

Mineral nutrition of dairy cows: can you have too much of a good thing?



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How much minerals should be fed?



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University

Requirements based on the net required for:

Maintenance

Lactation

Growth

Foetus

- Converted to a dietary requirement (per d or per kg DM) by an absorption co-efficient
- Coefficient is low for many minerals (e.g. 5% Cu, 20% Zn)

How much minerals should be fed?



Requirements based on the net requirement for:

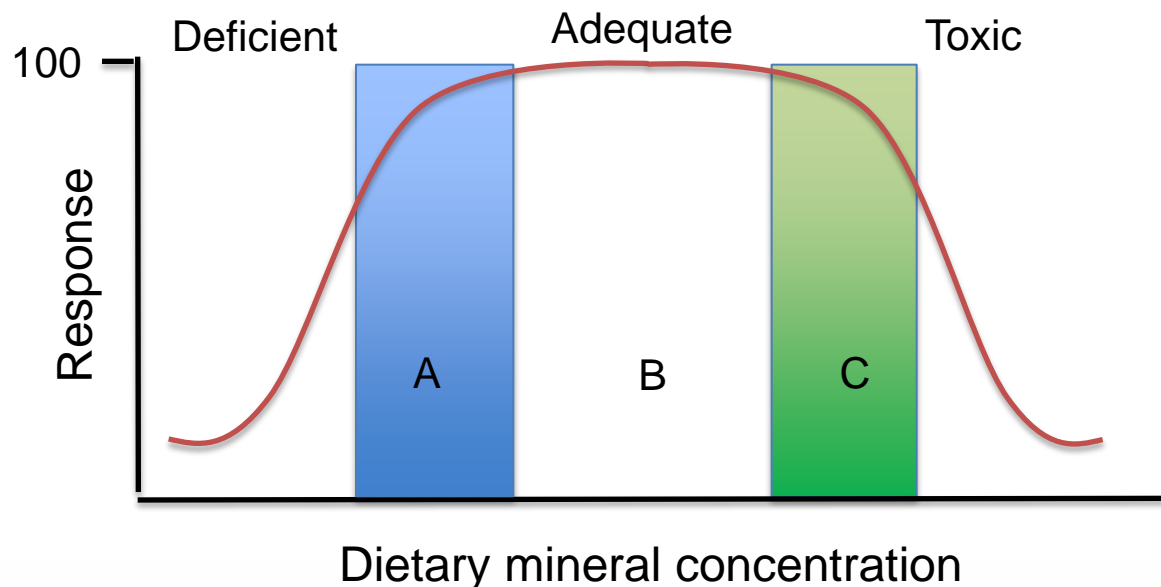
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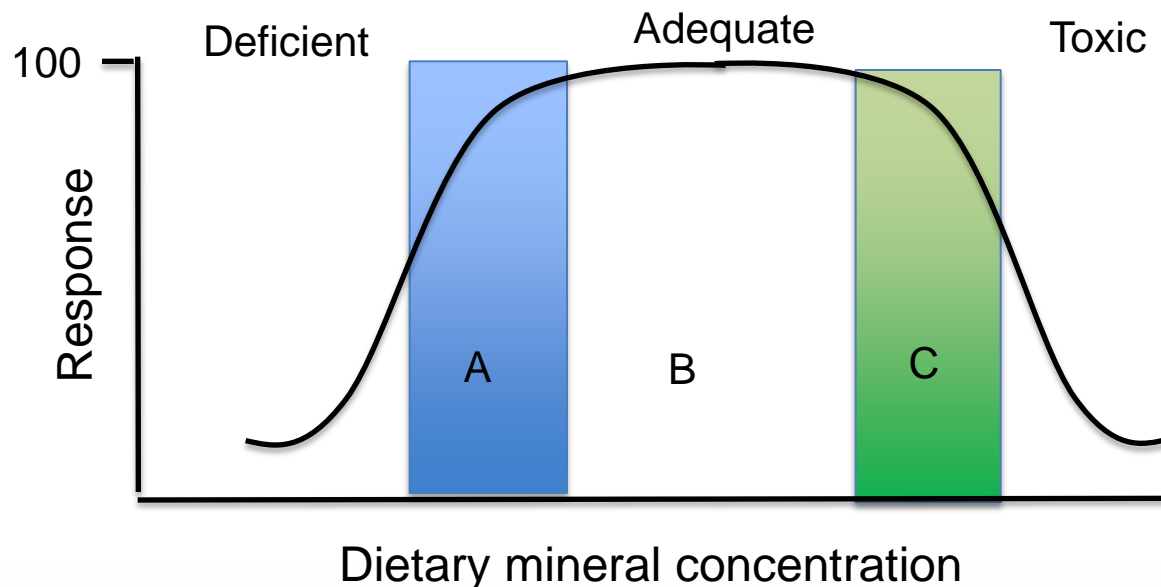
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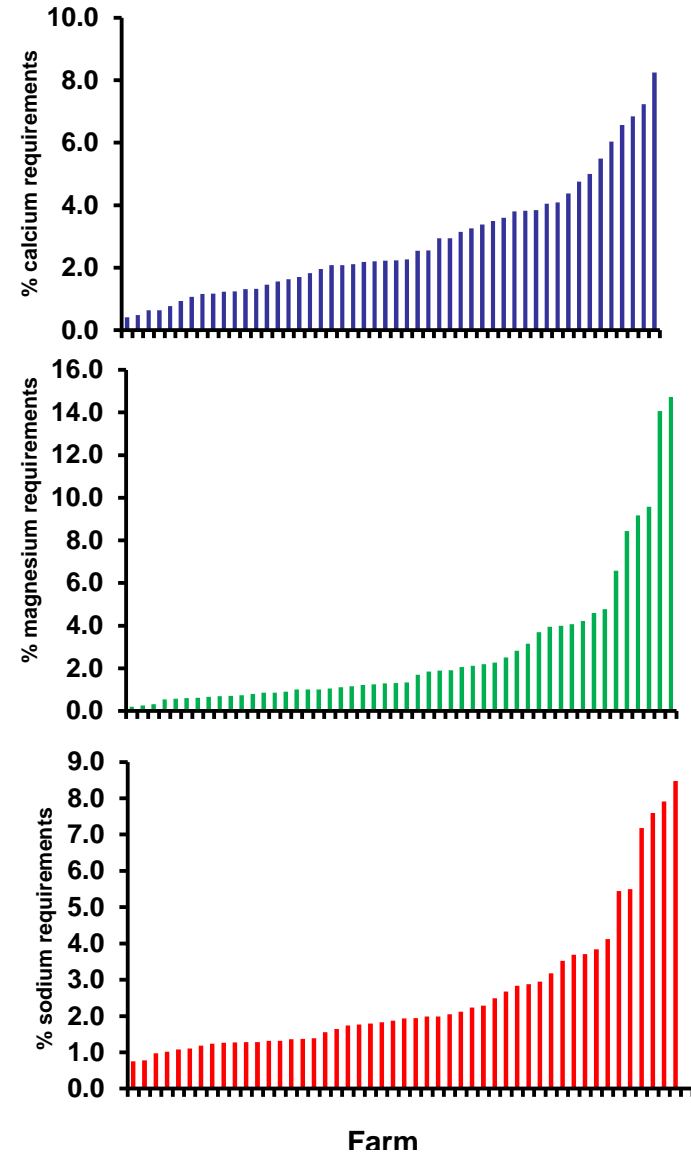
- 50 herds sampled between Nov 2011 and March 2012
- Average herd size = 245 cows and yield of 7982 kg/cow
- Samples taken of TMR for lows and highs, dry, parlour concentrates, forages and water
- Details collected on supplementary mineral sources and levels.



