

the rate of 100 to 300 pounds per acre, were recorded for alfalfa in the North-western Provinces. Inoculation, as has been said, is not generally necessary, but, where it is considered indispensable by reason of the absence of the nitrogen-assimilating bacteria, a supply of this bacteria-laden soil will, it is believed, prove more effective than the use of a culture.

### Rotation and Fertility.

Editor "The Farmer's Advocate":

I am a subscriber to your valuable paper, and operate a 200-acre farm. If possible, I would like you to answer the following questions through your paper:

1. By a rotation of crops, say oats seeded with red clover and timothy first year, hay second year, with clover plowed under in the fall, followed by hoe crop, can the fertility of the soil be kept up from year to year, or is it necessary to top-dress the land with farmyard manure every three or four years? It takes a great deal of manure, especially when one uses it for orchard purposes, to have much for the land in general, so I would like to know if my land, which is a sandy and clay loam, will retain its productiveness by the clover being turned under as above, and no manure.

2. Do you consider peas an easy crop on the land, and would they be a suitable crop to follow clover, instead of a hoe crop, as we can only handle a limited amount of hoe crop every year? If peas would not be the best crop, what would you advise?

ROBERT FRASER.

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The rotation above mentioned is a good one as far as it goes, yet it is questionable whether any rotation, without the addition of some form of fertilizer, either barnyard manure or artificial material, is sufficient to produce the most profitable crops of which the land is capable over a long period of years. The continuance of this rotation year after year over a long space of time would tend to deplete the land in potash and phosphates, and there would be a danger of it becoming "clover sick," a condition which would not permit of the growth of clover. "Clover sickness" is common in the Old Land, and there is no reason to believe that we are immune from it in Canada. There is a well-known difficulty in growing leguminous crops of the same kind frequently on the same soil. Many farmers have realized by experience the fallacy of attempting to grow certain of these crops year after year upon the same fields. Experiments carried on at Rothamsted Experiment Station show that there is no evidence that wheat or mangels have any injurious effect upon the soil which would unfit it for the renewed growth of the same crop, and the same is largely true of barley. This, of course, refers to these crops only when sufficient fertilizer is added. A successful crop of clover, according to these experiments, can only be produced after an interval of from three to seven years. Clover grown too frequently produces sickly plants which die away often completely in a severe winter. It is a significant fact that soils rich in lime, and well supplied with potash resist "clover sickness" to a marked degree. While a fungus (*Sclerotinia trifoliorum*) is found associated with the trouble, the fact remains that, in order to become subject to the attack, the plant must be constitutionally weakened by some cause, of which there is little doubt but that it is some agency, biological or otherwise, in the soil. Whatever the cause, "clover sickness" is a fact, and where a crop of clover was plowed down every third year, and no potash or phosphates added to the soil, there would be some danger of the land becoming unfitted for clover-growing.

All are agreed that a short rotation of crops tends to maintain high production from year to year, more than does longer rotation or no rotation at all. At Rothamsted, wheat has been grown on the same soil for sixty-eight successive years, and a plot which has had no fertilizer during that time still yields in the neighborhood of twelve bushels per acre. Where fertilizers were applied, no falling-off has been noticed, and the plots still yield about forty bushels per acre. The unmanured plot has shown a continuous and steady falling-off in yield from the beginning. In connection with the loss with rotation, another field at Rothamsted has been cropped under the following four-year rotation for sixty-four years, viz., roots, barley, clover hay, wheat. No fertilizer has been added to this soil. In 1908 the roots yielded 3 of a ton. In 1909, barley produced 10.0 bushels of grain and 11.3 cwt. of straw. In 1910, clover hay yielded only 17.4 cwt., and in 1911 the wheat gave 21.5 bushels of grain and 21.4 cwt. of straw. This shows that the different crops possess very different powers of development under adverse circumstances. The

wheat yield is still not bad, but is only a little over half that on fertilized soil growing wheat year after year. The barley yield is very low, but, like the wheat, is above that where no manure has been applied to the plot. Rotation is a benefit, but cannot be relied upon to take the place of fertilizers altogether. The clover crop is very light, as a result of the plants being weakly, owing to the short interval in the rotation, and the addition of no lime, potash or phosphates. The root crop is almost a total failure; the plants never bulb to any extent. The fact that the wheat follows the clover gives it a better chance, because the clover crop stores some nitrogen, which helps out very materially in the case of the wheat. The failure of the clover and roots shows lack of potash and phosphate material in the soil. Thus, for all crops a four-year rotation is not sufficient to maintain soil fertility without the addition of fertilizer.

