PASTURE SEED MIXTURES FOR DISTRICTS OF LOW RAINFALL.

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The low rainfall districts. of New Zealand grow poor pastures of low carrying capacity. They are situated in Canterbury, Central Otago, Marlborough, Wairarapa and Hawkes Bay, a total area of several million acres. Although precipitation may be moderate to low, i.e., below 30 inches per annum, the distribution is often erratic and uncertain, Very dry periods and droughts occur usually, sometimes between spring and autumn, Pastures are frequently eaten bare during these dry times, and of ten for want of other feed sheep have to be kept on these bare pastures nibbling any available herbage still closer, It is in these dry or drought periods that the effects of a low rainfall are severe. On shallow shingle soils the dryness is felt more quickly and severely than on loam or clay loam soils. The problem of suitably grassing these areas is further complicated by the occurrence of several soil types even within any low rainfall district. The aim of nearly every farmer in these districts is to secure high producing, good quality and more permanent pastures . As the life and production of the pasture is dependent greatly upon the mixture sown, the choice of a suitable seed mixture becomes an important farm management consideration.

CLASS OF SOIL AND USEFUL SPECIES: In the low rainfall districts there are many soil types varying from soils of high fertility to the light shingle class of low fertility, some of which are conspicuously low in organic matter, The heavy soils in general. produce pastures comparable wi-th those of the high rainfall areas.

All other soils must be considered when compounding Pasture seed mixtures suitable for such low rainfall districts. These soils may be classified for the purpose of opening discussion on the subject, *into* three main groups; good medium soils; stiff clay or clay loams usually overlying impervious clay subsoils, and light to very light shingle soils with very free drainage and extremely low water holding capaci ty .

It will be appreciated readily that the medium soils are capable of growing good ryegrass and cocksfoot, lucerne, all clovers, etc., without difficulty even though the growth of these plants is retarded each dry period by lack of moisture, On these soils lucerne is especially useful as has been demonstrated in Marlborough and North Canterbury. All other deep rooted pasture plants such as cocksfoot, mont. red, and ordinary red clover do very well. Ryegrass and white clover in normal and wet seasons give extremely good results. By adoyting approved establishment and top-dressing methods good pastures can be grown and maintained for many years on these soils.

The clay soils are usually cold and somewhat sour in nature. They are often lacking in adequate drainage when wet and bake hard when dry. They are usually low in organic matter and in need of heavy liming and phosphating before good pastures *can* be established and maintained. *On* these soils certified white clover and certified ryegrass together with mont. red clover and subterranean clover make good pastures only with liberal liming and top-dressing.

The light soils generally are perhaps the most difficult to handle from the point of view of establishing high class permanent pastures. They are naturally poor and low in organic conten. They hold little' moisture and dry out very rapidly when the normal dry periods occur. It is here that subterranean clover must be given first preference. Red and Mont. red clover, and to a lesser extent, cert. white clover along with cocksfoot and ryegrass are, of course, important associates. Cocksfoot has not yet been fully appreciated on these soils simply because its establishment is relatively more

difficult than ryegrass. Cert. ryegrass without abundance of clovers is disappointing.

With the *exception* of lucerne on the medium and freer soils and subterranean clover on the light and dry soils it is a remarkable fact that the same species are used very largely to compound mixtures for all types. Omission of *one* or other of the species mentioned and dominance of others in a given mixture or pasture, however, is an important point of difference.

LIFE OF PASTURES IN LOW RAINFALL DISTRICTS.

In these districts at present the life of a high producing. pasture of desirable species is, in practice, relatively short. This fact was readily accepted by the farmer in the past when he sowed what is termed a 1-2 year pasture, or a 3-4 year pasture and was apparently contented with the thought that in a few years he would renew the pasture again. Discerning farmers endeavoured to secure a more permanent pasture but to the rank and file the idea of a permanent pasture was an ideal "impossible of achievement." All farmers however, recognise the value of a permanent high producing pasture and it is only fair to state that many have attempted the establishment of such.

The short lived paature consists of Italian or "false" perennial ryegrass and red clover. In the 3-4 year pasture mixture perennial ryegrasa of the commercial, instead. of the true type, of ten replaces Italian. Where certified or true perennial ryegrass has been sown with red clover alone and no toy-dressing applied the useful life of the pasture in general is extended but little, It is true here,. however, that the invading; species such as hair grass,-' browntop, etc., are slower in establishing themselves in competition with true perennial ryegrass. This is due to the fact that the relatively unpalatable ryegrass (1) is less,:, readily eaten than the relative&y more palatable invading plants which are kept closely "grazed. Many farmers have tried a few pounds. of cocksfoot in the 3-4 year-mixture thereby hoping to extend the life of the. award for a few more years. Under favourable circumstances success has 'been achieved. More 'of ten, due. to the unsatisfactory method of sowing-, the light seeding, the early competition of the cover crop and the too common severe] grazing in the first year, at the end of three or four years only scattered though' often strong -growing, cocksfoot. plants remain.

