Lincoln College

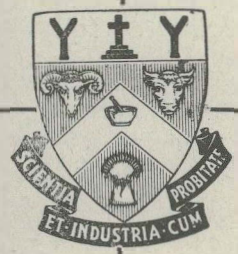
CANTERBURY AGRICULTURAL COLLEGE

LINCOLN COLLEGE
Received on
26 JUL 1988
COLLEGE
LIBRARY
CANTERBURY, N.Z.

RURAL EDUCATION BULLETIN

Vol. 4 No. 4 MAY, 1949

SPECIAL PURPOSE PASTURES IN INTENSIVE GRASSLAND FARMING



SCHOOL OF AGRICULTURE
UNIVERSITY OF NEW ZEALAND

SPECIAL PURPOSE PASTURES IN INTENSIVE GRASSLAND FARMING

E. Bruce Levy and P. D. Sears, Grasslands Division Department of Scientific and Industrial Research

DEFINITION:

It could be said that all pastures are special purpose pastures, or indeed, that the management could be such as to make even the general purpose pasture a special purpose pasture at one time or another of the year.

Viewed ecologically, any pasture plant association that is in accord with its environment may be deemed a special purpose pasture. Thus, the danthonia or browntop dominant pasture on the hills, the leniently grazed cocksfoot dominant pasture, the hard grazed perennial ryegrass-white clover pasture, the rotationally grazed dominant short rotation-red clover pasture, the dominant paspalum, or kikuyu pasture and the temporary Italian ryegrass-cowgrass pasture may all be regarded as special purpose in the economy of grassland farming.

The concept in this article, however, is rather to view sets of pastures, each rising to a dominant at different seasons of the year to accord a much better spread of production with management designed to throw the maximum of feed from each component of the sward at critical periods of the year more particularly in summer and winter. It aims to provide growth paddock by paddock over the farm and season by season that will better cater for the demand of the high producing ewe or dairy cow than if we adopt for these animals a general purpose pasture over the entire farm.

It is quite possible, in most of the lowland ploughable country of the North Island at least, to grow a pasture or a series of pastures with a potential capability of 500lb butterfat per acre or 6-9 ewes and lambs, plus cattle. Such pastures must consist of a mixed association of grasses and clovers that tend to produce at different seasons of the year, and management must be directed towards full utilisation by *in situ* grazing at the most highly nutritive stage, consistent with maximum production of actual herbage at that high nutritive stage. Where we cannot arrive at a one universal sward designed to cater for the full seasonal demand of the 500lb butterfat per acre annually, special purpose pastures are provided, paddock by paddock over the farm. Grazing management of such special purpose pastures is designed to give each special purpose component of the swards a full opportunity to express itself in growth, consistent again with utilisation in a

highly nutritive stage (20 per cent. to 25 per cent. protein). Special purpose fodder crops fit in with this concept. The usual concept is to have one general purpose pasture over the entire farm and to conserve really surplus spring and summer feed as hay and/or silage (and possibly dried grass) to tide over the crucial winter, early spring and summer needs. In this latter concept, it must be stressed that the full demand of the milking animal should be met before there is restriction in grazing due to areas on the farm being shut up for hay and silage. Much as it may be necessary to conserve a certain quantity of feed in the form of hay and silage on the dairy farm, yet it must ever be borne in mind that approximately half of the butterfat producing potential of the herbage is lost from the feed so conserved. Furthermore, there is risk of a considerable loss in aftermath growth, particularly in a season where drought conditions prevail soon after the hay and silage crop is harvested. During the past season at Grasslands, our experimental hay and silage farm, and the crop farm suffered more from drought than did the laxly rotationally grazed farm and the special purpose pasture farm which contain no crops and on which no hay or silage was made.

ANIMAL REQUIREMENTS:

In all the considerations of the breeding of pasture plants and the management of these along particular lines, we must always be guided by the feeding habits and requirements of the animals we are using to convert the food supply into human food products.