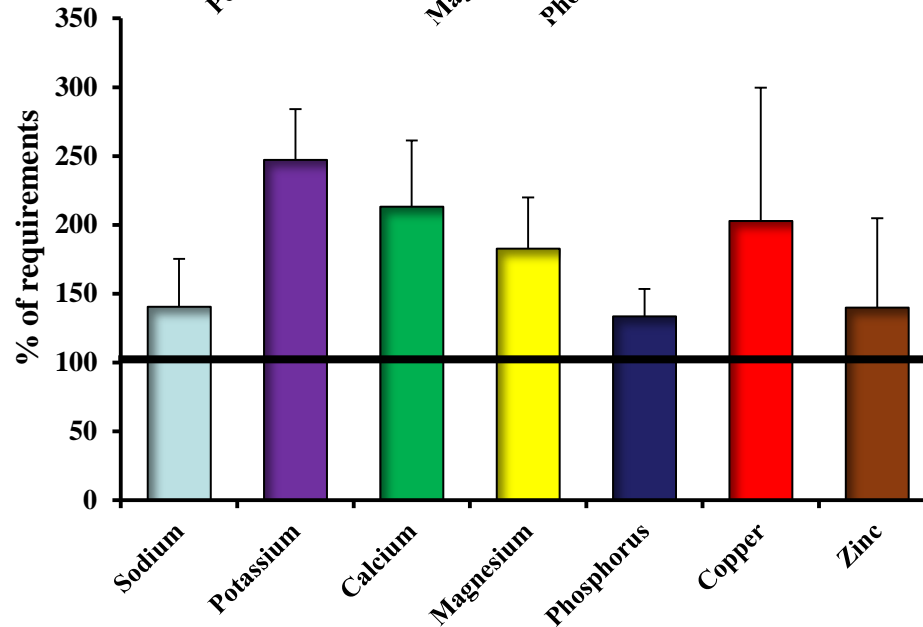
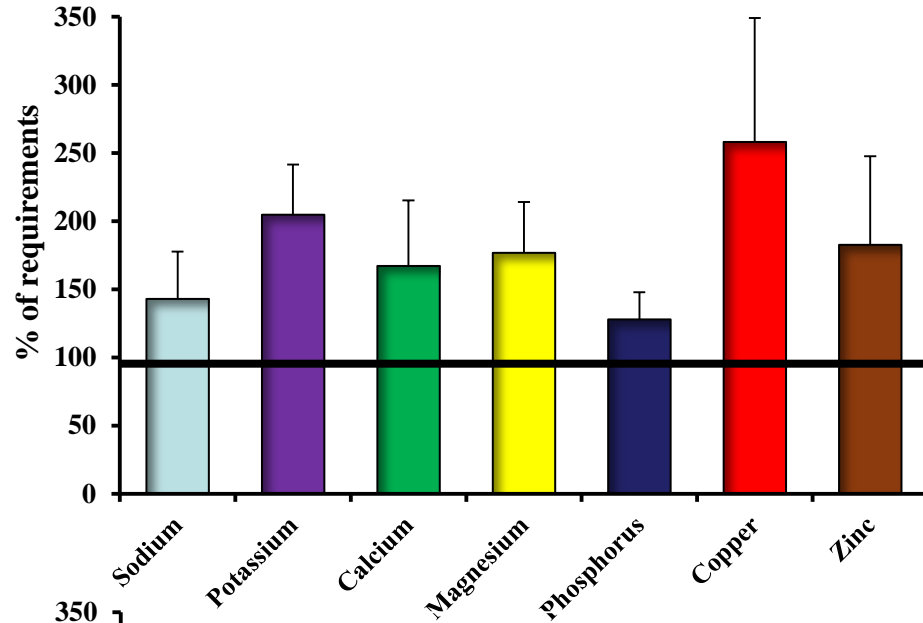
Additional supply of minerals through water



