

1947-48 [Cmd. 7493] Colonial Office. Colonial research 1947-48. Reports of the Colonial Research Committee, Colonial Products Research Council, Colonial Social Science Research Council, Colonial Medical Research Committee, Committee for Colonial Agricultural, Animal Health and Forestry Research, Colonial Insecticides Committee, Colonial Economic Research Committee

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COLONIAL OFFICE

COLONIAL RESEARCH

1947—48

REPORTS OF THE

Colonial Research Committee

Colonial Products Research Council

Colonial Social Science Research Council

Colonial Medical Research Committee

Committee for Colonial Agricultural,
Animal Health and Forestry Research

Colonial Insecticides Committee

Colonial Economic Research Committee

*Presented by the Secretary of State for the Colonies to Parliament
by Command of His Majesty
July, 1948*

LONDON

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Cmd. 7493

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Colonial Research Committee
Fifth Annual Report
(1947-1948)

The Church House,
Great Smith Street,
Westminster,
S.W.1.

4th June, 1948.

Sir,

I have the honour to transmit to you the Fifth Annual Report of the Colonial Research Committee, covering the year ended 31st March, 1948.

I have the honour to be,

Sir,

Your obedient Servant,

S. CAINE

The Right Honourable Arthur Creech-Jones, M.P.
Secretary of State for the Colonies.

COLONIAL RESEARCH COMMITTEE

Membership

THE LORD HAILEY, G.C.S.I., G.C.M.G., G.C.I.E., *Chairman* (retired in September, 1947).

(SIR SYDNEY CAINE, K.C.M.G., acted as Chairman from October, 1947).

SIR EDWARD APPELTON, G.B.E., K.C.B., D.Sc., LL.D., F.R.S., Secretary, Department of Scientific and Industrial Research.

SIR ALEXANDER CARR-SAUNDERS, M.A., LL.D., Director, London School of Economics.

SIR DAVID CHADWICK, K.C.M.G., C.S.I., C.I.E.

SIR JOHN FRYER, K.B.E., M.A., F.R.S., Secretary, Agricultural Research Council.

SIR HAROLD HARTLEY, K.C.V.O., C.B.E., M.C., F.R.S.

SIR EDWARD MELLANBY, G.B.E., K.C.B., M.D., F.R.C.P., F.R.S., Secretary, Medical Research Council.

SIR ARNOLD PLANT, B.Sc. (Econ.), B.Com., Sir Ernest Cassel Professor of Commerce in the University of London.

DR. AUDREY RICHARDS, M.A., Ph.D., Reader in Anthropology, University of London.

MR. J. G. HIBBERT, M.C., Colonial Office	}	<i>Joint Secretaries.</i>
[DR. E. B. WORTHINGTON, M.A.]		

NOTE: Dr. Worthington was seconded in October, 1946, for duty with the East African Governors' Conference and is at present acting as Scientific Secretary to the East Africa High Commission.

COLONIAL RESEARCH COMMITTEE
FIFTH ANNUAL REPORT

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COLONIAL RESEARCH COMMITTEE

FIFTH ANNUAL REPORT

I. GENERAL.

1. In September, 1947, to the great regret of all concerned, Lord Hailey relinquished the chairmanship of the Committee, and Sir Sydney Caine, K.C.M.G., acted as Chairman during the remainder of the year under review.

2. Early in 1948, the Secretary of State decided that a reorganisation of the Colonial Economic and Development Council was desirable, in view of the rapid increase in economic development in the Colonies, which had necessitated changes in the internal organisation of the Colonial Office, and of the setting up of the Colonial Development and Overseas Food Corporations. A new Council with considerably larger membership was accordingly created in March, 1948, whose main function will be to advise on broad issues and to work out a proper balance between the economic and social aspects of Colonial development. The Secretary of State desired that the new Council should maintain close touch with developments in the Colonial research field, and the opportunity was taken to reconstitute the Colonial Research Committee, with a view to its closer association with the Council. The title of the Committee was changed to "Colonial Research Council" and the terms of reference and composition of the new body are set out in Appendix I to this report.

3. During the year a certain amount of progress and exploratory work was accomplished in connection with the organisation of research activities in the Colonies on a regional basis, particularly in East Africa, where the supervision of research of common interest to all the East African territories is one of the responsibilities of the East Africa High Commission. In the course of the year, the East Africa Agriculture and Forestry Research Organisation and the East African Veterinary Research Organisation were instituted, and schemes for the creation of an East African Medical Research Bureau and an East African Industrial Research Organisation have been formulated. Dr. Worthington, who had been seconded to the East African Governors' Conference as Scientific Secretary, returned to England on a short visit in September, 1947, and informed the Colonial Research Committee of a number of projects for research on a regional basis which he was contemplating submitting to the East Africa High Commission and the East African Governments for consideration. The Secretary for Colonial Agricultural Research (Dr. H. H. Storey, F.R.S.), and the Director of Colonial Medical Research each visited East and West Africa to study and discuss with the Government officials primarily concerned the directions in which greater co-operation in research might be achieved. As regards Central Africa, a Research Secretary (Dr. J. E. Keyston) was appointed by the Central African Council* in 1947, and it is understood that he will be submitting to the Council proposals for the creation of a Central African Research Council. In the South Pacific, the creation by the South Pacific Commission of a Research Council is envisaged. In the West Indies, plans are being made for the creation of a Department of Social and Economic Research in the University College of the West Indies, and in East Africa of an East African Institute of Social Research at Makerere College.

* The Council consists of representatives of the Governments of Southern and Northern Rhodesia and Nyasaland. The Secretary of State for the Colonies is not responsible to Parliament for the administration of the first-named territory, which is a self-governing Colony.

4. Amongst the more important matters to which the Committee and the other Colonial research advisory committees devoted attention during the year were the proposals for the creation of a Colonial Research Service, to which exhaustive consideration has been given by the Colonial Office and the Treasury. At the end of the year they were approaching finality. It is hoped that it will shortly be possible to circulate the proposed terms of service to Colonial Governments and the research committees for their information. The service will apply to officers appointed to undertake scientific research overseas in all fields. The scale of remuneration for research officers other than medical research officers will be that laid down for research workers in the United Kingdom Scientific Civil Service (London scales); while the scale for medical research officers with recognised medical qualifications will be that laid down by the Medical Research Council for such workers in the United Kingdom. In each case, an additional Overseas Research Allowance will be payable. The fixing of the latter has been delayed pending the result of recent enquiries into the salary scales of officers employed in certain Colonial Agricultural, Medical and other Departments. A Colonial Superannuation Scheme, which will cover officers of the Colonial Research Service and provide benefits for the officer and his dependants on a contributory basis, has been prepared.

5. No Colonial Research Fellowships were awarded during the year. Certain amendments to the scheme are being made.

6. Over sixty new schemes were approved during the year for grants under the Colonial Development and Welfare Acts, and nearly ninety supplementary schemes. Some of the latter were of very considerable importance, since they represented major schemes evolved from a preliminary or pilot scheme. A complete list of these schemes is given in Table I of Appendix II to this report. It will be seen that the cumulative total of the allocations made for the above schemes is over £2,000,000, as against £1,100,000 for the schemes made during the preceding year. This figure represents expenditure spread over periods ranging from a few months to ten years. Table II of Appendix II shows the allocations for research from 1940 down to the 31st March, 1948. Of the total sum of £4,247,626, approximately 43.3 per cent. has been for agricultural, veterinary or forestry schemes, 5.7 per cent. for fisheries research, 6.3 per cent. for insecticides research, 3.4 per cent. for locust control, 9.5 per cent. for medical research, 6.7 per cent. for products research, 0.8 per cent. for Colonial research fellowships, 6.0 per cent. for social science, 11.8 per cent. for tsetse and trypanosomiasis research and 6.5 per cent. for miscellaneous schemes. Table III shows the actual monies paid out in respect of research schemes approved under the Acts for each of the financial years since the year 1940-41. In many cases, progress in getting schemes into full operation is still hampered by shortage of scientific personnel, labour and materials, but the position in these respects has somewhat improved during recent months.

II. FIELDS OF RESEARCH REVIEWED IN THE PRESENT REPORT OF THE COLONIAL RESEARCH COMMITTEE, AND IN THE ACCOMPANYING REPORTS OF THE SPECIALIST ADVISORY BODIES.

A. Agricultural, Animal Health and Forestry

7. See the attached Annual Report of the Committee for Colonial Agricultural, Animal Health and Forestry Research for the year 1947-48.

B. *Building Research*

8. The Department of Scientific and Industrial Research, in consultation with the Colonial Office, have appointed an Architect to act as Colonial Liaison Officer at the Department's Building Research Station. His duties will be to collect the available information relating to building in the Colonies, to collate and classify it, to make its existence known to all Colonial Governments and other potential users, and to provide Colonial Governments with any information on technical aspects of building and building materials that the Station can supply, which may be of value to them or for which they may ask. For this purpose Colonial Governments are being asked to nominate suitable officials to act as correspondents with him, and to provide him with full information regarding building of any consequence which has been undertaken or is projected, the materials used and the climatic or other natural conditions. The officer appointed is Mr. G. A. Atkinson, B.A. (Architecture, London), A.R.I.B.A., who has visited or worked in a number of overseas countries including several Colonial territories. It is contemplated that he shall visit the various areas of the Colonial Empire, or individual territories, as and when required. This appointment should prove of great value, since there is a very definite need for the interchange of information in connection with the large building programmes envisaged in many Colonial territories.

C. *Demography and Census*

9. Considerable progress has been made during the last two years in the holding of censuses in the Colonial Empire. During 1947-48, censuses or counts have been taken or were in process of being taken in the Gambia, the Gold Coast, Sierra Leone, the Federation of Malaya, Singapore, North Borneo, Sarawak, Brunei, Seychelles and the West Indies. Preparations for the holding of a census during 1948 are being made in Malta, Gibraltar and Hong Kong.

10. Work is proceeding on the tabulation of results and the preparation of the report on the general West Indian census, and a number of provisional reports have already been received. Complete reports were received during the year from Fiji and the Falkland Islands on censuses taken in the previous year.

11. Dr. R. R. Kuczynski, Demographic Adviser to the Secretary of State, died in November, 1947. At the time of his death he had just completed the first two volumes of a work of major importance entitled "A Demographic Survey of the Colonial Empire," on which he had been actively engaged for a number of years. It is hoped that these two volumes, which cover the African Colonial territories, will be published at an early date, and that the materials available will enable the remaining two volumes, which cover the rest of the Colonial Empire, also to be completed and published.

D. *Economic*

12. See the attached first Annual Report of the Colonial Economic Research Committee for the year 1947-48.

E. *Engineering and Roads*

13. Two activities of importance to workers in this field were initiated during the year by the Crown Agents for the Colonies. The first was the institution of an Engineering Advisory Service to offer facilities to Colonial

officials calling for the purpose of obtaining information of an engineering character. It is hoped that this service will facilitate personal contacts and a closer liaison between the technical officials of Colonial Governments and the engineering staff of the Crown Agents, and in this way assist the exchange of information. The second was the publication of the "Crown Agents' Review", which is primarily intended to assist officers of Colonial Public Works departments, railways and other departments concerned with constructional work or the development of communications, and to provide them with information on the many new techniques which are now being developed. The first two numbers of this periodical were published in July, 1947, and March, 1948, respectively.

14. Consideration is being given in the Colonial Office to the desirability of effecting a closer liaison between Colonial Public Works Departments and the Road Research Laboratory of the Department of Scientific and Industrial Research.

F. Fisheries

15. Dr. C. F. Hickling, Fisheries Adviser to the Secretary of State, was on tour from January to August, 1947, visiting all the British Colonial territories from Aden and Somaliland to Fiji, as well as South India, Ceylon, Java and the Kwangtung Province of China. Particular attention was paid to fish culture, with the potentialities of which he was very much impressed, as well as to marine and freshwater fisheries.

16. Visits to assess the practicability of developing fish culture were made by a professional fish farmer from Palestine to Nyasaland, Northern Rhodesia, Kenya and Uganda. His reports show considerable possibilities of increasing the supply of fish by this technique. He will visit the British West Indies in the spring of 1948. Promising pioneer work in fish culture is being done in Northern Rhodesia, and its Government is engaging a professional fish farmer to lay out and run a full-scale demonstration fish farm. The lack of trained personnel will handicap the expansion of fish culture, and it is with the object of supplying trained personnel that a scheme is now being prepared to establish a training centre in Malaya, at which fundamental research will also be done.

17. The Fisheries Research Station on Lake Victoria should be completed by the summer, and observations have already been started. A preliminary report on the fisheries of Lake Nyasa, with recommendations for their control, has been published.

18. A survey is being made of the fishery possibilities of the Gulf of Aden, from the point of view of canning and of Vitamin A production as well as of a general increase in the supplies of fish. The motor-driven fishing craft have been fitted out for exploratory and experimental fishing on the coasts of Arabia and Somaliland. Similar surveys are about to begin in Borneo and Sarawak.

19. In West Africa, Dr. Brown is establishing the Fisheries Research Institute, and has drawn up plans for a research vessel, and also for an immediate programme of research on the possibilities of shark fishing. Dr. Wheeler began work on the Marine Fisheries Research Vessel No. 1 in Seychelles in December, 1947, and is proceeding to Mauritius in the spring of 1948.

20. Plans are being drawn up for a marine fisheries research station to serve South-East Asian Colonial territories. This station will have a research vessel, and will probably be situated at Singapore.

21. Consumer tests are being carried out in Sarawak on the acceptability of dehydrated fish meal for human consumption. It is proposed to engage a specialist in methods of fish preservation to advise Colonial Governments and conduct research.

G. Geodetic and Topographical Surveys

22. Recruitment has again been slow throughout the year, both of Field Surveyors and of Cartographic Staff. There has, however, been a steady increase of staff and mapping can be said to have made a real start.

23. By the end of March, 1948, the Directorate had on its strength 21 (10) Surveyors (all grades) out of a total establishment of 73 ; 5 (3) Computers (all grades) out of a total establishment of 9 ; 132 (94) Cartographers (all grades) out of a total establishment of 146 ; and 5 (—) Photographers (all grades) out of a total establishment of 5. (The figures in brackets indicate the numbers at the end of the previous year.)

24. Mapping from the R.A.F. air-photography of West Africa was begun in April, 1947, and by the end of the year under review the following work had been accomplished :

Gambia. (a) Planimetric mapping is complete, and fair drawing 75 per cent. complete. The map will be published in 30 sheets, covering some 5,500 square miles, at 1:50,000.

(b) Fourteen sheets are being prepared at scale 1:10,000 in the neighbourhood of Bathurst. One hundred and ninety square miles have been compiled and a further 650 square miles are in course of compilation.

Sierra Leone. A map is being prepared for publication in 15 sheets at scale 1:10,000 covering Freetown Peninsula, and planimetric compilation is complete. Unfortunately the photography was not of high enough quality for the map to be contoured, and it will be issued, in the first instance, uncounted. The area will be rephotographed and a contoured edition issued later.

Gold Coast. Control Surveys continued in the Gold Coast until the end of 1947. The work covered an area of 10,500 square miles. Mapping has continued throughout the year under review. Eight sheets at scale 1:5,000 have been completed and issued covering the Volta River Delta ; two sheets at scale 1:5,000 covering the Ajinc dam site on the Volta River have been completed and issued and twenty-two further sheets are in hand ; two sheets have been compiled and fair drawn for publication at scale 1:62,500 and work on a further 36,000 square miles is in hand.

East and Central Africa. In May, 1947, the Royal Air Force began a large programme of air photography in East and Central Africa, and by the end of March, 1948, had covered the following areas with photography at scale approximately 1:30,000:—

						<i>Square miles.</i>
Kenya ... ..	...	...	...	...	...	46,300
Uganda ... ..	...	...	...	...	...	46,000
Tanganyika ... ..	...	...	...	...	...	34,000
Northern Rhodesia ... ..	...	...	...	...	...	10,800
Swaziland ... ..	...	...	...	...	...	6,500
Bechuanaland ... ..	...	...	...	...	...	3,700
Total	...	...	...	...	...	147,300

and at much larger scales:—

					<i>Square miles.</i>
Zanzibar and Pemba	...	...	...	...	570
Mauritius	...	...	...	...	350
					<hr/>
Total	...	...	...	...	920

It is probable that the figures for Uganda and Kenya are much greater than those given, as photography continued throughout March and the returns are not yet complete.

Survey parties commenced work in fixing ground control in Kenya, Uganda, Tanganyika and Northern Rhodesia, and others will shortly start in Swaziland and Nyasaland. Mapping is proceeding rapidly. Thirty sheets of provisional plots at scale 1:50,000 were issued covering groundnut areas in the neighbourhood of Urambo and Masasi in Tanganyika. Preliminary work has begun on some 50,000 square miles.

Malaya, North Borneo and Sarawak. The Director of Colonial Surveys visited the Federation of Malaya, North Borneo and Sarawak during March-April, 1947, and was able to arrange for air-photography of considerable areas. The latest figures available indicate that the following areas have been covered:—

					<i>Square miles.</i>
Federation of Malaya	...	...	...	...	3,700
North Borneo	...	...	...	...	9,350
Sarawak	...	...	...	...	8,000
					<hr/>
Total	...	...	...	...	21,050

The Director also arranged for ground control to be fixed by local resources and the first results have arrived from Sarawak. Those of North Borneo are expected to start arriving shortly. Preliminary work on the photographs has commenced.

Other Mapping. The 12-sheet map of Jamaica at scale 1:50,000 has been completed and a provisional edition issued, and work on a one-sheet map of Jamaica at scale 1:250,000 is continuing. The two-sheet map of Antigua at scale 1:25,000 has been completed and issued. A one-sheet map of St. John's, Antigua, and vicinity at scale 1:10,000 has been completed and issued. An 11-sheet map of Graham Land in the Antarctic is being prepared for publication at 1:500,000. A one-sheet map of the Falkland Islands Dependencies area is being prepared for publication at scale 1:3 million. Miscellaneous work includes the preparation of maps for the next edition of the Colonial Office List.

25. *Programme for 1948-49.* The Royal Air Force detachment will continue its work in East and Central Africa, the first areas to be photographed being in Northern Rhodesia (Kariba Gorge area) and Southern Nyasaland. It is proposed that the detachment shall move to West Africa in the autumn of 1948. Ground surveys will continue in East and Central Africa with all available surveyors.

26. A British Commonwealth Survey Officers' Conference, which was convened by the Secretary of State for Commonwealth Relations, took place from the 18th to the 29th August, 1947. Major-General G. Cheetham, Director-General Ordnance Survey, was nominated President of the Conference, which was attended by over 150 delegates including representatives

from 17 Colonial territories. The purpose of the Conference was to allow survey officers throughout the Commonwealth and Empire to meet and discuss technical problems of mutual interest and to obtain information as to recent developments in survey matters in all parts of the British Empire. Numerous papers of a technical nature were discussed and a number of visits arranged.

H. *Geological Survey*

27. In November, 1947, the Secretary of State addressed a circular despatch to Colonial Governors, in which he stressed the development of Colonial Geological Surveys as a matter of the first importance, and invited them to put forward schemes for assistance under the Colonial Development and Welfare Acts to provide for the expansion of existing Surveys or for the creation of new organisations where these did not already exist. It was suggested that the schemes should cover a period of eight years in the first place, and it was intimated that 100 per cent. assistance from Colonial Development and Welfare Funds would be considered in respect of the first five years of this period and assistance on a progressively reduced scale for the remaining three years, the schemes being reviewed at the end of the fourth year. The Secretary of State emphasised the desirability of a regionally organised service being instituted wherever practicable, although he appreciated that this would not be possible immediately, and that for the time being the existing territorial organisations would have to be continued and assisted by regional conferences and by the occasional secondment from one territory to another of officers who had specialised in particular branches of geology.

28. The replies received to the circular despatch showed that Colonial Governments were fully alive to the importance of this matter and desired to co-operate fully in the development of Geological Surveys. Progress, however, will inevitably be hampered during the next few years by the shortage of geologists, for whose services industry is an important competitor. The universities teaching geology, both in the United Kingdom and in other countries of the Commonwealth, have been notified that more than one hundred well qualified geologists are likely to be needed for Colonial surveys. The Director of Geological Surveys (Dr. F. Dixey, O.B.E.), has visited some of the universities and institutions in the United Kingdom to explain to the teaching staffs and students the many advantages of a career in this important field, which will offer not only permanent and pensionable posts with good prospects of promotion, but work that will always be interesting because of the variety of problems and of the facilities afforded for close association with native peoples. It is hoped to recruit about twenty-five new geologists for duty in the Colonies during the coming year.

29. Dr. Dixey visited East and Central Africa and the South African High Commission territories during May-July, 1947, and paid liaison visits to the Union of South Africa and Southern Rhodesia. His consultations with the Administrations showed that to endeavour to re-organise the existing territorial surveys on a regional basis at the present time would be premature, but it was agreed that periodic conferences of Directors of Colonial Survey of neighbouring Colonies should be held with as many other geologists in attendance as possible, in order that discussions on problems of common interest could be frequent and the various territorial departments enabled to arrange mutual help by the exchange of staff and equipment.

30. Dr. Dixey also visited Jamaica, British Honduras, Trinidad, British Guiana, Barbados and St. Lucia in January-February, 1948, and discussed with the various Administrations the desirability of investigations being instituted into such matters as the examination of rock or mineral specimens and mineral deposits, water supplies, volcanic phenomena, road metals, building materials, soil erosion, etc. Proposals are under discussion for a considerable expansion of the British Guiana Geological Survey during the next eight years, and in view of the importance of the mineral industry of the Colony and of the opportunity of increased development in the future, it will probably be necessary for the department substantially to expand its activities and staff. In this event, it would be in a position materially to assist other territories.

31. It is proposed that the Director shall shortly visit the Federation of Malaya, North Borneo, Sarawak, Hong Kong, Fiji and the Western Pacific, and return via the United States and Canada to establish contacts with the Geological Surveys in those countries.

32. Arrangements have been made with the Imperial College of Science and Technology, London, to enable Colonial Geologists to take courses of study while they are on leave, and six officers availed themselves of this privilege during the year. A lecturer in geology at the University of London undertook a special geological task in North Borneo during the long vacation, and it is hoped to arrange for the Professor of Geology and Mineralogy at Cape Town University to take a small party of his students to investigate the geology of Mauritius in 1949. Universities teaching geology in the United Kingdom and in other Commonwealth countries have been supplied with details of subjects for research in the Colonial territories that might be undertaken by post-graduate students.

I. *Insecticides*

33. The attached first Annual Report of the Colonial Insecticides Committee gives a comprehensive picture of the rapid development taking place in this field of research.

J. *Land Tenure Systems. Native Law and Local Government (Africa)*

34. An African Studies Branch was set up in the Colonial Office during the year. This Branch forms a clearing house for the exchange of information between the British African Colonial Governments on local government, land tenure and native law. It keeps in touch with research on these subjects in the universities and maintains technical liaison with other Commonwealth countries and with the overseas departments of foreign countries. It is also engaged on research in the contemporary history of certain African problems. A quarterly "Digest of Local Administration" is being produced which contains studies carried out by the Branch, which will also provide a vehicle for the publication of research in these fields in Africa. The Branch provides the secretariat for the Advisory Panels on Land Tenure and Native Law (see paragraphs 22 and 29 of the report of the Colonial Research Committee, 1946-47); and for a new Local Government Advisory Panel which has recently been formed to advise on the application of English local government experience to Africa.

35. *Native Law.* In conjunction with the Native Law Advisory Panel the Branch has carried out a survey of the legislation governing the organisation, jurisdiction and work of the native courts in the British African territories and a survey of the methods of recording native customary law.

36. *Land Tenure.* During the year the Land Tenure Advisory Panel has examined and advised on reports of research into problems on land tenure received from Nigeria, Northern Rhodesia and the Gold Coast. It has also advised on a number of specific questions involving land policy and research submitted by Colonial Governments.

37. *Local Government.* The Panel has only recently been appointed and has not yet met. The Branch has, however, carried out a survey of local government developments in Africa which has been published in the Digest. It is also engaged on studies in administrative history.

K. *Locust Control*

38. Extensive campaigns for the control of the Desert Locust in East Africa and the Middle East, which have been in progress since 1942, have now come to an end, and the countries involved are free of swarms. The Anti-Locust Research Centre, under Dr. B. P. Uvarov, has been largely responsible for planning the campaigns. The Centre is now able to concentrate on its primary duty of investigation and research.

39. The success of the Desert Locust campaigns has been to a great extent due to the information service built up by the Centre with the co-operation of local governments. During the year over 1,000 reports have been received and analysed. These reports provided a basis for monthly bulletins and forecasts of the locust situation issued by the Centre.

40. Since 1945 there had been a dangerous increase in the population of the Red Locust in its outbreak areas in Tanganyika. These areas are kept under supervision by the International Red Locust Control Service, but in spite of control campaigns, some swarms had escaped and were breeding in Central Tanganyika. On the advice of the Centre, special campaigns were organised on an international basis, covering the autumn of last year and the early months of 1948. These have met with outstanding success. Apart from the immediate practical importance of this achievement, it has supplied a proof that locust plagues can be checked before they assume dangerous proportions, provided the outbreak areas are properly supervised and timely measures are taken against incipient swarms. The policy of outbreak prevention, consistently pursued in Africa for the last two decades, is beginning to pay dividends.

41. The African Migratory Locust has shown some signs of incipient swarming in its outbreak area in the French Sudan. A small conference of international experts was organised by the Centre in London and a plan for joint action by French and British Colonial authorities in West Africa has been prepared. Mr. H. B. Johnston has been appointed as a liaison officer with the French authorities and is now in Africa.

42. The Red Locust campaign last autumn provided an opportunity for an experiment in spraying adult locusts from aircraft. The experimental campaign, in which British, South African and Belgian experts co-operated, was eminently successful in showing the effectiveness of spraying roosting locusts with dinithro-ortho-cresol solution at a dosage as low as a gallon per acre. This experiment also contributed to the suppression of the incipient outbreak.

43. Field investigations on locust migrations in relation to weather factors are continuing in East Africa by a Senior Scientific Officer of the Centre and Dr. R. C. Rainey, who has been seconded for the purpose by the Empire

Cotton Growing Corporation. The investigations have been carried out in Somalia, British Somaliland and Kenya on the Desert Locust, but with the disappearance of swarms of this species, the team is being transferred to work on the Red Locust in Tanganyika Territory. East African Governments and the International Red Locust Organisation are financing this work and assisting in its execution.

44. Fundamental research on a variety of problems, including insecticide action, nutrition, pigments, fertility, behaviour, physiology and aerodynamics of locust flight are in progress. Most of these investigations are being carried out by research students at universities, with grants from the Centre. The locust breeding laboratory of the Centre supplied over 10,000 live locusts of two species for these researches.

45. A visit was paid by the Director of the Centre to Cyprus in order to advise on the control of the Moroccan Locust there. A rapid survey of the situation suggested that the island presents an excellent opportunity for submitting to a practical test the idea of permanent prevention of locust outbreaks by change of ecological conditions in outbreak centres. A plan of investigations, the results of which may well have a very wide application, is being prepared.

46. Direct co-operation in locust control and research between experts of several nations has continued to be very satisfactory and fruitful and considerable progress has been made in the formulation of International Conventions intended to provide a permanent basis for such co-operation. A Convention on the Red Locust is almost ready for signature and one on the Migratory Locust is approaching completion, but divergences of opinion are delaying the preparation of a Desert Locust Convention. Since it would be extremely dangerous to leave the outbreak areas of the Desert Locust without supervision, a conference of British experts held at Nairobi in February, 1948, has recommended the establishment of a Desert Locust Survey, which should take over this task from the organisations which have successfully concluded recent control campaigns. It is hoped that experts of other interested nations will co-operate by extending the surveys to their territories. A British survey team is already at work in Arabia where a new outbreak area of the Desert Locust has been discovered during a visit by the Director of the Centre in March, 1948.

47. New publications by the Centre include its third *Anti-Locust Memoir*, dealing with the breeding and migrations of the Desert Locust in Western and North-Western Africa, and the first *Anti-Locust Bulletin*, containing a summary of recent advances in the knowledge of anatomy and physiology of locusts and grasshoppers. Two more *Bulletins* are in the press. Other research publications sponsored by the Centre include accounts of aircraft spraying against the Red Locust; observations on egg-laying sites of the Desert Locust in Tripolitania; and a description of a new parasite of the Desert Locust in East Africa.

L. Medical

48. See attached Annual Report of the Colonial Medical Research Committee for 1947-48.

M. Meteorology

49. Some advance has been made in the organisation of meteorological services, but this has been hampered by the shortage of trained meteorologists

and the services in many areas are little more than skeleton services. Meteorological investigations are in progress in the Gold Coast to assist the "swollen-shoot" campaign, and the work of observers in the Falkland Islands Dependencies has continued.

N. Products Research

50. See attached Annual Report of the Colonial Products Research Council for 1947-48.

O. Social Sciences

51. See attached Annual Report of the Colonial Social Science Research Council for 1947-48.

P. Statistics

52. During the early part of the year the statistician submitted detailed plans for the organisation of a Statistical Section to serve the Colonial Office generally, and to ensure the proper supply of basic statistical material and its collation, presentation and analysis. These proposals are under consideration.

53. Excluding the staff specifically employed in connection with problems of Colonial balance of payments, no increase in actual establishment occurred until the end of the year. Consequently, the contribution made has been concerned mainly with planning rather than the preparation of concrete statistical information. Nevertheless, a substantial number of enquiries have been answered and a great deal of statistical material has been supplied in connection with such matters as the following:—Colonial economic survey, research schemes, 1950 World Agricultural Census, European Recovery Programme (Colonial aspect), Colonial cost of living indices, Canadian trade delegation, United Nations. .

Q. Tsetse Fly and Trypanosomiasis

54. Progress was made during the year in giving effect to the recommendations of Professor Buxton and Professor Davey who visited East and West Africa, respectively, in 1945-46, at the suggestion of the Tsetse Fly and Trypanosomiasis Committee. In East Africa a Tsetse Reclamation Service was set up with headquarters in Nairobi to advise and assist in practical measures of tsetse reclamation undertaken in any of the territories of the East Africa High Commission. The Tinde and Shinyanga Laboratories were also put on an East African basis and arrangements were made to appoint Dr. Lester, Director of Medical Services, Palestine, to the post of Director of East African Tsetse Research and Reclamation. This central direction of research will enable the work already in hand to be more closely co-ordinated and expanded and will ensure the proper use in practical measures of the knowledge gained in research. In West Africa plans have been drawn up for the establishment of an Institute for Trypanosomiasis Research on a West African basis in accordance with Professor Davey's recommendations. Colonel H. W. Mulligan has been appointed as Director and sites have been obtained in Kaduna and Vom, where building will shortly commence. Two-thirds of the cost of the Institute is being defrayed from the Colonial Development and Welfare Research allocation and one-third by the four West African Governments.