In this question we have a three-year rotation, with a second cutting of clover plowed down. On a sandy-loam soil, as suggested, plowing in of a green leguminous crop is of great value to the soil. Green manuring adds a large amount of humus. Under such a system, if good crops of clover could be grown yearly, there would be very little danger of a lack of humus or nitrogen. There is, however, as previously hinted, a danger that the clover will gradually become more difficult to produce, and that the second crop will be of little value to plow down. Continuous green manuring, without the addition of lime, tends to acidify the soil, and an acid soil is never a good cropper. Then there is the danger of the clover killing out altogether, which would leave the soil for six years without the addition of any humus or fertilizer, except that of stubble of the cereal crops, and if during this year the soil were fallowed, further loss of nitrates would ensue. Warrington estimates that in a four-years' rotation of turnips, barley, clover and wheat, 73 pounds of nitrogen, 22 pounds of phosphoric acid, and 61 pounds of potash, are removed per acre. Estimating the



A Champion Jersey.

Merry Mike, winner of first prize and championship at Oxfordshire Show, at Witney. Exhibited by Lord Rothschild.

yield of second-crop clover at one ton of dry hay per acre, which would be a high average for all years, the amount of nitrogen returned in plowing it down, according to Warrington, would be 49 pounds, potash 41.7 pounds, and phosphoric acid 12.45 pounds per acre. It is quite clear that in the four-year rotation the plowing down of a second crop of clover would not be sufficient to keep up the fertility. The main loss would be in potash and phosphates, which are greatly needed by the clover crop, and a lack of which, such as there would be under these conditions, would in a few years bring the clover yield down so small as to be of little value as a fertilizer.

This rotation, if phosphates and potash were added in sufficient quantity in the form of commercial fertilizers would be all right without barnyard manure, but without these the soil would become depleted in time. A light dressing of farmyard manure with the hoe crop would solve the problem, and why not purchase a little commercial fertilizer to mix with the farmyard manure for both the orchard and cropped land to make it go further on all, and insure better crops throughout. The three-year rotation is a good one, and if a little fertilizer is used, should work out all right, but, for best results, sufficient live stock to produce manure for all the soil about once in four years is essential. Rotations are valuable, and should always be followed, but they cannot accomplish everything. Manure is essentially a part of the best rotations.

With regard to the growing of peas on a certain portion of the hoe-crop land, it is likely they would be as good a grain crop as any. This, however, would place a portion of the land at a considerable disadvantage from the standpoint of a cleaning crop.

### Co-operate in Buying Spreaders.

Editor "The Farmer's Advocate":

The picture of the manure spreader at Weldwood, scattering the lime-stone is good. Speaking of the use and value of the spreader, I must say I can get double the value of my manure with the spreader that I can by hand.

I wanted to put two hundred pounds of fertilizer to the acre, and also eight loads of manure, on a piece of corn ground, so I put eight or ten inches of manure in the spreader, and then 25 pounds of fertilizer spread over the manure, then finished the load out with the manure. It worked fine. I then worked the manure and fertilizer in with the disk. The spreader for me, if it cost twice the money. I think one spreader could just as well serve three or four farmers as not, and we would not then feel the price so much. It is not like a mower or rake, as we all need these at about the same time. Let, say, six farmers get together and pay \$20 each and get a good spreader, and lessen the work—for spreading by hand is hard work—and raise larger crops of all kinds. Get a spreader and "The Farmer's Advocate," and be happy.

A. D.

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## THE DAIRY.

### Milk Weighing by Rule.

Milk-weighing is one of the problems, of the modern dairy farm. Approved spring-balance scales, properly adjusted, do the work well where individual cow records are kept, but in case of

factory patrons who wish to check the factory weights, something more is required. To equip the milk stand with a platform scale is troublesome, and a greater cost, perhaps, than the patron feels warranted in assuming. Naturally, this suggests the use of something "cheap and easy," but shortcuts are usually the reverse of satisfactory.

In case of approximating the weight of milk in vats, in order to add the proper quantity of rennet or coloring matter, cheesemakers sometimes judge by the eye or use a graduated piece of wood or other material which has been worked out ac-

cording to what has been actually weighed in at the receiving stand. "The Farmer's Advocate" learns that some parties, taking advantage of this idea, have turned out in large quantities what is styled a "milk scale," and that in one case in Eastern Ontario a couple of hundred of them were disposed of to one purchaser for \$100, of which \$50 was cash, and the remainder a note payable at one of the banks. Accompanying the so-called scales was the right to sell in a couple of townships, the retail price to be \$1.00 each. The article was a strip of wood about one inch wide and one-eighth inch thick, by less than 30 inches long, graduated on one side to represent from 30 pounds up to 240 pounds, presumably for 30-gallon cans, and on the other from 32 pounds up to 320 pounds, for a 40-gallon can. Then, to adjust the scale, because of the usual concave bottom of the cans, there is a small, movable bit of tin attached, with set screw at the lower end. The implement closely resembles the little yard sticks that are given away for advertising at the fall fairs. According to the literature distributed, all one has to do is to place the stick down to the bottom exactly in the center of cans, and wherever the milk comes up to "you have the correct number of pounds," and "guaranteed to give the best of satisfaction." Evidently, it would also have to be held exactly plumb, or there would be serious variations in the weight shown. It was not stated where the "scale" was made, except "in the States," but these were "selling like hot