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Matching pasture to livestock enterprises, coastal regions

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This publication contains estimates of the daily growth rate of pastures and selected forage crops, as well as a guide to selecting pasture and forage crop types for enterprises requiring high livestock growth rates. It covers the following NSW regions: **Far North Coast, Mid North Coast and Lower Hunter, South Coast and Far South Coast.**

Estimates are of the median growth rate, and are based on available research results; growth predictions from 'GrassGro' (a growth model developed by CSIRO using soil moisture, temperature, light and pasture species growth characteristics); and from long-term observations by experienced agronomists and livestock officers. This approach has been adopted as it is inappropriate to base growth rates solely on limited research data – given the climatic variability and the relatively short period over which research results are collected.

Growing conditions vary greatly between seasons, regions, districts and also between parts of paddocks, so reference to the section covering variability is strongly advised. The estimates presented are *approximations only and intended only as a guide* to assist producers in budgeting feed supply to meet livestock requirements.

It is anticipated that as further information comes to hand that these guidelines will be updated.

Presented growth curves are 'smoothed' with variability reduced to facilitate use.

Where more accurate estimates of growth are needed, it is recommended that tools such as 'GrassGro' are considered. The suitability of the model is subject to parameter sets of 'species characteristics' in the model matching the pasture type involved.

ASSUMPTIONS

It is assumed that pastures are of satisfactory density for the area; growing on a soil of good 'moisture holding capacity' (e.g. clay loam); grazed at moderate stocking pressure; well managed; and fertilised adequately (except where specified) to avoid nutrient deficiencies. It is also assumed that pasture is maintained in the vegetative phase of growth where possible and are grown under rain fed conditions unless specified otherwise.

Climatic and soil type data used in 'GrassGro' was taken from:

- Far North Coast – Grafton on sandy loam over a light to medium clay.
- Mid North Coast – Tocal Agricultural College on silty loam over light clay.
- South Coast – Nowra on sandy loam over a medium clay.
- Far South Coast – Bega on sandy loam overlaying a light clay.

ESTIMATES OF DAILY GROWTH RATE OF PASTURES

FAR NORTH COAST

Description of pasture types used in estimates.

Naturalised pasture. Dominated by carpet grass on lower slopes with no introduced legumes present. The pasture has patches of bladey grass, with occasional red grass, pitted blue grass, wire grass and traces of paspalum. On drier sites, Queensland blue couch, common couch, Forbes and Parramatta grass are present depending on locality. Pastures are on low fertility soil with no fertiliser history. Generally, they are continually stocked at low stocking rates and occasionally burnt.

Naturalised pasture/clover. Pasture as above but with a greater proportion of introduced clover (5-10%) and paspalum, especially on lower slopes.

Management consists of top dressing at 125 kg/ha of superphosphate or equivalent and white clover seed has been added. Management is usually by continuous stocking, but also by alternated grazing and resting periods with growing stock.

Kikuyu. Grown on moderately fertile soils, kikuyu is dominant with minor proportions

of clover and paspalum and carpet grass. Management consists of low fertiliser input, with intensive stocking at moderate stock pressure.

Kikuyu plus nitrogen. As above but with routine nitrogen (N) application. Kikuyu is dominant with most other species excluded. Management consists of intensive stocking at moderate rates.

Pastures fertilised for P (phosphorus), S (sulfur), K (potassium) and N applied routinely (e.g. up to 300 kg N/ha) so that it is not limiting growth. These areas are often overseeded with annual ryegrass (not included in production curves). Response to N is often poor in spring because of low rainfall.

Ryegrass + N. Late March to early April sown Italian ryegrass (e.g. Tetila) on moderate fertility country, usually sown into renovated or suppressed summer pasture. Also surface sown into soybean cropped areas without fertiliser ('beef 'n beans' system).

They are intensively managed with moderate to high stock pressure. P,S,K applied at sowing with 20-30 kg N/ha and 20-30 kg N/ha applied during season (only when not sown into soybeans).

Setaria/rhodes grass. Established on moderate fertility country. Setaria and rhodes grasses are fairly dominant with some carpet grass and introduced clover (10-15%) present. Fertilised at sowing and occasionally with PS and K. They are managed semi intensively at moderate stocking pressure.

Oats + N. Late March to early April sown on moderate fertility country, usually into renovated or suppressed summer pasture. Also can be surface sown into soybean cropped areas without fertiliser ('beef 'n beans' system).

Pastures are intensively managed with moderate to high stock pressure. Crops are grazed out in early spring. P,S,K is applied at sowing with 20-30 kg N/ha and 20-30 kg N/ha applied during season (only when not sown into soybeans). *See Fig 1 and Table 1.*

MID NORTH COAST/LOWER HUNTER

Description of pasture types used in estimates

Naturalised pasture. Dominated by carpet grass on lower slopes with no introduced legumes present. The pasture has patches of bladey grass, with minor areas of red grass, pitted blue grass, wire grass, traces of paspalum. On drier sites Forbes and Parramatta grass are present depending on locality. Pastures are on low fertility, low pH soil with no recent fertiliser history. Occasionally burnt.

Naturalised pasture /legume. Pasture as above but a greater proportion of introduced legume (5-10%) and paspalum present especially on lower slopes.

Management consists of top dressing with superphosphate or equivalent. White clover seed has been added in the past. Maintenance fertiliser is below requirements with an average of the equivalent of 250 kg superphosphate spread over 5 years (adequate to maintain low levels of legume in pastures). Potential growth rates greater with fertiliser rates closer to optimum.

Kikuyu. On moderately fertile soils, kikuyu is dominant with minor proportions of clover and paspalum. Management consists of intensive stocking at moderate stock pressure. Fertiliser is applied occasionally (P & S), at levels adequate to maintain some legume in the pasture. Nitrogenous fertiliser is applied when oversowing with ryegrass. Pasture growth rate potential is greater with increased fertility and grazing pressure.

