

Northland Pastoral Extension Research Stocktake

Pasture Growth Rates in Northland

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1.0 Otakanini Data

Below are monthly pasture growth rates for a Redhill sand complex at Otakanini for the period 1964 to 1974 on a medium soil fertility site.

Month	Kg PDM/ha/day	SE
Jun	17	11
Jul	18	12
Aug	29	14
Sep	37	15
Oct	51	17
Nov	50	20
Dec	45	24
Jan	32	21
Feb	29	23
Mar	31	14
Apr	36	15
May	26	16
Average	12760	2370
Highest	17110	
Lowest	9470	

For most seasons the total dry matter yield would be within the range of 10,400 to 15,100kg per ha.

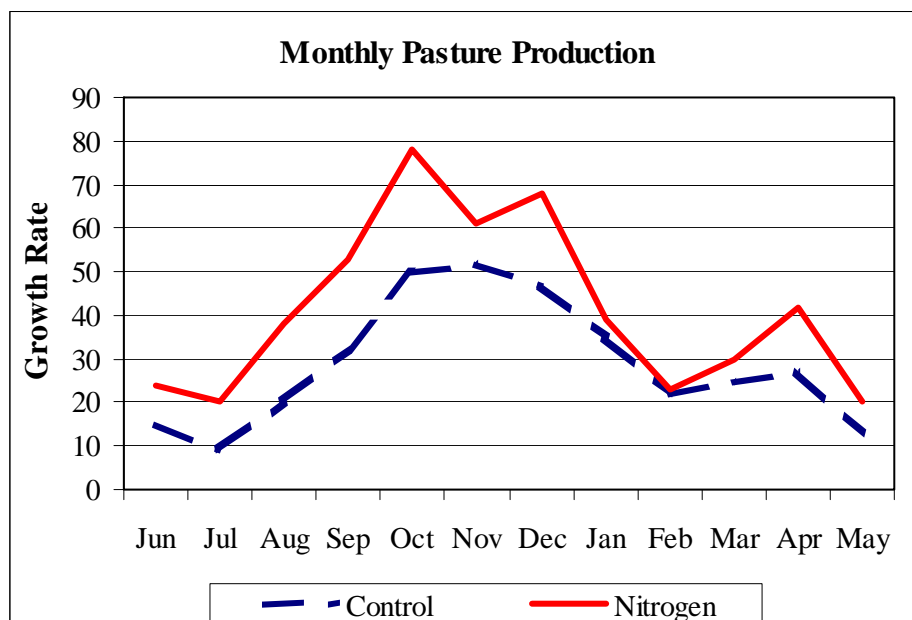
The average estimate of winter production is 1870kg pasture dry matter per ha for the months May June and July. The range in two years out of three is from 1370 to 2370 and the actual range in the long run (95% of years) is from 1060 to 2680. So for feed budgeting purposes any reasonable figure can be taken and a two weekly monitoring of indicator paddocks is needed to determine actual pasture growth for that period and the feed budget adjusted accordingly.

2.0 Kaiwaka Data

The data below is for a nitrogen trial at Kaiwaka on a strongly leached and podzolised northern yellow brown earth. The pasture was rye clover with a history of heavy applications of fertiliser.

The trial was started in September 1970 and nitrogen was applied every two months as sulphate of ammonia with a total annual application of nitrogen of 420kgN per ha. The lowest response to nitrogen was in the months December to February inclusive.

	Control	Nitrogen
Jun	15	24
Jul	9	20
Aug	20	38
Sep	32	53
Oct	50	78
Nov	52	61
Dec	47	68
Jan	35	39
Feb	22	23
Mar	25	30
Apr	27	42
May	13	20
Total	10410	14880



3.0 Northern Wairoa Research & Demonstration Farm

The data below for the Northern Wairoa Research Farm at Dargaville is for the years 1976 to 1982 and applies to the Kaipara clay soils. This data was derived from pasture growth estimates based and fortnightly plating of every paddock on the area concerned.

	1976	1977	1978	1979	1980	1981	1982	Av	Range
May	15	20	30	20	36	36	27	26	15-36
Jun	20	16	25	19	15	18	19	19	15-25
Jul	17	20	18	13	14	18	14	16	13-20
Aug	35	18	16	12	22	5	43	22	5-43
Sep	22	33	40	17	27	36	45	31	17-45
Av M/J	17	19	24	17	22	24	20	20	17-24
Av M/S	22	21	26	16	23	23	30	23	16-30

Note: Av M/J is average monthly pasture production for the three months May, June and July.