- Mineral content of water varied considerably
- Up to 8% of Ca reqmnts could be through the water
- Up to 15% of Mg could be through the water
- Up to 9% of sodium could be supplied through water



Typical winter mineral feeding levels

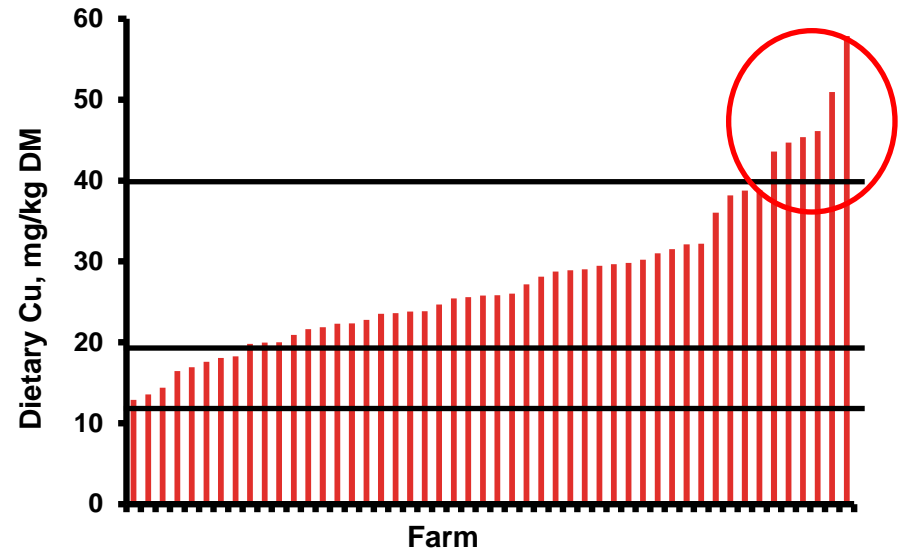




Cu feeding levels

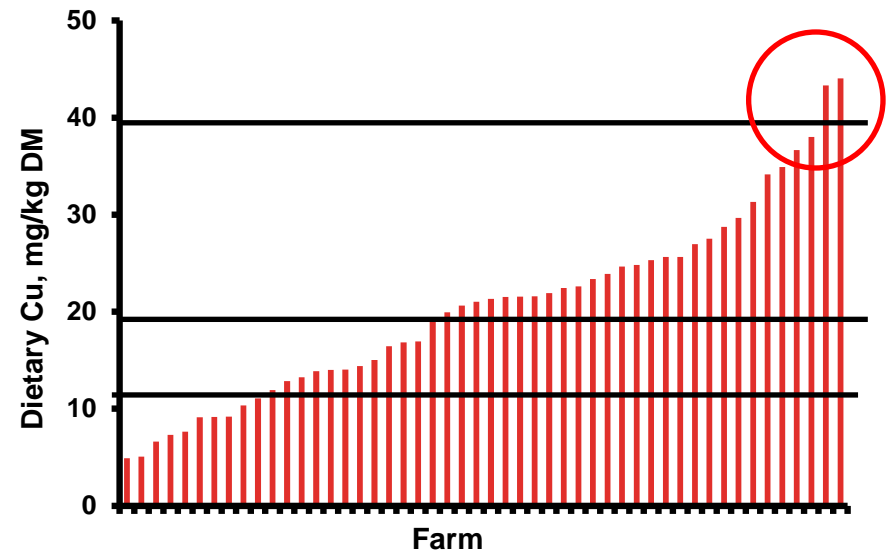
In early lactation:

- 6 out of 50 herds feeding above 40 mg/kg DM
- 40 above 20 mg/kg DM



In late lactation:

- 2 out of 50 herds feeding above 40 mg/kg DM
- 27 above 20 mg/kg DM

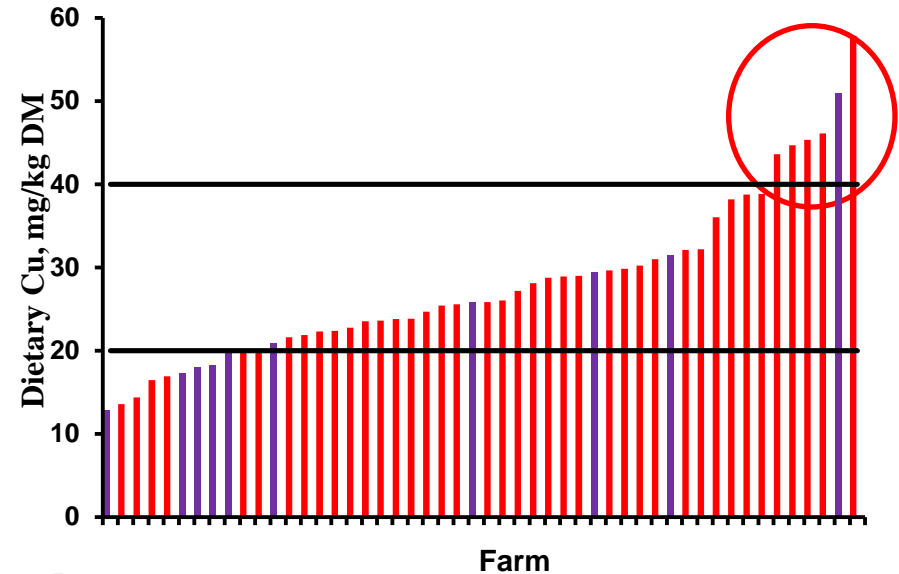




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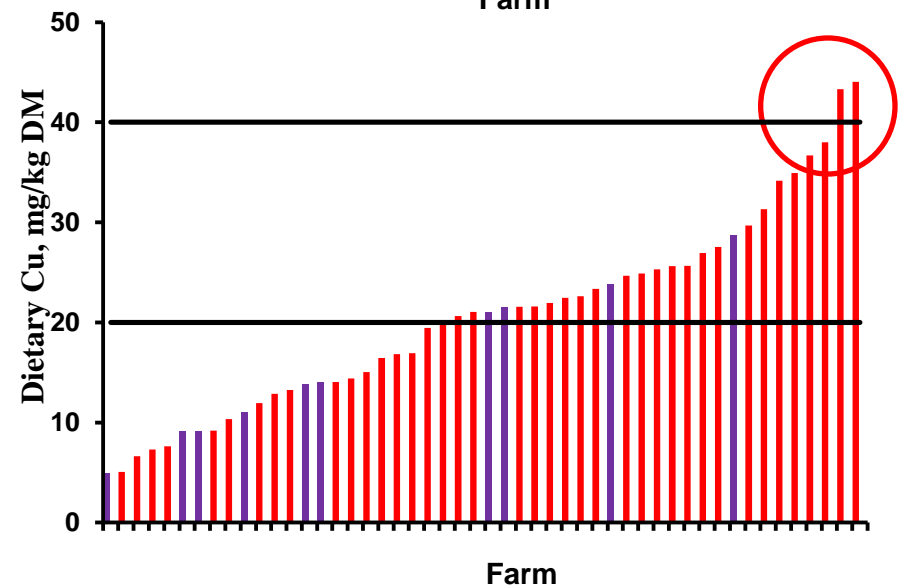
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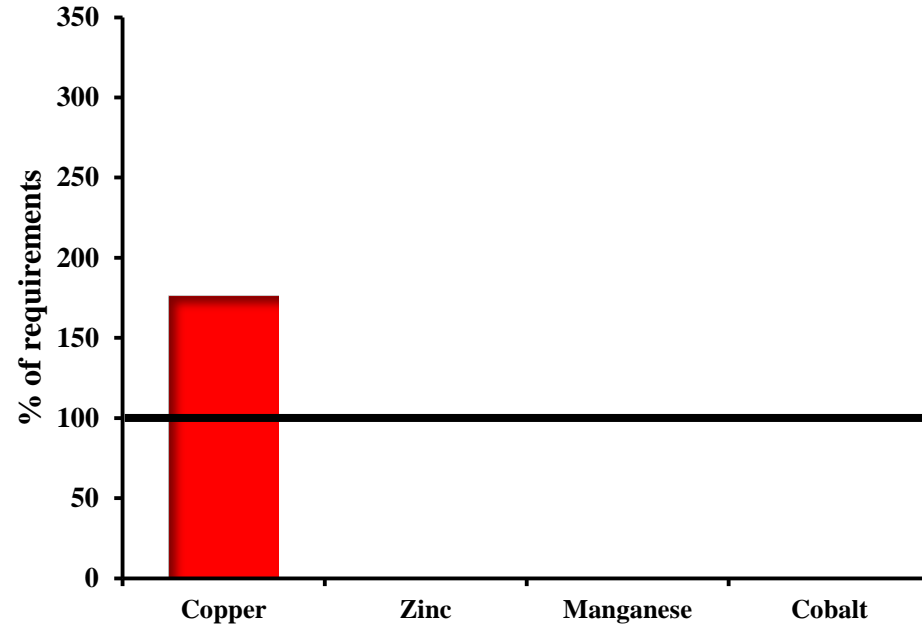


