PROCEEDINGS

PASTURE DEVELOPMENT IN THE SPEAR GRASS COUNTRY OF CENTRAL QUEENSLAND.

FIELD MEETING, ROCKHAMPTON, MAY 7–8, 1982

A joint field meeting, with the Queensland Department of Primary Industries, was held on May 7 and 8 on four cattle properties between Rockhampton and Marlborough. It examined various aspects of cattle nutrition and pasture technology within the speargrass (*Heteropogon contortus*) country of Central Queensland and possible roles for two grasses, creeping bluegrass (*Bothriochloa insculpta*) and para grass (*Brachiaria mutica*) and two legumes, shrubby stylo (*Stylosanthes scabra*) and leucaena (*Leucaena leucocephala*).

THE SPEARGRASS COUNTRY

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Black speargrass (*Heteropogon contortus*) occurs as a dominant grass on a wide range of soils and especially in the various ironbark (*Eucalyptus* spp.) forests and woodlands along the eastern coast of Queensland. It is not usually dominant on heavy clay soils or badly drained areas. It will tolerate low soil nitrogen and phosphorus but does not like high soil salinity. Kangaroo grass (*Themeda australis*) rather than speargrass was probably the original dominant grass along the eastern seaboard but with the introduction of domestic animals and repeated burning the speargrass has achieved its present position.

Speargrass is important because it occurs on some 29 million hectares in Queensland and supports 3.5 million head of cattle, approximately one third of the total Queensland cattle population. Because it occurs on poor soils which have little cropping potential it will remain an important pasture asset.

Cattle on speargrass country usually gain weight only over summer, putting on 80–110 kg liveweight, depending on the pasture and the season. A proportion of this is then lost over the winter months. The initial development of this country is usually by thinning or clearing the original timber. Although this will cause a two to three fold increase in grass production and an increase in carrying capacity it does not markedly improve liveweight gain and individual animal growth rates. Where improvements do occur they are experienced only in the drier years.

To develop this country any further there are two options:

1. Plough out the speargrass and replace it with plants such as Hatch creeping bluegrass (*Bothriochloa insculpta*), and

2. Keep the speargrass and augment it with a legume, eg. Fitzroy shrubby stylo (*Stylosanthes scabra*).

PROPERTY DEVELOPMENT AND MANAGEMENT

J. HATCH

"The Caves", "Zamia", "Werribee Ck.,"—The Caves

We have three properties near The Caves about 25 km north of Rockhampton. Average rainfall is 900 to 1000 mm per year. Natural vegetation ranges from brigalow to eucalypt woodland with black speargrass. Total area of the three properties is 1800

ha, of which there are 120 ha of para grass (*Brachiaria mutica*), 560 ha of Verano (*Stylosanthes hamata*) sown into native pasture with superphosphate and 80 ha of Hatch creeping blue grass (*Bothriochloa insculpta*). Each year 24 ha of the creeping blue grass are de-stocked in March for seed harvesting in late May. About 500 cattle are bought each year for fattening and at any one time up to 1000 head may be carried on these properties.

This property "The Caves" was purchased in 1960. At the time it was covered with brigalow regrowth. It had been planted to rhodes grass (*Chloris gayana*) and green panic (*Panicum maximum* var *trichoglume*) but these did not persist. The area was cropped to wheat and sorghum to control the brigalow regrowth, and then planted to creeping bluegrass with green panic under a crop of sorghum in 1972.

The sorghum stubble was lightly grazed and the area generally handled carefully for a year or two to let the creeping bluegrass establish. The green panic only lasted three years.

Creeping bluegrass has a long growing season and can make some winter growth here because there are only 2–6 frosts per year and then mostly in drier years. It fattens bullocks better than rhodes grass or green panic and it is less demanding of nitrogen.

Creeping bluegrass is easy to return to cropping but seed is hard to harvest and expensive, presently selling for $15 kg^{-1}.

The seed production area had about 50 kg ha^{-1} of nitrogen fertilizer (as Nitram) applied to it in 1981, and it hasn't been cultivated since 1971. In good years it will still fatten 1 beast per 0.4 hectare.