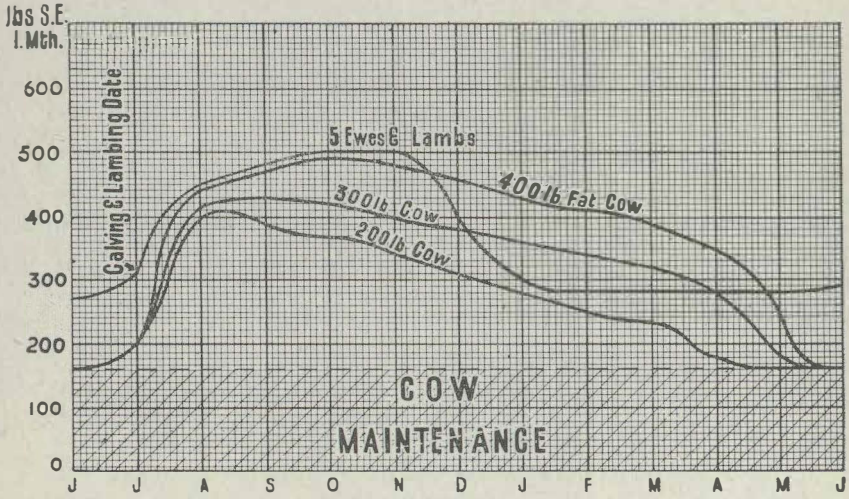
Just as in modern manufacturers'industry where the success depends largely on a complex budgetary control and the elimination of guesswork and waste, so in our agricultural industry we should apply the same principles of evaluating the efficiency and needs of all the many factors operating in the total production system.

After fully appreciating the basic need to care for the animal's health and to guard against disease and deficiency troubles we can very briefly outline the main points of animal feed requirements and habits as follows:—

1. **FOOD NUTRIENTS REQUIRED:**

In the graph are shown the food requirements for dairy cows and breeding ewes and lambs as spread over the season. This is expressed in terms of starch equivalent, as calculated from British feeding standards on measurements made on groups of cows at Massey College, Palmerston North. Even though there is still argument about the validity and application of such standards, the graph does show clearly how great is the feed supply required by the dairy cow in the period following calving with a very gradual falling-off towards drying off in the winter. The comparative figure for ewes and lambs is of interest in showing that the sheep man

does not need to worry so much about his autumn feed supply as does the dairy farmer. Of interest, too, is the demonstration of the obvious advantage of using animals with a high production ability, because of the fact that the food requirement for the animal maintenance, itself a considerable amount, is the same for a low as for a high producer. One could, on the other hand, take from the graph the inference that if the low producing cow were better fed it would mean a considerable rise in production. This is borne out by farmer experience, and by statistical examinations of dairy herds in New Zealand by the Dairy Board. The goal of 350lb butterfat per acre, or even our hypothetical 500lb per acre, is not impossible with adequate feeding of the best, at least, of our present dairy population.



Requirements of starch equivalent for cows of 900lbs. weight of different production levels and for 5 ewes (170lbs. LW) and lambs (80lbs. LW).

2. FOOD INGESTION CAPACITY OF THE ANIMAL:

Because we are using the animal as a machine in food conversion it obviously follows that we should endeavour to provide that food in such quantity and quality and in such a readily accessible form that the animal can get its fill without undue trouble and without wasting too much time and effort in the gathering process itself. All this, of course, carries with it the reservation that the animal may need a certain amount of exercise in order to maintain a healthy condition. Table 1 shows the result of some interesting work carried out at Cornell University, New York, in the measurement of cows' ingestion on different food supplies.

TABLE 1.—Ingestion of pasture by cows and pasture in different conditions of height and density.

	Available pasture per acre		Amount eaten per day per cow	
Condition of Herbage	Green	Dry	Green	Dry
Dense 4in-5in. high	4500lb	1000lb	150lb	32lb
After a few days' grazing ..	2200lb	500lb	90lb	20lb
Further few days	1100lb	250lb	45lb	10lb
Open pasture 10in-12in. high	5000lb	1200lb	70lb	20lb

It can be seen that the cows ate to their full capacity of 150lb green grass per day only when they were on a dense, well-grown sward. When the food supply became more difficult for the animals to gather, they ate much less, and well below their maximum capacity. After all, why should an animal go out of its way to gather food for the factory when the factory manager doesn't take the trouble to provide that food?

