Agricultural Research in India.

"THE Annual Report of the Imperial Council of Agricultural Research for the year 1936-37" which has just been published, with commendable promptitude—a fact which considerably enhances its value to the general public—is a record of yet another year of strenuous and intensive work. The work of the Research Council embraces, it may be recalled, not merely problems relating to scientific agriculture but also to its practical and economic aspects which so materially limit the results of scientific research. Comprehensive as the various lines of the work have been in the past the report discloses that advance has been made along a much wider front than before; in fact so greatly have the activities multiplied that it is just as well that the Council should have thought it necessary to conduct a kind of stock-taking. For this purpose, the Council have invited Sir John Russell and Dr. Wright to examine the situation and advise regarding the lines of future progress and their visit to India for this purpose has been one of the outstanding events of the year. Their report will soon form the subject of discussion and consideration by the Advisory Body of the Council; many lines of the work already in progress and the results achieved have won their approval and appreciation and we have no doubt that their report besides being greatly helpful will bear more ample testimony to the excellence of the aims, methods and results.

The section on Animal Husbandry has greatly expanded its activities and bids fair to even outstrip the other sections—quite a contrast with the state of affairs some years ago—thanks to the great interest evinced by His Excellency the Viceroy in the welfare of the cattle of India. The second Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry which was held in December 1936, was an important event and the discussions embraced many important matters such as Veterinary Education, Animal Health and Breeding, Nutrition and Dairying. The report details briefly the decisions reached on these important matters, among which we may mention the one recommending more attention to the development of the various breeds of buffaloes as dairy animals, the formation of Fodder and Grazing Committees in the provinces to be co-ordinated by the Imperial Council, the progress made in the definition of important breed characteristics of Indian dairy cattle for the maintenance of Pedigree Herd Books, the proposals for opening a Central Veterinary College for the highest grade of veterinary education and the progress made in respect of the research schemes conducted by the Cattle Disease Investigation Officers appointed under this scheme. A Village Economic Enquiry on the production and consumption of milk was completed in the year and we look forward to the publication of the report of this enquiry which will furnish the economic background for the working out of a sound general policy for the improvement of cattle in India.

The Research schemes in respect of the various crops are dealt with briefly and the salient features indicated. Most of these schemes which had completed their original periods of sanction were given further extensions to avoid any break in the continuity of the work pending the report of Sir John Russell. Sugarcane and sugar come in for the largest share both in the number of research schemes and the amount of expenditure incurred, a fact fully warranted no doubt by the magnitude of the industry in India. We note that the comprehensive scheme for enquiring into the cost of production of crops has come to a close and the report is under preparation. This should be a veritable mine of information on the economic side of farming in most parts of India and its value will probably relate even more to these particular features than to the cost of production of sugarcane itself in connection with which the inquiry was initiated. The various Sugarcane Research Stations have all continued to work along the same lines as heretofore. Manurial trials in U.P. indicated 100 lbs. of nitrogen per acre as the limit of profitable application for sugarcane while experiments in the Bombay-Deccan show that even at 300 lbs. per acre the optimum dose has not been reached and doses up to 600 lbs. per acre are being investigated. Cane-breeding in Mysore demonstrated the possibility of using X-rays for the production of a number of new bud variations; the Coimbatore varieties demonstrated their adaptability in all the stations, and one of them namely Co. 419 has given an out-turn of 54 tons per acre. The sugar section of the Harcourt Butler Technological Institute has been converted into the Imperial Institute of Sugar Technology, the cost to the Central Government being estimated at Rupees 14 lakhs to be spent over a period of five years. As a teaching and research Institution in Sugar Technology we hope the Institution will develop into one of the foremost institutions of the kind in the world. We note among the research items of the Institute reference to more than one method of utilisation of molasses including the recovery by chemical means of all the valuable ingredients. Let us hope that practical methods will be devised to work it successfully, for this method of molasses treatment cuts the problem at the very root. In connection with its utilisation as a cattle feed, feeding trials are in progress with six different kinds of feed mixtures. Obviously in a country where the deficiency of cattle feeds is a chronic and crying problem this method holds out probably the greatest promise.

