

RECOMMENDATIONS FOR THE
ORGANIZATION OF COLONIAL RESEARCH
IN AGRICULTURE, ANIMAL HEALTH
AND FORESTRY.

A Report by the Committee for
Colonial Agricultural Animal
Health and Forestry Research.



COLONIAL OFFICE

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A REPORT BY THE
COMMITTEE FOR COLONIAL AGRICULTURAL
ANIMAL HEALTH AND FORESTRY RESEARCH

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RECOMMENDATIONS FOR THE ORGANIZATION OF COLONIAL RESEARCH IN AGRICULTURE, ANIMAL HEALTH AND FORESTRY

1. INTRODUCTION

THE COMMITTEE for Colonial Agricultural, Animal Health and Forestry Research was established by the Secretary of State for the Colonies for the purposes, among others, of advising on the general policy for research within the fields covered by its title, on the provision required for such research, and on the scope and functions of regional and other research institutions in the Colonial Empire. We have, therefore, considered it appropriate that we should state the policy upon which our recommendations will be based.

2. As recently as 1945 the subject of this memorandum was reviewed by a Sub-Committee of the Colonial Advisory Council for Agriculture, Animal Health and Forestry¹. We traverse much the same ground; and we could have simplified our task of writing by endorsing large sections of this report. But we have considered it desirable to present a self-contained document avoiding cross-references tiresome to the reader.

3. Two recommendations of the Sub-Committee's report—in addition to that which led to our establishment—have been accepted in principle by the Secretary of State: namely, that a Colonial Research Service should be set up, and secondly, that agricultural research in the Colonies should be organized as far as possible on a regional basis. The memorandum is mainly concerned with planning the measures to carry out the second of these two points of policy.

4. We are well aware that agricultural research is no new thing in the Colonial Dependencies. "What we have to propose does not represent any fundamental change in existing arrangements; it is merely a step in the logical evolution of a process, of which the foundations were laid by the first Lovat Committee in 1926, and which was elaborated at the Imperial Agricultural Research Conference in 1927 and by the second Lovat Committee of 1928."² But a re-examination of the position is now overdue; and post-war planning for Colonial development has emphasized the need for expansion of research services that had, in any case, inevitably become attenuated during the war period. Furthermore, the provision of funds for research by His Majesty's Government, under the Colonial Development and Welfare Acts, will greatly assist the expansion that we advocate; although it is evident that these funds can serve only to augment provisions that will need to be made by the Colonial Governments, and not to replace them.

5. For conciseness, we shall use the word "Agriculture" to cover not only agriculture in the narrow sense, but also animal health and forestry, unless the context requires a limited connotation. The word "Colonies" includes the Colonies, Protectorates and Mandated Territories that make up the Colonial Empire; "Departmental Director" includes the Directors of Colonial Departments of Agriculture, Veterinary Services and Forestry.

¹ Report of the Sub-Committee of the Colonial Advisory Council of Agriculture, Animal Health and Forestry on "The Organization of Agricultural, Animal Health and Forestry Research in the Colonial Dependencies." C.M. No. 12, 1945.

² Loc. cit.

2. GENERAL PRINCIPLES IN ORGANIZING COLONIAL AGRICULTURAL RESEARCH

6. "The progress and development of Colonial Agriculture depends on two forms of activity, the constant accumulation of new knowledge and its wise application."¹ While it is our main function to advise on the manner of re-organizing and co-ordinating the former of these two activities throughout the Colonial Empire, we are fully conscious of the truth that, unless the new knowledge is applied to the practice of agriculture, the efforts devoted to research are sterile. Further, there is no finality in research, and the acquisition of knowledge must be a continuing process. The purpose should be, not solely to solve a range of scientific problems, but to build an organization for agricultural research that will endure as an integral part of the Government activities of each Colonial region.

7. We consider, therefore, that three principles should guide us in recommending measures for the future organization of agricultural research in the Colonies:

I.—That agricultural research shall be so organized and so maintained that it shall play its full part in providing the knowledge upon which agricultural improvement can be based;

II.—That the organization of agricultural research shall 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 shall be so organized that it is accepted as an essential and continuing activity in Colonial communities.

8. The first of these principles will be met only if two conditions are satisfied:

(a) That the tasks undertaken by the agricultural research service are so chosen that the knowledge gained will contribute in the fullest possible measure to agricultural improvement; and

(b) That the research service is fully efficient to perform these tasks.

We deal with these in Sections 3 and 4 below.

