laborious, and has been out of fashion, but it is being taken up again. Real progress is being made with the study of phosphorylase, the enzyme responsible for the reversible conversion of glycogen or starch into glucose. The reviews make little mention of the synthesis of starch from glucose phosphate in this way achieved by Hanes at Cambridge: it is the most outstanding piece of work of the last year or so.

Hormones and vitamins still cause the publication of thousands of papers: it is to be doubted whether Lord Woolton reads any of them. Here and there is progress, also much doubtful work; it will require another ten years work to see the plain where the trees once stood in this subject; the reports give them 150 pages.

Nutrition is the subject of greatest importance to-day and to-morrow, and there is just a chance that something of real value to the peoples of the world may come out of the work. There are good reviews on nutrition of man, animals and plants, including the burning questions of soil deficiencies and minerals. These are highly controversial questions, and the practical farmer does not always accept the conclusion of the scientific worker. If only the excreta of the petrol engine were of value to the land all would be well—otherwise, according to some, we must be prepared to return sewage to the land or find out how to make humus on the largest scale. There is need for many years of experiment and for critical examination of the results, but the subject is so important that both zealous workers and the necessary ample funds are likely to be available in many countries.

We have a final plea to the editors, namely, that the writers of each section of the report should preface it by a paragraph or two indicating the chief achievements and tendencies in the subject. Apart from easing the task of the reviewer, such would appeal to almost every reader of the sections in which he is not an active worker.

E. F. ARMSTRONG.

DEFICIENCY SYMPTOMS IN PLANTS

Hunger Signs in Crops

A Symposium prepared by George M. Bahrt, Bailey E. Brown, Arthur F. Camp, H. D. Chapman, H. P. Cooper, O. W. Davidson, Ernest E. De Turk, George N. Hoffer, Henry A. Jones, James E. McMurtrey, Jr., Edwin R. Parker, Robert M. Salter, George D. Scarseth, Joshua J. Skinner. Edited by Gove Hambidge. Pp. xii+327+79 plates. (Washington, D.C.: National Fertilizer Association, Inc., 1941.) 2.50 dollars.

UNHEALTHY growth of crop plants, apart from trouble induced by diseases or pests, is usually associated with physiological causes, which in some cases imply excess or deficiency of various substances utilized in the metabolism of the plant. The relative quantity of these substances is immaterial, as the plant suffers as much from a deficiency of an element such as boron, of which only a minute trace is required, as from a deficiency of a major element, such as nitrogen, required in large quantities. In practice it is deficiency rather than excess that is most likely to occur, and various signs and symptoms present themselves.

Only by careful and accurate observation and experiment is it possible to ascertain the meaning of these symptoms, and considerable experience with any one crop is needed before the observations can be systematized and set out for the guidance of the ordinary grower. Work on deficiency symptoms or "hunger signs" has been carried out by a large body of scattered observers on a considerable variety of crops. In the volume under review investigators with special knowledge of certain crops or groups of crops have epitomized the present state of our knowledge of the known deficiencies for those particular plants. Major and minor nutrients are all considered, and the symptoms, cause and ameliorating treatment are discussed.

The range of crops covers tobacco, cereals, potato, cotton, vegetables, deciduous fruits, legumes and citrus, thus giving a comprehensive survey of the position with regard to the chief world crops. Many illustrations are given in black and white and in colour. As is usual with colour photographs these need careful interpretation, for it is easy for a non-expert to be misled into attributing hunger signs to the wrong element, especially if a bias exists in favour of any particular nutrient. If this is borne in mind the illustrations provide an extremely useful guide and fill a want that has long been felt by workers in this field. A key to the plant nutrient deficiencies is given for most of the crops, which provides an excellent supplement to the illustrations. The citation of references is wisely restricted to a small number specifically associated with each crop.

Altogether, the committee on fertilizers of the American Society of Agronomy is to be congratulated on the production of a volume which will prove specially useful as a laboratory guide for all workers on plant deficiencies, as well as an illuminating text-book for growers and for students of plant life.

W. E. BRENCHLEY.