man emphasizes that our soils are suffering a net annual loss of about 3 million tons of phosphorus, or almost 10 times as much as is supplied annually by chemical fertilizers.

Another table gives the sources of the nutrients and the amounts added from each source. It is interesting to note from this table the large amounts of all of these elements except phosphorus which are added to the soil annually in rainfall. In 1930, there were added through rainfall to the agricultural lands in the United States 3,347,395 tons of nitrogen, 1,529,400 tons of potassium, 5,735,250 tons of calcium, 2,294,100 tons of magnesium, 5,768,900 tons of sulfur and no phosphorus. In that year, the rainfall contributed appreciably more calcium, magnesium and sulfur than did any other one source of these elements. The greatest amounts of nitrogen came from the fixation of atmospheric nitrogen by the micro-organisms in the root nodules of legumes and by those living in the soil itself. Large amounts were added also in rainfall, animal manures, and chemical fertilizers. The major additions of phosphorus were credited to animal manures and commercial fertilizers. The largest amounts of potassium came from animal manures, rainfall, and chemical fertilizers.

NITROGEN OF THE AIR IS NOW A SOURCE OF FERTILIZER

The air over a single acre of soil contains approximately 31,000 tons of free nitrogen, none of which is available to the majority of plants until it is "fixed" in a form which can be used by plants and applied to the soil as a plant nutrient. The bacteria in the nodules of legumes, such as clover and alfalfa, and certain micro-organisms living in the soil have the peculiar ability to "fix" the nitrogen present in the air of the soil and thus enrich the soil in which they grow. Before the World War this was the only way in which this universally distributed source of nitrogen was tapped in the United States for agricultural purposes.

For our nitrogen compounds we were dependent on the great natural deposits such as those of nitrate of soda in Chile. According to figures in a report on Chemical Nitrogen issued by the United States Tariff Commission, in 1900 two-thirds of the world's supply of nitrogen came from the deposits of nitrate of soda in Chile. The remaining one-third was produced as a by-product in the manufacture of coke and gas from coal.

Since 1915, however, procedures have been perfected for the commercial "fixation" of nitrogen of the air in the form of synthetic compounds. In 1934 these synthetic products resulting from the industrial "fixation" of nitrogen of the air furnished 74.5 percent of the world's supply of nitrogen. Only 7 percent came from the deposits in Chile and the remaining 18.5 percent from by-products in the manufacture of coke and gas from coal.

SOIL FERTILITY AFFECTS KENTUCKY AND CANADA BLUEGRASS

The reason why Kentucky bluegrass grows on one soil and Canada bluegrass on another was studied by Hartwig in New York, who published his results in the Journal of the American Society of Agronomy. Two areas were examined, in one of which Kentucky bluegrass (*Poa pratensis*) was dominant, in the other, Canada bluegrass (*Poa compressa*). In both areas patches of the other species occurred and soil samples were taken under each species in both areas.

These areas were studied in various ways. Contrary to the prevailing notion that *Poa compressa* is found on the more acid soils, Hartwig found the acidity of the soil under this species lower than under *Poa pratensis.*

The most important feature was that under *Poa pratensis* there was generally more total nitrogen and more available phosphate than under *Poa compressa,* though the difference in the quantity of phosphate was small. From this it would seem that the former occupied the more fertile spots. This idea is in harmony with Hartwig's observation that in the area where Canada bluegrass is dominant, pastures which receive much manure soon become set with Kentucky bluegrass.

SHADE AFFECTS ACTION OF SULFATE OF AMMONIA ON TURF

Recently two British investigators, Blackman and Templeman, publishing in the Annals of Applied Biology, have discussed certain conditions under which sulfate of ammonia does not benefit grass and discourage clover. Where the shade is deep enough to limit growth (where the light intensity is equal to less than .44 that of daylight) apparently it is the grass and not the clover which is adversely affected by the addition of sulfate of ammonia.

The production of leaves depends upon the grass plant taking up nitrogen from the soil and synthesizing proteins within its cells by chemically combining the absorbed nitrogen with the carbohydrates