Note: Av M/S is the average monthly pasture production for the five months of May to September.

Again the monthly data shows tremendous variation from year to year but for a feed budgeting period from May to September there is less variation. In the seven years there was one year with poor growth rates and likewise one year with very good growth rates and for the other five years the average monthly growth rates were quite consistent.

This data also from the Northern Wairoa Research Farm for a 12-year period from 1949 to 1960. The site was on a tile drained Kaipara clay soil with ryegrass paspalum and white clover pasture.

Total pasture production for each year was as follows:

Year	Kg PDM	Year	Kg PDM	Year	Kg PDM
1949-50	12,260	1953-54	20,300	1957-58	21,460
1950-51	14,900	1954-55	19,260	1958-59	16,260
1951-52	17,800	1955-56	20,650	1959-60	10,940
1952-53	21,410	1956-57	16,900	1960-61	13,810

The pasture was cut every two weeks and the means as follows:

Month	Total Yield		Grass		Clover	
	Mean	SE	Mean	SE	Mean	SE
May	32.4	13.3	23.3	7.4	4.6	1.9
Jun	24.6	12.3	23.8	12.6	3.6	2.0
Jul	24.9	8.5	22.2	10.2	2.7	1.7
Aug	33.0	10.9	26.7	9.9	3.6	2.4
Sep	50.1	15.2	38.4	14.2	5.7	3.1
Oct	58.4	14.9	46.7	14.6	6.4	3.0
Nov	63.3	18.1	43.4	18.0	8.4	4.9
Dec	73.6	24.9	50.0	21.2	11.9	8.7
Jan	58.2	19.6	43.3	21.8	8.1	6.1
Feb	70.9	23.4	50.1	24.3	4.5	3.0
Mar	48.2	18.9	47.4	17.4	5.6	5.2
Apr	40.9	20.9	33.4	17.4	5.6	2.6
Annual	17,160	3610	13,000	2,830	2,030	900
Lowest	12,260					
Highest	21,460					

During the years 1996 to 2001 pasture cuts were taken from ryegrass dominate paddocks and from paddocks which during the summer and autumn were kikuyu dominant. Both areas received nitrogen during the winter period of 130kgN per ha.

	Ryegrass	Kikuyu	Diff
May	38	42	+10%
Jun	32	27	-16%
Jul	30	23	-23%
Aug	41	32	-22%
Sep	65	60	-8%
Oct	71	71	
Nov	78	80	+2%
Dec	66	69	+4%
Jan	43	58	+35%
Feb	27	57	+111%
Mar	33	70	+112%
Apr	28	52	+86%
Total	16900	19600	

During the winter months June to August the kikuyu pastures produced 20% less than the ryegrass paddocks and during the spring September to December about the same but in the summer and autumn period the kikuyu out produced the ryegrass paddocks by 85%. The total dry matter yield in favour of the kikuyu dominant paddocks was 18%. On this property effort was made to control the kikuyu pastures in the autumn by grazing and mowing to induce ryegrass dominance during the winter. This was achieved in most years so that spring growth rates were similar but the kikuyu dominance in the autumn still resulted in poor winter production.

4.0 Northland Monitoring Project

For the period 1986 to 1989 there was the Northland Monitoring Project carried out by D G Clayton in conjunction with the Ruakura Agricultural Centre. Two farms were involved one at Dargaville the other at Hukerenui and monthly pasture production was collected for three years as follows.

Monthly pasture production for the Hukerenui farm.

