FIELD MEETING IN THE BRISBANE VALLEY ON APRIL 19, 1974

This meeting examined and discussed a successful oversowing of siratro into native pastures, pastures on river flat country affected by flood and pastures for the hill country. Pastures were inspected at "Glen Esk", the property of Mr. M. Brough, and "Mt. Brisbane", the property of Mr. J. McConnell.

SOD SEEDING SIRATRO INTO NATIVE PASTURES—2 YEARS AFTER

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Large tracts of relatively undeveloped spear grass country are available in the sub-coastal area of south-east Queensland. Most of it has been cleared for many years, and has been running cattle at a beast to 2.4 ha and down to a beast to 4 ha. With the impending construction of the Wivenhoe Dam, much of the highly productive flat country will be flooded and this will put a requirement on landholders to utilize the forest country to a greater extent. The dam must also give rise to increased land costs, which will demand a higher return than is at present acceptable.

With these facts in mind, an investigation was commenced to look for a relatively cheap method of improving large areas of this country. It was obviously out of the question to use fully developed mixed tropical pastures, because of two factors. Firstly, the high cost of these pastures make their use uneconomic to graziers on the scale required to lift whole-property production. Secondly, many of the grazing properties are not set up to cultivate and plant large areas of land because of lack of suitable machinery, and in many cases lack of suitable, relatively flat land.

It was therefore decided to look at the inclusion of a legume into existing native swards. It is well accepted that for the mid-summer period, native pastures are extremely productive. Their limitation lies in early maturity, giving rise to shortages of energy and, in particular, protein in the autumn. Siratro has proven extremely productive and persistent in fully developed pastures in the West Moreton region. It is persistent under moderate stocking pressures with continuous grazing and can thicken up from an initially poor stand. It was also the most successful legume in early sod-seeding work carried out by Mr. G. Filet, of the Department of Primary Industries, Ipswich. Apart from being highly productive in this situation, it was noted that animals utilized greater amounts of the native pasture in areas where it grew associated with siratro.

EXPERIMENTAL METHOD

Establishment

In this investigation, the aim was to test the value of siratro in native pasture in terms of animal production. The most likely technique expected to achieve a satisfactory pasture as soon as possible was used. The planting would have been delayed had climatic conditions not been suitable. No thought at the planning stage was given to the cheapest method of establishment. That was to come as a later stage of the project.

An area of 40 ha was burnt in the spring, and dead and fallen timber cleaned out of the area to be sown to siratro. Because only minimal clearing was required, and because this was to facilitate planting, it was considered to have had little

effect on carrying capacities of the two areas. The area to be planted to siratro was ripped on the contour to a depth of 10 cm. It was sown during the last week of December 1971 using a normal combine with the tynes just breaking the soil surface. Seed was covered by dragging diamond harrows reversed behind the combine. Between ripping and sowing, the superphosphate (250 kg ha^{-1}) was applied as a separate operation. This was merely for convenience, and could have been applied as effectively at sowing. During the establishment period, the animals grazed continuously on the whole 40 ha, concentrating on the siratro in autumn. A six-week period prior to the first Tropical Grassland Society field day was the only time (except in winter) when the area has not been stocked. This period of spelling allowed the siratro to bulk up and set seed. During the establishment period, weather conditions were extremely good.

Grazing management

In 1972-73, 13 animals were allocated to each of the 20 ha. Animals were bred on the property and were about 15 months old at commencement of grazing. One animal was culled on the native pasture area, so the stocking rate was slightly lower. The stocking rate on both areas was very close to 1 beast to 1.6 ha. Grazing commenced in November 1972.

In 1973-74, 16 animals were allocated to each paddock. The same type and age of stock was used. The stocking rate was thus increased to 1 beast to 1.2 ha. Grazing commenced earlier, at the beginning of October. The siratro had given higher production in this current season, so by mid summer it was considered necessary to increase the stocking rate to 1 beast to 0.8 ha.

It would appear at this time that this increase in stocking rate could have occurred earlier in the season or alternatively the stocking rate could have been further increased.