9. In order that the second principle shall be met, it is essential that there shall be complete understanding and co-operation at all levels between the research service and Colonial Departments. As users of research results, the Departments should not only play their part in pointing out the gaps in knowledge to be filled by research, but there should be constant collaboration to develop research results into terms of agricultural practices. To meet this need at the highest level we recommend the establishment of regional Agricultural Councils; but we believe that it may be one of the most important functions of such Councils to ensure that there is no barrier to collaboration between workers at all levels in the research and departmental services.

10. In order to ensure the continuity that is the purpose of our third principle, we consider it important that no impression be created that the planning and execution of agricultural research are not the intimate concern of the Colonial authorities. Mainly for this reason we advise against any proposal that funds made available by His Majesty's Government should be used primarily to set up a central establishment carrying out agricultural research in and for the Colonies, but administered and directed from London. This arrangement would tend to give to research the appearance of an alien activity imposed from outside. We believe it essential, on the contrary, that the responsibility of the Governments and the people of a Colonial region for

¹ Loc. cit.

establishing and maintaining research organizations be clearly recognised. The Committee for Colonial Agricultural, Animal Health and Forestry Research has an important part to play in assisting development along the best lines; it has functions of initiating and inspiring new research, of advising upon and criticising research programmes and of ensuring co-ordination; and, furthermore, of assisting in the selection of research workers, watching over their interests and keeping them in touch with developments in the scientific world. But it should not attempt to direct research in detail or to control research workers, which are functions that must be exerted by authorities on the spot.

3. THE NATURE OF COLONIAL AGRICULTURAL RESEARCH

11. The tasks confronting an agricultural research service in the Colonies may be classed under three heads:

(a) Basic surveys, aiming at the better identification of the problems for detailed research and contributing to the proper assessment of the agricultural resources and potentialities of the Colonies.

(b) The solution of the problems of agriculture that come under examination by the research worker as being *prima facie* amenable to scientific investigation.

(c) "Research directed to the maintenance of steady advance in those fields of application of science which are primarily related to agriculture, so that agricultural science may continually strengthen itself to deal with recognised problems of the industry, so that advantage may be taken of all fresh developments in pure science, and so that new ideas in agriculture may be stimulated."¹

12. With regard to (a), basic surveys are of great general importance as contributing knowledge essential to the proper planning of both research and development. These surveys may be considered to fall into several broad categories; e.g., surveys of inanimate resources, such as soils, water supplies, fertilizer resources, climate; of biological resources, such as plants and animals and their interactions; and socio-economic studies, such as studies of systems of peasant agriculture and of agricultural populations in relation to physical resources. We realise that many of these studies, and particularly the socio-economic studies, are the primary concern of others rather than the agricultural research worker. In the case of some, e.g., meteorology, it may suffice simply to bring the requirements of agriculture to the notice of those responsible for the collection of data. But we are convinced that an agricultural research organization must be deeply concerned in the conduct of some and in the results of all these surveys, which should form the solid basis of its research work.

13. The tasks considered under (b) and (c) cover a wide variety of research activities in the laboratory and in the field, ranging from straight-forward applied or "technological" research through what has been termed "basic" research, occasionally to truly fundamental research. No exact division on this basis is, however, possible; and most problems will call for each kind of research for its complete solution.

14. We have intentionally placed (b), implying an emphasis on applied research, in the prior position. We are conscious that in many Colonies agricultural improvement is held up by problems for the solution of which the basic knowledge

¹ Loc. cit.

already exists. Thus great immediate benefit may be expected to accrue from applied research; and we consider that it should be a primary duty of the agricultural research organizations to undertake this work.

15. In thus recommending a concentration on programmes tending towards the applied side of research, we realise that we are deviating from the policy laid down by the Imperial Agricultural Conference of 1927 for regional research. We believe that the ruling then made, that a regional organization should devote itself to "long-range" and "wide-range" research, tended in the event to dissociate the organization from close contact with the agriculture of the region.

16. It would be a mistake, however, to go to the other extreme and to insist that the research organizations should concentrate solely on applied work. The scientific health of an organization requires a proper balance between applied, and basic and fundamental research. The denial to the competent research worker of any opportunity to embark on original lines of research would cause discontent and make the service unattractive; and a failure of the flow of new knowledge from basic research would ultimately impoverish the applied research and reduce it to an uninspired routine.

17. We are confident, however, that, provided suitable encouragement is given to initiative in the workers, a balance will be reached naturally between applied and basic research. The occasion for deviations from a strictly applied programme will emerge as work progresses; and it is important that those in charge of research recognise these occasions and be ready to exploit them. They should be given discretion in framing their programmes to include reasonably wide research projects that, with a liberal interpretation, are relevant to the objectives of the organization.

