

PROGRESS OF AGRICULTURAL RESEARCH IN INDIA

THE Ninth Annual Report of the Imperial Council of Agricultural Research covering the period 1st April 1938 to 31st March 1939, as usual, gives a brief account of the progress of the numerous research and other schemes carried out under the auspices of the Council. In the personnel of its officers the Council loses the services of Sir Bryce Burt, its experienced and energetic Vice-Chairman, who as the doyen of the Agricultural Service in India was an exceptionally valuable asset to the Council during the years he was connected with it. Sir Bryce Burt retired at the end of the year and at the beginning of the year his retirement was preceded by that of Col. Sir Arthur Olver who as the Council's Expert in Animal Husbandry, was able to initiate and organise the many-sided research in that important branch of agriculture to which the report bears ample testimony. In regard to research schemes practically every important crop is covered with, of course, the exception of cotton and jute which are served by separate organisations and funds; likewise animal husbandry has been embracing a gradually widening range of subjects. Nevertheless there is the feeling that the tempo in this respect has slackened somewhat and that many important schemes though considered and sanctioned have to remain on the waiting list for a very long time. Several schemes were completed in the year and some which should have come to a close have been extended for further periods. The current schemes number one hundred with a budgeted expenditure of Rs. 1,04,25,080 while those which came to a close and were not extended had a budget of Rs. 22,09,860.

Research on rice occupies an important place among the schemes and the results obtained already in the different centres are said to be of much practical value under the different local conditions. Thus the Assam schemes have led to the production of deep water rices suited to three different levels, the seeds of which were released for general distribution. Age of seedling experiments in Bengal, improved strains suited to local conditions in S. Bihar and the Central Provinces, a method of breaking dormancy in rice seed in Orissa, the use of molasses as a manure for rice in the United Provinces, fertiliser trials in all the centres may be of mention from among the year's results of this kind while on the scientific side work related to the composition of leachings from rice soils, physiological studies, water requirements, factors in the flowering of rices and so on. Fertiliser trials reveal considerable difference as between one province and another; in Bihar an application of 60 lbs. of N and 60 lbs. of P_2O_5 gave a net profit of Rs. 35 to Rs. 40 per acre; in the Central Provinces the highest net profit per acre was with 20 lbs. of P_2O_5 and amounted to only Rs. 3-12-0 per acre, while in Orissa doses of nitrogen from 20 to 40 lbs. gave increased yields which however did not pay for the cost of manure. In regard to wheat, certain methods for the control of rust have been

advocated as the result of the investigations so far and these control measures are said to be under consideration for practical action. In barley several types have been sent from time to time to assess their suitability to the British market but no sample has been satisfactory in all respects; work on cholam malts was concluded in the year and methods of storing were worked out and its usefulness for infants and invalid children demonstrated. Fruit research schemes bulk largely and nearly every province and every kind of fruit is served. Among the results achieved may be singled out those relating to the cold storage schemes of Poona and of the Punjab which have been testing the suitability of different kinds of fruits and vegetables for cold storage; we look forward to useful results. While many lines of work have been taken on hand we feel that fruit pests and diseases are not receiving adequate attention; the chief and by far the most serious trouble with the fruit industry and one against which the grower feels helpless is disease and we think this should have the first claim as regards research for the devising of simple remedies. Among fibre crops sunn hemp is being studied; and the retting trials lead to some valuable practical conclusions which we hope will be tested by the actual cultivator and assessed for factory use.

Progress in research on oilseeds, including the diseases of the cocoanut trees in Travancore, on tobacco and potatoes has been slow. An officer was deputed in the year to the U.S.A. for studying the cultivation and preparation for market of tobacco, for a period of six months; two more such officers are also proposed to be sent; we think six months is too short a period for this purpose and also that the study should include the market in the U.K. in relation to supplies of Indian-grown cigarette tobacco. Soil research has related to fundamental problems; the new nitrogen fixation theories of Dhar on which much work was done are now pronounced not to be supported by experimental evidence. Much of the work in this section including that on the composition of town refuse is, we are glad to note, to be written up for publication. The dry farming researches seem generally to have yielded useful results, but in this, as well as in many other investigations, we feel that full use has not been made of work in the different departments especially of the earlier years. Sugar research continues to be the most comprehensive and enjoys the biggest budget. We are told that hereafter this work will receive a fixed proportion of the sugar excise duty realisations, amounting roughly to Rs. 11.2 lakhs per year. Very important investigations are in progress under this head; we would suggest separate short reports being issued on each of these both as interim and as final ones. The Institute of Sugar Technology admitted 19 students in the year for the various courses and 38 students completed their courses. In regard to the starting of the cultivation of cloves, action has been left to be

taken by the departments concerned, but we feel that unless some special attention is bestowed by the Council itself no satisfactory progress will be made.

