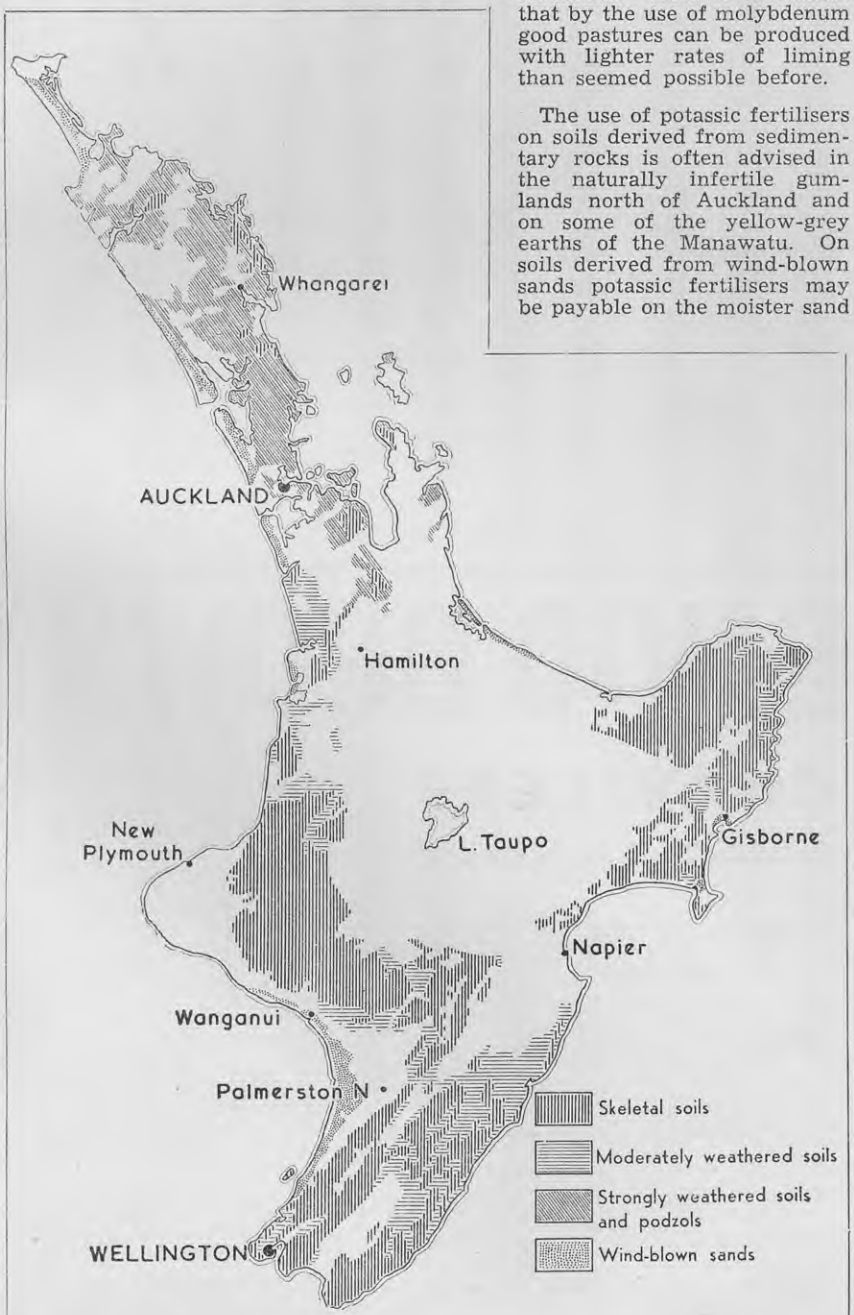
notably of molybdenum. Long-term trials to obtain an estimate of phosphate fixation have not been done except on a few experimental stations.

Liming improves the fertility of most soils derived from sedimentary rock. Some soils derived from limestone and calcareous mudstones and sandstones in the drier east coast districts of the Wairarapa and Hawke's Bay are an exception. Particularly, the steep hills formed from these parent materials need no lime. The rate at which lime should be applied to be effective depends largely on soil type. Quite small amounts of lime, from 2cwt. to 6cwt. per acre, markedly improve pasture production on some soils in the southern half of the North Island. The more clayey soils of the warm and moist northern districts, however, show a need for heavy liming. In the past 2 tons per acre and over was advised on many clay soils and gumland soils near and north of Auckland. Now it is known that by the use of molybdenum good pastures can be produced with lighter rates of liming than seemed possible before.

The use of potassic fertilisers on soils derived from sedimentary rocks is often advised in the naturally infertile gumlands north of Auckland and on some of the yellow-grey earths of the Manawatu. On soils derived from wind-blown sands potassic fertilisers may be payable on the moister sand flats along the Manawatu coast. Potash deficiencies are also expected to occur in all districts where the rainfall exceeds 60in. to 70in. per annum, particularly on fields frequently cut for hay.



[*Adapted from a map of Soil Bureau, Department of Scientific and Industrial Research*

Pasture responses to small amounts of copper sulphate have been observed only in the last 2 years. Several soil types are involved, namely peats, young coastal sands, very poor pipe clay gumland, sandy gumlands, and some hill soils derived from sandstone.

Molybdenum deficiencies are found in many soils. The most spectacular pasture responses to this element have occurred on clay hills derived from sandstones in the Warkworth district, north of Auckland.

Zinc, magnesium, and boron deficiencies so far seem to be of very minor and only local significance in pasture production.

SOIL GROUPS

Yellow-grey Earths

Concurrent with overseas practice the names adopted for the main soil groups often describe the dominant colour of their profile. It is a nomenclature somewhat confusing but difficult to change. The yellow-grey earths are associated with an annual average rainfall of about 20in. to 35in. They occur therefore only in the driest districts of the North Island, in central Hawke's Bay (see map on page 43). Most soils from this group are formed from limestone, mudstone, and sandstone, but a small proportion of pumice may be present. The quite large areas of flat land in central Hawke's Bay are mainly derived from old alluvium deposited by rivers from material carried down from the hills. The parent material of the old alluvia is therefore similar to that of the hills. The soils formed on the old alluvia, however, often differ quite markedly from hill soils. Being flat or nearly so, they are more receptive to rainfall; there is less run off, hence more leaching; and there is more moisture for chemical and biological activity, hence more advanced soil development. Often there is a well-developed clay pan in the subsoil which is practically absent in hill country. This clay pan formation is typical of yellow-grey earths in both Islands. It makes for pugging in winter and fairly quick drying in summer. Mole drains usually last well on these soils.

Owing to the relatively low rainfall the yellow-grey earths are not strongly leached. The word leaching