3. FOOD QUALITY:

Following from the need of a large quantity of nutrients per day for the inherent high producing animal and on account of the limitation imposed by the capacity of its stomach and its collecting device, it is obvious that the quality of the food supply must be kept at a maximum. The following few figures are characteristic of the changes that can take place in pasture growth even when growing under good conditions.

TABLE II.—Comparison of pasture at different stages of growth

Palmerston North

	Crude Protein		Crude Fibre	
	% of D.M.	% Digestibility	% of D.M.	% Digestibility
5in.-10in. Leafy	26	85	17	89
10in.-14in. Flowering ..	20	82	21	86
18in.-24in. Seedhead ..	10	70	31	73

This data was secured from high production pasture at Palmerston North. The position with low production pasture is even more extreme in the differences between the quality of the growth at a young stage and that when it gets away rank and stemmy. On top of this is the greater overall difference in food quality of low production pasture, compared with the high quality pasture shown above.

4. AMOUNT OF FOOD NUTRIENTS RETAINED BY THE ANIMAL AND THE AMOUNT RETURNED TO THE PASTURE:

Considered as a food converting machine, the animal is of fairly low efficiency insofar as it uses much of the energy value eaten for its own use and produces only a relatively small quantity of energy food for human consumption. This varies with the class of animal and its particular use. Most of the nitrogen and minerals ingested, however, is returned in the dung and urine, most of the nitrogen and potash being in the urine and the phosphate and lime in the dung. There is a certain amount of these retained by the animal, however, in its flesh, milk, and bone structure. This is shown in broad outline in the following table:—

TABLE III.— % retained and voided nutrients by animals.

	Nitrogen			Ash Constituents	
	Retained	Voided		Retained	Voided
		Dung	Urine		Dung and Urine
Milking Cow ..	25	18	57	10	90
Fattening Sheep	4	17	79	4	96
Fattening Pig ..	15	21	64	4	96

Per Acre Fertility Drain by Disposal of Animal Produce or Carcases

1. Milking cows at 600 gallons milk per acre—275lb butterfat per acre.

	Per Acre Losses in Fertiliser Ingredients			
	Sulphate of Ammonia lb	S/phos. lb	30% Pot. Salts lb	Carb. of Lime lb
Whole product sold off farm ..	160	60	30	21
As cheese-whey returned ..	140	35	3	—
As butterfat-skim milk retained	Losses negligible.			
2. Cattle Beast (1000lb) one beast per acre.				
Raised and fattened on farm ..	116	77	5½	40
Stores—fattened only on farm	Losses negligible.			
3. Sheep at 6 per acre 150lb live-weight each.				
Raised and fattened on farm ..	105	48	48	21
Stores bought in and fattened	Losses negligible.			
4. Fat lambs at 6 per acre, 75lb live-weight each	57	24	24	10
5. Wool 72lb per acre (6 sheep)	43	—	42	—

5. ANIMAL FEEDING AND EXCRETION HABITS:

Attention must also be paid to the widely differing feeding habits of the animals used, and also to the differential between their eating times and their excretion of dung and urine. The different grazing methods of sheep, horses and cows are very obvious and, of course, lead to marked changes in the sward and its growth. Also, the habits of animals to congregate in "camping" areas at night and so concentrate their dung and urine in one part of the paddock, is a very obvious means of changing the pasture growth and composition. This is especially noticeable on hill country with its ridges and hollows, but the same effect can be seen on flat country, especially where there is any contributing factor such as shelter or any stock frightening effect along a road frontage. On dairy farms the relationship between night and day grazing should be carefully studied because of the strong possibility of transferring fertility in the dung and urine, from the "day" to the "night" grazing areas.

PASTURE PRODUCTION:

On the pasture production side it is a question of combining soil fertility and the plants that can fully utilise that fertility, with a grazing management which permits full expression of each member of the pasture sward or swards, consistent with high nutritive value of the herbage consumed, and with a minimum of conservation and supplementary crops. In all operations attention must be given to a uniform re-distribution of animal residues, paddock by paddock over the farm.

The annual soil fertility turnover requirement of a 500lb butterfat pasture—some 14.000lb dry matter, is, expressed in terms of available fertilisers, approximately 25cwt sulphate of ammonia, 17cwt 30 per cent. potash salt, 7½cwt superphosphate and 3cwt carbonate of lime per acre. Whence comes this seemingly enormous shower of fertility? There is only one place that the minerals can come from and that is from the soil. If these are not present they have to be supplied out of the bag. Fortunately the potash supply in most New Zealand soils is adequate

—the shortages lie most in phosphate, lime and the all-essential ingredient, nitrogen.