The third meeting of the Animal Husbandry Wing of the Board of Agriculture was held in the year and a large variety of subjects was considered and schemes reviewed. The importance of mixed farming as an aid to fodder production was stressed and the grant of special funds from the Council to the provinces for this work was recommended. Cattle diseases like pleuro-pneumonia of goats, Johnes disease in dairy cattle, surra in horses, theileriasis of cattle, rinderpest of cattle, in goats and sheep, and Doyles disease of poultry were considered and further work on nearly all of them recommended. As a preliminary to pedigree registration the breed characteristics of seven important breeds were defined and the information was published in the year. In respect of sheep and wool, an animal nutrition scheme for Assam, investigation of poultry diseases, development of the fishing industry and apiculture and pig keeping, considerable preparatory work by the Council in the year is reported. We note that the proposal to open a Central Veterinary College for India has now been dropped. The

Report contains a review of the operations of the Agricultural Marketing Officers and the Central Marketing Staff.

In addition to the three journals being published by the Council quite a large number of monographs, reports and bulletins were issued during the year. A description of crop plant characters in respect of rice and cotton, the voluminous reports on the cost of production of sugarcane and cotton, and a report on the prospects of cinchona cultivation in India may be mentioned among the large number of publications in the year. Among other activities may be mentioned an enquiry into the agricultural and veterinary needs of Coorg with a view to developing the resources of this small but important tract. The Report bears ample evidence that the Council is performing a most important function somewhat on the lines of the Federal Department of Agriculture in the U.S.A. Though fundamental problems and those of all-India application alone may be deemed to come within the sphere of the Council's activities, we cannot help thinking that the extent to which the work leads to practical results and to general adoption should be watched and suitably provided for. A. K. Y.

THE DEVELOPMENT OF GALACTIC DYNAMICS AND SOME ALLIED PROBLEMS*

THE Address deals with the dynamics of rotating configurations, and its astronomical applications. It also deals with the theories regarding the origin of the solar system.

The earliest work on the Maclaurin spheroids and pear-shaped configurations of liquid masses is first mentioned. This leads on naturally to the work of Jeans on rotating compressible masses. Of a fundamentally different nature is the work of Milne, Chandrasekhar and others on the distortion of polytropic configurations of a rotating mass in relative equilibrium. The Address deals exhaustively with the work of Chandrasekhar, Von Zeipel and Kopal in this field. Recent work, stimulated by the author of the Address himself, has generalised the results to the case where the variation of angular velocity, in specifying the polytropic configurations of a rotating gaseous model, is taken into consideration.

One of the most important applications of the theory of rotating gaseous configurations is to the explanation of the spiral arms of spiral

nebulae. Of several such theories the oldest is that of Jeans, but this theory meets with a number of objections. Later theories are due to Brown, Vogt and Lambrecht, Wellman, Jehle and the most comprehensive work is that of Lindblad. Recent investigations by Banerji, Nizamuddin and Bhatnagar appear to give reasonable conditions for the formation of spiral arms.

The last part of the Address is devoted to modern theories of the origin of the solar system. After a brief mention of the planetesimal theory of Chamberlain and Moulton, and the tidal theory of Jeans as modified by Jeffreys, the Address deals comprehensively with the binary star theory suggested by Russell. The theory of Lyttleton and objections to it by Luyten and Hill, and further modifications by Lyttleton are explained in detail. A recent suggestion of Banerji of looking at the problem as a problem of three bodies in its general aspects has enabled Bhatnagar to come to the conclusion that the result of collision would be that the components of the original binary would themselves collide. This provides another objection to Lyttleton's theory of a nature different from that pointed out by Luyten.

B. S. M.

* Summary of Presidential Address.—By Prof. A. C. Banerji—Mathematics Section, Indian Science Congress, Madras, 1940.