Paspalum. On moderate fertility country, dominated by paspalum, with some white clover content (commonly around 5 % in autumn rising to 12 -15 % in spring). Pastures are managed at a moderate stocking pressure. They are occasionally topdressed with superphosphate or equivalent only. The potential growth rates are greater with increased fertiliser and management input.

Setaria. Established on low to moderate fertility country. Setaria is dominant with some carpet grass and introduced legume (up to 10% rising to 15% maximum in spring) present. They are fertilised at sowing and occasionally top-dressed with P, S and K. Pastures are managed semi intensively at moderate stocking pressure. There is potential for higher growth rates with increasing fertility/fertiliser rates, and improved grazing management.

Ryegrass + N. This pasture consists of Italian ryegrass (e.g. Tetila) sown in late March to early April on moderate to high fertility country. They are usually sown into renovated or suppressed summer pasture.

Pastures are intensively managed with moderate to high stock pressure. P and S are applied at sowing with 20-45 kg N/ha and 20-45 kg N/ha applied during the season. They are responsive to increasing rates of N. K is top-dressed where deficient.

Oats + N. This is sown as a crop in late March to early April, on moderate fertility country and usually sown into renovated or suppressed summer pasture.

It is intensively managed with moderate to high stock pressure. The crop is grazed out in early spring. P, S, K are applied at sowing with 20-45 kg N/ha and 20-45 kg N/ha applied during season. *See Fig 2 and Table 2.*

Fig 1

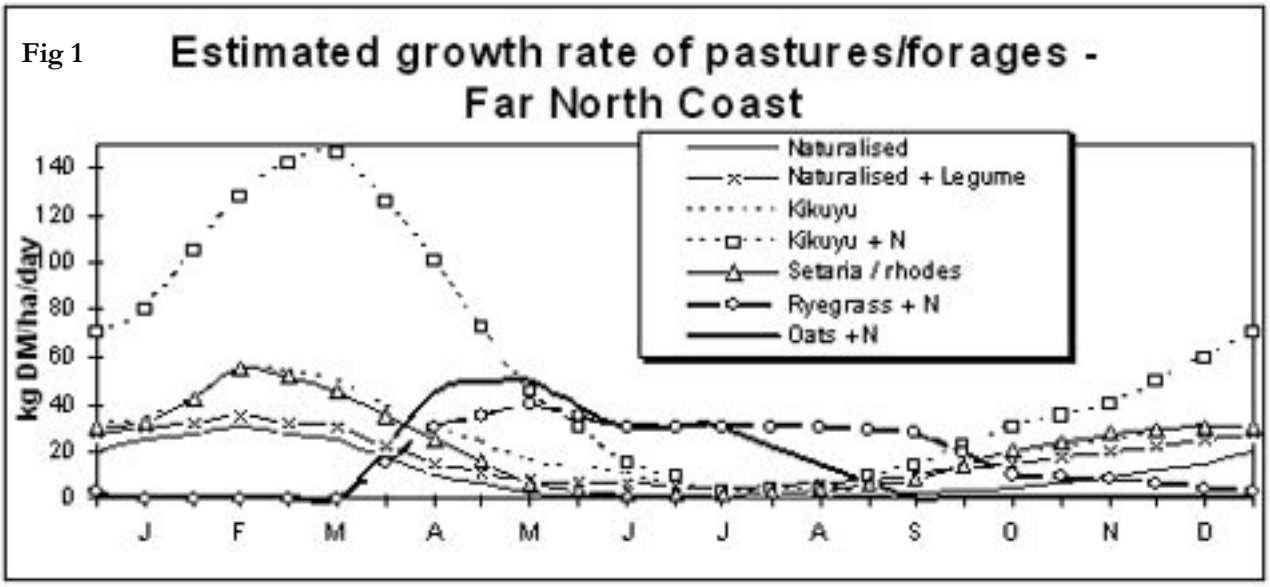


Table 1. Estimated pasture growth rate (mid month) of specific pasture types (kg DM/ha/day) Far North Coast (areas similar to Grafton).

	J	F	M	A	M	J	J	A	S	O	N	D
Naturalised	25	30	25	10	3	0	0	0	3	5	9	15
Naturalised + Legume	30	35	30	15	8	6	5	6	10	15	20	25
Kikuyu	34	54	50	30	16	10	3	2	8	18	25	30
Paspalum	80	128	146	100	45	15	3	4	14	30	40	60
Setaria	30	55	45	25	6	2	2	4	8	20	28	30
Ryegrass + N	0	0	0	30	40	30	30	30	28	10	8	5
Oats + N	0	0	0	45	50	30	30	15	0	0	0	0

