For greatly enlarged food production the two factors of primary importance are sufficient labor to perform the necessary farm work and sufficient soil fertility to make the larger crop yields possible.

Labor has been drawn away from the farms in recent years to such an extent as to compel the adoption of every possible expedient to get the farm work done. Thus in modern farming a team driven by one man commonly consists not of two horses, but of four or six, with plows, disks, harrows, rollers, seeders, and other farm implements or machines of corresponding size. Many farm boys have been necessarily kept out of school, and in 1916, for the first time during the years of the present century, the attendance at the Illinois College of Agriculture decreased, although the student attendance in the University as a whole has continued to increase.

In the formation of a great military force for the defense of right and liberty, there must be no thought of preventing the farm people in this country from bearing their full share in active military service, but where men are taken from the farms for such service there must be some system of replacing on the farms the full labor equivalent, measured in terms of efficiency, or else food production will suffer; and by failing to make definite provision for ample supplies of food we may invite ultimate disaster by cutting off our most vital resources at the fountain head.

1 An address delivered before a conference of the Mayors of Illinois, at Chicago, April 27, 1917.
And we must not be so foolhardy as to follow a plan whose success requires a termination of war in six months. On the contrary, let us fully understand that we may need to produce more food in 1918, and still more in 1919, than in 1917. Whether the war continues for six months or for six years, the United States must be depended upon for a larger and larger supply of food for both Europe and America; and when peace is declared, all humanity must then be made to rejoice because America shall have in store an abundant food reserve which may at once be used to relieve the suffering and starvation in all countries, whether classed as friend or foe during the conflict.

The control of all who may be called directly into the Nation's service must lie with the federal government. Congress already has under consideration a plan to assign to the service of food production on federal furlough those who may be better fitted for such service than for immediate activity in the military; and it is not within the province of the mayors of Illinois to provide the men for either branch of service.

But in soil fertility there is a second factor of no less importance in food production, and no greater opportunity could come to the mayors of this Commonwealth than now exists to exert their influence to bring about the production of larger and larger supplies of food by positive and permanent systems of soil enrichment.

You should know that the University of Illinois is operating forty soil experiment fields well distributed over the state on the important soil areas; that more than sixty counties in Illinois have already been covered by detail soil survey in which every kind of soil on every farm is investigated; and that thousands of samples representative of all important soil types have already been analyzed. These investigations have furnished the information needed in the present crisis.

The basic facts which must underlie the rational enrichment of Illinois soils are already established. Briefly they are these: (1) All of our common, or normal, soils are not only devoid of limestone, but they show some acidity, and in large areas, especially in southern Illinois, they are very sour. (2) They are deficient in the element phosphorus. (3) They are becoming deficient in organic matter, or humus.

To double the crop yields of Illinois would require only the use of the limestone which is found in almost measureless deposits in all sections of the state; the application of fine-ground phosphate rock, which is easily secured from the great natural deposits in Tennessee; and the production (thus made possible) and the proper utilization of home-grown organic matter, such as the clovers and other legume crops, crop residues, and farm manure. In the production of the legume crops, the nitrogen is secured from the free and inexhaustible supply in the air; and the decaying organic manures have power to liberate the potash contained in all normal soils in practically inexhaustible amounts.
What should the mayors of Illinois do to help insure food production? The proper answer to this question seems simple and certain: Erect in every town a storehouse for limestone and phosphate, in which from ten to a hundred carloads can be kept on hand ready for the farmers to haul and apply whenever the conditions of the roads and fields and farm labor permit. When the farmer brings a load of produce to town, let him haul back a load of limestone or phosphate.

There is much talk by the townspeople about cooperation with the farmers. Here is an opportunity to do something more than talk—something of substantial character, something which looks toward enriching the country in order that the increased produce may in time increase the general prosperity of both the country and the town.

Limestone and phosphate rock are natural fertilizing materials, which are made ready for use simply by grinding, and they may be kept in storage indefinitely with no deterioration in condition or quality. They are the only materials the farmer needs to buy for the rational economical improvement and permanent preservation of fertility in normal soils.

Nitrates, potash salts, and sulfuric acid are all needed in the manufacture of munitions, but their use in fertilizers is unnecessary for normal soils and is also unprofitable to the general farmer, altho they may have a proper place in market gardens, especially where the supply of manure is insufficient.

The average yield of wheat in Illinois is about 16 bushels per acre, but an increase of 19 1/2 bushels has been produced by limestone and phosphate rock on the University Farm at Urbana. The actual acre-yields, as an average of four field trials each year for four different years, were 28.2 bushels where home-grown organic manures were used alone, 43.5 bushels with manure and phosphate rock, and 47.7 bushels with manure, phosphate, and limestone.

These results are secured where soil improvement is well under way; but whether the yield is 16, 28, or 48 bushels per acre, the labor and other expenses are the same for the plowing and preparation of the seed bed, the same for the seed and seeding; and, in the case of corn, these expenses are also the same for cultivation, whether the land is impoverished or enriched. While to decrease the labor on the farms would probably effect a proportionate decrease in production, to increase largely the labor supply for this year, over and above that for last year, would by no means insure a corresponding increase in production. The larger increase in crop yields can be achieved only by soil enrichment.

As an average of four trials each year for the first four years, the yield of wheat on the experiment fields in Franklin and Saline counties on the poor land of southern Illinois was 5.7 bushels per acre where organic residues were plowed under, 17 bushels with the residues and limestone, and 19 bushels with residues, limestone, and phosphate. The best yields in these trials were 8.5 bushels with the
organic residues, 29.8 with residues and limestone, and 32.9 bushels with the organic matter, limestone, and phosphate. In the first year of these experiments the yield of corn was increased more than 12 bushels per acre by the use of ground limestone.

On my own farm in southern Illinois I have harvested $35\frac{1}{2}$ bushels of wheat per acre where manure, limestone, and phosphate rock were applied, and only $11\frac{1}{2}$ bushels where the farm manure alone was used.

On the University Farm in Champaign county the average acre-yield of corn for the last ten years has been 28.8 bushels on one field and 79.5 bushels on another field. The soil is the same—the common $200 corn-belt prairie land. The two fields were plowed and prepared at the same time and planted with the same kind of seed. They were cultivated alike, watered by the same rains, and warmed by the same sun. But why this enormous difference in acre-yield—from less than 30 to nearly 80 bushels, as the average for a decade? The answer is found in two words: rotation and fertility. The lower yield is from corn grown every year on the same land with no restoration of fertility, while for the higher yield the corn is grown in a good crop rotation including some legumes, and the soil is enriched with limestone, phosphorus, and home-grown organic manures applied only in such amounts as can be produced from the crops actually grown upon this land.

These methods of positive permanent soil enrichment are now thoroly established and are practiced by many of the progressive and most successful farmers, but the one great difficulty in bringing about their more rapid and more general adoption is the impossibility of securing shipments when the local conditions permit their application.

It is for this reason that I urge you, Mayors of Illinois, to go home and induce your Chambers of Commerce or Commercial Clubs to provide commodious storehouses in which ground limestone and fine-ground phosphate rock can be kept and supplied to the farmers at any and all times; and let me urge, too, that these materials be furnished to farmers at the actual cost of bulk carload shipments, leaving the city people to secure interest on their investment from a country made richer by their effort and influence, remembering that worn-out soil yields no purchasing power to the farmer, no freight to the railroad, no business to the merchant, no food to the consumer.