55. Reports on trypanosomiasis in Eastern and Western Africa by Professors Davey and Buxton, respectively, on tsetse in British West Africa and on the Anchau Rural Development Scheme by Dr. T. A. M. Nash were

prepared for publication during the year by the Bureau of Hygiene and Tropical Diseases under a Colonial Development and Welfare scheme sponsored by the Tsetse Fly and Trypanosomiasis Committee. The reports will shortly be published and distributed to research institutes and workers in the field.

56. Particulars were received during the year of successful research by a commercial firm as a result of which a new compound was evolved which gave promising results in the laboratory as a trypanocide. At the instance of the Committee arrangements were made for the drug to be tested in the Sudan and in East Africa by veterinary organisations there in collaboration with representatives of the firm. Preliminary results of the field trials bear out the promise in the laboratory of a valuable new drug against *T. Congolense*.

57. As the first of the series of technical conferences to be held in Africa under arrangements made during Anglo-Franco-Belgian Colonial discussions in Paris, an international conference on trypanosomiasis was held at Brazzaville, French Equatorial Africa, early in February, 1948. Almost every territory in Africa south of the Sahara was represented at the conference by scientists directly concerned with trypanosomiasis work; there were also delegates from the London Committee and from metropolitan France. The conference recommended immediate action in regard to the following matters:—application of the drugs at present available for treatment and prophylaxis; a statement of successes and failures with various methods of bushclearing and trapping and with insecticides for the reduction of the incidence of the fly; and a continued collaboration between the countries concerned by means of an international Information Bureau on the Congo and an International Scientific Committee in Europe. Arrangements were also made for the uniform mapping of Tropical Africa on an agreed scale to show the incidence of both the disease and the various species of the fly.

R. *Water Resources*

58. A report has been prepared by Professor F. Debenham, O.B.E., Professor of Geography, Cambridge University, on the water resources of Northern Rhodesia, Nyasaland and the Bechuanaland Protectorate (with references also to the position in Kenya, Uganda, and Tanganyika), following a visit paid by him in 1946 to those territories. This report will shortly be published.

APPENDIX I

COLONIAL RESEARCH COUNCIL

The Council was established in February, 1948, in replacement of the Colonial Research Committee, to advise the Secretary of State for the Colonies on general questions relating to research policy in the Colonial Empire or for its benefit; to co-ordinate the work of the various committees which at present advise the Secretary of State on special aspects of research; and to tender advice to the Secretary of State on research matters not falling within the province of any of these committees. The Council will maintain close contact with the Colonial Economic and Development Council.

B

The present membership of the Council is as follows:—

THE PARLIAMENTARY UNDER-SECRETARY OF STATE FOR THE COLONIES (*Chairman*).

THE DEPUTY UNDER-SECRETARY OF STATE IN CHARGE OF ECONOMIC AFFAIRS (*Vice-Chairman*).

MR. ERIC BARNARD, C.B.E., D.S.O., M.A. (Department of Scientific and Industrial Research).

SIR ALEXANDER CARR-SAUNDERS, M.A., LL.D. (Chairman, Colonial Social Science Research Council).

SIR JOHN FRYER, K.B.E., M.A., F.R.S. (Chairman, Committee for Colonial Agricultural, Animal Health and Forestry Research).

PROFESSOR SIR IAN HEILBRON, D.S.O., D.Sc., LL.D., F.R.S. (Chairman, Colonial Insecticides Committee).

DR. ALEXANDER KING (Advisory Committee on Scientific Policy).

SIR EDWARD MELLANBY, G.B.E., K.C.B., M.D., F.R.C.P., F.R.S. (Chairman, Colonial Medical Research Committee).

SIR ARNOLD PLANT, B.Sc. (Econ.) (Chairman, Colonial Economic Research Committee).

SIR EDWARD SALISBURY, C.B.E., D.Sc., F.R.S. (Secretary, The Royal Society).

PROFESSOR J. L. SIMONSEN, D.Sc., F.R.S. (Director of Colonial Products Research).

PROFESSOR R. H. TAWNEY (Professor of Economic History, University of London).

MR. J. G. HIBBERT, M.C. (*Secretary*).

(DR. E. B. WORTHINGTON, M.A. (*Scientific Secretary*)).

NOTE: Dr. Worthington was seconded in October, 1946, for duty with the East African Governors' Conference and is at present acting as Scientific Secretary to the East Africa High Commission.

APPENDIX II

Table I

LIST OF SCHEMES APPROVED FOR RESEARCH GRANTS UNDER THE COLONIAL DEVELOPMENT AND WELFARE ACTS DURING THE PERIOD 1ST APRIL, 1947 TO 31ST MARCH, 1948

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
178 178A 178B	General :— General	Appointment of research worker in medical entomology. <i>Investigation by Dr. G. A. Walton, Medical Entomologist, Sierra Leone, into the bionomics of Ornithodoros Mubata in reference to Relapsing Fever.</i>	£ 1,256
143A	do.	Building Research <i>Attachment of a Colonial Liaison Officer to the Building Research Station of the Department of Scientific and Industrial Research (supplementary provision).</i>	2,975
149B	do.	Research Work by Dr. G. T. Stewart at Liverpool School of Tropical Medicine (<i>supplementary provision</i>).	180
76A	do.	Appointment of Dr. H. H. Storey, F.R.S., as Scientific Secretary to the Committee for Colonial Agricultural, Animal Health and Forestry Research. (<i>supplementary provision</i>).	1,800
57B	do.	Research by Dr. C. Leubuscher into the economic factors underlying location of industries in the colonies engaged in processing raw materials (<i>supplementary provision</i>).	1,900
174A 174B	do.	Work of the Colonial Insecticide Committee in the United Kingdom. <i>Provision for Staff and travelling overseas.</i>	3,300
185A	do.	Colonial Insecticides Committee <i>Supplementary provision for headquarters staff.</i>	400
128B	do.	Research at the Imperial College of Science into the design of apparatus for the application and dissemination of Insecticides in the Colonies. <i>Provision for an additional Research Assistant.</i>	500

B 2

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
198	General—contd. General	Social Science Research Studentships. <i>The Grant provides for 12 post-graduate studentships for a period of six months each by way of preparation for a period of not less than two years' social science field research under schemes to be drawn up during the training period.</i>	£ 3,560
167A	do.	Collation and organisation of Colonial Agricultural Statistics. <i>Visit by an officer of the Agricultural Economics Research Institute Oxford, to one of the African Colonies.</i>	350
77A	do.	Investigation by the Medical Research Council into the technique of Par-boiling Rice. <i>Supplementary provision to enable the field of investigation to be widened.</i>	100
230	do.	Purchase of six Cameras for use by Sociological Workers.	90
47A	do.	Demographic Research ... <i>Publication of the late Dr. Kuczynski's "Demographic Survey of the Colonial Empire."</i>	350
202	Africa :— General	Trypanosomiasis Research ... <i>Investigation of methods of diagnosis and certain other points in infections with the African trypanosomes to be carried out at the Winches Farm Field Station of the London School of Hygiene and Tropical Medicine.</i>	2,000
203	do.	Publication of Report on Tsetse Flies and Trypanosomiasis in Africa by Professors Puxton and Davey and Dr. Nash.	1,000
28B 28c	do.	Preparation of a Handbook of African Languages by the International African Institute (<i>supplementary provision</i>).	2,357
204 204A	Central and East ...	Locust Control <i>Purchase of aircraft to carry out trials to test the efficacy of destroying locusts by poison spraying from the air.</i>	53,500

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
205 205A	Africa— <i>contd.</i> Central and East.	Locust Control <i>Trials to test the efficacy of destroying locusts by spraying with poison from aircraft.</i>	£ 47,875
99A	East Africa :— General	Development of Agricultural Research in East Africa. <i>Visit of representatives of the Committee for Agriculture, Animal Health and Forestry Research (supplementary provision).</i>	75
153A	do.	Agricultural Research <i>Appointment of a Secretary to the Director of the East African Agriculture and Forestry Research Station for three years.</i>	1,660
153B	do.	Establishment of the East African Agriculture and Forestry Research Organisation. <i>The scheme provides for £45,000 capital and for £114,500 in respect of one half of the recurrent expenditure, spread over a period of five years. The East African Governments have agreed to contribute the other moiety of the recurrent expenditure.</i>	139,500
192	do.	East African Veterinary Research Organisation. <i>Interim grant to provide for buildings at Kabete.</i>	25,000
192A	do.	Establishment of the East African Veterinary Research Organisation. <i>This scheme includes provision for £25,000 capital expenditure and £94,000 in respect of recurrent expenditure, spread over a period of five years. The total recurrent expenditure is estimated at £279,000 towards which the East African Governments have agreed to contribute £80,000. The balance will be met from anticipated sales of biological products.</i>	119,000
207 207A	do.	Fertiliser Experiments <i>Grant provides for the carrying out over a period of three years of controlled experiments on an extensive scale both in the field and in the laboratory.</i>	34,170

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
222	East Africa— <i>contd.</i> General	Agricultural Research <i>Study of anthropol fauna of tropical soils by Dr. George Salt, School of Biology, Cambridge University.</i>	£ 1,320
148B	do.	Labour Efficiency Research <i>Enquiry by Dr. Northcott into factors affecting the efficiency of African labour (supplementary provision).</i>	400
238	do.	Medical Research <i>Investigation by Dr. A. G. Walton over a period of 3 years into the bionomics and distribution of Ornithodoros Ticks in relation to relapsing fever in East Africa.</i>	6,054
126A	do.	Tsetse Reclamation <i>Provision of buildings for the accommodation of the East Africa Tsetse Reclamation Department.</i>	37,000
68B 68C 68D 68E 68F 68G 68H	do.	Colonial East African Insecticides Research Unit. <i>Supplementary grants to meet the cost of additional salaries, the purchase of launches and scientific equipment and the carrying out of experiments in the dissemination of insecticides from aircraft.</i>	104,511
221	Kenya	Fertiliser Experiments <i>An experimental fertiliser programme to be carried out in the Kenya Highlands.</i>	8,500
107A	do.	Linguistic Research and Production of Text Book of Kikuyu Grammar (<i>supplementary provision</i>).	195
200 200A	do.	Sociological Research <i>Study by Miss Mary Parker of urban life and municipal development in Kenya.</i>	655
24B	do.	Development of Water Supplies <i>Grant to provide for a Hydrographic Survey and for experimental work necessary as a preliminary to the full development of water supplies in Kenya.</i>	16,640
229	do.	Fisheries Research <i>Study of the fish biology of streams and rivers in Kenya by Dr. Winifred Frost, Fresh Water Biological Association, Ambleside.</i>	600

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
234	East Africa— <i>contd.</i> Kenya	Sociological Research <i>Anthropological research by Mr. A. H. J. Prins among the Teita people of Kenya.</i>	£ 3,230
162B 162C	Tanganyika	Malaria Research <i>Supplementary grants to provide for the purchase of further equipment and for additional travelling expenses in connection with the research work being carried out by Dr. Muirhead Thomson.</i>	700
173A 173B	do.	Medical Survey in East Africa in association with the East African Groundnut Scheme. <i>Supplementary grant to cover cost of equipment, staff, and visits by Professor G. Macdonald and Colonel T. J. Davidson.</i>	4,325
216	do.	Tsetse Fly Research <i>Provision for additional research workers in the Department of Tsetse Research, Tanganyika, for work on the ecology of certain predators and hosts of the tsetse fly.</i>	4,150
125(a)A 125(a)B	Uganda	Yellow Fever Research Institute, Entebbe. <i>Supplementary grant to meet the cost of buildings for staff required for the expansion of the Institute's activities, and to cover one half share of the running costs of the Institute for 1947.</i>	18,863
147B 147C	do.	Yellow Fever Research Institute, Entebbe. <i>Provision for the appointment of Dr. W. H. R. Lumsden as Entomologist attached to the Institute.</i>	195
184	do.	Hydrological Research. <i>This grant, spread over five years, provides for the establishment of a Hydrological Survey Organisation for the collection of Hydrological data required in connection with the various schemes and problems of water conservancy and hydroelectric development in Uganda</i>	114,500

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
193	East Africa—contd. Uganda	Sociological Research <i>Research by Mr. A. Southall of Makerere College, Uganda, into the life, diet and social organisation of the Luo people.</i>	£ 165
217	do.	Establishment of a Central Cotton Research Station. <i>This scheme, which is made in favour of the Empire Cotton Growing Corporation, replaces the scheme No. R.95 made in favour of the Government of Uganda, under which a grant of £125,000 was authorised. (See Colonial No. 208, p. 13.)</i>	203,250
151A	do.	Yellow Fever Research Institute, Entebbe. <i>A grant to continue the appointment of a pathologist, a laboratory assistant and a secretary at the Yellow Fever Research Institute, Entebbe, during 1948.</i>	2,800
232	do.	Provision for research work by Dr. R. W Ross at the Yellow Fever Research Institute, Entebbe.	2,700
233	do.	Research into East African music as part of linguistic studies.	2,450
134A 134B	Zanzibar	Research over a period of four years into the "Sudden Death" disease of cloves.	49,960
226	do.	Social and Economic Survey... <i>Provision for a social and economic survey to be conducted in Zanzibar in order that accurate sociological information may be obtained as a basis for a more complete programme for the development of the Protectorate's economic resources and the expansion of the social services.</i>	7,000
43c	Central Africa :— Nyasaland	Survey of fisheries of Lake Nyasa (<i>supplementary provision</i>).	540
220	do.	Lake and River control Agriculture Experimentation. <i>Provision for irrigation and agricultural experiments in</i>	3,150

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
	Central Africa—contd.		£
	Nyasaland ...	<i>certain areas in which intensive agricultural development in irrigation may be possible in connection with schemes for controlling the waters of the Shire River and Lake Nyasa.</i>	
187	Northern Rhodesia	Rhodes-Livingstone Institute ... <i>Grant to assist the Central Office of the Rhodes-Livingstone Institute which carries out sociological research among Central African peoples. Grant also contains provision for visits by specialists to the Institute.</i>	2,100
194	do.	Sociological survey of the Luapula area.	5,690
223	do.	Ecological Survey ... <i>Investigation by Mr. C. G. T. Morison, Department of Agriculture, University of Oxford, and other scientists of (a) Soil vegetation relationships in N. Rhodesia and (b) the genus Brachystegia in N. Rhodesia and Tanganyika.</i>	2,000
235	do.	Agriculture Research ... <i>Provision of laboratories, housing and equipment, needed for the Agricultural Research Service.</i>	10,000
176	West Africa :— General ...	Pest Infestation Survey ... <i>Training of four scientific Officers pending appointment to the West Africa Pest Infestation Survey team.</i>	1,420
90A 90B 90C	do.	Infestation of Stored Products in West Africa. <i>Provision for the employment of scientists to carry out a detailed pest infestation survey in West Africa for two years.</i>	29,285
133A	do.	Building Research ... <i>Visit of experts from the Department of Scientific and Industrial Research to West Africa to advise on establishment of a regional building research organisation.</i>	252
106B 106C	do.	Psychological Research by Dr. Geoffrey Tooth (<i>supplementary provision</i>).	1,600

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
183	West Africa—contd. General	Fisheries Research <i>Interim grant to provide for a house for the Director of West African Fisheries Research, office accommodation and the purchase of a launch.</i>	£ 3,550
199 199A	do.	Medical Research—Nutrition <i>Employment of Dr. R. H. Fox at the Human Nutrition Research Unit, London, for training and subsequent work in West Africa on the clinical aspects of malnutrition.</i>	1,080
155A 155B 155C	do.	Educational Research <i>Research into problems of secondary school science teaching (supplementary provision).</i>	595
211	do.	Preparation of a Report by Mr. E. O. Longley, M.R.C.V.S., on Caprine Pleuro-Pneumonia in West Africa.	30
212	do.	Medical Research <i>Visit of Professor B. G. Macgraith to survey facilities for medical research in Sierra Leone, Nigeria and the Gold Coast.</i>	390
180	Gambia	Establishment of a Nutrition Field Research Station in the Gambia. <i>Provision for acquisition of buildings and equipment and for salaries of staff for five years.</i>	105,430
210 210A	Gold Coast	Linguistic Research <i>Purchase of recording apparatus in connection with work being carried out by Mr. Whittaker, Achimota College.</i>	210
213	do.	Linguistic Research <i>Visit to the Gold Coast by Mr. J. Berry for research into the relationship between the Adangwe and Ga languages.</i>	700
125(b)A	Nigeria	Yellow Fever Research Institute—Lagos. <i>Grant to cover one half of the running costs of the Institute for 1947.</i>	9,000
182	do.	Ecological Survey <i>Investigation in Nigeria for six months by a small expedition led by Dr. P. W. Richards, School of Botany, Cambridge University.</i>	350

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
109A 98c	West Africa—contd. Nigeria	Hot climate physiological research in Nigeria by Dr. W. S. Ladell (<i>supplementary provision</i>).	£ 11,300
224	do.	Rice Research <i>Grant to assist research for five years into the improvement of the rice growing industry in Nigeria. The Government of Nigeria are contributing the balance of the total cost which is estimated at £117,770.</i>	65,000
188	Sierra Leone	Sociological Research <i>Investigations by Dr. Hofstra into various aspects of the life of the Mendi tribe.</i>	660
169A	South Africa High Commission Territories :— Basutoland	Investigations into Pellagra (<i>supplementary provision</i>).	60
195	do.	Sociological Research <i>Fact-finding survey by Mr. V. J. Sheddick on problems relating to land tenure.</i>	2,400
189	Swaziland	Agro-Economic Survey <i>Survey by Mr. Liversage (previously Agricultural Economist to the Government of Kenya) in conjunction with Mr. Thornton, Agricultural Adviser to the High Commissioner.</i>	850
214	Middle East :— Aden	Fisheries Research <i>Grant to provide for technical research for the purpose of expanding the fisheries industries of Aden and British Somaliland.</i>	16,500
190	Indian Ocean :— Mauritius	Experiments in the Growing of <i>Aleurites Fordii</i> in Mauritius. <i>Provision for the visit of an officer from the Tung Oil Research Station, Nyasaland.</i>	340
52A	do.	Investigation into Poliomyelitis in Mauritius (<i>supplementary provision</i>).	50
88D 88E 88F 88G 88H	do.	Fisheries Research <i>Supplementary grants for the survey of fisheries in the Mauritius-Seychelles area.</i>	5,980

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
227	Indian Ocean—contd. Mauritius	Mosquito Eradication Campaign <i>Malaria is now endemic in the island of Mauritius. Preliminary experiments with house spraying in the island have met with success, and it is now proposed to embark on a campaign of eradication. This will take the form, at least in the first instance, of an island-wide spraying programme of all dwellings and other buildings for a period of two years.</i>	£ 29,000
158A	Far East:— General	Malaria Research <i>Grant to enable a three years Malaria Survey to be carried out in North Borneo, Sarawak and Brunei. (See scheme R.158—Cmd. 7151, p. 21).</i>	3,560
219	do.	Cocoa Cultivation <i>Visit of Dr. E. E. Cheeseman, East Malling Research Station, to Malaya, North Borneo and Sarawak to investigate the possibilities of expanding cocoa production in those territories.</i>	1,260
177 177A 177B	Federation of Malaya	Scrub Typhus Research <i>Grants to provide for ecological and field studies over a period of three years.</i>	20,798
186 186A	do.	Sociological Research <i>Visit by Professor Raymond Firth to study the social and economic conditions of the peasantry in Malaya.</i>	845
196	do.	Educational Research <i>Grant to assist cost of publication of a history of the educational policy of the Straits Settlements by Dr. D. D. Chelliah, of Singapore.</i>	88
115B	do.	Malaria Research <i>Grant to provide for an extension of the field trials being carried out by the Institute of Medical Research, Kuala Lumpur.</i>	3,740
208 208A	do.	Timber Research <i>Establishment of a Timber Research Station. Grant is to cover capital expenditure, and one half of the recurrent ex-</i>	89,200

COLONIAL RESEARCH COMMITTEE

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
	Far East—contd. Federation of Malaya	<i>penditure for five years, the remaining moiety being defrayed by the Federation of Malaya.</i>	£
215	do.	Educational Research <i>Investigation into the teaching of Malay in English Schools in Malaya by Miss M. B. Lewis of the School of Oriental and African Studies.</i>	770
181	Sarawak	Sociological Research <i>Grant to enable a "pilot" six months socio-economic survey in Sarawak to be undertaken by Dr. E. Leach.</i>	1,125
209	do.	Fisheries Research <i>Grant is to assist a three year survey of Sarawak fisheries and practical experiments in (a) the possibility of power methods in Sarawak waters, and (b) the production of fish meal both edible and agricultural.</i>	5,950
206	Pacific :— Fiji	Linguistic Research in Fiji by Mr. G. B. Milner, School of Oriental and African Studies.	1,825
179	West Indies :— General	Soil Research <i>Grant provides for a 10 year programme of Soil Research in the West Indies to be carried out under the auspices of the Imperial College of Tropical Agriculture. The staff to be recruited under this scheme includes a Senior Officer, three Field Surveyors, a Soil Chemist, a Soil Physicist, a Chemist and three Assistant Surveyors together with a Junior Analyst for survey research, senior and junior cartographers and clinical and technical assistants.</i>	165,000
191	do.	Fisheries Research <i>Visit of an expert to Jamaica, Trinidad and British Guiana to advise on Fish Farming.</i>	1,000
93B 93C 93C(a) 93D 93D(a) 93D(b)	do.	Sociological Research <i>Psychological investigation over a period of three years amongst school children in the West Indies by Mr. A. Deans Peggs and Mr. B. J. Bedell.</i>	12,374

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
197	West Indies— <i>contd.</i> General	Banana Research <i>Banana breeding and investigation into Panama Disease by the Imperial College of Tropical Agriculture, Trinidad and the Government of Jamaica, over a period of five years.</i>	£ 154,600
65A	do.	Medical Research <i>Investigation into nutritional oedema in West Indian infants by Dr. C. J. Waterlow (supplementary provision).</i>	250
132A	do.	Preservation of Architectural Treasures. <i>(See Cmd. 7151, p. 22.) (Supplementary grant.)</i>	65
159A	do.	Cocoa Research <i>Scheme provides for a 10 year programme of Cocoa research to be undertaken at the Imperial College of Tropical Agriculture, Trinidad.</i>	140,000
225	do.	Sociological Research <i>Survey of the Friendly Society movement in the West Indies by Mr. A. F. Wells.</i>	4,000
201	British Honduras ...	Industrial Research—Cassava Starch. <i>Visit by an expert to investigate the possibilities of Cassava Starch production.</i>	600
54A	Leeward and Windward Islands	Control of Food Crop Pests ... <i>Supplementary grant to cover the cost of printing and publishing the report of Mr. R. G. Fennah, of the Imperial College of Tropical Agriculture.</i>	220
218	do.	Study of Natural Vegetation ... <i>Grant to provide for the publication of a report by Dr. J. Beard.</i>	440
231	do.	Seismic Investigation <i>Investigation into contemporary seismic activity in the Leeward and Windward Islands, by Mr. G. E. C. Fertel.</i>	1,900
82C 82D	Jamaica	Refrigerated Gas Storage of Bananas (<i>supplementary provision</i>).	390

Scheme No. (Prefix R)	Territory	Description of Scheme	Amount
145A 145B 145C	West Indies— <i>contd.</i> Jamaica	Sociological Survey <i>Employment of a social psychologist and an assistant as members of the team working under the direction of Miss Edith Clarke.</i>	£ 2,560
175	Trinidad	Establishment of a Sugar Technology Research Unit at the Imperial College of Tropical Agriculture. <i>This grant covers £46,250 required as capital expenditure and one half of the estimated current expenditure over a five years period, the other moiety being defrayed by the sugar industry.</i>	96,250
171A	do.	Research into Vacuum-oil Food Drying Processes (<i>supplementary provision</i>).	313
228	do.	Ecological Research <i>Grant for a study of the ecology of secondary forest growth on abandoned cultivated land by Mr. P. Greig-Smith, Botanical Department, Manchester University.</i>	415
Total			£2,052,051

Table II

ALLOCATIONS FOR RESEARCH UNDER THE COLONIAL DEVELOPMENT AND WELFARE ACTS, 1940 AND 1945

Period to	Totals	
	Allocation for period	Cumulative allocation
	£	£
31st October, 1942	57,158	57,158
31st March, 1943	15,340	72,498
31st March, 1944	224,835	297,333
31st March, 1945	116,795	414,128
31st March, 1946	660,776*	1,074,904*
31st March, 1947	1,099,382*	2,174,286*
31st March, 1948	2,073,340*	4,247,626*

Notes:—

The majority of the allocations are in respect of schemes extending over more than one year. For actual expenditure, see Table III.

* These figures include the expenditure incurred up to 31st March, 1948, and totalling £66,435 on Scheme R.7 (work of the Colonial Products Research Council, including the establishment of the Colonial Microbiological Institute in Trinidad)—See Appendix II, Cmd. 6486.

Table III

ACTUAL ISSUES IN RESPECT OF RESEARCH SCHEMES 1940-48

Financial Year	Issues		
	£	s.	d.
1940-41	Nil		
1941-42	6,670	0	0
1942-43	13,793	7	2
1943-44	30,450	6	6
1944-45	58,345	5	2
1945-46	93,306	10	1
1946-47	169,388	1	4
1947-48	421,937	9	4
Total	£793,890	19	7

Colonial Products Research Council
Fifth Annual Report
(1947-1948)

Treasury Chambers,
Whitehall, S.W.1.
30th April, 1948.

Sir,

I have the honour to enclose herewith the Annual Report of the Colonial Products Research Council for the year 1947—1948.

I am,

Sir,

Your obedient Servant,

HANKEY.

(*Chairman.*)

The Right Honourable A. Creech Jones, M.P.,
Secretary of State for the Colonies.

c

COLONIAL PRODUCTS RESEARCH COUNCIL

Membership

THE RT. HON. LORD HANKEY, G.C.B., G.C.M.G., G.C.V.O., F.R.S.,
Chairman.

MR. ERIC BARNARD, C.B.E., D.S.O., M.A., Deputy Secretary, Department of Scientific and Industrial Research.

PROFESSOR H. V. A. BRISCOE, D.Sc., F.R.I.C., Professor of Inorganic Chemistry, Imperial College of Science and Technology, London.

MR. ANEURIN DAVIES, Co-operative Wholesale Society.

MR. C. G. EASTWOOD, C.M.G., Colonial Office.

SIR JOHN FRYER, K.B.E., M.A., F.R.S., Secretary, Agricultural Research Council.

PROFESSOR SIR NORMAN HAWORTH, Sc.D., LL.D., F.R.S., Professor of Chemistry, University of Birmingham.

PROFESSOR SIR IAN HEILBRON, D.S.O., D.Sc., LL.D., F.R.S., Professor of Organic Chemistry, Imperial College of Science and Technology, London.

SIR HARRY LINDSAY, K.C.I.E., C.B.E., Director of the Imperial Institute.

SIR EDWARD MELLANBY, G.B.E., K.C.B., M.D., D.Sc., F.R.C.P., F.R.S., K.H.P., Secretary, Medical Research Council.

PROFESSOR J. L. SIMONSEN, D.Sc., F.R.I.C., F.R.S., *Director of Research.*

MR. G. THOMSON, Chairman, General Council, Trades Union Congress.

PROFESSOR A. R. TODD, M.A., D.Sc., F.R.I.C., F.R.S., Professor of Organic Chemistry, University of Cambridge.

LT.-COL. H. J. HOLMAN, B.Sc.,

MR. J. G. HIBBERT, M.C.,

} *Joint Secretaries.*

COLONIAL PRODUCTS RESEARCH COUNCIL

FIFTH ANNUAL REPORT

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COLONIAL PRODUCTS RESEARCH COUNCIL

FIFTH ANNUAL REPORT

PART I. GENERAL

In the last Annual Report the possibility of the early practical application of some of the results of the Council's research work was foreshadowed. This view has received added support in the present year from the interest taken by several firms in the various products which have been developed during the investigations concluded on behalf of the Council. The Council has emphasised that much of its work must, of necessity, be of a long-term nature, but it is glad to report that some of the work carried out under its aegis has already proved of practical value. The results of research so far achieved are available to all and a list of papers and patent applications, in which will be found full details, appears as Appendices I and II in both this year's and the two previous years' reports.

2. The Council has maintained its overseas contacts both through its official correspondents and through Colonial officers on leave in this country. Thanks are due particularly to those officers who have taken so much trouble to meet the Council's requests for plant material required for research. Without their assistance the work of the Council would be seriously handicapped. Close contact has also been kept with Dominion workers, both directly and through the Dominion Scientific Liaison Officers in London.

The interest shown by industrial firms in the work of the Council is clearly indicated by the many occasions on which they have consulted the Director of Research and by the invitations extended to him to visit their research laboratories.

3. Marked interest has been shown in a number of problems which have been studied in Sir Norman Haworth's laboratory at the University of Birmingham. Several firms have applied for the right to work the patents relating to levulinic acid for the production of an anti-freeze compound, while another company is considering the manufacture of sorbitol on a large scale. Considerable progress has been made by one organisation with the manufacture of a substitute for blood plasma from sugar by a biological process developed by Professor Stacey working in the Birmingham laboratory. Successful clinical trials have been conducted both in this country and in the U.S.A., and this product promises to be one of major importance. The same firm has prepared also a glucose substitute which appears to have considerable prospects. While these two latter developments have not arisen directly out of research being conducted on behalf of the Council, the Director of Research has kept in close touch with the work and on his recommendation the Colonial Office has sponsored the firm's application for supplies of sugar for their research and development work. Further expansion on the above lines may well be the first steps toward the establishment in the sugar-growing Colonies of important industries based on sugar as a raw material, the ultimate goal which the Council had in mind when inaugurating its research programme on sugar.

4. After their visit to the West Indies in 1944, the Director of Research and Sir Robert Robinson suggested that the West Indian sugar industry

should seriously consider the establishment of a Sugar Technology Research Association. This question has now been under discussion for some time with the result that recently it was decided to extend considerably the basis of the work on this subject being undertaken at the Imperial College of Tropical Agriculture, Trinidad. It is with pleasure that the Council notes that Dr. L. F. Wiggins, who has been employed as leader of the Council's research team on sugar in Sir Norman Haworth's laboratory at Birmingham, has recently been appointed as Director of Research in the Sugar Technology Department of the Imperial College. The Council desire to place on record its appreciation of the very valuable services which Dr. Wiggins has rendered. The Council further has learned with great satisfaction that Dr. Wiggins has been awarded a prize of \$5,000 by the Sugar Research Foundation Inc., New York, for his research work on the chemistry of sugar, an appreciable amount of which during recent years has been carried out on behalf of the Council. Arrangements have been made for Dr. Wiggins to continue to exercise a close supervision of the work in progress in Birmingham, but the direct control of the work has been placed with Mrs. Gregory. Mrs. Gregory has been associated with this research since its inception.

