SYMPOSIUM AND FIELD MEETING IN CONJUNCTION WITH THE SUNCOAST BEEF PRODUCERS' ASSOCIATION HELD AT TEWANTIN ON SEPTEMBER 19, 1970

THE ABILITY OF PASTURES IN THE COASTAL LOWLANDS (WALLUM) TO MEET YEAR ROUND DEMANDS OF BEEF CATTLE

A REVIEW OF PASTURE DEVELOPMENT IN THE WALLUM

by

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So that we can relate the present state of development of the Coastal Lowlands to some point in time, I would like to list some important dates.

1952—C.S.I.R.O. commenced work at Beerwah. D.P.I. took over their Coolum Station.

1953—A species trial was established at Beerwah.

1954—This trial was first grazed. It has been grazed by sheep since then.

1964—The Caloundra Downs lease was granted by the Government. The release of other development blocks, e.g. Sippy Downs and areas around Bundaberg began in this year.

1968—The last Government release was granted.

1970—With the cessation of Government releases, the demand for Wallum land has continued and land values have jumped spectacularly.

The area we are interested in stretches from Caboolture in the south to Baffle Creek in the north and accounts for a total area of approximately 1,990,000 acres. However, this area includes the islands off the coast, e.g. Bribie and Fraser Islands and if these are excluded, the area of Coastal Lowlands on the mainland is 1,580,000 acres.

To get some idea of the amount of land available to pasture developers, I refer to McGuire (1968).* He lists the usage of the area under the headings as shown in Table 1.

TABLE 1

Land use in the Wallum according to McGuire (1968)

	Area (000 ac.)	%
State Forest	830	41.7
Timber Reserves	10	0.5
National Parks	29	1.9
Other Reserves	71	3.6
Private Forests	56	2.8
Municipal Lands and Roads	72	3.6
Vacant Crown Lands	323	16.2
Holdings > 200 acres	389	19.5
Holdings < 200 acres	211	10.6
	1.990	

Of 830,000 acres of State Forest, there are approximately 63,000 acres planted to pines, the rate of planting being 5,000 acres per year. The Forestry Department gives the potential plantable area as only 350,000 acres.

* Quarterly Review of Agricultural Economics **2**.: 140-57.

Of the total area, excluding State Forest there are 210,000 acres of vacant Crown Land as potential pasture country plus 389,000 acres of holdings greater than 200 acres, and 100,000 acres of holdings smaller than 200 acres. So we have a total area of potential pasture land of 700,000 acres within this region. This is out of a total acreage of 1,580,000 acres.

How much of this land is held by developers who intend establishing pastures? The following acreages are the result of a survey conducted in the early part of this year, when approximately 75% of 107 known developers were visited. Total figures have been derived from local information and from Lands Department maps.

As a result of this survey, it would appear that the area held by people with declared intentions of establishing pastures is 229,000 acres, approximately 80,000 acres of this were released as special development leases.

To get some idea of the distribution of these properties, I established five groups of the landscapes described by Coaldrake (1961).*

These are shown in Table 2 together with total and winter rainfall, the area of land held by developers and the percentage of the total area occupied by developers. Table 2 also contains the total area of cleared land and the area of pasture within each group at February 1970.

TABLE 2

Grouping of landscapes in the Wallum (Coaldrake 1961), with total and winter rainfall, total area, area held by developer, land cleared and under pastures (February 1970)

Group no.	Landscapes	Rainfall Total	Rainfall Winter	Total Area	Area of Development Land	Percentage of Total	Cleared Land	Pasture
1	Glasshouse, Currimundi	50–60″	12″	214,000	26,100	12	11,300	6,900
2	Maroochy, Cootharaba, Cooloolah, Noosa	55–65″	15″	186,000	35,300	19	8,400	6,400
3	Womalah, Coondoo, Tin Can	50–60+″	10–15″	307,000	61,500	20	11,800	9,800
4	Boonooroo, Burrum, Takura, Hercules	40–45+″	8–10″	511,000	54,400	10	10,800	4,600
5	Buxton, Gregory, Kinkuna, Elliott, Hummock, Kolan	42–43″	5–10″	358,000	51,400	14	7,400	6,200
	Total for Wallum			1,576,000	228,700	15	49,700	33,900

Now to look at the preference shown for particular species, I have divided the area into north and south, the dividing line being at Big Tuan Creek which closely approximates where the 50 in. isohyet comes to the coast. The area of pasture planted in the northern section is 10,800 acres and in the southern portion 23,100 acres.

