FIELD MEETING OF THE TROPICAL GRASSLAND SOCIETY IN CONJUNCTION WITH THE NORTH COAST BEEF RESEARCH LIAISON COMMITTEE—HELD IN THE CLARENCE REGION OF NEW SOUTH WALES ON APRIL 2 AND 3, 1971

INTRODUCTION TO THE "CLARENCE BEEF COUNTRY"

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The main emphasis on this tour will be to examine the particular type of legume adapted to this sub-tropical environment. The native and naturalised pastures of this area are short-grass pastures restricted in growth by rainfall and soil factors. Even when fertility is adjusted short-grass pastures are more suitable because of other environmental factors. For a number of reasons sown grasses have little if any advantages over those already naturalised so emphasis is given to maximising the contribution of the legumes.

Emphasis will be given to low cost pasture development, to the type of legume suitable for oversowing and for extensive utilisation, and to topdressing responsive native and naturalised pasture legumes with superphosphate. Lotononis will be examined also but in a completely different type of situation to its use in Queensland.

I shall briefly introduce you to the "Clarence Beef Country" and its relationship with other North Coast environments. This will be followed by comments on the type of legume which is adapted to this sub-tropical environment.

ENVIRONMENT

The North Coast of New South Wales is a sub-tropical environment, as instanced by the distribution of use of the available commercial tropical legumes. The glycines and desmodiums are used as far south as the Nambucca-Bellingen Valleys. Lotononis and Siratro are useful in the Macleay Valley.

Physiographic regions

The North Coast of New South Wales can be broadly divided into the following physiographic regions on the basis of rainfall and the geology to which the soil types are directly related.

A. Tweed, metamorphics, "high" rainfall, (> 150 cm).
B. Richmond, basalts
   (i) "Red" soils, "high" rainfall, (> 150 cm).
   (ii) "Black" soils, "intermediate" rainfall, 100-150 cm.
C. Clarence Basin (both geological and geographic basins), sandstone/granite and shale/metamorphics, "low" rainfall, 90-110 cm.
D. Dorrigo Plateau, basalts metamorphics and granite, "high" rainfall, (> 150 cm).
E. Nambucca-Bellingen, metamorphics and sedimentaries, "intermediate" rainfall, 100-150 cm.
F. Macleay, sedimentaries and metamorphics, "low" rainfall, 90-110 cm.

The Clarence Basin (geological and geographic) or "Clarence Beef Country" is subdivided on the basis of soil texture. The sandstones/granites form coarse textured soils similar to those of the Southern Spear Grass zone of S.E. Queensland. The shales/metamorphics form finer-textured soils similar to those of the Dairy Pastures zone of S.E. Queensland.

Research from Grafton Research Station has direct relevance to the "low" rainfall areas of the "Clarence Beef Country", as well as the Macleay Valley and similar areas in S.E. Queensland. The research can be readily adapted to much of the "intermediate" rainfall areas.

Soils

The soils of the Clarence Basin have been subjected to numerous cycles of weathering. They are acid, with a pH of 5.0 to 5.5 and are mostly podsolic. Fertility is low with marked deficiencies of phosphorus and nitrogen. Molybdenum is also necessary for legume growth and deficiencies of sulphur. calcium and potassium have been identified in some soils.

Climate

The sub-tropical climate of the "Clarence Beef Country" is similar to parts of S.E. Queensland with temperatures ranging from below freezing to about 38°C (100 F). Frosts are a feature of the environment with numerous frosts up to minus 3-4°C in cooler areas ranging to occasional frosts of minus 1-2°C nearer the coast. Because the area is not steeply dissected cold air drainage from the ridges is limited.

Annual rainfall over most of the area is 90-110 mm with a high variation in distribution. Intra-seasonal and seasonal droughts are frequent. The rainfall favours summer growing species though useful rain falls between March and October for winter growing species. August and September are the driest months. Rainfall on a narrow coastal strip east of the Coast Range is 110-140 mm per annum.

TYPE OF LEGUME

In developing legumes for the "Clarence Beef Country" particular emphasis must be placed on persistence. Each legume adapted to the region has a particular value related to environmental and management factors. All too often the right species for the region is planted in the wrong situation.

