

nished by this investigation is sufficient to show the great value of this practice as a means of storing up moisture for the crop of the succeeding year.*

MECHANICAL ANALYSES OF THE WESTERN PRAIRIE SOILS.

For the following report on the mechanical condition of these soils we are indebted to Dr. Edward J. Russell, Goldsmith Chemist, Rothamsted Experiment Station, Harpenden, England, who in addition to the work involved in making the mechanical analysis has very kindly written out in the appended notes his opinion—a very favourable one on the whole—of the structure of the soils as deduced from the physical data.

"1. *The Manitoba Soils.* The Manitoba soils fall into three groups, Nos. 1 and 4 the Red River valley and Brandon soils being much the heaviest; Nos. 2 and 3 from Portage la Prairie are good loams; and Nos. 7 and 8, the Dauphin soils are distinctly light and sandy."

"The Red River Valley and Brandon soils are characterized by the presence of rather large proportions of fine material, clay, fine silt and silt, and comparatively small proportions of coarser particles. They possess in a high degree all the properties associated with clay and silt; they are retentive of moisture and of plant food, and they are rich in potash. Such soils are very fertile wherever the air and moisture supply is satisfactory and the difficulty of getting a tilth not too great; the losses consequent on cultivation are reduced to a minimum and the plant is able to make the most of the food stuff present."

"The difficulties generally presented by this type of soil are that they tend to become very sticky and therefore expensive to cultivate, and they tend to become too compact for plant roots to get a proper air supply. In England similar soils have largely gone out of arable cultivation and are laid down to grass.† But there are two important features of the Manitoba soils that effectually prevent this stickiness and compactness; the presence of a large amount of organic matter, and the fact that they do not lie in a wet state throughout the winter. So long as these two features remain strong are the soils likely to continue fertile."

"The only one that is likely to change is the amount of organic matter. Continuous wheat cultivation necessarily results in the dissipation of organic matter, and if it went on indefinitely it could not fail to bring the amount so low that undesirable features would present themselves just as they have done elsewhere. This, however, never need happen; as soon as the organic matter shows signs of falling too low it will only be necessary to grow green crops, preferably leguminous crops, periodically and to convert them into manure either by feeding on the land or by ploughing them in. At this stage lime and other mineral manures would probably be necessary. The data accumulating at the Experiment Station will enable the officers to give ample warning when the danger limit is being approached. There is no sign of it in the present sample."

"The Portage la Prairie soils are good loams closely resembling the famous brick earths of Kent and Sussex. As they possess less fine silt and clay than the Red River soils they are less dependent on their organic matter for the purposes of tilth; they would probably be easy to cultivate, however little there was. At the same time the organic matter is so great an advantage as a supply of nitrogenous plant food that it should not be allowed to fall too low."

"The Dauphin District soils are altogether different. They contain so little clay and fine silt that they derive but little retentive power from their mineral constituents. They are therefore, like the Red River valley soils, but to a very much greater extent, dependent for

* Unfortunately, fallowing is not without its concomitant evils. We have already pointed out that dissipation of humus and nitrogen results from continuous grain growing, and that the greater part of this loss is more particularly consequent upon the stirring and opening up of the soil by repeated cultivation during the fallow season. It must now be stated that a further loss may result from fallowing—viz. the removal of more or less of the rich surface soil by erosion and drifting. The constant cultivation of the land breaks up the fibres, the binding element which gives the toughness to the prairie soil. As the fibre becomes shorter, the surface loam more readily dries and pulverizes; it is then easily carried away by the strong wind. In the period of recent seasons in prairie regions. Very serious losses have occurred from this cause in some of the older cultivated districts of the Northwest. The adoption of a cropping system in which the soil is occasionally put in soil suggests itself as the natural and best corrective.

† See footnote on page 24.