5. Commercial interest is being shown also in the comparatively simple method devised at Birmingham for the separation of starch into its two constituents, amylose and amylopectin, and the industrial utilisation of these two components separately for purposes appropriate to their properties. Amylopectin, for instance, has properties which make it superior to whole starch as a beater size in paper making, and amylose acetate is comparable with cellulose acetate in the manufacture of textile fibres and films. It would, however, be of considerable advantage if natural sources of starch could be developed comprising only one of the constituents, and with this in view the study of various Colonial starch-producing plants is being actively pursued (see para. 21).

6. Reference was made in the last report to the very important work of Professor Hilditch at Liverpool University on the oil from the seed of the West African vine (*Tetradacarpidium conophorum*). Further commercial tests are being undertaken by firms engaged in the paint and linoleum industries, but there seems no doubt that "conophor" oil, if available in quantity, would form a very welcome addition to the world's supplies of drying oils. The problem now seems to have resolved into one of how the seeds can be grown and treated economically on a large scale, and extensive agricultural experiments have already been started in Nigeria and Sierra Leone with the object of obtaining this information. It will inevitably be some time before these trials are completed.

7. Professor Hilditch's method of treatment of "conophor" seeds has been applied to experimental shipments of rubber seeds, and preliminary results have shown that an oil very much superior to that hitherto obtained from rubber seed can be produced. A meeting of representatives of the rubber growers and of the Colonial Office and other interested Government Departments was held to discuss the possibility of large-scale collection and treatment of the seeds, and two important growers have undertaken to explore the question thoroughly on their estates in the Malayan Union.

8. The importance has not been overlooked of supplying the paint industry with materials from Colonial sources suitable for the manufacture of alkyd resin paints (see para. 24 (d)).

9. Investigations on Colonial plants of possible medicinal value continue. The nature of the active principle of Koussu flowers (*Brayera anthelmintica*)

is gradually being elucidated. If it is possible to obtain from this plant an active compound which can be standardised, it should prove a useful addition to those compounds available for the treatment of internal parasites in man and animals. It was reported in 1945 that extracts of the plant *Hydrocotyle asiatica* had proved active in the clinical treatment of leprosy. Work is being continued in Professor Todd's laboratory at Cambridge to isolate the active principle and to determine if this claim can be substantiated.

10. *Striga lutea* is a pest of considerable importance to maize and millets, and it is therefore gratifying that progress has been made in the determination of the fact responsible for the germination of the seeds of this parasitic plant.

11. The erection and fitting up of the laboratory of the Colonial Microbiological Research Institute, Trinidad, has progressed rapidly during the year and is now almost complete. The official opening of the Institute has been arranged for 5th July, 1948, and Lord Hankey, Chairman of the Council, with Lady Hankey will be visiting Trinidad for the ceremony.

12. At the Fourth International Congress of Microbiologists held in Copenhagen from the 20th to the 26th July, 1947, Dr. A. C. Thaysen, Director of the Institute, attended as the official Colonial representative. On the recommendation of the Standing Committee of the British Commonwealth Scientific Official Conference, a Specialist Conference on Culture Collections of Micro-organisms was held from 5th August to 8th August, 1947. The Conference proposed that the Colonial Microbiological Research Institute in Trinidad should be a centre for culture collections. It was also recommended that Dr. Thaysen should be a member of the proposed Permanent Committee, with the Director of Research of the Council acting as his deputy in London. At its meeting on the 24th September, 1947, the Council agreed to these recommendations.

13. At the Council's meeting held on the 24th September, 1947, Dr. E. B. Worthington, Scientific Secretary of the East African Governors Conference, outlined his draft proposals for the establishment of an East African Scientific and Industrial Research organisation. The Council expressed its interest in the scheme and promised, insofar as it lay within its competence, to consider sympathetically any scheme which might eventually be put before it.

14. In para. 16 of the last Report attention was drawn to the fact that the existing procedure for the purchase of special research equipment for the various Colonial scientific laboratories was not entirely satisfactory. As a result of discussions with the Crown Agent for the Colonies modifications in the method have been initiated, with a view to meeting these criticisms. A circular despatch has been sent to all Colonial Governments drawing attention to the new arrangements.

15. The first post-war Annual Meeting of the British Association for the Advancement of Science was held in Dundee from 27th August to 3rd September, 1947. The Director of Research was invited to preside over Section B relating to chemistry. In his presidential address entitled "Science and the Colonies" he referred to some of the problems which have been studied by the Colonial Products Research Council.

Earlier in the year he had been asked to participate in a Colloquium held in Dublin under the joint auspices of the Irish Chemical Association and the Dublin section of the Royal Institute of Chemistry. At this meeting he delivered the opening address on "Agricultural Products and the Chemical Industries" which related largely to the work of the Council.

In February, 1948, the Director recorded a series of three broadcasts for

transmission on the Empire and General Overseas programmes. In these he described various aspects of the Council's work.

16. The Director of Research will shortly visit Sweden and Finland at the invitation of the Swedish Chemical Society and the Association of Finnish Chemists, and in each of these countries one of his lectures will relate to the work of the Council.

PART II. REVIEW OF RESEARCH WORK IN PROGRESS

Citrus Products

17. (26)* Investigation of the solids present in *Citrus* oils has been continued by Mr. J. H. Chapman working under the supervision of Professor Sir Ian Heilbron and Professor E. R. H. Jones. Tanganyika bitter orange oil has been shown to contain the coumarin derivatives, aurapten, *isoaurapten* and bergapten. This would appear to be the first occasion on which *isoaurapten* has been shown to occur in nature, although it can be prepared readily from aurapten. The chemistry of aurapten is being further investigated.

On evaporation grapefruit oil (from Palestine) leaves a residue (15 per cent.), the main constituent (*ca.* 50 per cent.) of which is a hydrocarbon probably $C_{27}H_{56}$. A new coumarin derivative has also been isolated and its structure determined. This substance was described originally in 1930 by Japanese workers, who incorrectly formulated it as 7-*n*-heptoxy coumarin. Other coumarins are also present in small amounts which have not so far been obtained in sufficient quantity for identification.

Clove Oil

18. (27) It has been recognised from the outset that it would prove extremely difficult to find new uses for eugenol and its derivatives, and this can only result from fundamental research.

Mr. W. A. Cummings has extended our knowledge by the preparation from vanillin of an acid containing a centre of assymetry, from which he has succeeded in obtaining one of the optical isomerides in a pure state. This investigation may open up an interesting new field, since it is apparently the first simple derivative *c*^o vanillin obtained in an optically active form.

A second subject of study has been the derivative of eugenol known as dehydrodieugenol, which is considered to be a diphenyl derivative. This substance has been comparatively little investigated. A new method for its preparation has been devised and it is now readily accessible for the detailed study which is projected.

Professor Clemo and his collaborators have already described a number of quinoline derivatives prepared from eugenol. By the introduction of an aldehyde group into the phenol 2-hydroxy-3-methoxy-5-allyl-benzaldehyde has now been prepared, which it is hoped may be used to extend the previous work.

Petroleum

19. (28) The synthesis of the ten isomeric methyl-naphthalenes has now been completed by Dr. J. C. Smith and Mr. G. B. Pickering in the Dyson Perrins laboratory at Oxford, and other substituted alkyl naphthalenes up to the *n*-hexyl derivatives have been prepared and characterised by crystalline derivatives. It had been hoped that the ultra-violet absorption spectra of the alkyl naphthalenes would have provided a method for their identification, but the results obtained in the Trinidad Leaseholds Ltd. Central Laboratory,

* Figures in parentheses refer to the corresponding paragraph in the 1946-1947 Report.

King's Langley, have proved disappointing. The infra-red spectra would appear to be more promising. An account of some of this work has been published and other papers are in the press.

This difficult research is being extended into the diphenylalkane series.

Carbohydrates

20. (29) *Sugar*. As has already been mentioned (para. 4) Dr. L. F. Wiggins, on his appointment as Director of Research in the Sugar Technology Department at the Imperial College of Tropical Agriculture, handed over the direct supervision of the work being carried out in the Birmingham laboratories to Mrs. Gregory early in February. He has, however, under the direction of Professor Sir Norman Haworth, been directly responsible for the work carried out during the past year. Owing to the shortage of research assistants it has proceeded on a much more limited scale than in former years and has been confined essentially to a development of the chemistry of the pyridazines and to certain basic carbohydrate derivatives. Comparatively little attention has, in the past, been paid to the pharmacological properties of pyridazines and with the very large number of new products now available this aspect is being systematically studied and is already producing results of considerable value. 2-Phenyl-4-amino-6-methyl-3-pyridazone has been found to have analgesic properties and is being further examined.

In view of the interesting properties shown by the 2:5-diamino-derivatives of mannitol and sorbitol, these substances have been further examined and considerable attention has been paid also to the chemistry of glucamine, a base which is readily obtained when glucose is heated with ammonia and hydrogen in the presence of a nickel catalyst. The results so far obtained would appear to show that a detailed study of this may prove to be of value.

During the year it has been found possible to arrange for Professor A. C. Frazer, Department of Pharmacology, University of Birmingham, to have a full-time assistant, Mrs. Wadja, and thus screen some of the very large number of carbohydrate derivatives prepared by Dr. Wiggins and his collaborators. Fifty-two compounds have been tested for analgesic, local anaesthetic and toxic properties. Of these ten were found to have analgesic properties and thirteen local anaesthetic properties. Three of the former were found to be superior to phenazone and one has been selected for a more extensive investigation with a view to its clinical trial. As a result of this work certain relationships between the chemical structure and the analgesic activity were noted, which has suggested the synthesis of new compounds.

A new technique has been developed for testing anthelmintic activity but no active compound has been found. It is anticipated as a result of the new laboratory accommodation, which has now been made available, there will be a considerable increase in the scope of the screening experiments during the coming year.

21. (30) *Starch*. Since Dr. Peat had only one research student, Miss M. J. Nicholls, the scope of the research on the problems of starch has been very considerably narrowed. One of the most interesting observations has been that there is a marked difference between the constituents present in different varieties of the pea. Thus, it has been shown that starch component of the wrinkled pea consists solely of amylose and is free from amylopectin. On the other hand the starch of waxy maize consists almost entirely of amylopectin with less than 2 per cent. of amylose.

Although a number of methods are now available for the comparatively simple separation of the two starch constituents for industrial purposes, it would undoubtedly be a great advantage if this process could be dispensed

with and the amylose or amylopectin obtained by cultivation of the appropriate plant. This supports the desirability of extending the study of the various starch producing plants available in the Colonies. Such a study has already been started by Mr. H. E. Watson in Nairobi. He has found that the dry seed of the wild banana (*Musa livingstonii*) contains about 40 per cent. of its weight of crude starch which can be separated mechanically after the hard outer shell has been cracked. The crude starch contains both fat and protein, the removal of which by appropriate methods leaves a product resembling potato starch in some of its properties. According to Watson's preliminary examination the amylose content of the starch is abnormally high, but this requires confirmation. Another promising source of starch would appear to be the tubers of the *Uwanga tacca*.

Timber Research

22. (33) It has not yet been found possible to obtain the plant necessary for this projected investigation. During the year orders have been placed through the Ministry of Supply for its manufacture, but unfortunately it will be some considerable time before it will be available.

Wallaba Wood Resin

23. (34) The experiments referred to in last year's report on the destructive distillation of the resin have been completed. It has been found by Mr. W. G. Campbell and Dr. R. H. Farmer of the Forest Products Research Laboratory, Princes Risborough, that when the resin is distilled at a temperature not exceeding 800° a hard lustrous coke is obtained of a quality suitable for metallurgical purposes. It is obvious that the manufacture of this could only be contemplated if a large scale use for the wood, free from resin, could be developed. A full account of this work has been prepared for publication.

Vegetable Oils

24. (35) The study of the vegetable oils which has been carried out in Professor Hilditch's laboratory at the University of Liverpool has covered a very wide field. We have been fortunate in having the assistance of a senior worker, Dr. J. P. Riley, now a member of the staff of the Inorganic and Physical Chemistry Department, which has enabled much useful work to be carried out on problems unsuitable for younger chemists.

The Council desires to place on record its appreciation of the valuable assistance given to them by Messrs. Bibby & Co. and more especially by Mr. Leslie Bibby, who undertook the extraction of the oil seeds from *Tetracarpidium conophorum* and rubber. Without this assistance it would have been impossible to prepare the oils in quantity sufficient for technical trials.

(a) *Conophor oil from seeds of Tetracarpidium conophorum*. It had been hoped that the oil from 1 cwt. of heat treated seeds might have been available for trial. Unfortunately only 96 lbs. from the freshly collected seeds were heat dried in Nigeria in accordance with the instructions which had been drawn up. The remainder, which had apparently been bought in the market, were sterilised in boiling water and subsequently air dried. As a result only 46 lbs. of oil were obtained from the heat treated seeds and it was necessary to alkali refine the remainder which had a large content of free fatty acid. Samples of these oils have been sent to the Paint Research Laboratory, Teddington, to the British Railways Executive Paint Research Laboratory, Derby, and to a number of firms engaged in the paint and linoleum industries. Reports of these trials have not yet been received, but preliminary results suggest that the oil dries more rapidly than linseed, gives an equally good film except

that it "yellows" somewhat more rapidly than does linseed. So far as these preliminary indications go it would appear to be definitely superior to linseed and should not be regarded merely as a substitute for it.

A quantity of the "conophor oil acid oil" containing 72 per cent. of fatty acids was recovered from the alkali refining of the "boiled" seeds. This oil has been distributed to firms interested in the manufacture of alkyd resins.

It has been found that the heat dried conophor oil seeds do not deteriorate when kept. The seeds received from Mr. Hartley in 1946 showed no increase in free acid content after 15 months' storage. This is a factor of considerable technical importance.

Sufficient oil cake was obtained after the extraction of the oil to enable small scale feeding experiments to be undertaken. An analysis of the cake showed it to contain 48 per cent. of "albuminoids," 25 per cent. of carbohydrates and 2 per cent. of oil; no toxic compounds were present.

(b) *Rubber seed.* The oil from the heat dried seeds sent from Ceylon by Dr. Child and referred to in last year's report, were found to contain 1.5 per cent. of free fatty acid which remained unchanged after the seeds had been kept for 9 months, whereas untreated seeds contain 16.8 per cent. free fatty acid. This confirms the view held that if the seeds are heat treated immediately after collection a valuable oil would be available. Later in the year (October) 186 lbs. of heat dried Malayan decorticated rubber seeds were received. These had been dried in copra ovens and the kernels contained 42 per cent. of oil with 1.1 per cent. of free fatty acid. By the extraction with the carbon tetrachloride Messrs. Bibby obtained 74.5 lbs. of oil (48 per cent.) with 1.4 per cent. free fatty acid. In order to remove the rubber present it was treated with "activated" fuller's earth, and there was an excessive loss of oil (12 per cent.). When a further quantity of the oil is received the method of refining will be investigated. This should prove possible in the near future since 2 cwt. of heat dried seed have been received in this country from Mr. Philpott and Dr. Whelan, Rubber Research Scheme, Ceylon. The receipt of these seeds will also enable a comparison to be made of the Ceylon and Malayan oils.

As was the case with conophor oil samples of the refined oil have been distributed, but sufficient is already known of the properties of rubber seed oil to warrant large scale production. According to preliminary reports which have been received the oil is very much superior to any rubber seed oil previously examined. The properties of the film places it below linseed in value as a drying oil. In other words rubber seed is a substitute or "extender" for linseed oil to which it can be added in fair proportions without substantially diminishing the serviceability of the oil (as compared with linseed *per se*). For the manufacture of paints and linoleum it could undoubtedly be improved by solvent segregation and some preliminary experiments in this direction have been carried out by Mr. Seavell.

The extracted rubber seed cake contains 35 per cent. of albuminoids, 41 per cent. carbohydrates with 4.8 per cent. of oil; cyanogenetic glucosides equivalent to 0.062 per cent. HCN were detected. Small scale feeding experiments are in progress with this cake. Mr. Dunn has been responsible for much of the experimental work which is summarised below.

(c) *Chemical constituents of Drying Oils.* For further progress in the study of drying and other vegetable oils it is essential that our knowledge of the total component acids of the oils should be as detailed as possible. It was information of this kind which enabled Professor Hilditch to suggest at a very early date that conophor oil was likely to be of technical value. Evidence of the fundamental importance of such knowledge has been given by

Professor Hilditch in a paper recently read to the Oil and Colour Chemists Association.

Mr. Dunn and Mr. Barker have now completed a study of the component acids in the oils from the seeds of two Labiates and three Euphorbiates obtained from the Sudan and Nigeria, whilst Mr. Seavell has commenced a comparison of the component acids in Argentine linseed oil with linseed oil from other sources and with those present in conophor, rubber seed, lumbang and stillingia oils. The last named oil, stillingia, is at present obtained from China but through Dr. Herklots arrangements have been made for samples of two varieties of seed grown in Hong Kong to be sent to Professor Hilditch.

Other oil seeds which have been examined by Dr. Riley include *Parinarium laurinum* and *Garcia nutans*. The high elaeostearic acid content of the latter oil (higher than that of tung oil) suggests that a more detailed study might be of interest. It is hoped to obtain a further quantity of this seed.

(d) *Chemical constituents of Drying Oils* (non-linolenic type). There is considerable demand in the paint industry for drying oils with a high linoleic acid but negligible linolenic acid content for use in "oil modified" resins of the alkyd and related types. Oils of this character are obtained from niger seed, sunflower and safflower and some others. Arrangements were made, therefore, for the collection of these seeds and Mr. Dunn is now engaged on the examination of niger seed from Southern Rhodesia, and Mr. Barker on sunflower seed oils from various sources.

(e) *An estimation of ricinoleic acid and other hydroxy acids*. No satisfactory method for the estimation of hydroxy acids which are present in a number of vegetable oils has so far been devised.

Since last year Dr. Riley has given much attention to this subject, but so far with disappointing results although his most recent work shows more promise of success. When a satisfactory method has been worked out it will be possible to study once more the oil from *Ongokea Gore* and also castor oil from various Colonial sources.

Plants of possible medicinal and insecticidal value

25. (36) (a) *Koussu*. Reference was made in last year's report to the arrangements which had been made with Dr. Beckley and Mr. Greenway for the collection in East Africa of further quantities of the flower heads of *Brayera anthelmintica*. This material has now been received by Professor Todd, the collection made by Mr. Greenway being especially valuable since it contained both male and female flowers. The biological activity of various fractions of the extract of these flowers has been tested by Professor Burn at Oxford by his new *in vivo* test. The active principle has been found to be an amorphous powder which treated with alkali yields a mixture of the kosins. The chemistry of these highly crystalline compounds is being investigated since it is clear that their structures must be closely linked with that of the active principle from which they are obtained.

(b) *Hydrocotyle asiatica*. Dr. B. Lythgoe and Dr. J. Bhattacharya have continued their investigations in the Cambridge laboratories of the constituents of this plant. They have succeeded in separating the main constituent as a crystalline potassium salt. This is an important advance and will greatly facilitate its further examination. It is possible that this substance is the aglucone of the glucoside which is stated by the French workers to be the active principle of the plant. This remains to be determined.

In the hope of throwing light on this problem, with the valuable assistance of Dr. Child, Director, Coconut Research Scheme, Ceylon, a quantity of the

plant was extracted with alcohol in Ceylon and a concentrated extract forwarded to Dr. Lythgoe. Unfortunately this extract contained no glucoside but only the substance referred to above. It is hoped to arrange for Dr. Child to extract the plant with alcohol immediately after collection, in which case hydrolysis of the glucoside, if present, would presumably be prevented.

(c) *Other Medicinal plants.* In Professor J. W. Cook's laboratory at the University of Glasgow further experiments have been carried out on a number of plants with the object of determining whether they are worthy of further study.

From the bark of *Mitragyna inermis*, Mr. G. M. Badger has isolated the alkaloid mitrincomine (rhynchophylline) and it is hoped that it may prove to be present in sufficient quantity to permit of its investigation. Results of equal promise have been obtained also by Mr. P. A. Ongley who has examined the leaves of *Catha edulis* and the seeds of *Picralima nitida*, the latter being found to be a rich source of alkaloids. Somewhat suprisingly Mr. Ongley has found that the bulbs of *Haementhus multiflorus* and *H. cinnabarinus* contain only traces of alkaloids, whilst similar negative results have been obtained by Mr. J. B. Mordan. He has found that the bark of *Simaruba amara* does not contain any alkaloid. This is in contradiction to previous statements. Mr. A. R. Somerville has commenced the examination of the seeds of *Caesalpinia crista*, but the work is still too incomplete to estimate whether further study is likely to prove profitable.

(d) *Brachylaena Hutchinsii.* It has been recorded that the wood of *Brachylaena Hutchinsii* contains an essential oil. Dr. Smith and Mr. Pickering in the Dyson Perrins Laboratory, Oxford, have now commenced a study of this oil, which preliminary experiments suggest may contain a sesquiterpene ketone.

(e) *Chlorophora excelsa.* Iroko, the timber of the tree, *Chlorophora excelsa*, is highly resistant to insect attack and it is for many purposes equal in value to teak. Dr. F. E. King and Mr. M. H. Grundon, Dyson Perrins Laboratory, have now isolated from the wood a phenolic substance, *chloropherin*, which probably has the formula $C_{15}H_{22}O_3$. It is a derivative of resorcinol, and its structure is now being investigated. Like other phenolic wood substances, which have recently been closely studied by Professor H. Erdtman in Sweden, it will probably be found to have fungicidal properties.

Striga Lutea

26. (37) Considerable progress has been made by Dr. A. W. Johnson working in Professor Todd's laboratory at Cambridge and Dr. R. Brown, Botany Department, University of Leeds, in the study of the germination factor of *Striga lutea*. An active concentrate of the factor has been isolated. The active principle has been found to be extremely unstable, which retards progress, but sufficient evidence has been obtained of its type to have made it possible to show that certain pure compounds possess the property in an extremely high dilution of inducing germination. The work is being actively prosecuted and it may incidentally throw light on the germination factor in other plants.

Colonial Microbiological Research Institute

27. (38) During the past year the Director has been occupied mainly with the supervision of the fitting out of his new laboratory, which we hope will

be completed by 1st June, the official opening having been arranged for 5th July. This supervision has been much facilitated by the arrival during the year of the Institute's engineer.

The work in the temporary laboratory, which has been generously made available for Dr. Thaysen by the Government of Trinidad, has been concerned with a survey of the problems which might with advantage be investigated when the Institute has been fully equipped and its staff appointed.

A survey of six suitable problems has been made during the year and a programme of research for two of them has been planned. This comprises the fermentation of the cocoa bean, which is of interest to the Caribbean and to West Africa, and the disposal of waste waters from the rum distilleries.

A commencement has been made with the survey of the following five additional problems:—

- (1) An investigation of the action of two new antibiotic substances on the growth of fungi in general and of *Fusarium oxysporum cubense* in particular, with a view to restricting the rate of growth and infective properties of the latter in the soil of banana plantations.
- (2) Enquiry into the cause of failure of the Food Yeast organism to grow at its normal rate in sugar cane juices and in solutions of raw sugar, which interferes with the economic working of the food yeast factory in Jamaica.
- (3) The influence on the microflora which establishes itself on arrowroot starch during manufacture on the texture and colour of the finished product.
- (4) The nature and origin of the stimulating action of decaying vegetable matter on root hair development in cocoa-tree and Immortelle roots.
- (5) The influence of malnutrition as met with in tropical countries on the composition of the intestinal microflora of man.

Dr. Thaysen attended the Fourth International Congress for Microbiology held in Copenhagen 20th to 26th July as the Colonial Office representative, and on this occasion he read two papers "The Camphor Effect" and "Food Yeast." Subsequently he attended the British Commonwealth Specialist Conference on Culture Collection and Micro-organisms held in London in August. It was recommended by this Conference that the Colonial Microbiological Research Institute should be a centre for culture collection and micro-organisms, more especially of types emanating from tropical sources. This recommendation was approved by the Council. In the course of the year cultures, notably of the food yeast organism *Torulopsis utilis*, var. *major*, have been despatched to a number of countries including Australia, New Zealand, China, India and the United States of America.

The investigation of the antibiotic present in the actinomycete, *sp. Meredith*, to which reference was made in last year's report, has resulted in the isolation by Dr. H. R. V. Arnstein, Dr. A. H. Cook and Dr. M. J. Lacey, working in Professor Sir Ian Heilbron's laboratory, of the active principle *musarin*. This substance would appear to be an optically active acid with the formula $(C_{33}H_{60}N_2)_{72}$, but no evidence of its structure has been obtained. A paper embodying the results of this work will be published shortly.

APPENDIX I

List of Publications

PAPERS PUBLISHED

Science and the Colonies. By J. L. Simonsen. Presidential address to Section B of the Annual Meeting of the British Association for the Advancement of Science held from 27th August to 3rd September, 1947.

The Utilisation of Cane Sugar for the Production of Chemicals useful in Industry and Medicine. By L. F. Wiggins. *International Sugar Journal*, 1948, **50**, 65-68; 95-98.

Anhydrides of Polyhydric Alcohols, Part VI. 1:4-3:6-Dianhydro Mannitol and 1:4-3:6-Dianhydro Sorbitol from Sucrose. By R. Montgomery and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 433-436.

Anhydrides of Polyhydric Alcohols, Part VII. 1:4-3:6-Dianhydro *d*- and *l*-Iditol. By L. F. Wiggins. *Journal of the Chemical Society*, 1947, 1403-1405.

Anhydrides of Polyhydric Alcohols, Part VIII. Some Alkenyl Ethers of 1:4-3:6-Dianhydro Mannitol and 1:4-3:6-Dianhydro Sorbitol. By Hilda Gregory and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 1405-1407.

Anhydrides of Polyhydric Alcohols, Part IX. Derivatives of 1:4-Anhydro Sorbitol from 1:4-3:6-Dianhydro Sorbitol. By R. Montgomery and L. F. Wiggins. *Journal of the Chemical Society*, 1948, 237-241.

The Conversion of Sucrose into Thiazole Derivatives, Part I. Sulphanilamidothiazoles derived from Levulic Acid. By Hilda Gregory and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 590-592.

The Conversion of Sucrose into Thiazole Derivatives, Part II. 2:4-Dimethylthiazole Derivatives and 2:4:5-Trimethylthiazole Derivatives. By Hilda Gregory and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 1400-1403.

The Conversion of Sucrose into Pyridazine Derivatives, Part II. 4-amino-2-Phenyl-6-Methyl-3-Pyridazone, 4-amino-2(*p*-Nitrophenyl)-6-Methyl-3-Pyridazone and their Sulphanilamido Derivatives. By W. G. Overend and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 549-554.

The Conversion of Sucrose into Furan Compounds, Part III. Some Amidino-Furans. By F. H. Newth and L. F. Wiggins. *Journal of the Chemical Society*, 1947, 396-398.

The Conversion of Sucrose into Furan Compounds, Part IV. Some Aminotetrahydrofuran Derivatives. By F. H. Newth and L. F. Wiggins. *Journal of the Chemical Society*, 1948, 155-158.

Starches of the Wrinkled and Smooth Pea. By S. Peat, E. J. Bourne and Mary J. Nicholls. *Nature*, 1948, **161**, 206-207.

The Component Acids and Glycerides of Australian Lumbang Oil. By F. D. Gunstone and T. P. Hilditch. *Journal of the Society of Chemical Industry*, 1947, **66**, 205-208.

Notes on the Component Acids of West Indian Ben and Mango Seed Oils. By H. C. Dunn and T. P. Hilditch. *Journal of the Society of Chemical Industry*, 1947, **66**, 209-210.

African Drying Oils, 1. The Seed Oil of *Tetracarpidium conophorum*. By F. D. Gunstone, T. P. Hilditch and J. P. Riley. *Journal of the Society of Chemical Industry*, 1947, **66**, 293-296.

The Rational Evaluation of Drying Oils. Some Possible Practical Alternatives to Linseed Oil. By T. P. Hilditch. *Journal of the Oil and Colour Association*, 1948, **31**, 1-24.

Some Amines and Amides Derived from Vanillin. By A. A. L. Challis and G. R. Clemo. *Journal of the Chemical Society*, 1947, 613-618.

Homovanillin. By A. A. L. Challis and G. R. Clemo. *Journal of the Chemical Society*, 1947, 613-618.

The Ten Dimethylnaphthalenes, their Physical Properties, Molecular Compounds and Ultra-Violet Spectra. By A. S. Bailey, K. C. Bryant, R. A. Hancock, S. H. Morrell, and J. C. Smith. *Journal of the Institute of Petroleum*, 1947, **33**, 503-526.

The Preparation of Microtools for the Micromanipulator. By A. C. Thaysen and A. R. Morris. *Journal of General Microbiology*, 1947, **1**, 221-231.

A Method Developed for the Study of Yeast Production with *Torulopsis utilis*. By A. C. Thaysen. *Antonie van Leeuwenhoek*, 1947, **12**, 204.

PAPERS IN THE PRESS

The Terpenes, Volume II. By J. L. Simonsen. Revised Edition by J. L. Simonsen and L. N. Owen. Cambridge University Press.

The Terpenes, Volume III. By J. L. Simonsen. Revised Edition by J. L. Simonsen and D. H. R. Barton. Cambridge University Press.

Some Aspects of Terpene Chemistry. By L. N. Owen and J. L. Simonsen. *Endeavour*.

Agricultural Products and the Chemical Industry. By J. L. Simonsen. Address at the Colloquium on "The Industrial Utilisation of Agricultural Products and Seaweed" held in Dublin 2nd and 3rd July, 1947, under the auspices of the Irish Chemical Society and the Royal Institute of Chemistry (Dublin Section).

Anhydrides of Polyhydric Alcohols, Part X. The Conversion of Glucamine into 1:4-Anhydro Sorbitol. The Constitution of Monobenzylidene 1:4-Anhydro Sorbitol. By V. G. Bashford and L. F. Wiggins. *Journal of the Chemical Society*.