HATCH CREEPING BLUE GRASS—ITS ROLE IN PASTURE IMPROVEMENT

J. H. WILDIN

Department of Primary Industries, Rockhampton

On the low fertility soils of the spear grass region rhodes grass, green panic and buffel grass (*Cenchrus ciliaris*) fail to persist more than 2 to 3 years. Creeping bluegrass on the other hand will persist and grow on soils with low levels of nitrogen and phosphorus and will replace speargrass and other native grasses.

It is a plant native to South West, South East and East Africa. The material now known as cultivar Hatch came from Zimbabwe in 1931 and was tested at Fitzroyvale (about 20 km east of Rockhampton) between 1936 and 1946. It was one of the highest yielders but didn't combine well with legumes, especially *Stylosanthes guianensis*. Because of this it was not eaten as readily as other grasses.

When the Plant Introduction Station at Fitzroyvale was closed down in 1946 John Hatch's father, Mr. Garney Hatch, obtained runners of creeping bluegrass and planted them across the road from here. From there it gradually spread around the district. Today there are some 3000 ha in the district.

The present cultivar, Hatch, was named in 1976 in honour of John's father. It prefers well drained soils but will grow on heavy black soils as well as acid, sandy or stony soils. It has a wide adaptation and grows in high rainfall areas as well as inland districts with 600 mm annual rainfall. In this area is preferred to the other tropical grasses even on the better soils.

Creeping bluegrass is photoperiod sensitive and does not flower until the days shorten in early May. Seed is harvested at the end of May. During summer it remains vegetative and very vigorous. In mild, wet winters it will continue growing. It is a good soil stabiliser for creek banks and waterways, the stolons forming a dense mat but they do not root down at every node and can be removed by grazing.

About 3000 kg seed are harvested each year with a yield of only 20 kg ha^{-1} but 50 kg ha^{-1} of nitrogen will increase this to 50 kg ha^{-1} seed. The demand for seed is high.

The local harvest is contaminated with seed of angleton grass but pure seed stands are being developed elsewhere.

During the active growing season it will withstand very heavy grazing (up to 5 beasts ha^{-1}), and at other times is stable and persistent under 2.5 beasts ha^{-1}.

The nitrogen content of the forage can be lower than that of green panic but phosphorus levels are similar. The nitrogen content is probably related to yield, creeping bluegrass being higher yielding.

Creeping bluegrass will grow with Siratro (*Macroptilium atropurpureum*) but Siratro cannot withstand the same grazing intensity. Verano caribbean stylo (*Stylosanthes hamata*) does well with it under heavy grazing. Fitzroy shrubby stylo (*S. scabra*) also will grow with creeping bluegrass. It will tolerate fire but is rarely burnt. It will benefit from renovation but this is rarely done. It grows longer into the autumn than most comparable grasses but can be a little slow in spring.

"THE SPRINGS"—PROPERTY DEVELOPMENT AND MANAGEMENT

W. GEDDES

"The Springs"—Glen Geddes

"The Springs" is 80 km north of Rockhampton. Average rainfall is 950 mm per year. Vegetation is eucalypt woodland with native pasture dominated by black speargrass (*Heteropogon contortus*), golden beard grass (*Chrysopogon fallax*), pitted bluegrass (*Bothriochloa decipiens*) and kangaroo grass (*Themeda australis*). The shallow texture-contrast soils, with a hard setting silty loam surface, are highly phosphorus deficient.

This property of 7000 ha is managed in conjunction with another property and is used mainly for growing and fattening Brahman cross bullocks. There is a small breeding herd of 150 cows (Brahman cross and Braford) which are mated with Braford and Droughtmaster bulls. Final fattening of bullocks is achieved using para grass grown in areas on which water is ponded. Animals are sold for the export market at about 5 years of age and 700 kg liveweight. Normal property management includes dipping when necessary (2–3 times/year), worm drenching and botulism vaccination. Extensive areas of native pasture are burnt each year in late spring–early summer.

On this property there is a Fitzroy stylo (*Stylosanthes scabra*) grazing experiment, which aims to study the responses obtained by introducing Fitzroy stylo with and without superphosphate into native speargrass pasture.

