

**Lime Research
in Northland
over the past 10-15
years
and how it has been
useful
to the industry.**

Authors

M.B.O'Connor¹, B.J.Hunt², B.Bellingham³

¹ AgResearch, Ruakura. PO Box 3123, Hamilton

² Northland Pastoral Research Ltd, Whangarei

³ Northland Lime Millers Association Chair, PO Box 144, Kaitaia

What is lime and why is it useful

Ground limestone consists of calcium carbonate and a variable proportion of clay or silt. Its main function when applied to pasture or cropping land is to raise soil pH. A change in pH affects a number of soil properties. It alleviates aluminium and manganese toxicity, makes phosphorus, nitrogen and molybdenum more available to plants, supplies calcium and improves soil moisture. Too much lime and too high a pH can affect the availability of boron, zinc and iron. Ideally soils need to be in the range of 5.8-6.2.

Lime production in Northland

Lime production for agriculture in Northland over the 1999-2003 period is shown in Table 1.

Table 1. Lime production for agriculture in Northland (tonnes), 1999-2003

1999	2000	2001	2002	2003	Mean
290,000	301,000	338,000	564,000	430,000	385,000

This lime is produced from 15 lime works in Northland 11 of whom belong to the Northland Lime Millers Association. In addition to lime for agriculture Northland produces an average of 887,000 tonnes a year for the cement industry and 48,000 for industry.

How is lime processed

Lime is blasted or ripped from a quarry and milled to a particle size range which ideally has >50% less than 0.5mm and <5% greater than 2mm. The lime is stored under cover until it is trucked out to the farm and spread, normally by contractors. It is also flown on using fixed wing planes. The tests used as a quality control measure are (1) a chemical test of the CaCO₃ content and the liming value and (2) a particle size analysis to maintain the particle size range as above. This range is chosen to give a balance of quick acting fine lime and a slower acting coarser lime. Generally liming is recommended every 3 to 4 years at 2.5-3 t/ha but can also be done more often at lower rates of application.

Mining lime versus mining other aggregates

There are similarities. There is similar equipment e.g. screening plants, crushing plants and a similar end result of producing a product to specification. Where it differs is that aggregates are produced for a client like a District Council or a roading contractor who requires a fixed quantity at a certain time whereas lime is produced for a farmer who has to decide when he wants it and how much he might want.

Importance of research

Lime is an accepted product for applying to pastures and crops. Because the farmer is the client research is seen as being very necessary in the process of confirming to the

farmer the principles of lime usage, assuring him of its quality and demonstrating responses in different situations through field trials and backup laboratory analyses.

How is the lime research funded in Northland

Essentially the research is funded by the Northland Lime Millers Association through a levy placed on every tonne of lime produced. Currently this levy is 5 cents/tonne lime processed. Further funding has been obtained from the Hine Rangi Trust, a Northland charitable trust which supports Northland agricultural projects. A typical annual figure for research provided by the Northland Lime Millers Association is \$15,000.

What is some of the research that has been done

Some examples of the research done over the past 10-15 years and what it means is shown in the following examples.

Throughout the period Mike O'Connor from AgResearch Ruakura conducted the research using technical assistance from Brian Hunt in Northland. AgResearch is very much seen as an agricultural research organisation and is well respected by the farming community. It undertakes independent research for a number of organisations.

Kamo trial

Period of study 1990 to 1995

Undeveloped land, initial pH 4.8.

Applied various rates of lime and superphosphate.

Results (Figure 1) indicated a marked response to lime and superphosphate with an optimum pH of 6.0.