RESULTS

Animal liveweights

No differences in the liveweights of the two groups of animals could be detected until March, 1973. After March the animals on native pasture maintained their condition until May, reaching a liveweight of 418 kg. On the other hand, the animals on siratro maintained a growth rate of 1.1 kg ha^{-1} day^{-1} until May at which time they had reached 441 kg. After the May weighing, both sets of animals were turned into the siratro in an attempt to utilise the remaining siratro before frost occurred. This was a mistake as it is obvious from the results that the siratro animals lost weight during June. The native pasture animals, obviously short of protein, did better, but still lost weight.

Better spring animal performances were recorded on the siratro pasture in 1973-74. These differences carried through into the early summer, but the native pasture animals gained more in mid summer, mainly because of the shorter green feed in the burnt native pasture area. Differences again showed up from March onwards. The addition of 8 extra animals at the end of February changed the average liveweights slightly. They had previously been run on a second native pasture area in the same area. Animals in the native pasture increased in liveweight from 268 kg to 400 kg by mid April. On siratro, the average liveweights rose to 424 kg over the same period.

Liveweight gain per ha

In 1972-73, slightly better gains were made on the siratro pastures up till March. This was probably due to the extra animal on this pasture. From March

till May, there was an increased liveweight gain of 22 kg ha^{-1} from the siratro animals over the animals on the native pasture. Greater losses were recorded after May by the siratro animals when the stocking rate had been doubled.

The pattern was repeated in 1973-74, but a larger increase in liveweight gain per ha was recorded in the April weighing compared to the previous years' results. At the end of April the increased liveweight gain amounted to 34 kg ha^{-1}. Very little increase was recorded when the additional animals were put on in February although it did show up in later weighings.

Liveweight gain per beast

Similar liveweight gains per beast were recorded on both pastures until March in 1972-73. After March there was a large increase in the liveweight gain per beast in the siratro area. In June, the siratro pasture was able to keep the native pasture animals from the large scale liveweight losses expected.

In 1973-74, there was a greater liveweight gain per beast on the siratro in spring. In mid summer however, the native pasture produced greater liveweight gains per beast. Autumn differences between the two animal groups was greater than in the previous year. The addition of extra animals on the siratro pasture depressed liveweight gain per beast in the February and March weighings. Lower liveweight gains in December and February can probably also be associated with below average rainfall, affecting pasture growth.

Botanical composition

Botanical composition surveys were taken over fixed transects with a wheel point quadrat in November 1972 and again in April 1973. I will make no comments on the results of these counts except to say that the paddocks were not similar in the sub dominant grass species. As well, it should be noted that in the so called spear grass country, spear grass (*Heteropogon contortus*) is far from the dominant species. There are larger proportions of the blue grasses in both pastures on a basis of percentage ground cover. Further determinations will be taken in 1975 to determine any effect of grazing pressure on native pasture.

DISCUSSION

The cost of establishing the pasture was $32 per ha. To date the maintenance cost has amounted to $15 per ha. No fertilizer will be applied in 1975. It is planned to fertilize with 250 kg ha^{-1} superphosphate every second year. Hence, so far the total expenditure on the pasture has been $47 per ha. Last year's liveweight gain was 22 kg ha^{-1} so at present beef prices, this would have increased the return by $10. If the present animals were sold now, then the increased return would be $15. The return in two years therefore, has been $25. If the same gains continue until the end of May as occurred in 1972-73, then it is possible this return could be increased further. The pasture is also improving each year and this, together with the good season, has contributed to the increased return in 1973-74.

The advantages

1. Increased productivity in autumn and perhaps also in spring.
2. Increased stocking rates.
3. Increased property development at low cost.

To summarise, we have used a legume—siratro—and established it in native pasture with minimum costs. It has proven capable of turning off a greater amount of beef per unit area than native pasture in good seasons.

Where do we go from here

At the moment, there is no certainty that siratro is the best legume available. It has its faults, but at present there is no better one available. As new ones arrive, they must be compared with siratro.

Neither is the technique we have used the best available. It may be possible to introduce siratro (or any future legume) more reliably by other methods. For example in the Boonah area, sowing has been successfully done without cultivation in autumn for 4 years.