18. Thus the advancement of knowledge that constitutes item (c) will come from researches that have emerged from a programme of work correlated closely with the agriculture of the region; and the fact that it has emerged in response to recognised needs will ensure that it is not too remote from practical needs. It will often be found that the more fundamental type of work can best be done at universities or research institutions outside the Colonies, where the workers will have the advantage of special apparatus and contacts with workers in many fields of science. But, on the other hand, there will be fundamental work that cannot be done outside the Colonial environment, and there will be need to provide for this in planning both the staff and equipment of regional organizations, and by arrangements for collaboration with Colonial universities or university colleges. There should, furthermore, be every encouragement to visiting workers who may wish to spend long or short periods in the region; even though the line of research that they may wish to follow may be remote from the immediate problems of agriculture, the presence of such workers is worth while for the mental stimulus that it can provide to members of an institution relatively isolated from contact with fellow scientists. We should, furthermore, welcome arrangements whereby Commonwealth universities recognised Colonial Research Organizations as places where a student for the Ph.D. degree might spend a part of his course.

4. THE CONDITIONS FOR EFFICIENT RESEARCH

19. Scientific research is a product of original thought and skill in experiment by the individual. It cannot be too strongly emphasized that organization can be no substitute for ability in the individual worker. The suitability of any form of organization for research will depend upon its capacity to provide conditions under which the individual will be willing and able to work at maximum efficiency. It will also depend

on its capacity to recruit a fair share of workers of the highest calibre; but recruitment will itself depend upon convincing the candidate for a research post, and those who advise him, that he will find in the Colonies the conditions necessary for efficient research.

20. We, therefore, set out below our views on the conditions that should be met by an organization for Colonial research.

(1) Satisfactory Terms of Service

21. The Secretary of State for the Colonies has under consideration plans to establish a Colonial Research Service. The terms for this Service, concerning which we have made independent recommendations, will aim at a basic uniformity of salaries with the United Kingdom Scientific Civil Service, with provision to bring the officer's emoluments to substantial equality with those of officers of similar status serving Colonial Governments. With this will be combined a transferable superannuation scheme, permitting movement into or out of the Service at any stage, without loss of rights to benefit. The intention is to recruit a part of the Service from among those wishing to make a career in the Colonies, and a part from among those of more mature experience who are prepared to serve for limited periods overseas. It is also hoped that officers already serving in Colonial appointments, who have shown an inclination for research, may be considered for transfer into the Colonial Research Service.

(2) Minimising Scientific Isolation.

22. We believe that the isolation in which many Colonial research workers have found themselves in the past has been a serious bar to efficiency. Some loss of scientific inspiration is inevitable when the individual moves from, perhaps, a British university to a Colonial environment. This drawback can be minimised by grouping research workers into regional Organizations, in place of scattering them, one or a few, at many territorial stations. A close association with Colonial universities and university colleges will also play a part. Opportunities for keeping abreast of modern scientific developments can be provided by maintaining and expanding a system of generous vacation and study leaves. Finally, through the existence of the Committee for Colonial Agricultural, Animal Health and Forestry Research, Colonial research workers will be assured that their work is not overlooked by the leaders of scientific thought in the United Kingdom.

(3) Reasonable Freedom in Research.

23. There are some who hold that organization and research are incompatible: that the research worker who is organized ceases to be more than a routine investigator, and that, with the loss of intellectual freedom, original thought tends to disappear. This may result from organization in research, but need not; and we believe that a form of organization can be devised under which research workers can give willing and efficient service. That is to say, a compromise is possible between complete freedom in research and research in which major objectives are proposed and accepted. Freedom in research requires that the research worker shall not be debarred from the pursuance of lines of work of his own choice. To grant such freedom might be held to risk losing sight of the main objectives. But, in fact, it is comparatively seldom that the occasion for any major deviation from an agreed line of research arises; and the majority of research workers are not unwilling to accept guidance in respect of the objectives of their research. Nor is initiative stifled, even though it be guided to a particular end. Where, exceptionally, a competent research worker is led to a major deviation from the agreed programme, it is seldom unprofitable to allow him to follow it.

(4) Confidence in the Direction of Research.

24. One essential feature of the form of organization that, in our opinion, will meet the needs of research is that the Director in charge shall be a man of science, who from his own experience in research, knows the possibilities and methods of research, the ways of research workers and their difficulties. We doubt whether anyone who has not been an active research worker for a part of his life can effectively lead a research team with the understanding and appreciation that will bring out the best of which its members are capable. It is important also that the Director's standing as a scientist should command the respect of those who serve under him. (He must also have other qualities to which we shall refer later.)