Table 3 shows the percentage occurrence of species on 45 properties which have pastures established. This does not include the area of particular species, but merely whether they were grown or not on properties.

* Coaldrake, J. E. (1961).—The ecosystem of the coastal lowlands (Wallum) of Southern Queensland, Bulletin 283, C.S.I.R.O., Melbourne.

TABLE 3
Percentage of Properties (total 45) on which Species are grown

Species	North	South	Total
Setaria	95	60	70
Pangola	25	70	50
Paspalum plicatulum	44	7	20
Green panic	25	10	18
Rhodes Grass	6	20	15
Lotononis	75	65	70
Siratro	95	35	55
White clover	6	65	45
Silverleaf and Greenleaf desmodium	12	50	40
Dolichos axillaris	19	14	15
Glycine	6	7	7

Other species which had been planted were Gatton panic, *Paspalum dilatatum*, *Paspalum commersonii*, Guinea grass, rye grass and molasses grass, Montgomery red clover, *Vigna marina* (*V. luteola*), *Dolichos uniflorus*, *Dolichos lab lab*, *Lotus major* and strawberry clover.

Setaria and lotononis were the most frequently planted grass and legume, setaria and siratro being most common in the north and Pangola, lotononis, white clover in the south. Although Pangola grass occurs more frequently in the south, the area planted to setaria is far greater than that planted to Pangola.

In fact, of the 34,000 acres of pasture, approximately 8,500 acres have been planted to Pangola and 22,500 have been planted to setaria. But over 6,500 acres Pangola have been planted in a mixture with other grasses, meaning that Pangola is the grass component of only 2,000 acres of pasture. The corresponding figure for setaria where it is the sole grass component of the pasture, is 8,000 acres.

Cattle numbers—There were approximately 20,000 head of cattle depastured in the coastal lowlands, being mainly breeders and their progeny. Estimates of final carrying capacities were:

Bundaberg	1 breeder	to	3	acres
Maryborough	1 ,,	,,	2½	,,
Gympie	1 ,,	,,	2	,,
Lake Cootharaba to Beerwah	1 ,,	,,	1	,,

It would appear that while store prices remain as they are, breeding will be the main enterprise within the area.

In summary, the total area of the coastal lowlands on the mainland is 1,580,000 acres. The area available for pasture development is approximately 700,000 acres. Of this area, developers hold 229,000 acres, and have cleared 50,000 acres and planted 34,000 acres to pasture.

SPECIES FOR COASTAL PASTURES—THEIR STRENGTHS AND WEAKNESSES

by

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There are about 18 legume and 20 grass species and cultivars that can be grown in this sub-tropical coastal environment. Mr. Peart in his paper clearly indicated the importance placed by developers on particular species and I think that some emphasis on seed production has affected choice of species. It is of interest to know the basis for these selections and if there are better alternatives. Clearly, selection of species

for use in pastures is more difficult because of the large number available, and to make a rational decision one needs to examine closely the attributes of each species in order to plan pasture use and the integration of different pastures in the grazing system.

The objective is to produce pastures that can maintain growth of young stock and keep breeding animals in good condition throughout the year. This applies in particular to elimination or reduction of weight loss in winter and early spring.

Thus the important factors are:

1. Production of adequate quantities of feed so that there is no limit to animal production, either in amount or in digestible nutrients and minerals.

2. Persistence of the pasture in a productive condition. This is dependent on the resistance of the species to frost, drought, fire, waterlogging, weeds and diseases and pests, and also includes perenniallity or the ability to regenerate from seed.

3. Stability of a pasture in terms of botanical composition. This includes the ability of species to withstand defoliation, trampling and grazing abuse.