Persistence

Many factors are involved in persistence; ecological adaptation, ability to withstand extensive grazing management, ability to regenerate under reasonable levels of utilisation and ability to withstand extra heavy utilisation in periods of intra-seasonal and seasonal droughts. Regeneration from seed as part of the normal recovery from drought and overgrazing is an important consideration.

The species showing most adaptation in this environment are those which are "free-seeding". These are naturalised white clover, naturalised Japanese lespedeza, jointed vetch (*Aeschynomene falcata*), fine stem stylo, and to a lesser extent lotononis and Siratro. They regenerate from seed to thicken existing stands and are spread in dung.

Grazing resistance is an important characteristic related to growth habit. All the above species (except Siratro) are capable of adopting a prostrate habit under heavy utilisation. A low sward with many growing points below grazing level ensures continued growth under heavy utilisation. Such species are very compatable with short-grass pastures.

Distribution

Soil type, moisture and fertility are inter-related in affecting the useful distribution of legumes. In this area some of the key indicators are whether carpet grass is dominant or absent, and whether the soil is a sandy loam or a clay loam. For instance, naturalised white clover and naturalised Japanese lespedeza are best suited to areas dominated by carpet grass while other legumes perform poorly in such areas. Fine stem stylo is best on coarse soils while lotononis is suitable for any native grass area.

Management factors affecting distribution include suitability for constant grazing or the need for autumn saving to get satisfactory production and the frequency of seasonal spelling for regeneration or seed set. For example most of the above legumes are suitable for constant grazing but Siratro is better when autumn saved and lotononis needs occasional spells to bulk-up. Suitability for oversowing will also influence distribution. In native grass areas accessible to sowing machinery lotononis is better adapted than Siratro but where mechanical oversowing is not possible Siratro becomes the better species because it is suitable to aerial seeding. The country too steep for mechanical sowing usually provides cold air drainage and a natural autumn saving of summer growth.

It is hoped that in the course of discussion in the next two days you will enquire intensively into these points; low cost development, topdressing native and naturalised legumes, oversowing, persistence and distribution of adapted legumes.

MAIN POINTS OF INTEREST ON FIELD TOUR

Setaria and Siratro pastures have been viewed on numerous field days and were not given emphasis on this field tour. They are extensively used by developers for sowing and one such pasture was shown from the road where a good initial stand of Siratro had been achieved by sowing at eight pounds to the acre.

One particularly important aspect of the developers' operations was discussed, that is fodder cropping for 18-24 months following felling in contrast to the more general practice of direct sowing following clearing. This helps even out soil variation and enhances pasture establishment.

The importance of rolling at sowing and use of the rollerdrill for oversowing were discussed. Examples of naturalised white clover and jointed vetch were inspected at "Caramana".

At "Hanging Rock" an extensive area of naturalised Japanese lespedeza was inspected. This had developed following topdressing with Mo superphosphate and had made a very substantial contribution to increased carrying capacity and increased calving percentages.

Also at "Hanging Rock" was an area of lotononis used in the fashion considered to be most appropriate for this species in "Clarence Beef Country". The lotononis was sown by itself into a granite soil area which carried native grasses before cultivation. Following heavy grazing which had reduced the amount of grass present the lotononis was periodically allowed to bulk-up to reduce grass competition. By this method heavy stocking rates were achieved when the pastures were used, generally for special purposes such as paddocks for weaners etc.

During lunch on day two a talk was given by the Manager of "Yulgilbar Station" on developments since starting a topdressing programme in 1965. Of 12,000 ha (4,000 ha mountainous) 1,872 ha were topdressed with 100-200 kg/ha Mo superphosphate with the area rising to 3,100 ha and the fertiliser rate dropping to 50 kg/ha in later years. Ladino was aerially sown over 2,000 ha in the second year but did not persist. Naturalised white clover is spreading rapidly and paspalum has taken over from carpet grass and blady grass. A mixed Devon × Shorthorn herd has been replaced by Santa Gertrudis, out of income, and total numbers have risen from 5,336 to 6,679 in the six years from June 30, 1965 to June 30, 1971. Today 70% of heifers joined at 2 years instead of the previous 3 years and branding percentages have risen from 50% to 70-75%.