The only original source of nitrogen is the air and the only efficient extractive agent we possess is the specific nodule bacterium on the clover host. We have measured at Grasslands that a good stand of pedigree white clover will abstract nitrogen equivalent to that in 1 ton of sulphate of ammonia per annum. This nitrogen is elaborated into protein in the clover leaf. The clover leaf is eaten and part of the nitrogen is retained by the milking animal, but the greater part is returned to the land in the urine and the dung. This manure supplies the all-essential nitrogen for the grasses to thrive and they in their turn elaborate this nitrogen into protein. When digested, part goes to flesh and milk, and part is returned to the sward and so the cycle goes on. Just as long as there is ample clover in the sward—and the appropriate bacterium—and just as long as there are appropriate grasses in the sward to utilise the stock nitrogen, the cycle is continuous. Hence if only we can balance up an efficient clover-grass companionship to carry a cow per acre or its equivalent in sheep or cattle, our nitrogen supply is assured.

Table 4 shows the differences in yield, the botanical composition and crude protein content of pasture growing with and without the addition of white and red clover at Palmerston North. The trials were laid down in 1946 and the measurements shown are for the period from 12/11/46 to 31/10/47.

TABLE IV.—Effect of Clovers and of Dung and Urine on Pasture Growth and Composition.

Trial at Grasslands Division, Palmerston North, yields for period 12/11/46-31/10/47:

	Treatment	Total dry Matter per Acre	% Clover	% Crude Protein
No Return of Dung and Urine.	Grass alone—no fertiliser ..	2700	—	12
	Grass alone + lime and super*	2500	—	13
	Grass + Clover—no fertiliser	12310	70	27
	Grass + Clover + Lime and Super.	13500	72	28
Full Return of Dung and Urine.	Grass alone—no fertiliser ..	4500	—	15
	Grass alone + Lime and Super	4900	—	16
	Grass + Clover—no fertiliser	13400	42	25
	Grass + Clover + Lime and Super	13600	39	26

*Phosphate and lime returned in sufficient quantity to replace total amount taken out in the highest yielding treatment, equal to approximately 8cwt Super and 5cwt Lime per annum.

An important point not shown clearly in the above figures is the greater spread of production over the year in the treatments receiving a full return of dung and urine. The very high yield of the grass and clover combinations not receiving dung and urine is, of course, the result of the strong growth of the clover which did not get much competition from grass and so was able to grow to full capacity in the spring and summer periods.

Too few farmers seem to realise that nitrogen and not phosphate is the basis of most grass growth as distinct from clover growth. This is particularly true in the winter and early spring when so much reliance must be placed on the grass component of the sward. The latest pedigree or mother seed white clover that Grasslands has produced has an exceptionally long seasonal spread of production but little reliance can be placed on cowgrass, Mont, red clover, Lotus major and the annual clovers, excepting subterranean clover, to add nitrogen during the months of winter and early spring. In the case of retarded spring growth the absence of nitrogen then is the limiting factor. But a nitrogen supply in the winter and early spring is of no avail unless we have varieties of grasses in the sward that can respond. Cocksfoot and timothy winter burn badly, and Yorkshire fog will respond well, but full reliance for growth must be placed on ryegrass—either the standard certified perennial ryegress, or short rotation ryegrass, Italian ryegrass and western wolths. These will grow in the winter and early spring if the nitrogen supply is adequate. If these are present in the sward and they turn yellow and stunted in the cold weather the deficiency is one of nitrogen supply.

Turning now to phosphate. Phosphate has its primary response through the clovers, and its efficiency is limited primarily to that period when clover growth is possible. Nevertheless, our more recent work goes to show that just as soon as the nitrogen supply is adequate, we get a good phosphate response by the grasses during the winter and early spring period. Without that nitrogen efficiency in the soil, phosphate has little or no response on the grasses of the sward.