There are two areas of para grass. An old area (3–3.5 ha) on which animals grazing from September to November 1981 gained 35 kg each while their counterparts without access to para grass each lost 9 kg. A new area was sown to para grass at 0.25 kg ha^{-1} in late 1980 into a well prepared seedbed at a cost of \$25 ha^{-1} and the pondage banks erected twelve months later at a cost of \$150 per 100 metres of bank or \$75 ha^{-1}. The banks will pond water to 0.75 metres at the deepest part.

PARA GRASS—ITS MANAGEMENT AND USE

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In the last 10 years 15 000 ha to 20 000 ha of para grass (*Brachiaria mutica*) have been planted in the Rockhampton district by 150 property owners. These plantings are on the marine plains, on "run-on" country and on poorer soils on sloping country. As

well there are 20 000 ha on the marine plains in the Broadsound area which have been established for many years.

Pastures of para grass are established traditionally by runners pushed into moist soil at 3 × 2 metre spacings but establishment from seed has become popular. Stock must be kept out until it is well established.

The major role of para is to provide high quality feed through winter and spring. This means it should be planted in situations that will pond water every year. The pondage banks are not erected until the stand is well established.

Most schemes are designed to pond 0.6 m of water. Costs depend on the slope of the land, but range from $80 to $150 ha^{-1}. Some fertilizer is recommended initially but silt in the water will then replace some of the fertilizer requirement in later years. Presently no legumes are available which will withstand the ponding.

No drainage is necessary as cattle will wade out into the water to feed and pugging is unimportant as the wetting and drying cycle takes care of this. Para grass self mulches and doesn't appear to become sod bound. The older the swamps the better the stand. Fire should be kept out of them. The carrying capacity depends on the season but established para grass can carry a beast to 0.4 ha.

FITZROY STYLO GRAZING TRIAL—OBJECTIVES AND PROGRESS RESULTS

C. H. MIDDLETON

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The aim of legume research in the central Queensland speargrass region is to provide a higher quality feed to give better animal performance in the winter/early summer period.

Over the last 15–20 years a lot of legumes have been evaluated, the best being various species of Stylosanthes. Verano, Seca and Graham stylo have proved useful further north. In central Queensland Fitzroy shrubby stylo shows most promise. It will grow in areas down to 600 mm annual rainfall and on low phosphate soils. It grows on a wide range of soils including the duplex, red earths and even some clays. It establishes easily into burnt areas, grows with speargrass, and withstands heavy grazing and burning once established.

Fitzroy offers the best prospects for improving the quality of speargrass pasture in winter/early summer. The major unknown at present is how much animal production it will give. Other problems that need to be clarified are long-term anthracnose tolerance and pasture seed production.

"The Springs" Grazing Trial

The trial, with 4 × 50 ha paddocks, started in April 1980 and is designed as a commercial-scale trial with management akin to that of commercial pasture. There are four treatments (native pasture; native pasture + Fitzroy; native pasture + superphosphate; native pasture + Fitzroy + superphosphate) to be sequentially imposed over time.

: In 1980 all four paddocks were native pasture (to check paddock uniformity)

: In November 1980 the whole area was burnt and two paddocks broadcast with 2 kg ha^{-1} of Fitzroy stylo. Half the seed was scarified. No specific *Rhizobium* is required but we did inoculate. From 1981 to 1983 we will compare native pasture with native pasture + Fitzroy.

: In late 1983 we will apply superphosphate to one native pasture and one native pasture + Fitzroy paddock giving the final 4 treatments.

The trial is stocked at one beast to 4 ha (12 beasts per paddock) and continuously grazed. We record animal performance and pasture responses.

The dominant native grasses are black speargrass (40–50%) golden-beard grass and pitted bluegrass. At the beginning of March this year before the wet season started there was only 1–1.5% Fitzroy stylo present. It is probably now 5–6%.

After the first (1981) wet season there were 8–9 Fitzroy plants m^{-2}. No seed was set the first year (normal) and by March this year there were still 7 plants m^{-2} (2–4 plants m^{-2} is enough).

