The Imperial Agricultural Research Conference.

A NUMBER of valuable reports and memoranda have been drawn up and circulated to delegates of the Imperial Agricultural Research Conference for their information and consideration. We print below some notes on points raised in these memoranda.

AGRICULTURAL OFFICERS OVERSEAS.

The recruitment in Great Britain for the agricultural services overseas has always been a matter of difficulty. Appointments were formerly few and irregular, and no arrangements were made to prepare men for them; with the result that, for many years, these services were more or less dependent on the flotsam and jetsam of English schools, that is, those who had not made good in Great Britain. Recruitment began to improve with the present century, in the establishment by Mr. Chamberlain of the West Indian service, and by Lord Curzon of the much larger one in India. Latterly, first India and then Egypt have closed their doors to the purely agricultural candidates, although they still appear to require scientific 'experts' in connexion with agriculture.

The finding of suitable men for the Colonial service was rapidly becoming an impossible task, when the Empire Cotton Growing Corporation started its career, with the creation of a number of attractive studentships in Great Britain, with the idea of providing a sort of pool of specially trained men, from which candidates could be drawn, when needed, for pushing the growth of cotton in British dependencies. When appointed, these men were attached to the local agricultural departments. The Colonial Office followed suit, and similar scholarships have been given for several years. A leaflet has now been placed in the hands of the delegates of the Imperial Agricultural Research Conference advertising the creation, among others, of sixteen to eighteen post-graduate scholarships "annually, at any rate till 1933 inclusive," by the Colonial Office, and twelve studentships by the Empire Cotton Growing Corporation for the current year. The difficulty in recruitment may now be regarded as solved, in that a career is opened up for any promising student who qualifies himself in any branch of science connected with agriculture.

Among the questions which have been discussed at the Conference is that of the position of scientific officers in agricultural departments and their relation to the administrative staff. Two memoranda on this subject have been submitted from Tanganyika. It is pointed out that the agricultural departments in the older tropical colonies have usually evolved from botanic gardens, to the staffs of which have been added a chemist, an entomologist, a mycologist, and in some cases a geneticist and an agricultural economist. The chemist frequently has his attention diverted from agricultural matters by demands for his services as an analyst or toxicologist, and the biological officers can rarely give adequate time to research owing to the amount of advisory work which they are expected to undertake. It is urged that the primary work of a technical officer should be that of an observer and investigator, and that his opportunities for travelling should be increased, to enable him to keep in close touch with the executive agricultural officers in the various districts, and the problems actually arising in the field. These officers, and the owners of plantations and farms who are willing to do so, should be invited to make observations on definite lines laid down by him, and thus increase the thoroughness of his investigations.

To enable such a policy to be carried out, it would be necessary to supply the technical officers with assistants who could carry on work at headquarters while they were travelling, and also to prepare technical memoranda for use in advisory work by executive officers. A memorandum from New Zealand on the same subject indicates that the adoption of such a policy in that Dominion has proved very valuable.

INFORMATION BUREAUX ON INDIAN AND COLONIAL AGRICULTURE.

The English public is not much interested in what goes on in India, unless perchance some Rajah visits England or there is a recrudescence of Hindu-Mohammedan religious riots. The main employment of the people, agriculture, is scarcely ever referred to in the daily Press; and, indeed, it would be looked upon as a very dull and uninteresting subject. But it is not really so, if properly presented; and it must be confessed that writers on scientific subjects are sometimes not very lucid. This point of view is stressed by the chief agricultural officer in India in introducing the report which he has prepared for the Conference. Starting at home, he asks for a publicity officer for the Indian Agricultural Department, to popularise the work being done, for all classes in the country. He goes a good deal further, and pleads for a closer liaison between all parts of the Empire for the same purpose; India and the tropical colonies on one hand, and the torrid zone and temperate regions on the other. In short, he suggests the establishment of a publicity bureau in London, to act as a popular clearing house of the results of agricultural research within the Empire—a very different thing, of course, from the publicity section of the Empire Marketing Board. The natives of most of our African Colonies grow crops similar to those in India, and largely under like conditions of climate. The hundred folio pages of this report on the present position of agricultural research in India, prepared by the heads of the various sections, on crops and their treatment, agricultural practices, cattle and all veterinary matters, should prove extremely useful to the officers engaged in trying to improve the undeveloped agriculture of our African Colonies.