More research must be conducted in these fields now that the principle (that a legume can increase the productivity of native pasture in sub coastal spear grass country in S.E. Queensland) has been demonstrated. Further research could also look at methods of best utilising this extra feed. I think that in this situation today, the makings of a new pasture revolution is evident.

At the last field day, I was challenged as to why pasture development had not been so rapid in the grazing areas of West Moreton. With the results presented here, I throw the challenge back. We now have a pasture for you. Could it possibly be a "goer" on your property?

EXPERIENCES IN SOD-SEEDING SIRATRO INTO NATIVE SPEARGRASS PASTURES ON GRANITE SOILS NEAR MUNDUBBERA

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In January 1972 a large scale experiment designed to study alternative systems of land development was established at the Narayen Research Station of the Division of Tropical Agronomy, C.S.I.R.O. The land use systems are as follows:

1. Unimproved silver-leaved ironbark woodland (C).
2. Native speargrass pasture—the trees killed by tordon injection (c.f. ring-barking) (K).
3. Native speargrass pasture (trees killed) with siratro sod-seeded with Mo superphosphate (KS).
4. Complete clearing and sowing to buffel grass and siratro with Mo superphosphate (PS).

Each of the above treatments, except No. 1, contains several stocking rates which overlap one another over the full range. The results to date cover two complete seasons, although in the KS and PS treatments the stocking rate was kept at three-quarters of the full rate from May to November 1972 to relieve the pressure on the establishing siratro.

ESTABLISHMENT

Timber treatment in the K and KS treatments was performed for \$8.10 ha^{-1} (\$3.25 ac^{-1}) (including chemical). The tree stand was approximately 150-200 ha^{-1} (60-80 ac^{-1}).

Sod-seeding was carried out using a linkage disc sod-seeder, sowing the seed down the tubes while broadcasting the superphosphate, and towing one unit of a cultipacker roller. The tractor carried an angled blade mounted in front, riding 4 inches above the ground, to push aside fallen logs and branches. Penetration by the discs was satisfactory only when the soil was moist at the surface. 0.8 to 1.2 ha per hour (2-3 ac h^{-1}) could be seeded in this way between the trees.

Sown pastures. Following timber pushing, windrowing, stick raking, burning

and one offset discing, the pastures were sown in two operations. In one the siratro and superphosphate were drilled and broadcast respectively with a combine drill and in the other the buffel grass broadcast from a "Vicon" fertilizer spreader trailing a cultipacker roller. The two operations were necessitated by the difficulty of sowing buffel grass seed through a conventional seeder.

