Northland Pastoral Extension: Popular Summary

Pasture: Clover Growth & Management

NORTHLAND NATURALLY
FIRST REGION OF NEW ZEALAND

Sustainable Farming Fund

Summary of Key Findings

- Northland farms historically had high clover content in pastures, with good nitrogen fixation rates.
- Recent surveys have shown lower and disappointing clover performance.
- Reasons for the decline may include soil nutrient deficiencies, more cattle than sheep, therefore more pugging, high soil temperatures in summer and pests like soil nematodes, clover flea and clover root weevil.
- Alternative legumes have been trialled, including subterranean clover cultivars from Australia, without much success.

The good old days

Over two years in the mid 1970s, researcher John Rumball, DSIR Grasslands Kaikohe, established that annual totals of nitrogen fixed by legumes in an intensively managed pasture on a Wharekohe silt loam (podzol) in Northland were 368 and 392 kg/ha. The pasture produced 11.4 – 14.1 t DM/ha, of which one third was white clover. This was 10-year-old pasture containing Ariki perennial ryegrass, Apanui cocksfoot and Huia white clover and it was set-stocked with 19 ewes/hectare. It had annual applications of 500kg/ha potassic super along with lime (1t/ha) every three years and supplementary sulphur.

	Year 1974-75 (1)	Year 1975-76 (2)
Pasture Growth DM/ha/yr	14.2	11.5
Nitrogen Fixation kgN/ha/yr	368	392
Total Rainfall – mm	1797	1704

Maximum clover yield and nitrogen fixation was during the autumn months and peaked at 48% of pasture content, when about one-third of the annual nitrogen fixation occurred. These nitrogen fixation results were the highest recorded through the country during the 1970s.

Fast forward

The Clover 300 project in the late 1990s showed a major problem with very low nitrogen fixation levels on almost all of 14 Northland beef farms. Clover populations were poor, especially during spring months, soil fertility was not balanced, pugging occurred in wet winters, temperatures soared and soils dried out in the summer and autumn months and soil nematodes were present in high to very numbers. "Out-of-control" pasture in the spring was largely ruled out as a cause of clover problems.

Clover flea, though present, caused only minimal damage. The overall average for all farms for three years was 12% clover content.

Farm	Average of 3 years	Nitrogen Fixation (KgN/ha) 1996/97	1997/98	1998/99	Soil Type
Cookson	142	176	68	185	Podzol
Whitehills	128	118	94	175	Podzol
Upokorua	126		94	172	Podzol
Te Rangi	112	161	92	82	Podzol
Linssen	81	91	53	100	Clay
Beazley	77	57	49	124	Podzol
Brown	69	52	54	100	Clay
Appleton	69		44	94	Semi Volcanic
Owen	66	80	22	96	Clay
Dromgool	58		54	62	Sand
Burrill	55	65	36	65	Limestone
Hewlett	53	77	33	48	Podzol
Wagener	50	43	38	69	Peat/Sand
Snodgrass	46	62	29	47	Semi Volcanic
Group Mean	**81**	**90**	**54**	**102**	

Clover 300 Survey Results
Clover nematodes

Nematodes are very small worm like organisms found in our soils, ranging from less than 1mm in length up to 2mm in length. They are in all soils with total populations ranging between one million to 20 million per square metre. Most of these nematodes assist in the breakdown of organic matter and the recycling of soil nutrients. But some are parasitic and feed on clover and/or grasses. Because nematodes primarily affect root efficiency and abundance, their effects can add to those of drought and low soil fertility. A survey of 19 Northland farms in spring 2006 showed nearly 20% of the resident nematodes are plant parasitic, twice the level considered to cause only "minor" damage.

Legume content and vigour by nematode population:

Farm	Total Nematode Population	Plant Parasitic Nematode Number	PPN as % of Total	Legume %	Clover Vigour
Gunson	9728	3541	36.4	4	2.8
Dromgool	7463	821	11.0	7	3.0
Beazley	9345	1400	14.5	27	8.0
Kennett	7657	1463	19.1	28	7.3

NB: Nematode population per 250cc of soil sample; clover "vigour" on scale of 0 to 10, from extremely poor to superb.

It is not a practical possibility to eliminate plant parasitic nematodes from farm soils. However, an option is to operate a legume-free pasture for one to three years before re-establishing a perennial pasture which will have a white clover component and, it is expected, a much lower initial nematode population. Species such as chicory or plantain for summer and autumn production, plus adding short rotation ryegrass for the winter, spring period, can provide a highly productive feed system with a nil legume base, for a short–medium period.

Remember to treat your new clover well:

- A balanced fertiliser input,
- Avoid shading by grasses,
- Sow at a shallow depth,
- Use a maximum of 15kg/ha ryegrass seed,
- Restrict nitrogen to a minimum,
- Avoid or reduce pugging damage in winter-early spring when clover stolon growth happening,
- Use white clover cultivars with some tolerance to nematodes.

Clover root weevil

The clover root weevil (Sitona lepidus) (CRW) entered New Zealand probably in the early 1990s but was not detected until 1996, by which time it had spread over 200,000 ha and containment was impossible. When CRW arrived, it found an environment free of diseases and predators, rich in its preferred food source (white clover) and unlimited population growth was the result. After several population booms and crashes, pastures end up with permanently lower clover densities compared to pre-CRW levels. Up to three generations per year can be expected in Northland, where in 2002-03 CRW slashed clover contents from 30% in pasture to 5% or 10%. Current estimates are that CRW is costing NZ pastoral farming about $150 million annually, which could rise to $500 million before it comes under biological control. The Irish parasitic wasp Microctonus ("little murderer") aethiopoides was released in the Bay of Islands in December 2006 and is now spreading with the CRW population.

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A project co-ordinated by the Northland Pastoral Farming Development Group.
The complete research stocktake on Clover Growth and Management in Northland is on the Enterprise Northland website: www.enterprisenorthland.co.nz