One of the greatest difficulties in the study of agriculture in the British dependencies overseas lies in the matter of literature. The whole range of crops in the warmer parts are different from those in Great Britain, and text-books, except on certain individual crops, are practically non-existent. The literature, therefore, consists of journals and pamphlets. Even in London, it is often a matter of considerable difficulty to locate a particular pamphlet or report, although there are important collections in various places. The Colonial and India Offices both contain a considerable number of journals and pamphlets on agricultural subjects, but these appear to be primarily intended as official records, and are not arranged for the convenience of the occasional visitor. The Imperial Institute and Kew Gardens have also accumulated a large amount of material, and this is admirably arranged for study; while the Bureaux of Entomology and Mycology will have all the information required in their respective subjects.

There are also scattered collections of less importance, and the London agencies of different countries are generally willing to supply copies of such pamphlets as they have for distribution. But there is a rather urgent need for strengthening one of these centres, or creating a new one, where the student of any

crop or practice or country may, without undue labour, find all that he wants. This subject is presumably being explored by the Colonial Office, and if the publicity bureau for India advocated above is established, this bureau will in the natural course of events be located where such a library is formed. Attention to this subject has been directed by the circulation of a leaflet describing the Science Library in South Kensington, where some quarter of a million 'references' have been got together on 'Agriculture, Economic Botany, and Forestry.'

The difficulties experienced in the collection of information as to the agricultural research going on in the different parts of the overseas Empire had to be faced by the Organising Committee of the Imperial Agricultural Research Conference. The Dominions, including India, are large enough to employ a numerous and well-organised staff, and it is never a difficult matter to obtain excellent summaries of progress being made year by year. But this is not the case with the colonies, varying as they do from countries the size of France to a few minute and poverty-stricken oceanic islands; and it was a happy inspiration which led the Marketing Board, with the help of the Colonial Office, to circularise the various British colonies in the tropics, asking them to prepare and forward by a certain date summaries of the present position of agricultural research in them and the most pressing needs for its increase in their territorities. One can imagine the interest which this circular must have caused in some of them, the ready response, and the incentive to make as brave a show as possible for submission to the collective authority of the Imperial Conference.

A summary of these reports has been prepared by the Organising Committee in handy form and printed under the title "Agricultural Research in the Overseas Empire"; and a copy has been placed before each member of the Conference. Canada, Australia, New Zealand, the Union of South Africa, and the Irish Free State lead off with some 56 pages; and, with the exception of a couple of pages on Cyprus and Palestine, the rest of the 120 pages are generously devoted to tropical colonies, concluding with a note on the activities of the Empire Cotton Growing Corporation in various parts of the Empire. This pamphlet should be a veritable godsend to the student of British tropical agriculture, a subject hitherto overshadowed by the often excellent literature so freely dispensed by Java, Cuba, Porto Rico, Hawaii, and the Philippines.

As a kind of addendum to the summary of reports referred to above, a series of extracts have been issued in folio form, typed and bound, each dealing with a separate aspect of agricultural research in the tropics (it is obvious that it would be impossible for members of the Conference to go through the originals in the short time at their disposal in Great Britain). One of these "Memoranda" deals, for example, with "Crops and Plant Breeding," and includes extracts of special interest at the present time. Such are: Breeding as applied to long-term crops, such as cacao, coffee, palms, tea and rubber, which occupy the ground for many years; shifting cultivation and its replacement—a system under which isolated areas of bush or forest are felled and burnt, and for a year or two food crops are grown, after which the land is allowed to become jungle again; the effect of grass and wild plants or cover crops on long-term plants; the problems requiring investigation in West African cacao, which is grown as a forest by the natives over large areas, without any attention to ordinary agricultural practice; the problems connected with Burma rice, the main source of this cereal food in the British Isles; the effect of soil and climate on the quality of Nyasaland tobacco, from which country the bulk of our "Empire tobacco" comes; the efforts being now made to evolve new kinds of banana on account of the spread of the 'Panama disease' (the cultivated bananas do not usually form seed and are always reproduced for crop purposes by suckers, on the same principle as the sugar cane and our potatoes); while the concluding third of this memorandum of 47 pages refers exclusively to various problems which are met with in the Empire cane sugar industry, now severely threatened by the fiscal support given in almost all foreign countries in the tropics to their own sugar factories. Various other crops are merely mentioned at the end of the memorandum, including sisal hemp, coconuts, oil palms, and so on; and to this list is added the question of industrial alcohol, now of special importance because the production of petrol in the British Empire is so very small.

