Status and Methods of Research in Economic and Agronomic Aspects of Fertilizer Response and Use

By the Committee on Economics of Fertilizer Use of the Agricultural Board. Publication 918, National Academy of Sciences—National Research Council, 2101 Constitution Avenue, Washington, D.C. 89 pages. $2.00.

READERS INTERESTED in a summarization of the status of research on yield response to fertilizer will find this publication useful. Its scope includes discussion of the pertinent concepts and principles, the characteristics of different types of yield functions, and problems in obtaining suitable data. There is also a section on application of results. The importance of joint agronomic-economic effort is indicated.

The difference between basic laboratory research and research under field conditions is mentioned.

But emphasis is given to the use of yield functions for a refined analysis of field results. The inference is that precision in materials and tools of analysis may be comparable to that needed to quantify basic relationships studied under thoroughly controlled conditions. To many this will seem to give undue emphasis to the notion of finding a particular function that will reflect *the true* yield response relationship for field conditions.

Such a refinement may have little bearing on the role of fertilizer in the total context of striving for optimum use of resources on farms or in agriculture generally. The relevant range of response, when viewing either micro (firm) or macro problems, is that in which increments in yield decrease with additional applications, under stated conditions. Whether the rate of decreasing increments for a particular series of responses is constant or variable, or whether the function will reflect a "turn down" in absolute yield, somehow does not seem important for developing practical guides to profitable use of fertilizer. Neither do refined measurements contribute anything of substantial importance in the area of increasing increments where it is obvious that if fertilizer pays at all, increased applications will pay more.

Except as yields are limited by other factors, evidence of decreases in yield resulting from applying "too much" is hard to find. Where these other yield limiting factors cannot readily be removed, the important practical question still remains one of characterizing the range of decreasing increments under these restrictive conditions. Asymptotic functions derived from measuring the main effects of two or three independent variables have in some instances fitted the entire reported production surface as well as functions that allow for a turn down in response. This conclusion can be made more general with reference to the relevant area of the production surface. (Asymptotic functions are represented by curves that do not turn down, but approach a horizontal plane without reaching it.)

One important omission relates to the problem of obtaining a least squares fit when using asymptotic regression. H. D. Patterson writing in *Biometrics*, September 1956, describes a simple, direct method for obtaining almost fully efficient estimates of parameters through a system of weighting the incremental yields. This has been found superior to graphic methods, and less time consuming, when the latter are used with sufficient care to approximate a least squares fit. Patterson's methods represents a clear gain in methodology for those using this type of function.

One wonders whether more about the role of fertilizer in the whole picture of farm technology could not be learned by using simpler but larger scale field trials. In these, controllable factors other than the ones being tested could be set at levels that would not seriously limit response to the variable factors. This would focus attention on the main area of farmer operations and leave the more precise measurements (which are obscured in the field) to the basic researchers. Some information about the "fringes" of the production surface would be sacrificed in the interest of more knowledge of wider applicability in the area of profitable operations. The report might well have differentiated more clearly between the objectives and needs of basic research and those of supplying guides more readily applicable to farms and to major areas of production.

These comments are not intended to discount the value of the publication, which is a contribution as a documentation of the past, and a stimulant to future work. Although much of it is directed to mathematically minded readers, there are some sections that appeal to a wider audience. These sections include discussions on history of crop response research, application of findings, and some of the discussion of basic concepts in yield response to fertilizer. A list of 214 references forms a useful bibliography. The appendix lists land-grant colleges reporting agronomic-economic research in 1954 and in 1957, together with industry-sponsored research under way in 1957.

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Marketing Farm Products

By Geoffrey S. Shepherd. Iowa State University Press, Ames. 523 pages. 1962. 4th ed. $7.50.

PROFESSOR SHEPHERD directs his *Marketing Farm Products* toward undergraduate and beginning graduate students who are interested in economic analysis and agricultural marketing. As in previous editions, his fourth edition is functionally oriented around the economic elements of marketing. The development of the system, its changes, and its problems are shown as reactions to economic forces. Professor Shepherd