad to discuss <sup>with you at any time in April</sup> the alterations and additions to ~~concern~~ the estimates ~~consequent~~ which are proposed for Marie <sup>work</sup> research with regard.

I am ~~leaving~~ <sup>expected</sup> to reach Singapore on Monday the 31<sup>st</sup>; and <sup>my date in April including</sup> ~~the~~ <sup>the</sup> second week ~~in April~~ will suit. We shall put you up

with pleasure if you can come to us. A letter which I have received from the Colonial Secretary asks that you, the Secretary for Agriculture, & I will indicate the alterations. Do you know ~~of the~~ ~~that~~ what he writes? The Secretary to Agriculture writes? Henderson has just seen the Chief Secy who held out to him a hope that his views might be possible. Sincerely yours

The Departmental expenses in this year may be put down as

Central

\$26090

Singapore for  
90 acres  
\$39000

Penang for  
79 acres  
\$24150

The vote in Kuala Lumpur is down as \$11600 for 166 acres, and is to be \$13300 in 1925. But it appears that there are no overhead charges in these figures and for these 2000 - 3000 should be added assuming Mr. Farguhason's time as half <sup>time</sup> ~~acre~~.

From the figures ~~it~~ can be seen the approximate increased cost of converting the Gardens in Kuala Lumpur into Botanic Gardens

Conversion would be very gradual would begin with tree planting and could be under the control of such an experienced Field Assistant as Mr. Mohamed Haniff.

There would be an increased labour force to house presumably as development progressed, and ultimately a European Assistant Curator, who could also take charge of roadside trees etc.

The transfer of the central organisation should in my opinion be complete

It involves

Building of office and herbarium	\$40,000
House for Director	20,000
House for Asst. Director	15,000
House for Laboratory Asst., Herbarium, asst., clerk, and Plant collector	16,000
House for Mr. Henderson	15,000
	<hr/>
	\$ 116,000
	<hr/>

Administrative and Scientific staff

Director (\$9000-300 A-10200 )	\$10200
Asst. Director(5400 -240A-7800)	5770
Laboratory Asst.	780
Herbarium "	1520
Clerk Class II	1680
Plant collector	510
	<hr/>
	\$20460

Suggested addition of Mr. Henderson

Grant for laboratory	1000
" " library	900
Travelling for Director and Asst. Director	2680
Herbarium expenses about	1050
	<hr/>
	\$ 5630

Singapore Gardens expenses

Asst. Curator	\$ 4414
Field Asst.	1890
Record Keeper	600
Foreman gardeners (2)	1251
Overseer	453
Suboverseer	318
Watchmen (5)	1175
Engine Driver and Carpenter	480
Carpenter	387
Bill collector	300
Peon	204
Label printers	360
Lines caretakers	180
Gardeners	\$2196 3300
Coolies (less \$600 in doors and <del>PRIMUM</del> in Economic Garden)	11000
	<hr/>
	\$ 26409

Travelling on Gardens Account	600
Stores and Tools	10100
Miscellaneous	1890
	<hr/>
	\$ 12590

Penang Gardens expenses

Asst. Curator with allowances	5575
<del>Field Assistant</del> Field Assistant	2400
Record Keeper	630
Overseer	570
Suboverseer	450
Watchmen	484
Carpenter	303
Bill collector	240
Label printer	168
Caretaker	180
Gardeners including chinese	4200
Coolies	5952
	<hr/>
	\$21152

Travelling on Gardens Account	600
Stores and Tools	2000
Miscellaneous	400
	<hr/>
	\$3000



I want to know please today please ~~please~~ <sup>7.4.24.</sup> ~~please~~

The cost of  
Erecting the new office \$ 20,000 immediate  
Erecting watchtowers lines \$ 20,260 immediate  
- Subordinates - \$ ~~44,575~~ \$ 5,680 - deduction  
- Paint costs - of quarters for 6 months

Estimate for Mr. Lennon's house. ~~Estimate~~ \$ 15,000 immediate  
Cost of 10 quarters in line May \$ 5,000 immediate  
Cost of 2 new plant houses in May. \$ 2,500 + \$ 2,100 ~~\$ 4,600~~

Cost of upkeep -  
Office

Antarium

Director's house

Act's house

Curator's house

3 Women's products

Antarium Act's

Laboratory Act's

Clerk

*[Faint, illegible handwritten notes or bleed-through from the reverse side of the page.]*

(Tel. 2)

# Straits Settlements

GOVERNMENT TELEGRAMS.

