

FERTILIZERS: THEIR NATURE AND USE.—IV.

By B. Leslie Emslie.

IMPORTANCE OF LEGUMINOUS CROPS IN THE ROTATION.

As already observed, nitrogen is by far the most expensive plant food on the market. It has also been indicated that the natural order of plants known as Leguminosæ, to which belong the clovers, alfalfa, hairy vetch, beans, peas, etc., are peculiarly endowed with the power of extracting the nitrogen of the atmosphere by the aid of bacteria living in small nodules on their roots.

HELLRIEGEL'S DISCOVERY.

For this valuable discovery, we are indebted to the famous German Agricultural Chemist, Hellriegel, of Bernburg, and his assistant and successor, the late Prof. Dr. Wilfarth.

Briefly stated, the discovery was in this wise: Plants of various kinds were grown in pots filled with pure sand, the sand being, of course, free of all traces of plant food. The plant nutrients were applied to the pots in solutions containing different quantities and proportions of the same, in order to ascertain the actual plant-food requirements of the plants. It was observed that legumes grown in pots which had received applications of phosphate and potash, but no nitrogen, continued to thrive, and ultimately yielded as well as the legumes in other pots which had received an application of nitrogen in the solution.

Furthermore, it was found that the soil in which the legumes had grown was finally far richer in nitrogen than at the commencement of the experiment.

Hellriegel naturally argued from this that the legumes have some means of obtaining their nitrogen supply not possessed by other orders of plants. It had already been noticed that the roots of clovers and other legumes were usually covered with small tuberous growths or nodules, and to these Hellriegel directed his attention. He found that these nodules contained myriads of bacteria, and were exceedingly rich in nitrogen, and succeeded in establishing the fact beyond a doubt that these bacteria were instrumental in obtaining for the plant its supply of nitrogen.

A NITROGEN FACTORY IN THE SOIL.

The importance of this discovery to the whole world cannot be overestimated, for it indicated to the farmer a means by which he could establish a nitrogen-producing factory in his own soil—a factory which would actually "work while he slept." By growing a crop of clover, alfalfa, beans or peas, not only do these crops obtain the nitrogen necessary for their own development without any expense to the farmer, but leave in the soil, in the crop residue, a supply of nitrogen for the succeeding crop.

It is very obvious, then, that the introduction of a leguminous crop as frequently as possible in the rotation is an admirable policy.

CLOVER IN ANNAPOLIS VALLEY ORCHARDS.

This policy has for long been in force in many parts of Canada, and for one notable example we can point to the famous Annapolis Valley in Nova Scotia, where for years the fruit-growers have grown and plowed under clover crops in their orchards, thus supplying the soil with nitrogen and humus.

The only fertilizers which they apply are those containing phosphoric acid and potash, usually in the forms of bone meal and muriate of potash, which are applied annually at the rate of 400 to 600 pounds bone meal and 200 to 400 pounds muriate of potash per acre, the larger amounts being for orchards in full bearing.

The clover is seeded down usually in June, and occupies the ground until May of the following year, when it is plowed under and the land thoroughly cultivated. Sometimes the clover crop is only grown once in every two years, which allows of the soil being more thoroughly cultivated and cleaned during the summer season.

CONSERVING THE MOISTURE IN SOILS.

Frequent stirring of the surface soil is very effective in conserving the moisture, as, when a soil is tightly packed, the water tends to rise to the surface and escape by evaporation. The breaking of the surface crust prevents this.

A COMPARISON OF VARIOUS LEGUMES.

Common red clover is unquestionably one of the best nitrogen-gatherers. An analysis of its stems and leaves shows a percentage of 0.92 nitrogen, and of its roots 0.88 per cent. nitrogen, and, as the weight of its roots is more than one-half that of its stems and leaves, quite an amount of nitrogen is stored up in the underground part of the plant.

Mammoth red clover, although a heavier yielder than the common red, contains a smaller percentage of nitrogen than the latter, so that, as a rule, a larger total amount of nitrogen per acre is left in the crop residue from common red clover. Crimson clover, as a fixer of nitrogen, is less capable than the two former, since its root system is not nearly so extensive.

The same may be said of hairy vetch.