Fig 2

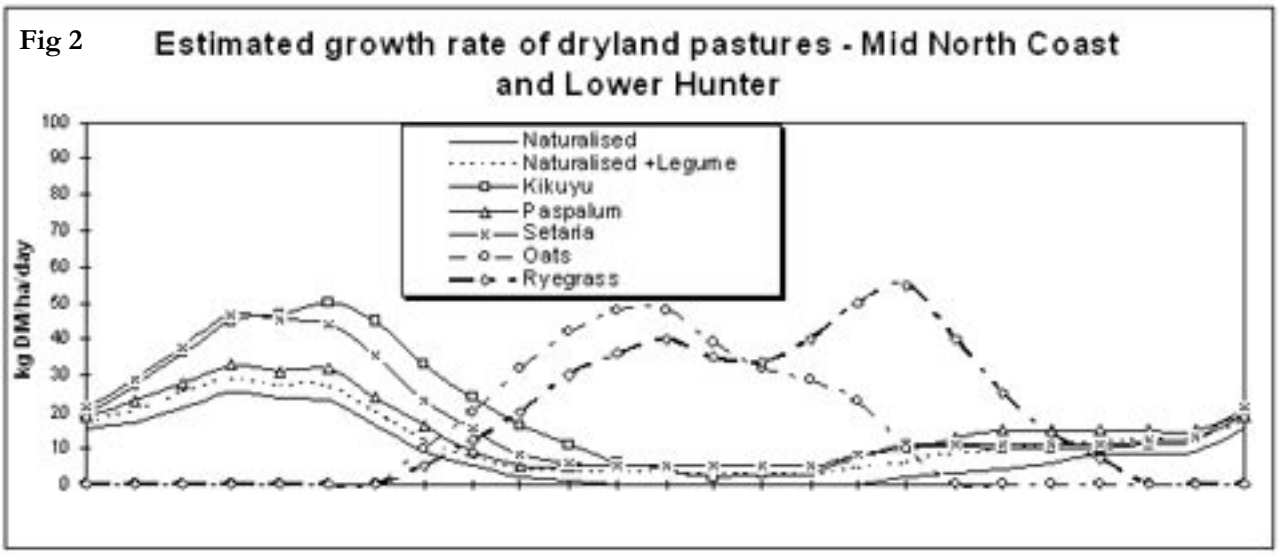


Table 2. Estimated pasture growth rate (mid month) of specific pasture types (kg DM/ha/day). Mid Coast and Lower Hunter (areas similar to Taree/Paterson).

	J	F	M	A	M	J	J	A	S	O	N	D
Naturalised	17	25	23	9	2	0	0	0	2	4	8	9
Naturalised + Legume	20	29	27	12	4	2	3	2	6	9.5	12	12
Kikuyu	27	45	50	33	16	6	2	3	11	10	10	12
Paspalum	23	33	32	16	5	5	5	5	10	15	15	15
Setaria	29	38	44	23	8	5	5	5	10	11	11	13
Ryegrass + N	0	0	0	5	20	36	35	40	40	25	0	0
Oats + N	0	0	0	10	32	48	39	29	10	0	0	0

SOUTH COAST

Description of pasture types used in estimates

Kikuyu. A kikuyu dominant pasture. Grazed rotationally at the 4 ½ leaf stage and top-dressed after each grazing over the growing period with 40 kg N/ha (90 kg urea or 120 kg ammonium nitrate/ha). Nutrition is not limiting. Superphosphate applied at 20 kg P/ha/year, with any other nutrients applied as required. Paddocks are strategically mulched (approximately 3 times) over summer to reduce the build-up of old runners (low digestibility). The legume content ranges from 5 -10 %. Management is intensive.

Forage sorghums. Sown late October/early November once temperatures are sufficiently high. Sown with recommended rates of N, P and K. Top-dressed after each grazing with 50 kg N/ha. Grazing management is intensive with heavy stocking rates or harvested for fodder.

Oats. Sown in early February with recommended rates of N, P and K. Rotationally grazed every 4-5 weeks. Top-dressed with 40 kg N/ha after each grazing, which is intensive.

Perennial ryegrass-based pastures. Perennial ryegrass with 10 to 30% white clover content. Rotationally grazed at 2 ½ to 3 leaf stage (with a grazing period of 18 to 20 days in the spring months and 35 to 40 days in the winter and at least 30 days in the summer. Top-dressed strategically during the autumn, late winter and spring with 40 kg N/ha. (after each grazing). Paddocks are intensively grazed and fertilised with P, *S* Mo and K as required. *See Fig 3 and Table 3.*

FAR SOUTH COAST

Description of pasture types used in estimates

Kikuyu. A kikuyu dominant pasture. Grazed rotationally at the 4 ½ leaf stage and top-dressed after each grazing over the growing period with 40 kg N/ha (90 kg urea or 120 kg ammonium nitrate/ha). Nutrition is not limiting with 20 kg P/ha/year applied with other nutrients applied as required. Strategically mulched (approximately 3 times) over summer to reduce the build-up of old runners (low digestibility). The legume content varies from 5 - 10 %. Paddocks are intensively grazed.

Forage sorghums. Sown late October/early November once temperatures are sufficiently high. Sown with recommended rates of N, P and K. Top-dressed after each grazing with 50 kg N/ha. Grazing management is intensive with heavy stocking rates or harvested for fodder.

Oats. Sown in early February with recommended rates of N, P and K. Rotationally grazed every 4-5 weeks. Top-dressed with 40 kg N/ha after each grazing. Intensively grazed.

Perennial ryegrass based pastures. Perennial ryegrass with 10 to 30% white clover content. Rotationally grazed 2 ½ to 3 leaf stage (grazing period of 18 to 20 days in spring and 35 to 40 days in the winter and at least 30 days in the summer). Top-dressed strategically during the autumn, late winter and spring with 40 kg N/ha after each grazing, with fertiliser applied so that nutrition is not limiting.

Japanese millet. Sown at the end of September into early October with recommended rates of nutrients. They are intensively grazed at high stocking rates.