(5) An Assurance of Reasonable Continuity in Research.

25. The efficient research worker should be assured that, within reason, he will be permitted to prosecute a line of research to its conclusion.

(6) Responsibility in the Framing of Research Programmes.

26. Since the formulation, equally with the execution, of programmes of research is a matter requiring scientific knowledge and experience in research, the main authority for planning research should be in the hands of research workers. Although we recommend elsewhere that others be given the opportunity of advising in the selection of problems for research and in the allocation of priorities, the possibilities of each line of research and the manner in which it should proceed are matters on which the experienced research worker can alone form an adequate judgement. The research staff of an organization should be in a position to feel that they have contributed to the planning of the programme they are asked to execute.

(7) Freedom to Publish.

27. We believe that freedom to publish is as indispensable in applied scientific research as in pure scholarship. This freedom is highly valued by the research worker whose scientific reputation largely rests on his published papers. We recommend that all research workers should be free to contribute to journals of international circulation papers under their own names dealing with their scientific research, if accepted by the Director as of suitable merit.

(8) A Satisfactory Physical Environment.

28. On this question we need only refer to the obvious necessity of full facilities for the economical and efficient prosecution of research—adequately equipped laboratories and field stations dispersed through the main ecological zones—and of satisfactory provision for the housing, health and recreation of the staff. Full consideration should be given to modern developments in the design and air-conditioning of houses in the tropics, whereby the comfort and consequently the efficiency of the staff may be enhanced.

5. REGIONAL ORGANIZATION OF AGRICULTURAL RESEARCH

29. The Colonial Empire consists of some thirty Dependencies, varying widely in their degree of social and agricultural development, and in their needs for, and ability to use the results of agricultural research. "Some Dependencies lie together and in their inherent circumstances and agricultural development constitute what can be treated as 'regions' in considering the needs of agricultural research; others,

however, are remote and at present completely isolated from the research point of view."¹ We have to consider how best these varying needs can be met.

30. We are impressed by the advantages of organizing agricultural research in regions wherever this is possible. Relative to the area of the Colonies the number of research workers must always be small; but the scientific isolation that is to some extent inevitable can be minimised by grouping the workers into regional Organizations covering as wide an area as is practicable. Although the workers must still remain to some extent dispersed to the points where their research can most suitably be done, membership of a large Organization would give them ties with their specialist colleagues and the advantage of assistance from experienced seniors. Regional organization would provide for a larger and more varied body of specialists than it would be economical to employ in a single Colony. Furthermore, since many of the problems of adjacent countries are identical, they can best be solved by the concerted attack of teams regionally co-ordinated, rather than by individual officers or local teams not fully co-ordinated with others in adjacent countries.

31. The building up of a series of regional Research Organizations to serve the major Colonial regions cannot be other than a gradual process. There is at present a marked shortage of workers in all the sciences, and any hasty establishment of regional Research Organizations might be at the expense of quality in their staff. We consider, therefore, that any attempt to force the pace would not be in the best interest.

32. In East Africa agricultural research has, since 1927, been in progress on a regional basis at Amani; and since 1941, as a result of recommendations by the East African Standing Veterinary Research Committee, there have been similar steps towards organizing regional veterinary research. The foundations for expansion and re-organization on the lines proposed in this memorandum were laid at two Conferences in 1946² and 1947.³ The region covered will be primarily Kenya, Uganda, Tanganyika Territory and Zanzibar; but it is expected that a close liaison will be established with research workers in Northern Rhodesia and Nyasaland, within a framework of research now being worked out by the Central African Council. It is expected that Colonial Departments in British Somaliland, Mauritius and the Seychelles will look to East Africa for specialist help.

33. In the West Indies a number of separate research schemes, each of regional implications, have been centred on the Imperial College of Tropical Agriculture, Trinidad. It is possible that, from this beginning, a general regional Organization may emerge, serving the West Indian Islands and adjacent mainland Colonies in the Caribbean.

34. Other possible regional groupings for future consideration are the West African Colonies; and Malaya, Sarawak and North Borneo. Until regional Organizations are established, and in such Colonies as do not fit into any regional grouping, we recommend that the research needs continue to be met through research branches of the individual Colonial Departments; or, where suitable, by visits of research specialists or teams, either from appropriate regional Organizations, or specially appointed for the particular purpose.

35. We have given much thought to the question whether there should be a single Organization embracing research in agriculture, animal health and forestry, or separate Organizations for each of these subjects. We are in no doubt that the objective

¹ Loc. cit.

