

inadequate and is rapidly diminishing. The supply of teachers in grant-earning schools is at present largely derived from the pupils passing from the primary schools to the secondary schools, there to be maintained out of public funds almost entirely throughout their scholastic career. Education authorities, in their endeavours to obtain the necessary staffs, have adopted the doubtful policy of attracting pupils to the profession by the offer of educational facilities and increased maintenance allowances, in some cases despite the moderate standard of ability displayed.

However anxious the Government may be to embark on far-reaching schemes, it will fail unless the supply of the men who are to carry out those schemes is present; and the supply of men of the right type will not be forthcoming unless (1) a national minimum salary scale of really adequate terms is established for all teachers in secondary schools; (2) teachers are free to move from one area to another without loss of position, salary, and pension rights.

Such a system would do away, once for all, with the present enormous disparity in the salaries of different men with the same qualifications engaged in the same work and in similar areas.

The present time affords an excellent opportunity of introducing a system obviously necessary and long overdue. It is to be hoped that the Government will not adopt the futile policy of trying to patch up here and there, but will lay the foundation of a national structure in which every child shall enjoy, as a birth-right, the most suitable and valuable education compatible with its capability.

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#### SOIL AERATION IN AGRICULTURE.

SOME time ago (NATURE, February 24, 1916, vol. xcvi., p. 716) we directed attention to a paper by Mr. and Mrs. Howard, of the Agricultural Research Institute, Pusa, on the ventilation of Indian soils. "More air and less water" was then set before the native cultivator as the secret of successful crop production. With characteristic enthusiasm for his subject, Mr. Howard has since developed this idea in a lecture given during a meeting of the Board of Agriculture at Pusa, and now published as Bulletin No. 61 of the Agricultural Research Institute. Although discussed chiefly in relation to Indian conditions, and particularly the alluvial soils of the Indus and Ganges valleys, the subject in its broader aspect is of universal importance to agriculture. The heavy rains of the monsoon falling on these soils, which consist largely of small particles of fairly uniform size, cause the surface to run together and form a crust; the soil loses its porosity and aeration is impeded. The remedy advocated is the incorporation with the first foot of soil of *thikra* (tile fragments) at the rate of 50 tons per acre. Leguminous plants like gram respond at once to the improved aeration. Nothing is said as to the cost of this treatment, or if it can be applied commercially over considerable areas.

Java indigo is another leguminous plant of special interest, and about this Mr. Howard has a great deal to say in relation to soil aeration. He holds that the variable dyeing power which has greatly handicapped the natural indigo in competition with the synthetic product of the German factories is due to defective and irregular aeration. The indigo plantations of Bihar lie on the higher ground of an undulating country with rice in the valleys between. During the monsoon all the country becomes more or less water-logged except the crest of the ridges, and occasionally

some of these go under. The high-water mark is said to be rising at the rate of 3 in. a year, owing to increasing interference by embankments (canal, rail, and road) with the natural drainage of the country. Mr. Howard suggests that "when a railway has to run across a broad, shallow drainage line, it might pay to lay it flat and to let the water run over it. At most the interruption of traffic would not be a very long one." It would be interesting to hear what the permanent-way departments and traffic superintendents of the Indian railways think of this idea. Whatever the cure, it is evident that the activities of the civil engineer have been harmful to agriculture in some ways, and a good case is made out for a thorough study of the drainage systems of India from this point of view.

With regard to water supply, the author goes even further than in his previous paper, and suggests that some of the money now wasted on over-irrigation might more profitably be spent on aerating stations for the supply of oxygen to the insufficiently aerated water of the rice swamps. In this connection a sharp distinction is drawn between rice and other plants which is difficult to follow. It is said that while the former takes up its oxygen in the dissolved state from the swamp water, other plants, e.g. wheat, assimilate it as free oxygen. As the root-hairs of the wheat plant must be in contact with moisture if they are to function properly, it is probable that oxygen, like other plant foods, passes in solution through a film of water surrounding the roots. Wheat, barley, and peas all grow well in water culture so long as the nutrient solution is kept aerated. If the supply of dissolved oxygen falls off, the plant suffers at once, even if the upper roots have access to free oxygen. The distinction between swamp rice and wheat seems rather to be that the former requires much water and relatively little oxygen, while the latter needs a moderate amount of moisture and much oxygen. Under favourable conditions wheat obtains this by the rapid passage of the gas through the water films surrounding the roots and soil particles.

Turning homewards, the variation in the quality of malting barleys grown on different British soils is shown to be due to soil aeration. The best malt comes from the light land where natural aeration is good. One effect of the expensive organic manure used by market-gardeners and hop-growers is to increase the aeration of the soil and encourage root development. It is suggested that a permanent aerator like the Indian *thikra* might achieve the same result at a lessened annual charge for manure.

We have only touched on a few of the many interesting points raised in Mr. Howard's lecture, which deals with one of the most important factors in crop production. Although the necessity for soil aeration has been unconsciously recognised ever since man first drove a spade into the earth, because of its very obviousness agricultural science has scarcely given the subject the attention it deserves. E. H. R.

#### THE INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE.<sup>1</sup>

THE genetic relation between the serious pursuit of natural science and the profession of medicine is nowhere better illustrated than in British India, and in British India nowhere better than by the Asiatic Society of Bengal (the original "Asiatic Society"), and by its autochthonous congener, the Indian Association for the Cultivation of Science, founded in 1876

<sup>1</sup> Report of the Indian Association for the Cultivation of Science for the Year 1914. (Calcutta, 1916.)