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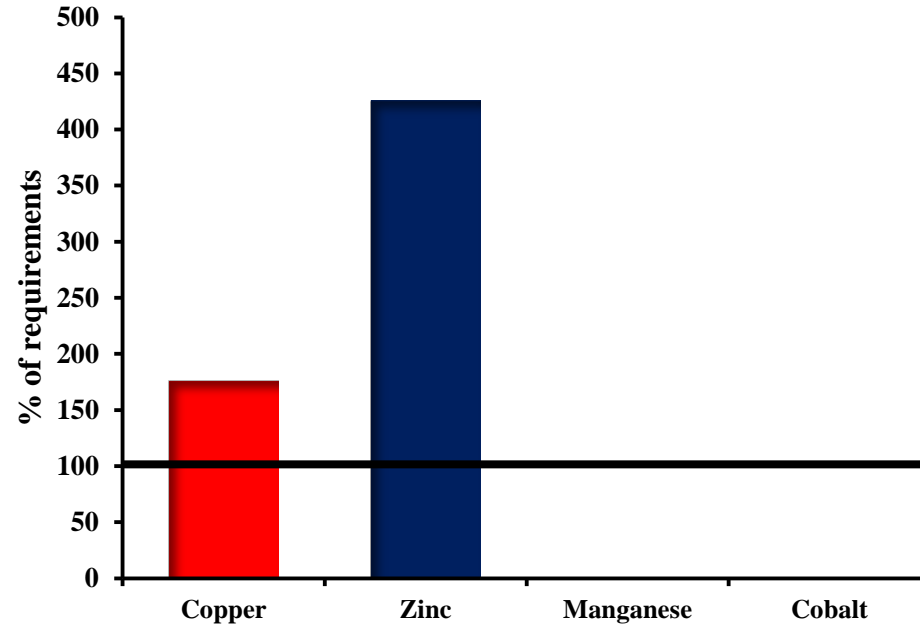