FITZROY STYLO GRAZING TRIAL ANIMAL PRODUCTION RESULTS

P. VENAMORE

Department of Primary Industries, Rockhampton

Forty-eight Brahman cross steers were weighed into the trial in late April 1980 but will be replaced annually by a new draft in March each year. They are weighed again in July and November and again in March when they are replaced. The weighing dates correspond roughly with the change in seasons and feed availability.

From April 1980 to March 1981 (325 days) animal liveweight gains ranged from 130–145 kg $head^{-1}$. There was no significant difference between native pasture and the future native pasture + Fitzroy stylo paddocks. From March 1981 to March 1982 there was a 13 kg $animal^{-1}$ advantage to the Fitzroy stylo paddocks. Mean gain was 110 kg $head^{-1}$. There was no difference in sward yield.

The new draft entering in March 1982 are not due to be weighed again until July 1982. For the first time this autumn they will have had access to a "reasonable amount" of Fitzroy stylo. It is expected this will begin to show increases in liveweight gain in these paddocks.

"PRINCHESTER"—PROPERTY DEVELOPMENT AND MANAGEMENT

F. S. MCCARTNEY

"Princhester" Marlborough

This property of 8000 ha is located on the Bruce Highway, 20 km south of Marlborough and 78 km north of Rockhampton. Yearly average rainfall is about 850 mm. Vegetation is mainly eucalypt woodland with speargrass (*Heteropogon contortus*) with some lower lying clay soils covered with Angleton grass (*Dichanthium aristatum*).

About 600 ha have been sown to the improved pasture species: buffel grass (*Cenchrus ciliaris*), Bambatsi panic (*Panicum coloratum* var. *makarikariense*), *Sorghum almum*, Kazungula setaria (*Setaria sphacelata* var. *sericea*), Verano (*Stylosanthes hamata*), Siratro (*Macroptilium atropurpureum*), Graham stylo (*Stylosanthes guianensis* var. *guianensis*) and Fitzroy shrubby stylo (*Stylosanthes scabra*). In 1975 a small plot of Seca shrubby stylo (*S. scabra*) was sown. A 12 ha plot of Fitzroy stylo is being grown for seed.

Before pasture development this property was able to carry only 1000 head of cattle, which were marketed as stores. Now "Pinchester" comfortably carries 1800 breeding and fattening cattle (Santa Gertrudis).

FITZROY SHRUBBY STYLO SEED PRODUCTION

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There are presently 100–110 ha planted to Fitzroy for seed production in Central Queensland. There have been some problems to date. Where heavy rain was received

last November anthracnose (*Colletotrichum gloeosporioides*) has appeared. Heliothis is causing trouble presently in some crops. Early frosts will also be a problem.

Stands should be planted early (November–December) certainly by January at 3–5 kg ha^{-1} on a well prepared seedbed with adequate fertilizer. Little, if any, seed will be obtained in the first year unless the crop has grown very well.

Treflan weedicide can be used as a pre-emergence treatment where grass weeds are anticipated. The crop is resistant also to 2,4-D at 2 litres ha^{-1} of amine. 2,4-D should be used about 3 weeks after germinating rains to control seedlings of the more troublesome and resistant weeds such as *Sida* spp. and *Crotalaria* spp.

Normally a peak of flowering is reached in May and in North Queensland the crop is not harvested until September but here most seed will be ripe by July. Generally 15–30% of ripe seed falls before the peak standing seed crop is achieved. The seeds hold well in the head but there is a long flowering period. Any open fronted header is suitable for harvesting with the air blast cut well down as seed is light. Use open sieves and reclean the sample later. High drum speed is normal but ground speed will depend on the amount of material entering the header. The air and sieves are the most important adjustment to the header.

PASTURE LEGUMES FOR THE SPEARGRASS COUNTRY

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Department of Primary Industries, Mackay

Over the last twenty years a number of legumes have been evaluated for use in the speargrass (*Heteropogon contortus*) country. Early selections which have played a part in pasture development were Townsville stylo (*S. humilis*) and Siratro (*Macroptilium atropurpureum*). Townsville stylo is now affected by anthracnose but Siratro is still available. It requires good seedbed preparation, adequate phosphorus and good grazing management to achieve and maintain stands.