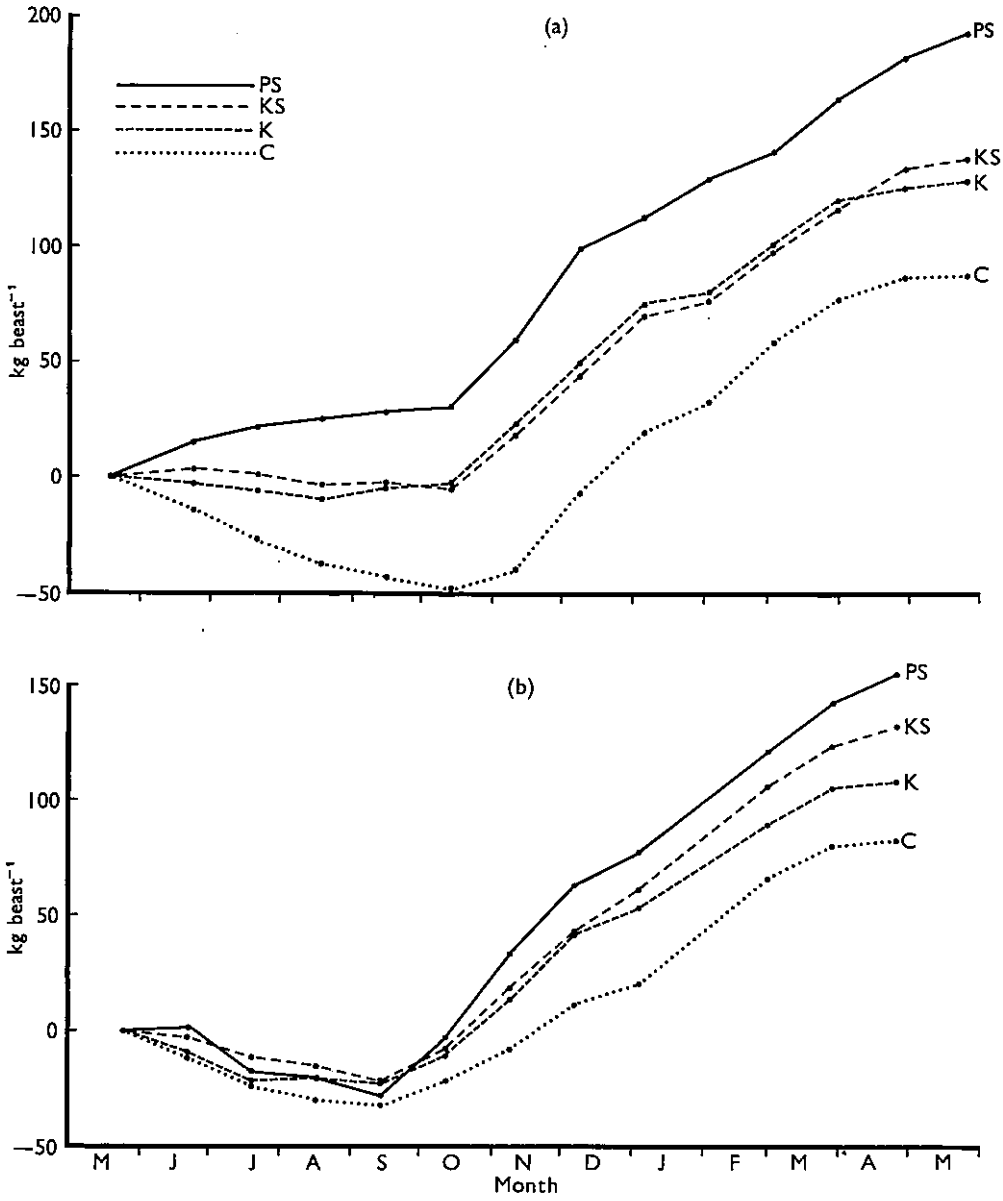

FIGURE 1

Cumulative liveweight gains of steers grazing four land use systems at Narayen (averaged over stocking rates). (a) 1972-73, (b) 1973-74.

Establishment conclusions

1. The speed of establishment of siratro is dependent on the amount of ground preparation performed. However, sod-seeded siratro will eventually establish as well as that seeded in a cultivated seedbed.
2. 2.2 kg ha^{-1} (2 lb ac^{-1}) of seed appears to be adequate for a successful establishment.