Month	1986/87	1987/88	1988/89	Average	Range
May	27	34	26	29	26-34
Jun	29	30	23	27	23-30
Jul	19	23	14	19	14-23
Aug	44	36	28	36	28-44
Sep	42	44	48	45	42-48
Oct	61	61	61	61	61
Nov	44	65	52	54	44-65
Dec	39	60	42	47	39-60
Jan	38	44	43	42	38-44
Feb	15	30	40	28	15-40
Mar	17	32	28	26	17-32
Apr	44	33	22	33	22-44
Av M/J	25	29	21	25	21-29
Av M/S	32	33	28	31	28-33
Annual	12,815	14,700	12,920	13,480	

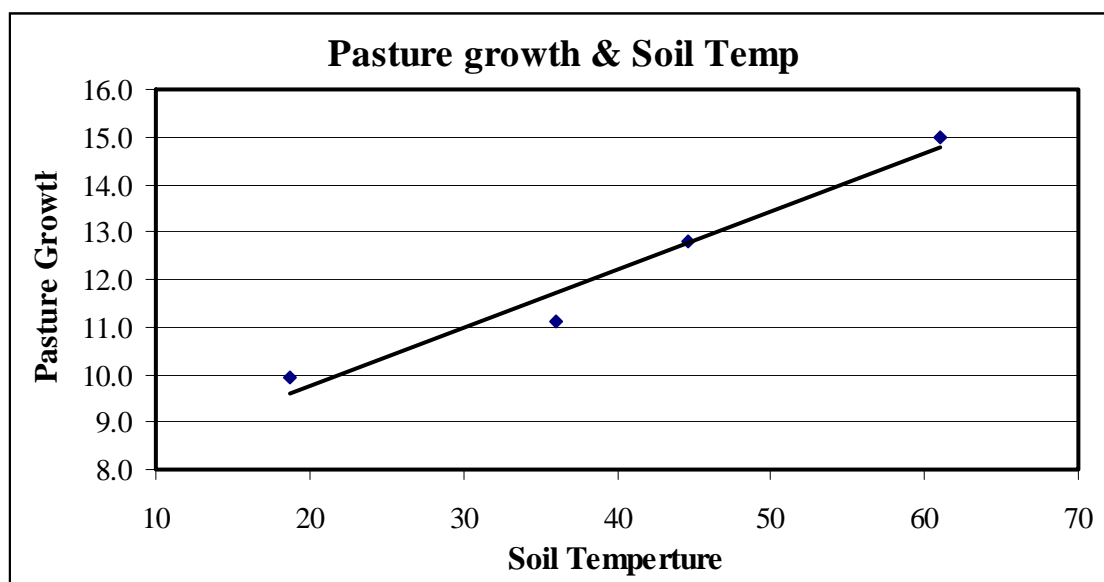
Monthly pasture production for the Dargaville farm

Month	1986/87	1987/88	1988/89	Average	Range
May	29	27	28	28	27-29
Jun	28	24	28	27	24-28
Jul	18	23	24	22	18-24
Aug	38	29	29	32	29-38
Sep	57	42	49	49	42-57
Oct	74	54	61	63	54-74
Nov	53	66	32	50	32-66
Dec	19	58	34	37	19-58
Jan	9	51	47	36	9-51
Feb	10	29	36	25	10-36
Mar	25	42	16	28	16-42
Apr	32	35	19	29	19-35
Av M/J	25	25	27	25	25-27
Av M/S	28	26	27	27	26-28
Annual	11,970	14,690	12,920	13,190	

The table below is the monthly pasture production and soil temperature data for the Hukerenui farm.

Month	1986/87		1987/88		1988/89		Average	
	Growth	Temp		Temp		Temp		Temp
May	27	12.8	34	15.4	26	12.6	29	13.6
Jun	29	9.1	30	10.1	23	11.7	27	10.3
Jul	19	8.8	23	9.8	14	11.2	19	9.9
Aug	44	10.1	36	11.2	28	12.0	36	11.1
Sep	42	12.1	44	12.6	48	13.7	45	12.8
Oct	61	15.2	61	14.2	61	15.6	61	15.0
Nov	44	16.9	65	16.5	52	17.7	54	17.0
Dec	39	18.1	60	19.0	42	19.8	47	19.0
Jan	38	20.0	44	19.7	43	20.7	42	20.1
Feb	15	19.6	30	21.7	40	19.8	28	20.4
Mar	17	17.3	32	18.2	28	19.4	26	18.3
Apr	44	16.1	33	15.4	22	16.1	33	15.9

The graph below is for the period July to October inclusive and compares pasture growth rates with changes in soil temperature. On average for this period for each increase in soil temperature by 1 degree C pasture growth rates increase by 8 kg per hectare per day. The same relationship applied for the Dargaville farm.