Stresses imposed by management affect all three factors.

I would like to indicate some of the individual species that I think have something to offer but which are not in general use. The others will be considered later under management and production.

1. *Annual legumes.*

(a) Phasey bean (*Phaseolus lathyroides*). This has not been generally used, perhaps because of inadequate supply of seed. It is adapted to wet soils, establishes rapidly and provides a palatable feed of high protein content. One of its greatest assets is provision of about two months grazing in the first grazing period starting 10-12 weeks from planting the pastures. It is susceptible to bean fly in the seedling stage, but this can be overcome by seed dressing with dieldrin; it is also susceptible to root-knot nematodes which generally occur on dry soils. It can be regarded as a "pioneer" legume but can be maintained in a pasture if allowed to set seed. At an earlier meeting of the Society Mr. Chester Lemon (Tropical Grasslands (1969) Vol. 3, pages 157-9) remarked on persistence of phasey bean in a five-year old kikuyu pasture by regeneration from seed.

(b) *Dolichos lablab* cv. Rongai. A biennial requiring well drained soil which possesses both drought and cold tolerance and is resistant to root rot, stem rot and insect attack. It establishes rapidly and is capable of producing good liveweight gains in the young stage of growth, but as a sole diet in a pure stand it is the only tropical legume so far shown to produce bloat. It is capable of producing about 600 lb seed/ac for use as stock feed (or sale).

(c) *Dolichos axillaris* cv. Archer. A short lived perennial adapted to well drained soils, drought tolerant and has early spring growth, some frost tolerance and is unpalatable until mature, which may be a valuable characteristic.

2. *Perennial legumes.*

(a) *Vigna luteola* (*V. marina*) cv. Dalrymple. A short lived perennial (2-3 years) stoloniferous and well accepted by stock, so much so that it can easily be eaten out. Adapted to water logged soils but susceptible to frost and insect damage. It deserves more attention in pasture work and may require special management considerations. Requires light grazing until well established.

(b) *Glycine wightii.* The three cultivars Clarence, Cooper and Tinaroo are all more drought tolerant than the *Desmodium* species. Clarence and Cooper are early flowering (April/May) and Tinaroo later (June-July). The latter is only suited to high fertility soils, and seems peculiarly adapted to the Atherton Taglelands, with little evidence of success elsewhere. All are susceptible to *Rhizoctonia* and *Ammemus* weevil. They are generally very slow to establish and to nodulate, and do not produce much growth until the second year from sowing. However they have been shown to be productive on shallower soils on coastal ranges.

(c) *Leucaena leucocephala* cv. Peru. This is a tree legume which has not been used much commercially. However it is potentially one of the best legumes in terms of dry matter production (over 11000 lb/ac) and protein production (over 3200 lb/ac). It requires very well drained soils and a higher lime application than other legumes and control from weed competition until it is 2-3 ft high. It withstands grazing, is late flowering and has produced liveweight gains of 2 lb/day from spring to late autumn. All these species are compatible with a wide range of grasses.

Temperate legumes.

The obvious species are white clover and lucerne, the former on wetter soils and the latter on well drained areas. The drought and frost tolerance of lucerne are particularly valuable features and although this species has not been generally used, I think it merits consideration on well drained soils. It will require special management in terms of rotational grazing for persistence. The most productive and persistent cultivar is still Hunter River.

3. *Grass species.*

(a) *Setaria anceps.* Both Nandi and Kazungula cultivars are in general use but their merits are not well defined. Both are adapted to a wide range of soils and tolerate waterlogging. Both are damaged by severe frost but Kazungula is a little more frost and drought tolerant. Kazungula establishes more quickly and competes more strongly with legumes. Both show earlier spring growth than other subtropical grasses in the coastal region. Unfortunately there is no comparative data on animal production for these two cultivars although both have been shown superior to Rhodes grass. Severe leaf spotting caused by *Piricularia trisa* has occurred on Nandi but this rarely attacks Kazungula.

