

From the cheese and butter makers' standpoint, there should be little difficulty in raising the quality of our dairy products to the highest standard possible. What with our dairy schools, our dairy instructors and inspectors, and the fund of dairy information distributed by both departments of agriculture, Canadian makers have every facility provided for perfecting themselves in the latest and most improved methods of cheese and butter-making. And we say it advisedly, the cheese or butter-maker, who has a first-class quality of milk supplied him, and has suitable buildings and the necessary equipment, and cannot make a first-class quality of cheese or butter, cannot be excused in the least. If he cannot make good cheese and butter under these favorable conditions he should not be in the business, and should take up some other calling where skill, intelligence and good judgment are not necessary to success.

But with the patron it is different. When co-operative dairying was a new thing in this country, not much attention was paid to educating and instructing the man who supplied the raw product as to how best to perform his share in the co-operation. Of late years a more extended effort is being made in his direction; but the patron is a very hard factor to reach. Outside of the dairy conventions, the dairy bulletins and an occasional dairy meeting no systematic method is being adopted towards inducing the patron to perform the duties which devolve upon him in the best possible way. No doubt the makers can do, and many of them are doing, effective work in this direction, but they are hampered to a large extent. The maker's position does not always give him that independence necessary to one who is called upon to instruct another. Where the maker is engaged to make by the cwt., it is to his interest to get all the milk he can, and if he should send home a can of milk because of its being tainted or sour he would offend the patron, who would withdraw his support. The problem, then, of educating the patron in the best methods of handling and caring for the milk supplied to a cheese factory or creamery is a very difficult one to solve. Perhaps the system inaugurated in Western Ontario recently, where a few factories are placed under the control of a competent manager, who devotes his whole time to the work, may be a means of solving the difficulty. We are of the opinion, however, that the education of the patron in the best methods of caring for milk for cheese and butter-making is the most important work which our dairymen have before them to-day. It seems to be the one branch in our co-operative dairy system which just now needs attention more than any other.

Some serious charges were made last season as to the quality of the cheese made in certain sections. We heard more than one in the trade make the statement that no improvement whatever was being made in the quality of Canadian cheese, and that in many instances the quality was not as good as it was a few years ago. These are strong statements, and should be weighed well by every dairyman in the country. Whether the patron or the maker is the more to blame for this unsatisfactory condition of things is not known. It may be that both are to blame, and have been negligent in regard to the duties they have to perform in making our co-operative dairy system a success.

Latent Fertility in the Soil

There is no more important question before the farmers of Canada to-day than that of maintaining and keeping up the fertility of the soil. The success of all farming operations depends upon it. Whether the farmer's specialty is live stock, dairying or grain-growing he cannot make a success of any one of them unless he gives special attention to maintaining the fertility of his land and making it as productive as possible. Too many farmers overlook this fact and condemn a certain line of farming as being an unsuccessful one to follow without getting at the very root of the cause of failure, viz., the condition of fertility in the soil.

The question of fertility is becoming of more vital importance to the farmers of Canada every year. Unless they give it first place in their farming operations the outlook for Canadian agriculture is not a very bright one. We have a country lavishly endowed with the elements that should go to make its soil productive. There are latent forces in the soil and atmosphere which, if the farmer knew how to control and utilize them, would make his farm much more productive than it now is.

In the December number of the *Industrialist* Mr. R. W. Clothier discusses the latent fertility of the soil. He states that farms do "run out" from long-continued usage and improper treatment, but adds that in the majority of cases a very small per cent. of their natural fertility has been taken away in the form of crops. By far the greater portion has been wasted by improper methods of cultivation. To quote :

"A very small per cent. of the total weight of plants is furnished by the minerals of the soil; and of this small per cent. the following elements are necessary to plant-growth: iron, sulfur, nitrogen, phosphorus, potassium, calcium, sodium, silicon, oxygen, and chlorine. Of these, all but potassium, phosphorus, and nitrogen are present in the soil in such abundance as to be practically inexhaustible. The amount of these three elements, then, contained in a soil will determine its fertility; and, since all of them may be considered of equal importance to plant-growth, a deficiency in any one of them makes the soil poor."

Taking Kansas soil as an example, the writer goes on to show that it contains 6,660 pounds of nitrogen to the acre to the depth of one foot. For an ideal crop of wheat 59.46 pounds of nitrogen per acre is required for both grain and straw. According to this an ideal crop of wheat could be grown yearly for 70 years before the supply of nitrogen would be exhausted. By the same cropping the phosphoric acid would last 115 years and the potash 200 years. But these represent the fertility in only the first foot of soil. Many of the roots penetrate below this depth, and, as the rain annually brings down to the soil from six to ten pounds per acre of nitrogen, it would seem that the fertility of the soil is practically inexhaustible. But the writer recognizes the fact that soils do wear out, and explains it as follows:

In the first place, only a small portion of this plant-food is ever available to the plant at any one time. Nearly all the nitrogen, for example, exists in the form of organic matter, which cannot be used until it undergoes the process of nitrification, the process by which the nitrogen of organic matter is converted into nitric acid and nitrates. Nitrification takes place by means of bacteria, which live in the soil. In order that these bacteria may thrive and perform their work well, they must have conditions of warmth and moisture, must be supplied with oxygen, and the acid formed must be removed or combined with some base. Quite often a base easily acted upon is not present and too much free acid accumulates. Then, too, in waterlogged soils the temperature remains too low and the air is excluded by the water. We must find some way to supply these necessary conditions.

But there might be plenty of available nitrogen and the soil fail to produce well on account of a deficiency in available potash or phosphoric acid. These elements exist in the soil in nearly or quite insoluble compounds; the potash in combination with other elements form double silicates, while the phosphoric acid is in combination with various bases which form insoluble phosphates. They may be liberated from these compounds and brought into solution by means of humic acids formed by the humus of the soil, by means of water holding in solution other salts, and by the action of the fibrous roots of plants. But, under the most favorable conditions, it has been estimated that less than one per cent. of these elements could be brought into solution in one year's time; and when once brought into solution their tendency is soon again to form insoluble compounds. Granting, however, that an abundance of these three elements exists in available form, soils may fail to produce because they lack the necessary water to carry this food to and into the plants.

The chief means by which these difficulties may be overcome is good tillage. There is no other way by which so much plant-food can be liberated as by thoroughly pulverizing the soil:

Good tillage loosens the soil and allows free circulation of air. It may often aid in hastening evaporation for a time, and