In recent years some farmers have sown permanent or certified white clover and subterranean clover as *an* extra *in.* the. 3-4 year mixture. -Where the establishment and subsequent management has been favourable to these species extremely good results have been secured. The outstanding. speoi es, however, that has formed the most valuable basis to these temporary pastures is red clover. Its value in all low rainfall districts on all soils except stiff clays is well known. Its only disadvantage is that its useful life rarely exceeds 3 to 4 years,

It cannot be 'too strongly enphasised: that apart from the establishment factor (2) the: subsequent grazing management which. i't is-admitted is not always controllable is a most potent factor. in determining the. life of. any pasture in these districts. Certain species such as subterranean clover, Mont. red clover, cocksf'oot and true perennial ryegrass., however; once established are better able than others to stand the strain of severe grazing for a short time' especially under. top-dressing condition-s.

NATURAL GROWTH PERIODS AND SEASONAL REQUIREMENTS.

In these districts growth takes place when rain falls in sufficient quantity. Winter time,. of course, is an exception, little

growth normally occurring at that time. In normal seasons the spring rainfall is usually sufficient to promote a fair growth. **The growth** period at this time extends from mid-September to the latter part of December. Sometimes Autumn growth which is usually low commences in February or March, but more frequently it is late March or April before autumn grown pasture can be relied upon. The autumn growth practically ceases by June. The fact *is* that the pastures in these districts produce the bulk of their herbage in three or four months in the spring and some herbage in two or three months in the late autumn. A small winter growth and **an** early spring growth of course, takes place on newly sown pastures, especially of the subterranean clover and ryegrass types. The feed supply gap is bridged in winter by supplementary feeds. That in summer *is* similarly catered for but here difficulty is experienced only too frequently in sowing suitable feed early **enough** for the continued fattening of lambs and other stock. To assist this period, pastures have to be definitely under-stocked in the growing period so that roughage is available. The pasture to be used in the dry period, must be largely grown in the spring time *or* the normal growth period. Deep rooted plants such as cocksfoot, Mont. red clover, ordinary red clover, and lucerne of course grow longer into. and remain green longer into the dry period. As pasture is the cheapest available feed the grazing management must be such that during the normal growth periods either all pastures are allowed to get out of hand or some pastures are specially spelled purposely or very lightly grazed at this time for use later when required in the tall or well grown and perhaps semi-wilted state. Thus for these areas pasture mixtures must aim to provide suitable feed in the spring in the tall or semi-overgrown state in summer and early autumn, in. the late autumn growth period a .d in winter.

The 3-4 year temporary pasture mixture of semi-permanent ryegrass and red clover provides for these requirements fairly well. With appropriate, i.e. , light stocking the red clover automatically gets **out** of hand in the spring and provides the desired semi-wilted high quality feed necessary to maintain fattening stock *in* a high state of thrift in late December and early January. Although pasture of this class is likely to maintain its place for a long time to come, unfortunately it does **not** enable the high pasture renewal costs to be avoided or reduced. Also it does not give the best late autumn and winter growth and is more likely to be seriously damaged by grass grub than other suitable and more permanent types, **such** as cocksfoot and **subterranean clover.** For a temporary 3-4 year pasture this simple mixture properly established with or without certified white clover and topdressed annually is extremely good. The advantages of including white clover are the added effect of nitrogen supply to the ryegrass and also the fact that this pasture mixture with suitable grazing may remain down for a much longer period.

SEED MIXTURES.

Consideration of the foregoing *together* with field experience in the management of farms on all of the three main soil types mentioned, leads *one* to suggest the following seed mixtures as suitable for *areas* of low rainfall.

(1) *Temporary* Pasture - all soil types:

1 - 2 year.		Lb. per acre.
Italian Ryegrass	...	25 - 35
Red Clover	...	5 - 6
		30 - 41.

3 - 4 year.		Lb. per acre:
True **or** certified Perennial Ryegrass	...	20 - 25
Red Clover	...	5 -
		25 - 31.

(2) Permanent Pastures; For purposes of avoiding misunderstanding all Pastures that are intended to last longer than four years are considered permanent.

A. MEDIUM SOILS:

General purpose:

	Lb. per Acre.		
	1.	2	3.
True or cert. per. ryegrass.	20	20	20
Red clover	5 - 25 6.	- -25	15 -
Cocksfoot ...			6 - 8
Cert. white clover ...	1 - 2	1 - 2	1 - 2
Mont. red olover ...	-	5 - 6	- 5 - 6
	26 - 33	26 - 33	27 - 36.

No. 1 mixture makes a good 6-8 year pasture, Nos. 2 and 3 give good feed at all seasons throughout the life of the mont. red clover. The cocksfoot is included in No. 3 for the purpose of a little more balance to the mixture.

Special Purpose.

Mixtures given for general purposes if grazed lightly in the spring and spelled in late November and December give very good summer grazing, especially No. 3. Other special purpose mixtures are :

	Lb. per acre.		
	1.	2.	3.
True or Cert. per, ryegrass	4 - 5	4 - 5	-
Cocksfoot ...	12 - 15	-	-
Mont. red clover ...	4 - 55	-	-
Cert. white clover ...	1 - 2	-	1 - 2
Luc e me	-	15 - 18	-
Phalari s tuberosa ...	-	-	6 - 88
	21 - 27	19 - 13	7 - 10.