(b) *Chloris gayana* (Rhodes grass). The two cultivars most useful in the region are Pioneer and Samford. The latter has more vigorous stolon development and produces greater quantities of leaf into autumn before flowering. Pioneer has the disadvantage of producing inflorescences throughout the season which lower palatability and feeding value. It does however have some frost tolerance, and is compatible with a range of legumes. Little is known of the compatability of Samford Rhodes with legumes. There is no real difference in the feeding value of the four cultivars available viz. Pioneer, Samford, Callide and Katambora.

(c) *Paspalum commersonii* cv. Paltridge. Grows on a range of soil types and persists under waterlogged conditions. It is susceptible to frost and not particularly drought resistant. It is compatible with a range of legumes and has a high digestibility up to flowering and is capable of high levels of animal production. In latter years it has been severely attacked by the felted grass coccid (mealy bug) reducing the persistence of the stand. Production is very good for 2-5 years before the grass may be eliminated by mealy bug.

(d) *P. plicatulum* cv. Hartley and Rodds Bay. Both will grow on a range of soils and are compatible with legumes. Hartley has a broader leaf and has a higher feeding value than Rodds Bay at all stages of growth, and shows slightly better cold tolerance.

(e) *P. maximum* cvs. Gatton and Petrie. The former is more vigorous but the latter adapted to a wider range of soils, is more drought resistance and has some cold tolerance.

(f) *P. coloratum* var. *makarikariense.* Bambatsi is the most frost tolerant of the cultivars, and has some drought tolerance.

(g) *P. coloratum* cv. Kabulabula—new introductions show promise in yield and persistence but problems of seed harvest are a major drawback.

ANIMAL PRODUCTION AND RESPONSE TO GRAZING

The following comments refer to animal production from pastures at the C.S.I.R.O. Beerwah Research Station, which receives a mean annual rainfall of 65 in. The pasture mixture was a complex one of 4 grasses and 5 legumes and covered a range of soil types, the total area is 108 acres.

The species sown in February 1964 were *Paspalum dilatatum, P. commersonii, Digitaria decumbens, Chloris gayana* cv. Pioneer, *Phaseolus lathyroides, Desmodium intortum, D. uncinatum, Lotononis bainesii* and New Zealand white clover. Animals started grazing the experiment continuously 12 weeks after sowing, and from May to December 1964 they gained 335 lb/head (1.5 lb/head/day) at a stocking rate of 1 beast : 4.5 acres. The animals grazing experiments at Beerwah weigh 500-550 lb when put on and are slaughtered when they reach 900-950 lb liveweight.

The stocking rate was increased to 1 : 2.25 ac and from December 1964 to December 1965 liveweight gain was 505 lb/hd or 1.4 lb/hd/day. In the period December to March in this year gains were 2.1 lb/hd/day. These figures demonstrate that a high level of animal production can be obtained early in the life of the pasture, viz. about 140 lb weight gain/ac in 13 months from seeding. Legume content was about 40%. In December 1965 different stocking rates (1 : 1 and 1 : 2) were imposed. The effect of stocking rate on liveweight gain per head was most marked over the winter period. The gains/head per day for the low and high stocking rates for different periods were: November-April 2.2 and 1.9, April-June 1.3 and 0.7, June-September 0.7 and —0.1, September-November 1.7 and 1.2 respectively. The difference between stocking rates in autumn and winter was due mainly to the quantity of feed available and a slightly higher legume content at 1 : 2 ac (30% and 25%). The comparative effects of stocking rate have persisted over a four year period with a 4 year mean of 279 lb/ac at 1 beast: 2 acres and 332 lb/ac at 1 : 1 acre. There have been pronounced effects on individual species. For example *P. dilatatum* was more persistent and increased with an increase in stocking rate. Rhodes grass decreased at higher stocking rates. Lotononis and white clover required a high stocking rate to be maintained whereas the desmodium species decreased as stocking rate increased.