Native pasture. These pastures consist of weeping grass (*Microlaena stipoides)*, love grass (*Eragrostis curvula*), with lesser amounts of annual grasses and broadleaved weeds. Legume content 5 – 10% consisting mainly of Glycine and Desmodium species. Nutrition is less than adequate with around 62.5 kg superphosphate/ha/annum or equivalent. The fertiliser history of paddocks is sporadic with top-dressing intervals often every 2 years. Paddocks have low stocking rates relative to carrying capacity. *See Fig 4 and Table 4.*

GUIDE TO PASTURES AND FORAGE CROPS FOR HIGH LIVE WEIGHT GAIN IN CATTLE

Feed Plans

Estimates made on the likely availability of feed of adequate quality have been made on the basis that:

a) Pastures are grown in suitable soils etc. and are well-adapted to that environment.

b) Pastures are well-managed for both the good of the pasture and the livestock enterprise. This may involve spelling pastures for 6–8 weeks to accumulate an adequate quantity of feed to supply the enterprise's requirements. Pastures are also maintained in the vegetative growth phase so that quality is at a high level (this is especially relevant with summer growing grass species).

c) Quality feed in the context of these plans means feed on offer has a digestibility of 70% or better, and means a 'mixed' pasture has a good balance of legume present.

d) Plans do not infer that this is only one paddock of a particular pasture type i.e. *one* may be grazed while others are rested to enable availability to be improved to meet livestock requirements.

e) The estimates are intended as a guide only to assist in selecting the appropriate pasture types to suit the enterprise targets. The variability in production is large and is covered in the variability section.

f) The quantity of feed available will be dependant on the growth rate of the pasture, fertility, stocking rate, rate of wastage, and previous management of the pasture. These estimates only indicate that in any particular half month period the pasture type is capable of having feed on offer of adequate quantity and quality to suit requirements in average seasonal conditions. Additionally, potential production may be

Fig 3

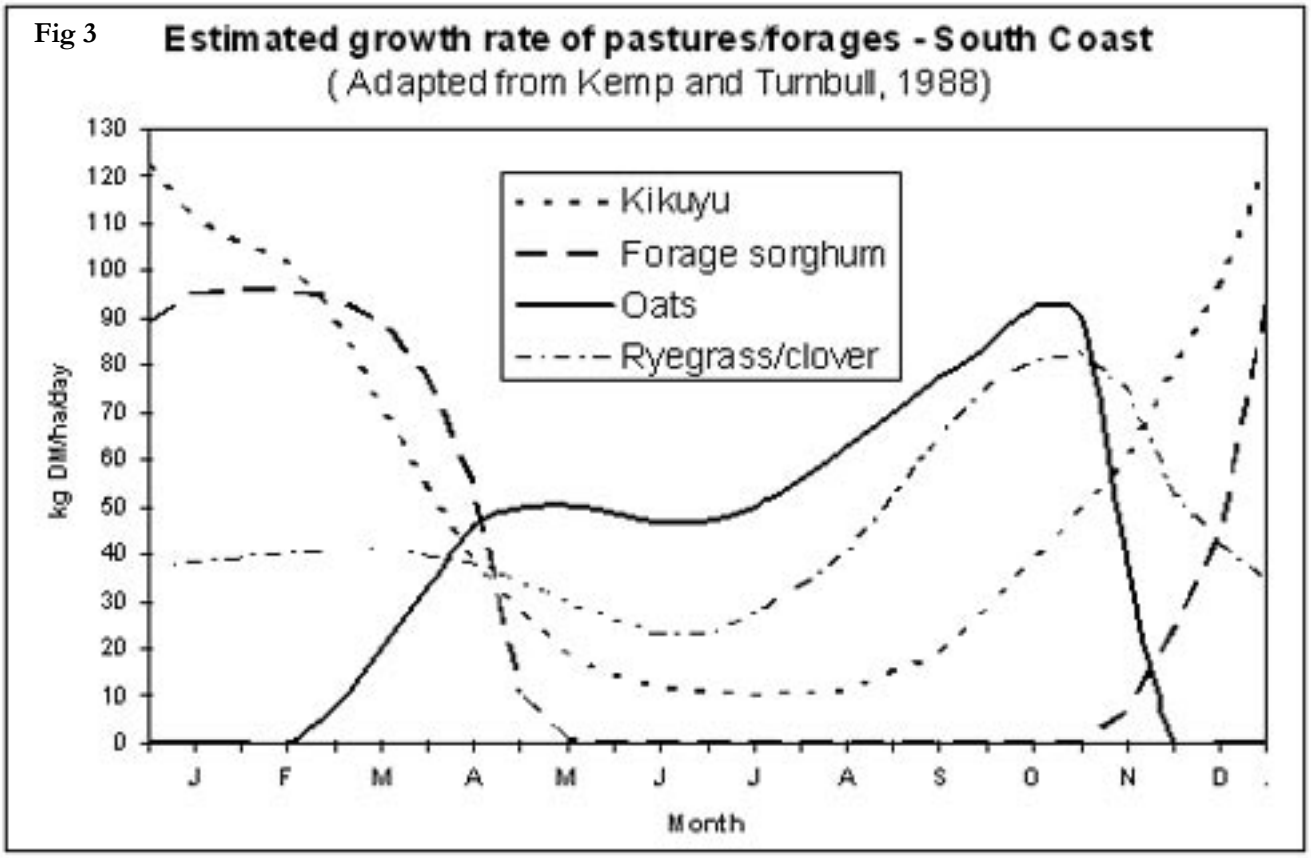


Table 3. Estimated pasture growth rate (mid month) of specific pasture types (kg DM/ha/day) on the South Coast of NSW (areas similar to Nowra).

