The principal purpose in fertilizer experiments is to determine what elements, or combination of elements, are needed, and in approximately what proportion and amount they should be added in order to secure the most profitable returns.

In efforts to accomplish this purpose the most common procedure has been to try the three fertilizing elements alone, in combination with each other, and in varying proportions. There is, however, much variation in the relative amounts applied, which makes it often impossible to compare the results upon different soils with the assurance that should attach to scientific work. Many of the experiments have been planned as much from the standpoint of a demonstration as an experiment and, therefore, such combinations and applications have been tried as experience indicated would probably give the most satisfactory results. For example, the earlier experiments nearly all showed a profitable increase from phosphorus while nitrogen and potash were often used at a loss. Therefore, in many of the later experiments only phosphorus has been tried alone, the idea being that, since phosphorus nearly always pays, it is necessary only to determine whether it will be profitable to use nitrogen and potassium in addition to the phosphorus. In fact, most fertilizer experiments have been planned with the idea of determining the profitableness, or unprofitableness of the different applications tried, rather than with the purpose of finding out the relative need of the soil for the different elements as a basis for figuring out the most profitable fertilizer practice for the different soils.

It is evidently impossible to try all the various combinations which might prove most profitable, as the number of plots required would cause too great an increase in the cost of the work. Since it is now admitted that the results secured upon one type of soil do not necessarily apply upon another, such a procedure is evidently out of the question, as the cost of carrying on so much work on every soil type would be prohibitive. Some method of determining, with reasonable accuracy, the relative need of the different types for the different