Included in this experiment were different rates of annual maintenance fertilizer applications. For superphosphate these were 1 cwt (1P) or 2 cwt (2P) per acre. For a stocking rate of 1 beast: 2 ac the mean liveweight gain for a 4 year period for 1P is 200 lb/ac and for 2P 279 lb/ac. At 1 beast: 1 acre 1P gave 280 lb/ac/yr, 2P 330 lb/ac/yr. Also the time taken to finish animals on pasture receiving 2 cwt superphosphate/yr was reduced by 90 days at the low stocking rate and by 23 days at the high. The important factor is that by reducing the quantity of maintenance superphosphate applied animal production was also reduced. The expenditure of c.$1.30 for the extra 1 cwt super will give about a 10 fold return from beef produced, i.e. a return of about $17.50 at a beast to 2 acres and $13.00 at 1 beast : 1 acre.

Animal production in a dry year (1969) *from pangola grass pastures with legumes or in pure stand with different rates of nitrogen fertilizer.*

A pasture of pangola grass with lotononis, white clover and the desmodiums stocked at 1.5 beasts/ac produced 520 lb LWG per acre, whereas pangola grass fertilized with 150 lb N/ac/yr at the same stocking rate to July and thereafter at 2 beasts/ac produced nearly 800 lb LWG per acre and pangola grass with 400 lb N at 2 beasts/ac to July and then at 2.5 beasts/ac produced more than 1300 lb LWG per acre. The important features were the differences in production over winter, and in the daily weight gains. The difference was due almost entirely to pasture quality with higher protein content of material where N was applied. If we consider briefly use of nitrogen on pure grass pasture, our results show a threefold increase in carrying capacity on pangola grass fertilised with 400 lb N/ac/yr and liveweight gains of over 1200 lb/ac at a stocking rate of 3 beasts/ac. A comparison with setaria has shown that pangola will produce from 50-100% more liveweight gain depending on stocking rate and level of nitrogen application. This is a marked difference between species and one that is not obvious when either grass is grown in combination with legumes. This illustrates that it is not safe to assume that use of nitrogen fertilizer on a pure stand of grass will inevitably lead to great increases in production.

Some of the important attributes of the above species are the following:

Lotononis bainesii is the only legume in the tropical group that possesses frost tolerance. It shows earlier spring growth and has two marked peaks of maximum production in November-December and again in March-April. It readily sets seed and with a high percentage of hard seed there is adequate supply for regeneration. It is susceptible to legume little leaf virus but fortunately this usually occurs in sporadic small areas of pasture and plants eventually recover. The desmodiums are not as persistent under continuous heavy grazing and produce most growth between November and March. *D. uncinatum* flowers in April/May and there is a good chance of seed setting before early frosts. *D. intortum* is later flowering (June) and regeneration from seed cannot be relied upon. It has, however, a longer growing season than silverleaf desmodium and has a degree of cold tolerance. Both are susceptible to legume little leaf but green leaf to a lesser extent, and both can be attacked by *Amnemus*, although this has not occurred to any noticeable extent on the coastal lowlands. Spring growth of these legumes commences with white clover in August/September, followed by lotononis, *D. intortum* and then *D. uncinatum*. The only grass with frost tolerance is *P. dilatatum* but it is the lowest in total dry matter yield.

In the drier area north of Maryborough with a mean rainfall of 42 in., liveweight gains of more than 350 lb/ac/yr have been obtained under continuous grazing at 1.0 beast/ac from Nandi setaria/siratro and Rhodes/siratro pastures in years of normal rainfall. *Paspalum commersonii* or Hartley plicatulum pastures with siratro and lotononis have also been productive. This environment is particularly difficult because of the dry winter, spring and early summer. The limit to animal production at this time is not only in pasture quality but also quantity. Siratro frosts off completely and is slow to commence growth in summer. Lotononis remains winter green but does not provide early summer growth because of lack of moisture.

There are a number of ways in which this problem could be tackled. The first is supplementation—conserved feed as hay or silage, standover feed of *D. lablab*—grain sorghum supplement, or use of urea/molasses licks in conjunction with poor quality herbage produced in summer. The latter is only of value in reducing mortality and is not of use for production. Secondly, use of special purpose crops e.g. oats, *Dolichos axillaris*; or use of N fertilizer on frost tolerant grasses in autumn to provide feed of higher quality as standover for winter. There are promising *P. coloratum* cultivars that could be used for this as well as possibly Petrie panic.