Mixtures No, 1 and 2 with appropriate management provide good mid-summer feed, Fair winter and spring feed is also secured. When sowing No. 2 mixture the lucerne should be appropriately established in the spring and the ryegrass broadcast over the newly established stand in the autumn. Wi th appropriate top-dressing and grazing management this mixture will give results for 10 years or longer. Two or three pounds per acre of Montgomeryshire red clover could beincluded with advantage in this mixture. Mixture No. 3 is worthy of trial for autumn and winter feed purposes.

B. CLAY SOILS:

General Purpose, Mixture No. 2 as given for general purposes on Medium soils is probably the best for general purposes on these soils and can be improved by the inclusion of 1 - 2 lb. of subterranean clover per acre. Mixture No. 3 in the same list wi th 1 - 2 lb, of subterranean clover is also recommended though cocksf oot does not do as well as ryegrass on these soils.

Special Purpose. Lucerne does not do well *on* these clay soils, cocksfoot is not encouraging, little to nothing is known of Phalaris tuberosa on these soils in New Zealand, and so the only special purpose mixture for summer feed production is the dominantly Mont. red clover type, These soils do not. dry up quickly so that this clover, together with white olover, is able to provide much mid-summer feed. The white clover, sub. clover and ryegrass mixture provides good autumn fair winter and good spring feed. Mont. red clover does well

in spring and autumn also. Appropriate grazing enables feed to be secured when required for special seasons,

C. LIGHT AND DRIER IAND.

It is on these soils that subterranean clover stands out **pre-eminently** as a soil builder and feed producer giving good **grazing in late autumn,** winter and spring. If spelled in November and December there is a fair roughage for summer feed: Along with cocksfoot a good summer pasture is secured,

General Purpose.	Lb. per acre.				
	1.	2.	3.	4.	5.
True or Cert. per. ryegrass	10 - 15	10 - 15	4 - 5		1 - 2
Subterranean clover,	2 - 4	2 - 4	1 - 2	1 - 2	1 - 2
Cert. white clover.					3 - 4
Mont. red clover.					
Cocksfoot.	-	-	12 - 15	12 - 15	12 - 15
	12 - 19	13 - 21	17 - 22	14 - 19	17 - 23

The above four mixtures are ail good for general purposes **on** the light and dry soils. Although mixtures No, 1 and 2 give the best late autumn, winter and spring production, the dominant cocks foot mixtures provide, the bulk cf the summer feed if appropriately managed in spring. The two mixtures (No. 3 and *4)* may be further improved on all soils except the very poorest areas by the inclusion of 3-4 lb. of Mont. red clover as in Mixture No. 5.

Special Purpose: ***On*** the better light soils favourable for lucerne this plant can be grown as mentioned for medium soils. Phalari a tuberosa also may be worthy of trial as mentioned for medium soils. It seems however that on the average light soils subterranean and Montgomeryshire red clover pastures and dominantly cocksfoot pastures will have to be manipulated by light spring grazing' so as to provide feed- **into** the summer period.

The above listed mixtures may appear unduly simple to those favouring complex ones but it must be remembered that in the districts concerned numerous species of grasses and clovers such as hairgrass, browntop, fog grass, trefoil etc., are always to be found.. They invade the pasture and assist towards making a complete soil cover. The desirable complex pasture nixture is thus secured even though a relatively simple mixture may have been sown.

The tendency in the districts concerned is to sow general mixtures ***over*** the greater portion of the farm, and as well to sow special mixtures in several paddocks to "supplement" the ordinary mixtures at special tines, Thus on light land the general mixture sown on a given farm might consist of true perennial ryegrass subterranean clover, and cert. white clover. While three or four paddocks, might be sown in cocksfoot, Mont. red clover, and subterranean clover t º provide special feed in December to January. In some districts lucerne is ***grown alone*** in one or two paddocks to provide midsummer feed. When not required for grazing, it is hayed.

CONCLUSION:

The irregular distribution of a low rainfall makes pasture production in the areas so affected difficult and to some extent uncertain, These difficulties can be reduced only by the appropriate stocking and top-dressing of sui table pastures. Seed. mixtures to produce such pastures have been suggested.

REFERENCES,

(1) Flay : "Clovers in Permanent Pastures under Canterbury Conditions, ThePalatability Factor."
N.Z. Journal of Agriculture. Vol. 45, No. 5, May 1937.

(2) Flay : "Establishment and Management of Permanent Pastures on the light *lands* of the Canterbury Plains."N.Z. J. of Ag. Vol. *47*, No. 2, 3 and 4, August, September and October, 1933.

(3) Smith : "Some aspects of Extreme Simplifications of Pasture Seed-mixtures."
N.Z. Journal of Agriculture, Vol.53, No. 5, November 1936.