Investigations aided by the Ministry of Agriculture

The Ministry of Agriculture has issued for the use of the Conference two valuable publications describing the research work in agricultural science conducted at institutions in receipt of grants from the Ministry. The investigations deal with practically every important branch of agricultural science, and although conducted at many different centres, show little or no evidence either of overlapping or of lack of co-ordination. Only a few items can be selected for comment.

The question of the necessity for change of seed in potatoes is under investigation. The practice of employing seed produced under more rigorous climatic conditions is almost invariably adopted in England, and is supposed to prevent 'physiological degeneration'; however, no evidence of the superiority of yield of Scotch seed over home-grown seed has yet been obtained in careful tests over several consecutive years, provided the crop be kept free of virus disease. Although the yields of crops are more effected by season than by any other factors, a dull summer, such as the past one, is not necessarily associated with a low yield, as would at first sight be expected. In studies of barley one reason for this has been elucidated. In dull light the leaf surface is larger but less active in rate of food production than in bright light, so that the plant maintains a fair level of activity over widely variable weather conditions. Methods of statistical inquiry have been developed to deal with the data obtained from the field experiments, and their applications to results from the long-time Rothamsted experiments have brought to light previously obscure factors influencing the yield, thus enabling direct experimental tests to be undertaken. Besides climatic factors, variations in the soil conditions, even within a small area, affect the yield; the so-called 'even' crop of the farmer, if harvested and weighed in small plots, is in reality very uneven. Soil heterogeneity includes variations in physical, chemical, and biological characteristics. The latter two can only be shown at present by laboratory examination of numerous samples from the area in question, but the former is susceptible to rapid demonstration by measurements with a dynamometer of the soil resistance to a cultivation implement.

In the realm of animal husbandry, the famous permanent pastures of British agriculture have come under critical examination. The presence of wild white clover has been regarded as the essential characteristic of a good fatting pasture, and the earlier work was largely devoted to the encouragement

of leguminous plants by phosphatic manures, and basis slag in particular, with striking results. Afterwards it was shown that the effects were only observed to their full extent on originally poor grass land and under fairly high rainfall. Recently, the necessity for clover as an appreciable constituent of the herbage has been questioned. The work originated in Germany and has been actively taken up in Great Britain. It is claimed that by frequent applications of quick-acting artifical nitrogenous fertilisers, and by close stocking, a constant supply of young grass herbage is secured, which in both feeding value and amount is much greater than can be obtained by the older methods, thus enabling more head of stock per acre to be kept. Investigation is being made of certain technical difficulties that may arise, such as the effect of periods of drought, the prevention of rankness in the herbage due to the animal excreta, and the possibility of the soil becoming sticky or poached in wet periods by the treading of the animals.

A closely allied line of investigation is the examination of the mineral content of pastures. It has been found, especially in certain overseas regions, that serious diseases among stock are associated with a deficiency in the pasture of some essential element, *e.g.* iodine, normally present only in minute amounts. The study of these deficiency diseases, and the methods of remedying them, either by manuring the grazing area or by direct supply in supplementary rations of the missing ingredients, has necessitated the co-operative investigation of pathologists, chemists, and agronomists. This illustration of team-work among different investigators—and different institutions—is only one of many others to be found in the researches conducted with the financial assistance of the Ministry of Agriculture.

EMPIRE SOIL PROBLEMS.

Memorandum 8, issued by the Organising Committee of the Conference, contains the technical papers relating to soils and manures, which are up for discussion. Almost the whole field of pedological work is touched upon, though very naturally problems relating to tropical soils form a large proportion of the whole. The Parliamentary Under-Secretary for the Colonies points out our ignorance with regard to tropical soils and the important chemical and physical problems arising in connexion with irrigation and soil deterioration. The extensive and intensive methods of carrying out a soil survey are dealt with by Sir John Russell, who emphasises the need for standardisation of methods and for more general agreement as to the determinations which shall be carried out.

Practically all the Dominions and Colonies represented submit accounts of the work being carried out by them and the special difficulties and problems with which they are faced. From West Africa, as a result of a previous conference between neighbouring colonies, comes the request for the establishment of a Bureau of Soil Science the duties of which shall be the collection and collating of the results of soil investigations, the publication of approved methods of soil classification and analysis, and the provision of the machinery for assisting colonial agricultural chemists to carry on soil research to a point beyond that possible in their local laboratories.

