Northland Pastoral Extension:

Research Stocktake

NORTHLAND NATURALLY
FIRST REGION OF NEW ZEALAND

Sustainable Farming Fund

Forage Crops

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1.0 Northland Yields of Brassica

Reference: Summer Brassica Forages in Northland

Piggot, Farrell, Stebleton, Shannon.

Proceedings Agronomy Society of NZ 10 1980.

Overview – Summary

- Brassica yields harvested late February ranged from 6 to 10 tonne DM/ha in climatically favorable years.
- Sorghum yields at two sites were much higher than the brassica yields.
- The main advantage of brassicas as a summer feed is their high feed value (high digestibility).

Establishment of these forage crops

- Most sites were cultivated by rotary hoe and drilled using a hoe coulter drill. Two sites (sprayed and drilled).
- Seeding rate:
  - Kale, rape and wairoa brassica at 3-5 kg/ha
  - York globe turnip at 1 kg/ha
  - Fodder radish at 7-8 kg/ha.
- Fertiliser dependent on soil test results.
- Nitrogen – urea at 50 kg N/ha was broadcast at or within 6 weeks of sowing.
- Post – emergence weed control (by using cholornitronfen plus pichloran) applied where necessary.
- Control of major insect pests (white butterfly and aphids) not normally undertaken even with pests being present.

Results

- Turnips produced more dry matter than kale or rape when harvested in early February.

		Yield tDM/ha			
Sowing Date	*Harvest Date*	*Turnip*	*Kale*	*Rape*	*Wairoa Brassica*
19/11/73	11/2/74	10.7	4.9		
1/11/77	9/2/78	6.5	3.8	5.4	4.6

- Once only but a very late harvest in April.

				Yield tDM/ha		
Location	*Soil*	*Sowing Date*	*Harvest Date*	*Kale*	*Rape*	*Wairoa Brassica*
Kaikohe	Silt	1/11/77	24/4	6.5	6.7	4.0
Ruatangata	Clay	16/10/78	26/4	21.8	15.5	13.0
Kaikohe	Silt	11/10/79	11/4	11.4	11.1	6.5
Ruatangata	Clay	9/10/79	8/4	5.7	4.5	4.8
Otakanini	Sand	19/10/79	16/4	21.5	13.7	12.7

- Brassica Yields – cut in mid February to early March

			Yield tDM/ha			
Location	*Sowing Date*	*Harvest Date*	*Turnip*	*Kale*	*Rape*	*Wairoa Brassica*
Kaukapakapa	19/11/73	25/2	6.1	5.7		
Kaikohe	1/11/77	9/3	7.1	6.1	7.1	6.2
Ruatangata	16/10/78	14/2		9.5	10.4	9.8
Kaikohe	11/10/79	20/2		5.7	6.6	5.9
Ruatangata	9/10/79	21/2		9.1	7.1	8.8
Otakanini	19/10/79	18/2		18.2	22.0	20.9

- Clay Soil – sown 16th October 1978

	Harvested Date and Yield		*Total Yield*
	14th February 1979	*26th April 1979*	
Kale–medium stem	9,500	1,900	11,400
Rangi rape	10,400	2,400	12,802
Wairoa brassica	9,800	1,800	11,600

- Kaikohe – a silt loam – sown 1st November 1997

	Harvested Date and Yield		*Total Yield*
	9th February 1998	*12 April 1998*	
Kale–medium stem	3,800	1,300	5,100
Rangi rape	5,400	1,700	7,100
Wairoa brassica	4,600	2,700	7,300
Yorkglobe turnips	6,500	0	6,500

- Clay Soil – sown 9th October 1979

	Harvested Date and Yield		*Total Yield*
	21st February 1980	*8th April 1980*	
Kestal Kale	9,100	800	9,900
Rangi rape	7,100	600	7,800
Wairoa brassica	8,800	600	9,200

- Sand – Otakanini – Sown 19th October 1979

	Harvested Date and Yield		*Total Yield*
	18th February 1980	*16th April 1980*	
Kestal Kale	18,200	3,400	21,600
Rangi rape	22,000	3,300	25,300
Wairoa brassica	20,900	3,000	23,900

Comments:

- Otakanini Site (being Whananaki Sand) also grew exceptional soybean crops plus high pasture yields. Ie: pasture yield averaged 12,760 kgDM/ha/year as a 9 year average from 1964 to 1977, with a high of 17,110 kgDM.
- Statistically there were no significant yield differences between forage crops when harvested mid February to early March.
- Results suggest that if feed is required in January or early February then turnips would be preferable.
- Wairoa brassica had the best regrowth (just).

