

Agricultural Research in India

THE Imperial Council of Agricultural Research has, since its inception in 1926, identified itself to an increasing extent with the course of agricultural research all over India. The latest Report of the Council, for 1937-38, gives a good indication of the rapid growth that has taken place in the Council's research activities during the last 5 or 6 years. The Council has at present on its hands over a hundred schemes and is maintaining a staff of over 300 research officers. The total expenditure on these schemes came to over Rs. 17 lakhs, during the year under review, out of which Rs. 4.25 lakhs were earmarked for sugar research and were spent, partly for the maintenance of the Imperial Institute of Sugar Technology at Cawnpore and partly to finance various schemes relating to the improvement of the sugar industry in different parts of the country. The other major activities, which consume over a lakh of rupees per head, are marketing schemes (2.56 lakhs), veterinary and nutrition research (2 lakhs), fruit research (1.11 lakhs), cold storage (1 lakh) and rice research (1 lakh). About 78 thousand rupees were spent on locust research, 71 thousands on wheat and barley, 47 thousands on oil seeds, including a sum of 15 thousands given to the Harcourt Butler Technological Institute, Cawnpore, 46 thousands on potato, 14 thousands on tobacco and about 20 thousands for studies on soils and manures. Among other items, may be mentioned a sum of Rs. 25,900 spent to maintain the botanical sub-section at Pusa, a sum of Rs. 22,600 given for the Agricultural Meteorological Section at Poona, and 58 thousands given as grants to various scientific bodies outside India.

The great prominence till now given by the Council to researches connected with the sugar industry has no doubt been amply justified by the remarkable results achieved in developing the industry during the last 5 or 6 years, but the sugar boom is now practically ended and there is no reason why the further development of the industry should not be left to a special Sugar Committee, similar to the existing Cotton, Jute, Coffee, Tea and Rubber Committees. Sugarcane is probably the last of our agricultural booms, and it is unlikely that we shall witness any further examples of sudden large-scale development in a crop, except probably to a limited extent in oil-seeds, fruits and rice.

The most pressing problem, however, which would demand the Council's serious attention in the near future would consist in devising measures for increasing the production-capacity per acre of the present area under cultivation, for extending the area if possible and for setting up an organisation which could secure the best return to the cultivator for the produce of his land. The production value per acre in India is, as is well known, notoriously low when compared to other countries such as Italy, Spain, Holland, etc. It could be increased only by better and judicious manuring of the crop, by greatly extending the present irriga-

tion facilities and by popularising the use of improved strains. It may be said that most of this work properly falls within the ambit of the provincial governments, but there are several problems involved in the programme, which require to be studied on an all-India basis and the Imperial Council of Agricultural Research could best act as the co-ordinating agency which could tackle such problems, avoid overlapping and supplement local resources.

For securing the best utilization of the present area under cultivation and for reclaiming the areas at present designated as "cultivable wastes", it is necessary to have a preliminary All-India Soil Survey, on a properly predetermined plan. This could best be carried out under the auspices of an all-India body such as the Council, with the co-operation of provincial governments.

In this connection, the recent remarks of Sir John Russell in reviewing the work of the Imperial Council of Agricultural Research, may also be kept in mind, especially his plea for bridging the gulf between the laboratory and the field and for placing the question of increased productiveness as the central problem before the country. Among the other problems awaiting more systematic attention in the near future, Sir John has mentioned those relating to the improvement of the quality of food-stuffs, development of the dairy industry and encouragement of fruit and vegetable cultivation—all directed towards securing an improvement in the diet of the Indian people.

Sir John has also recommended a more systematic study of irrigation problems and of water relations between soil and crops, of questions relating to erosion and maintenance of soil fertility—all of which could best be dealt with by an All-India Soil Conservation Committee.

At present, the resources of the Imperial Agricultural Research Institute are not fully utilized for tackling the several fundamental and applied problems, which the Council has to solve. Though some problems of a purely academic type could best be given over to Universities and other scientific institutions scattered over the country, in order to create a general interest in them in agricultural research, there are numerous other problems closely interleaved with practical agricultural conditions, e.g., those relating to soils, manures, plant breeding, plant diseases, quality of crops, etc., which could best be tackled at a central Agricultural Institute such as the one at Delhi.