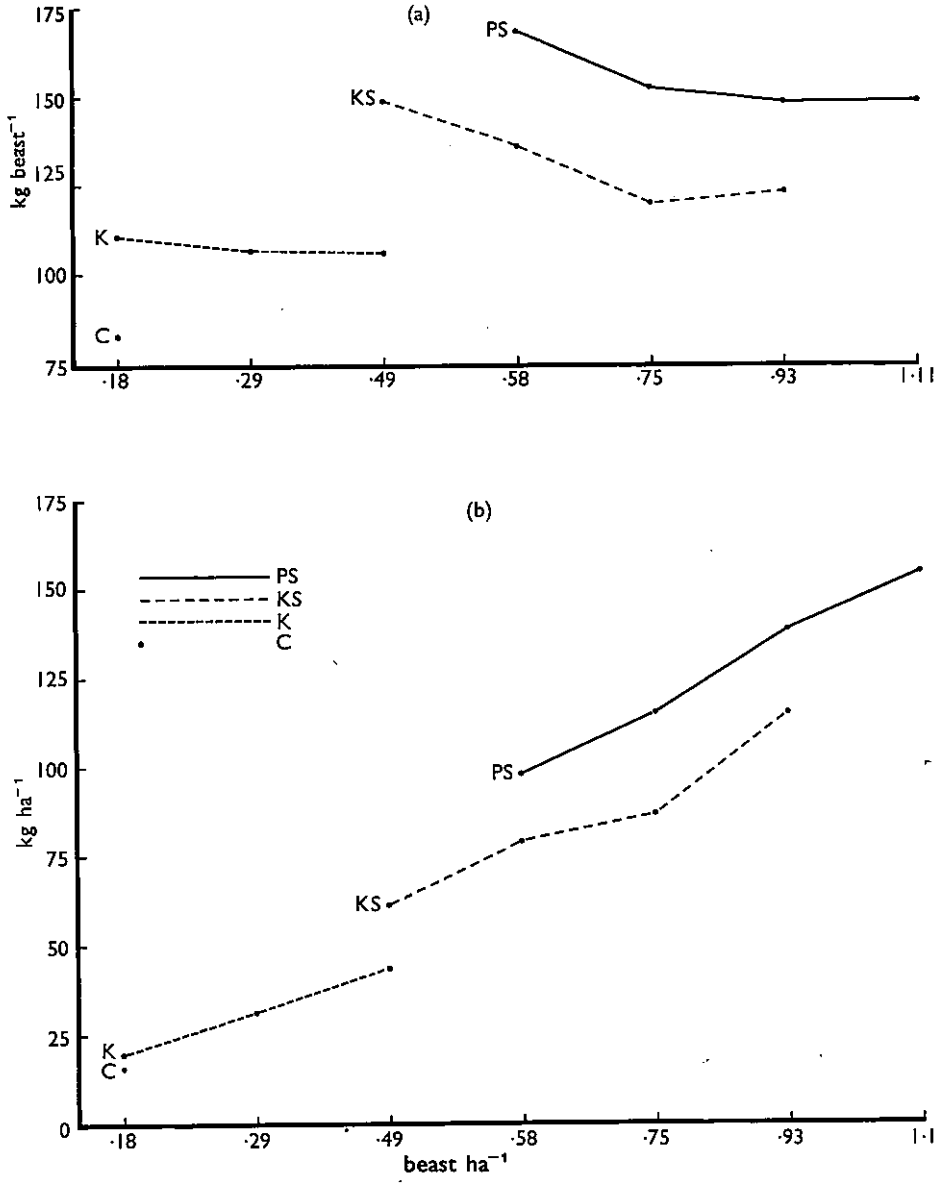

FIGURE 2

Animal production from four land use systems at Narayen for the period May 1973—April 1974. (a) kg $beast^{-1}$, (b) kg ha^{-1}.

3. Grazing need not be withheld during the establishment phase though it should, perhaps, not be too severe or, on sown pasture, should not be started until the seedlings are firmly enough rooted.

THE PASTURES

Siratro based pastures. The two favourable summers have promoted a very vigorous growth and predominance of siratro in both pasture systems. While buffel grass appears to be sufficiently strong-stemmed to cope with a heavy smothering growth of siratro, the native grasses are more readily smothered. Already considerable changes have occurred in the sod-seeded native pastures. Speargrass is the most persistent native grass but the indications are that it will be necessary to introduce a stronger grass into the system at some stage. Since buffel grass will not establish effectively in anything but a fairly well cultivated seedbed, green panic appears, from preliminary observations elsewhere, to be a suitable choice.

Native pastures. There has been a large build-up in rank grass in the native pastures without trees which must largely be attributed to the extra water available once the trees have been killed.

ANIMAL PRODUCTION

The first two full years of animal production records are shown in Figure 1. The important features of these are:

1. The rates of gain on all treatments, irrespective of large differences in botanical composition, are comparable during the main summer growing season.
2. Differences between treatments are manifest largely in spring and autumn when siratro based pastures give a total of up to 4 or 5 months production advantage over the unimproved native pastures.
3. Winter production is very dependent on climate. The dry winter of 1972 favoured the sown pastures over the native. Because of the slower establishment of the siratro in the native sod-seeded pastures, it was rapidly eaten up so this treatment behaved similarly to pure native pasture for the last half of winter. However, in 1973, the relatively moist conditions helped maintain the native pastures because of the growth of weeds and annual grasses but caused considerable deterioration in the carry-over herbage of the sown pastures.
4. Improvement of pastures by incorporating siratro has led to increases of from 4 to 10 times in per hectare production or 1.4 to 2.0 times in per head production (see Figure 2).