Recently a concentrated effort has been made to evaluate the *Stylosanthes* spp. Shrubby stylo (*Stylosanthes scabra*) accessions were the most outstanding with the cultivar Fitzroy emerging as a commercially available line. Shrubby stylo needs little seedbed preparation and will grow and spread with little or no applied phosphorus. Animal performance on them remains an unknown.

Fitzroy stylo can be planted after a grass fire and nodulates with native *Rhizobium*. It can be sown aerially and is a fairly early and heavy seeder capable of spreading out from sites on which it is planted. Only low seeding rates are required. Fitzroy is not, like the earlier release Seca, resistant to anthracnose but has proven satisfactory for use under grazing in drier southern locations in Central Queensland. Hopefully Fitzroy can be used over large areas without initial phosphate application. It will recover from heavy frost or fire, shooting from the base or even just below the ground or from a massive seedling regeneration.

Within other species of *Stylosanthes* there are useful plants. Related to Schofield stylo (*S. guianensis* var *guianensis*), which was useful in higher rainfall areas of North Queensland and around Mackay, is cultivar Graham. Graham is much earlier seeding than Schofield and gives a very heavy seed set which has enabled stands to thicken up markedly after planting. It has, to date, also retained some resistance to anthracnose. It is particularly useful on the wet coastal areas but will grow in drier country than Schofield. It flowers from late March with ripe seed during April and can be harvested in May. It sets seed 3–4 weeks earlier than Cook and 8–10 weeks earlier than Schofield. It will grow over 1 metre tall in wetter areas. It will withstand some frost without being killed.

Graham has a different role to Fitzroy. It needs some phosphate and is really for more intensive situations with some cultivation of the seedbed and possibly an introduced grass planted with it.

The third major new stylo is Verano caribbean stylo (*Stylosanthes hamata*). It was released as anthracnose came on the scene. It is a weak perennial that is a replacement for Townsville stylo at least in North Queensland. It needs some phosphate and will be planted and used as was Townsville stylo. It also nodulates effectively with native rhizobia but advantages such as faster early growth are claimed for inoculated seed on some soils.

ANIMAL PRODUCTION FROM LEGUME BASED PASTURES

B. WALKER

Department of Primary Industries, Rockhampton

With native pastures 85% of the forage production occurs over the three summer months, December to February. This has to carry animals for the rest of the year. Animal weight gain starts with the break of the season. There is a quick increase in liveweight gain which starts tapering off by the end of February. Liveweight then remains static for several months followed by animals loosing weight until the next growing season starts. This occurs no matter how much feed is available. It is a feed quality drought.

We know that if a legume plus sufficient superphosphate is included in the pasture the liveweight gain pattern is initially the same as on native pasture until the end of February–March. Up to this time the cattle have been eating mainly grass. They then start to seek out the legume and will continue to gain weight until June or July. They will also then hold this weight until the break of the season in November. They may even gain a little. Once the season breaks rapid weight gain is resumed. The main benefit from legume based tropical pastures is obtained during April to November.

On only native speargrass pastures animals weaned at say 150 kg in May take 4 to 5 years to reach 550 kg weight for sale. On the fertilized legume based pasture they do not lose weight over winter/spring and are ready for turning off up to 2 years earlier.

With the shrubby stylos we have legumes capable of growing on infertile soils without added phosphate fertilizer. What is the effect of leaving out the phosphorus likely to be, on animal production? The aim of "The Springs" trial, is to find out what happens where there is no added phosphorus and later when a little is applied. What we expect to happen on speargrass pastures in Central Queensland is something like the following.

	Speargrass alone	*Speargrass + legume + fertilizer*	*Speargrass + Fitzroy stylo + no fertilizer (15 ppm soil P)*	*Speargrass + Fitzroy + low fertilizer*
Stocking rate (ha anim)	4	1.5	3	2
LWG head^{-1} (kg)	90	160	110	130
LWG ha^{-1} (kg)	22	106	37	65

Figures for stocking rate and liveweight gain on speargrass and speargrass + legume + full fertilizing in the first two columns are known, those in the last two are our ideas of what we think will happen. What we really need to know is how much or how little phosphorus is necessary to start the system going and influence animal production.

