



Photo: Soil Conservation and Rivers Control Council
(D. N. Bircham)

An aerial view of the upper Motueka River. On the right of the river, running close to the tip of the aeroplane's wing, is a line of trenced willows. These are a part of the works in hand to train the river, to prevent flooding and erosion of the valuable land alongside.

It is sometimes well worth while to undertake isolated soil-conservation works but it is preferred that, from the soil-conservation surveys, conservation farm plans should be formulated. The land-capability classes are recorded in practical detail on a map of the farm. The permanent future use of each unit of land is planned within the economy of the farm and appropriate conservation treatments are developed for each class of land in each new paddock. The plan is then discussed in detail with the farmer, and the implementing of the plan is staged over a period of years to suit his resources. According to the needs of the farm the plan finally adopted combines good farming and the special conservation practices required for the best permanent use of the land.

The goal of soil conservation is the application of conservation-farm plans on every farm in a catchment. Greater protection and control can be obtained from closely integrated schemes, and, further, instances of flooding and gullying and other deterioration often affect several farms. Farmers can do only a limited amount of effective control individually, but collectively they can achieve balanced control and full use of the soil and water resources of entire catchments. Conservation farm plans on farming land, supplemented by conservation forestry and other conservation measures on the unfarmed portions of catch-

ments, provide a soil-conservation scheme, which, coordinated with river-control and drainage schemes in the lower parts of the catchment, achieves a complete catchment-control scheme.

Drainage and River Control

As with soil-conservation measures so, in the case of river and drainage works, it is often necessary to undertake isolated remedial jobs because of the urgency of correcting unsatisfactory conditions or preventing progressive damage. However, the broad purposes of such works and the means of achieving the desired ends are best understood by considering major control schemes covering extensive lengths of river valleys and including works both on the river itself and for the drainage of adjacent land.

The objects of major river-control schemes are firstly to stabilise the channel and increase its hydraulic efficiency, secondly to reduce the spillage of floodwaters, and thirdly to provide a better drainage outfall for land requiring it. The first object is achieved by training works to induce freshes and floods to do the necessary excavation, by bank protection, and by cut-offs. The second object is achieved to some extent by improved channel efficiency. In more elaborate schemes general stopbanking is required and, in some cases, part of the major floods may be diverted down floodways or ponded. Achievement of the third object depends usually on normal river levels being sufficiently low for gravity drainage of the adjacent country. When the land is capable of high development better water control is justified and drainage water may then be pumped during periods of high river flow. Before embarking on a large-scale scheme to attain these objects two other matters must be considered: one is the condition of the catchment and the soil-conservation measures required so that detritus will not overwhelm the river works downstream, and the other is the economic benefit that the scheme will confer.

The predominant use of training works is in the shingle reaches of a river for the purpose of producing a single-thread channel. In its shingle phase a river generally occupies a wide bed containing braided channels that are constantly changing, and the axis of the river is usually relatively straight. To produce a single-thread low-flow channel in such a river