IT HAS long been known that iron, aluminum, manganese, potassium, phosphorus, calcium, and many other elements play an important part in the fertility complex. It is also recognized that this complex is directly associated with the plants' utilization of commercial fertilizers. The soils of the southeast are varied in their content of these various elements and as a result give varied responses to certain commercial fertilizers. It seems reasonable to expect that a fertilizer would give a different response to a particular crop such as cotton on a coastal plains soil deficient in iron as against one of the Piedmont soils high in this particular element. Likewise a sand or sandy loam might respond differently than either a clay or clay loam soil.

A number of investigators have pointed out the effect of certain of the natural elements of the soil upon crop response. Brown and Corson (2) conclude that iron is necessary for proper plant development and its importance is probably due to a stimulative catalytic action aiding in the formation of chlorophyl. Volk (8) points out the possibility of potash fixation in some soils by free alumina. McLean and Gilbert (6) and Sommer (7) found that aluminum in small quantities stimulated the growth of plants and in larger quantities caused toxicity. Acid fertilizers lower the pH value of the soil, increase the solubility of aluminum, and thus decrease crop yields as pointed out by Blair and Prince (1). Lipman and Waynick (5) have pointed out the losses of various elements from the southeastern soils as compared to other sections of the United States. Due to intensive rainfall, moderate temperatures, excessively acid soils, and other factors, many of the Southeastern soils contain considerable soluble aluminum and as pointed out by Burgess and Pember (3) crop production may be seriously impaired by the solubility of this one element.

From this brief outline of previous researches which are somewhat closely associated with some of the fertilizer problems, it would seem that soils with certain climatic conditions might have more or less definite fertilizer requirements.

GENERAL CONDITIONS AND PLAN OF EXPERIMENT

The farming system generally followed in the southeastern states makes the use of commercial fertilizer materials necessary for a profitable agriculture. Due to the small amount of livestock kept in this region, fertilization of the soil is dependent upon crop rotation with the judicious use of and application of complete commercial fertilizers. Perhaps the leading crop for the great area of red and yellow soils lying in a region from the Gulf of Mexico, Atlantic Coast to Virginia and northward into the mountains. The soils in this belt are as varied more so, than they are in any other agricultural section; however, they can be divided into more or less definite provinces, based on origin and geologic formations or minor soil regions have certain fertilizer requirements that may or may not be generally recognized. With these factors in mind a number of experiments were started from 1920 to 1930 with a view toward finding the fertilizer requirements for some of the major soil types of South Carolina, which are similar to the soils found in other states of this belt.

The soil grouping generally recognized in South Carolina is as follows:

- Mountain
- Piedmont
  - upper
  - middle
  - lower
- Coastal Plains
  - sandhills
  - upper
  - middle
  - lower

All of the experiments reported were under a 3-year rotation system except the Barnwell and McColl test. The 3-year rotation followed consisted of cotton the first year, followed by oats or peas or soybeans the second year, and corn with cowpeas or soybeans interplanted the third year. In addition, winter cover crops were planted for soil improvement wherever possible. It was the plan of this experiment to have one ton of ground limestone applied per acre to one-half of each plat every three years. This was done where possible as indicated in Table 1.

In South Carolina, as is true with most the Southeastern states, the cotton crop receives a major portion of the fertilizer.