Thus, after a pasture has been built up to a strong growth of dominant clover following the application of adequate phosphate and lime, it is quite possible that more phosphate will be needed to be applied before the grass constituents can gain the dominant place and so raise the total level of production from the pasture. This can be calculated from a knowledge of the growth ability and chemical composition of grass and clover. Pedigree New

Zealand white clover growing at its best at Palmerston North will give a total annual yield of some 10,000lb of dry matter per acre. This contains on the average, 0.8 per cent., P_2O_5 and 5 per cent. nitrogen. Ryegrass growing at its best will give a yield of some 15,000 D.M. with an average of 1 per cent. of P_2O_5 and 3.5 per cent. N. Thus, let us assume that, say, super has had to be applied to produce the white clover growth. If this is eaten by an animal and the total of the phosphate and nitrogen is returned to the sward and all becomes available to provide for grass growth, the nitrogen supply, plus the amount made directly available in the soil by the clover nodules, would support the 15,000lb of ryegrass growth. But over and above the phosphate returned in the dung derived from the clover growth 70lbs P_2O_5 (3½cwt Super) would be needed in the soil before the phosphate supply was sufficient for such 15,000lbs of ryegrass growth. Presuming this 15,000lb of ryegrass growth is eaten and the dung returned uniformly to the land, the amount of phosphate necessary to supply henceforth is dependent on amount of phospnate retained by the animal and its products, or tied up in the soil by fixation processes. The same principle applies with potash. The necessity to have sufficient phosphate as well as of other elements for grass growth at high level is shown in the following results secured in a trial on pure ryegrass at Palmerston North.

GROWTH FOR PERIOD JANUARY, 1948-JUNE 30, 1948

	Relative D.M. Yield
1. No fertiliser	100
2. + adequate phosphate (8cwt per acre super per annum)	102
3. Adequate nitrogen (800lb N per annum)	194
4. Nitrogen + phosphate	258

Potash is present in most soils and there is no point in adding more without definite knowledge that there is a real deficiency. Although the demand by the sward for potash is very great (especially the grass) yet the return to the pasture in the urine of the animal very nearly makes good the drain by the plant.

It is seen that the lime requirement of a 500lb butterfat per acre pasture is relatively low compared with potash, phosphate and nitrogen, but lime is essential to create a favourable growing place for the clovers of the sward and a favourable living environment in the soil for the teeming millions of clover-nodule bacteria that are the real nitrogen factory for the farm.

A sound manurial programme for each farm can be deduced only from a full understanding of the above cycle

in soil fertility and pasture growth. In brief we can summarise it as follows:—Nitrogen is necessary to start the clover plant; added phosphate and lime give extra clover growth which provides food for nitrogen-fixing bacteria; these extract free nitrogen from the air and pass it on to the clover which elaborates it into plant protein. This is consumed by the grazing animal and used to build up animal protein. Excess nitrogen is passed back in the dung and urine which in turn provides for extra grass growth. As the soil nitrogen supply is built up, added phosphate now allows added growth of the grass constituent. The balance from then on swings between grass and clover dominance and production, depending on loss of nutrients from the soil as well as added fertilisers to that soil.

SEASONAL PASTURE DEMAND FOR HIGH PRODUCTION:

Turning now to the sward and its constitution to cater for high butterfat or high fat lamb or beef production. We have seen we need a mixture of plants to get as close as possible to the production curve demand of the 400lb butterfat cow. The mid-winter and early spring requirement is best met by short rotation ryegrass, Italian ryegrass and western wolths ryegrass. These continue on to mid-spring when the running is taken up by perennial ryegrass, white clover and subterranean clover and augmented in the late spring by cocksfoot and timothy. At this time the short rotation ryegrass, Italian ryegrass and western wolths ryegrass decline and they need a spell to shed seed. The mid-summer is taken up by broad red clover, white clover and Montgomery red clover with a small contribution from perennial ryegrass and cocksfoot. Perennial ryegrass ceases growth towards mid-January and rusts badly unless adequately supplied with moisture and nitrogen. So much at this time depends on the season. The clovers, particularly red clover, will go well into the autumn and so will strawberry clover, white clover and Lotus major. Of the grasses, paspalum stands out as of very great value where there is sufficient soil moisture and heat for this summer period.