Northland Dairy Company Focal Farm Scheme 1989 to 1992

Whangarei Heads-coastal property medium to high fertility with pastures kikuyu dominate over the summer months. The chart below is for the ryegrass dominate pastures.

Month	1989/90	1990/91	1991/92	Average	Range
May	12	18	15	15	12-18
Jun	14	14	7	12	7-14
Jul	16	18	31	22	16-31
Aug	11	36	46	31	11-46
Sep	20	34	44	33	20-44
Oct	33	91	47	57	33-91
Nov	38	78	36	51	36-78
Dec	29	28	28	38	28-38
Jan	39	33	19	30	19-39
Feb	43	38	13	31	13-43
Mar	32	7	11	17	7-32
Apr	36	12	13	20	12-36
Av M/J	14	17	18	16	
Av M/S	15	24	29	23	
Annual	9,825	12,380	9,429	10,544	

The following chart is for the kikuyu dominate pastures on the farm.

Month	1989/90	1990/91	1991/92	Average	Range
May	35	30	32	32	32-35
Jun	14	21	20	18	14-21
Jul	16	19	19	18	16-19
Aug	9	21	20	17	9-21
Sep	29	27	28	28	27-29
Oct	40	54	44	46	40-54
Nov	47	86	53	62	47-86
Dec	58	12	33	34	12-58
Jan	50	23	35	36	23-50
Feb	45	34	35	38	34-45
Mar	40	21	30	30	21-40
Apr	28	25	30	28	25-30
Av M/J	22	23	24	23	22-23
Av M/S	21	24	24	23	21-24
Annual	12,501	11,345	10,737	11,528	

The total pasture production from the kikuyu pastures was about 9% more than the ryegrass swards with 16% less growth during the winter and early spring and almost 50% more during the summer and autumn period.

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Rye	15	12	22	31	33	57	51	38	30	31	17	20
Kik	32	18	18	17	28	46	62	34	36	38	30	28
Diff	+113%	+50%	-22%	-13%	-15%	-16%	+21%	-10%	+20%	+29%	+41%	+40%

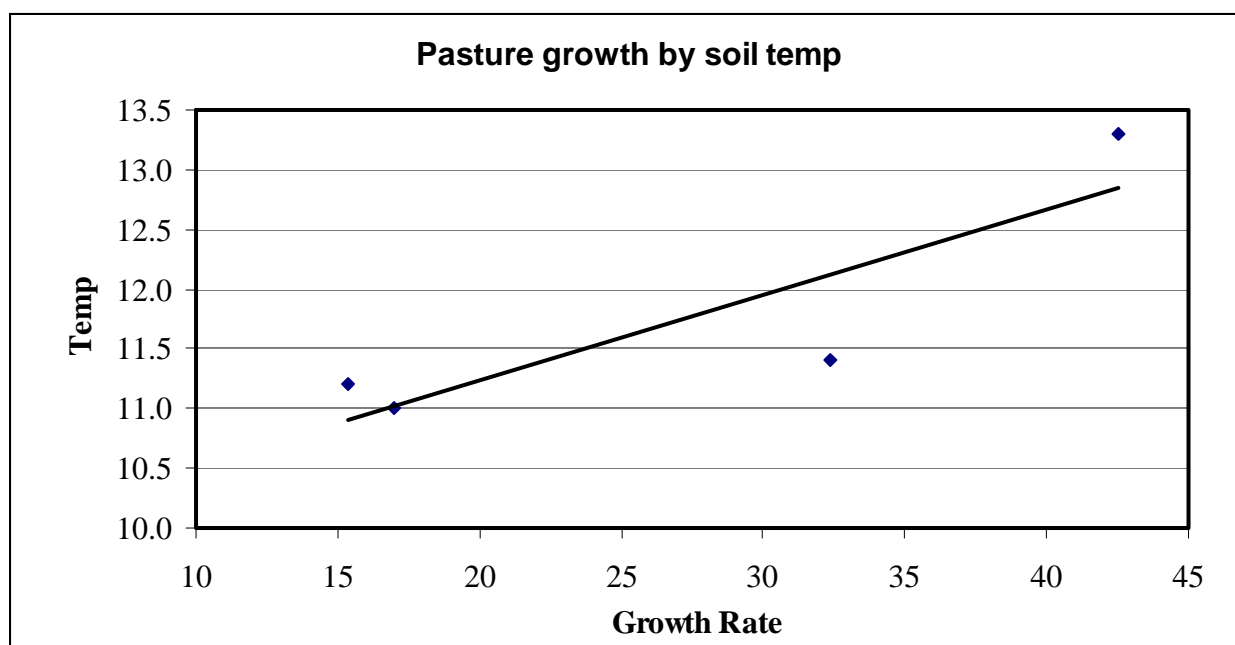
Waiotira Dairy Farm medium to high soil fertility with pastures mostly rye and clover with some paddocks with kikuyu.