² "East African Research: Agriculture, Animal Health and Forestry." Proceedings of a Conference held in Nairobi on the 21st and 22nd March, 1946.

³ "Agriculture and Forestry Research Conference." Proceedings of a Conference held in Nairobi on the 29th, 30th and 31st July, 1947.

should be to ensure that research in the several facets of land use should proceed as a fully co-ordinated activity; and we recognise that to this end it will often be necessary that research workers in all three subjects collaborate as a team. The consolidation of all the sciences within a single Organization would ensure collaboration at all levels; and, in the view of the majority of us, this is the desirable aim. We recognise, however, that there are other factors to be considered; and consolidation may, in practice, be impossible. The objective we have stated above should be possible of achievement provided there is close collaboration between separate Organizations functioning as individual units. Where, however, separate Organizations are set up, it will be of the utmost importance to ensure that no barrier arises to hinder collaboration between the Directors and staffs of the several Organizations. An important means to the desired collaboration would be the siting of the headquarters and main laboratories of the Organizations in the closest possible proximity, so that personal consultation between all research workers, and mutual understanding and appreciation, may be facilitated.

6. REGIONAL CONSULTATIVE MACHINERY

36. In paragraph 42 we state our view that the special circumstances of a research organization require that it shall have a certain measure of independence; but it is equally essential that those in charge of research organizations shall consult those who administer or practise agriculture. We recommend that this need should be met by establishing a standing Advisory Council for Agriculture, Animal Health and Forestry in each region.

37. This Council should contain representation of the Agricultural, Veterinary and Forestry Departments of the Colonies forming the region, and of agricultural producers; and, on the research side, it should contain the Directors of Research Organizations and of important Commodity Research Stations, and a number of senior research officers. The exact pattern would be dictated by the circumstances of the region; and the only point that we consider it necessary to emphasize is that the representation of the several interests should be adequate to ensure that each has a full hearing.

38. The functions of the Council would be generally to discuss and advise on agricultural policy in the region, on the needs for research arising therefrom, and the priorities to be accorded; to examine and comment on research programmes presented by the Directors of Research; to receive reports of research completed and to advise on the means for ensuring that the results of research are applied to the practice of agriculture. The Council should be entitled to invite the attention of the Secretary of State to any matters that it might consider appropriate. It should be kept fully informed of the activities of any similar Councils that might be set up for medical, social or other sciences, and for higher education, thereby ensuring that no conflict arose in the policies advocated by each separate Council.

39. The Agricultural Council should not itself be responsible for framing actual programmes of research. This duty should be the responsibility of each Director of Research. We have already expressed our view, however, that the Director of Research should always consult his research staff in preparing programmes of research, and that his staff should be in no doubt that they will be called upon to contribute to their preparation. This need will usually best be met by establishing Research Committees, under the Chairmanship of the Director, within the Research Organization.

7. THE FORM AND CONSTITUTION OF A REGIONAL RESEARCH ORGANIZATION

40. We consider that the Research Organization should normally form a constituent unit in the group of common services where agreement has been reached to administer these through a single regional authority. We recognise, however, that in some regions circumstances may require a deviation to a somewhat different form. We do not consider this undesirable, provided the pattern meets the condition that we regard as essential; namely, that the Organization shall be established, administered and directed from within the region.

41. The post of regional Director is of cardinal importance. It calls for a man of exceptional attainments if the system is to work. As we have already stated, he should be a research worker of proved ability in his science; in addition, he should possess a sound agricultural background to enable him to appreciate the problems that arise in agricultural development. He should have considerable administrative gifts, be able to delegate responsibility and to bring the best out of his staff. Finally, he should be able to win the confidence of Colonial departments and unofficials with whom the regional Organization will have contacts. Such men will not be easy to find and in framing terms of service this point should be borne in mind.

42. The Director should have independent charge of the regional Organization and should be directly responsible to the appropriate authority in the region, not only for the execution of the research programme but also for the proper administration of the Organization, the expenditure of its funds in accordance with its estimates, the discipline and posting of its staff and the construction and maintenance of its buildings and stations. In addition, we consider it important that he should be free to correspond directly with the Secretary to the Committee for Colonial Agricultural, Animal Health and Forestry Research, and through him bring to the notice of the Committee any matters affecting the research work of the Organization. This arrangement would in no way diminish the Director's responsibility to the regional authority for the research and administration of the Organization; but we regard it as most desirable that a direct channel should exist for consultation on scientific matters between the Director and leaders of research in the United Kingdom.