CONCLUSIONS

There is a clear advantage to be gained in killing timber, but it is, at best, only half as good as with the additional introduction of siratro and superphosphate. While these and the Glen Esk trials are still young, and much has yet to be learnt about the outcome of such practices in terms of their long-term productive potential and stability, it is clearly a promising approach.

Management criteria cannot yet be spelled out. There are obviously strong interactions between the introduced legume and the native species which are likely to be conditioned by grazing management.

There are reports, and our own experience indicates, that surface broadcasting of siratro seed may be successfully carried out, though it must be realized that the rate of establishment will be slower even than with sod-seeding. The nature of the season will also have a considerable influence on the success of broadcast sowing.

DISCUSSION OF PASTURES FOR THE REGION

The main points arising from the discussion of low-cost pasture development in the sub-coastal spear grass area of south-east Queensland are given below.

Establishment

Siratro established rapidly on prepared seed beds but good results had also been obtained from sod seeding. Establishment was slower in areas where rainfall was lower and/or poorly distributed. At most localities in the region the sloping topography and light textured soils made cash cropping a risky enterprise to recoup establishment costs. The Tordon used to kill trees did not appear to have any deleterious effects on young plants. The injected trees retained their leaves for about 12 months so that establishing seedlings were shaded.

Burning or slashing of the native grasses had also given successful establishment of siratro with well-controlled burns being a cheaper method. Burning in spring after rain ensured the retention of a sufficient cover of litter to protect germinating seedlings of siratro. It was important to burn large enough areas of native pasture to prevent overstocking of the burnt area.

The free-seeding habit of siratro and its robust seedling vigour were important attributes contributing to its successful establishment in the region. In studies near Mundubbera up to 140,000 seedlings per hectare had been counted in a grazed siratro pasture. In well established pastures with a closed canopy almost all of these seedlings died through lack of light but in new sowings with minimum cultivation techniques these new crops of seedlings ensured rapid spread and thickening of the stand from a low density establishment.

Maintenance fertilizer

Most soils in the region were deficient in phosphorus so that superphosphate dressings were essential to promote vigorous legume growth. Maintenance applications of 125 kg ha^{-1} yr^{-1} of superphosphate were adequate in many cases but considerations of soil type and chemical analyses of soils and plants were useful guides to maintenance fertilizer requirements. Potassium levels were low to marginal in some areas and analyses of soil exchangeable potassium could also be used to guide fertilizer recommendations.

Legume species

The drought tolerance of siratro and its capacity to withstand heavy grazing were strikingly demonstrated during the 1969 drought when cattle carried right through without destocking and the pastures showed a complete recovery in the subsequent growing season. Only minor successes have been obtained with other legumes in this subcoastal region. Glycine does not grow well except on the more fertile soils and then only in the higher rainfall areas.

Siratro is defoliated by light frosts which do little damage to fine-stem stylo but the early promise of this species has not been borne out in most locations. Nodulation problems, slowness to establish and susceptibility to shading from taller grass species appear to be major problems with this species. Townsville stylo is an annual which has only grown well in a restricted number of localities. Irregularity in spring and early summer rains means that this legume is often a very late starter. Improved perennial types of *Stylosanthes* are being sought in large collections which are undergoing preliminary assessment in the region.

Dolichos axillaris was sod-seeded near Esk prior to the 1969 drought but was inferior to siratro. Dense regeneration of seedlings occurred following the drought but the stand rapidly declined in subsequent years. This performance has been repeated at other sites in the region.

SOME ASPECTS OF BREEDING HERD MANAGEMENT IN THE WEST MORETON REGION OF SOUTH-EAST QUEENSLAND

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INTRODUCTION

The number of calves produced and marketed in a beef herd has an important bearing on the level of income derived from beef enterprises, where breeding is an integral part of the operation. Property income is maximised by increasing both the reproductive rate and reducing the age of turn-off at a given weight of the sale animal. A high level of nutrition is a prerequisite for the achievement of both goals. The cost of providing this high plane of nutrition must be kept within economic limits for the financial success of the business.