Going into the autumn there is nothing to compare with perennial ryegrass aided again by white clover and later by subterranean clover. Cocksfoot and timothy recover well in the late autumn and help materially over this period. Both these latter winter burn, however, and they cannot be held for winter feed.

In the late autumn and winter the run is again taken up by short rotation ryegrass. Italian ryegrass and western

wolths ryegrass. Prairie grass, Yorkshire fog, and Phalaris tuberosa also produce well over this winter period.

It will be seen that there is a fairly wide range of species to provide, if handled satisfactorily from the view point of the plant itself, a long range of productivity over the seasons on the farm. The point for consideration is how to so establish and graze-manage these species for maximum production.

It is certain from the outset, that if we are to sow the lot and graze-manage under a set and close stock method, then we must rule out most species except perennial ryegrass, white clover, crested dogstail, paspalum, browntop and Danthonia pilosa. This point is shown quite clearly in a trial at Grasslands. Three paddocks were sown in 1946 in a complex mixture. Each were subject to different grazings:—

1. Close and continuous (åt 1in. continuously).
2. Sheep rotational grazing (up to 3in.-4in. down to 1in.).
3. Dairy rotational grazing (up to 8in.-10in. down to 2in.).

Analysis of the composition as at 1/10/47 shows as under on a percentage dry weight basis:

	1 Continuous Grazing	2 Short Spell Rotational Grazing	3 Long Spell Rotational Grazing
Perennial ryegrass ..	43.3	41.6	31.1
Short Rotation ryegrass ..	2.9	21.7	40.2
Timothy	6.8	1.2	—
Cocksfoot	1.0	3.2	—
Other grasses	—	4.0	0.7
White clover	42.4	24.3	23.3
Red clover	2.8	2.8	4.2
Other species	0.8	1.2	0.5

The main feature of the above analysis is, of course, the failure of the short rotation ryegress when under the close and continuous grazing, and its dominant position in the sward (at that time of the year) when under the rotational grazing with long spells in between grazings. The relatively high percentage of timothy in the continuous grazed area is a reflex of its excellent establishment in the open light conditions of that treatment. However, this species did not persist as it was later on chewed out very rapidly, when the growth from the other species subsided. The red clover content of all the treatment was very low at the time of analysis (October), due to its low growth at that time of the year. Later on in the summer and autumn period the position changed considerably, especially in the long spelled paddock, where the red clover showed up in a dominant position. The yields and com-

position for the summer-autumn period (December 8, 1947-March 22, 1948) for the three treatments are shown in the following table:—

	1 Continuous Grazing	2 Short Spell Rotational Grazing	3 Long Spell Rotational Grazing
Ryegrass (Short Rotation and Perennial)	37.3	48.8	20.4
Timothy	—	0.5	Trace
Cocksfoot	0.6	1.0	0.8
Other Grasses	1.6	3.5	Trace
White Clover	54.7	31.8	21.4
Red Clover	5.1	12.1	55.3
Other Species	0.7	2.3	2.1
Yield for period (in lbs Dry Matter per acre)	2900	3400	5100
Crude Protein % of Dry Matter	25.4	23.8	20.4
Crude Fibre % of Dry Matter	15.5	17.3	19.9
Number of Grazings	Continuous	5	2

It is seen that under close and continuous grazing the sward stabilised at perennial ryegrass and white clover with a relatively low yield of high quality herbage. Under the short spell rotational grazing there was a lift from red clover in the autumn, and from the short rotation ryegrass in the winter period as these two species were not knocked as hard as under the continuous grazing. Where the spells between grazing are longer and the grazing not so severe, there is a considerable increase in growth of the red clover which, although of lower feeding value due to its greater maturity, is still excellent feed and of great value for this difficult period. Thus under the more carefully controlled spelling of this mixture, much greater growth is obtained as the various species within the mixture were given a better chance to express their particular growth potentials.

Similar conditions to this will apply on the dairy farm. Under close and continuous grazing we are left with perennial rye and white clover, but if we leniently graze-manage under a lax rotational system then we can maintain for some years at least short rotation ryegrass, cowgrass, Montgomery red clover, cocksfoot and timothy as well as perennial ryegrass and white clover in the sward. On the hills we can get ever so much more out of Lotus major, cocksfoot, perennial ryegrass and white clover and browntop, to the detriment maybe of Danthonia pilosa. We see no way of catering for really high consistent production over the year than by so sowing and so graze-managing as to utilise to the full all plants that can appropriately serve the production curve demand of the high producing cow.

