In the case of deteriorated hill country it has been found that perennial ryegrass will not hold, and its place is taken by weeds or fern. A mixture suited to unploughable country of this nature has as its main constituents:—

Cocksfoot
Browntop or danthonia
Crested dogstail
Paspalum (Auckland Province)
Lotus species and subterranean clover
Yorkshire fog
Perennial ryegrass is sown, but is often temporary.

On the ploughable hill country white clover and perennial ryegrass can be introduced on the more fertile clays, such as limestone. In cases where topdressing can be carried out economically on poor hill country and subdivision is adequate, the level of fertility can be raised to enable a rye-clover-paspalum sward to be established.

Browntop is suited to the damper and more shady faces, and this environment also meets the requirements of cocksfoot. On the more exposed, sunnier situations danthonia establishes and thrives better than browntop. Of the clovers, subterranean, *Lotus major* and *Lotus hispidus* occupy a lower plane or fertility to that of white and red clover. On the very poor silica soils *Lotus hispidus* establishes freely, and is a good fertility builder where these types occur.

The meadow grasses—timothy and meadow foxtail—should be sown on the heavy fertile clays and semi-alluvial flats.

(2) Competition Between Species

Selection of mixtures must aim at producing that desirable "balance" in the pasture. This balance, however, must be maintained by proper management, stocking, and topdressing. Perhaps the most notable example of one species crowding out other and more permanent species is the inclusion of too great a quantity of red clover mixtures, and the same applies to Italian ryegrass. These two pasture plants are quick growing and purely temporary elements in the sward, so that if they make up too great a proportion of the young sward the permanent elements—ryegrass and white clover—will suffer, to the detriment of the permanent pasture. Therefore, only sufficient of the temporary species are included to act as fillers until the long-lived species are established.

Here is an example of a mixture for pasture on ploughable limestone hill country:—

Perennial ryegrass	25lb		20lb
Italian ryegrass	8lb	NOT	15lb
Cocksfoot	8lb		8lb
White clover	2lb		2lb
Red clover	1lb		3lb
Total	44lb		48lb

(3) Importance Of Strain

Too much emphasis cannot be laid on this aspect of pasture establishment. Just as animals adapt themselves to local conditions or become acclimatised, so do plants build up different forms or strains for characteristics, such as permanence, leafiness, seed-producing qualities, and so on. In New Zealand different strains of ryegrass and clovers have been selected from plants which exhibited the desirable forms of permanence and leafiness for pasture production. Seed from these plants has been bulked for regrowing and the further production of seed for distribution to farmers. It has been found that these lines of certified seed fully repay the grower for the establishment of permanent pastures.

(4) Establishment Capacity

The establishment capacity of a seed mixture means the number of plants which survive from the number of seeds which germinate. One of the aims of the plant breeder is to produce strains which have a high establishment capacity; thus, the farmer may rest assured that he will receive full value for his money if he sows certified seed, always provided, of course, that the species sown is suited to the level of soil fertility. If, for example, perennial ryegrass is sown on poor, leached soils, germination may be high, but subsequent establishment will be low. On the other hand, if a mixture containing, say, Yorkshire fog, browntop, and *Lotus hispidus* is broadcast on these low fertility soils better results will be achieved and a "grassland soil" built up, which may ultimately reach a level where ryegrass and white clover can be sown to form a permanent pasture.

Hard-and-fast rules cannot be laid down for the selection of pasture seed mixtures for any soil type, but the above remarks are given as a guide, and if the four cardinal points mentioned are observed successful permanent pasture establishment will result.