AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

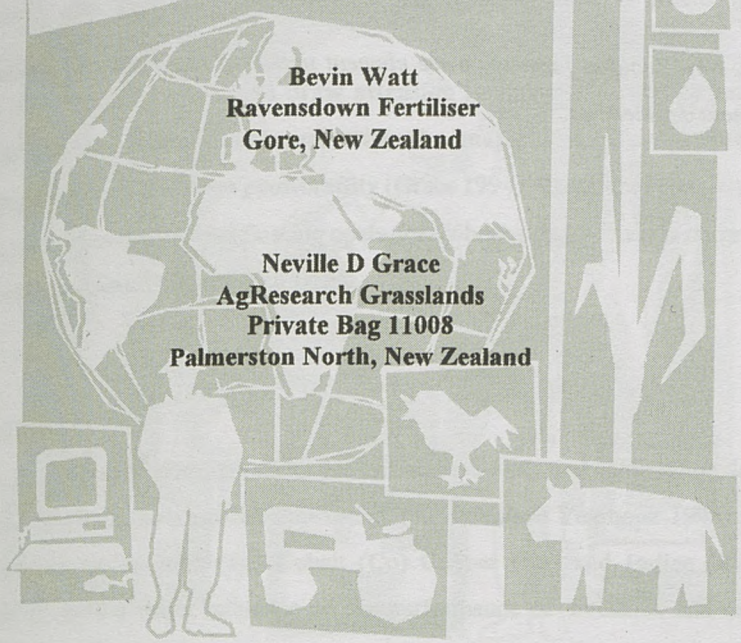
Paper to The International Farm Management Congress, Durban, South Africa,
19th July 1999.

12TH CONGRESS

"PROACTIVE MONITORING VERSUS A NON PLANNING APPROACH TO ASSESS THE TRACE ELEMENT STATUS OF GRAZING RUMINANTS IN NEW ZEALAND"

Bevin Watt
Ravensdown Fertiliser
Gore, New Zealand

Neville D Grace
AgResearch Grasslands
Private Bag 11008
Palmerston North, New Zealand



IFMA '99

think globally
farm locally

ABSTRACT

Trace element deficiencies are an important problem which influences livestock production in New Zealand. Protocols to diagnose trace element deficiencies and long term strategies to prevent the deficiencies have been established based on information obtained from on-farm research. ***There is a need to educate and advise farmers in trace element nutrition in order to improve the profitability of livestock farming.***

Keywords: New Zealand farming, trace element nutrition, diagnosis and prevention of trace element deficiencies.

INTRODUCTION

Many farmers seem unaware of appropriate protocols to determine the animal health trace element status of their flocks and herds. This means that too frequently they become vulnerable to ineffective services and products. As consultants our responsibility is to guide farmers in the direction of scientifically established protocols to assess the trace element status of their livestock.

In this enlightened age it seems odd that we have so much technical knowledge yet it is so frequently said, particularly by scientists that, what we need, is greater transfer of technology to the farmer.

The purpose of this paper is **to draw attention to these scientifically established protocols and to promote their use with the major aim of improved animal performance and greater farm profitability** (Grace 1994). To achieve this purpose I will be using practical examples from farming operations where a major study is currently being carried out in the South of the South Island.

BACKGROUND

New Zealand has 47.4 million sheep 4.9 million beef cattle and 4.23 million dairy cattle all of which graze out-doors all the year round. (New Zealand Yearbook 1998).

Deficiencies of Selenium (Se) Cobalt (Co) Copper (Cu) and Iodine (I) can, and frequently do, have a major influence on the performance of livestock and can impact markedly on farm profitability and, as 51% of New Zealand's Gross National Product is dependent on agriculture, the New Zealand economy in general. On the other hand the cost of trace element supplementation to grazing animals is expensive. So whether it is the loss of production or the cost of supplementation, the need to accurately diagnose particular trace element deficiencies is critical. Once diagnosed a cost effective trace element supplementation strategy can be implemented to prevent the adverse impact of the deficiency and to enhance animal performance and farm profitability.