43. We recommend that important decisions on research policy in respect of individual regions should not be taken in advance of the appointment of the Directors, on whom will principally rest the responsibility for implementing the policy and who should, consequently, have a voice in its formulation. The general research programme of a regional Organization must be strongly influenced by the circumstances, needs and opportunities of the region in which it is situated; and only after a Director has taken up his post in the region can he assess these factors and prepare a satisfactory programme. The Director should normally be the first appointment to a regional Organization; and research staff should only be appointed when he has had time to decide on the nature of the staff required to implement his programme and to prepare the laboratories, houses, etc., to receive them.

44. The regional Research Organization should be constituted basically of a Headquarters Division and a number of "branch of science" Divisions. The Headquarters Division would provide for administrative, library, editorial, statistical and engineering and workshop services. The Science Divisions would represent those sciences that the particular needs of the region required; thus within a purely agricultural Organization there would be Divisions selected from the sciences of Genetics, Entomology, Plant Pathology, Plant Physiology, Ecology, Soil Science, Biochemistry, and so on. Similarly in animal health there would be Divisions of Pathology, Animal

Physiology, etc. In forestry the sciences to be covered largely parallel those in agriculture, but the great complexity of problems arising in the forest call for special forestry training in the staff concerned. Each important Division should contain at least two senior research officers and the necessary complement of juniors.

45. It is important, however, that these Divisions should not work in any kind of isolation from one another. On the contrary, we consider that there would often need to be a parallel sub-division of the staff into teams on a "project" basis. For example, pasture research is a subject that may need to be handled by a team consisting of ecologists, plant breeders, plant and animal physiologists, soil scientists, bio-chemists and, perhaps, entomologists and plant pathologists. The leader of such a team might be a senior officer of one of the Science Divisions, or he might be a specially appointed officer experienced in pasture research. Each member of the team would be primarily a member of a Science Division and, therefore, responsible in technical matters to the head of his Division, and, if at headquarters, working in the Division's laboratory; but at the same time he would have a second responsibility to the team leader for directing his work along lines conforming with the team's programme. Where separate Organizations exist to cover the plant and animal sciences, a single project team will often contain workers from both Organizations.

46. It may be thought that this form of dual responsibility will lead to difficulties and prove unworkable. Provided that there is close consultation between the Directors, the heads of Divisions and the team leaders, we consider the difficulties should not arise. We can see no alternative that will ensure the best results. Thus, for instance, the Soil Chemist in a pasture research team must work in a soils laboratory; if supervised at all, his soils work must be supervised by a Soils Chemist and he must have the constant advice of his specialist senior in all his problems. But the team leader, who cannot be in a position to supervise the technique of each member of his team, must, nevertheless, be responsible for ensuring that the work of each member of his team proceeds along the general lines required by his programme. Often an individual officer will be a member of two or more teams, when the work of one team does not occupy his full time.

47. Of outstanding importance among "team" activities is that covered by the title of Crop and Animal Husbandry. It will call for integration of the research by plant and animal workers; and since its activities will be mainly on experimental stations of Departments, it will require the closest collaboration with Departmental officers. For the important post of head of this team it will be necessary to have a man who is not only a master of his subject, but has also personal qualities that will win the confidence of those with whom he must collaborate.

48. The physical establishment of a regional Organization should consist of a Headquarters with offices, main laboratories for each science Division, experimental grounds, and staff housing; and branch establishments as required in a range of ecological zones equipped with the laboratories, houses, etc., needed for the work undertaken and the staff employed. We assume that these secondary stations will usually be established at suitable Departmental Experimental Stations, by agreement with the Director of the Colonial Department, or at Commodity Research Stations. While, as we have already suggested, the field work of such teams detached from Headquarters will be in collaboration with the Departmental officers, we consider that it will often be advisable to allow research officers the sole control of relatively small areas of land for special work that cannot well be done on a co-operative basis. In cases where the Departmental Stations are unable to provide the facilities required, it may be necessary for the Research Organization to establish sub-stations under its own control.

8. THE RELATION OF THE REGIONAL RESEARCH ORGANIZATION TO COLONIAL DEPARTMENTS OF AGRICULTURE, ANIMAL HEALTH AND FORESTRY

49. We have already emphasized in paragraph 9 the paramount necessity of co-operation between Research Organizations and Colonial Departments in the region. Each has an essential part to play in a partnership working to the single end of agricultural advancement. An effective partnership requires that each partner shall understand the other's part and shall have confidence that he will play his part.