As might well be expected, the assistance which soil survey work can give to irrigation problems comes out in several of the memoranda. Australia and the Union of South Africa both pay attention to the types of soil and the composition of the water suitable for irrigation, and the latter Dominion has some further interesting notes on exhaustion of soil by pine-apple cultivation. The Barbados review their own special soil problems connected with the sugar cane, whilst Ceylon discusses soil erosion, and Nyasaland the soil problems of tobacco growing. Altogether the memorandum presents a useful survey of Empire soil problems and will repay perusal by workers in Great Britain.

STORAGE AND TRANSPORT OF AGRICULTURAL PRODUCE.

Matters of outstanding importance relating to the preservation and transport of agricultural produce, and in particular of perishable fruits of Australia, New Zealand, and South Africa, were discussed at the Conference. It has been pointed out that if the problems of immigration and land settlement are satisfactorily settled, the total production of food-stuffs from British colonies can be greatly increased. At the present moment, only some five per cent. of fruit produced in Australia is exported, while for New Zealand and South Africa the successful marketing of perishable food-stuffs, produced in great quantity, is still exceedingly difficult.

It is matter for congratulation for all concerned that arrangements have been made for Dr. Franklin Kidd, of the British Food Investigation Board, to visit Australia for the survey of local problems, the investigation work already in progress, and the possibilities of further work. It is anticipated that on the evidence of his report extensive lines of new investigation will be initiated.

The chief problems of transport for Australia relate to frozen lamb, mutton, beef, poultry, rabbits, and fruit, all of which present considerable difficulty. It is well known, for example, that the time taken on the voyage from Australia to England is, in general, too long to enable the export of chilled beef to be commercially feasible; that this fact has for long been a serious handicap to the Australian cattle-raising industry, and that owing to low prices realised for frozen materials, the ordinary method of freezing does not provide a way out of the difficulty. Much will depend on the matter of Dr. Kidd's report, as it is clear that improvements are called for in the pickling of meat, the treatment of slaughter-house wastes, and the defrosting of beef. Regarding fruit, much valuable information is now available relating to brown-heart in apples, the atmospheric and temperature conditions existing in ships' holds carrying apples from Australia, the storage properties of Victorian varieties of apples, and the incidence of the conditions known as 'bitter bit,' 'scald,' and 'internal breakdown.' The experience acquired in the investigation of such matters should be of infinite value when the problems of preservation and transport of oranges, pears, peaches, apricots, grapes, and tomatoes have been more fully assailed.

The problem of apple storage for New Zealand is also one of prime importance. The main damage to exported fruit is due to 'brown heart,' while in local storage there is extensive 'flesh-collapse' due to low storage temperature combined with high humidity. It is gratifying to note that improvements in storage have been assured and are further prefigured by the reduction in the water-content of apples. It cannot yet be said that the preservation of pears is satisfactory, but much practical success has followed storage at comparatively low temperatures. It has been shown that orchard conditions greatly affect the ability of the fruit to withstand bad storage conditions, and that in certain cases prematurity of the fruit tends to occur with extreme susceptibility to 'flesh-collapse.' It is hoped that this difficulty may be overcome by storage under relatively high temperatures and low humidity. It would further appear

that increasing the water-holding capacity of soils on which prematurity regularly occurs may enhance the resistance of fruit to 'flesh-collapse,' and that on such soils green manuring is decidedly advantageous.

In a paper to the Conference communicated by Dr. E. A. Griffiths, Government Physicist of the Department of Agriculture of South Africa, it was pointed out that it is neither practical nor sound to carry out investigations on fruit in England when such fruit has already undergone a period of long transport. On the other hand, the Dominions have neither the personnel of research workers nor the facilities for the conduct of the essential work. He urged that extensive investigation in England would help mainly to the understanding of the influence of respiration products on the storage of fruit and in the improving of technical methods in determining the conditions and effects of storage.

Agricultural Economics.

In a paper presented to the Conference on "Research in Economics for Tropical Countries," it was pointed out that since the raising of crops is the main industry in tropical countries, research must be carried out in agricultural economics. Tropical planters turn out partly manufactured produce, *e.g.* sugar, coffee, or sisal, and are thus confronted by a twofold problem. At present more attention is usually paid to the economics of the factory than to agricultural economics, and thus the gain in the factory is largely discounted by loss in the field. When profits are good, work is often uneconomically performed, and thus when bad years come it is difficult to prevent disaster. In such cases the action necessary depends on the nature of the crop, though the general aim must be to control the quantity of produce reaching the market, *e.g.* coffee valorisation and rubber production restriction.