In summary, I would like to make the following points.

1. Pasture production in this environment is markedly seasonal with maximum growth rates in summer and little growth in winter. Dry matter production by the grasses range from a few lb/day in winter to over 100 in summer. The attributes of different species will allow some reduction in the period of limited weight gain or weight loss in winter.
2. In the past decade considerable knowledge has been gained in the technology of successful pasture establishment but our knowledge of pasture management required for maintaining optimum production is far from complete. Much of this information will come from grazier experience and will be a valuable contribution provided that certain basic principles are recognised. These are (i) correction of nutrient deficiencies by adequate fertilizer application at time of pasture establishment and adequate maintenance applications thereafter; (ii) that the limits to animal production are sufficient feed of high quality. This is most important, animals can be starving in the midst of plenty.

At most times the limitation is digestible protein, and the protein content of the diet has to be maintained at a high level for satisfactory animal production. Research results show quite clearly that in grass/legume pastures this is only attainable by a high legume content in the mixture.

3. The species currently available are capable of producing reasonable levels of animal production and there is sufficient knowledge of their behaviour under grazing to plan compatible mixtures for different soils and systems of production. In the Northern wallum the species used have survived a number of very dry years and given productive pastures after rain with up to 50% legume content.
4. It must be realised that as the development of a property reaches completion there is an intensification of production and greater demands on the pastures. Different species may need to be used for these different phases e.g. those that persist under lower stocking rates in the development phase and those persisting under high stocking rates ultimately.
5. It is possible to reduce the grazing pressure on pasture by management systems involving different stocking rates and classes of stock, as in a breeding and fattening operation where an increase in stocking rate occurs after calving in summer and sale of fat cattle before winter can reduce grazing pressure at this time. Use of special purpose crops or supplements may also have to be considered.

NUTRITION OF GRAZING ANIMALS

by

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When animals graze pasture their intake of feed is theoretically *ad lib* (as much as the animal can eat) but may be restricted by many factors such as the amount of forage available, its palatability, digestibility, and the length of time the animals spend grazing each day. The diet is natural plant material, chiefly leaves and stems, with only small amounts of flowers and seeds.

There is free choice within the limits of forage available. In many pastures the scope of selectivity is very wide and the animals will normally select out a better ration than the average of the pasture. There are wide variations in quantity and quality of forage available, depending on many environmental and management factors, e.g., heat, cold, fertilizer applications, rotational grazing. Feed intake is highly variable due to the changing amount and composition of forage, and weather conditions which may influence grazing habits. Water content is highly variable, from less than 10% in dry standing herbage to over 90% in growing herbage wet with dew or rain. A given pasture may contain many species varying widely in growth form, season of development, nutritive value and acceptability to animals. Some may contain substances which are harmful, if only at certain times.

It becomes obvious that to make the best use of pasture in beef cattle enterprises, considerable attention must be given to management to make the best use of available materials.

Two approaches are possible—

(1) A grazier may decide on a certain type of enterprise, and aim at doing those things which have to be done in order to achieve his objective. This would often involve modifying his existing pasture set-up in order to make up for variations in growth and productivity.

(2) He may choose or be forced to grow a certain type of pasture and may aim at simply using it to best advantage.

In either case he needs to have a fairly accurate idea both of the potential quantity and quality of pasture grown and of the requirements of the animal for different types of production.

It is unusual for a dryland pasture to provide a productive ration all the year round. Probably lucerne in some situations and some years would come closest to the ideal, particularly with adequate fertilization, but in general we are faced with a situation in which a pasture is productive for a number of months and may support animals

at maintenance or variable weight loss for the remainder of the time. Productive months may be at the top level of production or at various proportions of this optimum performance.

Feed required for fattening.

I will take the hypothetical case where a pasture is productive for an eight-month period commencing in October and consider what is required of such a pasture in terms of the following fattening enterprises.

(a) Growing weaners from 400 lb to 820 lb liveweight in one season, turned off with good finish suitable for the yearling trade.