At this point a word of caution. For some time I have been aware that some farmers view the application of trace elements with a degree of mystique. This view can soon be strengthened by sales people who deal with unscientifically supported products in perhaps more aptly described as potions! Too many farmers it seems are willing to spend their hard

earned money on products of dubious merit in the naive and desperate hope that one or more trace elements will dramatically increase production and be their economic saviour!

While the above products are sometimes partly effective it behoves all of us as professionals to openly discourage this hit and miss approach of preventing trace element deficiencies.

Good animal health results when animals are fed liberal quantities of forages that contain adequate amounts of all nutrients including trace elements. These animals also need to be free from disease.

In other words the prevention of trace element deficiencies is just one part of an overall animal health programme that should be implemented on farms.

I work as a Field Officer for a major New Zealand fertiliser company the mission of which is to provide farmers with appropriate supplies of nutrients (major and minor) to ensure optimal plant growth (dry matter production). This in turn will provide pastures of high nutritive value for optimum animal health and performance. As farming is a business farmers need to obtain a maximum return on their investment.

The challenge to us as consultants is to provide correct information and to implement appropriate protocols from soil testing procedures, plant analysis, blood and liver sampling to ensure the biology of the farm can be managed for profitability and sustainability. Today there is no place in farming for hearsay and unproven products.

PROCEDURES TO ASSESS THE TRACE ELEMENT STATUS OF GRAZING LIVESTOCK

From research carried out in New Zealand in the last several decades dietary nutrient requirements have been determined and many aspects of trace element metabolism have been studied. This information is now being used to diagnose and prevent trace element deficiencies. The trace element status of grazing animals can be assessed by collecting pasture samples during autumn and spring to determine Se, Co, Cu and I concentrations.

This is also coupled with the collection of blood and liver samples for the determination of Se, Vitamin B12, (Co) and Cu concentrations.

Criteria based on tissue trace element concentrations are then used to diagnose trace element deficiencies *(Table 1)*.

Table 1: **Criteria used to Determine Trace Element Deficiencies**

			Deficient	Adequate
Cobalt				
Serum	Vitamin B_{12}(pmol/L)	Sheep	<336	>500
		Cattle	<75	
Liver	Vit. B_{12} (nmol/kgFW)	Sheep	<280	>375
		Cattle	<75	>220
Pasture	(mg/kg DM)	Sheep	<0.08	>0.1
		Cattle	<0.04	>0.06
Selenium				
Blood	(nmol Se/L)	Sheep	<130	>250
		Cattle	<130	>250
Liver	(nmol Se/kg FW)	Sheep	<250	>450
		Cattle	<600	>850
Pasture	(mg Se/kg Dm)	Sheep	<0.02	>0.03
		Cattle	<0.03	>0.04
Copper				
Blood (serum)	(nmol Cu/L)	Cattle	<4.5	>8.0
Liver	(nmol Cu/kg FW)	Sheep	<65	>95
		Cattle	<45	>95
Pasture	(mg Cu/kg DM)	Sheep	<4.0	>5.0
		Cattle	<6.0	>9.0

These criteria have been established from trace element supplementation animal response studies in on farm situations.

The studies entail dividing 60-80 young sheep into two groups of 30-40 animals. One group was then supplemented with Se or Vitamin B12 and the growth rates compared to the other untreated (control) group over a 4-5 month period. If the growth rate of the treated lambs was significantly greater than the control animals then a Se or Co deficiency has been detected. This animal response to Se and/or Co was then related to blood, liver and pasture Co and Se element concentrations (Clark et al 1985). The data for Cu has been collected from detailed studies on growth and reproduction in cattle and field observations of clinical signs such as nerve disorders (enzootic ataxia - Swayback) and bone disorders that predisposes lambs to fractures (Grace 1994).

