past. Such crops will require a relatively higher soil fertility level than the present major row crops, which are very efficient in the use of available soil nutrients.

An expansion in the production of forage and livestock enterprises will result in a more favorable soil conservation land use pattern than has been followed in the past.

The Southeastern area has relatively small farms, low native soil fertility, deficient farm equipment, and low farm capitalization. In contrast with the limitations, there are many desirable characteristics of the region. The area has a favorable climate with a fair distribution of rainfall during the growing season. The soils have very favorable structure and most of them are very responsive to applications of fertilizer materials.

Favorable climatic conditions, particularly temperature and distribution of rainfall, combined with desirable soil characteristics, provide an ideal base for the expansion of grassland enterprises in the southeastern area. With economic conditions and with the efficiency of the scientific information on plant production on the fertility requirements of our major crops, it will be possible to greatly expand livestock enterprises and to develop a more satisfactory land use pattern—desirable in efficient utilization of the land, and improvement of our soil resources.

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**Crop Response to Nitraphosphate Fertilizers**

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INTEREST in processes involving the acidulation of phosphate rock with nitric acid has been greatly stimulated by a sulfur shortage and an expanded capacity for nitric acid production in this country. Hignett (1) pointed out that nitric acid has been used in Europe for acidulating phosphate rock for about 20 years and described the several processes which have been used commercially. The basic potential economy in these processes is generally recognized to be the dual role of nitric acid in solubilizing phosphate rock and in serving as a source of nitrogen in the resultant fertilizer products. Other potential advantages of these products are: (a) concentration of plant nutrients and (b) homogeneity of the granular particles containing two or more nutrient elements.

Hignett (1) and Walthall (4) described the four major processes and feasible modifications used by the Tennessee Valley Authority in pilot-plant development work since 1948. Walthall also listed selected references on the treatment of phosphate rock with nitric acid. Fig. 1 is a block flow sheet of these processes, using nitric acid alone, or mixtures of nitric and phosphoric or sulfuric acids, to acidulate phosphate rock, showing how a variety of compound fertilizers and separate products may be produced. The slurries produced by the extraction of rock with acid are then ammoniated and granulated in the process of drying. Several of these products, designated “nitraphosphates,” which have been produced by TVA in pilot-plant equipment at Muscle Shoals, Ala., have been tested in greenhouse and field experiments since 1948. Only the nitraphosphates made by Process I, nitric-phosphoric, and Process II, nitric-sulfuric acidulation (Fig. 1), have been sufficiently tested to report the findings.

Field experiments with corn as the test crop were initiated in 1949 in Georgia, Kentucky, and Tennessee. Experiments in 1950 were conducted with corn, cotton, and small grain in several southeastern states and with small grain in Iowa and Nebraska.

**Objectives of the Tests**

Inasmuch as the nitraphosphates which carry most of the nitrogen as ammonium and potassium as potassium chloride, it was the major question affecting crop response the availability of the phosphorus in these products. Thus, most of the tests were designed to determine the effectiveness of the phosphate, using supplemental applications of nitrogen and potassium and the following questions are important in testing these fertilizers: (a) water solubility of the fertilizer, (b) particle size, and (c) single- versus multi-nutrient-component granules. The need for an answer to this question is most effective placement of the phosphates is another problem connected with the use of these fertilizers.

**SOLUBILITY**