RECEIVING FORM.  
 NO. 205  
 Receiver: 7-4-24  
 Replied: 7-4-24

RECEIVING FORM.

CLASS: \_\_\_\_\_  
 To (Name): *HL*  
 No. of Message: \_\_\_\_\_  
 Remarks: *govt*  
 From (Stn.): \_\_\_\_\_  
 Date: *7*  
 Time: *9/7 am*

To: *Director Botanical Gardens Singapore*  
*Shave and a half*  
*meet you Wednesday*  
*afternoon your*  
*office discuss botany*  
*question*  
*conservator*

Recvd. from: *HL* Sent to: \_\_\_\_\_  
 By: *[Signature]* Local No. *1* Local No. \_\_\_\_\_ Local No. \_\_\_\_\_

*\* discuss*



30/4/24  
17/4/24

40 in C.F. 419/21.

Office of Conservator of Forests,  
F.M.S. & S.S.  
Kuala Lumpur, 16th April 1924.

Sir,

With reference to your correspondence No. 1044/21

I have the honour to enclose a draft from the Director of Botanic Gardens, Singapore, in reply to Colonial Secretary's letter No. 9036/21 of 14th March, 1924.

2. I am inclined to think we should give some reason for the proposed sharing of Expenditure item A, and that we should also state definitely, giving reasons, that all buildings in Kuala Lumpur are to be built by and at the expense of the Federated Malay States Government.

3. Mr. Burkill tells me that he has said nothing about the immediate employment of Mr. Henderson because he thinks that matter is on the way to settlement between the Colonial and Chief Secretaries., but I think some reference to the point is needed in order to make Item A clear, and in reply to the last sentence of the Colonial Secretary's letter.

I have the honour to be,

Sir,

Your obedient servant,

*[Signature]*  
Conservator of Forests,  
F.M.S. & S.S.

*D of A.*  
For your information.  
*[Signature]*

The Director of Agriculture,

S.S. & F.M.S.,

Kuala Lumpur.

V.D/PJJ

(G 3)

From Whom ....	
Place ....	
Date ....	

**SUBJECT**

Mosses  
Correspondence with H. N. Dixon Esq  
1927

*Connected Papers*

**MINUTES**

KEY TO FAMILIES OF  
Dicotyledons  
~~ANGIOSPERMS~~

in Malaya

H. R. Hemsley



From Whom .....

Director of Agriculture

Place .....

K. L.

Date .....

17. 8. 20

SUBJECT.

YAMIC  
No. 2272  
Date  
...

Garden's Department to be ~~amalgamated~~ <sup>extended to</sup>  
~~with the Agricultural Department~~  
the IWS -

Connected Papers.

MINUTES.

Letter to D of Agriculture K. L. 20. 8. 20

Reply dated 26 July 1920.

Order saying will meet D of A. in Kuala Lumpur  
soon -

Botanic Gardens,

Singapore,

22nd. June, 1930

Dear Haynes,

I am very glad to see that Lawton Brain will welcome the spread of the Gardens Department to Kuala Lumpur. I had been waiting for some direct invitation from the F.M.S., for something more than the suggestions that have come from leading F.M.S. planters there.

I have sketched in the attached four sheets my idea of the Gardens Department in 1935. It is written as if in the present, with explanations in the margin.

May I call to see you at some early date to discuss the ~~minimum~~ possibility of snapping my course as indicated?

Sincerely yours,

Henry Buckle

A.S. Haynes Esq.

High Commissioner's Office,

Singapore.

THE GARDENS DEPARTMENT IN 1925

This arrangement exists

Age limit

*Hauiff*  
Mr. Mohamed, to count as one  
until his retirement

\* Calcutta has such an officer  
and Decca had, and perhaps  
has still.

