INTRODUCTION

Nitrogen Fixation.

In a given climate without the means of alteration of water supply, the primary deficiency responsible for declining crop yields is that of available soil nitrogen. Crops become yellowish, stunted, unproductive and heavily infested with weeds. Although such crops respond to fertilizers such as sulphate of ammonia this is not only expensive but it does not give the lasting improvement in soil fertility which follows organic enrichment and improved physical structure.

Dismissing the addition of nitrogenous fertilizers soil nitrogen may be increased in several ways:-

1. By nitrous & nitric acid in rain water, derived from natural nitrogen-oxygen combination in lightning flashes (however, this, even in areas of heavy rainfall, is unlikely to exceed 10 lb. per acre per annum, whereas a crop removes between 26 lb (Sorghum) and 100 lb. (Tobacco) per acre per annum).

2. By free living nitrogen fixers ranging from photo-synthetic blue green algae (Anabaena) and bacteria (Rhodosporillum) to heterotrophic bacteria (Clostridia & Azotobacter) having complex nutritional requirements. The nitrogen fixing blue-green algae only seem to add an appreciable quantity of nitrogen to the soil in wet tropical or sub tropical conditions, such as paddy fields or on bare soils after heavy rains. The process of nitrogen fixation by azotobacter has been extensively studied and appears to be important in only two types of agricultural soil: those receiving appreciable dressings of decomposable material low in nitrogen; and those carrying an obvious development of blue green algae. Lyon & Buckman (1943) found that the soil under a grass ley apparently free from legumes accumulated 40 lbs of nitrogen per acre per year

if the ley was cut and the grass left on the surface. They further suggest that azofication by free living fixers in the representative arable soil totals at least 25 lb. of nitrogen per acre per year; and that, probably, the average figure is 40 to 50 lb which is of the same order of magnitude as the removal of nitrogen by volatilisation.

3. Finally soil nitrogen may be increased as a result of symbiotic nitrogen fixation. This is not confined to leguminous plants although they are at present the only agriculturally important nitrogen fixing crops; Bond (1958) has demonstrated nitrogen fixation in eight genera of Angiosperms all of which have nodules apparently containing Actinomycetes. He suggests that the ability of some of these genera to pioneer barren mineral soils is a consequence of their nitrogen fixing powers and that in the future these plants may be of agricultural and sylvicultural importance.