Anhydrides of Polyhydric Alcohols, Part XI. On the Action of Phosphorous Tribomide on 1:4-3:6-Dianhydro Mannitol and Sorbitol. Some Chloro Derivatives of 1:4-3:6-Dianhydro Sorbitol. By W. G. Overend, R. Montgomery and L. F. Wiggins. *Journal of the Chemical Society*.

Anhydrides of Polyhydric Alcohols, Part XII. The Reaction between Mannitol and Hydrochloric Acid. By R. Montgomery and L. F. Wiggins. *Journal of the Chemical Society*.

Conversion of Sucrose into Pyridazine Derivatives, Part III. Constitutional Studies in the Products of Chlorination of 2:6-Dimethyl 3-Pyridazone. By R. F. Homer, Hilda Gregory and L. F. Wiggins. *Journal of the Chemical Society*.

Conversion of Sucrose into Pyridazine Derivatives, Part IV. Further Sulphanilamido Derivatives from 6-Methyl Pyridazone. By R. F. Homer, Hilda Gregory, W. G. Overend and L. F. Wiggins. *Journal of the Chemical Society*.

Conversion of Sucrose into Pyridazine Derivatives, Part V. Experiments on the Synthesis of 3-Amino 6-Methyl Pyridazine and of its Sulphanilamido Derivatives. By Hilda Gregory, W. G. Overend and L. F. Wiggins. *Journal of the Chemical Society*.

Thymol and cyclohexanol as Fractionating Agents for Starch. By E. J. Bourne, G. H. Donnison, (Sir) Norman Haworth, and S. Peat. *Journal of the Chemical Society*.

The Component Acids and Glycerides of West India Citrus Oils. By H. D. Dunn, T. P. Hilditch and J. P. Riley. *Journal of the Society of Chemical Industry*.

Nitration of Some Derivatives of Eugenol. By G. R. Clemo and J. H. Turnbull. *Journal of the Chemical Society*.

Alkyl Naphthalenes, Part II. By J. C. Smith, S. H. Morrell and G. B. Pickering. *Journal of the Institute of Petroleum*.

Production of a Metallurgical Coke from the Resin of Wallaba Wood (*Eperua falcata* Aubl.). By R. H. Farmer and W. G. Campbell.

The Inhibition of *Fusarium oxysporum cubense* by Musarin, an Antibiotic produced by *Actinomyces* sp. Meredith. By H. R. V. Arnstein, A. H. Cook and M. S. Lacey. *Journal of General Microbiology*.

APPENDIX II

List of Patent Applications

No. 9671. Alkyl and Dialkylaminoalkyl Pyridazones (Great Britain).

Colonial
Social Science Research Council
Fourth Annual Report
(1947-1948)

London School of Economics
and Political Science,
Houghton Street,
W.C.1
27th May, 1948.

Sir,

I have the honour, on behalf of the Colonial Social Science Research Council, to transmit to you the fourth report of the Council, covering the period from 1st April, 1947, to 31st March, 1948.

I have the honour to be,

Sir,

Your most obedient Servant,
A. M. CARR-SAUNDERS,
(*Chairman*)

The Right Honourable A. Creech Jones, M.P.
Secretary of State for the Colonies.

D

COLONIAL SOCIAL SCIENCE RESEARCH COUNCIL

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- MR. P. A. WILSON, M.A., *Secretary*.

COLONIAL SOCIAL SCIENCE RESEARCH COUNCIL
FOURTH ANNUAL REPORT

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COLONIAL SOCIAL SCIENCE RESEARCH COUNCIL

FOURTH ANNUAL REPORT

I. INTRODUCTORY

1. During the year 1st April, 1947, to 31st March, 1948, the Council held ten meetings.

2. In October, 1947, the Council learnt with regret of the resignation of Professor A. L. Goodhart, who found himself unable, owing to pressure of other duties, to continue his membership. They are happy to welcome, both in their personal capacity and as representatives of fields of study which have an important contribution to make to their work, two new members: Professor Frank Debenham and Miss Margery Perham.

II. RESEARCH PROJECTS

3. During the year under review a number of projects mentioned in previous reports have now reached or are nearing completion:—

- (i) *The Study of French Colonial Administration in North Africa* by Miss Sybil Eyre Crowe under the supervision of the University of Oxford.
- (ii) The four linguistic studies of *Ganda* by Dr. A. N. Tucker, *Ibo* by Miss M. M. Green, *Kikuyu* by the Rev. Lyndon Harries and *Hadrami Arabic* by Dr. R. B. Serjeant.
- (iii) Mr. F. Smithies' investigation of *Secondary School Science Teaching in West Africa*.
- (iv) Dr. B. G. M. Sundkler's study of the *Development of African Separatist Churches*.

4. One other project which, though it cannot be described as completed, has attained its immediate objective, is the study, planned in conjunction with the Human Nutrition Research Unit, of the efficiency of African labour employed by the Kenya-Uganda Railways in Nairobi. This study, as the Council foresaw, has not provided the answers to all the questions, but has nevertheless yielded results which are both interesting in themselves and at the same time serve as a pointer to further lines of investigation that will need to be followed up in the future. Dr. C. H. Northcott has presented on behalf of his team a draft report which is now being studied.

5. Some projects have, for one reason or another, suffered interruption. Pressure of other duties has so far prevented Mr. F. J. Fisher from carrying his Survey of the *Economic and Social Aspects of Colonial Policy during the War Period* beyond the preliminary stage. The Council hope that this survey, which should form the starting point and frame of reference of surveys of contemporary post-war economic and social conditions, will make rapid progress during the coming year. Miss Catherine Fletcher's study of the *Relation between the content of Education and after-school occupational life of Girls and Women in the Gold Coast* was unfortunately terminated by ill health after Miss Fletcher had returned from a preliminary visit to the Gold Coast with the object of delimiting the field of this research. The Council who, as reported last year, eagerly accepted the invitation of the Human

Nutrition Research Unit to collaborate with the Nutrition Field Working Party in the Gambia, by attaching a sociologist and an economist to the Party, have so far been unsuccessful in finding either a sociologist or an economist who would appear to be qualified to do this work and willing to undertake it. Dr. Kenneth Little, whose name appeared in the last Annual Report as the recipient of a grant for work in Sierra Leone, has, however, been able to visit the Gambia for a consultation with the Field Working Party and it is hoped that as a result of this visit useful assistance will be given to the Working Party and arrangements made for collaboration at least on the sociological if not on the economic side.

Mr. M. G. Marwick, who was awarded a Colonial Research Fellowship to undertake psychological studies in Northern Rhodesia and Nyasaland on the adaptation of the individual to life in a social community and of primitive social communities to contact with Western society, interrupted his work in January of this year to take up a teaching appointment at Fort Hare. It is hoped that he will be able to re-visit Northern Rhodesia and Nyasaland during the coming long vacation in order to assemble more data on the subject of his research.

6. The year under review has also seen the interruption of a project to which the Council attach the utmost importance. In the previous reports attention has been called more than once to the paramount need for sound demographic data. This year the Council have to record with deep regret the death of Dr. R. R. Kuczynski, who, with the aid of a grant from Colonial Development and Welfare funds, devoted the last years of his life to the important task of improving the demographic data which form the essential foundation on which Colonial research in the social sciences must be built. At the time of his death the first two volumes of Dr. Kuczynski's monumental *Demographic Survey of the Colonial Empire*, financed with the aid of grants from the Population Investigation Committee, the Carnegie Corporation of New York, and Colonial Development and Welfare funds, were already in print; while the manuscript of the two succeeding volumes was nearing completion. The Council are happy to record that a grant has been made to Mrs. Long to enable her to see volumes I and II of her father's work through the press, and to complete the preparation for the press of the manuscript of volumes III and IV. Owing to an increase in the size of the work and the rise in printing costs, the grant originally made to finance publication will unfortunately prove insufficient for the purpose, but the Council are hopeful that further financial assistance will be forthcoming to ensure publication of all four volumes of this important work.

7. On the following projects work is still proceeding:—

- (i) *The Analysis of the Political Structure of Native Society in the Gambia* by Mr. D. P. Gamble, reference to which was through inadvertence omitted from last year's report.
- (ii) *The Sociological Study of the Peasant Community in Jamaica* being carried out, under the supervision of the London School of Economics, by Miss Edith Clarke with a team of assistants. During the year Miss Clarke's team has been strengthened by the addition of a social psychologist in the person of Miss Madeleine Kerr.
- (iii) *The Study of Mental Illness and Juvenile Delinquency in West Africa* by Dr. Geoffrey Tooth. Dr. Tooth has recently completed a study of the effects of trypanosomiasis in the Gold Coast, and arrangements for the publication of his earlier study of juvenile delinquency in that territory will, it is hoped, be made shortly.

- (iv) The two synoptic projects sponsored by the International African Institute, namely the *Ethnographic Survey of Africa* and the *Handbook of African Languages*. Some parts of the latter are now being published, while others are expected to appear shortly. A five year plan was drawn up in 1946 which is expected to bring this project to completion within that period; though it is recognised that the need for further intensive studies of particular regions is likely to be revealed in the course of the work, and arrangements are already in train for a field study, with French and Belgian co-operation, of the languages of the Northern Bantu Borderland. This ancillary study will, it is hoped, be financed jointly from French and Belgian as well as British sources.
 - (v) The anthropological studies in Northern Rhodesia and Nyasaland being carried out by the Rhodes Livingstone Institute. During the year a grant has been made for the appointment of an additional research worker to the staff of the Institute.
 - (vi) In the Council's report for 1945-46 reference was made to the experiment whereby a free grant had been made to the Government of Kenya to enable them to recruit a number of sociologists to work directly under the Government on field studies required in connection with land and settlement problems. During the intervening two years three sociologists have been appointed to undertake such field studies while a fourth has been employed to write up in England, for the use of the Kenya Government, field data already assembled by him in the past. Professor Schapera, after his visit in 1947, presented a valuable report on the working of this scheme, in which he attempted to delimit the respective spheres of Government planning on the one hand and of academic research on the other in the case of studies of this type, and made proposals for the joint administrative and academic supervision of the work. His recommendations were accepted both by the Government of Kenya and by the Council, and a fifth sociologist was appointed to the Government of Kenya shortly after the close of the year under review, while it is hoped that a sixth will be appointed before long.
8. New projects put in hand during the year include:—
- (i) A visit to Malaya by Professor Raymond Firth one of the objects of which was to complete and bring up to date a *Study of the Malay Peasantry* begun before the war.
 - (ii) A study, originally launched with the aid of a grant from Makerere College, of the *Diet and the Social Structure of the Luo* by Mr. Aidan Southall, a member of the teaching staff of the College.
 - (iii) A study, under the direction of Professor I. Schapera, of *Native Land Tenure in Basutoland* by Mr. V. G. J. Sheddick.
 - (iv) Research into the use of psychological tests for educational and other purposes in the West Indies, by Mr. A. Deans Peggs and Mr. B. J. Bedell.
 - (v) A study of *Municipal Government in Kenya* by Miss Mary Parker.
 - (vi) A linguistic study of *Fiji* by Mr. G. B. Milner.
 - (vii) Educational research into the *Teaching of Malay in English Schools in Malaya* by Miss M. B. Lewis.
 - (viii) A *Survey of the Friendly Society Movement in the West Indies* by Mr. A. F. Wells, who was previously working on Lord Beveridge's voluntary social service enquiry in this country.

- (ix) A *social survey of Zanzibar* to be undertaken by Professor Batson, whose previous pilot survey undertaken to delimit the scope of the main survey was referred to in the last Annual Report.

9. Two projects which have been under discussion during the year are perhaps, for different reasons, deserving of special mention. A problem which for some time past has been much exercising the minds of lawyers, administrators, sociologists, and the Christian missions, has been that of the adaptation of African marriage laws and customs to the rapid changes now taking place in African society, in consequence of the impact of Western European ideas. Early in 1947 a proposal was put forward by the International Missionary Council for a study of this important subject. On the recommendation of the Colonial Social Science Research Council a grant has now been approved towards the cost of a preparatory survey of the documentary evidence bearing on this subject. The preparatory survey will probably indicate the need for a more extended survey in due course, including possible field studies in various parts of Africa. The Carnegie Corporation of New York have generously consented to bear a major share of the cost of the preliminary survey. As in the case of other synoptic African projects, this research will be administered by the International African Institute who will be assisted and advised by an executive committee on which the various interests concerned will be represented.

10. The study of art, as such, like the study of archaeology, as such, has never been considered as falling within the ambit of social science research eligible for assistance from research funds under the Colonial Development and Welfare Acts. In the reports drawn up in 1943 and 1944 by the groups of experts appointed by the Colonial Research Committee, no mention was made of research in this field. Nevertheless, during the last three years consideration has been given from time to time to the question of research into African music. The subject is one which has a close bearing both on anthropological and linguistic research and on the education of the African. Much of the "literature" of African peoples is "unwritten" and is embodied in song rather than in verse, the interpretation of which is difficult without an understanding of the musical element which is an integral part of it. On the other hand neither the sociologist nor the linguist is, generally speaking, competent to pronounce on the technical soundness of projects for research in this field. A proposal was put forward some three years ago for a School of African Music. Though strongly supported in many quarters, this proposal would have entailed the expenditure of a very large sum of money, and the Council after careful consideration felt unable to recommend a grant for such an ambitious scheme. They asked, however, that proposals of a less ambitious character should be put before them for *ad hoc* research projects closely related to sociological and linguistic studies, and a number of such proposals have been received from the Directors of Education in various African colonies. One of these has now been selected for an experimental grant of two years' duration. The work will be carried out by Dr. Klaus Wachsmann, Curator of the Uganda Museum, in consultation with the East African Institute of Social Research.

III. RESEARCH NEEDS

11. During the year under review the programming of research needs has made a steady progress. Professor Schapera's visit to Kenya referred to above has resulted in the production of a valuable survey of research needs in that colony, which it is hoped will shortly be published. Dr. W. E. H. Stanner, who took up his duties as Director of the East African Institute

of Social Research in the autumn of last year, is now in East Africa carrying out a survey of research needs in other territories in that region; a task in which it is hoped he will be assisted by an ethnographic survey of Tanganyika by Dr. H. Meinhard, which is being planned jointly by Dr. Stanner and the International African Institute as part of the *Ethnographic Survey of Africa*.

12. Professor Raymond Firth, whose survey of research needs in West Africa was published in the April, 1947, and July, 1947, numbers of *Africa*, visited Malaya during the long vacation of 1947 for the purpose *inter alia* of surveying research needs both in the Federation of Malaya and in Singapore. The Council are indebted to him for a valuable report which is now being studied. Dr. Edmund Leach paid a contemporaneous visit to Sarawak, and the Council are indebted to him for a valuable pilot survey of the little-known sociological problems of that Colony, which is likewise now being studied. They are hopeful that before long schemes will be made to put in hand a selection of the research projects recommended in these two reports.

13. In the West Indies, research needs may be said to have been under review, from the administrative angle, by the Comptroller for Development and Welfare ever since that office was constituted, while valuable survey work has been done by other agencies, such as the West Indian Conference held in St. Thomas in 1946, which made a comprehensive report to the Caribbean Commission and the Caribbean Research Council. It still remains for this work to be synthesised and brought together in a coherent research plan for the British West Indian Colonies, a task which it is hoped will be accomplished, by the head of the proposed Department of Social and Economic Research in the University College of the West Indies when appointed.

14. The regional sub-committees referred to in last year's report have continued to operate during the year under review, and the Council are indebted to those of their members who have given up time to the work of these sub-committees, as well as to Mrs. Gertrude Williams and Dr. Meyer Fortes who have served as co-opted members on the West Indian and West African Sub-Committees, respectively. They are also indebted to Dr. Edmund Leach, who has assisted the Far East Sub-Committee in connection with plans for research in South East Asia.

IV. ORGANISATION

15. During the year under review the Council have had the benefit of prolonged discussions with Dr. Stanner, in connection with the establishment of the Institute of Social Research in East Africa, and the planning of research in that region. These discussions in which Dr. Lamont, Principal of Makerere College has participated, have revealed the great difficulty of providing adequate accommodation for the Institute and its staff under present conditions. The problem of local accommodation has caused the Council much anxiety in other regions also. The Rhodes-Livingstone Institute, which unlike the East African Institute is an independent body under its own Board of Trustees, but which receives financial assistance from Colonial Development and Welfare funds, has encountered this difficulty in an acute form. Scarcely any housing or office accommodation is available locally, which makes it virtually impossible for field workers to prepare their field material for publication in the area in which they have been working, and has made it necessary for the sociologists attached to the Institute under

Colonial Development and Welfare grants to return to England for this purpose. This has afforded the Council an opportunity of discussing the Institute's present work and future plans with Dr. Max Gluckman, the retiring Director, and with Miss Elizabeth Colson, who has recently been appointed to succeed him. Nevertheless it is clearly not an ideal arrangement for research workers to have to travel so far from the field in order to work up their material, while there can clearly be little hope of establishing strong centres of learning and research located in African colonies until adequate housing, office and library accommodation can be provided on the spot.

16. The Council are happy to be able to record that during the year under review a scheme for a Department of Social and Economic Research in the University College in the West Indies has received approval in principle, and it is hoped shortly to appoint a head of this Department. The entire cost of the establishment and maintenance of the Department for the first five years will be met from Research funds.

17. The Council have not yet had an opportunity to study the report of the Commission on University Education in Malaya. It is, however, their hope that before long an institution of full university status will be established on British territory in South East Asia, which will be able, in co-operation with the Governments and with other bodies interested in research, to undertake responsibility for co-ordinating and supervising all social science research in this region, including research carried out with the aid of Colonial Development and Welfare grants.

18. The position in West Africa is complicated by the proposal to establish two university colleges in the region. Owing to the shortage of research personnel of high calibre, it would hardly be justifiable to establish two institutes for research in the social sciences in West Africa. The Council hope that it will not be long before a scheme is made to appoint a Director of social science research in West Africa, who, after consultation with the university authorities and the Governments, will make plans for the establishment of an institute or department of research attached to whichever of the two university colleges would appear most suitable.

V. PERSONNEL

19. The hopes of the Council recorded in the last Annual Report that, in order to relieve the shortage of qualified research personnel, provision could be made for training potential research workers, without the training being linked to a pre-determined research project, have now been translated into a scheme in which the Secretary of State is empowered to offer a number of post-graduate studentships by way of preparation for field research in the Social Sciences in the Colonial Empire. Only two such studentships have so far been awarded, but the Council hope to recommend further awards shortly. Although it is too soon to pronounce judgment on this experiment, the Council are confident that it will fulfil its expectations, and that experience will show that provision can usefully be made for the award of a further batch of studentships when the first batch is exhausted.

Colonial
Medical Research Committee
Third Annual Report
(1947-1948)

Medical Research Council,
38, Old Queen Street,
S.W.1.
June, 1948.

Sir,

On behalf of the Colonial Medical Research Committee, I have the honour to transmit to you the Third Annual Report of the Committee, covering the period 1st April, 1947, to 31st March, 1948.

I have the honour to be,

Sir,

Your obedient Servant,

E. MELLANBY

(*Chairman*)

The Right Honourable A. Creech-Jones, M.P.,
Secretary of State for the Colonies

COLONIAL MEDICAL RESEARCH COMMITTEE

Membership

SIR EDWARD MELLANBY, G.B.E., K.C.B., M.D., F.R.C.P., F.R.S.,
Secretary, Medical Research Council, *Chairman*.

BRIGADIER J. S. K. BOYD, O.B.E., M.B., Ch.B., D.P.H., D.T.M. & H.
(late R.A.M.C.), Director, Wellcome Laboratories of Tropical
Medicine.

PROFESSOR P. A. BUXTON, C.M.G., F.R.S., Professor of Medical
Entomology, University of London.

DR. A. N. DRURY, C.B.E., M.D., F.R.S., Director, Lister Institute
of Preventive Medicine.

BRIGADIER N. HAMILTON FAIRLEY, C.B.E., M.D., D.Sc., F.R.C.P.,
F.R.S., Wellcome Professor of Tropical Medicine, University of
London.

DR. F. HAWKING, D.M., D.T.M., National Institute for Medical
Research.

PROFESSOR B. G. MAEGRAITH, M.B., B.S., D.Phil., Professor of
Tropical Medicine and Dean of Liverpool School of Tropical
Medicine.

DR. B. S. PLATT, C.M.G., M.Sc., Ph.D., M.B., Ch.B., Professor of
Nutrition, University of London.

MAJOR-GENERAL SIR JOHN TAYLOR, C.I.E.,
D.S.O., M.D., LL.D., D.P.H. (I.M.S. retd.)

DR. A. F. MAHAFFY, C.M.G., M.D., D.P.H.,
D.T.M.

*Joint
Secretaries*

The Committee records with deep regret the death of an original
member, Dr. W. H. Kauntze, C.M.G., M.B.E., M.D., Ch.B.,
F.R.C.P., D.P.H., Medical Adviser to the Secretary of State for the
Colonies.

COLONIAL MEDICAL RESEARCH COMMITTEE
THIRD ANNUAL REPORT

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COLONIAL MEDICAL RESEARCH COMMITTEE

THIRD ANNUAL REPORT

GENERAL

1. Four meetings of the Committee were held during the year. Major-General Sir John Taylor took over the duties of Joint Secretary from Dr. F. Hawking in December, 1947, and also the Secretaryship of the Malaria and Helminthiasis Sub-Committees. Dr. Wilson Rae acted as member of the Committee in place of Dr. Kauntze (deceased).

COLONIAL RESEARCH SERVICE

2. At the end of the year the Colonial Office had almost completed its prolonged discussions with the Treasury and other parties regarding the terms of service for the Colonial Research Service. The scale of remuneration proposed for medical research workers with recognised medical qualifications will be that laid down by the Medical Research Council for such workers in this country. An appropriate Overseas Research Allowance will be payable.

WORK OF THE COMMITTEE

3. The extension of the work of the Committee in the development of medical research in Colonial territories has been severely hampered during the year by the shortage of suitable research workers, and by difficulties in obtaining the necessary accommodation for them in areas in which investigations might be undertaken. Projects in hand have, however, been continued and certain new ones initiated; important amongst these are the nutrition research organisation in the Gambia and the Medical Survey in Tanganyika. The Committee has been specially concerned with the organisation for future medical research in East and West Africa; in relation to this, members of the Committee have visited several areas in Africa and have reported on local medical problems and the facilities for their investigations, as well as undertaking arrangements for projects in hand.

4. Subsequent to a visit to Southern Rhodesia, Dr. F. Hawking visited the Central and East African colonies during the period August-October, 1947, and reported on general aspects of the research problems and facilities for research which exist in those territories. Dr. B. S. Platt visited the Gambia in October, 1947, and again during the period January-April, 1948, in connection with the organisation of the Nutrition Field Working Party and the Nutrition Field Research Station. His observations on the work in the Gambia will be found in the report on the progress of nutrition research. Dr. A. F. Mahaffy visited Nigeria in September, 1947, and discussed with local officials the proposal that the Committee should assume full responsibility for the scientific direction of the Virus Institute at Yaba (Lagos), at the end of 1948. He also visited the East African Colonies in November, 1947, to make arrangements for taking over the Virus Institute at Entebbe, Uganda, and to discuss research problems in general. Professor G. Macdonald visited the East African Territories during October-November, 1947. He was primarily concerned with preliminary arrangements for the initiation of the Medical Survey in Tanganyika, the details of which are given below. Professor B. G. Maegraith visited Sierra Leone,

Gold Coast and Nigeria, in November-December, 1947, and submitted a report on the development of medical research in West Africa. Sir John Taylor, in the course of a visit to Egypt in December, 1947, reported on the schistosomiasis investigation which has been undertaken there by the Medical Research Council. The following are projects in hand or contemplated for Africa:—

(a) *East African Bureau of Health.*

As mentioned in the previous report, the late Professor McSwiney, following his visit to East Africa in 1946, recommended "the establishment of a Bureau which might be called the Bureau of Health and which would collect, analyse and disseminate information relating to health, with particular reference to preventive medicine." The East African authorities endorsed the proposal that this Bureau should be set up with headquarters at Nairobi, and expressed the view that it was essential to have a central body in East Africa to co-ordinate the work of the field surveys and to collect and disseminate the information obtained from such surveys, and from research work which is now being carried out independently in various parts of these territories. The Committee approved the proposal and recommended that the Bureau should be set up and that it should be known as the East African Bureau of Medical Research. The details connected with the establishment of this Bureau are now being worked out in consultation with the East African High Commission.

(b) *East African Medical Survey.*

The proposals for the institution of a Health Survey in East Africa arising out of the late Professor McSwiney's report have been followed up. The intention originally had been to associate the Survey with the Groundnut Scheme, but as the personnel who will be employed on the scheme will be selected individuals and will not represent the average inhabitant of the area, it has been decided to locate the Survey where observations can be carried out on the population of village groups.

Professor G. Macdonald visited Tanganyika during the year, and submitted to the Committee a report and recommendations on the organisation of the Survey. It was recommended that the original experimental surveys should be located in Sukumaland, at the southern end of Lake Victoria, in an area where a Development Scheme is in progress, with headquarters at Malya. The general lines of the Survey have been approved by the Colonial Medical Research Committee. Dr. Pitchford is already in the area making arrangements for equipment, transport and housing, and Dr. Rosemary Jackson, who will undertake the necessary laboratory work, is obtaining experience of the conditions and the local diseases in hospitals in different parts of Tanganyika. Colonel Davidson was recommended for appointment as head of the Survey in February, 1948, and it is hoped he will proceed to Tanganyika at an early date to complete the arrangements. He will also consider suggestions that have been made to associate the local health work with that of the Survey. The investigations that are being undertaken on the physiology of the African inhabitants of the area, by Dr. Holmes, at the Makerere College, Uganda, will provide useful information in relation to the enquiry; arrangements have been made for Dr. Harvey, at the Medical Research Institute, Nairobi, to establish standards of physical measurements. The services of additional members of the staff proposed for the Survey are being obtained and it should be fully established in the coming year.

(c) *Virus Research Institutes.*

During the period under review, the Virus Institutes in Uganda and Nigeria were financed by grants made by the Rockefeller Foundation and by the

Secretary of State for the Colonies under the Colonial Development and Welfare Acts as well as by contributions from the local Governments concerned. This arrangement will continue until the end of 1948, when the Rockefeller Foundation has signified its intention of withdrawing its participation. Following this, it is intended that the Committee should assume responsibility for the scientific direction of these Institutes. However, because of the difficulties and delays in getting the necessary additional housing accommodation built, it has not been possible to assign new staff to these laboratories, and it is apparent that an adequate number of trained individuals will not be available at the end of 1948, properly to take over the responsibility for continuing and expanding their work. In an attempt to overcome this difficulty, the Committee has recommended that the Rockefeller Foundation should be requested to delay their withdrawal until the end of 1949.

(d) *Research Laboratory at Freetown, Sierra Leone.*

The Laboratory at Freetown, which is the property of the Liverpool School of Tropical Medicine and has been used by the School as a research centre for West Africa for twenty years, has been offered to the Colonial Office for the same purpose. Professor B. G. Maegraith visited Freetown on behalf of the Colonial Medical Research Committee to report on the project and on the facilities for the study of particular tropical diseases in the area. The Colonial Medical Research Committee have recommended that the Laboratory should be taken over on arrangements to be made by the Colonial Office. The Laboratory, which has been used for other purposes during the war, will be vacated in July, 1948, and will then require to be reconditioned and equipped. It will be developed as a research laboratory as staff becomes available.

(e) *Research on Hot Climate Physiology.*

Arrangements have been completed for the programme of research on the physiology of hot climates in Nigeria mentioned in the previous report. This work will be under the direction of Dr. W. S. S. Ladell, lecturer in biochemistry at the Yaba Medical School. Housing and laboratory accommodation will be made available at Oshodi, near Yaba, and a laboratory technician has been appointed to assist in the work. Considerable importance attaches to this investigation and the Committee has recommended the appointment of a full-time research officer to work with Dr. Ladell.

(f) *Physiological Research at Makerere College, Uganda.*

Dr. H. Lehmann proceeded to Uganda in July, 1947, and has commenced work at Makerere College, under the general direction of Dr. E. G. Holmes. He will give particular attention to problems associated with malnutrition and anaemia. Provisional accommodation has been made available at the Mulago Medical School, but a new laboratory has been provided for, and is now under construction. A laboratory technician has been appointed to assist Dr. Lehmann.

(g) *Research on Relapsing Fever.*

Early in 1947, the Committee recommended that, because of the importance of relapsing fever in East Africa, further studies on the binomics of the insect vector, *Ornithodoros moubata*, were desirable. Arrangements have been made for Dr. G. A. Walton to undertake this investigation. He has now completed the necessary preliminary studies in the United Kingdom and will leave shortly for East Africa.

(h) *Nutrition Research.*

The organisation and progress of the scheme for nutrition research in the Gambia, including the formation of the Field Research Station and the Field Working Party, are described below.

(i) *Filariasis.*

The proposals for research on filariasis and its treatment, are dealt with in the section on Helminthiasis.

As these various projects are developed a wide field of research on diseases in the tropics should be covered.

REVIEW OF RESEARCH WORK IN PROGRESS

Malaria.

5. The team under Dr. J. McArthur, which has been constituted to investigate malaria and its control in Borneo, commenced work during the year. Dr. McArthur will make his headquarters eventually in Labuan, when the necessary accommodation is available; meantime the team is established at Sandakan and is carrying out a malaria control scheme on the basis of previous findings on the part played by *A. leucosphyrus* as a vector. Preliminary reports indicate that this shade-breeding species can be readily controlled by limited clearing of jungle shelter and that this method can be effective as a practical measure. Dr. McArthur has prepared an extensive memoir on his studies on malaria in Borneo; arrangements are being made for its reproduction for distribution.

6. Dr. Muirhead Thompson, who had been engaged in the study of *A. gambiae* and *melas* and their control in West Africa, the results of which have already been published, was posted during the year to East Africa to carry out entomological studies on the local Anophelines. He has established his headquarters and laboratory at Dar-es-Salaam and has already reported interesting findings on salt-water breeding *A. gambiae* and on the effects of different salt concentrations on *gambiae* and other species. The results of his findings may be applicable to the introduction of special species control methods in the area. It is intended that the work shall be continued for a period of two years.

7. The work on the control of malaria in the Kenya Highlands which had been commenced in the previous year was continued, and supervised by the Division of Insect-Borne Diseases, Medical Research Laboratory, Nairobi; the results have been reported to the Committee. Impregnation of huts by D.D.T. over an area of 700 square miles was carried out and a comparison of the results with the conditions in a control area was attempted. There was a marked decrease in 1947 in the number of cases of malaria in Kisii and Kericho as compared with 1946. Difficulties in getting staff for dispensaries in the control areas made it impossible to obtain full figures of relative incidence, and epidemic malaria did not occur anywhere in the area at a level that would have provided a test of high value. Parasite rates have to be relied on for comparison. The parasite rates in the treated area in May after the first impregnation with D.D.T. was 6 per cent. and, after the second impregnation in September, 3 per cent. The corresponding figures for the control area were 9.3 per cent. and 9 per cent. respectively. The work will be continued throughout another year.

