

than exhaust itself unless we bring in from outside a large amount of fertilizing material, which for nine-tenths of the farmers in this country, must be in the shape of chemical fertilizers, and the solution of this question, imposed on us by the force of circumstances, seems to be that it is only by the judicious use of well compounded fertilizers that we can maintain the fertility of our soil, and these substances required to make chemical fertilizers exist in the mineral kingdom, which appear to us to be specially reserved to repair the depredations of the past and of the present, and to guard us against the effects of such disasters for the future. It is therefore not correct to say that, with farm-yard manure made on the farm alone, and nothing but that manure, we have everything required; it is, however, true to say that, in order to obtain large crops, there is only one method at our command, and that is to have recourse to chemical manures in preference to all others; with their aid we can govern the requirements of the farm instead of being governed by them.

As I have now clearly shown that the best of soils will soon be depleted of plant food by continuous cropping, I will endeavor to show, for the benefit of those who would like to know, how fast the depletion takes place under both systems of agriculture. I here make an approximate statement of how the waste goes on, which will be sufficiently accurate to illustrate the point:—

Approximate estimate of Nitrogen, Phosphoric Acid and Potash, taken from 100 acres worked as a dairy farm. Stock carried on the farm:—5 horses, old and young; 14 milk cows; 1 bull; 8 young cattle; 15 sheep; 5 hogs.

ANNUAL SALES.

|  | Nitrogen. | Phos. Acid | Potash. |
|--|-----------|------------|---------|
|  | Lbs       | Lbs        | Lbs     |
| 1/2 Horse Live Weight, 600 lbs.          | 14        | 10         | 1       |
| 4 Cows " " 3,200 lbs.                    | 74        | 53         | 6       |
| 8 Calves " " 600 lbs.                    | 14        | 10         | 1       |
| 4 Sheep " " 1,000 lbs.                   | 30        | 11         | 1 1/2   |
| 8 Lambs " " 300 lbs.                     | 6         | 3 1/2      | 1/2     |
| 5 Hogs " " 1,250 lbs.                    | 23        | 8 1/2      | 3       |
| 12 Cows, Milk 400 lbs. each, 48,000 lbs. | 307       | 86         | 81      |
| 15 Sheep's wool, unwashed, 75 lbs.       | 5         | 5          | 3       |
| 100 Bushels Barley, 5,000 lbs.           | 87        | 45         | 22      |
| 50 " Peas, 3,000 lbs.                    | 120       | 35         | 35      |
| 200 " Potatoes, 12,000 lbs.              | 44        | 22         | 70      |
|  | 713       | 289        | 224     |

Approximate estimate of Nitrogen, Phosphoric Acid and Potash, taken from 100 acres worked as a grain farm. Stock and produce carried on the farm:—4 horses; 4 cows; 1 calf; 3 hogs; 550 bush. oats; 275 bush. peas; 450 bush. barley; 200 bush. wheat; 200 bush. potatoes; 60,000 lbs. hay.

ANNUAL SALES:

|                                 | Nitrogen. | Phos. Acid | Potash. |
|---------------------------------|-----------|------------|---------|
|                                 | Lbs       | Lbs        | Lbs     |
| 3 Calves, Live Weight, 250 lbs. | 5 1/2     | 4          | 1 1/2   |
| 1 Hog " " 250 lbs.              | 4 1/2     | 3 1/2      | 1 1/2   |
| 200 Bushels Oats, 6,400 lbs.    | 120       | 35         | 25      |
| 350 " Barley, 17,500 lbs.       | 270       | 120        | 74      |
| 230 " Peas, 12,000 lbs.         | 185       | 70         | 45      |
| 150 " Wheat, 9,000 lbs.         | 21        | 11         | 35      |
| 100 " Potatoes, 6,000 lbs.      | 44        | 22         | 70      |
| 15 Tons Hay.                    | 1512      | 931 1/2    | 445     |

In both cases this is exclusive of what is necessary for the maintenance of the family on the farm; also in the case of the grain farm, it is exclusive of straw not used and which might be sold.

The intelligent farmer will see at a glance from the foregoing estimates the enormous amount of plant food that is sold off, never to return except from outside sources, and which must be either in the shape of chemical fertilizers, purchased foods, or barn-yard manure purchased in the towns and villages at a heavy cost, and even without taking the cost into consideration, it is beyond the reach of nine-tenths of the farming community; and when we take into consideration the fact that there is only about one-half percent of each of these essential elements of plant food in good barn-yard manure, it staggers us to think that it would require

about 30 tons in the case of the dairy farm, and about 95 tons in the other to make up what was sold off.

These facts go to prove conclusively that the best and richest of soils will become exhausted, unless something is used either in the shape of chemical fertilizers, or food from outside be bought and fed to stock on the farm, and returned to the land in the shape of manure.

Any of our old pioneer farmers who took the axe on their shoulders, cleared off the forests, and cultivated the virgin soil, will tell you that the produce is 25 to 50 percent less than when first brought into cultivation, and as time wears on the decrease in yield continues, until, in many cases, some of the farms in the older counties that were once considered the garden of Canada, have become completely sterile.

If we would come to our right minds, and develop an improved system of cultivation, we must cease to regard the soil as an inexhaustible mine, but rather look on the soil as our stock in trade, from which we are to manufacture all that is necessary for the sustenance of both man and beast, and we must do it (if we want to be successful) in as an intelligent manner as the mechanic who builds a steam engine, and who studies all the details carefully in order to save fuel, etc., and gets the greatest amount of power at the least expense. At this age of the world, it will not pay to do anything in a haphazard manner, but in order to be successful, we must investigate and study the most minute details, in order that we may see an intelligent reason for every change.

