

would think that it is the stagnant water and lack of oxygen which determines the accumulation; while in situations where limestone comes near the surface in dry, warm districts one finds a deposit of mellow black soil accumulating which can be due neither to cold nor excessive moisture, nor to lack of oxygen.

In certain areas where swampy soils containing much organic matter have developed and are deficient in mineral matter it may be practicable to transport inorganic or mineral matter, such as sand and pumice or clay, on to the surface, and so improve the soil in its deficiency. Nature has done this for the extensive Te Puke and Rangitaiki Swamps. Layers of air-borne pumice and volcanic ash are to be found at various levels in the former, and calcareous mud, pumice, and ash layers in the latter swamp. These layers greatly facilitate drainage, and ameliorate the conditions physically and chemically to a degree which owners of other swamp lands can only envy. When one reflects on the good which a pumice deposit will effect on a swamp soil it at once suggests what should be supplied to a pumice soil to improve it.

It must not be thought, however, that humus soils are everything that could be desired, for even they have their weaknesses. Frequently they are deficient in mineral plant-food, but respond at once to dressings of phosphates or potash when these are lacking. Sir John Russell, F.R.S., quotes a pathetic instance of an American farmer who endeavoured to farm on a black soil. "The land looked rich," he said, "as rich as any land I ever saw. I bought it, drained it, and built my home on a sandy knoll." His first crops were fair, but grew rapidly worse. He and his wife and children wasted twenty years of their lives on this land. It was poverty, poverty always. After he had given up his holding, and a chemist had been at work on the problem, the farmer one day brought his wife and children to see the heavy crops on plots treated with potassic fertilizers alongside the miserable ones on untreated land. In tears he asked, "How was I to know that this single substance which you call potassium was all we needed to make this land productive and valuable?" In the case of humus soils mechanical analysis is inapplicable, so that any knowledge, apart from field and pot experiments, must be gained by chemical analysis.

The importance of increasing the store of organic matter or humus in New Zealand soils has not in the past received that attention merited by the importance of this aspect of manuring. There are three ways in which the organic matter in the soil may be increased in farming practice: (1) By applying dung, stable, farmyard, or other crude refuse of an approved organic nature to the soil; (2) by growing and turning in a green crop, known as "green-manuring"; (3) by putting the land down in pasture, which allows organic matter to accumulate. The difficulties of supplementing the store of organic matter in the soil are sufficiently indicated by these methods of redress, but the problem must be faced if many of the coarser-grained soils of this country are to be profitably and continuously worked.

At Stanley Brook Valley, Nelson, there is a flat area of gravelly loam and sandy silt concerning which the writer advised the local branch of the Farmers' Union in March, 1919, that "the improvement of these soils will depend largely on increasing the organic matter in