(b) Finishing stores of an initial liveweight of 600 lb at a liveweight of 1020 lb.

(c) Finishing forward stores of 800 lb initial liveweight at a liveweight of 1100 lb.

The daily intake requirements of dry matter, digestible protein and total digestible nutrients (TDN) for the three classes of stock at their initial (I) and final (F) liveweights are set out below:

	Dry matter		Dig. protein		TDN	
	I	F	I	F	I	F
Weaners (400-820 lb)	11	19	1.0	1.7	7.8	12.9
Stores (600-1020 lb)	17.5	29	1.3	1.9	11.4	16.8
Stores (800-1100 lb)	23	29	1.7	2.0	14.9	16.8

The weaners have to put on 2 lb a day to achieve the required finish in the time available. To make this rate of gain the dry matter eaten must be of a certain quality; for example it should contain approximately 1 lb of digestible protein and the total digestible nutrients should equal at least 65% of the quantity of dry matter eaten. The amount of dry matter needed will increase in each month until in the last month, with liveweights approaching the final 820 lb, the dry matter requirement will be 19 lb and the amount of digestible protein 1.7 lb a day. In terms of actual pasture eaten, assuming an average moisture content of 75%, the amount will range between 44 and 76 lb a day. Allowing for wastage of 20% of available pasture, we arrive at a figure of 1770 lb of pasture required in the first month to 2850 lb of pasture required in the final month for fattening weaners.

Similarly, adjusting the requirements for age and higher weights, needing more feed for maintenance, the monthly pasture requirements range between 2650 lb and 4400 lb for backward stores and between 3550 lb and 4250 lb for forward stores over a shorter period of 5 months.

The requirement for any one month is lowest for fattening weaners and greatest for fattening forward stores. The greatest total requirement is for fattening backward stores, whilst this is the same for forward stores and weaners. The latter is likely to be more profitable, however, and compares with fattening backward stores to give a gross margin of about $45, while the return from forward stores is likely to be in the vicinity of $25.

Pasture production depends on many factors, some of which are under control by the landholder, such as the kind of species, the amount of fertilizer and the stocking rate. However, others such as moisture supply and temperatures we cannot manipulate or if we did pasture production would be unprofitable.

It is obvious that at any particular time, a pasture may be deficient in any one or all of the three major factors, available dry matter, available digestible protein or available total digestible nutrients. Under our conditions, shortage of dry matter and energy are likely to occur in the second half of the year, and shortage of protein in autumn and winter.

Should the pasture be inadequate to cope with requirements, animals not turned off as fats might be maintained with varying degrees of weight loss over the remaining four months and finished in the next season. Alternatively, the less active period might be used for strategic buying or a new factor such as winter cropping, irrigation or lot feeding might be introduced into the system to ensure that the necessary degree of finish is reached in as short a time as possible. This introduces complex economic considerations.

Requirements for Breeding

The requirements for breeding cattle differ considerably from those of fattening cattle. However, for the production of a high quality vealer of between 500 and 600 lb liveweight it may be assumed that approximately 4000 lb of high quality pasture should be available per month during the period of suckling.

The optimum time to calve should be September, before the flush growth, with weaning in March or April. The cow would then be mated at 2 to 3 months after calving on a rising plane of nutrition, which is a big factor in obtaining high conception rates. Again it might be necessary to revert to irrigation or cropping in order to maximise weight gains. If the calf is weaned while there is still good feed available the cow will have a chance to build up condition which should help to carry her over the winter and the critical period of late pregnancy and early lactation.

At a lower level of performance, say with weaners of 400 lb or less, consideration could be given to marketing two year old stores. This system is less demanding in terms of fertility and pasture quality than vealer production and their comparative profitabilities will be determined by the extra inputs needed to attain the higher level of production.

Naturally, fewer breeders can be carried on a given area, if cattle are to be carried to two years of age. For every 100 breeders at a calving rate of 80%, approximately 60 more cattle will be carried, attaining the ratio of breeders to total cattle from 1 to 1.8 to 1 to 2.4. The gross return for a breeding unit for vealers could be about 70% of the return for two year olds.