Now, from the foregoing facts, I think the question has been settled conclusively that land will not maintain its fertility—even if everything is put back—under the best system of farming, as there is a waste going on that must be made up in some way or other; the farmer cannot create something out of nothing, as he is but finite. Therefore we have to take into consideration the cheapest manner by which this waste can be overcome, and, in order to save time and expense in experimenting and going over the same ground which those in older countries have done, we ought simply to look up their records, where we will find the question fully discussed, and the conclusion arrived at is that well compounded chemical fertilizers will have to be resorted to by all progressive farmers.

Indeed, Prof. Atwater, of the U. S., says it is his belief that chemical fertilizers will supercede the use of barn-yard manure, being more immediately available, cheaper for farmers generally, and altogether nicer and easier to handle than barn-yard manure.

Another fact we must not lose sight of is, that either hay or grain grown by the use of rightly compounded fertilizers is much better in quality than by farm-yard manure. For instance, if a farmer will cut a small sheaf of hay from a field where fertilizers were applied, and cut a similar sheaf where none was used, having them conveyed under cover and dried carefully, he will find the hay grown with a fertilizer will have a nice, fragrant, aromatic perfume, whereas the other will have a dry, fibery smell like old flax, the difference being so marked that the value of hay for feeding purposes grown by fertilizers must, at least, be 25 percent better than the other. Wheat in the Genesee Valley, western New York, where wheat growing some years ago was abandoned by the farmers on account of the sterility of the land, has now again been taken up with renewed vigor and satisfaction through the use of fertilizers.

In support of Prof. Atwater's idea, as already quoted, a well conducted experiment on potatoes was tried in the Province of Quebec, during the summer of 1886, with the following results:—A field of potatoes was planted; on a part of the field about 15 tons of genuine milkman's cow manure was applied per acre, and on the balance of the field a fertilizer at the rate of 800 lbs. per acre, analyzing—ammonia, 3 1/2-4 1/2 percent; phosphoric acid, 8-10, and actual potash, 6-8 was used. The result of the experiment was a return of 32 bushels more potatoes per acre where the fertilizer was applied, as compared with the other part of the field where manure was used. The crop was sold all round at the rate of 40c. per bushel. Estimating the manure to be worth

\$1.50 per ton laid down on the field, which is below the average cost, and the fertilizer costing \$42 per ton on the field, we get the following results:

15 tons manure at \$1.50 per ton.....\$22 50  
800 lbs. fertilizer at \$42 " ..... 16 80

Saving in favor of fertilizer.....\$ 5 70  
32 bushels increase in potatoes at 40c. 12 80

Total gain in favor of fertilizer...\$18 50

I will cite another instance in favor of well compounded, complete fertilizers versus partial fertilizers: A gentleman in Ontario was in the habit of applying wood ashes on corn when planted; he seemed to think that the potash was all that was required. He was persuaded to try a well compounded fertilizer containing the three essential elements. The result was that where the fertilizer was applied the crop rushed ahead of the part where ashes were applied, and ripened sufficiently early to escape an early frost, while the part where the ashes were applied did not, and he was the only farmer in that part of the country who had any corn fit for seed.

This fact should be borne in mind by the general farmer, that he had better use a complete fertilizer than trust to a partial one, unless he is sufficiently posted in chemistry to know exactly what is wanting in his soil in order to produce without fail a good return.

Numerous other instances could be quoted, if time and space permitted, but the best proof that properly compounded fertilizers are needed is the fact that about 25 years ago the manufacture of fertilizers had only begun in a small way in the United States, and, according to government returns two years ago, over \$30,000,000 worth was made, and the consumption was equal to the production, which shows the estimation in which they are held by our neighbors in the U. S.

To sum up, this fact should be borne in mind by our farmers, that on account of our lands becoming exhausted, it seems a short-sighted policy that we should be shipping annually large quantities of our mineral phosphate, when they are so much needed at home, and, at the same time, it is a strong argument in their favor, showing to the outside world our short-sightedness in throwing away our birthright.

DISCUSSION.

MR. WELD—I do not intend to enter into the discussion of this paper, but before you commence, I wish to say one word. Since you chose this subject, it has been ventilated in other quarters—by our stockmen and their organs, aided by the professors of the Model Farm. Now, as this paper stoutly opposes the theories of these authorities, who maintain, in the live stock interests, that the farm-yard manure made on the farm will accomplish all that is claimed by the writer of the paper that has just been read. It should be deeply deplored by every honorable and independent farmer in Canada that a question like this should be dragged into politics for the purpose of advancing the interests of a few speculators. I feel it my imperative duty to call upon you as a body of honorable, intelligent and independent farmers, composed of stockmen, dairymen and mixed-husbandry farmers, to discuss this deeply interesting question upon its merits, and from that standpoint alone. It is my only desire to see truth and justice prevail, and I myself, as well as a large body of independent farmers throughout the Dominion, have implicit confidence in your decisions.

PRESIDENT LEITCH—There is a farmer present who informed me just before the opening of this meeting that he had seen a proof of Mr. Brodie's paper, and had read it before a meeting of the Grange in his neighborhood. He informed me that the Grange meeting had unanimously pronounced the paper to be a piece of rubbish from beginning to end, and he came here for the purpose of protesting against the discussion of such