8. The Malaria Sub-Committee have been specially concerned with the question of the most suitable methods for the use of Paludrine in suppression and treatment of malaria. Additional reports have been received during the

E

year of the results of a number of field trials with the drug that have been made in different areas of Asia and Africa. From Malaya Dr. Field, working under a grant from Colonial Development and Welfare funds, has presented interim reports showing the results with different dosage for suppressive use in estate labourers and in treatment. Comparisons have also been made with SN7618 and mepacrine. This work is being continued under the grant for the purpose. An extensive series of reports on the results with Paludrine in trials in a number of different centres in India where malaria is endemic has been received through Major-General Sir Gordon Covell, and Colonel M. K. Afridi with whom the Committee have kept contact. Dr. Blair has reported on the results obtained in Southern Rhodesia and reports have also been received from East and West Africa. Figures of special interest on the results of different suppressive courses on relapse of malaria in members of the Australian Forces, returned as convalescent malaria cases, have also been available for consideration.

9. Members of the Colonial Medical Research Committee and the Malaria Sub-Committee including Professor Maegraith, Professor G. Macdonald, Dr. Mahaffy, and Dr. Hawking in the course of visits to different areas in Africa have made enquiries into local experiences with Paludrine. A point of importance that has emerged is that, while Paludrine, both in suppression and treatment, in certain dosage has given highly satisfactory results in India and Malaya, there has been less confidence in the drug as it has been used in some parts of Africa. The question has arisen whether there may be a difference in the susceptibility of African strains of malaria parasites to the action of Paludrine as compared with Asiatic strains. For the purpose of investigating this point, the Medical Research Council, by arrangement with the Ministry of Health, deputed Mr. Shute and Miss Maryon to Lagos, to obtain strains; one strain has now been established at the Malaria Laboratory, Horton Hospital, where the unit of the Ministry of Health affiliated to the London School of Hygiene and Tropical Medicine will undertake trials.

10. The evidence obtained from these various sources will be reviewed by the Malaria Sub-Committee for the purposes of indicating the most suitable methods for the use of Paludrine in suppression and treatment of malaria.

Nutrition.

11. Nutrition research in and for the Colonies continues to be carried out partly through the agency of the Medical Research Council's Human Nutrition Research Unit, the work of which is summarised in the Council's report for 1946-47 (in the press). The following are lines of work in progress:—

12. (1) *Pellagra*. Drs. R. A. Webb and J. Waterlow, during their visit to Basutoland in 1947, found that pellagra had increased in prevalence in the past fifteen years since the low extraction home-made maize flour had gradually been replaced by machine-milled whole maize meal. They found that certain other changes, which may have contributed to the spread of pellagra, had occurred in the dietary during recent years. However, in a preliminary communication (*Lancet*, May 15th, 1948, p. 752), the results of experiments in the unit provide evidence for the presence in maize bran, and therefore in whole maize meal, of a toxic substance which may be "pellagra-genic". The presence of this substance in the diet may play a part, along with insufficiency of the vitamin nicotinic acid and possibly of certain amino acids, in the causation of the disease.

13. (2) *Fat Metabolism in the liver*. Work on the metabolism of fat in the liver is being continued; in particular, difference in the metabolism of

saturated and unsaturated fatty acid is being studied with the aid of radioactive isotopes. The study of the pathology of the liver in malnutrition is being continued on material obtained from the Gambia, thus extending Dr. Waterlow's investigation on fatty liver disease in West Indian infants, the report on which is now published (M.R.C. Special Report Series No. 263).

14. (3) *Parasitisation and Nutrition*. As a preliminary to an investigation of the inter-relationship of parasitisation and nutrition, experiments with rat hookworm (*Nippostrongylus muris*) in animals on diets containing different proteins and amino acids has shown that acquired immunity to the parasite is lowered if there is insufficient lysine in the animal's food.

15. (4) *Tropical ulcer*. Since the unit was established the effect of the state of nutrition on the healing of tissues, especially the skin, has been studied in preparation for work in the field on tropical ulcer. In their work on the subject, Drs. Balfour and Penney have found that in the wounds of scorbutic subjects which do not heal properly, a substance—apparently a polysaccharide—which can normally be shown to be present can no longer be detected; it re-appears, however, when ascorbic acid, vitamin C, is restored to the tissue. The part this substance plays in wound healing is being investigated further.

16. (5) *Field nutrition research in the Gambia*. Work began in October, 1947, on the reconditioning of buildings for the Field Research Station at Fajara. By the end of April, 1948, about 50,000 square feet of floor space was in use and 40 acres, about half of the area of the site, was cleared ready for food crops and for experimental and farm animals. Dr. J. H. Walters has been appointed medical superintendent of the Station and he, with the help of Dr. R. H. Fox, is making preparations for research; special attention is being given to the aetiology and clinical features of hepatomegaly which is a common condition; to skin lesions; to acute rickets which is also common; and to gastro-intestinal disturbances. Drs. Walters, Dean Smith and Fox have made clinical surveys in neighbouring villages and schools; they see patients every day at the Bakau Dispensary which is adjacent to the Field Station, and pay weekly visits to the Victoria Hospital, Bathurst. These last two valuable facilities are made available by the courtesy of the A.D.M.S. the Hon. C. W. F. Mackay.

Miss M. Ling, Matron of the National Hospital for Nervous Diseases, Queen Square, visited the Gambia in January and February, 1948, and organised the opening of a sixteen bed research ward on 1st March, 1948. On her return she arranged for the secondment of the Second Assistant Matron, Miss C. Bowins, and Staff Nurse F. Mitchell, who took charge of the ward in the middle of April, 1948. We are indebted to the Board of Management of the National Hospital for their co-operation in the solution of the problem of obtaining staff suitable for this specialised type of nursing.

17. Investigations are being made into the monkeys available in the territory. It is proposed to build up a colony of the kinds suitable for research purposes for experimental work on the station and for export to research workers in the United Kingdom.

18. Space has been allotted on the station for experimental work on the technology of colonial foodstuffs. It is intended to link this work with the food crops produced on the station and with the work by the staff of the Field Working Party in the village of Geneiri. In recent months the staff at Fajara have, on the one hand, been able to give support in several ways to the work in this village and, on the other hand, steps have been taken to make available to the staff of the Field Research Station facilities for making observations and experiments in the village.

19. Accommodation now earmarked at Fajara is about twice that originally envisaged for the Nutrition Field Research Station in order to provide facilities for research in other branches of tropical medicine. It will be possible in a few months to arrange for a further ward for sixteen patients and corresponding laboratory and other facilities, as well as housing for research, technical and African staff.

20. Professor B. S. Platt and Mr. A. J. Wakefield visited the Nutrition Field Working Party at Geneiri in October, 1947; they reviewed the survey work and discussed with the Working Party and the Gambia Committee, plans for their second year's work. In January, 1947, Dr. W. T. C. Berry, Medical Officer on the staff of the Working Party, began to organise a survey of the village of Geneiri in the West Kiang Division and, with the assistance of Dr. Dean A. Smith of the Department of Nutrition of the London School of Hygiene and Tropical Medicine, and Dr. R. H. Fox, he has completed a survey of the state of nutrition and of the prevalence of disease amongst the villagers. Dr. Berry returned to England at the beginning of April, 1948.

21. Signs of nutritional ill-health, especially those attributable to insufficiency of B vitamins and possible constituents of proteins, were found to be common. Anaemia, due in part at least to malaria, is widespread; rickets is also a common disease. Infant and child mortality is high; about half the children born in the village in recent years have died before reaching the age of ten years. Examples of fatty liver disease in infants have been seen and infant mortality has been reduced by feeding food yeast and skim milk powder. A marked loss of weight has been recorded in the hungry season, i.e., the end of food supplies which coincides with the time of the heaviest agricultural work in preparation for the next year's crops. About 30 per cent. of the villagers have signs of hunger or famine oedema at this time.

22. Miss E. Richardson collected data on food consumption till the end of March, 1948; her observations confirm and support the conclusions which have been tentatively drawn from the clinical survey. She has also obtained information on sociological and economic factors in the village, no sociologist or economist having been appointed to the staff of the Working Party. Miss B. Santer has succeeded Miss Richardson and will continue to collect data on food consumption. She will also supervise the various arrangements made for supplying the villagers with additional food in the extra effort which is being made to increase the land under food crops, and will begin work on the introduction of new foods and on the improvement of processing, handling and storage and cooking of foods.

23. Miss P. Haswell has completed a survey of village lands, their utilisation, records of crops, their cultivation and yields, and the labour costs of production. Since the arrival at the beginning of April, 1948, of agricultural equipment, rapid progress has been made with the current year's plans for doubling the area under the staple cereal grain, increasing the area under cultivation for groundnuts from 200 to 350 acres, growing a token area of rice by improved methods, and producing vegetable crops for agricultural and dietetic trials. The villagers intend to grow the same crops as in 1947 by their own methods and on the same land. Most of the additional land will be cropped jointly with the villagers and the working party staff, using machinery for the most time-consuming operations. Work on the remaining land will be field trials of fully mechanised production. Miss Haswell is recording the costs of all the operations for Professor A. W. Ashby and Dr. Raeburn of the Agricultural Economics Research Institute at Oxford; they hope to be able to determine by the analysis of the costings data

obtained over a period of years, an economic measure of the success of this experiment in mechanisation of African village farm lands.

24. Mr. P. A. Donovan, Agricultural Officer in the Gambia Department of Agriculture, has been associated with the Field Working Party to collaborate with Miss Haswell in the agricultural development work. He will also conduct plot trials on groundnuts and other crops on 40 acres of land cleared for the purpose in the adjacent village of Masembe. Experience has shown that crops, agricultural techniques and animal husbandry practices found to be satisfactory on an experimental station have failed or not been adopted where application on a wide scale has been attempted; it is now recognised that there will be, in the course of this experiment, opportunities for making trials and observations on a village scale, when possible causes of failure can be studied. Mr. J. H. Palmer, the senior agricultural officer, and other members of the staff of the Department of Agriculture are co-operating in various aspects of this work.

25. If the Working Party's experiment is a success and is extended to a number of neighbouring villages, then certain services and obligations will relate to a group rather than to an individual village. This possibility is being kept in mind in the provision and siting of facilities such as the workshop and in the management of such profits as are devoted to services already organised for the benefit of groups of villages. By such means it is hoped to make use not only of existing village sociological institutions but also of those which are found in larger units of native society.

26. It has been recognised that education of the villagers will be necessary at various stages in the evolution of the scheme and the first step in such educational work is to secure a measure of literacy. Progress has been made by Mr. O'Halloran who has been experimenting with various methods of teaching the Gambian to read and write. It is, however, recognised that this is only the first and perhaps the easiest step, and that occupational training not only in agriculture and new methods of mechanised agriculture will be needed and the Gambia Government are considering the preparation of a syllabus which will enable the villagers to take an active part in the general improvement of village social conditions.

27. Professor Platt and other members of the Nutrition Field Working Party have met the Gambia Committee under the Chairmanship of the Colonial Secretary to consider from time to time the interpretation of the London Committee's plans in relation to local conditions.

28. (6) *Nutrition research in other areas.* In West Africa, in addition to the projects in the Gambia, there are Nutrition Officers in the Gold Coast and Nigeria; the Government of Nigeria are recruiting staff to form a Nutrition Research Unit. In East and Central Africa there are now Nutrition Officers in Northern Rhodesia, Tanganyika and Uganda. The Central Organisation assisted in the formation of a survey team for Northern Rhodesia, including Miss B. Preston, the Nutrition Officer; arrangements have been made for the Nutrition Officer in Tanganyika, Miss H. Dewey, to work with the East African Survey Unit. Miss J. H. Henry has completed the survey of food consumption of employees of the Kenya-Uganda Railway which was initiated with the help of Miss M. W. Grant. Nutritional investigations were also made by Dr. H. C. Trowell (Uganda) and Dr. D. Harvey (Kenya) in this study which was part of a broad investigation into the efficiency of railway employees. Miss J. C. Chettle, Nutrition Officer, Mauritius, has prepared a "nutrition balance sheet" relating the territory's food resources to its requirements.

29. In the West Indies, Miss Cambell has, in addition to her work as Nutrition Officer, conducted acceptability trials of dried foods prepared in Trinidad by Mr. E. R. Leonard by the vacuum-oil method developed in the Human Nutrition Research Unit. In Barbados the Nutrition Officer, Miss J. Parry, has been working in the Education Department. In British Guiana, Dr. Nicholson, as School Medical Officer, has continued to investigate the state of nutrition of school children and to study the effects of various dietary supplements. The British Guiana Nutrition Committee has, through its "basic stock-taker," Mr. G. W. P. Roberts, B.Sc., reported on the Colony's food position, approximate costs of nutrients, the relative importance of locally-produced and imported foodstuffs, and made an estimate of its future food requirements.

30. In the Far East a regional nutrition conference was held in Baguio in February, 1948, under the auspices of the United Nations Food and Agriculture Organisation. This was attended by Miss M. W. Grant, from the central organisation, Dr. Lucius Nicholls, Nutrition Adviser to the Special Commissioner for South-East Asia, Dr. R. C. Burgess and Dr. I. A. Simpson, from the Institute of Medical Research, Kuala Lumpur. Important recommendations were made at this conference which if followed will, by securing a minimal vitamin B₁ content for rice, prevent the occurrence of beriberi amongst rice-eating peoples. Work on the parboiling of rice, one of the most satisfactory means of retaining vitamin B₁ in the milled grain, is continuing in the Human Nutrition Research Unit. Miss Grant visited Hong Kong, Singapore, where she renewed her contact with nutrition investigations being made there under the direction of Dr. C. J. Oliveiro, and Malaya, for discussions with Dr. Burgess on his nutrition survey.

31. (7) *Nutrition pamphlets.* The Nutrition Sub-Committee and the Central Organisation have examined various reports and are preparing a series of pamphlets. The first of this series, on the Treatment of Deficiency Diseases, has now been printed and circulated. The following are in the course of preparation:—

Milk

Part I.—Nutritional Importance of Milk (completed).

Part II.—Milk Production.

Part III.—Methods for Increasing Milk Consumption.

Part IV.—Milk in Infant Feeding (completed).

Maize and Pellagra.

Rice and Beriberi.

32. (8) *General organisation for nutrition research.* In 1937, a Research Sub-Committee of the Committee on Nutrition in the Colonial Empire, under the Chairmanship of Sir Edward Mellanby, recommended the formation of a central organisation for the co-ordination of nutrition investigations in colonial territories. Dr. Platt was appointed in 1938, as senior member of the proposed organisation; the Human Nutrition Research Unit, the Field Research Station, and the Nutrition Field Working Party in the Gambia and the Department of Nutrition at the London School of Hygiene and Tropical Medicine, which have been set up under his direction, can be regarded as being parts of a central organisation. The staff of this organisation is, however, mainly concerned with research and pilot investigations. The Nutrition Sub-Committee has had under consideration the means by which Colonial Governments can be further assisted in their efforts to improve the nutrition

of colonial populations. The Committee has recommended that a section of applied nutrition be formed—its objects would include:—

- (i) visits to colonial territories to help with investigations in nutrition problems and to advise on the means by which they may be solved ;
- (ii) teaching and training of personnel whose work in colonial territories would be more effective if they had a sound knowledge of nutrition ;
- (iii) critical examination of nutrition papers prepared in colonial territories to ensure that data are presented and used to the best advantage ;
- (iv) the collection, dissemination and analysis of information relating to colonial nutrition and the preparation of pamphlets, memoranda and educational material. The staff would include senior members concerned with
 - (a) the medical aspects of nutrition
 - (b) dietary investigations
 - (c) food technology
 - (d) food management including certain aspects of food production, and
 - (e) sociological, economic and educational aspects.

Dr. Dean A. Smith and Miss M. W. Grant are at the present time working on applied nutrition ; the proposals provide for an expansion of these activities. The London School of Hygiene and Tropical Medicine, in response to an enquiry from the Colonial Office, has agreed to administer such funds as may be put at their disposal for an applied nutrition section in colonial nutrition.

Helminthiasis.

33. The development of research on helminthological subjects in colonial territories must, to a considerable extent, depend on basic laboratory studies carried out in the United Kingdom in which medical research officers, under the Colonial Office, may or may not be directly engaged. The members of the Colonial Medical Research Committee and the Helminthiasis Subcommittee have maintained close contact with the research on schistosomiasis and filariasis in progress, and have in some cases been concerned in the laboratory work ; plans are in hand for early development of field research under the Colonial Office.

34. *Schistosomiasis.* At the London School of Hygiene and Tropical Medicine and the Liverpool School of Tropical Medicine, infected snail colonies of different species have been established for transmission of different schistosome species to experimental animals ; these will provide a means for the study of new chemotherapeutic compounds. *S. Mansoni* has been established and work on transmission of *S. haematobium* to a mammalian host is in progress.

35. Field trials of Miracil in the treatment of schistosomiasis were commenced at Salisbury in Southern Rhodesia by Dr. F. Hawking and Dr. Ross (members of the scientific staff of the Medical Research Council) and Dr. Blair (of the Southern Rhodesian Medical Service). The preliminary results of their investigations have been reported to the Colonial Medical Research Committee and published. This work is being continued by Dr. Blair.

36. The Medical Research Council has also established a team for research on different aspects of bilharzia disease and its control in Egypt, the services

of Dr. Newsome and Dr. Cowper being transferred from the Colonial Office for the purpose. Dr. Newsome has been especially engaged in trials of Miracil in treatment and Dr. Wootton was deputed to assist him in the associated biochemical work for a short period. The blood levels of Miracil produced by the dosage employed were estimated during the investigations and will be useful in relation to fixing the suitable level and frequency of dosage. This work is still in progress. Dr. Cowper is undertaking the helminthological research including observations of snail control methods and the use of molluscicides; in addition he has been able to arrange for the supply of infected snail consignments to laboratories in the United Kingdom and also material for the preparation of diagnostic antigens. The experience gained in Egypt will later be available for application to the study and control of schistosome infections in colonial areas.

37. *Filariasis*. The cotton-rat infection with *Litomosoides carinii* has been maintained at the National Institute for Medical Research, Hampstead, by Dr. Hawking and also at the Liverpool School of Tropical Medicine. Further studies on the natural history of the infection have been made and the action of various drugs on it tested.

38. In the Annual Report for 1946-47, it was noted that certain arsenical and antimonial compounds do not appear to effect the circulating microfilariae although they have a marked filaricidal action. The introduction of the new compound, Hetrazan, which has a powerful action on the microfilariae and may also have an effect on the adult worms, provides a new line for chemotherapeutic investigation. It is considered important to determine the potentialities of Hetrazan and definitely to establish its action. For the purpose the Medical Research Council are prepared to send a team to a selected area in Africa, at an early date, to carry out chemotherapeutic trials in infections with *W. bancrofti*, for a period of six months or longer. If the indications obtained from the trials justify this, it is proposed to institute a longer term investigation under the Colonial Office, in continuation of the work of the Medical Research Council team, directed towards the control of filariasis by chemotherapeutic treatment and by measures against the vector, as well as undertaking general research on the subject. The drug will also be tried on infections by *Loa loa* and *Onchocerca volvulus*.

39. The Colonial Medical Research Committee have recommended the development of research on Loiasis in West Africa for which Professor Gordon of the Liverpool School of Tropical Medicine has been asked to draw up a scheme. Little is known of the breeding places and life history of *Chrysops*, which is known to be a vector of *Loa loa* in Africa. As a preliminary to undertaking research on the subject, Mr. Crewe, holding a Colonial Medical Research Studentship, has been engaged under the direction of Professor Gordon in the study of species found in this country. It is proposed to send him out as one of a team to continue entomological work as part of a general investigation into the epidemiology of the disease. Such investigations are essential for development of methods of prevention and control of Loiasis which constitutes a serious problem in the Cameroons and certain other areas of Africa.

Virus Diseases.

40. The Virus Research Institutes in Nigeria and Uganda have, up to the present, been primarily concerned with a study of the epidemiology of yellow fever. During the course of this work, several other apparently hitherto unknown viruses have been isolated and considerable time devoted to their study.

41. Our understanding of the epidemiology of yellow fever in Africa is based on work which has been done by the staff of the Institute in Entebbe, in an area in Western Uganda known as Bwamba County. The results of this work in Bwamba provide evidence of a man-to-man yellow fever cycle with *Aedes (Stegomyia) simpsoni* Theo. as vector and of a monkey-to-monkey cycle transmitted by forest-dwelling mosquitoes, of which *Aedes (Stegomyia) africanus* Theo. is the most important. The evidence also indicates that the disease is endemic in the monkeys of the forest, and that it is able to maintain itself indefinitely in these animals. There is good reason to believe that, in Bwamba, yellow fever is essentially a disease of monkeys, which is in no way dependent on the presence of human infection, but which is introduced from time to time into areas inhabited by man.

42. We are, therefore, led to the conclusion that in Africa, as in South America, there are two distinct types of yellow fever epidemiology occurring in two entirely different kinds of environment. One occurs in urban centres, is a disease of man, and is transmitted by the domestic mosquito, *Aedes (Stegomyia) aegypti* L.; the other is associated with jungle or forest, is a disease of lower animals, and is transmitted by forest-dwelling mosquitoes. It is now believed that the forest disease is the original epidemiological type, and that it is from this source that urban centres are invaded from time to time.

43. In addition to the work on yellow fever, the viruses of several other diseases were investigated during the year. These studies included transmission experiments with Rift Valley fever virus and Bwamba fever virus, and an investigation of a previously unidentified agent which has been called Mengo encephalomyelitis virus. The results of the work on the latter have been submitted for publication by Dr. G. W. A. Dick. The work with Rift Valley fever virus, as well as that on various aspects of the yellow fever problem, has also been prepared for publication.

Hot Climate Physiology.

44. In January, 1947, Dr. W. S. S. Ladell was deputed from Nigeria to visit Palestine, at the request of the Palestine Board of Scientific and Industrial Research, for the purpose of making a rapid appraisal of the living and industrial conditions in relation to climate and advising on the lines on which research could suitably be carried out on physiological and climatological problems. It was considered that research in Palestine might have application also in Colonial territories. Dr. Ladell submitted a report on his observations with recommendations on amelioration measures and indicated lines on which physical and clinical research might suitably be undertaken.

45. Dr. Ladell who, in August, 1946, had made a series of observations on air temperatures, humidities and air movements in the working of the Enugu Colliery, Nigeria, paid a further visit to the Colliery in April, 1947, to make physiological observations on the effects of work on miners under the conditions of high temperature that obtained. He found that there was a statistical correlation between mid-shift rectal temperature and the environmental conditions in the working place as judged by "Effective Temperature." The rectal temperatures and body weight changes found during an 8-hour shift showed that some men were under considerable strain. Rectal temperatures up to 102°F. and weight losses up to 3.5 k. were found. Sweat and chloride losses were heavy but there was no indication of salt deficiency, the miners being heavy salt eaters. The physiological estimate of inefficiency was confirmed by the European overmen: according to them it was necessary to double up the hewers in the hotter places if sufficient coal was to be cut ;

one hewer would be resting while his mate would be hewing. One indication of diminished efficiency was the higher incidence of minor accidents reported in the hotter districts.

Scrub Typhus.

46. A team of three workers (Dr. J. R. Audy, Mr. J. R. Harrison and Mr. K. L. Cockings) went to Malaya late in 1947, and has commenced an investigation of the scrub typhus problems in that area. Dr. Audy is in charge of the study which will be carried out under the general supervision of Dr. Lewthwaite, Director of the Institute for Medical Research, Kuala Lumpur. Particular attention will be given to the epidemiological aspects of the disease.

Committee for Colonial
Agricultural, Animal Health and
Forestry Research
Third Annual Report
(1947-1948)

6A, Dean's Yard,
London, S.W.1
7th June, 1948

Sir,

I have the honour, on behalf of the Committee for Colonial Agricultural, Animal Health and Forestry Research to transmit to you the Third Annual Report covering the Committee's work from the 1st April, 1947, to the 31st March, 1948.

I have the honour to be,

Sir,

Your most obedient Servant,

J. C. F. FRYER,

(Chairman)

The Right Honourable A. Creech Jones, M.P.,
Secretary of State for the Colonies

COMMITTEE FOR COLONIAL AGRICULTURAL,
ANIMAL HEALTH AND FORESTRY RESEARCH

Membership

- SIR JOHN FRYER, K.B.E., M.A., F.R.S., Secretary, Agricultural Research Council, *Chairman*.
- SIR EDWARD SALISBURY, C.B.E., D.Sc., F.R.S., Director, Royal Botanic Gardens, Kew, *Vice-Chairman*.
- DR. J. CARMICHAEL, D.Sc., M.R.C.V.S., Veterinary Research Division, May & Baker, Ltd.
- PROFESSOR H. G. CHAMPION, C.I.E., Professor of Forestry, Oxford University.
- MR. G. F. CLAY, C.M.G., O.B.E., M.C., Adviser to the Secretary of State on Agriculture.
- MR. T. DALLING, M.A., M.R.C.V.S., F.R.S.E., Director, Veterinary Laboratory, Ministry of Agriculture and Fisheries.
- DR. C. D. DARLINGTON, D.Sc., F.R.S., Director, John Innes Horticultural Institution.
- SIR FRANK ENGLEDDOW, C.M.G., M.A., B.Sc., F.R.S., Drapers Professor of Agriculture, Cambridge University.
- PROFESSOR J. W. MUNRO, D.Sc., Professor of Zoology and Applied Entomology in the University of London.
- DR. W. G. OGG, M.A., Ph.D., Director, Rothamsted Experimental Station.
- MR. W. A. ROBERTSON, C.M.G., Adviser to the Secretary of State on Forestry.
- PROFESSOR J. L. SIMONSEN, D.Sc., F.R.S., Director of Colonial Products Research.
- MR. J. SMITH, O.B.E., M.R.C.V.S., Adviser to the Secretary of State on Animal Health.
- DR. S. P. WILTSHIRE, M.A., D.Sc., Director, Commonwealth Mycological Institute.
- DR. NORMAN C. WRIGHT, M.A., D.Sc., Ph.D., Chief Scientific Adviser to the Ministry of Food, Montagu House, Whitehall.
- DR. H. H. STOREY, Ph.D., F.R.S., Secretary.
- MR. L. LORD, Assistant Secretary.

During the year Professor J. A. Scott Watson, C.B.E., Chief Education and Advisory Officer, Ministry of Agriculture and Fisheries, resigned from the Committee.

COMMITTEE FOR COLONIAL AGRICULTURAL, ANIMAL
HEALTH AND FORESTRY RESEARCH
THIRD ANNUAL REPORT

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COMMITTEE FOR COLONIAL AGRICULTURAL, ANIMAL HEALTH AND FORESTRY RESEARCH

THIRD ANNUAL REPORT

I. GENERAL

During the year 1947-48 the Committee for Colonial Agricultural, Animal Health and Forestry Research held seven meetings. The activities of the Sub-Committees covering research on cocoa, stored products and soils are recorded in their separate reports which appear in later sections.

2. In order to secure specialist advice on problems placed before them, the Committee have established a system of informal consultative panels, which include specialists from beyond the Committee's limited membership. By this arrangement the Committee were able to secure advice on research projects from leading workers in the research fields concerned; the system was particularly valuable where the officer in charge of the research project was able personally to visit each member of the panel and to explain and discuss his programme of work. The Committee record their great appreciation of the care and time given to this work by those who have consented to serve on the panels.

II. THE WORK OF THE COMMITTEE

3. During the year under review the Committee completed their consideration of policy in relation to agricultural research in the Colonies. Their conclusions have been published in a paper entitled "Recommendations for the Organisation of Colonial Research in Agriculture, Animal Health and Forestry" (Colonial No. 219—H.M.S.O. 1948; 4d.)

4. The Committee considered that, bearing in mind the long-term needs of the Colonies and the best use of the funds provided by His Majesty's Government under the Colonial Development and Welfare Acts, their primary objective should be to lay the foundations for research services that would be efficient in providing the knowledge required by Colonial agriculture and, at the same time, would endure as a permanent part of the Colonial structure. Consequently they set themselves three principles to guide their recommendations: (i) that agricultural research should be so organised and so maintained that it should play its full part in providing the knowledge upon which agricultural improvement can be based; (ii) that the organisation of agricultural research should be such that the resulting knowledge obtained flows freely to those who will apply it to practice or will convey it effectively to those who will apply it; and (iii) that agricultural research should be so organised that it is accepted as an essential and continuing activity in Colonial communities. To satisfy these principles it was necessary that the research service should be fully efficient and should undertake the right tasks; that there should be close collaboration with the Colonial Departments responsible for the application of the knowledge gained; and that from the start Colonial Governments and peoples should be under no misapprehension concerning their essential part in planning and maintaining the research services of their countries. The Committee had functions of guiding, advising, and criticising, but not of controlling or of directing.

5. Since the urgent need of the times is for a rapid expansion of production in the Colonies, the Committee felt that the research services should in the early years set themselves a short-term objective and should concentrate on problems of applied research for the solution of which the essential fundamental knowledge often already existed. In making recommendations to this effect, the Committee were well aware that the primary function of the research services that they were proposing should be in the field of basic or fundamental research, and that without the flow of knowledge from this source applied research must soon lose inspiration. Nevertheless, they felt that this early concentration on the applied side would bring immediate benefits and would soon give place to a desirable balance between applied and basic research.

6. The success of any scheme for research must ultimately depend on the quality of the research workers employed in it. Realising this the Committee gave much thought to means for improving the conditions under which research will proceed in the Colonies, and for ensuring that these will attract and retain the best type of research worker. These conditions include not only a favourable mental and physical environment, but also satisfactory terms of service. As was recorded in their Second Annual Report, the Committee had early given close attention to the terms of service considered suitable for a Colonial Research Service; and they regret that the complicated negotiations leading to the establishment of this Service are only now nearing finality. Although a small amount of recruitment has been possible during the year on temporary terms, there can be no large-scale recruitment nor training for Colonial Research posts until candidates, and those who advise them, can be provided with a statement of what service in research in the Colonies has to offer.

7. On the form of organisation for agricultural research in the Colonies, the Committee endorsed earlier recommendations for the establishment of regional Research Organisations, each serving a group of Colonies within a geographical region. This concentration was considered to offer many advantages over a multiplicity of research institutions in individual Colonies; advantages of better qualified direction, of minimising scientific isolation, and of more economical use of staff.

