

a series of experiments on the effects of cattle-stocking at varying degrees of intensity, and the acreage cost of keeping the cattle; where breeding can be done; where cattle can be kept throughout the year; and where cattle have to be periodically bought and sold. The relation of fencing to the density of cattle-stocking, and the variation in the acreage cost of necessary fencing according to the size of the holding and the acreage density of cattle kept, are important. With fairly reliable information under these heads it might be possible to outline methods for the Government financing of cattle-purchase, with a reasonable expectation that the costs would be finally recoverable. Personally, I might add that I do not consider that a mere increase in the cattle kept will be found economically sound except where the holdings are comparatively large. Fencing-costs, reduction in sheep carried, the increased cattle-density necessary over that of large holdings, and the necessity of often having to buy on a high market and sell in a low one, preclude cattle being the sheet-anchor of control on small holdings.

(2.) *Introduction of grasses and clovers more likely to be permanent and resist second-growth invasion than the standard English grasses.*

Roughly expressed, it may be said that the hope of every holder of second-growth invaded country is that the country will turn into danthonia grassland, as has been the experience on much of the surface-sown hill lands of the North Island. Danthonia, however, belongs to the class of grasses known as light-requirers, and cannot possibly obtain the upper hand when shaded. Danthonia will not endure even a moderate amount of shade, and is likewise not particularly tolerant of an extremely wet climate. A wet climate is, on the other hand, of great benefit to the development of secondary growth. Again, provided it is not shaded, danthonia prefers well-consolidated rather than loose land. Generally speaking, all the conditions for rapid danthonia-spread are absent from the country that has so badly reverted to second growth, and unless methods favouring its development can be adopted into the region in question there is no reason to believe that danthonia will become generally dominant unless the amount of burning done can be vastly increased. On sunny faces, provided fern and scrub growth is kept out, danthonia is always likely to become established and spread, irrespective of whether it is intentionally sown or not. It is generally admitted that intentional sowing will lead to more rapid establishment than where no sowing is done, but actual sowing of danthonia, particularly in combination with other grasses, is often extremely disappointing. Burning, by removing shade, frequently has a marked effect on danthonia-spread, and in fact, in the past, has been one of the main factors that has led to its dominance over wide areas.

The establishment of a close and continuous sward of some grass or combination of grasses is essential in the suppression of secondary growth, and the fact is being strikingly demonstrated that the only type of grasses that are likely to be suitable in this respect are those that are capable of spreading on soils of low surface fertility. The main grasses that come to one's mind are danthonia (work on the fertility and shade factors with regard to the different forms of the pilosa, racemosa, and semiannularis groups may yield very significant results); brown-top and its forms; ratstail; tall oat-grass (perhaps on account of its suitability for loose soils); paspalum; and perhaps tall fescue. It would appear as if it were essential to try and make one or other of these grasses the dominant one on second-growth country, so that wherever any thinning-out takes place the likelihood is that the vacant spaces will be seized on by grass rather than by undesirable vegetation. Other grasses, such as crested dogstail, poa pratensis, and microlaena are all likely to prove useful. Rye-grass most certainly should never be sown on burnt-out patches of secondary growth, except perhaps where the soil-fertility is still high and the value of cocksfoot is more than doubtful. Generally speaking, the philosophy that has been adopted in the past on initial sowings is that the mixture should contain a combination of the better grasses which keep going for a few years, and a certain amount of such grasses as danthonia and brown-top to occupy the ground rendered vacant by the thinning-out of such grasses as rye and cocksfoot. Whether this reasoning is really sound or not I rather have my doubts. Unfortunately, in much of the present deteriorated country only rye-grass/cocksfoot mixtures with a small proportion of crested dogstail and clovers have been sown, and the sowing of combined high-fertility elements and low-fertility elements together on the initial burn has not been under any exact observation. Were I advising on the sowing-down of initial burns of Whangamomona country at the present time I should be inclined to exclude all rye-grasses and cocksfoot, and make brown-top/danthonia, crested dogstail, paspalum, poa pratensis the only grasses I would use, and white clover (the question of wild white clover is one that must be investigated on hill pastures), suckling-clover, lotus major, and perhaps subterranean clover. I would likewise be inclined to sow a certain amount of fog, particularly if the burn was not a really good one.

Quite apart from the mixtures to be used on land where the original sowing has been replaced by secondary growth comes the question of the formation of the seed-bed and whether the seed should be mixed with manure. One can divide the types of vegetation on which reseeding should be done into hard fern, bracken fern, water fern, manuka, and particularly pasture that is thinning out but may not be seriously invaded by second growth. On this last type of vegetation a seed-bed cannot be secured by burning, and I would, in attempting to renovate such a sward, advise the sowing of brown-top and crested dogstail with about 1½ cwt. of super per acre on the dark faces, and brown-top danthonia, crested dogstail, and paspalum together with manure on the sunny faces. Lotus major and perhaps subterranean should be the main clovers used. In the sowing of second growth of all kinds a seed-bed formed by burning the growth either standing or with some prior treatment depending on its type naturally would take place, and I would again make what are generally looked upon as the poorer grasses and clovers the only ones to be used.