Another direction in which the Council could usefully extend its activities, lies in efforts at securing a better price to the cultivator for the produce of his land. This may be done by a more efficient system of marketing—beginnings of which have been already made by the Council—and also by finding other industrial outlets for agricultural produce. This latter aspect is already engaging the serious attention of economists and agricultural experts in West-

ern countries. Though India could usefully consume a much higher proportion of food materials than she produces at present, still in view of the depressed market for cash crops such as cotton, rubber, coffee, tea and sugarcane, and the early possibility of an all-round increase in the production capacity of our land per acre due to better manuring, increased irrigation facilities, etc., there is bound to be an increasing excess of agricultural production over consumption and the problem of how best to utilize the excess must be faced.

Agriculture is the chief industry of India and there is no reason why more efforts should not be made to find industrial outlets for our agricultural products. Space does not permit a discussion of the methods adopted in America, Germany and elsewhere in order to tackle this problem. Already the Imperial Council of Agricultural Research have got a few schemes of an Agri-industrial nature such as the malting of cholam, but further scope in this direction is immense.

C. N. A.

Indian Forest Mycology with Special Reference to Forest Pathology*

WORK done in India on forest tree diseases and the peculiar problems which they present have received little publicity and Dr. K. D. Bagchee, who is investigating them at Dehra Dun, dealt, in his Presidential Address to the Botanical Section, at considerable length, with what has been so far accomplished. In forest tree disease investigations, the root and stem rotting fungi, the canker pathogens, the nursery diseases and the rots of timber call for attention but none, perhaps, gives more anxiety to a forest mycologist than the rusts which cause a great deal of damage to young plantations, especially of conifers.

In the case of root and stem rotting fungi, the discovery of the primary pathogens responsible for the rots is of great importance. Bagchee finds that the rots, in more cases than one, are the result of the combined action of several fungi and bacteria, as in the case of the *gauj* disease of *sal* in the U.P. Terai. In the root-rot disease of *shisham*, he has definitely discovered that the primary organism of the disease is a species of *Fusarium*, though the fruiting bodies of *Ganoderma lucidum* and *Polyporus gilvus* have been invariably found at the base of dead or dying trees. Controversies regarding the pathogenicity of some root- and stem-rotting fungi have been finally set at rest, for Bagchee has shown that *Fomes annosus*, *Armillaria mellea* and *Trametes pini* do play an important rôle in bringing about some of these rots.

But the most important work done during

the past decade on forest tree diseases mainly concerns itself, however, with the rusts. Bagchee reports that there are fifteen rusts affecting the conifers alone in our Northern Indian Forests. As a rule, these are heteroecious and have their aecial stages on the narrow-leaved conifers and the telial stages (or the perfect stages) on the broad-leaved plants, usually dicotyledons. Intensive study by Bagchee of the two rusts, *Chrysomyxa deformans* and *C. piceae* on *Picea morinda* and of another *Chrysomyxa* sp. on *Pinus excelsa*, whose telial stages, strangely enough, occur not on the broad-leaved dicotyledonous plants but on the conifers themselves and whose aecial stages have not so far been discovered, has led to the inevitable conclusion that these rusts have adopted a microcyclic mode of existence abandoning the necessity of passing from one host to another to complete their life-cycles, as they are able to perennate in the mycelial form within the coniferous hosts.

In rusts which are not microcyclic, one of the important tasks of a mycologist is to find out the alternate hosts where the telial stages occur. Bagchee has been singularly fortunate in being able to establish this in three cases, the most important discovery being the matching of *Peridermium brevius* with a species of *Coleosporium*, which Bagchee proposes to name as *C. barclayense*, found on *Senecio rufinervis*.

It must not, of course, be supposed that all fungi found in the forests are harmful. Their rôle in converting leaves, logs, roots and other plant debris into humus and their part in renovating and enriching the resources of nature for the life and growth of new things, have been also briefly referred to.

M. B.

* Summary of the Presidential Address (Botany Section) by Dr. K. D. Bagchee, D.Sc., D.I.O., F.N.I., Indian Science Congress, Lahore, 1939.