"MONA VALE" PROPERTY DEVELOPMENT AND MANAGEMENT

G. WYLAND

"Mona Vale", Glen Geddes

"Mona Vale", 50 km north of Rockhampton has an average annual rainfall of 780 mm. The property is in two blocks and occupies an area of 5400 ha, of which 75% is eucalypt woodland with speargrass and the balance clay flats.

Improved pastures of Siratro (*Macroptilium atropurpureum*) (20 ha), para grass (*Brachiaria mutica*) (10 ha), *Leucaena leucocephala* (Peru 26 ha and Cunningham 20 ha) and Highworth lablab (*Lablab purpureus*) (32 ha) have been sown. The property carries 1200 Brahman cross breeding and fattening cattle. Leucaena is used as a protein supplement to the native grass from March to December each year.

"Mona Vale" is the main producer of Peru and Cunningham leucaena seed in Australia and normally a total of over 3 tonnes are harvested. One of the unique features of this property has been the development of specialised machinery to harvest leucaena seed.

LEUCAENA—ESTABLISHMENT AND MANAGEMENT

J. H. WILDIN

Department of Primary Industries, Rockhampton

Within Central Queensland the ridge country that cannot be cultivated is seen as Fitzroy stylo country. The flats where water can be ponded can be used for para grass whilst the lower slopes and flats can be used for fully improved pastures planted in a prepared seedbed. These areas also provide a place for leucaena which can be used as a protein bank to supplement not only the forage available from the ridges but also the para grass areas. The use of these lower slopes and flats not devoted to para grass should be split between grass legume pastures and leucaena. The total planting of leucaena should not exceed 5% of the total property area e.g. 200 ha on a 4000 ha property. It is part of an integrated system of forage production and utilization.

Leucaena here is grown as a tree rather than as a browse shrub and in this way will grow on into the winter. It is very permanent once established. At least a 50 year life is expected.

Leucaena is planted into a well prepared seedbed with appropriate fertilization along the row at planting. This may include phosphorus, potassium and even lime. The rows here are 4 m apart but the spacing can be varied depending on the rainfall of the district. We always plant at a constant density in the rows aiming to place seeds 5 cm apart in the rows. Scarified (hot water treated) and inoculated seed is essential with seed placed no deeper than 3 cm in the soil.

Leucaena prefers alkaline soils and will not thrive on acid soils with lower pH 6.0.

The plantings of both Peru and Cunningham leucaena on "Mona Vale" are used primarily for seed production. Once the seed crops for the year have been harvested, weaners, bullocks or backward cows are given access to the leucaena areas. Young stands when 2–3 m tall are grazed with weaners only so as not to damage the plants. Once the upper canopy gets beyond the reach of cattle, stands can be grazed continuously. Until then rotational or controlled grazing is necessary.

Cunningham is a later flowering cultivar than Peru. The Peru areas are harvested by machine in March–May. The plants are up to 7 m tall and a special, locally constructed, machine is used. The Cunningham stands are younger and are presently hand picked in June–July to as late as August. Yields of seed are 150–200 kg ha^{-1} but only about 100 kg ha^{-1} can be harvested with one pass of the harvester.

For grazing purposes there are minimal, if any, differences between the two cultivars. Mimosine has never been a problem as the areas are only used as a supplement to adjacent grass areas. The aim is to plant .04 ha per beast and to allow the animals access only from March to the break of the season in October–November. Any one group of animals stay on the leucaena for a maximum of 4 months and can gain at 1 kg day^{-1}.

The only fertilizer applied at this stage is at planting. Maintenance fertilizing may be needed also but the situation is not known and the plants appear healthy with age.

ECONOMICS OF PASTURE IMPROVEMENT IN SPEARGRASS COUNTRY

L. WICKSTEAD

Department of Primary Industries, Bundaberg

The economics of pasture improvement depend on many factors and to illustrate these estimates are presented for a number of options for the Coastal Burnett, the Inland Burnett and the Central Queensland Speargrass areas.