Month	1989/90	1990/91	1991/92	Average	Range
May	29	45	19	31	19-45
Jun	17	19	22	19	17-22
Jul	35	23	22	27	22-35
Aug	37	32	26	32	26-37
Sep	42	37	34	38	34-42
Oct	43	55	43	47	43-55
Nov	42	67	38	49	38-67
Dec	41	39	31	37	31-41
Jan	26	15	17	19	15-26
Feb	17	16	14	16	14-17
Mar	26	19	12	19	12-26
Apr	23	33	11	22	11-33
Av M/J	27	29	21	26	21-29
Av M/S	30	30	22	27	22-30
Annual	11,498	12,167	8,790	10818	

5.0 Kerikeri Dairy Farm Data

The monthly pasture production below was collected from a dairy farm near Kerikeri with good levels of soil fertility the Olsen P levels ranging from 15-35 and the soil type was mostly a mature yellow brown earth soil. The eight years of data is as follows.

	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	Av	Range
May	14	13	24	24	12	16	15	18	17	12-24
Jun	19	14	8	6	18	13	8	18	13	8-19
Jul	22	22	14	13	15	10	16	11	15	10-22
Aug	18	20	15	6	18	20	18	21	17	6-20
Sep	25	30	45	40	38	24	28	29	32	24-45
Oct	39	56	34	51	41	50	34	35	43	35-56
Nov	50	48	72	45	50	32	34	32	45	32-72
Dec	45	28	28	40	22	28	32	29	32	22-45
Jan	16	44	15	22	37	5	32	33	26	5-44
Feb	21	10	46	27	20	20	21	24	24	10-46
Mar	13	27	22	24	39	32	23	13	24	13-39
Apr	27	13	32	30	9	28	10	20	21	9-32
Total	9400	9885	10770	9980	9700	8455	8240	8610	9380	
Av M/J	18	16	15	14	15	13	13	16	15	13-18
Av M/S	20	20	21	18	20	17	17	19	19	17-20



For this property the pasture growth rates from July to October inclusive increased by 12kg per ha per day as the soil temperature increased by 1 degree Celsius.

6.0 Waiotira Sheep & Beef Farms

Below is the data on monthly pasture production for three year collected from two study farms during 1989/90 to 1991/92. One property with an Olsen P level of 10 was classified as the WLF property. (Waiotira Low Fertility), and the second with Olsen P levels of 20 as the WHF property. The average pasture production data for the three seasons for the two properties is compared below.

Pasture Production by Soil Fertility level.