2.0 Turnips in Northland – Dairy Farms

Reference: *Turnips for Summer Milk Production.*

D.A. Clark and other.

Proceedings of the NZ Grassland Association 57: Pg 145-150 (1996)

Overview

- 1994/95 L.I.A consulting officers sampled turnips crops and surveyed farmers.
- Note: November and December 1994 were very dry months eg: 5 to 12 mm rain in December throughout Northland.

Results

- Northland: average of 6,620 kgDM/ha from 48 sites throughout Northland.
  - Although some yields were low to very low eg: average of 4300 kgDM/ha from 5 crops in the Far North district, considering the climate, these yields are not too bad.
  - Some crops seen during 20-24th December had a yield under 1,000 kg DM/ha at that time, from a late October sowing.

- NZ wide results: mean yield was 7,358 kgDM/ha with a range from zero up to 15,193 kgDM/ha.
  - Barkant was the cultivar used in 88% of these crops.
  - The average proportion of farm sown in turnips was 4.3%, ranging from 0.8% up to 17.3%.

Factors Associated with Yield

- Rainfall in November and December. For each mm of rainfall an increase in yield of 6.8 kgDM/ha in November and 31 kgDM/ha in December.

- Fertiliser: mean nitrogen application rate was 30 kg/ha (range 0-145 kgN/ha). Mean phosphorus application was 63 kgP/ha (range 0-278 kgP/ha!). (Comment – I am not too sure that I believe the 278 kgP/ha?).

- For each kgN/ha applied after sowing an associated increase of 13 kg of turnip DM achieved. No association between N at sowing or phosphorus applied in the 3 months before sowing.

- Sowing Date: mean sowing date was 10th November. Statistically there was no association between sowing date and yield, but the highest yield crops were planted in the last 10 days of October. There was a positive association between time of sowing and the time of measurement: an increase of 41 kgDM/ha/day. This implies that the crops were being measured – (grazed) before maturity.

  Mean crop growth time was 84 days (range 36 to 153 days).

Discussion

- A major problem of uneven germination of coated seed was common in dry soil conditions. Other trial work showed that crop master fertiliser (20.10:0:13) gave much lower establishment, producing half the plant population compared to results when using other fertilizers, with only 15% establishment of uncoated, viable seed 30 days after sowing.

Possible reasons for this:

- The hygroscopic ammonium sulphate drawing moisture away from the seed and preventing germination.
- The release of ammonia gas as ammonia sulphate breaks down may kill young seedlings.

  (A standard recommendation is to not use a sulphur fertilliser product, which would avoid these potential problems).

- It is important to let Barkant crops grow for as long a time as possible to obtain high yields. Trial work shows that total DM yield is still increasing at 120 days from sowing, although leaf yield peaked at 91 days: bulb yields increased rapidly from 90 to 120 days.

Early planting has a greater risk of poor tillage due to wet soils but has a major advantage of optimum soil moisture and temperature for high initial growth rates, plus good conditions (moisture) for N application. Plus, crops are available to grazing by mid January without sacrificing yield.

3.0 Adapting to Brassicas

Reference: *Adapting cattle from pasture to brassica diets.*

P Woods, Couchman and Barlow

Proceedings of the NZ Society of Animal Production 1995 Vol 55 page 251-254.

Overview

Feeding policies for adapting cattle from pasture to brassica diets were compared. Groups of 20 Friesian weaner bulls were offered three diets at a fixed daily allowance of 12% of liveweight as dry matter on offer for a six week period during February and March 1994. Animals continuously grazing pasture and a Wairoa brassica crop were compared to a group receiving half their allowance as pasture and half as Wairoa brassica, in separate night and day breaks. Unfasted animal liveweights were measured each week for the duration of the trial. Utilisation and botanical compositions were estimated from quadrat harvest to ground level before and after grazing.