By this we do not infer ultra-special purpose pastures such as pampas, lucerne or such simple combinations as perennial ryegrass-white clover, or short rotation ryegrass and red clover, or cocksfoot-white clover, or timothy-white clover, or paspalum-white clover. Rather our plan is to take two or three planned complex mixtures, and to graze-manage these, i.e., to graze and to spell in order to encourage over a specific requirement period, a specific growth of one or more species to cater for that production requirement. Some would make hay and silage to tide over such periods, and let us be very explicit on this point. Hay and silage or crops should on no account be dropped until the farmer has shown to his own satisfaction that he can successfully use by *in situ* grazing more of the feed of the farm than he has been accustomed to in the past.

Three permanent or semi-permanent pastures stand out pre-eminently in our outlook:

One is dominated by perennial ryegrass-white clover, the second by short rotation ryegrass, white clover and red clovers. To both of these cocksfoot and timothy may be added. The third pasture is one dominated in the summer by paspalum-white clover. The latter will apply more in the Auckland Province, but it also may have a place along the West Coast and East Coast of the North Island.

In addition to these, temporary pastures have a special purpose mission and these are dominated by Italian ryegrass, short rotation ryegrass, western wolths ryegrass, green cereals and cowgrass (broad red clover).

As to seed mixtures for these respective pastures we recommend the following quantities per acre:

1. Permanent pasture—general purpose:

25lb Certified perennial ryegrass.
10lb „ short rotation ryegrass.
3lb „ Montgomery red clover.
3lb „ White clover—preferably mother seed.
3lb „ timothy } optional.
5lb „ cocksfoot }

2. Semi-permanent or special purpose (winter and summer):

25lb Certified short rotation ryegrass.
10lb „ perennial ryegrass.
3lb „ cowgrass or broad red clover.
3lb „ Montgomery red clover.
3lb „ mother white clover.

3. Permanent and special purpose (summer pasture):

10lb Paspalum.
15lb Certified short rotational ryegrass.
3lb „ Montgomery red clover.
3lb „ mother white clover.
Sow in spring or early autumn.

4. **Temporary 2 year special purpose (winter and summer):**
   20lb Certified Italian ryegrass } or 40lb Certified
   20lb ,, short rotation ryegrass } Italian ryegrass.
   6lb ,, cowrass or broad red clover

5. **Temporary 1 year special purpose (winter pasture):**
   25lb western wolths ryegrass (Italian ryegrass meanwhile).
   1 to 2 bushels barley or green oats.

MANAGEMENT AND UTILISATION OF THESE PASTURES

The general purpose pasture (No. 1) is practically the only pasture that will stand a set system of relatively hard, close and continuous grazing, when it will decline to a simple perennial ryegrass—white clover pasture of approximately 10,000lb dry matter per acre. Under a more lax rotational grazing system all the constituents will play their part and one could expect a better all-round seasonal spread of production with a total annual production of some 12,000 to 15,000lb dry matter per acre.

The semi-permanent or special purpose winter and summer pasture (No. 2) should be carefully graze-managed over its establishment period to ensure that the clovers successfully establish. For this a heavy top-growth should not be permitted. With this precaution in mind, the pasture, sown in the autumn, and kept well in hand by the use of sheep or weaner calves or by both, can be spelled, May-June to give special purpose feed in July-August. If there is only one such paddock on the farm this should be grazed in breaks by the use of the electric fence. To get the greatest value out of this class of pasture and to ensure it is grazed by the off and on system of grazing, some four paddocks should be sown to the one mixture and those four paddocks rotationally grazed in the early spring—July, August. This special purpose grazing permits of spelling the dominant perennial rye-white clover pastures on the farm at a time when these are setting out to make their greatest run of growth for the season. From August-September both the semi-permanent and permanent pastures could be rotationally grazed, and thus both pasture types are in a strong position to supply the peak food requirements of the milking stock.

During November-December the special purpose (No. 2 pasture) should be spelled or leniently grazed in order to give the red clover a chance to grow. This spell also gives the short rotation ryegrass a chance to seed.