Mean dry-cow trace mineral feeding levels



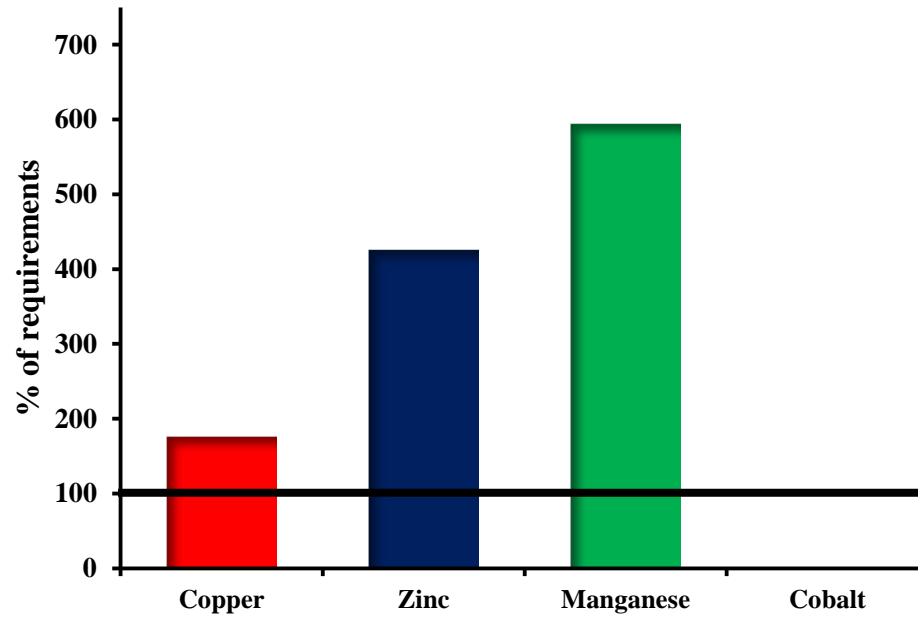


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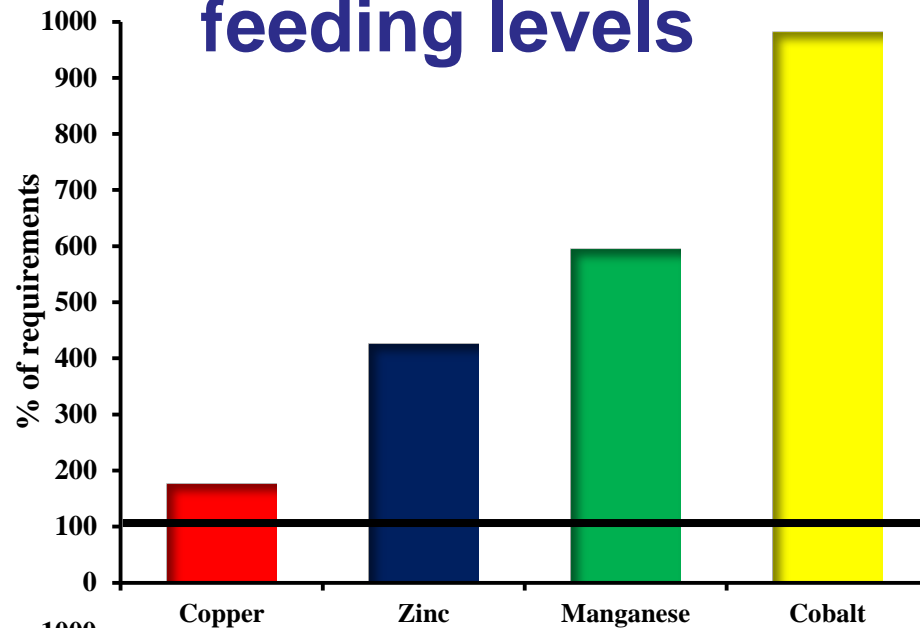


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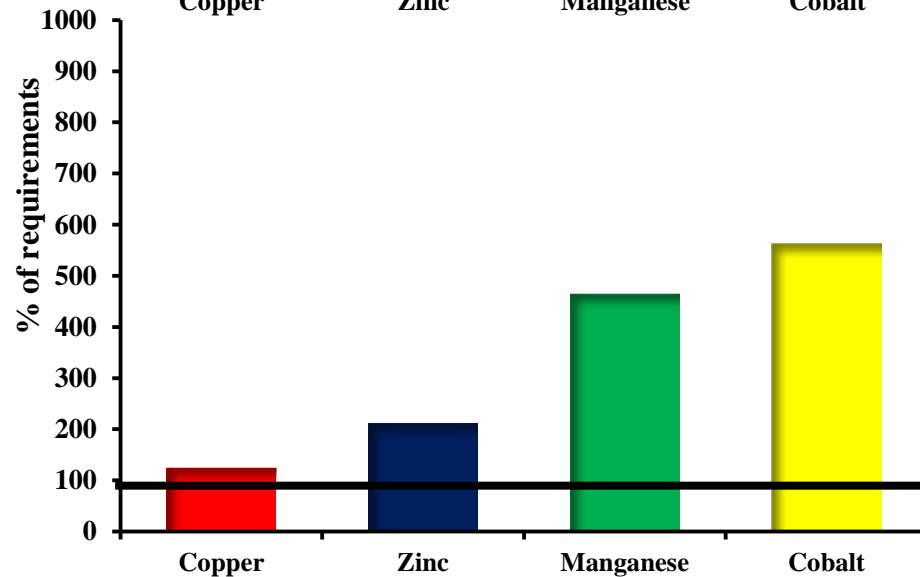