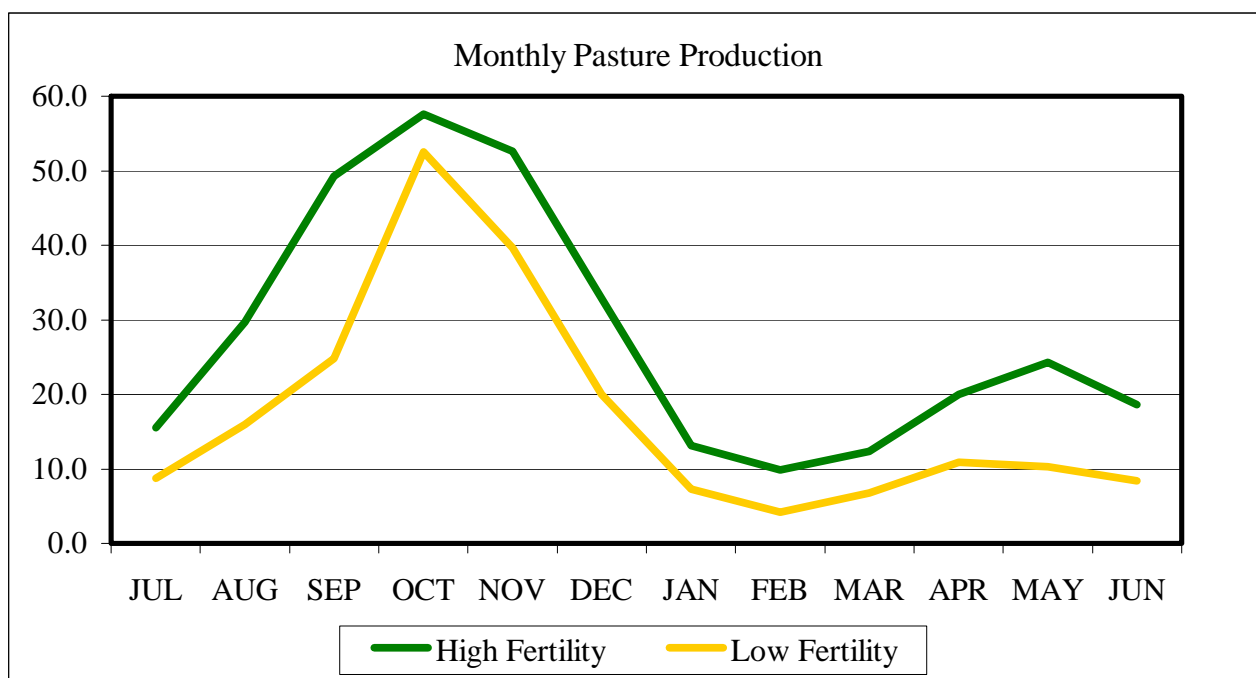


Table 8: Summary Pasture Production by Olsen P Level

	Low F	High F	
Total Pasture DM	6381	10217	
Sep/Oct/Nov/Dec	4185	5862	
Peak months as a % of the total grass production	66%	57%	
	Low F	High F	% Diff
Autumn	854	1731	103%
Winter	1017	1960	93%
Spring	3551	4831	36%
Summer	959	1695	77%
Total	6381	10217	60%

The high fertility property produces 60% more grass in total but of more significance is the difference in the shape of the feed wedge. For the low fertility farm the grass growth has a pronounced peak with 66% of total grass grown during the four months September to December.

For the high fertility farm it is 57% and the grass growth curve is flatter. On high fertility farms the pasture growth rate is 90-100% more during the autumn and winter months than on low fertility farms.