8. The Committee's report dealt at considerable length with the requirements for ensuring proper collaboration between the proposed Research Organisations and the Colonial Departments through which the Organisations' research would filter to the agricultural producers. The Committee recommended the formation in each region of an advisory body that should be fully representative of all concerned, and should advise on the needs for research and examine and comment on the research programmes presented by the Directors of the Organisations. The report emphasised, however, that apart from formal consultation at this high level, there was the greatest need for collaboration between the Organisations and the Colonial Departments, and a clear definition of the functions of each. The Committee felt that ideally the Organisation should prosecute basic research and should collaborate with the Department in the type of technological research lying between basic research and straightforward field experiment and demonstration. Work of the last mentioned type, together with extension work arising therefrom, should constitute the Department's share in the process of developing research from the laboratory bench to field practice.

9. The Committee recommended that a close liaison should exist between the Research Organisations and Colonial universities and university colleges.

They would desire to see Research Organisations sited, if this were possible, in close proximity to Colonial universities, and taking a limited part, if this were desired, in their advanced teaching.

10. With their ideas clarified on policy, the Committee felt themselves in a position to consider in a preliminary way the financial needs of Colonial agricultural research. By their terms of reference the Committee were required to advise on the provision needed to implement their policy. Although at this stage it was impossible to prepare anything approaching exact estimates for the next few years, the attempt was made to determine the order of magnitude of the sums likely to be required over the years up to 1955-56. The figures took account of the contributions towards the cost of research that might be expected from the Colonial Governments concerned; but, even so, the Committee foresaw a need in future years for assistance from His Majesty's Government possibly in excess of the amount that might reasonably be allocated for agricultural research under the Colonial Development and Welfare Act, 1946. Furthermore, the rising costs both in respect of capital and running expenditure already suggest that the Committee's provisional figures may be well below the actual requirements. The Committee have requested the Secretary of State to give consideration to the difficulties revealed by this provisional attempt at a financial assessment, and to afford them guidance on their future policy.

11. Apart from the consideration of these questions of major policy, the Committee's work during the year under review has been mainly concerned with advising on means for putting into effect their general recommendations. The year has seen the formal establishment of two Research Organisations for Agriculture and Forestry and for Veterinary Science, respectively, in East Africa. It has seen also agreement on several research schemes in the West Indies. Initial discussions on the organisation of research in West Africa have taken place. The Committee have advised on a number of other individual research schemes and have reviewed in more or less detail a range of fields of research, including the possibility of delimiting agricultural zones in the Colonies on meteorological data, factors concerned in the resistance of plants to drought, the special problems resulting from mechanisation in agriculture, the inter-actions of plants and insects that infest them, certain sources of vegetable oils, the production of lac, the study of termites, plant quarantine and the preparation of a flora of East Africa.

12. The Secretary for Colonial Agricultural Research, who is Secretary to the Committee, visited East Africa in July, 1947, to attend a conference on agricultural research, and again in January, 1948, for discussions of progress with the East Africa High Commission and the Directors of the Research Organisations. Following the latter visit he spent two months in West Africa for initial discussions with Governments and the heads of Colonial Departments on the form of research organisation desirable in the British West African Colonies.

III. PROGRESS IN THE ORGANISATION OF RESEARCH IN THE COLONIES

(a) *Regional Organisations of Research in East Africa.*

13. The foundations for regional re-organisation of research on agriculture, animal health and forestry had been laid by a Conference held in 1946 in Nairobi, to which reference was made in the Committee's Second Annual Report. In July, 1947, a further conference was called and was attended by the Secretary of the Committee for Colonial Agricultural, Animal Health and

Forestry Research and by the Director Designate of the proposed Agricultural Research Organisation. This conference recommended the immediate establishment of two research organisations, the East Africa Agriculture and Forestry Research Organisation and the East Africa Veterinary Research Organisation. Its recommendations were approved by the East African Governments, endorsed by the Committee for Colonial Agricultural, Animal Health and Forestry Research and accepted by the Secretary of State. Finances are to be provided partly by the East African Governments and partly by His Majesty's Government under the Colonial Development and Welfare Act.

14. Dr. B. A. Keen, F.R.S., and Dr. E. G. White, M.R.C.V.S., were appointed Directors of the two organisations and assumed duty in the second half of 1947. The East Africa Agriculture and Forestry Research Organisation absorbed the existing research establishment of the East African Agricultural Research Institute at Amani, Tanganyika ; but it had been intended from the days of the early discussions that the headquarters of the new Organisation should be established in a more central and accessible site. A favourable site near Nairobi was found and negotiations with the Government of Kenya for its acquisition were nearly completed at the end of the year. It is expected that work on laying out the site and constructing laboratories and housing will proceed during 1948-49.

15. The 1947 Conference recommended that the two Organisations, between which the closest collaboration was essential, should be sited as close together as possible. It was hoped that they might be actually contiguous ; but for the initial phase, at least, this proved to be impracticable. The East African Veterinary Research Organisation, by a most advantageous arrangement with the Government of Kenya, was to take over the Kenya veterinary research establishment at Kabete ; although not actually contiguous, the new site for the East Africa Agriculture and Forestry Research Organisation is separated from Kabete by only a few miles. It is expected that co-operative research between the two Organisations on animal husbandry will be centred at the new East Africa Agriculture and Forestry Research Organisation site.

16. Apart from the continuation of the existing research of the Institute at Amani—on soils, plant physiology, virus diseases of plants, ecology and taxonomy—two newly established research schemes are now operating under the East Africa Agriculture and Forestry Research Organisation. The first of these is clove research in Zanzibar. Dr. F. J. Nutman had been appointed Director of Clove Research in 1946 and, after a visit to Zanzibar for initial planning, he started work with a small team of specialists in November, 1947. The primary purpose of this scheme was to determine the cause of a disease now rampant in Zanzibar clove plantations, known as "sudden death disease", and to devise control measures. The few months' work of this team has produced evidence of great interest, but the outcome cannot yet be predicted.

17. A second scheme under the East Africa Agriculture and Forestry Research Organisation is concerned with fertiliser trials in East Africa. Apart from growing recognition of the truth that the productivity of soils cannot usually be maintained in the tropics any more than elsewhere unless the mineral nutrients exported in produce are in some way returned, investigations into the use of fertilisers had acquired increased importance by the discovery of a large deposit of phosphate rock in Uganda and by progress in research on its conversion into forms suitable for agricultural use. The abandonment of a scheme for research on cinchona (which had been recommended in consequence of recent developments of synthetic anti-malarial drugs) had

F

freed its Director, Mr. L. R. Doughty, to take charge of a fertiliser research team. Rapid progress was made in assembling a team of workers and in planning in collaboration with Agricultural Departments an extensive series of experiments for the 1948 growing season, both in areas of African agriculture and on the European farms of the Kenya Highlands. Acknowledgment is gratefully made of the help accorded by Messrs. Imperial Chemical Industries Limited, who seconded to the East Africa Agriculture and Forestry Research Organisation an experienced member of their fertiliser research staff, Mr. R. V. Holme. Although at present the main work of the fertiliser teams is directed to straightforward experimental field trials, more fundamental studies of soil fertility are also in progress, which will reinforce the field work and derive inspiration from the field results. It is not expected that the East Africa Agriculture and Forestry Organisation will continue to conduct standard field trials beyond the first three years, by which time Agricultural Departments should have made up their complements of staff to a point allowing them to assume full responsibility. Meanwhile, basic research on fertility problems will be augmented.

18. A further proposal for applied research under the East Africa Agriculture and Forestry Research Organisation is in the field use of modern insecticides for controlling crop pests. As soon as the necessary entomological staff can be assembled field trials will be put in hand in collaboration with the research unit of the Colonial Insecticides Committee and the several agricultural authorities concerned in East Africa.

19. The Director of the East Africa Agriculture and Forestry Research Organisation has had discussions with the Chief Scientific Officer of the East African Groundnut Scheme, from which emerged an agreement on collaboration in research, the Organisation to undertake research on certain more fundamental problems on behalf of the Scheme.

20. The immediate task of the East African Veterinary Research Organisation has been to take over certain functions previously performed by the Kenya Veterinary Department as well as absorbing the small establishment previously operating as a Central Veterinary Research Institute. These functions included both research on animal diseases and other matters concerned with animal industries, and also that of supplying on a large scale a range of vaccines and sera. It had been agreed that the routine production of vaccines should be the duty of a special branch of the East African Veterinary Research Organisation and that the aim should be to make this financially a self-balancing activity. The Director of the East African Veterinary Research Organisation and the Kenya Director of Veterinary Services are engaged on the complicated task of reorganising all phases of the work at Kabete under the new auspices, without a break in continuity; but this is unlikely to be completed before the end of 1948. Meanwhile, the shortage of veterinary research officers has precluded any large augmentation of the East African Veterinary Research Organisation staff beyond that necessary to maintain the existing lines of work.

(b) *Regional Organisation of Research in the West Indies.*

21. Following recommendations by the Committee, the Secretary of State has approved assistance under the Colonial Development and Welfare Act to three research schemes to be affiliated to the Imperial College of Tropical Agriculture, Trinidad, and to operate under the general direction of the Principal of the College.

22. The Soils Research Scheme provides for sections dealing with soil survey and with soil fertility studies. The costs of this Scheme are to be met from a grant under the Colonial Development and Welfare Act.

23. The purpose of the Banana Research Scheme is mainly to continue and expand earlier work by the Imperial College on the breeding of varieties resistant to the two major diseases of the crop in the West Indies, Panama disease and *Cercospora* leaf spot. Activities will be divided between Trinidad and Jamaica, the more fundamental genetical studies at the former and the breeding at the latter. To provide further material for this breeding programme, an expedition to South East Asia has been arranged for 1948, under the leadership of the College Professor of Botany. The programme covers also research on Panama disease, for which an experienced plant pathologist has been appointed.

24. Under a separate scheme research has now been started on the refrigerated gas storage of bananas. A team seconded from the Food Investigation Board of the Department of Scientific and Industrial Research is working in Jamaica, both on this problem and on straightforward refrigerated storage of the new varieties of bananas that became available under the breeding programme. The work is supervised by a senior officer of the Food Investigation Board whose essential part in this research scheme is gratefully acknowledged. The Jamaica Banana Industry has agreed to contribute towards the costs of banana research.

25. The third of the West Indies schemes recently recommended for assistance, in consultation with the Cocoa Research Sub-Committee, is that for cocoa research. The research programme includes selection of types of cacao and their clonal propagation, genetical investigations and breeding, physiological study of the plant, work on diseases and pests, agronomic investigations and also study of cocoa soils as a part of the Soils Research Scheme already mentioned. Field investigations will be carried out on an estate recently acquired through an arrangement with the Trinidad Government and Messrs. Cadbury Brothers Limited. Action is in hand to obtain the staff for cocoa research, and a senior physiologist has already been appointed. The Cocoa, Chocolate and Confectionery Alliance Limited has generously agreed to contribute one half of the total cost of this Scheme.

26. Consideration of regional organisation for research in the West Indies would be incomplete without reference to the British West Indies Central Sugar Cane Breeding Station, which was established in 1933 in Barbados. The improved sugar cane varieties produced at this Station now constitute a high proportion of all grown in the sugar-producing British West Indian Colonies, all of which contribute to the Station's maintenance.

(c) *Regional Organisation of Research in West Africa.*

27. It has already been recorded (para. 12) that only preliminary conversations have taken place with the Governments of the West African Colonies on the establishment of regional agricultural and veterinary research organisations. Nevertheless, the Committee have been concerned with a number of research schemes in West Africa which would under present proposals be absorbed into, or be co-ordinated with, an overall regional research organisation.

28. Passing reference only is necessary at this point to the West African Cacao Research Institute, whose work is described in a later section (para. 40). This Institute, which is now established by Statute and financed from cocoa trading profits, has an imposing record of successful research, particularly in elucidating the cause and control of the Swollen Shoot disease, which constitutes a serious threat to the cocoa industry of the Gold Coast.

29. The expansion of an Oil Palm Research Station, originally set up by the Government of Nigeria, was assisted by a grant made under the Colonial Development and Welfare Act in 1946. Its functions are to carry out a fundamental study of the oil palm, to study the agronomy of the crop and to select and breed for improved seed. The question of research on methods of processing has been deferred for further consideration. For various reasons progress in building and in assembling staff has been slow; in view of the shortage of staff, the developments in field experimentation that have taken place are impressive. Of a total of rather over 4,000 acres covered by the Station, some 500 acres have been planted with oil palms in experiments on cultural methods, progeny trials and tests of selected seed issued to cultivators. In connection with work on selection, individual yield records are being maintained on palm plantations on a number of Departmental experiment stations and on farmers' plots.

30. Research in the problems of rice cultivation is important to all West African Colonies. At Rokupr in Sierra Leone a rice experiment station established by the Colonial Government is expected to become a centre for rice research for West Africa. Meanwhile, financial assistance was granted in 1947 to the Government of Nigeria for the establishment of a number of secondary rice experiment stations; but developments are still in an early stage.

(d) *Individual Research Schemes.*

31. Under this head are considered a number of research schemes in areas where as yet no advance has been made towards regional organisation.

32. On the recommendation of the Committee, a grant was made to the Government of the Malayan Union to provide for the capital cost of a timber utilisation research station at Kuala Lumpur, including the construction of a laboratory and its equipping with testing plant and machinery. Although the Committee felt that in general the Colonies should look to the Forest Products Research Laboratory of the Department of Scientific and Industrial Research at Princes Risborough, or to a similar laboratory in the Union of South Africa, for advanced research on the properties of timbers, they agreed that it was desirable to set up a laboratory in the Far East to serve not only Malaya but also Borneo and Sarawak.

33. A small grant was recommended to assist the Government of Nyasaland in studying problems of irrigation. This matter arose from proposals to control the flood waters of the Shire River, which, if implemented, would make available considerable areas for intensive agriculture.

34. A scheme for survey of the insect infestation of stored products in West Africa is dealt with in paragraph 51 in the report of the responsible Sub-Committee.

(e) *Visits of Research Workers to Colonial Territories.*

35. The Committee are impressed by the benefits that can be obtained from the visits by leading scientific workers for short or long periods of research in Colonial territories. Not only can such workers contribute directly through the investigation of important problems, but their personal contacts with Colonial Workers, who are inevitably more or less isolated scientifically, can do much to keep alive the spirit of research. Furthermore, future recruitment of research workers for the Colonial Service is likely to be assisted if members of university staffs are personally acquainted with conditions in the Colonies.

36. Recommendations were made for a small grant to Mr. C. G. T. Morison of the Department of Rural Economy, University of Oxford, to lead an expedition studying soil-vegetation relationships in East and Central Africa. A botanist was to accompany his expedition for systematic studies on the genus *Brachystegia*, which is the dominant tree over much of the area. This expedition has been postponed to the latter half of 1949.

37. An expedition led by Dr. P. W. Richards of the Cambridge University School of Botany, financed primarily by a Royal Society grant but assisted also under the Colonial Development and Welfare Act, had at the end of the year just completed studies on the ecology of tropical rain forest in Nigeria. Mr. P. Greig-Smith of Manchester University was awarded a grant to enable him to study the ecology of secondary forest in Trinidad.

38. Finally, the Committee have recommended a grant to allow Dr. George Salt, of the Cambridge University School of Zoology, to survey the arthropod fauna in East African soils. He will spend some six to nine months from the middle of 1948 in East Africa, working under the auspices of the East Africa Agriculture and Forestry Research Organisation. Dr. Salt is well known for his research in this field in the United Kingdom, and will carry his specialised knowledge and technique to areas where no work of the kind has previously been done.

IV. REPORTS OF STANDING SUB-COMMITTEES

(a) *Cocoa Research Sub-Committee.*

39. Two changes in the membership of the Sub-Committee took place during the year, and the members are now Mr. C. G. Eastwood (Chairman), Mr. F. C. Bawden, Dr. L. E. Campbell, Mr. G. F. Clay, Sir Frank Engledow, Sir Geoffrey Evans, Mr. W. M. Hood, Professor J. W. Munro, Dr. W. G. Ogg, Mr. W. A. Robertson, Sir Edward Salisbury, Dr. H. H. Storey, Mr. E. E. Wells, and Dr. S. P. Wiltshire.

40. The Sub-Committee continued its practice of dealing with matters as far as possible by correspondence. It met once during the year, but maintained its close review of the progress of the work of the West African Cacao Research Institute by means of the circulation of the comprehensive quarterly reports issued by the Institute. Dr. Storey visited the Institute in March and reported to the Sub-Committee on his return. The Sub-Committee welcomed his statement that the physical conditions at Tafo showed considerable improvement. The Institute, which now has a real existence in law as well as in fact following the enactment of the Gold Coast Ordinance for the establishment of the Institute and for the incorporation of the Managing Committee, has maintained its high standard of research work. Research has been continued on the bionomics, ecology and chemical control of capsids; on Swollen Shoot viruses, including the biology of virus vectors; on *Calonectria rigidiuscula* and other fungi; on the propagation and testing of clonal material; and on manurial and cultural practices. The Institute has devised a practicable means for controlling capsids on young cocoa by the application of D.D.T. oils and emulsions to the main stems and branches.

41. The Sub-Committee has also kept under review the progress of the Gold Coast cocoa disease control and rehabilitation campaign and the Nigerian cocoa survey. It has considered the question of cocoa virus disease in Trinidad and, in the circumstances, and in view of the useful evidence on the effect of the disease which it will provide, has agreed to the maintenance of the block of severely diseased cocoa on River Estate, pending the start of a wholesale eradication campaign in the virus belt.

42. Members of the Sub-Committee attended the Cocoa Conference in September, convened by the Cocoa, Chocolate and Confectionery Alliance Limited, at which representatives of the industry, and officers from the West African Cacao Research Institute and of the staff of the Imperial College of Tropical Agriculture concerned with cocoa research, were present. Among the matters considered by the Conference were the importance of cocoa breeding, the preparation and quality of cocoa, and the preparation of small samples of cocoa beans, memoranda on which, prepared by the industry's Cocoa Research Panel, had previously been considered by the Sub-Committee. As a result of discussion by the Conference, certain amendments were made in the memoranda, which were subsequently approved by the Sub-Committee and transmitted by the Secretary of State to Colonial authorities concerned.

43. At the end of 1947 and the beginning of 1948, Mr. E. E. Cheesman, formerly Professor of Botany at the Imperial College of Tropical Agriculture, and now of the East Malling Research Station, visited Malaya, Sarawak and North Borneo at the request of the Secretary of State, to report on the potentialities of cocoa cultivation in those countries. Briefly, Mr. Cheesman is of the opinion that, subject to further investigations of the suitability of the climate—the rainfall is higher than that of other cocoa-growing regions—a production of 100,000 tons a year may well be possible eventually in Malaya; substantial production in Sarawak is unlikely, but a promising area was seen in one Division, and the production of even 10,000 tons of cocoa a year would improve the economy of the country. The possibilities in North Borneo fall somewhere between those of Malaya and Sarawak. He emphasised that it will inevitably take a good many years before substantial production can be forthcoming from these new areas.

44. Research funds under the Colonial Development and Welfare Act were approved for the West Indian regional cocoa research scheme, under the aegis of the Imperial College of Tropical Agriculture, previously examined by the Sub-Committee, and the staff is now being recruited. Under the scheme the College has taken over about 400 acres of River Estate.

(b) *Soils Sub-Committee.*

45. During the year Dr. H. Greene resigned his membership of the Sub-Committee on his appointment to the Food and Agriculture Organisation in Washington. The members of the Sub-Committee are now Dr. W. G. Ogg (Chairman), Mr. G. F. Clay, Dr. E. M. Crowther, Mr. G. V. Jacks, Mr. C. G. T. Morison, Dr. A. Muir, Professor G. W. Robinson, Dr. A. B. Stewart, Dr. H. H. Storey and Sir Harold Tempany. The Sub-Committee has held no meeting during the year, but has continued to deal with matters by correspondence.

46. The memoranda on fertilizer experiments, which Dr. Crowther and Dr. Stewart kindly undertook to prepare at the request of the Sub-Committee, were completed and were published as Colonial No. 214—*Memoranda on Colonial Fertilizer Experiments (1) Planning and Conduct of Fertilizer Experiments by A. B. Stewart, M.A., B.Sc., Ph.D., F.R.I.C., and (2) Fertilizer Experiments in Colonial Agriculture by E. M. Crowther, D.Sc., F.R.I.C.* The memoranda provide valuable guidance for Colonial Departments of Agriculture and Research Institutes on the conduct and technique of fertiliser trials. The Secretary of State, who has expressed his indebtedness to Dr. Crowther and Dr. Stewart for the trouble they have taken in preparing these memoranda, has transmitted copies to Colonial authorities concerned.

47. As a direct result of the recommendation of the Sub-Committee consequent on its discussion of Colonial soil nomenclature and classification,

a Commonwealth Agricultural Bureaux Specialist Conference on Tropical and Sub-Tropical Soils is to be held at Rothamsted in June, 1948, to discuss (a) tropical soils and soil classification, (b) fertility problems, and (c) soil conservation. Arrangements have been made for the Soil Chemists of a number of Colonial Departments of Agriculture to attend the Conference; in addition, several distinguished foreign soil workers with experience of tropical soils will attend the Conference as guests of His Majesty's Government. Members of the Soils Sub-Committee will also attend the Conference, the arrangements for which have been made by an Organising Committee presided over by the Chairman of the Soils Sub-Committee.

48. The Sub-Committee examined proposals for a programme of fertiliser experiments in East Africa under the aegis of the recently established East Africa Agriculture and Forestry Research Organisation. Under the scheme field trials will be conducted on as extensive a scale as possible and in collaboration with Departments of Agriculture wherever Departments have staff and facilities available. Subsequently the Sub-Committee examined a further proposal for the extension of the fertiliser scheme into the Kenya Highlands. Similar fertiliser investigations are being undertaken by the East African Groundnut Scheme within its own areas.

49. Towards the end of the year under report, the Sub-Committee was asked to examine a proposal for a Gold Coast soil survey which had been approved in principle by the Secretary of State, and also to consider the question of placement of fertilizers under Colonial conditions. The Sub-Committee was meeting in May to discuss these matters.

(c) *Stored Products Research Sub-Committee.*

50. During the year Mr. W. W. Payne of the Oils and Fats Division of the Ministry of Food became a member of the Sub-Committee. The other members are Professor J. L. Simonsen (Chairman), Mr. G. F. Clay, Mr. W. McAuley Gracie, Mr. G. V. B. Herford, Mr. J. G. Hibbert, Mr. F. W. Irving, Professor J. W. Munro, Professor H. Raistrick, Mr. J. J. Scouler and Dr. H. H. Storey. Dr. R. A. E. Galley of the Interdepartmental Standing Conference on Insecticides and Dr. J. A. Freeman, Senior Entomologist of the Infestation Control Division of the Ministry of Agriculture and Fisheries regularly attend meetings. The Sub-Committee held four meetings during the year.

51. The work of the Sub-Committee has been chiefly concerned with the West African Pest Infestation Survey. After considering the preliminary report presented by Mr. Cotterell on his return from West Africa, the Sub-Committee appointed a Working Party under the Chairmanship of Professor Munro to draw up a detailed programme and estimates for the survey proper, on the basis that the survey would, in addition to collecting quantitative infestation data, also carry out, as a major part of its work, experiments on infestation control measures. The detailed programme and estimates were recommended by the Sub-Committee, and the provision of research funds under the Colonial Development and Welfare Act was subsequently approved. Towards the end of the year Mr. Cotterell proceeded to Nigeria (where the Sub-Committee had agreed that the survey should be carried out), in order to arrange accommodation for the survey team. By the end of the year under report, two Control Chemists and one Senior Entomologist had been appointed and had sailed for Nigeria. The Director of the Infestation Control Division of the Ministry of Agriculture and Fisheries was good enough to make arrangements for the two Chemists to receive a certain amount of training in control measures in his Division. It has unfortunately not been possible as yet to appoint the Senior Entomologist required to bring the survey team up to its full strength.

52. Arising out of its consideration of the problem of maize storage in Uganda on which it had been asked to advise, the Sub-Committee appointed a Working Party under the Chairmanship of Professor Munro, and with Mr. T. A. Oxley of the Pest Infestation Laboratory of the Department of Scientific and Industrial Research as Convener and Secretary, to enquire into the most suitable conditions for storage of food products in tropical and sub-tropical regions, and to make recommendations on the types and designs of stores and on the further research which may be needed. The report of the Working Party, which was received at the end of the period under review, and which, in view of the lack of adequate information, recommended the carrying out of a short survey of tropical Colonial territories in order to study existing types of storage, to discuss problems on the spot with those concerned, and to summarise the knowledge and experience of Entomologists, Engineers and Agriculturists, was subsequently approved by the Sub-Committee. It recommended also that, if possible, Mr. Oxley should undertake the study.

53. At the beginning of 1948 the Toxicity Sub-Committee of the Inter-departmental Standing Conference on Insecticides, after further considering the use of D.D.T. and benzene hexachloride (B.H.C.) with foodstuffs, agreed on the limits within which the two insecticides could be recommended with foodstuffs, i.e., D.D.T., 7 parts per million; B.H.C., 0.5 part of gamma-isomer per million (about 4 parts crude B.H.C. per million). The Sub-Committee, having considered this recommendation, drew attention to the possibility that during handling (and particularly if they pass through several hands), foodstuffs may be subjected to repeated applications of D.D.T. or B.H.C., resulting in insecticide content above the safety limits. The Sub-Committee accordingly recommended that pending the formulation of an agreed code of practice the use of the insecticides for the protection and disinfection of primary food products, including maize meal and wheat flour, should be carefully controlled, and considered that this control would best be effected by restricting the use of insecticides for this purpose to persons authorised by Colonial Governments. Since the end of the period under review, a code of practice governing the use of D.D.T. and B.H.C. with stored foodstuffs (together with particulars of analytical methods for assessing the degree of contamination) prepared by Dr. R. A. E. Galley and Mr. R. P. Tew, has been accepted by the Sub-Committee.

54. Other matters considered by the Sub-Committee included the permanent infestation control machinery desirable for West African Colonial territories; the effect of breakage of groundnuts on the development of free fatty acid; and the possibilities of the heat treatment of groundnuts, immediately or shortly after harvest, in preventing the formation of free fatty acid.

Colonial Insecticides Committee
First Annual Report
(1947-1948)

Imperial College of Science and Technology,
South Kensington,
London, S.W.7.
5th May, 1948

Sir,

I have the honour to enclose herewith the
Annual Report of the Colonial Insecticides
Committee for the year 1947-48.

I am,

Sir,

Your obedient Servant,

IAN HEILBRON,

(Chairman)

The Right Honourable A. Creech Jones, M.P.,
Secretary of State for the Colonies.

COLONIAL INSECTICIDES COMMITTEE

Membership

PROFESSOR SIR IAN HEILBRON, D.S.O., D.Sc., LL.D., F.R.S., Professor of Organic Chemistry at the Imperial College of Science and Technology, *Chairman*.

PROFESSOR P. A. BUXTON, C.M.G., F.R.S., Professor of Entomology, London School of Hygiene and Tropical Medicine, *Vice-Chairman*.

DR. J. CARMICHAEL, late Colonial Veterinary Service.

DR. R. A. E. GALLEY, Secretary, Inter-Departmental Co-ordinating Committee on Insecticides.

DR. P. C. C. GARNHAM, Reader in Parasitology, London School of Hygiene and Tropical Medicine.

DR. D. L. GUNN, Anti-Locust Research Centre.

DR. W. J. HALL, M.C., Director, Imperial Institute of Entomology.

DR. F. HAWKING, D.T.M., National Institute for Medical Research.

PROFESSOR G. MACDONALD, M.D., D.P.H., D.T.M., Director, Ross Institute of Tropical Hygiene.

DR. A. F. MAHAFFY, C.M.G., Joint Secretary, Colonial Medical Research Committee.

PROFESSOR J. W. MUNRO, M.A., D.Sc., Professor of Zoology and Applied Entomology, Imperial College of Science and Technology.

PROFESSOR J. L. SIMONSEN, D.Sc., F.R.S., Director, Colonial Products Research Council.

DR. H. H. STOREY, F.R.S., Scientific Secretary, Committee for Colonial Agriculture, Animal Health and Forestry Research.

MR. J. K. THOMPSON, Secretary, Tsetse Fly and Trypanosomiasis Committee.

Ex-Officio Members

The Secretary of State's Medical, Agricultural, Animal Health and Forestry Advisers.

LT.-COL. H. J. HOLMAN, B.Sc., Secretary.

Officer-in-Charge of Research to the Committee—MR. C. B. SYMES, O.B.E.

COLONIAL INSECTICIDES COMMITTEE

FIRST ANNUAL REPORT

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COLONIAL INSECTICIDES COMMITTEE

FIRST ANNUAL REPORT

PART I. GENERAL

The Committee was set up by the Secretary of State in January, 1947, under the Chairmanship of Professor Sir Ian Heilbron, D.S.O., D.Sc., LL.D., F.R.S.

2. The decision to create such a body arose from a suggestion of the Tsetse Fly and Trypanosomiasis Committee, which had had under consideration the better organisation of insecticide research work in respect of the Colonies. This proposal received the concurrence both of the Colonial Medical Research Committee and the Committee for Colonial Agricultural, Animal Health and Forestry Research.

3. No formal terms of reference were laid down at the inception of the Committee, but the general objects were set out in an exchange of letters between the Secretary of State and the Chairman. It was hoped, however, that from the point of view of the Colonial Office the Committee might operate as a single focus of reference for problems relating to research in, and the practical utilisation of, insecticides for the control of insect pests and disease vectors of all kinds. Hitherto, insecticide matters had been dealt with as ancillaries to the particular problem concerned; but the technical and scientific considerations involved had become so complex that it was felt that this piecemeal technique was no longer adequate.

4. At its inaugural meeting on 14th January, 1947, the Committee formulated the following terms of reference as appropriate to its task:—

- (i) to initiate Insecticide Research, including experimental field work;
- (ii) to examine Insecticide Research and Experimental Schemes submitted to it by Colonial Governments or other appropriate bodies;
- (iii) to advise on any problems concerning the use of insecticides which may be submitted to it;
- (iv) to make available the latest scientific information to those concerned with the use of insecticides in the Colonies.