50. The keys, therefore, to successful agricultural advance are mutual appreciation and confidence. One important means to this is consultation. The regional Agricultural Council that we recommend will do much to remove the barriers to free consultation that tend to arise. Much will depend, however, on a good personal understanding between the Directors concerned; and, through their influence, on a similar understanding between all members of the services they control.

51. A second means to confidence is a clear definition of responsibilities. The establishment of a separate organization for research, where, as in many Colonies, research and administration have hitherto been under a single control, will require some adjustments of authority. These should be recognised in advance and freely accepted.

52. The primary functions of a Colonial Department—the implementation of agricultural policy in its many aspects—are well understood, and the responsibility of the Departmental Director is not in doubt. But in the field of research, in its widest sense, there is an overlap of functions between a Research Organization and a Department; and it is here that a definition of responsibilities is needed if misunderstandings are not to arise.

53. In the first place we should say that it is implicit in our proposals that the main responsibility for the planning and execution of agricultural research should devolve on the regional Research Organizations. We feel that the principle cannot be questioned that research will proceed with the greatest economy and efficiency if it is carried out or supervised by research workers, free to devote their whole time to research, and under the direction of a man experienced in the control of research. But we are fully aware that the Departments are staffed not only with a number of specialists but with trained agriculturists, veterinarians, etc., who are qualified to contribute much to the advance of research in a variety of ways, and are often able to do so in the course of, or incidentally to, their primary departmental duties. Furthermore, the research worker will often be dependent on the departmental officer for the provision of the material for his research.

54. In the choice of objectives for research, the Departments have an essential part to play. In consequence of their close association with the practice of agriculture and with the producers, they will generally be the first to recognise the outstanding problems and the best equipped to judge the relative urgency of their solution. On the Departments, therefore, should rest a responsibility to ensure that the Research Organization is fully aware of these problems, and, in the light of their special knowledge, to advise on the Organization's research programmes. Conversely, and more particularly if, as we propose, the specialist officers hitherto available to the Departments for research are partly transferred into the regional Research Organization, a responsibility must rest on the Research Organization to ensure that the problems in agricultural development which the Departments bring to light are given the fullest consideration in the research programme. The Departments would not concern themselves with the detailed planning of research, which is a matter that should rest with

the Director of Research and his staff. But they should have the right, and the duty, to advise on objectives and priorities. The proposed Agricultural Councils will provide the opportunity, at an official level, for full consideration of these points.

55. The process of developing a typical research project passes through a number of stages. The early stages will usually constitute work that can be done only by, or under the supervision of, workers possessing specialised qualifications. A stage will ultimately be reached, however, when this no longer applies; and the project then becomes one for "technological research", generally at an experiment station. A third stage is reached when the project becomes one for demonstration and advice to producers. Whereas the first stage is the responsibility of the Director of Research and the officers of the Research Organization, the last stage is the responsibility of the Departmental Director and his staff. The intermediate stage is essentially one for collaboration between the two authorities; and responsibility should rest with the two Directors in consultation.

56. A particular case of technological research, where the Research Organization and the Colonial Department are equally concerned, is that of the long-term experiment in husbandry, on agricultural systems, the use of fertilizers, the management of animals and grassland and the like. Since these experiments must usually be done on Departmental Stations, executive authority over them should rest with the Director of the Department; but we consider that he should accept an especially close form of collaboration with the Research Organization in the planning, recording and interpreting of the experiments. To give the Research Organization such a form of limited responsibility for these experiments (while retaining the Departmental Director's executive authority) would ensure a continuity that a Department may often find difficult to maintain in view of the numerous other calls on its staff.

57. In contrast with what we have termed the "research project", which implies a search for knowledge of a somewhat wider and more general nature, there is a type of "investigation", which for reasons of limited, and often local, significance, and for lack of research staff, it is impossible to include in the Research Organization's programme. Such investigations will embrace agricultural and socio-economic surveys, short-term experiments in crop and animal husbandry, variety trials, the mass selection of crops (which, of necessity, will have a strictly limited and local value), and similar matters. These do not call for the direct service of the specialist research worker. They should remain the responsibility of the Departmental Director, whose freedom to embark on such work should in no way be restricted. We recommend, however, that it should be the policy of Departmental Directors to advise the Research Director of any investigations that they propose to initiate, to seek his advice on the conduct of such investigations and, perhaps most important of all, to keep him fully informed of the progress and results. For whilst we do not wish to stress unduly the need to avoid duplication of work on common problems, we feel that the Research Organization should, amongst its other functions, act as a repository for information on all research and investigations carried out in the region.

