

nonsense at farmers' meetings. What I protest against is the wholesale condemnation of anything, no matter how apparently absurd, without sound argument. For my part, I shall not yield to the Grange, to the Government, to the fertilizer men, or to any other power, unless they discuss the question fairly, and are able to give substantial reasons for their beliefs. My impression is that they are all wrong, or at least they do not give the whole truth, and their statements are therefore misleading. The discussion cannot be commenced without first stating the character of the soil and the system of rotation. I tried several tons of fertilizers, and have found no profitable results from them, but I am not so bigoted as to condemn them on this account. I believe the fertilizers I used were very badly adulterated. There should be rigid inspection, and farmers should learn when and where to apply them. They should first make careful experiments on a small scale, and if the directions of the chemists did not then prove satisfactory, it should be known whether the fault was in the chemist or in the fertilizer. I do not believe that barn-yard manure made on the farm is the great cure-all. Something must be returned to make up for the enormous drafts from the soil which are yearly being sold off. Some soils have great depth, and the supply of plant food is practically inexhaustible; but it may be more costly to unlock the insoluble constituents than to supply more available material. This can only be ascertained by direct experiment. When tillage and green manuring are carried out on an extensive scale, your crops can subsist largely on the food made available in the soil, but the natural fertility is being exhausted all the more rapidly. When the land is once run down, the fertility may be profitably maintained by proper management, but the restoring of the natural fertility may cost more than the land is worth. I believe that many soils are deficient in only one or two of the essentials of plant food, in which case it is a great waste of valuable material to supply barn-yard manure alone, which contains all the essentials. I don't agree with the writer when he says that farmers should buy general fertilizers; they should rather find out which constituents were most deficient, and then apply a special fertilizer. Buying food for stock to enrich the soil is only practical when there is profit in feeding it, and when the soil requires a general fertilizer.

JOHN O'BRIEN—I use large quantities of gypsum with good success, but I have had no experience with fertilizers. My soil is somewhat stony, and I pick out fresh batches of stones every year which come into contact with the plow point. In this way my soil sinks, and every inch I lose on the top I gain in the bottom. So long as this continues, I don't see how it is possible for my soil to become exhausted. If the bottom soil is worse than the surface soil, of course then this is a bad thing. If all the soil were plant food, it could never become exhausted, but the good is taken, and the bad left. I am in favor of making experiments with fertilizers.

JAS. K. LITTLE—I tried plaster and found no good effects. My soil is a stiff clay, and I have increased its fertility by plowing under clover. I am a strong advocate of green manuring, and have never tried fertilizers, but from what I hear, I have little faith in them.

W. A. MACDONALD—The great error which the live stock authorities make in discussing the soil restoration question is that they fail to draw

a distinction between increasing the productiveness of the soil and the increase of its fertility. In stock raising, when nothing but the home-made manure is returned, both productiveness and exhaustion may proceed at a rapid rate for many years; in fact, the greater the productiveness the more rapid the exhaustion, and if it is better to raise heavy crops for quarter of a century than light crops for half a century, then the stockmen are on the right track. There is no relation whatever between stock-raising and soil fertility; a pasture that carries a good cow per acre will become exhausted much faster than a grain field of average yield. The degree of exhaustion is determined wholly by the quantity and quality of produce sold off the farm, be it milk, grain or beef—providing the manure is carefully husbanded. The reason why stock-raising increases the productiveness of the soil is because under this system of husbandry the dormant plant food becomes more rapidly available, but it is absurd to credit this effect to the stock; the same end can be more efficiently attained by green-manuring, thorough tillage, root culture and the application of lime, salt and plaster, but the relative economy of these methods must be ascertained by each farmer for himself. Stock-raising can therefore only be defended on the ground that the business pays without counting the manure; and although both productiveness and fertility can be increased by purchased foods, yet this system of soil restoration is accomplished at a heavy loss, unless there is a direct profit in the feeding. But in speaking about fertility or exhaustion, a great deal depends upon what constituents of plant food are meant. The nitrogen (or ammonia, as Mr. Brodie is pleased to call it) may be restored differently from the other essential constituents. By green-manuring, thorough tillage, etc., the nitrogen can be not only maintained but also increased, as this element comes from the atmosphere as well as from the soil, and here stock-raising plays no part whatever. Phosphoric acid and potash, however, cannot be supplied through the upper regions, and when they are deficient—which they usually are—the most economical way is to supply them in the commercial form. Barn-yard manure, being highly nitrogenous, is a badly balanced ration for many soils. My soil can be kept productive for half a century by the application of phosphates alone. The argument of the stockmen that barn-yard manure improves the texture of clay soils is also a weak one, because the same end can be attained by green-manuring. Commercial fertilizers, being very concentrated, only produce profitable effects when the soil is in a good mechanical condition. Mr. Brodie does not put the case right when he says that fertilizers are better than manure for the quality of the crop; any fertilizer or manure which is excessively nitrogenous, especially if the soil is also so, will produce a poor quality of grain, grass, roots, or milk, although the bulk of the crop may be materially increased. There are some deep fertile soils, composed largely of minute rocky fragments, which can hardly ever be exhausted under a proper rotation of crops; but whether or not it is profitable to use commercial fertilizers with barn-yard manure or green-manuring, must be ascertained by experiments. In such cases, phosphates are usually lacking.