EFFECT OF REPRODUCTIVE LEVEL ON PROPERTY INCOME

The economic benefits to the producer in terms of percentage increase in gross income per year, and based on current cattle values, by increasing branding percentage for three different types of enterprise are calculated as follows:

Type of Enterprise	Branding %			
	65	75	85	Total
Breeding and selling store yearlings		+11%	+9%	20%
Breeding and selling stores 2 yr old	Base	+10%	+8%	18%
Breeding and selling fats 3 yr old	figure	+ 8%	+7%	15%

The lower percentage increase in gross income from the older age of turn-off, demonstrates the well known fact that the older the age of turn-off the less important is branding percentage.

(In calculating the above figures, the herd in each case was standardised on a common adult equivalent, that is, it was assumed that a given property has a certain carrying capacity at a given time of the year, say winter-spring dry season, after the normal sale cattle were sold and cattle of different ages were given an adult cattle equivalent rating.)

The important point of the exercise is that it clearly demonstrates that property income increases with increased reproductive rate.

The West Moreton situation

Available evidence indicates that the reproductive level in many beef herds in the West Moreton is below an acceptable level. Herds which have been investigated had branding percentages approximating 70-75%, and it is considered that the average figure would be somewhere in this vicinity. A branding figure around 85% would be a reasonable target at which to aim.

FACTORS INFLUENCING REPRODUCTIVE RATE

The Beef Cattle Husbandry Branch of the Queensland Department of Primary Industries has studied the reproductive performance of breeding herds throughout Queensland, including herds in the Brisbane Valley, over a number of years. It is very evident that poor nutrition is one of the major causes of low reproductive rate while infertility diseases also contribute to the lowered performance.

The level of nutrition is reflected in the body condition of the breeding cow and this is particularly noticeable in the lactating animal. Body condition has been shown to be constantly related to breeding performance of beef cattle in Queensland. In non-lactating mature cows, the effect of body condition on conception rate is not so pronounced, but marked effects, allied to growth and maturity, have been observed in heifers. However, the effect of body condition is critical in lactating females, and causes a marked delay in breeding and, particularly in poor seasons or when cows calve late, a considerable reduction in pregnancies.

Of the infectious infertility diseases, vibriosis is probably the most important in the West Moreton region and its presence is generally demonstrated by low conception rates in well-grown and well-conditioned first-mate heifers. Brucellosis and leptospirosis cause abortion and undoubtedly account for some reduction in calves born.

PRACTICAL BREEDING HERD MANAGEMENT

There is factual evidence which points very strongly to the adverse effect of low body condition, especially during lactation, on the conception rate and pregnancy levels in beef herds. There is also evidence that high conception rates are associated with weight gains in mated cattle, but this does not necessarily apply in all environments. The basic requirements are strong condition at calving, and adequate good quality feed early in lactation. Therefore, if high reproductive levels are consistently to be obtained, management should be aimed at conserving body condition on the cow and mating her when nutritional conditions are most favourable, which should coincide with a period of vigorous pasture growth. Additional management factors are disease control, sound bull management and special care of lactating first-calf heifers.

Conserving body condition

The first step is to maintain a judicious stocking level. Overstocking of pastures reduces the amount of feed available and reduces selective grazing. The result is reduced liveweight gain, and thus bodyweight and condition, and reduced milk production, and thus lower weaning weight of calves. Low phosphorus intake further aggravates the problem.

The next step is to reduce the period of nutritional stress during lactation. This means that the calf should be weaned before the nutritive level of pastures falls below the maintenance requirement of the cow. Under most Queensland conditions, this is not later than the end of autumn.

A further advantage is gained if weaning can be carried out before this stage is reached so that the cow has a period of non-lactation while pastures are still capable of giving some liveweight gain, thus allowing the cow to improve in body condition before the onset of winter. However, this earlier weaning is practicable only where spring calving can be achieved. With later, summer calving, weaning too early sacrifices some suckling gain in the calf.

