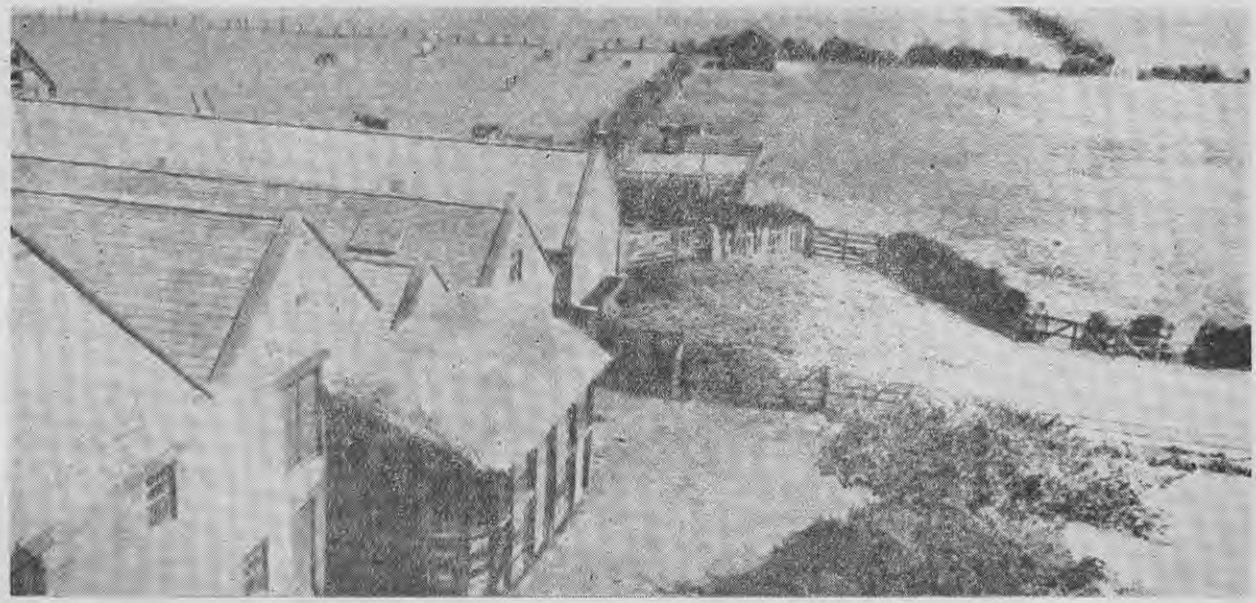

Cockle Park Experimental Station, Northumberland.

Reynolds, Martyn, Clark, and other members of the club were careful experimenters with manures for crops on a unit cost basis, reporting their results to the club from time to time. Topdressing started hesitantly in the Cambridge district in the eighties (2), the seed drills being used as distributors. Its early progress was delayed by a baffling feature which arose from the cautious manner in which those who first tried it would topdress only part of a paddock, to be sure that the topdressed part was better than the untopdressed part. Curiously enough, it was usually worse, the grass on it being only a few inches high while the rest was knee high and going to seed. This is said to have been a common experience. It was not realised for some time that the stock were eating the topdressed grass and leaving the rest. Topdressed paddocks automatically became understocked.

In the nineties the practice spread further afield. "Some beautiful green paddocks were to be seen from the main road in passing through the Morrinsville district, and it used to be a mild joke to suggest that those Morrinsville farmers, anxious to sell their hungry farms, had sprinkled some bonedust over their front paddocks" (11). About 1900 John McCaw, then Superintendent of the Bank of New Zealand Assets Realisation Board, began topdressing at Matamata with 1½cwt. to the acre, in order to prolong the life of the pastures whose persistent running out seriously interfered with the grazing management (9). This was contrary to the advice of the Department of Agriculture whose recipe for the Matamata County was "a combination of gorse, kept under control by stock, together with . . . some selected grasses (such as . . . chewings fescue and *danthonia semi-annularis*)" (14).

Scientific Background

As is often the case, practical men gave the clue to the experts. The same thing had happened in England, where the Cheshire farmers who used crushed bones on old grass at the beginning of the nineteenth century had started the investigation which resulted in the invention of superphosphate by J. B. Lawes in 1842. In 1843 Dr. Justus von Liebig applied the economic law of the minimum to agriculture, stating that "by the deficiency or absence of one necessary constituent, all the others being present, the soil is rendered barren for all those crops to the life of which **that one** constituent is indispensable."

In 1856 Lawes set apart about 8 acres of grassland in his park at Rothamsted for investigating the comparative effects of different manuring substances on permanent grass—"in the first instance, probably to determine the best means of increasing the gross amount of produce. But not only has the general character of the herbage as to vigour, colour, date of ripening, etc., materially altered, but the composition of the produce has entirely changed. . . . No fresh seed has been artificially sown within the last fifty years certainly, nor is there any record of any having been sown since the grass was first laid down" (13). The dominance was shifted from sheep's fescue to cocksfoot.

The history of basic slag as a commercial product began in 1879 with the successful demonstration of the Bessemer process of steel-making at Durham; while in 1886 Hellriegel and Wilfarth in Germany discovered the fact that clovers could extract nitrogen from the atmosphere. These two discoveries were amalgamated by Sir William Somerville, Sir Thomas Middleton, and Professor Douglas A. Gilchrist at Cockle Park, Northumberland, in a series of experiments which began in 1896.

Somerville determined the superiority of basic slag over other manures for renovating poor grassland on heavy clay soil. He used sheep to measure the productivity of the pasture. "Hitherto in grassland experiments the values to be attached to various improvement methods were assessed by the extra weights of hay produced" (15). Realising that this did not necessarily measure the quality of the herbage, Somerville used live-weight gains to assess the results. He decided that the improvement in productivity was largely due to the appearance of wild white clover, which was the only new plant to come in. He also found that the application of lime doubled the calcium intake of the herbage plants.

Somerville worked with 3-acre plots, which were criticised as not being the usual farm practice. So Middleton set