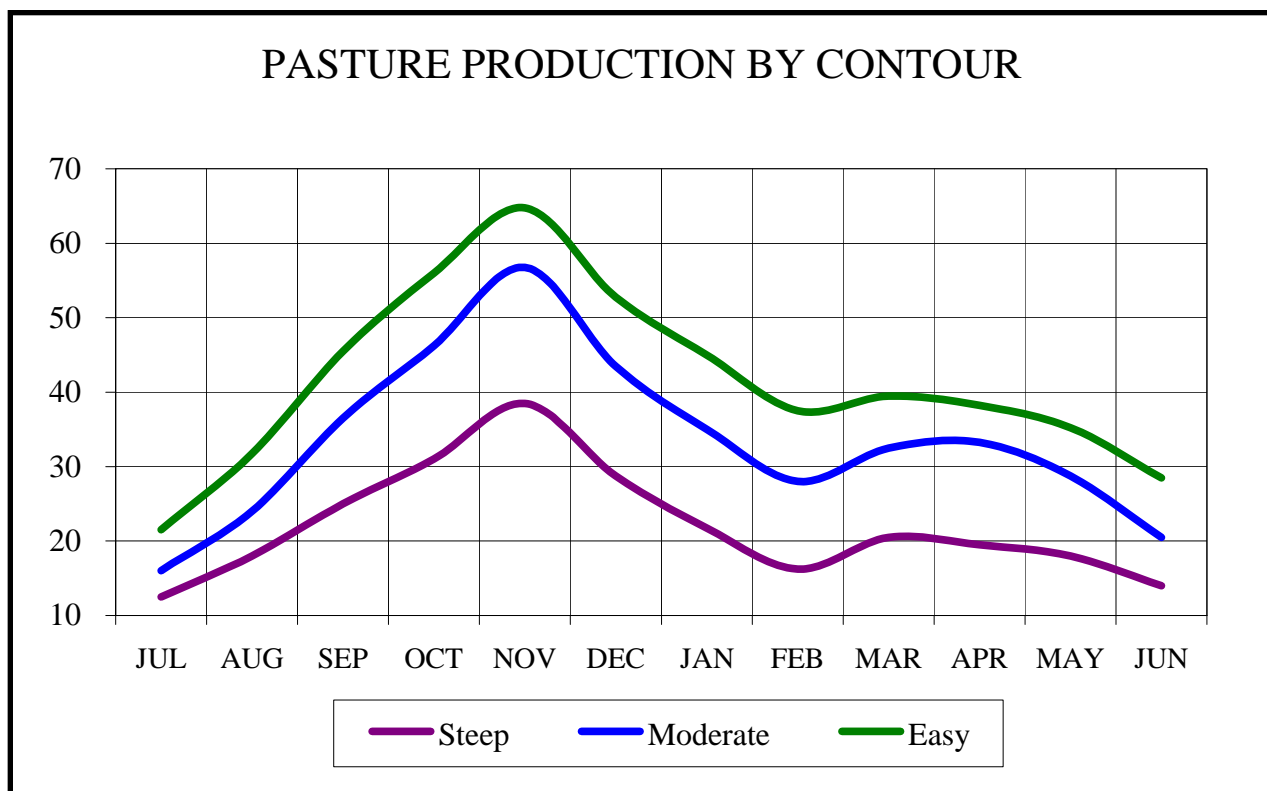
During the period 1994/95 to 1997/98 there was data collected from a Sheep and Beef property at Maungaturoto and monthly pasture production was collected and compared with easy, moderate and steep contour as follows. The soil type was mostly a yellow brown earth.

	Steep	Moderate	Easy	Ratio S:M:E
May	18	29	35	51:82:100
Jun	13	16	22	49:72:100
Jul	18	24	32	58:74:100
Aug	25	37	46	57:76:100
Sep	31	46	56	55:80:100
Oct	39	57	65	55:83:100
Nov	29	44	53	59:88:100
Dec	22	35	45	55:82:100
Jan	16	28	38	48:78:100
Feb	21	33	40	43:75:100
Mar	20	33	38	52:82:100
Apr	13	16	22	51:87:100
Total	8022	12197	15094	53:81:100

The steep country was defined as land where stock tracks were evident and easy land being capable of cultivation with two wheel drive tractors and moderate country was in between the two. A trained technician did the assessments of the contour. On average the steep country grew 53% of the grass that was grown on the easy country and the moderate country grew 81% of the grass compared with easy country. Soil test information indicated that the Olsen P levels were similar across all sites where the cages were located. The biggest difference between the contour classes was during the summer months January and February and simply reflects differences in soil moisture levels.

The monthly growth rates data is as follows:

	STEEP					AVG	MODERATE					AVG	EASY					AVG
	94/95	95/96	96/97	97/98	94/95		95/96	96/97	97/98	94/95	95/96		96/97	97/98				
JUL	12	10	14	14	13	17	12	16	19	16	23	17	24	22	22			
AUG	14	23	18	17	18	18	30	24	24	24	25	32	37	33	32			
SEP	16	28	32	24	25	25	38	45	38	37	30	48	55	49	46			
OCT	23	35	35	31	31	41	45	49	50	46	45	62	56	61	56			
NOV	43	47	36	28	39	65	56	54	52	57	71	62	62	64	65			
DEC	11	50	34	20	29	14	63	58	39	44	23	70	66	52	53			
JAN	12	36	25	14	22	19	44	48	29	35	25	54	63	38	45			
FEB	16	23	16	10	16	24	30	38	20	28	30	38	58	24	38			
MAR	22	13	27	20	21	32	22	40	36	33	38	30	43	47	40			
APR	23	14	18	23	20	34	31	36	32	33	41	32	39	41	38			
MAY	20	15	20	17	18	31	26	33	25	29	37	33	38	33	35			
JUN	9	11	22	14	14	12	17	31	22	21	20	27	38	29	29			
AVG	18	25	25	19	22	28	35	39	32	33	34	42	48	41	41			
TOTAL	6722	9277	9034	7057	8022	10098	12593	14357	11741	12197	12410	15360	17611	14995	15094			



The pasture growth rate data below was collected from another sheep and beef property near Waitira and the soil type was a yellow brown earth and the soil fertility levels were low with an average Olsen P test of 10.