However, sound management should provide for a "strategic" weaning approach which is based on the weaning of calves according to the prevailing nutritional conditions and body condition of cows. In periods of severe nutritional stress, such as in times of drought, it may be necessary to wean calves as early as 2 to 3 months of age, or younger, with a view to preserving the cow.

At the other end of the lactation period, the cow should not be required to commence lactation too long before the expected rise in the nutritional level of pastures above maintenance. The desirable situation is to have the cow calving on a rising plane of nutrition and for this to continue throughout the period of lactation. However, where cows can be calved in good strong condition, calving 6 to 8 weeks before the expected rise in the nutritional level of pastures will still

allow the cow to go back into calf within an acceptable time with a calving interval of approximately 12 months.

Where it is difficult to maintain an acceptable level of body condition by controlling the period of lactation, low-cost feed supplements may be used during the period of sub-maintenance nutrition. However, the cost-benefit relationship must also be considered.

Heifer management

Adequate growth and development at mating are important in attaining high conception rates in first-mate heifers. The aim should be to have heifers attain a liveweight of at least 270 kg liveweight for British breeds and 300 kg for *Bos indicus* derived breeds by the intended time of mating. Thus, it is important that replacement heifers receive no major growth checks after weaning. The allocation of one of the better paddocks should be a first step and where necessary supplementary feeding in the form of improved pasture, or crop, or feed supplements might be employed.

Lactating, first-calf heifers are the most vulnerable to nutritional stress which is reflected in low conception rates. Special care should be given to this group if satisfactory conception rates are to be obtained. As a first step, heifers on their first mating should be segregated from the rest of the breeding herd and be given one of the best paddocks available. They should be retained under these favoured conditions until after the second mating season. The aim should be to ensure that the heifer calves in strong condition, that as much of this condition as possible is conserved and that she is re-mated on a rising plane of nutrition. This may call for supplementary feeding during the period when pastures are at sub-maintenance nutritional level. Where heifers can be maintained in good condition in early lactation it is advisable to calve them a little ahead of the main herd to give them a chance to start recycling in line with the older cows.

Disease control

Where infectious infertility diseases are known to exist in a herd, the appropriate protective vaccination programme should be implemented.

Culling on fertility

The regular culling of animals of known low fertility should be adopted. This would apply to animals which fail to produce and rear a calf in two successive years. The culling of cows on failure to calve in any one year can be employed only in herds of high fertility. In herds of low fertility, the cause is likely to be poor nutrition or disease and therefore culling of animals which fail to calve in any one year will not solve the problem. Instead, the cause of low fertility should be determined and rectified before any culling on infertility is introduced. However, where heifers at first mating are well grown and in good condition and infectious infertility diseases are under control, heifers which fail to conceive are likely to be shy breeders and should be culled.

Bull management

Bulls represent half the breeding unit and it is most important that they be fit, active, fertile and capable of service before they enter the breeding season.

RECOMMENDED BREEDING MANAGEMENT PROGRAMME

Based on the requirements for high conception rates as previously outlined, the following breeding herd management programme is recommended for the Moreton region and can be applied to south-east Queensland generally.

Mating should be restricted to as short a period as possible in keeping with high conception rates, and a mating period of no more than three months should be the ultimate aim. This means that all cows will calve before the start of the mating season. Initially the calving period should be restricted to the period from August to December with no calves dropping after this time. Ideally calving should occur from August to October, but such a short calving period will be possible only with very good management.

The present recommendation is a mating season from November to March to give an August to December calving, but with the ultimate objective of a November to January mating to give an August to October calving.

There are ample data which clearly show the advantage in weaning weight of early born calves over those born later. Another advantage of early calving is that it allows an earlier weaning, thus helping to improve the body condition of the pregnant cow going into the winter. These cows will calve in better condition and thereby stand a better chance of going back into calf quickly.

Practical application

This recommended breeding management has been adopted by at least three cattlemen in the Brisbane Valley and has proved successful. In one herd of approximately 190 breeders, the overall conception rate in the year 1970 was 77.6% and progressively increased each year to a level of 96.6% in 1973. In a larger herd of approximately 600 breeders, the level of conception has risen from 75% in 1969 to 90% in 1973. In both herds a mating period of four months was used.