5. These terms of reference were further amplified at a meeting on the 21st March, 1947, when the Committee reached the following conclusions:—

- (a) that it should concern itself primarily with the experimental application of the results of fundamental insecticide research;
- (b) that in the final stages of the development of insect control it would almost certainly be necessary for the Committee to sponsor field experiments on a large scale;
- (c) that it should be its task to encourage and reinforce when required research projects undertaken by Colonial Government Departments;
- (d) that it should co-ordinate agricultural, medical and veterinary interests in the use of insecticides. In this connection the need for full consideration being given to the effects of insecticides on beneficial insects was emphasised, and also the need for experiments to ascertain the ecological problems involved in the use of insecticides.

6. The Committee and the research schemes inaugurated by it are financed from funds voted under the Colonial Development and Welfare Act.

7. The Secretary and the Headquarters staff of the Committee are accommodated at the Imperial Institute, South Kensington, London, S.W.7. The thanks of the Committee are due to the Colonial Products Research Council for making available the services of Lieutenant-Colonel H. J. Holman and for permitting the secretarial staff of the Committee to be accommodated in its offices.

PART II. WORK OF THE COMMITTEE

8. *Meetings.* The Committee held eight meetings during the period under review.

9. *Officer-in-Charge of Research to the Committee.* The Committee itself does not undertake the detailed formulation of programmes of work. This is the responsibility of the Officer-in-Charge of Research, Mr. C. B. Symes, O.B.E., who was appointed to this post during the year. Mr. Symes was until the end of May, 1947, Officer-in-Charge of the Colonial Insecticides Research Unit at Entebbe, Uganda.

10. *Sub-Committees on Malaria and Aircraft Trials.* The Officer-in-Charge of Research is assisted and advised in his task by two Sub-Committees, a Malaria Sub-Committee and an Aircraft Trials Sub-Committee. The composition of these Sub-Committees, which may include non-Committee members, is as follows:—

Malaria Sub-Committee :

Professor P. A. Buxton
Dr. P. C. C. Garnham
Professor G. Macdonald
Dr. A. F. Mahaffy
Mr. C. B. Symes
Lieutenant-Colonel H. J. Holman

Aircraft Trials Sub-Committee :

Professor P. A. Buxton
Dr. P. C. Garnham
Dr. D. L. Gunn
Professor D. M. Newitt (Courtauld Professor of Chemical Engineering, Imperial College of Science and Technology).
Mr. C. G. Eastwood (Colonial Office)
Mr. W. J. Bigg (Colonial Office)
Mr. C. B. Symes
Lieutenant-Colonel H. J. Holman
Representatives of the Ministry of Supply Chemical Defence Experimental Establishment at Porton, attend the Aircraft Trials Sub-Committee meetings.

11. *Colonial Insecticides Research Unit, Uganda.* In 1945 funds were granted for the creation of a research team to undertake investigations on the use of the new synthetic insecticides against tsetse-flies and mosquitoes. The team which was to operate under the aegis of the Tsetse Fly and Trypanosomiasis Committee, started work in Uganda during the last quarter of 1945. Although investigations were seriously held up by delays in the arrival of staff, equipment and other factors, it had contrived by the end of 1946 to complete a considerable amount of research. This comprised principally a series of field applications of insecticides against tsetse on islands and promontories of Lake Victoria and the study of the effects of various insecticide formulations against mosquitoes when applied to the inner surfaces of native dwellings. Research on other problems was also conducted and the field work was

supported by a large number of laboratory investigations. At the beginning of 1947, the Colonial Insecticides Committee took over from the Tsetse Committee the responsibility for the scientific supervision of the Colonial Insecticide Research Unit in East Africa. A summary of the research work carried out by the Unit since that time is given in paragraphs 41 to 57. This is reported in detail in Progress Reports Nos. 3 and 4 to the Colonial Insecticides Committee and earlier research is recorded in Progress Reports Nos. 1 and 2 to the Tsetse Fly and Trypanosomiasis Committee.

Mr. K. S. Hocking took over the charge of the Unit from Mr. C. B. Symes on 26th May, 1947. In addition to Mr. Hocking the team now comprises two entomologists, one chemist, two field officers and three laboratory assistants, together with native staff. Steps are being taken to recruit a further four field officers.

12. *Colonial Insecticides Team, Porton.* There are many problems connected with insect control which are essentially fundamental in character and which can best be studied in a laboratory in this country, where there are so many more facilities than are available in the field. During the work of the Colonial Insecticides Research Unit in Uganda a number of such problems were brought to light. Among these were the prevention or avoidance of absorption of insecticides by vegetation, by mud and thatch and through the skin of cattle, and the prevention of loss of toxicity by exposure to sun. The comparison of the toxicities of different types of deposits such as large and small crystals, amorphous forms, films, suspensions, powders and smokes and the influence of particle sizes are some of the other investigations which should be undertaken as soon as possible. The Committee has accordingly recommended the building up of a research team in the United Kingdom, which will include in its programme of fundamental research the problems referred to above. Financial provision has been made available for a period of three years in the first instance to maintain a team of two entomologists, one chemist and two experimental officers, and provide the necessary laboratory equipment. The Ministry of Supply has kindly made available certain accommodation at the Chemical Defence Experimental Establishment at Porton, near Salisbury, and this is being supplemented by the erection of a sectional hut. The accommodation is now nearly ready and the team is being recruited. It is hoped to start research work very shortly.

13. *Malaria Eradication Experiment, Mauritius.* Malaria was introduced into Mauritius about 1862 and is now endemic. The disease is the principal cause of death in the Colony, and in 1942, for example, 3,054 persons died of malaria, representing 9.45 deaths per thousand persons. Intensive propaganda during the past few years has induced the hope that the disease can be controlled, and the Mauritius Government has made provision in its development programme for a loan amounting to 5,000,000 rupees (£375,000) to be devoted to anti-malarial measures during 1946-56. As the Island is isolated from other lands by large tracts of ocean, if the eradication of the prevalent malaria vectors is once attained, it should be possible to prevent reinfestation by appropriate action at seaports and airports. For this reason the Committee considered that Mauritius might prove an ideal territory in which to carry out a large scale experiment on the eradication of the malaria-carrying mosquitoes by the use of the new insecticides, D.D.T. and benzene hexachloride. Dr. A. Rankine, Director of Medical Services, Mauritius, who was on leave in the United Kingdom, was accordingly invited to attend a Committee meeting and gave a detailed account of the serious malaria problem in the Colony. He asked for the Committee's assistance in the initiation of an island-wide mosquito control experiment and, in consultation with him, a provisional scheme was drawn up. The matter was further explored in detail by the

Malaria Sub-Committee and in February, 1948, the Officer-in-Charge of Research to the Committee visited Mauritius and discussed the proposals with the authorities on the spot. As a result the Mauritius Government have agreed to launch an anti-malaria campaign beginning in September, 1948. This will take the form, at least in the first instance, of an island-wide spraying of the interiors of all dwellings and other buildings. Provision has been made for the experiment to extend over a period of two years. It is proposed that the cost of labour, field equipment, insecticides and the general operation of the scheme shall be provided from local resources, but that an equipped team of research personnel shall be furnished by the Committee, the cost to be borne by Colonial Development and Welfare Research funds. Financial provision has now been made and orders have been placed for equipment and insecticides. The research team are also being recruited. Further details of the proposed campaign is given in para. 59.

14. *Mosquito Eradication, Cyprus.* In June, 1947, Mr. M. Aziz, M.B.E., Chief Health Inspector, Medical Services, Cyprus, gave the Committee a full account of the very successful methods of larvae destruction used in the mosquito eradication campaign being conducted in that Colony. The Committee was not asked to assist directly in the campaign, but the Secretary has kept in touch with Mr. Aziz since his return to Cyprus and has been able to give some indirect assistance by expediting the supply of various materials. At a recent meeting, the Committee supported a proposal of Professor Buxton that Dr. Busvine, a member of his staff, should visit Cyprus, and recommended that the Colonial Office should approach the Cyprus Government to ascertain whether such a visit would be welcomed.

15. *Aircraft Experiments.* From the experiments carried out by the Colonial Insecticides Research Unit in Uganda it has become clear that where large areas of inaccessible bush are concerned the use of ground equipment for the application of insecticides is impracticable. The only chance of achieving appreciable coverage is by aircraft dissemination. Although a considerable amount of aircraft spraying was carried out during the war, a great deal of this was empirical in character and there are still many gaps in our knowledge of the performance in tropical countries of aircraft as a means of disseminating insecticides against tsetse flies and mosquitoes. Researches on these lines are urgently needed and it is proposed to carry out a series of trials in East Africa beginning in July, 1948. Not only may the results be of great value in assisting in the solution of the tsetse problem, but they will doubtless be of considerable importance in assessing the value of aircraft in the African Colonies for the control of other harmful pests, and the treatment of agricultural crops with weed killers and fertilisers, etc. The opportunity will be taken during the tsetse trials to include other types of experiments where possible, so as to make full use of the aircraft while available. In this connection it has been recommended that a preliminary experiment on air spraying of a native cotton area should be included at an early stage in the trials.

The experiments as at present envisaged will be carried out in Uganda and Tanganyika and the Colonial Insecticides Research Unit will be made available for this purpose. The staff of the Unit is being supplemented by a Senior Field Executive Officer, whose task will be to carry out the general administrative details and lay-out of the experiments under the Scientific Officer in charge of the experiments. A physicist and two field officers are also being added to the Unit. The importance of the research is fully appreciated in East Africa and the Committee are assured of the full co-operation of the East Africa authorities, which is so essential to the success of the experiment. The Officer-in-Charge of Research, during a recent visit to East Africa, discussed

the details of the experiments with Dr. E. B. Worthington, the Scientific Secretary to the East African High Commission, Mr. S. Napier Bax, the Inter-Territorial Tsetse Reclamation Officer, Mr. H. M. Lloyd of the Tanganyika Tsetse Department, Dr. B. A. Keen, Director, East African Agricultural and Forestry Research Organisation, and Dr. E. G. White, Director, East African Veterinary Research Organisation. The aircraft to be used are Ansons, which have been chartered from Messrs. Airwork, Ltd., who will also operate and maintain them during the experiments. The aircraft will be specially fitted with spray gear and tanks and smoke producing equipment. The South African authorities have kindly furnished, through Dr. Gunn, specifications and drawings of the smoke producing equipment used by them in their Zululand experiments. The spray gear and tanks are being constructed to the design of the engineering staff of the Chemical Defence Experimental Establishment, Porton. The Committee are grateful to the officers of Porton for the very great deal of invaluable assistance and advice which they have given. For further details of experiments see para. 58.

16. *Helicopter Experiments.* In many places difficult terrain such as hilly country and ravines precludes the use of even the most manoeuvrable fixed-wing aircraft, and insecticide dissemination from the air would be possible only from a helicopter. Moreover, small islands and narrow winding riverine strips of tsetse infestation, perhaps only a few yards wide in places, provide examples of areas which can be treated economically, if at all, only by helicopter. In addition it may be possible to take advantage of the peculiar downwash of a helicopter to obtain deep penetration of foliage canopies. On the recommendation of the Colonial Insecticides Committee, financial provision has been made available from Colonial Welfare and Development Research funds, for the purchase of a suitable helicopter. The type selected by the Committee is a three-rotor, twin-engined aircraft capable of carrying a load of three tons. This helicopter, which has been designed by the Cierva Autogiro Co., Ltd., is not yet in production, but the Ministry of Supply has agreed to sponsor the necessary development work, and it is anticipated that the aircraft will be delivered to the Committee within fifteen months.

Certain fundamental research on the helicopter as a means of spraying insecticides, was carried out in 1946 by Messrs. Pest Control Ltd. with the support of the Ministry of Supply and the Agricultural Research Council. Further fundamental experiments with the same small type of machine as was then used, a Sikorsky R4 (load carrying capacity 400 lbs.) are very shortly to be conducted at Porton and the Sprayers Sub-Committee of the Inter-Departmental Research and Development Co-ordinating Committee on Insecticides are drawing up a programme of research in which the requirements of the Colonial Insecticides Committee will receive priority. During the coming year further experiments may be expected to be undertaken with other types of helicopter. In this way it is hoped that by the time the Committee's helicopter is delivered, an appreciable amount of fundamental data will be available regarding the use of the helicopter as a spraying machine. Certain trials will be necessary in this country before the three-rotor helicopter is operated overseas; these will be conducted by the Colonial Insecticides Team at Porton in collaboration with the staff of the Chemical Defence Experimental Establishment at Porton. For the trials in East Africa, which are not expected to begin before the end of 1949, it is intended that the scientific staff used for the fixed-wing aircraft experiments shall be employed. This will ensure continuity in the experiments and the full use of the field experience gained in the earlier trials.

17. *Aircraft Experiments against Tsetse in Zululand.* During a visit to this country, Dr. P. J. du Toit, Director of Veterinary Services, Onderstepoort,

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Pretoria, very kindly gave the Committee an account of experiments conducted by the Onderstepoort Veterinary Institute, with the assistance of the South African Air Force, on the use of D.D.T. smoke generated from aircraft against tsetse in Zululand. An extremely interesting film, illustrating these experiments, was shown during the meeting. The experience of the South African workers is of particular importance and value to the Committee in connection with the proposed aircraft trials in East Africa.

18. *Aircraft Experiments against Tsetse in Swaziland.* A memorandum prepared by the Dominions Office summarising the proposals of the Government of the Union of South Africa, for the extension into Swaziland territory of the tsetse fly control measures by aircraft already carried out in Zululand (see para. 17) was submitted in May, 1947, to the Committee through the Secretary of the Tsetse Fly and Trypanosomiasis Committee. The Committee expressed the opinion that if such an experiment were closely controlled and observed, it should yield valuable data on which to base future tsetse control measures. In February, 1948, the Officer-in-Charge of Research visited Swaziland at the invitation of the High Commission to advise on malaria and tsetse control (see paras. 60-62). During this visit he had an opportunity of seeing the South African Air Force in operation disseminating D.D.T. smoke over tsetse infested areas. The results of the operation have not yet been finally assessed.

19. *Defoliation Experiments.* A difficult problem which is under consideration in East Africa relates to the defoliation of bush vegetation. If this can be achieved at an economic cost, it may prove a useful weapon in the task of reclaiming tsetse infested areas. It is known that tsetse flies are susceptible to changes in environment brought about by clearing or thinning the bush. If partial defoliation can be accomplished by the spraying of foliage with chemicals then the change in the conditions may be sufficient to make the treated area untenable to tsetse flies. The question of suitable chemicals has been discussed with Mr. Napier Bax, Tsetse Reclamation Officer, East Africa, and various authorities in this country have been consulted. As a result it has been arranged that Mr. Napier Bax shall receive a number of chemicals for preliminary trials. Should these prove successful, the Committee have agreed to assist in large scale trials using aircraft which will be available in East Africa in connection with the other experiments referred to above.

20. *Disinfestation of Aircraft.* Financial provision has been made for an experiment on the disinfestation of aircraft in East Africa. It is proposed to spray the internal surfaces of five or six aircraft of the East African Airways Corporation with different non-inflammable and non-corrosive formulations of D.D.T. and benzene hexachloride and to expose mosquitoes to them at weekly intervals to determine how effective such treatment will be in keeping the aircraft free from living mosquitoes. Most of the work will be done in stationary aircraft but in order to expose a proportion of the insects to ordinary flight conditions during their contact with the insecticide, it is proposed to carry out a number of special observation flights between Nairobi and Entebbe with each of the treated aircraft. These flights should provide data on the influence, if any, of the changes of altitude and temperature on the reaction of mosquitoes to treated surfaces. It has been arranged with the Kenya Medical Department that the bulk of the tests which will have to be done in Nairobi, shall be carried out by Mr. Guggisberg, a zoologist engaged for this purpose by the Committee. The experiment has only just started and it is as yet too early for any results to be available.

21. *Experiments with the Use of Smoke.* An experiment on the use of smoke against tsetse flies was carried out by the Colonial Insecticides Research Unit, Uganda. The whole of the 50 acre island of Makusu on Lake Victoria was smoked four times by the use of one pound "gammexane" (benzene hexachloride) smoke generators. Further details of this experiment which showed promising results are given in para. 42. The possibilities of larger 20 lb. generators are being studied. The Tanganyika Government propose, in collaboration with Imperial Chemical Industries Ltd., to conduct a large scale experiment over six square miles using 20 lb. "gammexane" smoke generators. The Committee is keeping in close touch with this experiment and the Officer-in-Charge of Research and the Secretary have held discussions with representatives of Imperial Chemical Industries regarding some of the problems involved.

The application of smoke in the normal way by ground generators is a difficult procedure, dependent as it is on exactly the right atmospheric conditions. Furthermore in dense bush, where paths must be cut in order to place the generators, application by this means is not practicable over large areas. The Chemical Defence Experimental Station at Porton has kindly undertaken to design for the Committee a bomb comprising a cluster of generators which can be dropped from aircraft, and, after distributing themselves over the prescribed area, will penetrate the bush canopy and generate the insecticidal smoke at ground level. The bomb in question will shortly be available and an experiment with it will be included in the East African aircraft experiments referred to in para. 15.

22. *The Todd Insecticidal Fog Applicator.* In the Todd Insecticidal Fog Applicator an insecticidal fog is produced by passing the insecticide either in oil or aqueous solution, under pressure, into a hot air blast. The temperature at the distributor head is about 1000°F. and the insecticide is ejected as a very fine mist or fog, the particle size of which can be varied by adjustment of the machine. A machine of this type was purchased and sent to the Colonial Insecticides Research Unit in Uganda; the Lister-Todd Engineering Co. Ltd., kindly arranging for an operator to accompany the machine. In January, 1948, experiments were conducted using benzene hexachloride in light diesel oil against caged tsetse flies in thick thorn scrub. The preliminary results have proved encouraging. Preliminary experiments using the T.I.F.A. to fog with pyrethrum against mosquitoes in prison buildings were also carried out and those again have shown promise. More details of the experiments are given in paras. 43 and 46. Reference has also been made in para. 27 to trials with the T.I.F.A. against froghoppers on sugar cane in Trinidad.

23. *Ecological Experiments.* The use of potent insecticides is not without its dangers and in exterminating pests there exists the risk of destruction of many insects which are beneficial to man. Thus bees and other pollinators may be killed; predatory insects and parasites, which are harmless to crops and normally destroy insect pests, may themselves be eliminated and pests hitherto kept in check may therefore gain ascendance. The balance of insect population is so delicate that the risk of upsetting it should not be taken without knowledge of the consequences. This knowledge is at the moment so inadequate that the Committee considered that an investigation of the problem was a matter of immediate urgency. It was proposed, therefore, to carry out an ecological study over several years on a number of uninhabited islands on Lake Victoria, and a scheme was drawn up to provide for the necessary expenditure. It soon became evident, however, that with the present shortage of scientific manpower the building up of a suitable research team for such an extensive project would prove an extremely difficult, if not impossible, task. The scheme was therefore left in abeyance for the time

being and a modified scheme proposed by Dr. Worthington, the Scientific Secretary, East African High Commission, adopted in its place. Certain local difficulties have arisen in this case, and it may not be possible to conduct the research quite in the way originally intended. The Committee is fully alive to the importance of the problem and it is hoped that it may be possible to start this research at an early date.

24. *Applied Research with Insecticides in Native Agriculture in East Africa.* The Committee for Colonial Agricultural, Animal Health and Forestry Research submitted to the Colonial Insecticides Committee a proposal that a programme for applied research with insecticides in native agriculture should be undertaken by a team organised under the East African Agricultural and Forestry Research Organisation, in collaboration with Departments of Agriculture, the Colonial Insecticides Research Unit, Uganda, and in consultation with the Colonial Insecticides Committee. At its meeting on 9th December, 1947, the Committee welcomed this proposal and pledged its support. It was considered that the agricultural team could best be assisted by making available the knowledge of the Colonial Insecticides Research Unit in Uganda on such matters as the technology of insecticides and the application of methods of control. If, however, the help was to be really effective it must be of a practical nature and as the Colonial Insecticides Research Unit in Uganda already had a full programme of work it was not possible to increase its commitments without supplementing the existing staff. The Committee has therefore made provision for the recruitment of a further field officer so that the necessary assistance may be given.

25. *Insecticide Research in East Africa.* Dr. E. B. Worthington, Scientific Secretary to the East African High Commission, during a visit to the United Kingdom in September, 1947, outlined to the Committee certain proposals for insecticide research work in East Africa. These were discussed at some length and the Committee expressed the hope that they might be kept informed of developments and promised, if desired, to give consideration to any matter that might arise and which was within their competence.

26. *Groundnut Scheme, Tanganyika.* The Secretary and the Officer-in-Charge of Research have kept in close touch with Colonel T. M. Woods, O.B.E., who is a member of the scientific staff of the East African Groundnut Scheme and who is responsible for the health of the personnel. Colonel Woods has been furnished with details of the methods of indoor treatment of buildings with dispersible powder for the control of mosquitoes and with the results of experiments with smoke against tsetse flies. Details of experiments with the Todd Insecticidal Fog Applicator, both with benzene hexachloride against tsetse and with pyrethrum against mosquitoes in buildings, were forwarded to Colonel Woods immediately on completion of the experiments in question. Colonel Woods himself paid a visit to the Colonial Insecticides Research Unit in Entebbe and discussed his problems with Mr. Hocking.

The Committee, through its Chairman, has already expressed to the Secretary of State its willingness to assist in any way it can with pest problems arising from this important venture.

27. *Control of Froghopper on Sugar Cane.* The financial loss to the sugar industry in Trinidad caused by froghoppers amounts to a very considerable sum each season. Moreover, the damage done is cumulative and the effect of one bad year is carried on to the next. The adult sugar cane froghopper feeds by piercing cane leaves and sucking plant juice through its hollow proboscis. Stomach poisons applied as surface coatings to foliage are therefore not effective and the best means of control is by the use of contact insecticides, which can be absorbed through the skin of the insect. Prior to

the war, pyrethrum was used with partial success, but more recently a dust containing benzene hexachloride has proved more effective. Methods of dusting in use have been criticised in some quarters as being laborious and an approach has been made for alternative suggestions. Information was furnished to Messrs. Caroni Ltd. who operate a group of estates in Trinidad regarding the Todd Insecticidal Fog Applicator referred to in para. 22, and which it was suggested might be tried against froghopper. A T.I.F.A. was accordingly purchased by the firm and despatched to Trinidad by air in time for tests to be carried out during the latter part of the froghopper season in 1947. While some degree of control was obtained, unfortunately the penetration of the fog under the conditions of the experiment proved disappointing.

Subsequently the Secretary of the Committee has discussed the problem of froghopper control with Mr. Pickles, Entomologist of the Department of Agriculture, Trinidad, during his recent visits on leave in the United Kingdom. He has also taken part in talks with representatives of sugar estates in this country, insecticide manufacturers and a helicopter operating company regarding the possibilities of carrying out experiments on disseminating insecticides from helicopters against froghopper outbreaks in Trinidad.

28. *Protection of Timber against Termites.* The possibility of the protection of timbers against termites by treatment with D.D.T. or benzene hexachloride is indicated in an experiment conducted in Uganda, when dipping for a few seconds in simple formulations prevented termite attack over a period of 17 months. Further details of this experiment are given in para. 55.

29. *Control of the Hide Beetle (Dermestes vulpinus).* It has been the practice in the past to treat hides and skins with an arsenical solution or to add naphthalene to the bales before shipment, in order to prevent attack by the Hide Beetle (*Dermestes vulpinus*). Neither of these methods is entirely satisfactory and at the request of the Imperial Institute, Mr. Symes, then in charge of the Colonial Insecticide Research Unit, planned, in co-operation with the veterinary authorities in Uganda, a series of experimental treatments of hides with various D.D.T. and benzene hexachloride formulations. Very promising results were obtained with oil solutions and emulsions (see para. 54). Further experiments will be undertaken with a view to arriving at a final recommendation for hide treatment.

30. *Simulium Fly and Onchocerciasis.* Onchocerciasis is a disease caused by a small worm which, through the bite of the *Simulium* fly, gets encysted in nodules on the shoulders, back, legs, etc., and from these nodules pour forth a stream of immature worms. These very often make for the eyes, which they destroy. Onchocerciasis is found all over the world in domestic animals, but the human disease is confined to tropical climates and there are severely affected areas in East Africa. In 1946 the Research Department of the Colonial Office supplied D.D.T. emulsion to Dr. P. C. C. Garnham, then Senior Parasitologist, Kenya, for initial experiments against *Simulium neavei* in the Koderia district of South Kavirondo, Kenya. The experiments took the form of a treatment of infested streams with the emulsion at a dosage of five parts per million, once a fortnight, over a period of five months. This resulted in a complete disappearance of adult *Simulium* in the neighbouring bush. Furthermore, no flies have been found in the area since March, 1946. As a result of this highly successful experiment the method is now being applied to another area of nearly 1,000 square miles in which there are about 100 infested streams. Whether or not the method can be applied to rivers such as the Congo and its tributaries, the Soey river of the Sudan, or the Nile, which are heavily infested with *Simulium* fly, has yet to be ascertained.

D.D.T. is toxic to fish and it may therefore not be desirable to use the method in areas where river fishing is of importance to the native community.

The Committee, though in no way responsible for Dr. Garnham's work, are very interested in promoting further and wider trials and in trying, when possible, the effect on these flies of insecticide applications to the riverine vegetation in which the adults spend most of their time. This latter method might well prove to be of use along the larger rivers.

31. *Insecticide Research in Malaya.* At its sixth meeting in September, 1947, the Committee considered a despatch received by the Secretary of State from the Governor of the Malayan Union asking that a research team be sent to study the application of the new synthetic insecticides to local problems. While it was appreciated that it might be very desirable to send either a small team or an experienced officer to visit Malaya, it was realised that owing to the grave manpower shortage this might not be possible for some time. It was therefore with much regret that the Committee felt itself unable to assist in this direction immediately, but it recommended that the Governor should be informed that it was most anxious to do all it could in the way of advice and in help in obtaining suitable equipment and supplies of insecticides. The Officer-in-Charge of Research and the Secretary have been in frequent communication with workers in Malaya and have been able to furnish information on the various questions which have been raised from time to time. At the end of 1947 arrangements were made, through the co-operation of the Director of Hygiene, War Office, for Colonel Measham, R.A.M.C., who was then proceeding to Singapore, to convey up-to-date information by visits to the various workers with whom the Committee was in touch.

32. *Insecticide Research in Nigeria.* Before taking up his appointment as Principal of the University College, Nigeria, Dr. K. Mellanby, then at the London School of Hygiene and Tropical Medicine, discussed with the Officer-in-Charge of Research and the Secretary, the provision which had been made at the College for research facilities. He was most anxious that the Colonial Insecticides Committee might see its way to send a team of research workers to study insecticide problems in Nigeria. This invitation was subsequently conveyed to the Committee officially by a letter from the Acting Chief Secretary to the Nigerian Government. The Committee much appreciated this offer and it is with great regret that, owing to its already heavy commitments and the difficulties of obtaining staff, it cannot at present send a team to that Colony.

33. *Liaison Officers Overseas.* At one of its early meetings the Committee recommended that a despatch be sent by the Secretary of State to the Governors of all territories in the Colonial Empire asking that liaison officers be appointed in each Colony to correspond direct with the officers of the Committee regarding scientific matters, rather than that the normal official channels of communications be adopted. The majority of Colonial territories have responded to this invitation and to all of these the Chairman has written offering the assistance of the Committee and asking for information regarding research on insecticides already being conducted in the countries concerned. Replies have now been received from twenty liaison officers, the majority of whom, in addition to furnishing the information requested, have asked for advice and information on various questions. It has been possible to give the assistance requested, including, in several instances, the supply of trial samples of insecticides, or to refer the correspondents to the appropriate source of information. In addition a large number of officers on leave have visited the Officer-in-Charge of Research and the Secretary to discuss their various problems. The Committee regard this personal contact between

its officers and those overseas as being of the utmost importance and invite officers working in fields related in any way to insecticides to establish this contact if they have not already done so. It is only by the closest collaboration with workers in the field that the Committee can carry out its task with complete success. The Committee further appreciates the importance of close liaison with research workers on similar problems in the Dominions. Reference has already been made to the common interests in the field of tsetse control which exist between East Africa and the Union of South Africa. The Committee have invited the Scientific Liaison Officers of the various Dominion Offices in London to attend its meetings so that they may be kept informed of the aims and progress of the Committee and also that the Committee may in turn be acquainted with insecticide developments in the Dominions.

34. *Inter-Departmental Research and Development Co-ordinating Committee on Insecticides.* Special reference must be made to the close liaison which exists between the Committee and the Inter-Departmental Research and Development Co-ordinating Committee on Insecticides. Professor J. L. Simonsen, F.R.S., and Dr. R. A. E. Galley, the Chairman and Secretary, respectively, of that Committee, are both members of the Colonial Insecticides Committee, and Professor D. M. Newitt, F.R.S., Chairman of the Sprayers Sub-Committee of the Inter-Departmental Committee, has been co-opted on to the Aircraft Trials Sub-Committee of the Colonial Insecticides Committee. Mr. C. B. Symes, Officer-in-Charge of Research, is a member of the Sprayers Sub-Committee. In this way proper co-ordination of effort is ensured. In the early stages of the Committee's discussions the question arose of the dissemination of information to workers overseas. Dr. Galley arranged to recommence the issue of the Abstract Bulletin and News Summary on Insecticides originally issued during the War by the Insecticide Panel, and advantage was taken to include in his distribution list the names of official liaison officers and other overseas officers with whom the Committee are in contact.

35. *Tsetse Fly and Trypanosomiasis Committee.* Concerned as they are with a common problem it is essential that the relationship between the Colonial Insecticides Committee and the Tsetse Fly and Trypanosomiasis Committee should be of the closest. This is ensured by the fact that both the Chairman and the Deputy Chairman of the Colonial Insecticides Committee are members of the Tsetse Fly Committee. The Secretary of the Tsetse Committee also serves on the Colonial Insecticides Committee.

36. *Anti-Locust Research.* The Committee has followed with interest the work of the Anti-Locust Research Centre, particularly the very successful aircraft attack on locusts in the Rukwa Valley of south-west Tanganyika in 1947. The spraying of settled swarms with an insecticide solution containing dinitro-*ortho*-cresol at a dosage of one gallon per acre produced practically 100 per cent. mortality. The results of this experiment will be of direct value to the Committee in carrying out its aircraft experiments in East Africa. The Secretary of the Committee attends the Inter-Departmental Committee on Locust Control, and the Officer-in-Charge of Research is a member of the *ad hoc* Committee on Locust Control at the Chemical Defence Experimental Establishment, Porton.