Figure 1 Kamo – pasture production year 3

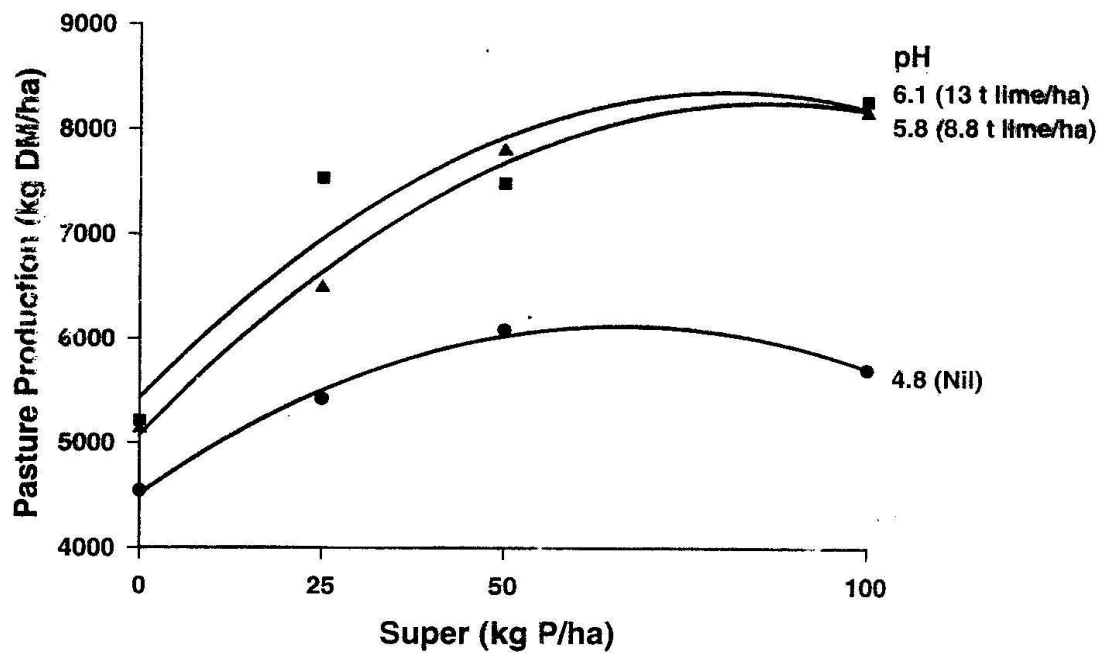


Figure 1 Pasture production in the third year

Waiotira Trial (1)

Period of the study: 1991 – 1995

Developed hill country, low fertility. pH 5.6

Applied various rate of superphosphate and one rate of lime.

The aim was to show the benefits of lime and superphosphate on pasture production. Results indicated a marked response to lime and superphosphate. Without lime the response to superphosphate was minimal.

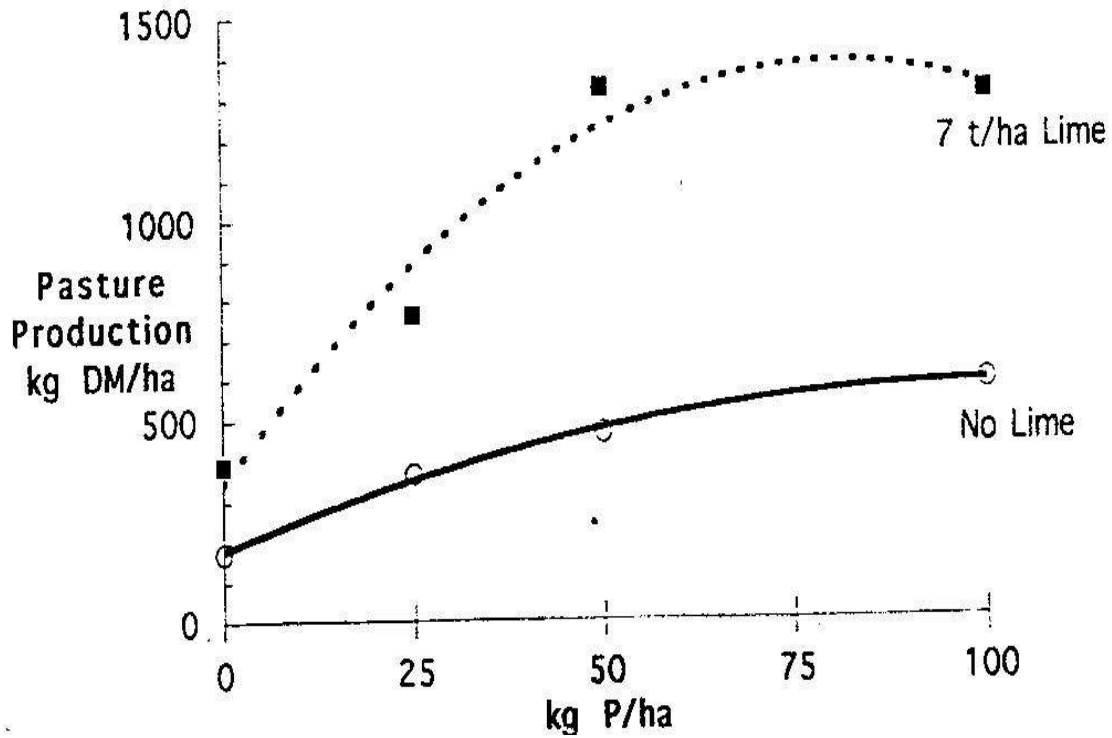


Figure 2 Pasture production with and without lime with various rates of super

Waiotira Trial (2)

Period of study: 1993-'95

Various rates of lime applied from low (0) to high (6t/ha)

Developed hill country, low fertility. Initial pH 5.3

The aim was to identify when lime responses occurred throughout the year and the ideal pH.