Introduction

Loss of liveweight and reduced rates of liveweight gain can occur for 2-3 weeks after initial access to brassica crops while animals adapt (rumen adaption).

Trial

- Groups of 20 Friesian weaner bulls were offered 3 different diets at fixed daily allowance for a 6 week period in February – March 1994.

  Allowances: herbage on offer.
  Start of trial at 21.6 kgDM/animal/day
  Mid trial period at 22 kgDM/animal/day
  End of trial at 25 kgDM/animal/day

- Bulls – either:

  - Continuously grazed Wairoa brassica
  - Continuously grazed pasture
  - Or received half their allowance as pasture and half as Wairoa brassica in separate back fenced night and day paddocks (called mixed diet treatment).

- Wairoa brassica was sown into a cultivated seed led on Waipu silt laom at Kaikohe in late October 1993. Five kg/ha of coated seed was broadcast, chain harrowed and rolled.

- Fertiliser and urea (100 kg urea/ha) applied to pasture and brassica: urea in mid December.

Results – Yields

- Wairoa brassica yield 8,000 kgDM/ha.

- Wairoa brassica was leafy in first grazing cycle but more stem and dead material was present in the second cycle.

- Pasture accumulation in December and January period was 7,000 kgDM/ha.

The application of Nitrogen in December encouraged pasture growth but quality declined rapidly as summer progressed.

The crop was capable of continuing growth and retaining better quality when pasture growth had stopped.

Green ryegrass content in the pasture was low as the leaf material died. Up to 37% of the pasture on offer consisted of dead material (typical for Northland).

- Table 1: Mean pre and post grazing herbage mass (kgDM/ha) and botanical composition of Wairoa brassica as sole diet

	Botanical Composition %				
First Grazing Cycle	Mass	Leaf	Stem	Grass	Dead
Pre Grazing	7,888	51	32	3	14
Post Grazing	6,917	24	64	5	7
Utilisation	12%				
	Botanical Composition %				
Second Grazing Cycle	Mass	Leaf	Stem	Grass	Dead
Pre Grazing	4,134	26	44	4	26
Post Grazing	3,925	6.5	77	7	10
Utilisation	5%				

Points:

- Reasonable good pre grazing mass (7,800)
- Very low utilisation; especially when fed as a sole diet

Table 2: Mean and post grazing herbage mass (kgDM/ha) and botanical composition (%) of pasture for each diet treatment, across all daily breaks throughout the trial:

		Botanical Composition					
Pasture as sole diet	**Mass**	**Ryegrass**	**White clover**	**Other**	**Legume**	**Other**	**Grass**
Pre grazing	7,716	8.3	20.8	8.2	26.9	0.7	35.1
Post grazing	4,936	7.7	18.5	6.1	25.1	1.0	41.6
Utilisation	36%						
		Botanical Composition					
Pasture as mixed diet	**Mass**	**Ryegrass**	**White clover**	**Other**	**Legume**	**Other**	**Grass**
Pre grazing	6,862	12.9	24.3	1.8	23.7	0.8	36.5
Post grazing	4,855	8.9	11.7	9.2	32.3	0.2	37.8
Utilisation	29%						

Points:

- Very high pre graze of 7,700 kg DM/ha for the pasture. Note: This is not a practical recommendation, but was used because of the trial design
- Relatively low utilization (36 and 29%) of this pasture
- Although it had a good legume content (29 and 26%) it had a very high dead plant content (35%)

Results: Cattle Growth Rates

- Liveweight differences between treatments either at the start (179 kg) or at the finish (207 kg) were not statistically different.

- Both groups of bulls receiving Wairoa brassica initially lost weight; the worst period being the first week. By the end of the second week these bulls had recovered the initial loss.