	J	F	M	A	M	J	J	A	S	O	N	D
Forage sorghum	95	96	89	54	1	0	0	0	0	0	7	44
Ryegrass / clover	38	40	1	38	30	23	27	40	65	81	75	42
Kikuyu	111	102	71	38	19	12	10	11	19	38	60	97
Oats	0	0	20	46	51	47	50	63	77	92	38	0

greater than that indicated, given exceptional management and/or favourable aspects of pasture production. Similarly, production can be less than that indicated, especially if management is less than accepted 'best practice'. *See tables 5,6,7 and 8.*

VARIABILITY IN FEED PRODUCTION

Important factors affecting reliability of feed production

The variability in pasture production in coastal districts can be very large and for this reason, it is

Fig 4

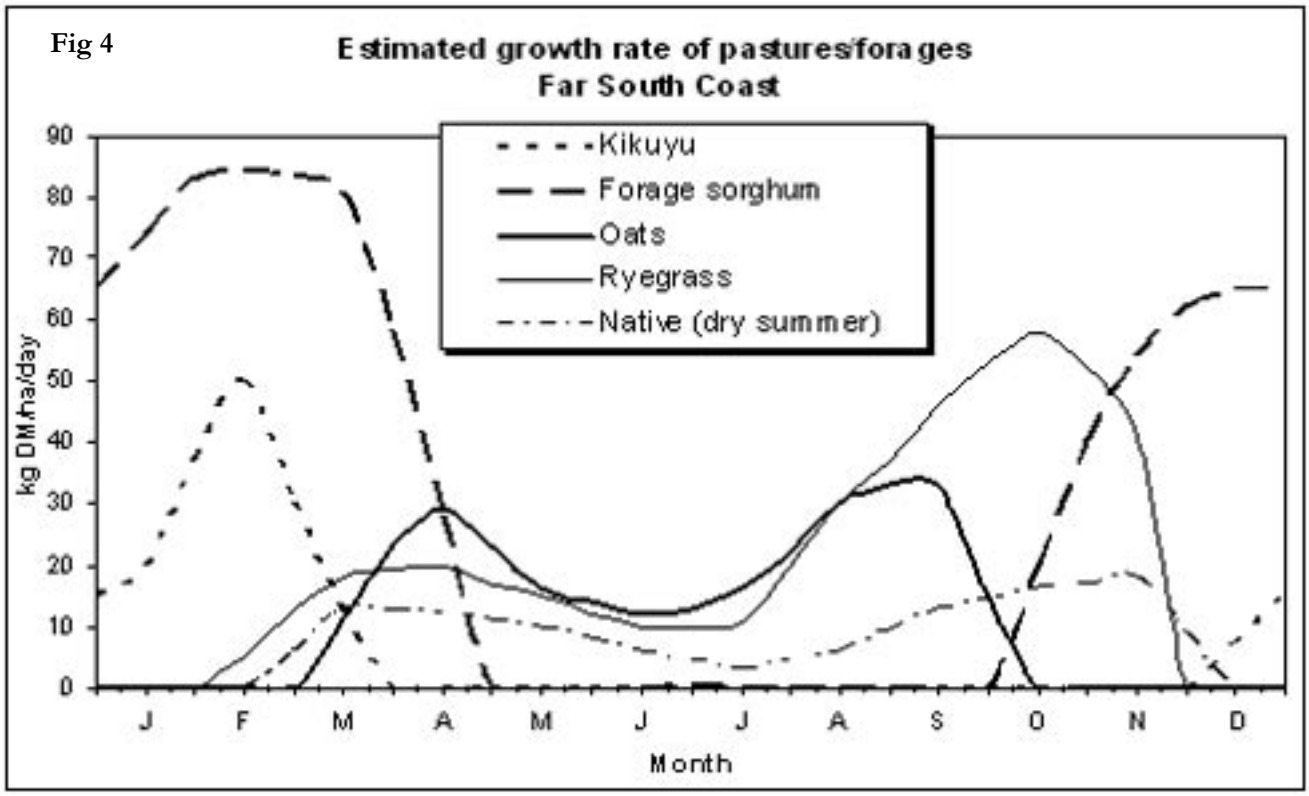


Table 4. Estimated pasture growth rate (mid month) of specific pasture types (kg DM/ha/day) on the far South Coast of NSW (areas similar to Bega).

	J	F	M	A	M	J	J	A	S	O	N	D
Kikuyu	20	50	13	0	0	0	0	0	0	0	0	15
Forage sorghum	74	84	81	28	0	0	0	0	0	20	54	65
Ryegrass / clover	0	5	18	20	15	10	11	30	28	58	41	0
Native	0	0	13	12	10	6	3	6	13	16	18	0
Oats	0	0	11	29	16	12	16	30	33	0	0	0

wise to consider all important variables that may affect pasture production in a paddock.

The more important factors to consider are:

- Climate
- Soil type
- Grazing management
- Soil fertility/fertiliser use

Climate

This is the most important variable to consider for coastal NSW.

To understand how much climate can affect pasture production, the growth model – used to assist in producing the pasture curves elsewhere in this publication – can also indicate how much variation occurred in the past, based on historical climatic data. Responsive species have been used to gauge the variability in all four seasons, and the median, 10, and 90 percentiles have been used to indicate the likely variability in good and poor conditions relative to the median. Variability can of course exceed these predictions in droughts and years of excessive rainfall.

Geographic location

The growing conditions within these geographic areas can be very significant. Generally, growing conditions are more favourable in the east than they are to the west, which is drier with less reliable rainfall.