Results indicated a lag phase before the lime worked due to dry conditions but then a marked seasonal difference with responses greatest in the autumn/winter/early spring (Figure 3).

Figure 3 Pasture responses to lime in throughout the year over 3 years

The trial also clearly indicated (Figure 4) that the quicker the pH was raised to 6.0 – 6.2 the better in terms of pasture production. Low rates of lime applied annually were not as beneficial as larger once only applications because they had little effect on pH (Figure 5).

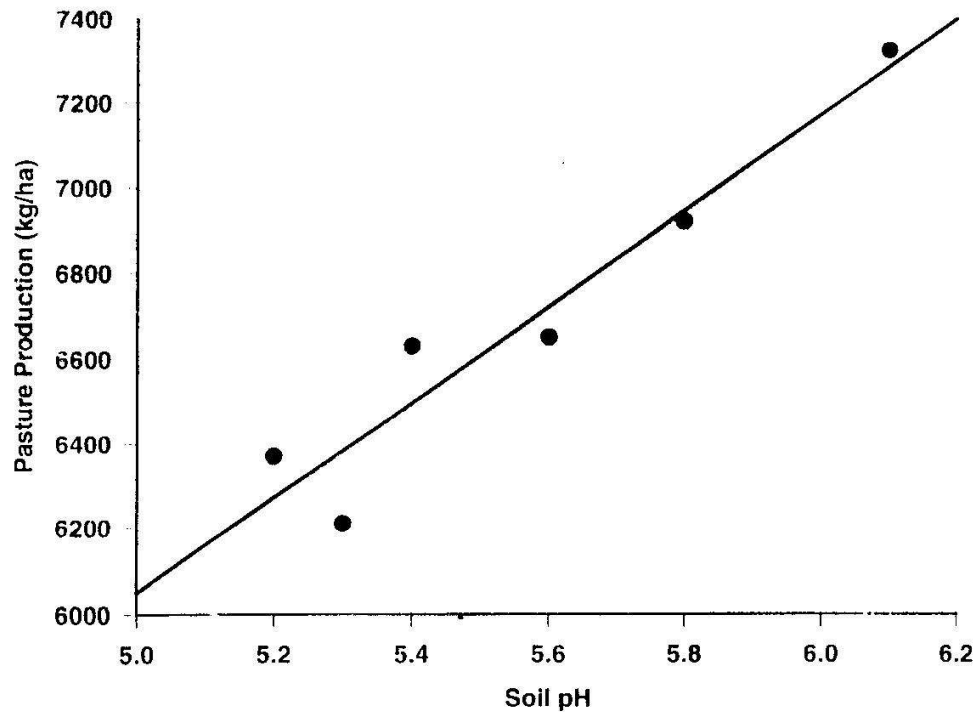


Figure 4 Pasture production relative to soil pH

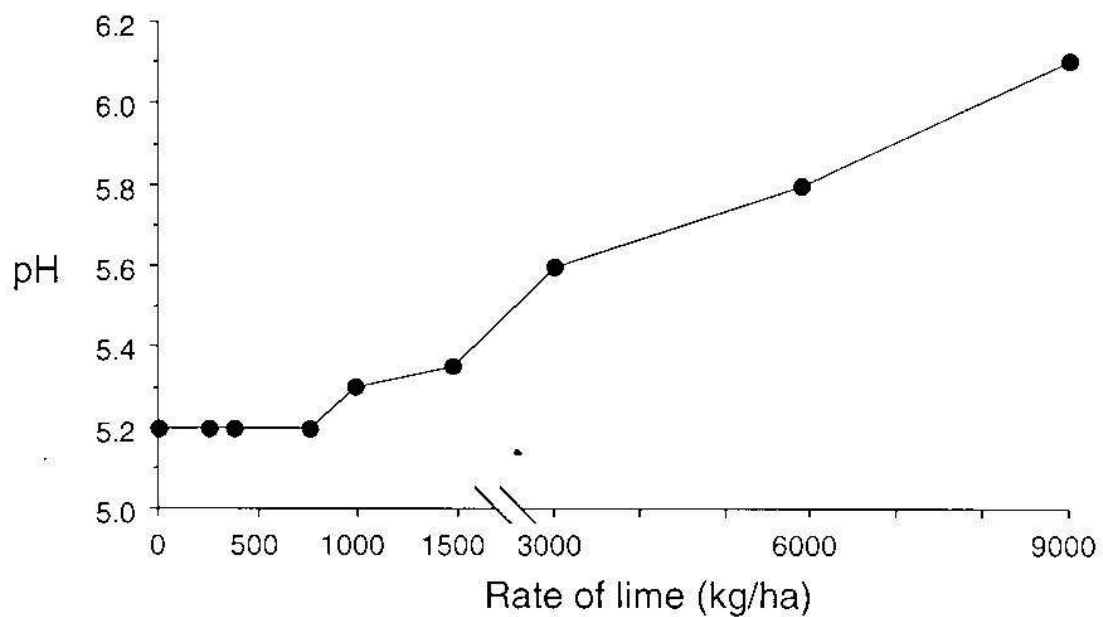


Figure 5 pH changes to various rates of lime

Ruawai Trial

Period of study: 1996 – 2004

Well established pasture with initial pH of 5.9

The aim was investigate farmer's claims that lime was increasing pasture production even when the pH was near optimum.

