THE USE OF THE HARVESTED PART OF THE CROP IN ESTIMATING THE EFFECT OF COTTON FERTILIZERS ON THE BASE SUPPLY OF THE SOIL

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Nitrogenous fertilizers exert a greater influence upon the base supply of the soil than do other fertilizers in common use. Sixty-nine per cent of the nitrogen used for fertilizers for the year ending June 30, 1934 was used in the southern states (5). The percentage of the fertilizer used which was applied to cotton by states in 1938 (8) was: North Carolina 18%, South Carolina 39%, Georgia 41%, Alabama 61%, Mississippi 64%, and Louisiana 40%.

Since such a large proportion of the fertilizer is used under cotton, it appears that the lime necessary to neutralize cotton fertilizers should receive special consideration. The only data available on the neutralization of nitrogenous fertilizers applied to cotton is that of Tidmore and Williamson (11) who concluded that "it will be necessary...to add more than the theoretical amount of lime...because of the removal of calcium by the plants and by leaching".

The theoretical amount of lime to add with nitrogenous fertilizers is determined by the method of Pierre (9, 10) who concluded from colorimetric pH determinations on greenhouse soils that "51% of the nitrogen was taken up by the plant as nitric acid," and 49% as a salt like calcium nitrate. From these data he concluded that 1.8 pounds of CaCO₃ equivalent should be added with each pound of nitrogen applied in fertilizers.

According to Pierre's method the base content of soils on which calcium nitrate and sodium nitrate have been applied for long periods of time should have increased 1.35 and 1.80 pounds of CaCO₃ equivalent for each pound of nitrogen applied, respectively. Calculations based on the data of Fudge (2) show increases of −0.19, 0.10, −0.35, 1.98, 0.35, 0.10, 0.00, and 0.70 pounds of CaCO₃ equivalent where nitrate of soda was applied, and 0.54 and 0.82 pounds of CaCO₃ equivalent per pound of nitrogen where calcium nitrate was applied. Evidently this method is not in agreement with the results obtained under field conditions.

Morgan and Bailey (7) found, in the absence of growing plants, that "soils having a high base status become depleted of bases, as a result of the treatment, to a degree approaching that of their biological decomposition products," which indicates that nitrogen leaches out as calcium nitrate. This work is in agreement with the work of Lewis (4) who found that the theoretical effect of the nitrogen recovered in the harvested part of the crop is not the same as the work of Morgan and Bailey (7) and of Lewis (4), it appears that the effect of nitrogenous fertilizers on the base supply of the cultivated soil may be estimated by subtracting the effects produced by the crop from the effects produced by the crop from the effects produced in the absence of the crop. It is the purpose of this paper to present data on the amount of lime necessary to maintain the base supply of the soil.

SUGGESTED METHOD OF CALCULATING EFFECT OF SOURCES OF NITROGEN ON BASE SUPPLY OF SOIL

The suggested method of calculating the effect of the element nitrogen upon the base supply of the soil depends: (a) Upon the nitrogen which is applied but not recovered in the harvested part of the crop, and (b) upon the excess of bases over acids other than nitrogen taken up by the increase in harvested part of the treatment. The nitrogen and other elements taken up by the cotton plant which are returned to the soil and their ultimate effect on the base supply of the soil appears to be the same as if they had not been tied up temporarily in the harvested part of the plant.