The Railway has enquired for  
one.

5 new officers, one vice Mr.  
Mathieu, one vice Mr. Milsum  
now part time, and 3 for new  
posts. Such get as pay \$300  
15A-450; and the same no. of  
houses will be required.

Local allowance in Kuala  
Lumpur, and in Penang

The European Scientific Staff consists  
of the Director (a student of the  
Higher plants) and the Assistant  
Director ( a student of the Lower  
plants), by which arrangement the whole  
systematic plant-world is covered. As  
the Director retires in this year (1825)  
and will be replaced by the Assistant  
Director, the new Assistant Director  
will be a student of the Higher plants,  
that the whole plant-world may remain  
covered.

The European horticultural officers are  
seven, respectively, the Curators of  
the Botanic and of the Economic Garden  
Singapore, of the Kuala Lumpur Gardens,  
of the Waterfall Gardens, Penang, of  
Parks (including the Government House  
Domain), an officer seconded for ser-  
vice with the F.M.S. Railway, and a  
probationer. The probationer's time is  
fully taken up in acting for other  
officers on leave, who at the rate of  
two months for every year of service get  
what he can give.

These horticultural officers have not  
the training by which they can progress  
to one of the scientific posts; but they  
~~can~~ get an increasing pay, and to induce  
them to remain in Government service  
there are allowances attached to the  
posts away from Head quarters commensur-  
ate with the <sup>responsibilities</sup> possibilities delegated to  
those officers in virtue of their



distance from head quarters.

The control of labour, handling of money, raising of sale stock, giving advice to purchasers on their gardens, giving aid to Municipalities, and other bodies who control public parks.

The duties of the horticultural officers are such that Europeans alone are suitable.

The Head quarters of the Department remain at Singapore, for two reasons (1) that Singapore is upon one of the world's greatest highways, and (2) is the educational centre of the Malay Peninsula. These two reasons outweigh the two in favour of Kuala Lumpur which are (1) the proximity there of the Agricultural Department's head quarters, and (2) of the Forest services head quarters. By reason of having an important Garden in Kuala Lumpur, the Director of Gardens is often there, and is in complete touch with the Agricultural and Forest Departments.

The Director of Gardens spends more time on tour than formerly, and to compensate for that has a native assistant in Singapore whose work is especially in the Laboratory and Herbarium.

At this date (1925) Mr. X a Cambridge graduate with the aid of the Worts

Travelling Fund is working in the Laboratory upon a study of the transpiration of forest tree seedlings, a question of pure botany but of great practical interest if thereby we come to understand how it is that giant forest trees whose leaves stand sun and wind get over the difficulties of early growth in deep shade. And Mr. X. an American botanist, has recently

\* It should develop into importance.

The Director will need to join clubs in Penang and Kuala Lumpur, the better to keep in touch with public men and should receive a small sum added to his salary to meet such expenses.

\* A possible contingency used in illustration of one use of the laboratory now under ~~construction~~ erection.

The Worts travelling fund has in the past taken botanical students to Ceylon and New Caledonia: it is given to men who have just taken a degree.

Applications for facilities have been received before now. Buitenzorg gives them, and has gained greatly thereby. Peradeniya has actually employed young men as well as giving facilities.

The Museum needs money for fittings, otherwise it is now in nature much as it will be

\* This is probable

These proposals have not been laid before Govt. yet, but have been kept in view for some time.

completed a monograph on the Malayan Nectrias, a group of very destructive fungi. Mr. X and Mr. Y. in fact all unofficial investigators, supply their own apparatus: they are given a work table and facilities for work on the understanding that their work bears on our problems.

Our problems are in botany and in horticulture: in points where we touch the work of the Agricultural and Forest Departments, the boundary is definable thus, we are concerned in what the plants are, they with their relation to man.

The Herbarium, which adjoins the Laboratory is devoted entirely to Malayan Systematic Botany, and the small Museum, attached to it, exists for the accommodation of parts of plants which are too bulky for treatment as herbarium specimens in the usual way. Occasionally special exhibits are organised in the Museum, which being open to the Public during working hours gets visited.