Results indicated that lime was having a “P sparing” effect on these particular soils—the Kaipara clays (Figure 6). In other words as a result of a growth benefit to lime (later identified as an N response) the plant roots were able explore a greater area and take up more of the native P in the soil.

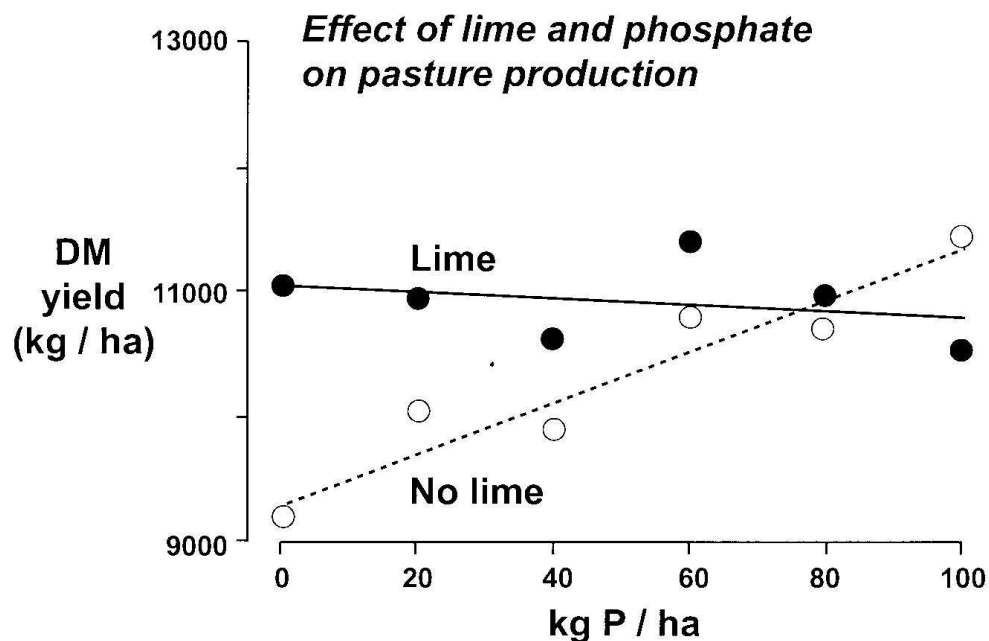


Figure 6 Effects of lime and superphosphate (kg P) on pasture production on the Kaipara clay near Ruawai.

How has the research been used

There have been various publications produced by the Northland Lime Millers Association on the research results obtained. A major publication was produced in 2001 called “Lime –the essential element in New Zealand agriculture.” This is a 47 page document which covers all aspects of lime including the Northland research. Approximately 10,000 copies of the publication were produced and distributed. The Ravensdown Fertiliser Company for instance purchased and distributed copies to all their clients. A further publication “Lime trials in Northland over the period 1990 -2003” was produced in 1994 and distributed to farmers in Northland. In addition there have been seminars and farmer discussion group meetings highlighting the trial results.

What has been the outcome of the research

The research (which continues) has resulted in a greater awareness by farmers and consultants in Northland of the value of lime.

- It has resulted in a better understanding by lime millers of their product leading to better promotion of lime
- It has heightened awareness amongst lime millers of the need for on-going chemical and physical testing of their lime. A number are now doing this.
- It has resulted in increased interest from lime millers in other areas of the country
- It has led to a heightened credibility for lime millers (and lime) from farmers and others which to an extent has led to better product sales (Table 1).
- We believe other aggregate produces could consider a somewhat similar approach as a means of promoting their industry, gaining support in their local area and perhaps a heightened credibility with their clients.

Acknowledgements

Thanks is due to members of the Northland Lime Miller's Association for their interest and participation in the research programme.

Particular mention should be made of stalwarts like Jim Manderson, Don Bellingham, Don Frazer and Sandy Simes who were instrumental in getting the Northland Lime Millers Association formed and the research programme underway.

Thanks is also due to the farmers on whose properties the research was done.