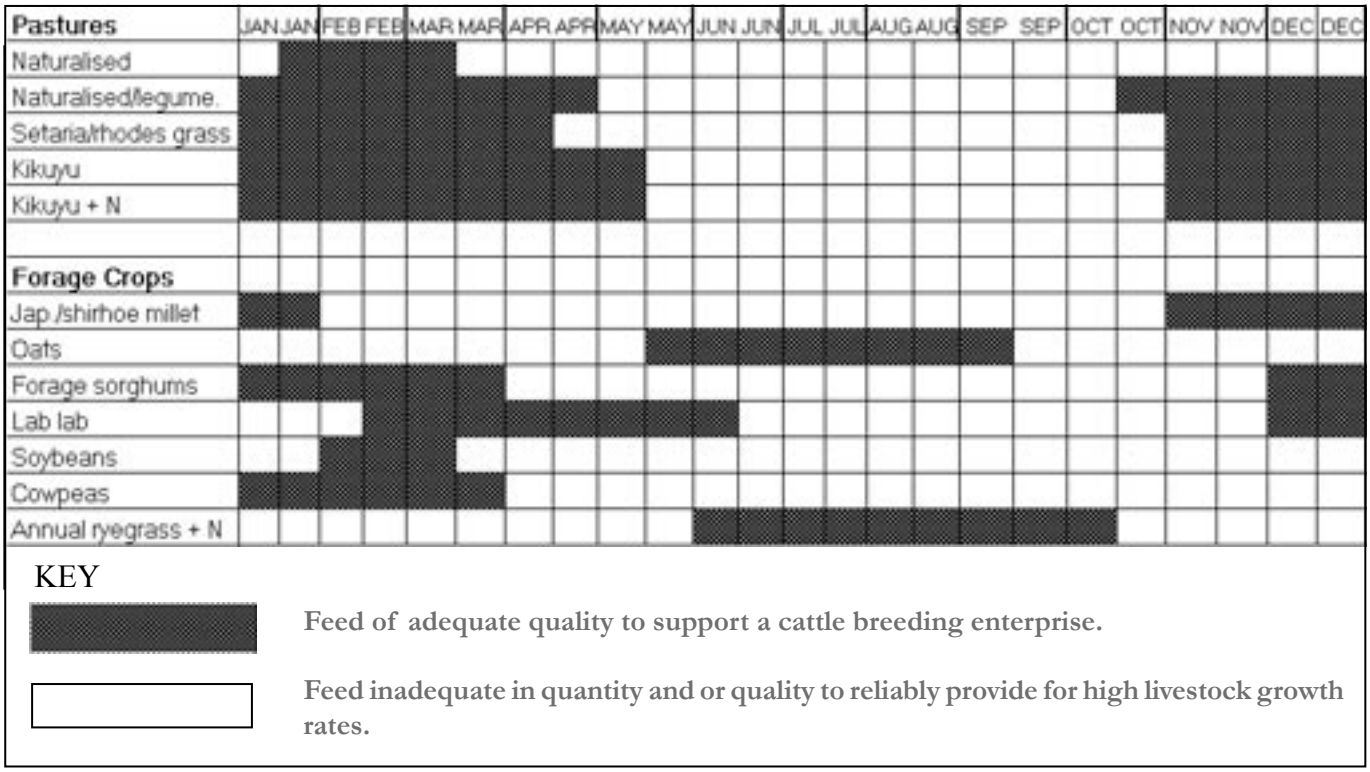
North to South differences can also be significant with summer dominance in rainfall increasing to the north.

Soil type

The daily growth curves presented here assume a soil type that has good 'moisture holding capacity' (e.g. clay loam).

Pasture production will be much less on lighter textured soils (e.g. granites)as soil dries out more rapidly, reducing pasture production potential.

Table 5. A guide to the periods in which pastures and/or forage crops are capable of supporting a cow and calf (e.g. 1 kg/day in calf) given best practice management of pastures and livestock – Far North Coast.



Note: These estimates are provided by agronomists and livestock officers as an aid to pasture selection and represent the likely production from these feed sources in average years, given the feeds are grown in appropiate soils and are well-managed. Adjustments will need to be made in most situations to cover the many variables involved in pasture production. Months are represented by two half months i.e. JAN JAN.

**See PROGRAZE manual for benchmarks on feed availability requirements for various levels of liveweight gain.*

On the positive side, lighter soils tend to respond quicker following rain than heavier soils.

Grazing management

Pasture production estimates assume that pastures are in the vegetative stage of growth, and stocked at moderate grazing pressure and well-managed. Overstocking and inappropriate grazing management for the species concerned may greatly affect the ability of the pasture to reach its full potential. Alternatively, correct management can greatly enhance the probability of the pasture reaching its full potential.

Pastures that have been grazed hard in the months beforehand may have inadequate leaf area to produce to maximum potential. Similarly, lax grazing will result in low potential for growth rate.