58. The re-organization that we propose may involve some redistribution of specialist staff. The Colonial Departments will continue to require a number of specialists on their establishments—such as entomologists, plant pathologists, etc.—for the technical work of administering control legislation, and to provide analytical, diagnostic and advisory services. It is essential that the Department should remain adequately staffed to perform these functions. But a number of Colonial Departments have, in the past, built up a cadre of research staff with the object of prosecuting research of the type that will now fall within the sphere of the regional Organization. We recommend that the Departments should agree not only to resign this research to

the new Organization, but also to transfer to it such specialist staff as are not an essential part of the Departmental machine.

59. The existence of a body of specialists in a Research Organization will lead to calls for advice on scientific matters outside the specific programme of research. We consider that these calls should be met to the best ability of the Organization. But it should not be overlooked that the Colonial Departments exist to give advice to agricultural producers and, while the Organization should be ready to assist when requested to do so by a Department, it should take care not to advise producers directly except by agreement with the Department concerned. Industries served by Commodity Research Stations will naturally look to these Stations for advice on their problems.

9. THE RELATION OF REGIONAL ORGANIZATIONS TO COMMODITY RESEARCH STATIONS

60. In many Colonies there have developed Commodity Research Stations under auspices that place them to varying degrees outside the Government machine. Examples are one-crop Stations, as for cotton, rubber, or cocoa, where finances are provided, wholly or in part, by producing or consuming industries.

61. Such Stations are usually under the control of Governing Bodies whose authority to determine policy is not in question. We commend to their consideration, however, the advantages likely to accrue from a close liaison with the Agricultural Research Organization, if one has been established in the region. We have already recommended that the Directors of major Commodity Stations should be invited to serve on the regional Advisory Council; and, conversely, we suggest that the Stations might benefit by co-opting the regional Director of Research on to their Governing Bodies. Furthermore, we believe that the Commodity Station might often find it convenient to come to an arrangement for the Research Organization to second to it research staff for prosecuting particular enquiries. We should welcome developments that led to a free movement of officers from the Research Organization into and out of the Commodity Station, as the problems requiring attention changed in their nature and emphasis.

62. The work of the Commodity Station, which must necessarily be of an applied character, will often reveal problems requiring basic research for their solution. We should welcome requests from the authorities of the Station for such work to be undertaken by the Organization, if, as will often happen, its equipment and more varied staff place it in a better position to prosecute efficiently the required research.

10. RELATION BETWEEN REGIONAL RESEARCH ORGANIZATIONS AND COLONIAL INSTITUTIONS FOR HIGHER EDUCATION

63. We consider it to be important that satisfactory relations should be established between Research Organizations and Colonial universities and university colleges. On this matter we endorse fully the views expressed by the Commission on Higher Education in the Colonies in Chapter VI of their Report.¹ It is there emphasized that the new Colonial universities should be recognised "not only as agencies for instructions, but as centres of research". It is especially important that

¹ Report of the Commission on Higher Education in the Colonies. Cmd. 6647, 1945. (H.M.S.O. Price 2s. By post 2s. 2d.)

a Director of Research should constantly bear this in mind and should assist in any way possible in the establishment in the developing universities of strong research schools in the sciences bearing on agriculture. We should deplore the appearance of any spirit of rivalry.

64. The Research Organization and the university can be complementary to one another. As is emphasized in the Commission's Report, "it is fundamental research which is proper to a university." On the other hand, much of the work of the Organization, which is on the applied side, is of a type that cannot suitably be delegated. We believe that the university will often welcome the opportunity to study fundamental problems bearing on agriculture; and the Organization should not neglect to bring to the notice of the university problems requiring fundamental research that may emerge in the course of its agricultural work.

65. The Research Organization can derive much from a close association with a university; and where other circumstances allow, we recommend that research establishments be located close to universities. Contact with other scientific workers, sharing general interests but with somewhat different outlook, can be a valuable stimulus to a research team. We consider that every opportunity should be taken to organize meetings for the interchange of information and opinions between Government and university research workers.

66. While we regard teaching as a function outside the normal work of a Research Organization, we recognise that it may be desirable for research staff to give occasional lectures on the subject of their own research work and sometimes, for special reasons, to undertake the advanced training of specialist students. This latter arrangement may often be a temporary one, as, for instance, filling a gap during the phase of building up the university's full structure. We see no reason to oppose a proposal on these lines, provided that the effective prosecution of research by the Organization does not suffer by the calls on its staff for teaching duties.

67. A Research Organization should offer every possible facility for post-graduate students to work in its laboratories on research projects for higher degrees.

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