A scheme is working by which the services of scientific officers in retirement are used. It began with the employment of Mr. Ridley (Director 1888-1912) upon a Phanerogamic Flora of the Malay Peninsula, which Flora he completed in 1922: following the precedent the present Director, about to retire, is to write at Kew a Dictionary of the Economic Products of the Malay Peninsula. And when the coming Director retires he will extend the Flora of the Peninsula to the Lower plants, toward which he has already published a series of "Materials for a Cryptogamic Flora" just as Sir George King and Mr. Ridley published a series of "Material towards a (Phanerogamic) Flora of the Malay

Peninsula"

A considerable amount of preliminary work has been done already.

The sale section in Singapore is organised for ornamental and economic plants, and in Penang for ornamental plants. Extension depends on the demand, and the demand is increasing.

Head quarters office  
Director  
Assistant Director  
Clerk  
Native scientific Assistant  
Library Laboratory and  
Herbarium subordinates.

The horticultural records of the Department are in good order. One published Catalogue covers all three Gardens. In addition each has its illustrated Guide book.

A sale section for ornamental and Economic plants exists in each Garden; the Curators correspond direct with each other, and help each other out.

Where one (is alone) favourably placed for propagating a particular plant, he does it for all.

The expenditure on each garden is met by the Settlements <sup>or by the</sup> estates wherein that Garden is; and the revenue is credited locally; but the expenditure on the Head quarters office is met by the Settlements and Federated Malay States jointly.

128.  
If Hill-stations are developed on Gunong Tahan, or Cameron's plateau or Bukit Fraser or elsewhere, there is a probability that Government will need to give vegetable and fruit growing a lead at these places, which probability is not being overlooked. But to plan at once seems premature.



Botanic Gardens,

Singapore,

28th. June, 1920

Dear Lewten-Brain,

Upon my return to Singapore, Chipp gave to me your letter to him of 17.5. which is a line suggesting that Chipp should see Haynes, written upon Haynes' letter to you containing the statement that you and Haynes support the idea of a strong Gardens Department existing in touch with the Department of Agriculture. Though the letter does not exactly say so, I understand that it relates to proposals that my Department should be put in charge of the Public Gardens in Kuala Lumpur, so coming to serve the Government of the Federated Malay States in a way likely to expand.

I have known some such an idea was held in several directions, in fact prominent members of the unofficial community have spoken of it to me. But it could not be for me to make any proposals to others than officials, and only as it coming to me from them. I have thought a good deal of what might be; and believe that it would be simple comparatively with the experience gained here and in Penang, and with the necessary funds to extend the utility of your Gardens in Kuala Lumpur considerably. I believe also that the extension of my Department to the Federated Malay States would make its efficiency greater both as affording an extension of area for our experimental introductions, and by putting additional horticulturists into the field of work. Administratively there are gains which you will recognise, one being that I become in part a K.L. man, and in closer touch with you, and other that the more horticulturists I command the easier it is to adjust the demands for their services.

My avoidance of discussing the possibility of my Department serving the Federated Malay States direct, with you or with anyone else as yet, leaves me at the disadvantage of not knowing exactly how you view certain important matters, nor how much you know of the future of the Gardens Department in the Settlements. The Department is growing considerably: at last I have got the two scientific officers sanctioned in 1913 (myself and Chipp) the building of the laboratory, sanctioned in 1914, commenced, an excellent horticulturist (Flippance) on the spot, and a second sanctioned, while a third is likely to eventuate, and I have, but am not satisfied with, an Indian assistant who was also provided in 1913. It can be a personal matter between you and me, and between Cubitt and me that we cover the ground without waste by overlapping. Cubitt would like to centre my Department in Kuala Lumpur for the purpose, but I think there are strong reasons for centring it here, and told him so. He may or may not have mentioned that circumstance to you. If desired we three might make a Board to define our interests: but nothing on earth will make me willingly submit again to anything like the Board of Scientific Advice in India, where outside parties could come in between those really concerned. In any case I would wish the Kuala Lumpur Garden to have a local Committee meeting about once a quarter as the Committees for this Garden and for the Waterfall Gardens meet, on which your Department would be represented (doubtless by you).