Soil fertility/fertiliser use

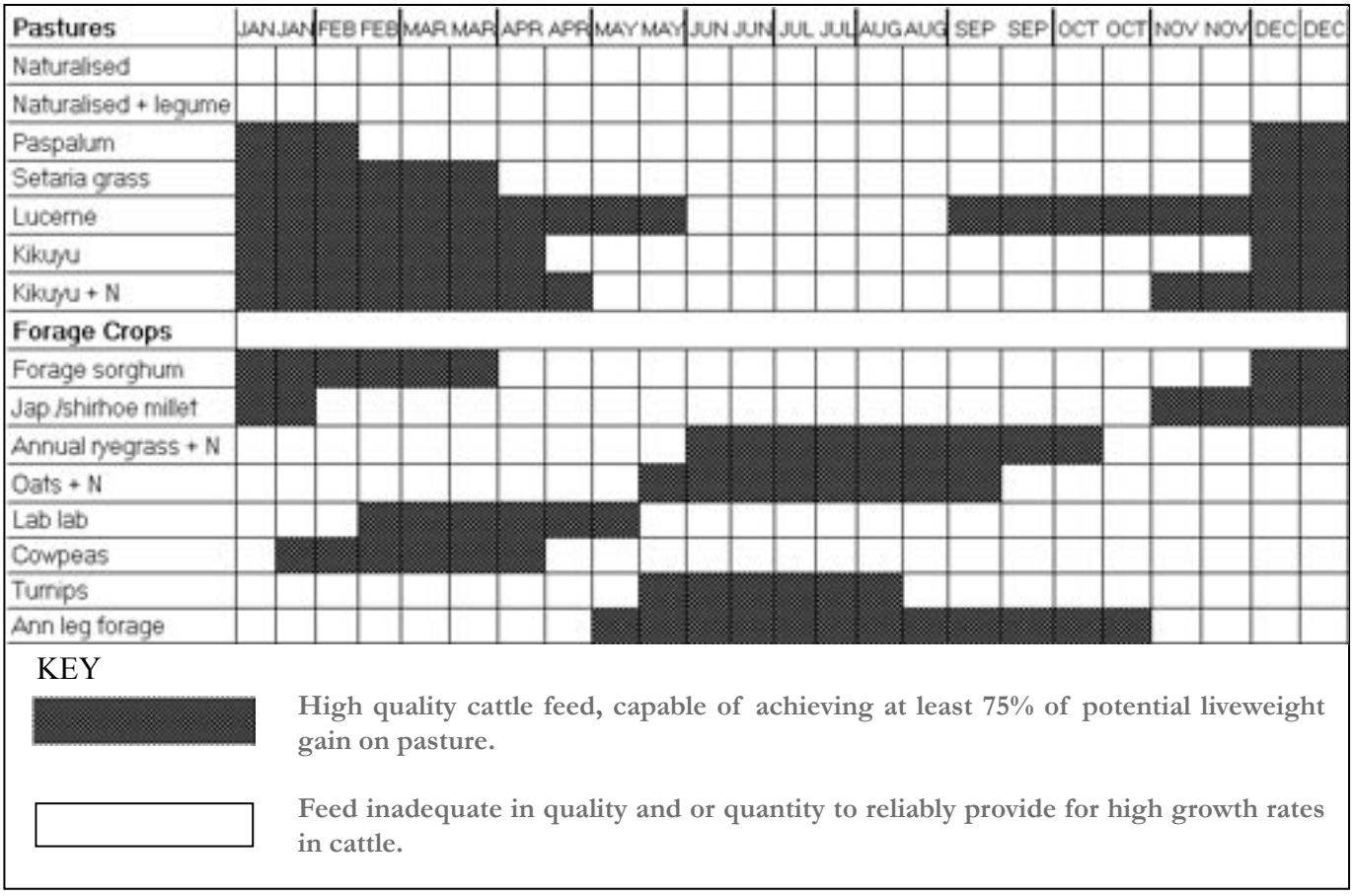
Soil deficiencies, especially phosphorus, sulfur, potassium and molybdenum can greatly affect the potential of pasture to produce. Similarly, low pH may have an adverse affect depending on the species in the mixture. Nutrient deficiencies can affect not only the overall production but also the reliability of production, seasonal production, botanical composition and quality of feed produced.

Pasture quality

Pasture quality is also very variable along with production quantity.

In the growth curves presented, quality will not be uniform throughout the year from any one species. For example, in the spring, growth

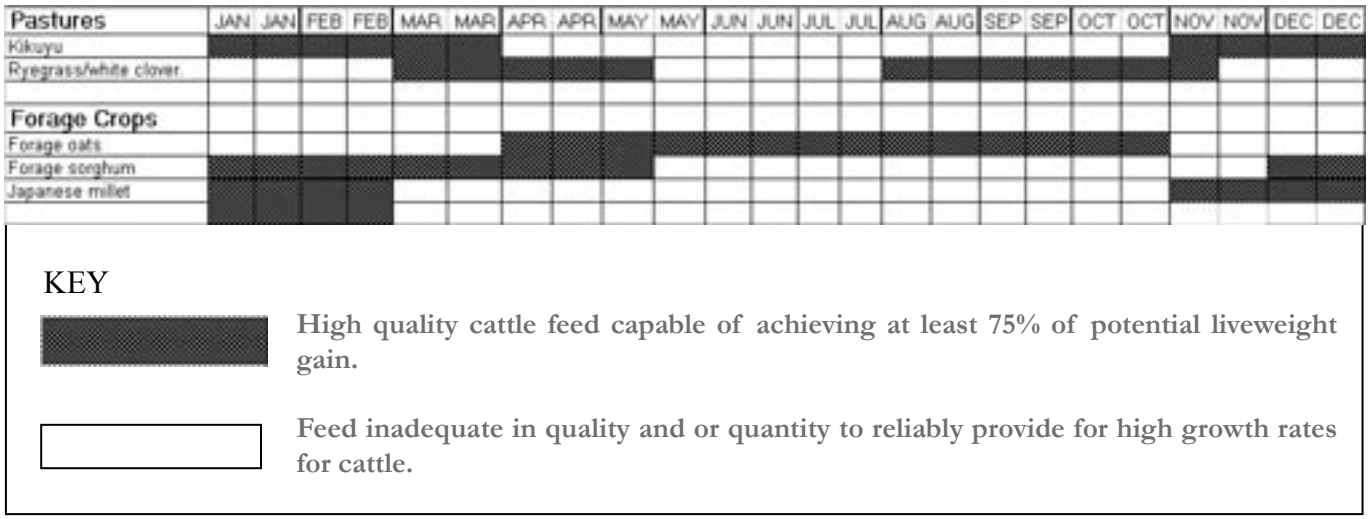
Table 6. A guide to pastures and forage crops capable of achieving at least 75% of maximum liveweight gain on pastures* (e.g. 13 month old steer at 0.9 kg/day) given best practice management of pastures and livestock – Mid North Coast and Lower Hunter.



Note: These estimates are provided by agronomists and livestock officers as an aid to pasture selection and represent the likely production from these feed sources in average years, given the feeds are grown in appropiate soils and are well-managed. Adjustments will need to be made in most situations to cover the many variables involved in pasture production. Months are represented by two half months i.e. JAN JAN.

**See PROGRAZE manual for benchmarks on feed availability requirements for various levels of liveweight gain.*

Table 7. A guide to pastures and forage crops capable of achieving 75% of maximum liveweight gain* given best practice management of pastures and livestock. Estimates of likely availability of quality feed – South Coast.