- The overall mean growth rate over the period did not differ significantly:

    - Pasture only at 0.72 kg liveweight gain / day
    - Wairoa brassica only at 0.64 kg liveweight / day
    - Mixed diet at 0.68 kg liveweight / day

- In all treatments the liveweight gain peaked in the final week:

    - Pasture only at 1.9 kg / day
    - Wairoa brassica only at 1.1 kg / day
    - Mixed diet at 1.44 kg / day

- Feed conversion ratios:

    - Pasture only at 11.4 kg DM / kg LW
    - Wairoa brassica only at 3.3 kg DM / kg LW
    - Mixed at 8.2 kg DM / kg LW

Discussion

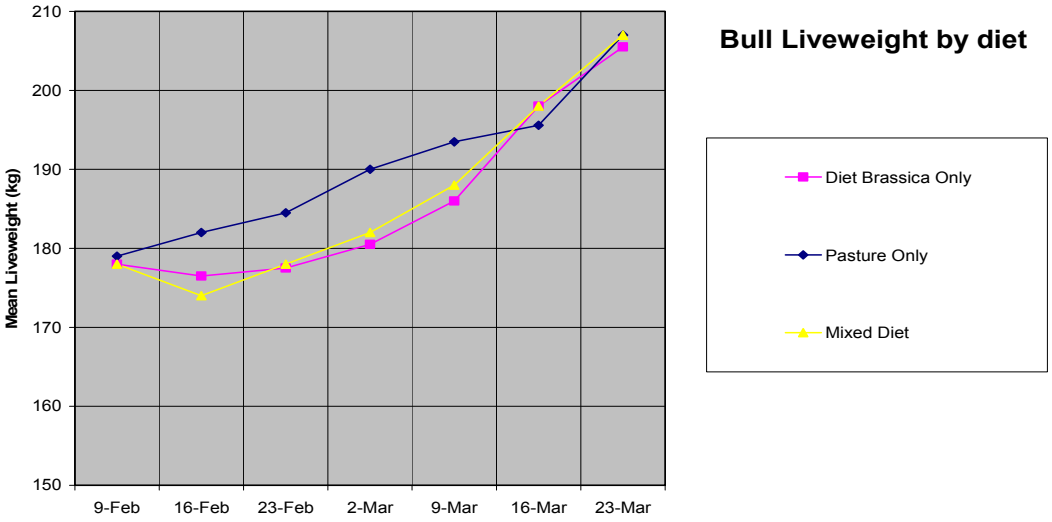
- Bulls showed a short term drop in weight loss (one week of losing weight and another week to make up this lost weight).

- There is little (or no) liveweight advantage in cattle given access to Wairoa brassica rather than pasture, for short periods: but this is based on an unrealistically high pre graze for pasture.

- There needs to be sufficient area of forage crop to ensure continued animal feeding for a minimum of six weeks.

- Other trial work found that the period of initial depression of liveweight gain can be eliminated if the brassica comprised 33% or less, of the total dry matter intake.

GRAPH



4.0 Kale and Fodder Radish Yields

Reference: *Summer crops of direct drilled kale and fodder radish to control Australian soldier fly.*

NZ Journal of Experimental Agriculture 1982, Vol 10 83-86.

R. Blank, Robertson, McMeikan, Piggot

Overview

- Data and comments below relate to yield of kale and fodder radish crops
- Both kale and fodder radish were successful in decreasing soldier fly larval population. This effect was one of the trial objectives

Trial

- Soil being Kiripaka bouldery silt loam
- Crops were direct drilled
- Pasture sprayed with glyphosate (2.5 kg/ha active ingredient) 6 days prior to drilling
- Drilled to 10-20 mm depth
- Drilled date 10th October 1979
- Urea (50 kg/ha of nitrogen) broadcast 20 days post drilling

Results

- Yield

Treatment	*Production t DM/ha October to January*
Control	3.2
Kale – mean	8.0
Fodder radish – mean	7.98

Results other:

- First cut from quicker maturing fodder radish was at 63 days after drilling
- Second cut from fodder radish and the first from the kale were taken at 97 days post drilling
- Trial area then grazed by sheep, then closed from grazing during February and March: but there was very little regrowth (not warrant harvesting)
- Conditions were good for brassica germination and establishment in October: warm temperatures and 170 mm rain over first 20 days maintaining soil moisture at 44% of soil weight
- Seedlings count at 20 days:
    - Fodder radish at 7 plants per metre of drill row
    - Kale at 5 plants per metre

.

Summary

- Pasture growth during trial period at 30 kg DM/ha/day average
- Forage crops more than double this at 70 kg DM/ha/day average

5.0 Sorghum Silage Crops

Reference: *Sorghums for conserved feed in Northland.*

A.O. Taylor, Rowley, Esson, Eastin and Wallace

Proceedings Agronomy Society of New Zealand Vol 4, 1974 page 74-78.