Yesterday I saw Haynes to whom I had submitted the enclosed memo, which is a sketch of the state in which I may be able to leave my Department when I retire in 1925. We agreed that the memo should be sent to you forthwith: and I am hoping that I shall get your remarks on it soon. Haynes seems to have found it

clear enough; but there are points where you may like amplification. For instance your geneticist working on the improvement of crops need not interfere with my horticulturists experimenting in fruit improvement on parallel lines.

Your officers will be welcome in my laboratory, as space permits. We shall not be working out the life histories of fungi there, but determining them.

Sincerely yours,



THE GARDENS DEPARTMENT IN 1925

This arrangement exists

Age limit

Mr. Mohamed Haniff to count as one until his retirement

Calcutta has such an officer and Decca had, and perhaps has still.

The Railway has enquired for one.

5 new officers, one vice Mr. Mathieu, one vice Mr. Milsum now part time, and 3 for new posts. Such get as pay \$300 I5A-450; and the same No. of houses will be required.

Local allowance in Kuala Lumpur and in Penang

The Control of labour handing of money, raising of sale stock giving HM advice to purchasers on their gardens, giving aid to

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The European horticultural officers are seven, respectively, the Curators of the Botanic and of the Economic Garden Singapore of the Kuala Lumpur Gardens, of the Water-fall Gardens, Penang, of Parks (including the Government House Domain), an officer seconded for service with the F.M.S. Railway and a probationer. The probationer's time is fully taken up in acting for other officers on leave, who at the rate of two months for every year of service get what he can give. These horticultural officers have not the training by which they can progress to one of the scientific posts; but they get an increasing pay, and to induce them to remain in Government service there are allowances attached to the posts away from Head quarters commensurate with the responsibilities delegated to those officers in virtue of their distance from head quarters.

The duties of the horticultural officers are such that Europeans alone are suitable.

The Head ~~quarters~~ quarters of the Department

Municipalities and other bodies who control public parks.

It should develop into importance.

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A possible contingency used in illustration of one use of the laboratory now under erection,

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#### Museum needs

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unofficial investigators, supply their own apparatus: they are given a work table and facilities for work on the ~~herbarium~~ understanding and their work bears on our problems.

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write at Kew a Dictionary of the Economic Products of the Malay Peninsula. And when the coming Director retires he will extend the Flora of the Malay Peninsula to the Lower plants, toward which he has already published a series of "Materials for a Cryptogamic Flora" just as Sir ~~Edmund~~ George King and Mr. Ridley published a series of "Material towards



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Head quarters office  
Director  
Assistant Director  
Clerk  
Native Scientific Assistant  
Library, Laboratory and  
Herbarium subordinates.

a (Phanerogamic) Flora of the Malay Peninsula  
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Telegrams:—  
"AGRICULTURE"  
KUALA LUMPUR.

OFFICE OF DIRECTOR OF AGRICULTURE,  
FEDERATED MALAY STATES,  
&  
STRAITS SETTLEMENTS.

P.K.

It is requested that the following  
number be quoted in the reply  
to this letter.

No. 1218/20. KUALA LUMPUR. 26th. July, 19 20.

Dear Burkill,

I am enclosing a memorandum by Bunting on the  
proposed scheme for a Federated Malay States and Straits  
Settlements Gardens Department.

As I told Chipp I am quite in favour of the idea,  
especially as it would enable a better staff to be kept up.

The only point that would need watching would be the  
relations between your Horticulturists at work on introduc-  
tions, culture and improvement and my Botanists, but suitable  
arrangements for this ought not to be beyond us.

I think a Conference between the Conservator of  
Forests, yourself and myself to put up a definite scheme  
might be useful.

I must say I think that your Head - quarters ought to  
be in Kuala Lumpur. It is much more central and it would be  
so much easier to keep in touch with one another's work if  
we are all in the same place.

Best regards.

Yours sincerely,

*H. Weston Brown*

*acknowledged 4.9.1920  
said would write to  
up meeting Jones*

The Director of Gardens,

S I N G A P O R E.