An inspection of the development of naturalised white clover and paspalum following topdressing with Mo superphosphate on Pollard Bros property at Mallangenee was interrupted by rain. However a talk given on the economics of low cost improvement based on this development was given.

LOW COST PASTURE IMPROVEMENT IN THE MALLANGANEE DISTRICT

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Low cost, broadacre or extensive development is the name given to pasture improvement in the Clarence district where expensive seed bed preparation is not involved. It has wide relevance to the beef industry in the Clarence region. The main components are superphosphate and an adapted legume. Legume species, principally the naturalised strain of white clover, may or may not accompany the superphosphate. It has been shown at Grafton that naturalised white clover, naturalised Japanese lespedeza, native legumes, and better grass species (e.g. paspalum) volunteer when superphosphate has been applied though admittedly more slowly than if the adapted legumes are introduced initially

TABLE 1

Returns from Beef Enterprise Before Superphosphate Application
(Four Year Average)

243 ha of timber and regrowth	
Av. carrying capacity: 98 cows	
Av. calving percentage: 74.5% (73 calves)	
16 heifers kept for replacement purposes	
57 calves sold as weaners @ $60 net of marketing costs	$3,420
16 cull cows @ $100 net	$1,600
Gross paddock income	$5,020

TABLE 2

Costs and Returns from Beef Enterprise During Development

Year 1:	121 ha regrowth cleared; 250 kg/ha Mo superphosphate applied to the 121 ha; 98 cows; 80 calves; 82% calving percentage.			
	Returns:	64 weaners	$3,840	
		16 cull cows	$1,600	
				$5,440
	Costs:	Clearing (121 ha @ $24.22/ha)	$2,940	
		Superphosphate (3.7c/kg)	$1,140	
				$4,080
	Net paddock income			$1,360
Year 2:	New regrowth sprayed; 250 kg/ha superphosphate applied to 121 ha; 98 cows; 82 calves; 84% calving percentage.			
	Returns:	66 weaners	$3,960	
		16 cull cows	$1,600	
				$5,560
	Costs:	Spraying	$ 410	
		Superphosphate	$1,020	
				$1,430
	Net paddock income			$4,130
Year 3:	250 kg/ha applied to 121 ha; 136 cows; 131 calves; 95% calving percentage.			
	Returns:	108 weaners	$6,480	
		16 cull cows	$1,600	
				$8,080
	Costs:	Superphosphate		$1,020
	Net paddock income			$7,060

TABLE 3

Assumed Costs and Returns from Beef Enterprise After Development

130 cows; 117 calves; 90% calving percentage; 250 kg/ha superphosphate, Mo superphosphate every 3 years.

Returns:	94 weaners	$5,640	
	23 cull cows	$2,300	
			$7,940
Costs:	Superphosphate		$1,050
Net paddock income			$6,890

Increase in income net of superphosphate costs on the 243 ha: $1,870 or 37%

The benefits of this type of development are threefold:

(i) increased quality and quantities of dry matter production permitting higher stocking rates;

(ii) improved nutrition of cattle resulting in faster growth rates of stock so that
(a) heifers can be joined at two rather than three years old,
(b) stocks are sold at a younger age;

(iii) higher liveweight of stock, especially lactating cows, resulting in higher calving percentages. The first two effects have been demonstrated in grazing trials.[1] However, meaningful calving percentage data cannot be generated from grazing trials due to physical and financial restrictions, hence recourse has to be made to the practical results experienced by local graziers.

The tables 1, 2 and 3 relate to results over a three year period on a clay loam soil derived from Walloon Coal Measure parent material in the Mallanganee district, north of Grafton. The site is composed of steep ridges generally inaccessible to machinery and only half the paddock was improved.

The tables are simplified in that cost items which would occur irrespective of development have been omitted. No account has been taken of the fact that, as a result of superphosphate application, heifers are joined earlier. Nor have higher weaner prices been assumed after development. Thus the returns are on the side of conservatism.

The tables demonstrate the order of magnitude and financial effect of improvements in calving percentages and stocking rate arising from superphosphate application. Based on this and other observations, it can safely be concluded that calving percentages will rise by 20% following superphosphate application. Stocking rate increase attributable to the area receiving superphosphate was approximately 70% by the third year. By the third year naturalised white clover was a prominant component of the pasture and paspalum was beginning to increase noticeably.