Take a property capable of carrying 400 breeders with a turn off as vealers or a total mature equivalent of 560. Such a property would support 280 breeders with a turn off as 2 year olds. At $70 for vealers, or $100 for 2 year old steers, gross margins would be similar. Vealers would need to be 500 lb liveweight and stores 700 lb liveweight.

Any combination of the above enterprises might be considered, depending on the amount of improvement, and quality of available pastures.

VISIT TO PROPERTY OF MR. N. S. LANYON NEAR BOREEN POINT

The property is a leasehold development of approximately 2800 acres in a 65 in. rainfall area, on soils typical of the coastal lowlands. About 500 acres have been developed to sown pastures and the property carries a beef breeding herd of approximately 230 breeders plus progeny. About 80 acres is devoted to seed production.

In the initial stages seed production was an important phase providing an early cash return. This was based mainly on Nandi setaria and *Lotononis bainesii*. The drop in retail price of setaria from c$4.00 initially to about $1.00 per lb no longer makes this an attractive proposition but seed production from lotononis will probably continue.

Most farmers in this area were concentrating on breeding enterprises rather than fattening purchased store cattle. Mr. Lanyon considered that a breeding herd would allow better utilisation of a fluctuating feed supply through the season. He had started with Herefords but considered milk production inadequate for the calves. He was considering using A.I.S. or Redpoll cows crossed with a Droughtmaster, Santa Gertrudis or Brahman bull.

Development programme

After clearing and stick raking the land was ploughed with a disc plough. Fertilizer was broadcast and the area then further cultivated and seeded with discs to which a "C" seeder was attached. A rubber tyred roller was linked to the seeder and served to cover seed and press pangola cuttings into the ground. Pangola has been broadcast during the seeding operations.

One of the earliest pastures was sown to Kazungula setaria, *Dolichos axillaris*, New Zealand white clover and red clover. The results were disappointing in that white clover was attacked by grubs, the axillaris did not persist and red clover was only productive in the first winter. The setaria was now thickening up but pangola would also be planted to fill in the gaps.

Later pastures were sown to Nandi setaria with lotononis and greenleaf desmodium. During the past drought pasture production on ridge sites had been poor but quite good on lower wetter soils.

Pasture mixtures now being used on lower flat ground consist of Pangola, *Paspalum plicatulum* (in place of setaria), lotononis, greenleaf desmodium and white clover. The better drained ridges were being planted to *Paspalum plicatulum*, pangola, Gatton panic, siratro and glycine. Some areas would be sown to *Dolichos lablab* as a nurse crop with glycine. Lotononis and greenleaf desmodium would also probably be used over most of the property.

Desmodium uncinatum cv. silverleaf, had not been used because of suggestions in the literature that it is not as insect resistant or productive as greenleaf desmodium.

The costs of pasture development on a per acre basis were:

Clearing	$27.00
Cultivation	$ 9.00
Fertilizer mixture	$21.00
Lime	$ 6.00
Seed	$ 8.00
Fencing & Dams	$ 2.00
	$73.00

Problems of production

In some areas groundsel had been a problem during the establishment period. This had been greatest in old windrows and had been controlled by spraying, at a cost of 75c per ac. Groundsel had been a problem with autumn sowing of pasture but was not apparent in spring sown pasture.

The most difficult period for animal production was during winter and spring. Growth of both setaria and pangola had ceased in about May. Sown pastures had been unable to carry 250 breeders during winter and these had been put on to 1500 ac of undeveloped wallum and supplemented with urea/molasses licks. Mr. Lanyon found that young stock still lost weight but older animals held or slightly improved in condition.

* Mixture equivalent to 5 cwt/ac superphosphate, 1 cwt KCl, 7 lb copper sulphate, 7 lb zinc sulphate and 4 oz molybdate. This cost was reduced to $18.00 per ac by mixing on the farm.

** Based on setaria at $4.00 per lb but this cost is variable. Pangola was available from a nursery established on the property and has been broadcast at approximately 2 cwt an acre.