Alfalfa—The root system of this crop is very

extensive, and penetrates to a great depth in the soil. The total weight of roots is, in fact, equal to that of stems and leaves, and the percentage of nitrogen in both is similar, so that, while approximately one-third of the total nitrogen content of the clover crop is in the roots, one-half of the nitrogen of alfalfa is contained in the roots of the plant.

HOW TO STIMULATE PRODUCTION OF NITROGEN IN THE SOIL.

If the farmer grows a crop of clover or other leguminous crop, having in view the enrichment of the soil in nitrogen, he will naturally wish to have as big a crop as possible, and the way to insure the proper development of a nitrogen-gathering crop, so as to enable it to rob the atmosphere of the maximum quantity of valuable nitrogen, is to see that the crop is provided with a sufficient supply of the other plant foods, viz., phosphoric acid and potash. No factory can be kept going unless regularly supplied with the motive power necessary for the evolution of the finished product; no more can this nitrogen factory in the soil maintain its productive capacity unless a regular supply of power in the form of phosphoric acid and potash be available.

Legumes, although independent of an artificial source of nitrogen, are nevertheless very dependent on an easily-assimilable supply of the other plant foods.

A FERTILIZER FOR LEGUMES.

It might be well to give here a fertilizer prescription adaptable, under average conditions, to clover and alfalfa.

The following mixture might be found very profitable:

300 pounds acid phosphate.

120 pounds muriate of potash, per acre.

This would cost about \$6.00.

In soils inclined to sourness, basic slag may be substituted for the acid phosphate.

For a mixture of clover and timothy hay, some artificial supply of nitrogen will, as a rule, be necessary to aid the timothy. If a medium dress-

BARN WITH PART WOODEN BASEMENT.

Editor "The Farmer's Advocate":

Having had our barn burnt by lightning a year ago last September, we built a new one last spring 70 x 40 x 20 feet, posts being 4 feet higher, width 6 feet less than old barn, and set it on a wall 8 feet high, part stone and part wooden, on a low cement wall. The frame is of timber, although it was the full intention to have a plank-frame, having the draft drawn after the pattern in the book, "Plank-frame Barn Construction." The reason for not using it was the chance to buy the timber at \$16 per M., already squared, and the difficulty in getting a carpenter to get out of the old rut of framing. The frame did not cost any more at that price than the plank would, as the plank cost more per M. The carpenter got \$200 for framing and enclosing, including basement, two sides of which are nearly all wood, and making all doors, door frames and window frames. Roofed with corrugated galvanized iron, laid on strips 18 inches apart, both of which we put on ourselves. The old barn was fixed with a driveway to draw out manure, while the new one is planned for a manure carrier. In the space marked for roots, another row of cows could stand, and a root cellar could be put under the bridgeway. The feed is all fed off the barn floor, as the sides of floor come over feed passages, or nearly so, except the box stalls. Chutes could be put to good advantage in the east mow, over horse stable. There are no beams to bother in center of mows, between purline posts, as purline posts go from king sill to purline plates.

Somebody who has built a plank-frame barn possibly could compare this cost of framing with theirs, for the benefit of those who are in the same boat I was a year ago, as different carpenters all set about the same price.

Lennox Co., Ont.