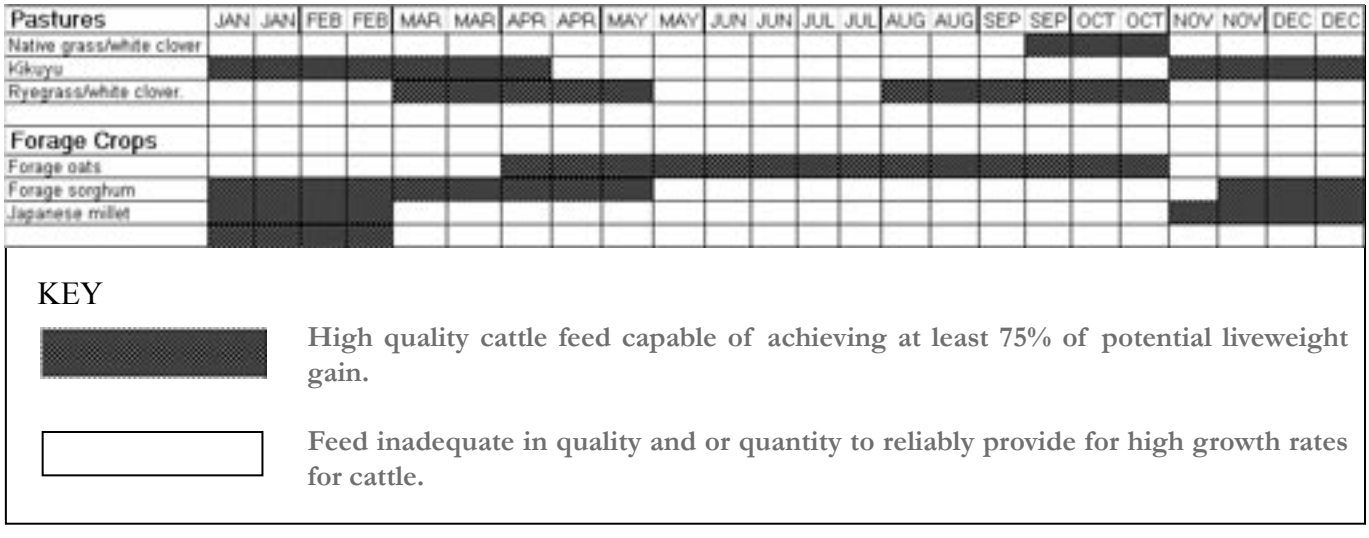


Note: These estimates are provided by agronomists and livestock officers as an aid to pasture selection and represent the likely production from these feed sources in average years, given the feeds are grown in appropiate soils and are well-managed. Adjustments will need to be made in most situations to cover the many variables involved in pasture production. Months are represented by two half months i.e. JAN JAN.

**See PROGRAZE manual for benchmarks on feed availability requirements for various levels of liveweight gain.*

Table 8. A guide to pastures and forage crops capable of achieving 75% of maximum liveweight gain* given best practice management of pastures and livestock. Estimates of the likely availability of quality feed – Far South Coast.

Far South Coast



Note: These estimates are provided by agronomists and livestock officers as an aid to pasture selection and represent the likely production from these feed sources in average years, given the feeds are grown in appropiate soils and are well-managed. Adjustments will need to be made in most situations to cover the many variables involved in pasture production. Months are represented by two half months i.e. JAN JAN.

**See PROGRAZE manual for benchmarks on feed availability requirements for various levels of liveweight gain.*

will tend to be lower quality than in the autumn because of the greater proportion of stem than leaf produced. This factor is extremely important with summer-growing grasses when they are in the reproduction phase.

Other factors

A large range of other factors may influence the ability of the pasture to reach its full potential. In some instances, these minor factors can cause devastating reduction in the reliability of feed supply.

Factors include pasture species adaptability, weeds, pests, diseases, aspect, waterlogging, salinity and so on. If you are in doubt about the extent of the potential reduction in pasture production due to any of the above mentioned factors, consult your district agronomist.

*Note** The wide variation in pasture growth that occurs between years needs to be remembered. For example, the computer growth model used to provide growth rate information on pastures indicate the following variability in seasonal production. These were based on using perennial ryegrass* as an indicator of a winter-growing species and a native grass# as an indicator plant for summer-growing species, and using the average, 10, and 90 percentiles to indicate the likely variability. Seasonal growth could vary as illustrated in Table 9.

Table 9. The variability in seasonal production from responsive pastures as predicted by 'GrassGro based on long-term rainfall records for the localities and soil types specified.

Far North Coast	**Good growing conditions**	**Poor growing conditions**
Spring	70 per cent above	60 per cent below
Summer	60 per cent above	60 per cent below
Autumn	120 per cent above	90 per cent below
Winter	150 per cent above	70 per cent below
Mid North Coast		
Spring	145 per cent above	73 per cent below
Summer	114 per cent above	46 per cent below
Autumn	70 per cent above	80 per cent below
Winter	89 per cent above	67 per cent below
South Coast		
Spring	113 per cent above	92 per cent below
Summer	77 per cent above	19 per cent below
Autumn	32 per cent above	57 per cent below
Winter	16 per cent above	74 per cent below
Far South Coast		
Spring	108 per cent above	79 per cent below
Summer	43 per cent above	65 per cent below
Autumn	43 per cent above	26 per cent below
Winter	71 per cent above	66 per cent below

CONTRIBUTORS

The following agronomists and livestock specialists have contributed information presented for the respective areas.

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NOTE

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders. Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk. Consult your veterinarian or adviser when planning pasture improvement.

FURTHER READING

PROGRAZE manual. NSW Department of Primary Industries (DPI).

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