Overview Summary

- Forage and grain Sorghums for silage were grown on 3 Far North sites during a very dry season
- Established with a spray and direct drill process:
    - Clay loam (difficult site) failed to produce crops over 30 cm in height
    - Podzolised sand gave a yield of:
        - 10,300 kgDM/ha for forage Sorghum
        - 11,500 kgDM ha for maize silage
    - Raw peat gave yields of:
        - 22,700 kgDM/ha for forage Sorghum
        - 22,300 kgDM/ha for maize silage

Strong suggestion that Sorghums could be useful crops for silage on land that is marginal for maize production because of low water availability.

- Sorghum silage is high in energy (43% soluble carbohydrate) and low in protein (6%)
- Direct drilling gave successful establishment on sand and peat but there needs to be very good attention to weed and pest control
- Compacted clay and clay loams need to be cultivated

Introduction

Sorghums are drought tolerant, warm season plants originating from North Africa. Potential is to use them for silage to overcome feed deficient.

Method

- Trials during 1973-74: very dry season with just 50% of normal rainfall for October to March

- Sites and soils:

    - Cape View (north of Kaitaia) Te Kopuru sand with a pan at 1 metre, pH 5.7
    - Stoney Creek (Mangonui) clay laom, pH 5.6
    - Sweet water (Kaitaia) raw peat, pH 4.6

- Sites: sprayed (paraquet) and direct drilled

- Fertiliser: Urea at 112 kgN/ha drilled at planting. 630 kg/ha of 30% potassic super. 250 kg/ha sulphate of ammonia. High levels of insect protection for black beetle control (was successful). Post emergence weed spray gave poor results (dry period). No mention of any lime used

- Drilled 24-26 October, harvested 28th March

Results

- Establishment - Seed germination was variable on each site and between sites. Establishment was best on sand at 60% germination: clay and peat had variation between 20-50% for germination.

  Clay loam – strong growth of clover competed strongly for soil moisture. Root penetration in the tight clay was poor: roots tended to run along the base of the disc cuts left by the drill.

  Peat – a serious weed problem too. Seedling Sorghum growth was slow on the peat initially but as the soil warmed up in late November the sorghum seedlings overtopped the weeds and tillered strongly to fill up much of the poor initial establishment.

- Grain Yield – Grain yields average 41% of the grain sorghum total yield and 34% of the forage sorghum total yield of silage dry matter.

- Total Dry Matter Yield - Mangonui site – yields not given. With plants not growing above 30 cm this was basically a failure. Due to:
  - Very dry 6 month period but especially December and January at 36mm compared to normal 170mm.
  - Spray and direct drilling not producing good germination. (a soil type restriction).

- Sweetwater (peat site)
  The early maturing hybrids gave better yields than the later maturing hybrid (lack of rain in summer restricted these late-maturing hybrids from expressing their greater potential); this site had good soil moisture early in the growing season.

- TABLE 1: Total silage DM yields per hectare (1973-74)

Plant Type	Sweetwater - Raw Peat	Cape View - Podzolised Sand
Hybrid Grain Sorghums		
- early maturing	17,020	12,070
- mid maturing	16,500	14,250
- late maturing	13,280	12,750
- Mean Yield	15,770	13,020
Hybrid Forage Sorghums		
- early maturing	16,490	9,840
- mid maturing	23,940	8,560
- late maturing	20,480	11,800
- Mean Yield	22,730	10,310
Hybrid Maize		
- Mean Yield	22,300	11,550

- Cape View (podzolised sand) lack of soil moisture halved the yields of sorghum and maize compared to the peat.

- Maize and tall forage sorghums use more water during vegetative growth than do small grain types, so less soil moisture remains for grain filling which is a large and important (high energy content) component of yield.

  Gain yield of the forage sorghums at Cape View (very dry soil) average only 64% of the grain yield from the grain sorghum (being shorter plants).

  At Sweetwater (higher soil moisture) grain yield of forage sorghums was 120% of the grain yield of the grain sorghums.

  Comment: you need good/reasonable soil moisture.

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