Horticultural Research occupies an important place among the year's activities and has related not only to problems of cultivation but to storage and preservation. It has been demonstrated that many of the choice varieties of the mango give promise of good keeping quality in cold storage and that fully ripe and yellow Nagpur oranges can be kept in good condition for three months in cold storage. The subject of gas storage of fruits and vegetables was also considered and an officer deputed to Cambridge for training in the technique of this method. In the U.P. fruit station it has been found that two of the East Malling apple stocks reputed to be resistant to woolly aphis have proved to be vigorous growers and to maintain their resistant quality. In the Punjab, a scheme for the preservation of fruit and vegetables was

being worked and good progress made in the preparation of Citrus squashes, Cordials and Tomato Ketchup, while work on the canning of fruits and vegetables, drying and other methods has been in progress. Important work in fruit culture, canning and fruit preservation are foreshadowed for the fruit research stations in the N.W. Frontier Provinces and Baluchistan. Let us hope that many of these will prove a much-needed ally to the Indian Sugar Industry, in regard to which the spectre of overproduction is already in sight, by affording a new outlet for sugar. The important subject of pests and diseases especially of the Citrus have been the subject of research in the Punjab and the N.W. Frontier Provinces in the latter of which a survey of the insect pests of fruit trees with special reference to the Sanjosé Scale is in progress. Work in the former indicated that Chlorosis can be controlled by the injection or spraying with highly dilute ferrous sulphate solution.

The subject of dry farming, important over a large section of the country, is now being studied in five stations in the Bombay, Hyderabad and Madras provinces, and the problems of run-off, penetration, and underground moisture have been intensively studied. The loss of soil due to run off in unprotected fields in the black cotton soil tract in Sholapur is put down at the amazing figure of 115 tons per acre after one or two days of heavy rainfall. Considerable practical value is claimed for the Bombay system of dry farming tried in these stations, and the method can perhaps be now recommended for general adoption. Soil research has related to many fundamental problems, nitrogen fixation, colloid constituents of soils, the relation of soil moisture to crop yield, the organic constituents of soils ; the subject of photo-nitrification on which views are divergent is being further pursued, as well as, that of soil nitrogen increase due to the application of molasses and other carbonaceous substances to the soil. In respect of wheat, provision for the establishment of a milling and baking laboratory at Lyallpur is a noteworthy development. Quality in rice, the malting of cholam, fairly extensive work on oil seeds both in the research stations and on the technology of vegetable oils in the Harcourt Butler Technological Institute, the cultivation of medicinal plants and of pyrethrum, the breeding of fresh-water fish in Bengal, potato breeding experiments, rust, research on wheat and other matters of research have continued to receive attention. Locust Research which is one of the major activities of the Council has continued its many-sided attack on the problem and it is now proposed to transfer the work to the Government of India, probably as a permanent organisation.

On the economic side certainly the most important section has been that of Agricultural Marketing. The surveys with which this section commenced to work have been completed in respect of all the main commodities. Several new commodities were also included in the list during the year and the main surveys in most of the provinces were completed. The Report on Wheat has already been published and others are said to be in an advanced stage of preparation. We would suggest the publication without delay of the various provincial surveys, for, irrespective of the final action which the Council may take the surveys will certainly interest the trade in general and the *entrepreneur* in particular who may meanwhile be expected to utilise the information in a manner calculated to improve the trade and production in these articles. A measure of great practical importance in marketing is the passing of the Agricultural Produce Act of 1937 by the Central Legislature ; rules prescribing grade designation, definitions of quality, methods of marketing, packing, etc., for tobacco, grapes, eggs, hides and skin were issued under the Act and the Stamp " Agmark " either alone or inside the map of India has been adopted as the " national mark " for graded produce. It is essential, we think, that the public should be appraised of the superiority of such graded produce so that it may fetch a higher price in the market and thereby bring about a general resort to this improved trade method. Without the incentive of a higher price it will be useless to expect any general adoption of this practice. We would suggest that a special advertisement campaign with regard to this kind of produce should be carried on simultaneously. Having had occasion to personally inspect the egg grading station in Travancore we would extend a special meed of praise to this work. One of the most important developments in the year is the action taken for affording cold storage facilities on a large scale, the initiative having been taken by the Army Department. The marketing section of the Council have actively co-operated and it is very gratifying to know that a chain of such cold storage depots will soon be erected in all the important stations in Upper India. Worked in conjunction with cold storage railway vans for the transport of perishable produce this new development will afford most substantial help to the grower of all kinds of perishable produce and in welcoming the development we will plead for the erection of similar depots in some of the large South Indian centres also.

The Publication Branch has in addition to the three journals *Agriculture and Livestock in India*, *Indian Journal of Agricultural Science* and *The Indian Journal of Veterinary Science and Animal Husbandry* brought out quite a useful " Handbook of Statistics for use in plant breeding and agricultural problems " and a number of miscellaneous bulletins. We also note more than one new feature in the *Agriculture and Livestock in India* especially the series of popular articles. The report is a comprehensive summary of the work done on a very large number of subjects. Each one of these is of great interest and importance to Indian Agriculture and in a brief review one could obviously do little more than touch upon a point here and a point there. The report must be read to realise the very wide and rapidly expanding scale on which schemes of agricultural improvement are being planned and worked by the agency and with the funds mainly of the Central Government as distinguished from the activities of the Provincial Governments.

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