THE effectiveness of agricultural lime in correcting soil acidity and increasing crop yields is dependent upon the degree of fineness to which it is ground. The finer the material, the more rapidly it dissolves and reacts with the soil. The rate of solution of slowly dissolvable materials, such as limestone, increases as the specific surface area of the material increases. Ground agricultural lime should contain enough fine material to provide rapid correction of soil acidity, and at the same time include some coarser material in order that the benefits of liming may be extended over a longer period of time. When limestone is ground specifically for agricultural purposes, extremely fine grinding often results in considerable increase in cost, which is frequently a deterrent to its use. Thus, the question arises as to how fine agricultural lime should be to give maximum yields.

These experiments were conducted to give information on this question, and to determine the relative efficiencies of different degrees of fineness of a dolomitic and calcitic lime.

Specifications regarding the fineness of grinding limestone for agricultural purposes have varied considerably. Many recommendations have specified that a large percentage of ground limestone should pass a 100-mesh sieve. Shorey (11) of the U.S.D.A. states, "Pulverized limestone (fineground limestone) should be ground fine enough for all material to pass a 20-mesh sieve, and at least 75% of it to pass a 100-mesh sieve. Coarse-ground limestone should all pass a 10-mesh sieve and at least 50% of it a 100-mesh sieve." Wianko and others (12) of Indiana recommended that, "A good grade of limestone should be fine enough so that all will pass through a 10-mesh sieve, one-half through a 40-mesh sieve, and one-quarter through a 100-mesh sieve." Among others who have recommended 100-mesh material as desirable in the specifications of fineness are Meyers and others (9) of Kansas ("100% to pass through a 10-mesh sieve or 40% through a 100-mesh sieve"), and Jones (5) of Ohio who lists agricultural ground limestone "as containing 40 to 60% material which will pass through a 100-mesh sieve." Lowery and Naftel (7) recommended for Alabama that "— the grade known as 'agricultural ground' a medium finely ground material (40 to 55% of which will pass through a 100-mesh screen) is desirable."

Other recommendations have not specified that a given percentage pass through a 100-mesh sieve. Cox (4) of New Jersey stated that, "If all goes through a 20-mesh screen, ground lime is satisfactory. If 75% passes through a 100-mesh screen, it is very fine; if 50% passes through a 100-mesh screen, it is coarse."

Some comparisons have been made of the effectiveness of burned lime or hydrated lime and finely ground dolomitic lime. Kouloeff (6), working with soil types representative of tile areas in the United States, found 200-mesh burned lime as effective as burned lime for increasing crop yields, and others (8) found that there was very little difference in the availability of ground limestone, ground hydrated lime when the limestones were between 40 and 60 mesh in fineness.

Experimental Procedure

These experiments were conducted with small field plots located on Norfolk loamy sand at the Main Station farm, Auburn, Ala. The plots were one ten-thousandth of an acre in size, and were enclosed in metal rims. The rims were 6 inches in height and 28.3 inches in diameter. Before the soil they were given two coats of black, acetic paint which was allowed to dry thoroughly.

The plots were in rows 48 inches apart, 12 inches apart in the row. They were pressed in 5 inches in depth. All lime and fertilizer treatments were applied within the rims. All treatments were replicated.

The amounts of lime indicated by the treatments of Table 1 were worked into the soil to a depth of 5 inches. A uniform fertilizer application of 100 pounds per acre of an 0–14–10 was applied to all plots in the spring and fall of 1942 and also in 1943, and enough borax to supply 15 pounds per acre was applied in the fall of 1942 and also in 1943. Lime was top-dressed at the rate of 225 pounds per acre of nitrate of soda in 1944 and with 200 pounds per acre in 1947.

Crimson clover was grown on the plots each spring and fall, and Sudan grass each summer. The green matter weights of the crimson clover were obtained, and the material was returned to the plots as manure. The Sudan grass was removed from the plots at the end of the growing season. All plots were sampled 6 inches deep from a depth of 5 inches.