Month	1993/94	1994/95	1995/96	1996/97	Average	Range
May	19	34	24	30	27	18-34
Jun	18	17	20	30	21	17-30
Jul	18	19	16	18	18	16-19
Aug	22	27	26	23	24	22-27
Sep	34	33	36	44	37	33-44
Oct	38	44	44	51	44	38-51
Nov	38	57	50	46	48	38-57
Dec	34	11	49	44	34	11-49
Jan	29	15	35	41	30	15-41
Feb	8	17	21	22	17	8-22
Mar	8	24	17	28	19	8-28
Apr	11	30	23	29	23	19-35
Av M/J	18	23	20	26	22	18-26
Av M/S	22	26	24	29	25	22-29
Annual	8425	9977	10950	12298	10413	

Once again there is the tremendous variation from month to month between years but the average pasture growth rates over the winter early spring feed budgeting period shows less variation over the four years.

7.0 Dexcel Data

The pasture assessments below were carried out by Dexcel Consulting staff and most by Pasture Assessments Ltd.

Irrigated pasture comparisons for the periods 1994 to 2000.

Month	Wellsford		Kerikeri		Te Hana	
		Irrigated		Irrigated		Irrigated
May	29	34	29	35	31	41
Jun	24	24	30	30	24	35
Jul	27	23	21	23	17	24
Aug	30	22	26	23	20	18
Sep	39	30	34	35	38	46
Oct	48	47	47	51	41	61
Nov	36	47	50	57	36	66
Dec	32	41	34	48	32	64
Jan	33	46	39	47	45	56
Feb	20	30	31	52	25	55
Mar	22	38	38	48	31	51
Apr	30	36	34	41	29	46
Total	11300	17200	12600	15000	11300	17200
Dec/Apr	27	38	35	47	32	54

The extra pasture production due to irrigation for the five months December to April inclusive ranged from 11 to 22 kg per ha per day with an average of 15kg/ha per day over the three sites which is an extra 3800kg pasture dry matter equivalent to about an extra 250kg milksolids per ha.

Period	Puketona		Ruawai	Ararua	Maung	Ruakaka	Waipu	
	1992-01		1998/02	1994/00	1997/01	1996/00	1994-2000	
Month	Kikuyu	Rye-New					Flats	Hills
May	36	30	34	37	30	33	34	36
Jun	25	25	36	34	32	32	32	36
Jul	23	25	33	29	23	27	20	22
Aug	31	33	44	28	29	28	24	28
Sep	46	53	50	39	31	51	38	47
Oct	61	64	56	47	31	70	50	57
Nov	61	56	75	40	34	49	51	53
Dec	49	54	78	38	28	46	49	50
Jan	55	48	45	40	22	34	49	52
Feb	47	42	37	33	16	23	35	32
Mar	45	39	31	27	21	22	37	41
Apr	37	38	36	30	19	21	38	42
Total	15700	15500	17000	12900	9600	13300	14000	15200

The average of all this data is 16100kg pasture dry matter and as it was mostly cage data it equates to about 11300kg pasture dry matter that would

be available for milk production giving a potential milksolids production of 800kg milksolids per ha.

8.0 Summary

- Monthly pasture growth rates in Northland can show a variation usually exceeding 100% from year to year.
- Most feed budgets are for the period May to September period inclusive and the average pasture growth rates for this five-month period can be consistent from year to year.
- The exception to this is that a wet winter on the wet clay soils will result in pasture damage due to pugging and subsequent spring pasture production can be reduced by 25%.
- The major geographical effect on pasture growth is related more to the climate than to differences in soil type and location. However the research data would suggest that in the Far North the autumn peak is better as is the winter growth rates. This assumes a rye and clover based pasture with adequate soil test levels but no nitrogen applied, or irrigation water used.
- Variations in contour affect pasture production.
- The greatest benefit of good compared with low levels of soil fertility is enhanced pasture production in the autumn and winter period.