The returns from pasture improvement are better from better classes of country. The ranking of the above three areas are; 1. Coastal Burnett; 2. Inland Burnett and 3. Central Queensland Speargrass.

Profitability is affected by:

1. The initial cost of putting the pasture in. This is vital.
2. Changes in stocking rate and liveweight gain that can be attained.
3. Fertilizer, renovation and maintenance costs.
4. Beef price.

Success of the venture in a business sense depends on:

1. Timing in relation to the beef cycle.
2. Interest rates.
3. The pasture life.

Assumptions made in making the present comparisons are:

1. A 10 year pasture life.
2. 12% interest rate.
3. Beef prices cycling from 90c kg^{-1} maximum to a 50c kg^{-1} minimum on an 8 year cycle.

In these comparisons, leucaena and para grass have been excluded and the open rolling country looked at with the most profitable of the present pasture development options compared against estimates for Fitzroy stylo development in each area.

Coastal Burnett

The best present option is for Siratro plus an improved grass planted into open speargrass country without much timber.

This can increase carrying capacity from 1 beast on 3.6 ha to 1 beast to 1.3 ha and lift liveweight gain per animal from 110 kg $annum^{-1}$ to 165 kg $annum^{-1}$.

The capital costs of such development are \$337 ha^{-1} if carried out when beef prices are high and \$213 ha^{-1} when they are low. It is always cheaper to do this development when beef prices are low as a major part of the cost is increasing stock numbers to achieve the higher the stocking rates. The extra cattle have to be purchased or retained at higher market prices.

With development when cattle prices are high the payback period is greater than 10 years and the rate of return on capital 10.5%. When prices are down the payback period is 9 years and rate of return 17.5%. This option has some risks attached to it and the rate of return is only marginally attractive even at the low point of the beef price cycle.

Using Fitzroy stylo flown onto country after a burn without any fertilizer application and using figures for an optimistic response and a more pessimistic

response the result is as follows. In both, stocking rate is increased slightly and in the pessimistic estimate liveweight gain stays the same as on the unimproved speargrass. The optimistic estimate is that inclusion of Fitzroy stylo will lift liveweight gain to 130 kg head^{-1} year^{-1}. For the optimistic estimate the payback period will be 5 years (low part of cycle) or 8 years if beef prices are high with rates of return 41% or 26%. The differences again being in the cost of the extra cattle to increase the stocking rate. These returns should be good enough to entice people into this style of development. This assumes the estimates of potential animal production from Fitzroy stylo are realistic.

Inland Burnett

The best present option is fine stem stylo (*Stylosanthes guianensis* var. *intermedia*) strip planted into speargrass. The stocking rate increases slightly and liveweight gain per head increases from 100 to 130 kg year^{-1}. Development when prices are high takes 10 years to repay, 7 years when beef prices are down. Rates of return are 12 and 18%. Not very attractive.

With Fitzroy stylo it is assumed that stocking rate increases from 1 beast to 5 ha on speargrass to 1 beast to 3 ha with liveweight gain either staying the same or increasing to the 130 kg head^{-1} as on fine stem stylo. Here there is no cultivation cost so payback periods are 8–10 years for the bouyant phase and 4 years if done when prices are low. Rates of return are 25% and 50% respectively. It must be emphasised that this analysis is largely *exante*. Estimates of animal production from Fitzroy aerial sown into speargrass remain unreliable until commercial data is more readily available.

Central Queensland

These figures are lower than for either Burnett area. This district has the lower rainfall of the inland Burnett and the poorer soils of the coastal Burnett, so returns will be less.

For the adoption of any technology at present it appears that there must be little capital requirement. A big return must be possible and the risks in undertaking the development must be low.

There are also worries in undertaking pasture improvement associated with an increase in the drought risks. More cattle have to be carried through drought if the improvement involves increasing stocking rate. The most attractive development therefore is likely to be one that does not increase stocking rate but gives a better per animal performance.

If Fitzroy stylo can increase liveweight gain to 130 kg head^{-1} year^{-1} without any need to increase stocking rate then drought risk is not increased and the only cost is for seed and aerial sowing. This would give a payback of 7 years and a rate of return of 24%.