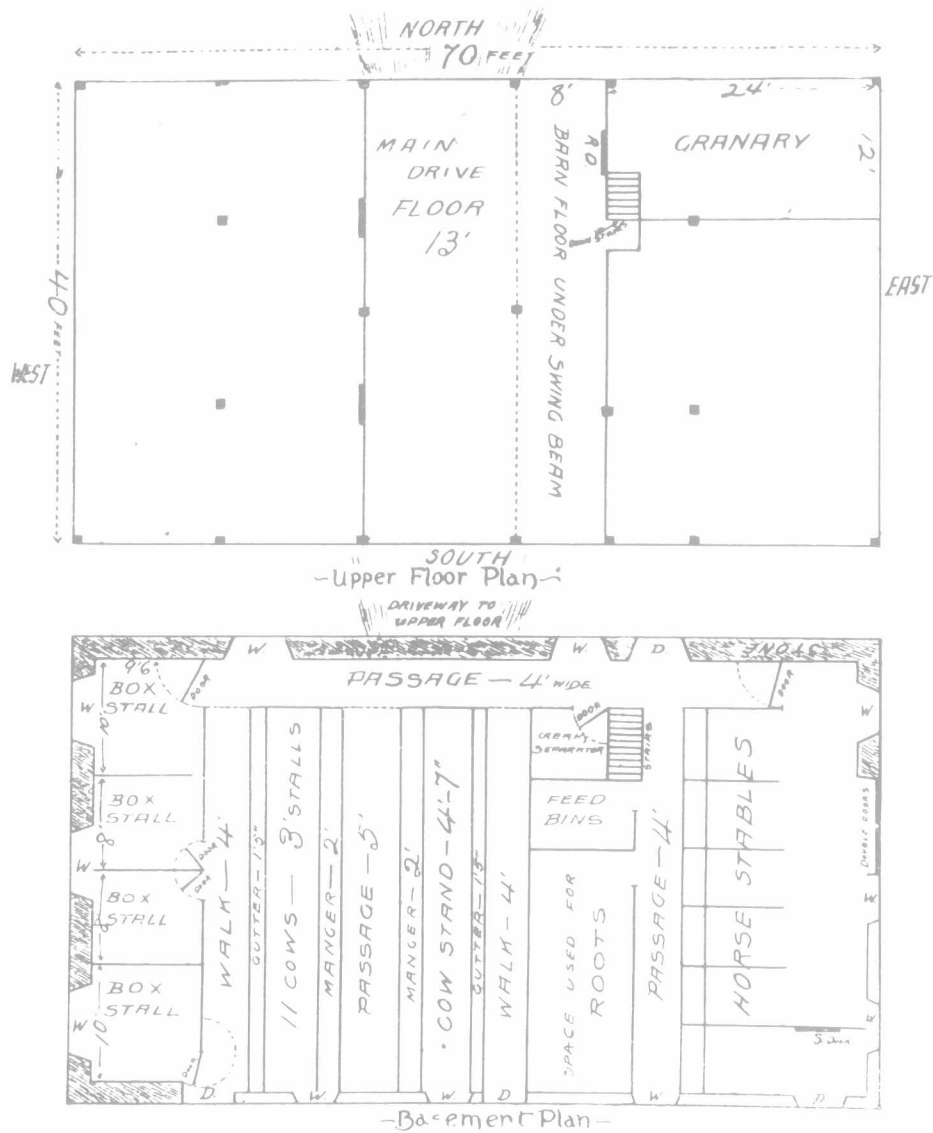
FARM POWER.

Editor "The Farmer's Advocate":

I have read with much interest the article of J. H. M., in your issue of Feb. 13th, re farm power. He seems well satisfied with the gasoline engine, and I have no doubt he has good reason, but I claim it is not the only power that gives perfect satisfaction. In the first place, the first cost is too great for the average farmer; secondly, there is quite an expense incurred for fuel; thirdly, there has to be a building expressly for the engine. All this added together would frighten the average farmer.

I have been using a 14-foot windmill for over three years, which gives me entire satisfaction. I find it a very handy power; for instance, when I find that my chop-bin is getting low, and a good wind is up, I can throw on the belt, and, inside of one minute, the mill is going full speed, turning a ten-inch grinder, and making fine meal of from ten to twelve bags of peas and barley per hour. Its horse-power is rated from 8 to 12, according to wind. It also drives a twelve-inch-mouth cutting box, with a blower and self-feeder attached, to perfection; also pulps the roots and pumps the water, and

I am arranging to saw my wood, also, this winter. In regard to cost, about \$2.25 would cover everything, except the cutting box, which I consider a very cheap power. As for durability, they are built to last, as the boxings are all fitted with roller-bearings, and the gearing is very heavy. The engine alone, without the 14-foot wheel, weighs 560 pounds. It is so constructed above that it cannot run above a certain speed. By means of two heavy coil springs, when the wind blows past a certain rate, it stretches one of the springs enough to permit the wheel to turn sidewise, so that the wind glides off, which en-



R. A. Asseltine's Barn.

ing of barnyard manure be given, no further supply of nitrogenous fertilizer would be required, but in case of no barnyard manure being available, 75 pounds nitrate of soda could be applied, in addition to the above quantities of phosphate and potash. The latter may be applied broadcast as early in spring as possible (especially if basic slag be the form of phosphate), since there is no danger of the potash and phosphoric acid being washed out of the soil; but, on account of its extreme solubility, and owing to the fact that it is readily leached out, nitrate of soda should not be applied until growth has commenced.