12TH CONGRESS
www.think globally farm locally

The signs of sub clinical I deficiency include a decrease in lambing percentage and an increase in neonatal mortality (Sargison et al 1997) while in severe I deficiency, goitre is readily observed.

As these above dose response trials are labour intensive, costly and time consuming then it follows that the criteria based on animal and plant tissue Co Se and Cu concentrations are an effective and convenient way to assess trace element status of grazing livestock.

Converse to the above we find that many farmers unaware of the usefulness of these studies and established criteria will implement inappropriate investigations rather than scientific trials.

While we must applaud the open mind of experimentation that these farmers exhibit we must also be aware of the reality that these attempts to measure animal responses are often ill founded and usually inconclusive because of inadequate experiment design and procedures. We must not however overlook the value of intelligent farmer observation.

SUPPLEMENTATION STRATEGIES TO PREVENT TRACE ELEMENT DEFICIENCIES

It is often said that for every problem there is a solution. The challenge however, can often be to **find** the solution. We are fortunate that there are a number of approaches to prevent trace element deficiencies. Recent developments in animal remedy technology has brought about the advent of low labour input trace element supplements. Examples are the single injection of long acting Vitamin B_{12}, Se and I. These will raise the status of these elements for 8 to 12 months or longer.

This technology comes at a cost but weighted against this is a very effective and labour saving method.

Other simpler approaches such as salt blocks containing trace elements, and drenches with trace elements are cheaper but are far less effective in ensuring adequate intakes of trace elements for productive animals.

think globally farm locally

OPTIONS FOR TRACE ELEMENT SUPPLEMENTATION

Cobalt

* Long acting injectable Vitamin B_{12}
* Water soluble injectable Vitamin B_{12}
* Co in fertiliser if the soil Mn does not reduce the Co intake by plants
* Intraruminal Co bullet

Selenium

* Long acting injectable Se as $BaSeO_4$
* Se in fertiliser
* Intraruminal Se bullet

Copper

* CuO needles
* Cu injection
* Cu in fertiliser

Iodine

* I drench every 4 to 5 weeks
* Iodised oil injection
* Potassium Iodate pasture spray

As the economic pressures in New Zealand farming continue to increase, the need to carefully consider options of supplementation, become more critical. The use of new high-tech animal remedies are likely to play an increasingly important role.

CONCLUSION

Decision making with the use of trace elements is a bit like a garden all cleared and ready to plant. Unless we seek appropriate advice and get on and plant it out then weeds will quickly come in and take over.

We all must resist the temptation of hearsay despite the popularity of case studies and success stories. Each property can be different in terms of the trace deficiencies of its livestock so it is **important to systematically assess the trace element status of livestock**

12TH CONGRESS IFMA '99 think globally farm locally

by using the expertise of others, procedures and criteria that have been scientifically established and validated.

The implementation of appropriate supplementation procedures will have a profound effect on enhancing the profitability of individual enterprises.

The role of consultants is to understand the procedures involved, to use the specialist knowledge of scientists and veterinarians, and to communicate the value of good science and farm management to their client base. This will be to the benefit of our farming community as a whole.

REFERENCES

Clark, R.G., Wright, D.F., Millar, K.R. (1985); A proposed new approach and protocol to defining mineral deficiencies using reference curves. Cobalt deficiency in young sheep is used as a model. New Zealand Veterinary Journal 33 : 231-237

Grace, N.D. (1994) Managing trace element deficiencies. AgResearch, Palmerston North, New Zealand.

New Zealand Official Yearbook 1998.

Sargison, N.D.; West, D.M.; Clark, R.G. (1997)

An investigation of the possible effects of subclinical iodine deficiency in ewe fertility and perinatal lamb mortality.

New Zealand Veterinary Journal 45:208-211

12th CONGRESS

IFMA '99

think globally
farm locally