Memorandum on the Suggestion of Handing Over Control of  
Public Gardens, Kuala Lumpur, to the S.S. Gardens Department.

With reference to the proposal that the S.S. Gardens Department should be put in charge of the Public Gardens, Kuala Lumpur, I think the suggestion a very sound one, but consider that for the purposes of administration the headquarters should be at Kuala Lumpur and not at Singapore. The reasons for this are obvious and may be outlined as follows - (a) Kuala Lumpur is midway between Penang and Singapore and therefore within easy reach of both places (b) with headquarters at Kuala Lumpur the gardens Department would be in close touch with both the Agricultural Department and the Forest Department, whose interests are all very closely allied (c) there is a possibility of the Singapore Gardens losing part of its economic garden and it will probably be necessary to develop this section in the F.M.S. as no suitable land is available in the S.S.

The Gardens Department should be solely responsible for the cultivation of fruit, vegetables, and flowering plants and shrubs, ornamental trees and palms and should undertake the distribution of both seeds and plants throughout the Peninsula. It would therefore be necessary to keep big stocks of seedlings, especially fruit, to meet the demands not only of the S.S. and F.M.S., but also of the Unfederated Malay States.

The new Gardens Department should be solely responsible for all the horticultural work in the F.M.S. as well as the S.S. and would therefore be put in charge of the fruit nurseries at Kuala Kangsar, the Gardens at Taiping and Maxwell's Hill as well as the Public Gardens at Kuala Lumpur.

Other work which might be undertaken is the planting of ornamental trees, palms and flowering shrubs in the open spaces which are to be found in many of the large towns. The planting of shade trees on the roadsides in the vicinity of villages and small towns should also be given attention.



An Alternative Suggestion.

The only alternative to the above proposals is to develop a stronger Horticultural section in the Agricultural Department with appointments for 3 properly qualified horticulturists, one for ornamental gardening, one for Vegetable culture, and one with a special training in the cultivation of fruit trees. Two additional men with a horticultural training might be employed ~~as~~ as Superintendents, Government Plantations, and on the Large Scale Experimental Farm and their services would be available if required by the horticultural section.

*R. B. M. S.*

20th July, 1920.

Agriculturist. F.M.S.

No Minutes should be written on this page. A separate half-sheet to  
be used if required.

---

From Whom ....

Place ....

Date ....

**SUBJECT.**

*Plan of the new system  
Public Gardens*

*Connected Papers.*

**MINUTES.**

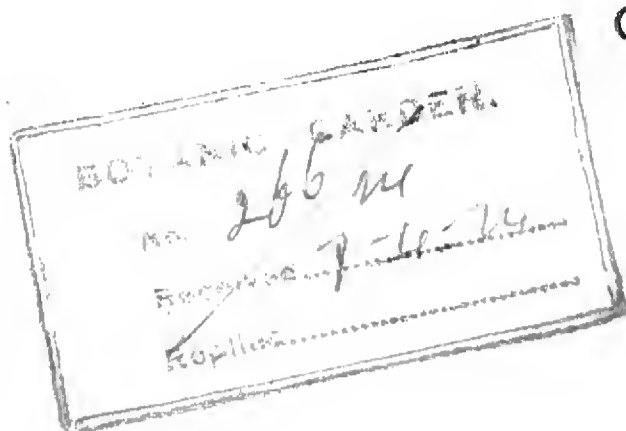


S/TGS.

Telegrams:—

"AGRICULTURE"  
KUALA LUMPUR.

OFFICE OF SECRETARY FOR AGRICULTURE,  
FEDERATED MALAY STATES,  
&  
STRAITS SETTLEMENTS.



It is requested that the following  
number be quoted in the reply  
to this letter.

No. D.A.1044/1921.

KUALA LUMPUR,

5th April, 19 24.

Dear Sir,

I have just had your letter of the 4th of  
April on the subject of the Lake Gardens,  
Kuala Lumpur.

As I am on the point of leaving Kuala Lumpur  
for a visit to Perak, I send you in original a  
letter from the Assistant Agriculturist with plan  
attached.