37. *London Advisory Committee for Rubber Research (Ceylon and Malaya).* The Officers of the Committee have been consulted by the London Advisory Committee for Rubber Research (Ceylon and Malaya) regarding the possibility of using aircraft in Ceylon for treating rubber

trees with sulphur for the prevention of Oidium disease and have taken part in several discussions on the subject.

38. *Contact with other Organisations.* The Officers of the Committee have maintained frequent contact with official bodies and commercial organisations in this country interested in insecticides, and are grateful for the great deal of assistance which has so freely been given them. In particular the Committee wish to record their appreciation of the very great help they have received from the Chief Superintendent and staff of the Chemical Defence Experimental Establishment at Porton, and from officers of the Ministry of Supply Headquarters. With the establishment of a Colonial Insecticides Team at Porton it is hoped that a collaboration of great mutual benefit will be established.

39. *International Trypanosomiasis Conference.* The Committee were represented at the International Trypanosomiasis Conference held at Brazzaville, French Equatorial Africa, in February, 1948, by Mr. K. S. Hocking, Officer-in-Charge of the Colonial Insecticides Research Unit. Mr. Symes, on behalf of the Committee, contributed a paper to the Proceedings of the Conference entitled "The Value of New Insecticides in Campaigns against the Tsetse Fly."

40. *Publications.* A number of papers have been published by members of the Colonial Insecticides Research Unit in Uganda and several are in the press. Delay in publication of research is still unavoidably very considerable, and in order to overcome to some extent the difficulties thus caused, a number of papers have been issued in mimeograph form. The distribution of these has, of necessity, been limited but copies have been made available to members of the Committee and to workers in the respective fields.

A list of the above papers is given as an Appendix to this report.

PART III. REVIEW OF RESEARCH WORK

Colonial Insecticide Research Unit, Uganda

TSETSE

Field Experiments with Screens

41.—(a) *Experiment No. 10* was carried out on Nfo Island (100 acres) to determine the effect on *Glossina palpalis* of hessian and black cloth screens and pupae shelters treated weekly with benzene hexachloride solution. Twenty-five hessian screens and 14 pupae shelters, placed in fly concentration areas were treated weekly for 16 weeks with 5 per cent. B.H.C. (Gammexane D. 929—13 per cent. gamma) in power kerosene and cotton seed oil. A 50 per cent. reduction in fly population in two weeks was obtained from the first applications. The density remained at this figure until spraying ceased, and recovered to normal about nine weeks after the last treatment.

(b) *Experiment No. 11* using 5 per cent. D.D.T. in diesoline instead of B.H.C. was carried out on Sowe Island (150 acres). Seventeen hessian, 79 box and eight floating screens and 22 pupae shelters were sprayed weekly for two periods of about 12 weeks with an interval of about six weeks between

the periods. A gradual reduction to about 35 per cent. of the initial density was obtained in the seventh month when treatment ceased. There was no apparent recovery of fly until about four months after the last treatment.

(c) *Experiment No. 14* was carried out on Mbirubuziba Island (35 acres) to determine the effect of screens treated with 5 per cent. D.D.T. in diesel fuel oil. Two hundred black cloth cubic box screens were soaked in this solution and distributed over the island mainly in three rings. They were sprayed with the same solution once a month for four months. The reduction of fly was approximately 90 per cent. in the first three months but there was no further reduction.

The results of experiments Nos. 10, 11 and 14 indicate that though treated screens may not eradicate *palpalis*, they may be very useful as a form of protection for people and cattle at river crossings, watering places and canoe landings and in corridors through heavily infested bush.

Field Experiments with Insecticidal Smoke

42.—(a) *Experiment No. 12* was carried out on Makusu Island (50 acres) to determine the effect on *G. palpalis* of benzene hexachloride smoke. The island was treated four times at 14-day intervals with 180 one-pound gammexane smoke generators placed around the periphery and on cut paths, but probably less than 90 per cent. of the island was covered by the smoke. The wind speeds in the open were 6 to 10 m.p.h. and in the middle of the island 2 to 3 m.p.h. The treatment resulted in about 80 per cent. reduction in fly population after each application with a final reduction of about 65 per cent. to 70 per cent.

(b) *Experiment No. 13* comprised a small scale trial on about 2½ acres of dense bush inhabited by *G. palpalis* at Bendegere with one 20 lb. No. 41 Gammexane smoke generator. The smoke penetrated at least 100 yards of this dense bush, helped by a wind of 10 m.p.h. All caged flies distributed throughout the bush were killed.

(c) The Unit will be associated with further trials of benzene hexachloride smoke generators to be conducted by the East African Tsetse Control and Reclamation Department in Tanganyika and also with trials of D.D.T. and B.H.C. generators against *G. pallidipes* in Swaziland.

Experiments with Insecticidal Fog generated by the Todd Insecticidal Fog Applicator (T.I.F.A.)

43.—(a) In *Experiment No. 15* a mile of lake shore at Nkumba infested with *G. palpalis* was fogged at 14-day intervals from a T.I.F.A. charged with 5 per cent. D.D.T. in light fuel oil. The T.I.F.A. was towed on a raft alongside to take advantage of onshore winds. The estimated dosage was about 0.4 lbs. of D.D.T. per acre. After five applications the fly population was reduced by about 50 per cent. and it appears there was insufficient penetration by the fog of the lake shore bush.

(b) *Experiment No. 16* comprised two trials with the T.I.F.A. in thorn scrub in the Masaka district. Caged *G. palpalis* were placed out in this *morsitans* type of country and benzene hexachloride in light diesel fuel was discharged as a fog. The results suggested that with a light breeze a kill of 100 per cent. might be expected up to 400 yards from the machine with some effect up to 600 to 700 yards.

(c) From the trials completed it seems that the volume of fog produced with the present T.I.F.A. is too small for work against tsetse and five or six times the amount would probably be more effective. Further trials of the T.I.F.A. in thorn bush are being conducted and in co-operation with the Tsetse Control and Reclamation Department the treatment of vegetation against *G. palpalis* in riverine bush in Kenya is also being carried out.

MOSQUITOES AND MALARIA

Field Experiments in the Treatment of Native Huts.

44.—(a) *Kasanji, Uganda.* The experiment was designed to ascertain the effect on malaria of a variety of D.D.T. and B.H.C. formulations applied to the internal surfaces of huts in a rural area. It has continued over nearly two years including two wet seasons. The results so far obtained from three applications seem to indicate that:

- (i) All treatments had caused striking reductions in populations of mosquitoes in houses ;
- (ii) The spraying of all internal surfaces with 5 per cent. D.D.T. oil solutions prevented the usual seasonal increase of malaria ;
- (iii) The spraying of roofs only with D.D.T. oil solutions appeared to have a similar effect, but the spraying of walls only had little effect ;
- (iv) The spraying of all inside surfaces with 5 per cent. B.H.C. solution in diesel oil was associated with a considerable drop in parasite rates (35 per cent. to 23 per cent. and 32 per cent. to 23 per cent.) and with B.H.C. wettable powder a still greater drop (55 per cent. to 29 per cent., and 34 per cent. to 28 per cent.).
- (v) There is serious loss, sometimes amounting to 85 per cent. or more of applied insecticide through absorption into the mud of walls: This is reduced to 35 per cent. to 40 per cent. when wettable powders are used. In two mulukas previously treated with oil solutions, wettable powders are now being applied.

(b) *Jinja, Uganda.* The experiment was designed to determine the effect on malaria of 4 per cent. D.D.T. in light diesel fuel applied to all internal surfaces of native huts at an approximate dosage of 200 mgms. per square foot. Five applications have been made in the period December, 1945, to November, 1947. The effect on mosquitoes was appreciable as is shown below:—

<i>Female Vectors per 10 houses per month</i>		
	<i>Treated Area</i>	<i>Untreated Area</i>
After 4th application (May-July 1947)	28.6	268.4
After 5th application (1st December, 1947 to 24th January, 1948)	1.3	103.9

The effect on malaria parasite rates was as follows:—

TREATED AREA						
Age of Children	Nov. 1945	June 1946	Aug. 1946	Nov. 1946	April 1947	Sept. 1947
0-1 yrs.	55%	55%	55%	59%	not yet available	
1-5 „	90	74	87	90		
6-10 „	78	63	83	81		

UNTREATED AREA						
Age of Children	Nov. 1945	June 1946	Aug. 1946	Nov. 1946	April 1947	Sept. 1947
0-1 yrs.	66%	20%	71%	not yet available		
1-5 „	100	71	96	88	not yet available	
6-10 „	88	76	84	85	available	

Little, if any, effect is noted over the first year, possibly because of extensive movement both temporary and permanent of people in and out of the treated area.

(c) *Proposed Field Experiment.* An experiment on the lines of the Kasanji experiment, but including a township area, will be conducted at Mbale, Uganda. Preliminary data are being collected.

Mosquito Behaviour in Experimental Huts.

45. Two series of observations have been made—the first in occupied and the second in unoccupied huts. The conclusions are as follows:—

- (a) Mosquitoes continue to enter occupied native huts throughout the night with peak periods of entry at dusk and dawn.
- (b) Early mornings captures do not give a true picture of numbers entering huts during the night.
- (c) In a series of catches 63 per cent. of 5,576 mosquitoes of all species and 79 per cent. of 506 *A. gambiae* were captured whilst resting on the underside of the roof thatch.
- (d) By the use of reversible traps it was determined that of 1,014 mosquitoes entering huts before 10 p.m. 63 per cent. remained in the huts until dawn next morning (i.e., for 8½ hours). It was also seen that 72 per cent. of all species and 74 per cent. of *A. gambiae* entering during the night remained for two hours or longer.
- (e) Treatment of huts with a 5 per cent. suspension of D.D.T. wettable powder in water and with 5 per cent. D.D.T. in kerosene at dosages of about 285 mgms. per square foot did not affect entry by mosquitoes nor did it stop entirely their “biting” in the huts.
- (f) In the huts treated 17 weeks previously with D.D.T. 5 per cent. wettable powder and 5 per cent. kerosene solution no mosquitoes released in the huts 12 hours previously were recovered.
- (g) The majority of mosquitoes escaping from treated huts did so within an hour of their release. It seems that few if any were capable of leaving after an hour.
- (h) Slightly more mosquitoes attempted to leave treated huts than untreated ones.
- (i) In a hut sprayed 24 weeks previously with 5 per cent. D.D.T. wettable powder suspension, 10 per cent. of mosquitoes released were alive after three hours, whilst in a similar hut but sprayed with 5 per cent. D.D.T. solution in kerosene at the same time, 10 per cent. were alive.

Effect on Mosquitoes of Insecticidal Fog released in a Building

46. The Todd Insecticidal Fog Applicator was used for applying a pyrethrum fog in prison buildings heavily infested with mosquitoes. Two pints of 0.07 per cent. pyrethrin extract were applied to 20,000 cubic feet in droplets of $\frac{1}{2}$ to 1 micron. There was a complete kill of all species of mosquitoes and some effect was obvious over a day or two.

LABORATORY AND CHEMICAL STUDIES

Toxicity of D.D.T. applied to Limewash

47. This investigation, which has been carried out in connection with the malaria control experiments has produced the following results to date:—

D.D.T. in oil solution applied to limewash of various ages made from partially slaked lime: (a) undergoes no chemical change or decomposition; (b) is not absorbed by the lime particles; (c) is absorbed to a serious extent; (d) is therefore masked by the lime surface and is greatly reduced in toxicity to insects alighting upon it.

Water suspensions of wettable powders are not absorbed to the same extent as oil solutions and are therefore more toxic when applied to lime-washed surfaces.

Behaviour of Surface Deposits of Insecticides on Mud

48. Further evidence has been obtained of absorption of oil solutions by mud. Up to 90 per cent. of the total amount applied may be lost as a contact insecticide in this fashion with resulting very low toxicities to alighting mosquitoes. With the wettable powders available absorption is much reduced, though it is still serious, at 38 per cent. or over of the total applied. The higher surface deposits from these powders give much better kills (e.g., 100 per cent. mortality of *G. palpalis* in 15 seconds' contact and up to 90 per cent. *A. aegypti* in 30 minutes' contact).

Toxicity of D.D.T. Oil Solutions on a Non-absorbent surface to G. palpalis and A. aegypti.

49. These observations indicated that *G. palpalis* is more susceptible to D.D.T. in oil than *A. aegypti* or *A. gambiae*. Differences in foot structures and stance may account for this. It was also noted that two weeks after application all the kerosene solvent had evaporated leaving a deposit of needle crystals. These were much less toxic to *A. aegypti* and to *A. gambiae* than the droplets of supersaturated solution that occur 24 hours after application.

Effect of Sunlight on the Residual Properties of D.D.T. and B.H.C.

50. Observations on D.D.T. kerosene solutions applied to glass plates exposed to sunlight have shown repeated losses of toxicity as compared with similar deposits not exposed to sunlight. A significant chemical change in the sunlight-exposed deposits of D.D.T. was the increase in the ratio of the hydrolysable to total chlorine. There is also a difference in physical structure—the deposits exposed to sun after a short time formed hard resinous masses with no crystallisation whilst those not so exposed formed droplets of supersaturated D.D.T. solution, the majority of which did not crystallise for two to four weeks or until they were agitated by the feet of flies brought in contact with them.

The loss of toxicity of benzene hexachloride exposed to sunlight on glass plates seems to be due entirely to volatilisation. The temperatures are often higher than 50° C. At this temperature in an oven the loss is equally

great reaching 95 per cent. in 30 minutes. The rate of loss is decreased by solvents of low volatility such as diesoline. Ultra-violet light appears to have no action upon gamma residues.

Methods of Analysis

51.—(a) *D.D.T.* (i) *The dehydrohalogenation method.* It was found that the procedure of Neal *et al* (*U.S. Public Health Report, Suppl. No. 177, 1944*) was satisfactory for the determination of amounts of the order of 10 mgms. (error ± 1 per cent.). This method is used for routine purposes. It was not found that the products of saponification of natural fats that may occur in extracts of plant residues interfered with the Volhard titration as suggested by Baier *et al.* (*Science, 1946, 104, 376*), nor did solvents such as benzene, diesoline and cotton seed affect the determination.

(ii) *Selective dehydrohalogenation of pp/D.D.T.* The crystallisation method of Chistol (*Ind. Eng. Chem. (Anal), 1945, 17, 470*) gave better results for pp/isomer contents than those of La Clair and Vogdenzang.

(iii) *The microscopical method of McCrae et al.* (*Ind. Eng. Chem. (Anal), 1946, 18, 578*), is useful for the analysis of technical D.D.T. but inaccurate for other preparations.

(b) *Pp/D.D.A.* The colorimetric method of Schechter *et al.* (*Ind. Eng. Chem. (Anal), 1945, 17, 704*) modified by using 5 per cent. potassium hydroxide in methanol as the colour developing agent was found to be more satisfactory than the sodium-alcohol reduction method of Smith and Stehman, and Stiff and Castillo for determination of bis (p-chlorophenyl) acetic acid in the urine and tissues of animals receiving D.D.T.

(c) *B.H.C.* (i) *The dehydrohalogenation method* was investigated. Selective dehydrohalogenation does not seem to be feasible.

(ii) *Colorimetric methods.* Attempts to obtain a more satisfactory and sensitive colour than the yellow orange obtained in the I.C.I. procedure have not been successful.

(iii) *Partition chromatography.* This method is being studied.

EXPERIMENTS WITH ANIMALS

Absorption by cattle

52. After intravenous injection of pp/D.D.T. an acidic metabolite presumably pp/D.D.A. was present in the urine for eight days in gradually decreasing amounts.

Benzene hexachloride fed to cattle produced a substance yielding hydrolysable chlorine in the blood, in amounts varying with the size of initial doses.

B.H.C., or a similar substance yielding hydrolysable chlorine, was found in the blood of a calf for five days after one spraying of the skin with B.H.C. in kerosene and cotton seed oil.

Absorption by Guinea Pigs

53. After intra-peritoneal injection of 25 mgms. of B.H.C. gamma isomer in sesame oil, material containing hydrolysable chlorine equivalent to 5 mgms. of insecticide was recovered from the urine during five succeeding days.

Not more than 10 per cent. of a dose of 40 mgms. of B.H.C. gamma isomer injected into guinea pigs was recovered from liver, kidneys, spleen, adrenals, abdominal fat and brain within 48 hours of injection.

Chemical studies are being made of the normal constituents of a guinea pig preliminary to further study of the form in which B.H.C. isomers are excreted.

OTHER EXPERIMENTS AND ACTIVITIES

Control of Hide Beetle.

54. A preliminary investigation of the effect of various formulations of D.D.T., B.H.C. and sodium silicofluoride on the Hide Beetle (*Dermestes vulpinus*) has been completed. In co-operation with the veterinary authorities in Uganda, D.D.T. in cotton seed oil plus kerosene and in water emulsion, and B.H.C. as dust, oil solution and powder suspension in water, all provided satisfactory control. Sodium silicofluoride was not so satisfactory. None of the treatments had any influence in tannery operations, and no discomfort was experienced in the handling of the 520 skins. It now remains in a further experiment to determine the most economic of these successful treatments.

Protection of Timber from Termite Attack

55. A preliminary test was conducted in co-operation with Mr. V. Harris, Senior Agricultural Entomologist, Uganda. Small slabs of susceptible timber were treated by the Colonial Insecticide Research Unit by (a) dipping for a few seconds; (b) dipping for 30 minutes in two 5 per cent. D.D.T. oil solutions, two 5 per cent. D.D.T. emulsions, 5 per cent. D.D.T. soluble oil or in two 5 per cent. benzene hexachloride oil solutions, a 1 per cent. B.H.C. miscible oil and a 1 per cent. B.H.C. liquid concentrate.

The treated slabs and untreated controls were then buried by Mr. Harris in a "graveyard" infested with two species of termite normally destructive to timber (*Pseudacanthotermes spiniger* and *Bellicositermes natalensis*). After 17 months all treated timbers were intact whilst all controls, except one, and additional untreated eucalyptus poles were completely destroyed or badly damaged.

Other Experiments in Progress

56.—(a) Studies are in progress on the behaviour of deposits applied to vegetation including the use of a variety of emulsions, colloidal suspensions, and wettable powder suspensions.

(b) The effect of soil treated with D.D.T. and B.H.C. on flies emerging from pupae is being investigated.

Co-operation with other Bodies

57. The Unit has been visited by twenty scientists, of whom four were from United Kingdom commercial firms and six were from outside of East Africa.

Insecticides for experiments have been provided to eight East African authorities.

Tsetse pupae have been sent to London and Liverpool and to Tanganyika.

AIRCRAFT EXPERIMENTS IN EAST AFRICA

58. It is hoped to start a series of trials in East Africa with fixed wing aircraft for applications of insecticides to vegetation for the control of tsetse. Anson aircraft fitted with emission equipment designed at the Chemical Defence Experimental Station, Porton, will be used. These trials, which it is hoped will commence about July, 1948, will consist of the following:—

- (a) A small series of trials each over about 200 acres of *G. palpalis* infested bush.
- (i) Application of one of the following: 5 per cent. D.D.T. wettable powder, or 5 per cent. B.H.C. wettable powder, or 5 per cent. D.D.T. emulsion, or 5 per cent. B.H.C. emulsion. Preliminary studies of these insecticides are now being conducted in Uganda and at the Chemical Defence Experimental Station, Porton.
- (ii) D.D.T. smoke from aircraft exhaust (produced from an oil solution).
Deposits of 0.25 lbs. of insecticide per acre will be aimed at on each of eight applications at intervals of 14 days. Entebbe aerodrome will probably be used for this series.
- (b) A larger series of (i) the best wettable powder or emulsion (from results of series a), (ii) the best smoke on 5-6 square miles of *G. swynnertoni* or *G. pallidipes* bush in Tanganyika. Deposits will again be of the order of 0.25 lbs. insecticide per acre (unless earlier results indicate the desirability to change this) for each of eight applications at 14-day intervals. Kondoa aerodrome in Tanganyika will probably be used for this series.
- (c) A series of experiments on the defoliation of bush vegetation will be carried out (see para. 19).

MALARIA ERADICATION EXPERIMENT—MAURITIUS

59. Reference has already been made in para. 13 to a proposed Malaria Eradication Experiment to be conducted in the island of Mauritius. Discussions have taken place in London and Mauritius and the details of the experiment have been settled.

The work proposed is an experiment in the elimination of malaria in the first place by insecticide applications to Anopheline vector feeding and harbouring places, followed, if necessary, by applications to breeding grounds and any other measures.

The island will be divided into six operational areas each with an insecticide team under a Field Officer. Since the most suitable insecticide formulation is not yet known the following formulations will be tried in different districts in the first instance:—

5 per cent. D.D.T. solution in kerosene.

D.D.T. wettable powder in water.

Benzene hexachloride wettable powder in water.

Results from these initial applications will determine the formulations to be used subsequently over the whole island. It is also proposed that initially there shall be three applications a year, starting, if possible, in about October, 1948.

The whole work will be under the charge of a malariologist or entomologist of experience with a scientific staff of one entomologist and one chemist for the necessary biological and chemical observations and estimations, upon the results of which applications of insecticide and any other measures will be based. The effects of the applications will be assessed by measurements of malaria parasite and spleen rates in children, and especially in the newly born, the incidence of anopheline vector larvae in breeding grounds, and the adult mosquito populations of houses.

SWAZILAND—VISIT OF THE OFFICER-IN-CHARGE OF RESEARCH TO THE
COMMITTEE

60. The Officer-in-Charge of Research was invited to view the tsetse and malaria problems in Swaziland, and to make suggestions with regard to measures that might be taken by the Swaziland Government for their control.

Tsetse

61. *G. Pallidipes* has apparently entered the country from the south during the past few years and now occupies about 25 square miles of bush. Infection in cattle has been very serious and the veterinary authorities have made extensive clearings to prevent further spread northwards. By an arrangement between the Swaziland and South African Governments the South African Air Force have extended their anti-tsetse aircraft insecticidal smoke applications to cover the infested portion of Swaziland (see para. 18). It is felt, however, in Swaziland that the smoke may not reach the flies in their dry season haunts in evergreen bush along stream beds, and Mr. Symes has expressed his agreement with this view. The local authorities are, therefore, anxious to adopt measures to deal with such remaining pockets of flies. The question of obtaining sufficient supplies of insecticidal smoke generators (both D.D.T. and B.H.C.) for this purpose is being explored on behalf of the Swaziland Government, who will bear the cost of the material.

Malaria

62. Infection is severe in the native population of the low veldt and much of the middle veldt. The local authorities are anxious to try insecticides or suppressive drugs in an attempt to reduce it. Certain small experiments have been conducted with D.D.T. oil solutions applied to the internal surfaces of houses, and with paludrine administration. The latter, however, is considered to be too expensive for widespread use. It has, therefore, been suggested by the Officer-in-Charge of Research after a brief study of the problem that trials on an adequate scale be made of D.D.T. and B.H.C. wettable powder in water for residual spraying of houses. The Swaziland Government has agreed to undertake these and the Committee are now expediting materials and equipment for this work, the cost of which will be met by the Swaziland Government. The Committee will, of course, keep in close touch with these experiments in Swaziland and afford whatever help may be possible.

APPENDIX

List of Publications of the Colonial Insecticides Research Unit.*Papers Published*

Toxicity of D.D.T. applied to Limewash. By A. B. Hadaway and F. Barlow. *Bulletin of Entomological Research*, 1947, **38**, Part 3, 489-495.

Field Experiments with D.D.T. and Benzene Hexachloride against Tsetse (*Glossina palpalis*). By C. B. Symes, A. B. Hadaway, F. Barlow and W. Galley. *Bulletin of Entomological Research*, 1948, **38**, Part 4, 591-612.

Insecticidal Effect of Surface Deposits of D.D.T. on Mud. By A. B. Hadaway and F. Barlow. *Nature*, 1947, **160**, 363.

Determination of Benzene Hexachloride in the Blood of Cattle. By F. Barlow. *Nature*, 1947, **160**, 719.

Circulated in Mimeographed Form.

Progress Reports No. 3 and No. 4 Colonial Insecticide Research Unit, Uganda.

Summary of Work of Colonial Insecticide Research Unit in Uganda 1945-46. By C. B. Symes.

Observations on Mosquito Behaviour in Unoccupied Treated Huts. By A. B. Hadaway.

Observations on Mosquito Behaviour in Huts. By A. B. Hadaway.

Preliminary Notes on Loss of D.D.T. and Gammexane by Absorption. By A. B. Hadaway and F. Barlow.

Surface Insecticidal Deposits on Mud. By A. B. Hadaway and F. Barlow.

Toxicity to *G. palpalis* and *A. aegypti* of D.D.T. on a non-absorbent surface. By A. B. Hadaway.

The Effect of Sunlight on Residual Properties of D.D.T. By A. B. Hadaway and F. Barlow.

Applications of D.D.T. to Vegetation. By A. B. Hadaway.

Colonial
Economic Research Committee
First Annual Report
(1947-1948)

The London School of Economics
and Political Science,
Houghton Street,
Aldwych,
W.C.2.
8th June, 1948

Sir,

I have the honour, on behalf of the Colonial Economic Research Committee, to transmit to you the first report of the Committee, covering the period 1st April, 1947 to 31st March, 1948.

I have the honour to be,

Sir,

Your most obedient Servant,

ARNOLD PLANT,
(*Chairman*).

The Right Honourable A. Creech Jones, M.P.
Secretary of State for the Colonies.

COLONIAL ECONOMIC RESEARCH COMMITTEE.

Membership

PROFESSOR SIR ARNOLD PLANT, B.Sc. (Econ.), Sir Ernest Cassel, Professor of Commerce, University of London (London School of Economics) (*Chairman*).

PROFESSOR G. C. ALLEN, M.Com., Ph.D., Professor of Political Economy, University of London (University College).

PROFESSOR A. J. BROWN, M.A., Professor of Economics, The University, Leeds.

MR. H. CAMPION, C.B.E., M.A., Director of Central Statistical Office, Offices of the Cabinet.

PROFESSOR S. H. FRANKEL, M.A., Ph.D., D.Sc. (Econ.), Professor of Colonial Economic Affairs, University of Oxford.

MR. R. GLENDAY, M.C., M.A., LL.B., Federation of British Industries.

MR. R. L. HALL, M.A., Director of Economic Section, Offices of the Cabinet.

MR. H. LEAK, C.B.E., B.A., Head of Statistics Division, Board of Trade.

PROFESSOR W. ARTHUR LEWIS, B.Sc. (Econ.), Ph.D., Professor of Economics, Victoria University of Manchester.

MR. E. A. G. ROBINSON, M.A., Lecturer in the Faculty of Economics and Politics, University of Cambridge.

MR. P. A. WILSON, M.A. (Acting Secretary).

COLONIAL ECONOMIC RESEARCH COMMITTEE

FIRST ANNUAL REPORT

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COLONIAL ECONOMIC RESEARCH COMMITTEE

FIRST ANNUAL REPORT

I. INTRODUCTORY

1. The report of the Colonial Research Committee for the year 1946-47 (Cmd. 7151) described the circumstances in which a new committee, entitled the Colonial Economic Research Committee, had been established to carry on the work previously entrusted to a sub-committee of the Colonial Economic Advisory Committee.

2. During the year 1st April, 1947, to 31st March, 1948, the Committee held three meetings.

3. Professor J. E. Meade has resigned from the Committee on relinquishing his appointment as Director of the Economic Section, Offices of the Cabinet, and has been replaced by Mr. R. L. Hall, his successor in that Office. On his return from the United States, Mr. Campion, Director of the Central Statistical Office, succeeded Mr. J. Stafford, who served as a member of the Committee during Mr. Campion's absence. Professor W. Arthur Lewis has been appointed a member of the Committee.

II. THE PLANNING OF RESEARCH

4. The year under review has not proved a particularly fruitful one. The task of generating interest in colonial research, attracting qualified research workers into this field, and planning actual research projects, is one which requires constant attention and much preparatory work. To this end the Secretary of State had already, before the Committee came into existence in its present form, made a scheme to provide the Committee with the services of a whole time Secretary, who could develop the necessary contacts with the relevant departments of the Colonial Office, with Colonial Governments, and with centres of learning in this country and elsewhere. But in view of certain prospective changes within the Colonial Office no appointment has so far been made.

5. Research in economics, unlike some other branches of the social sciences, is to some extent an automatic by-product of day-to-day administration in the Colonial Office and Colonial Governments, which inevitably throws up much statistical and other material of great economic interest. Such material is however "raw" material, requiring to be analysed or processed before its significance can be appreciated. The processing of such data for administrative purposes is again part of the normal routine of a Government Office. The scope of such routine analysis is necessarily circumscribed by administrative needs; but during the year under review the need for economic research of this kind within the Colonial Office has grown very markedly as a consequence of currency difficulties and of development plans, and has resulted in the formation of an Economic Intelligence and Planning Department, located within the Office, and having attached to it two research officers and two assistant research officers. In these circumstances it was considered that the best solution would be to await the establishment of the new Department and then to merge the secretariat of the Committee with it. Plans to that end are now being made.

III. RESEARCH PROJECTS

6. The result of these decisions has been that the work of the Committee during the year has been largely confined to the supervision and prolongation of research projects initiated under the auspices of the Research Sub-Committee of the Colonial Economic Advisory Committee. The field work in connection with Miss Ady's study of the *Occupational Structure of Representative Communities in the Gold Coast as influenced by war-time Government expenditure*, and with Miss Deane's examination of *National Income, Production and Expenditure in Northern Rhodesia and Nyasaland* has now been completed. Miss Deane's report on her work is also nearing completion and the Committee hope that both these studies will soon be published. A scheme for a series of studies by Dr. Charlotte Leubuscher of *Factors affecting the location of industries processing Colonial primary products* has made steady progress during the year. Dr. Leubuscher has submitted reports on cocoa, copra, palm-oil and palm kernels, and ground-nuts, sisal, and sugar. Arrangements have been made for the publication of these reports one by one in the *Bulletin* of the Imperial Institute. It is hoped that in due course arrangements will be made for the eventual publication of these and subsequent reports in a single bound volume. On the recommendation of the Committee, and after discussions with the Commonwealth Relations Office, a scheme was made during the year to finance an *Agro-economic Survey of Swaziland* by Mr. V. Liversage in conjunction with officers of the Swaziland administration. Mr. Liversage, who was previously agricultural economist in Kenya, was seconded for this purpose by the Ministry of Agriculture of Northern Ireland. Mr. Liversage's report is now being studied.

7. At the close of the year two other projects were under consideration which it is hoped will be launched during the coming year; a study of colonial monetary systems and a study of the finance of capital development in parts of tropical Africa.

8. The Committee have co-operated with the Colonial Social Science Research Council in projects launched under the auspices of that body and in the establishment of departments of economic and social research attached to Colonial universities.