HENRY ANDERSON—I am a strong advocate of nitrogenous fertilizers, and I don't think I can get enough of them, although I have used phos-

phates with marked success. Since I began to save all the liquid manure—which is strongly nitrogenous—by keeping the stock mostly in box-stalls, I find a great increase in the productiveness of my soil.

Moved by John O'Brien and seconded by Jas. K. Little, that this Council, after careful deliberation on the subject of soil exhaustion, having compared the experience of its members with that of the best known authorities, make the following suggestions and recommendations:

1. That the farmer's first and most imperative duty is the saving of his barn-yard manure—both the solid and the liquid excrements of his stock, the main source of our soil exhaustion being attributable to neglect in this important particular.

2. That the extent to which the farmer should engage in stock-raising ought to depend upon the direct profits made in the business, calculating the food consumed at market prices, there being a loss in raising manure when there is no direct gain in feeding the stock.

3. That every farmer should study the requirement of his soil, and conduct experiments in order to ascertain if any of the constituents of plants exists in deficient quantities; if so, the lacking ingredients should be added in the form of commercial fertilizers applied with barn-yard manure when the greater profit is in the stock feeding, and with green manuring when the greater profit is in grain growing. Nitrogen fertilizers, if purchased at all, should be purchased sparingly, the farmer depending mainly upon atmospheric nitrogen, obtained by the introduction of green-manuring, thorough tillage, and root-culture, largely into the rotation of crops, unless he has proved by experiment that this element can be otherwise more cheaply obtained.

4. The farmer who has a deep, fertile, clayey soil, composed largely of fine fragments of rocks, and not poor in any of the constituents of plant food, may depend upon thorough drainage and barn-yard manure for maintaining productiveness for an indefinite period of time, without purchasing foods or commercial fertilizers, providing he extensively adopts the system of rotation mentioned in the last paragraph.

5. The farmer who has a thin layer of soil upon a substratum of rock, gravel or sand, must depend, for maintenance of fertility and productiveness, upon purchased foods when stock-raising is profitable, and upon commercial fertilizers and green manuring when grain is profitable—or upon a combination of these, depending upon the constituents most lacking in the soil.

6. No farmer can exhaust the fertility of his soil by selling off nothing but butter, providing he carefully husbanded the manure.

7. This Council deeply deplors the fact that so much of our valuable phosphates are being shipped out of our country to enrich nations which compete with us in the world's markets, and that so little interest is manifested by our farmers in experimenting with them to ascertain the quantity of phosphoric acid in their soils; also the extensive exportations of our ashes without experimenting with them as to the condition of their soils with reference to the supply of potash.

8. That this Council will use its utmost endeavors to have our fertilizer laws made in the interests of our farmers, whereby they may be able to procure at all times the pure, unadulterated article.

The motion was carried.