After Christmas the special purpose pastures, now dominantly red and white clover with some good ryegrass roughage, will provide excellent summer grazing, until mid-March when they should be cleaned up and spelled for

winter grazing and early spring feed. Special purpose summer pasture (No. 3) can be fairly closely winter and spring grazed until some time in November when it too should be spelled to encourage the development of paspalum and white clover for the summer. During the summer it can be well grazed, but here again it would be better rotationally grazed by means of the electric fence. Paspalum thus grazed will give ever so much more feed than if it is close and continuously cropped over the entire spring and summer period. In the late autumn the paddock should be well scrubbed out by grazing, chain harrowed and manured, to encourage a rapid return of ryegrass and white clover for the winter and spring.

The two-year temporary pasture (No. 4) is ideal for cleaning up country and for providing special grazing in the winter and early spring. A hay or silage crop can be taken in November and the paddock spelled to allow the red clover hay crop. The certified Italian should last two years under normal seasons, but in a very dry summer, unless allowed to seed in November-December, the whole of the Italian will disappear. Here lies the value of the 50-50 short rotation ryegrass-Italian ryegrass mixture. The short rotation ryegrass element will carry on with the cow grass for two good years.

Special purpose pasture (No. 5) is essentially a one-year pasture designed to give rapid autumn feed mainly from the cereal, and carried well into the winter and spring by the western wolths ryegrass.

In October this paddock should be ploughed and sown to a crop or it could be left to go over the full spring period to be re-ploughed in the summer and prepared for autumn sowing.

The concept of special purpose pastures on the hills may have almost as wide an application as on the flats. It would seem reasonable where easy slopes and small flats are ploughed within the hill complex that these should go the special purpose pastureway rather than the general purpose pasture way. None-the-less there is also a distinct possibility of establishing, by appropriate over-seeding, top-dressing and grazing management special purpose pastures on the hills that have been designated good winter country or good summer country as the case may be. Here by oversowing winter-growing species in the case of the former and summer growing species in the case of the latter, with appropriate spell, we may be able to improve greatly the carrying capacity of the winter country and the summer country respectively.

RENOVATION OF PERMANENT PASTURES:

On any high-producing farm there is a tendency for the high-stock concentration, coupled with periodic drought and winter poaching, to thin out a pasture. We consider on these farms it should be a standard practice to oversow in the autumn some more ryegrass and clovers. Twenty pounds of perennial ryegrass or short rotation ryegrass or half a bushel of each, plus 2lb mother seed white clover and 2lb red clover, after a good tripod harrowing, would be well worth while on every high producing farm where it is known the soil fertility is up to grade to ensure successful establishment and growth of the oversown seed. Poor pastures on the farm may be improved by this oversowing method, but here the process will be slower, and will of course, depend on the fertility building process accompanying the oversowing itself. Care must be taken in all such oversowing to guard against suppression of the new seedling growth by the already present plants, as well as too much damage by grazing stock, until the seedlings are well established.

CONCLUSION:

In these recommendations we would like to point out that neither the seed mixtures as set out nor the grazing management suggested are irrevocably laid down to be slavishly followed. There will be modifications to suit individual management and herd requirements. For example, the whole-milk supplier to towns must make more careful provision for winter feed than the butterfat or whole-milk for cheese farms which coincide their main output of these products to the flush seasons of grassland production. It is felt, however, that there is a specific need for greater consideration to provide for the early spring, when cows are coming in, to give a sustained summer flow and to give an earlier peak of production in the spring. A high producing farm should come to its peak of milk flow by the end of October at latest and its decline from there should be gradual until dried off in the late autumn.

We will consider this effort worth while if we have aroused a keener sense of interest in our grasslands as being capable of doing much more than they have in the past, and if we have drawn attention to the fact that farmers can increase their production by a closer study of the feeding requirements of their animals, together with the attainment of a grass consciousness that makes such feeding possible and profitable.

The Bulletin is issued on the first of each month from February to November. The annual subscription is five shillings post free, or four shillings for two or more copies. Correspondence should be addressed to: The Editor, Rural Education Bulletin, Lincoln College, P.B., Christchurch.

Printed by Simpson & Williams Ltd., 169 St. Asaph Street, Christchurch.