The cost of the plan is \$2/-

I have arranged with Mr. Cubitt to see you  
at Singapore on the afternoon of Wednesday  
next and hope that this arrangement will suit you.

I am looking forward to meeting you and also to  
discussing the question of the transfer of the  
Gardens.

Yours very truly,

I. H. Burkill Esq.,  
Director of Gardens,  
Singapore.

It is requested that the following number be quoted in the reply to this letter.

No. ....

DEPARTMENT OF AGRICULTURE,  
FEDERATED MALAY STATES  
&  
STRAITS SETTLEMENTS.

Kuala Lumpur, 5th April, 1924.

Sir,

With reference to our conversation of the 4th instant I have the honour to inform you that the Gardens Committee for 1924 consists of the following gentlemen:-

Chairman: Secretary for Agriculture, S.S. & F.M.S.  
Mr. C. W. H. Cochrane.  
" G. E. S. Cubitt.  
" G. E. Greig.  
" D. H. Hampshire.  
" D. S. Gardner.  
The Hon'ble Mr. Choo Kia Peng, J.P.  
Datoh Lee Kong Lam, M.S.C., J.P.  
Mr. F. G. Spring (Hon. Secretary).

2. The following figures give the cost of upkeep of the Public Gardens:-

Vote for 1923	...	...	...	...	\$11,600.00
Actual Expenditure in 1923	...	...	...	...	11,576.92
Vote for 1924	...	...	...	...	\$11,600.00
Expenditure to date	...	...	...	...	903.00
Estimated Expenditure for 1925	...	...	...	...	\$13,300.00

3. It will be seen that the estimates for 1925 provide for an increase of \$1,700/- over the vote for the present year. This increase has been asked for so that grass may be cut more frequently, to upkeep small areas of blukar that have recently been cleared within the Gardens area, and generally to upkeep the Gardens in a better condition.

4. Attached is a map of Carcosa Domain and the Public Gardens from which it will be seen that the area of the Gardens

Ag. Secretary for Agriculture,  
S. S. & F. M. S.  
Kuala Lumpur.

P.T.O.

is 166 acres 2 roods, this area including the grounds of Old Carcosa marked x on attached sketch map and excluding the grounds of the Lake Club marked A.

5. The Public Gardens area could be increased by taking in a portion of Carcosa Domain, the whole of which has now been cleared of blukar, small trees only being left to develop.

I have the honour to be,

Sir,

Your obedient servant,

*E. Farquharson*

Assistant Agriculturist.



Botanic Gardens,

Singapore,

4th. April, 1924

Dear Sir,

You are aware that the Conservator of Forests, you and I are to consult together in regard to the proposed transfer of the centre of the Botanic Department from Singapore to Kuala Lumpur. One of the proposals connected therewith is, of course, the transfer of the charge of the area called the Gardens in Kuala Lumpur from you to me; and I apparently ought to estimate what its upkeep under me is likely to amount to, in advance of our consultation. Could you please help me therefore:-

- a) by telling me what the upkeep costs at present;
- b) the area so kept;
- c) and if any areas would be added from what you hold.

2. It has been suggested that the grounds of Carcosa would be thrown into the same area for upkeep, not for access to the Public: and so I should like to know what their area is also. If a map is available, and you could procure one at my expense, marking on it what in your opinion the area would be, I should certainly understand the position.

3. Mr. Cubitt intends to be in Singapore on the 8th. It is extremely short notice, I know: but if I can have the figures before he comes, our work will be facilitated.

I trust to meet you at some early opportunity, and

am,

Yours faithfully,

G.E. Shaw Esq.

Secretary for Agriculture.

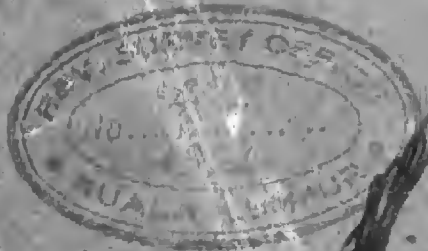
Scales Chains to an Inch

Sec:

60



Section 70



427-  
 18-11-20

Placed by [Signature]



No Minutes should be written on this page. A separate half-sheet to  
be used if required.

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