In the tropics, methods of research—which must be concerned largely with cost accounting—are usually simpler than in temperate climates, as it is usual to farm one main crop only and that generally for export. Research in agricultural economics is necessary, and should be a public charge. To provide information, an agricultural census, the co-operation of planters, and the provision of agricultural colleges are required, while the formation of agricultural accounting societies like those at present under trial in Wiltshire might be beneficial.

In a memorandum by Mr. W. J. Lamont, Chief of the Division of Agricultural Economics and Marketing, Union of South Africa, consideration was urged of a scheme to provide statistics and other information required by agriculturists seeking new outlets for their products. Lack of such information has been frequently felt, as, for example, when a South African commission was inquiring into the possibility of increasing wine exports.

Some system is required whereby Britain and the Dominions may be provided with the latest available information about custom duties, trade agreements, restrictions on imports, and statistics of exports and imports, etc. Publication might be undertaken by the Empire Marketing Board or the *Board of Trade Journal*, with perhaps special supplements dealing with a different Dominion each month. Probably the best method would be to issue a special annual volume with monthly or quarterly supplements. If an annual volume were published, a few special articles might be included on such subjects as the Canadian and American wheat pools, the compulsory pooling of tobacco in the Union of South Africa, or the wine trade of the British Dominions. In conclusion, Mr. Lamont urged that the adoption of some such scheme would be of the greatest service to all the Dominions.

Suggestions for Co-operative Research.

In a comprehensive memorandum on "Co-operation in Agricultural Research," prepared for the Conference by R. W. Thornton, Director of Field and Animal Husbandry in the Union of South Africa, the following are among the subjects suggested as suitable for research on co-operative lines in various parts of the Empire: (*a*) The farming of Angora goats for the production of mohair, an industry which has seriously declined in recent years; (*b*) the relative cost and efficiency of horse versus mechanical transport for various farm purposes; (*c*) 'rust' in wheat, the principal factor limiting the production of this most important crop; (*d*) the production of legumes, particularly the soya bean, which could be grown in rotation with maize and might be produced in equal quantity in those parts of the Empire where maize is largely grown; (*e*) the ocean transportation of live-stock and agricultural products with the view of greater uniformity in regulations.

University and Educational Intelligence.

Bristol.—The opening of the new physics laboratory by Sir Ernest Rutherford on Oct. 21 was marked by a notable address by him on the significance of fundamental research and the splendid facilities which the laboratory affords for its pursuit. "Under such excellent conditions," he remarked, "we may confidently anticipate that this laboratory will fulfil the wishes of the donor by developing into one of our most important centres of training and research." What is now needed is the endowment of a number of research fellowships of about £250 a year each, to enable young men or women who have shown marked ability for research to carry out investigations in the laboratory.

At a special congregation held in the great hall of the University on Oct. 21, Prof. A. M. Tyndall, Henry Overton Wills professor of physics in the University, presented to the Chancellor, Lord Haldane, the following distinguished men of science for the honorary degree of doctor of science: Prof. Max Born, professor of theoretical physics, Göttingen; Sir William Bragg, director and Fullerian professor of the Royal Institution; Prof. A. S. Eddington, Plumian professor of astronomy, University of Cambridge; Prof. A. Fowler, Yarrow professor of the Royal Society; Prof. P. Langevin, professor of general and experimental physics, College de France, Paris; and Sir Ernest Rutherford, Cavendish professor of experimental physics, University of Cambridge, and president of the Royal Society.

Cambridge.—It is announced that Sir Arthur Shipley bequeathed some of his library to the Molteno Institute, the Balfour Library, and the Cambridge Philosophical Society.

Mr. F. H. Harrington, Sidney Sussex College, has been appointed Assistant to the Superintendent of the Museum of Zoology.

A grant of £150 has been made from the Worts Fund on the recommendation of the Polar Research Institute committee to the recent Cambridge expedition to Edge Island, Spitsbergen.

Mr. Norman McLean, fellow and tutor of Christ's College, and University lecturer in Aramaic, has been elected master of the College in succession to the late Sir Arthur Shipley.

Leeds.—The University Council has placed on record its grateful indebtedness to Sir Edward Allen