Mean dry-cow trace mineral feeding levels



All farms

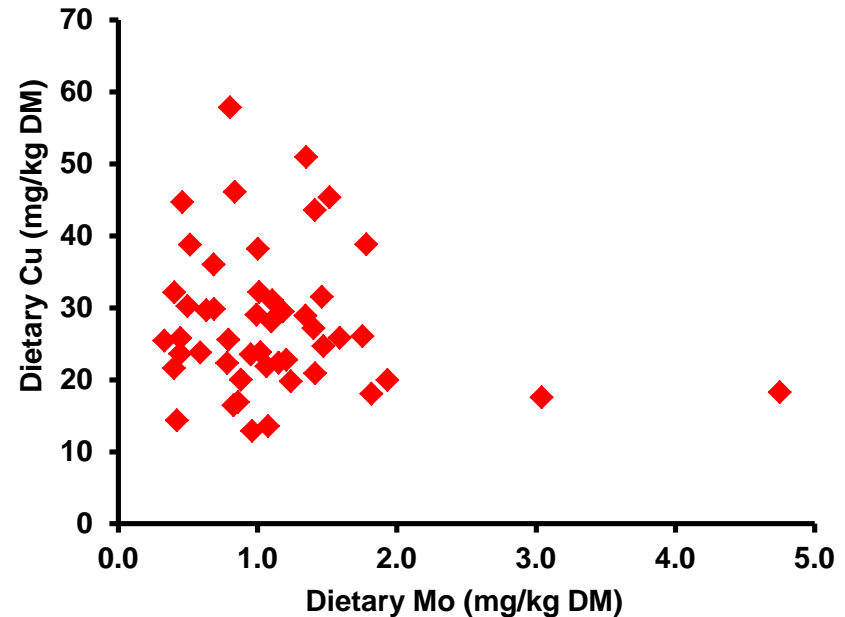


Organic farms



Diet Mo and Cu conc

- Few farms are feeding too little Cu
- Cu can be locked up by antagonists, justifying a higher feed rate
- No relationship between dietary Mo levels and Cu concentration in diet
- Herds with lowest Mo concentrations were feeding the highest Cu

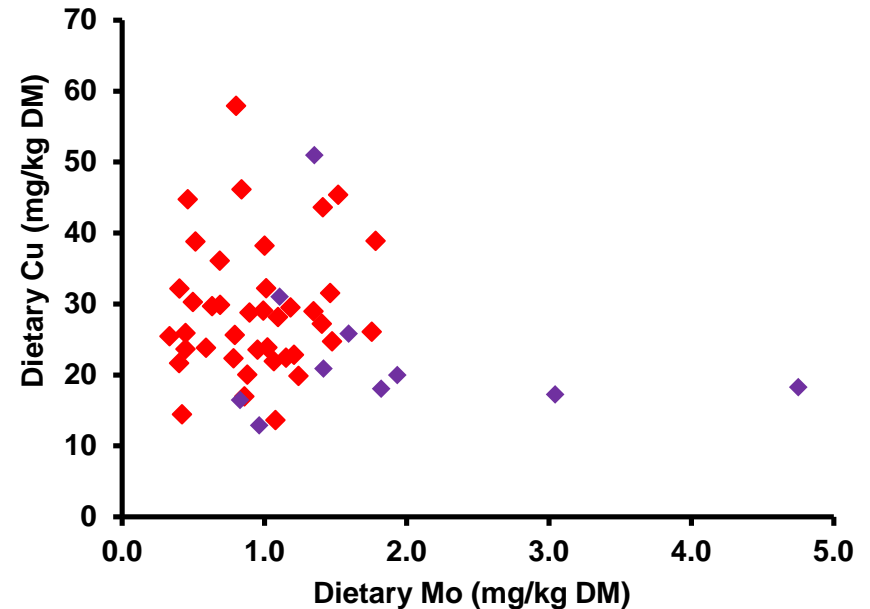


Sinclair & Atkins (2013)



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Effect of forage source and high Mo and S on cow performance and Cu status

- Cows fed maize silage or grass silage based diets
- Supplemented with Cu to result in 19 mg/kg DM
- Without (-) or with (+) added S (1.5 g/kg DM) and Mo (7.0 mg/kg DM)

	Maize	Maize + Mo + S
Intake, kg DM/d	23.5	24.0
Milk yield, kg/d	38.1	40.6
Plasma Cu	13.3 $\mu\text{mol/L}$	13.7 $\mu\text{mol/L}$
Plasma Cp:Cu	1.4	1.2

Sinclair et al., (2013)



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	Grass silage	Grass silage + Mo + S
Intake, kg DM/d	22.6	20.5
Milk yield, kg/d	38.9	37.9
Body condition change	0.27	0.09



Effect of forage source and high Mo and S on cow performance and Cu status

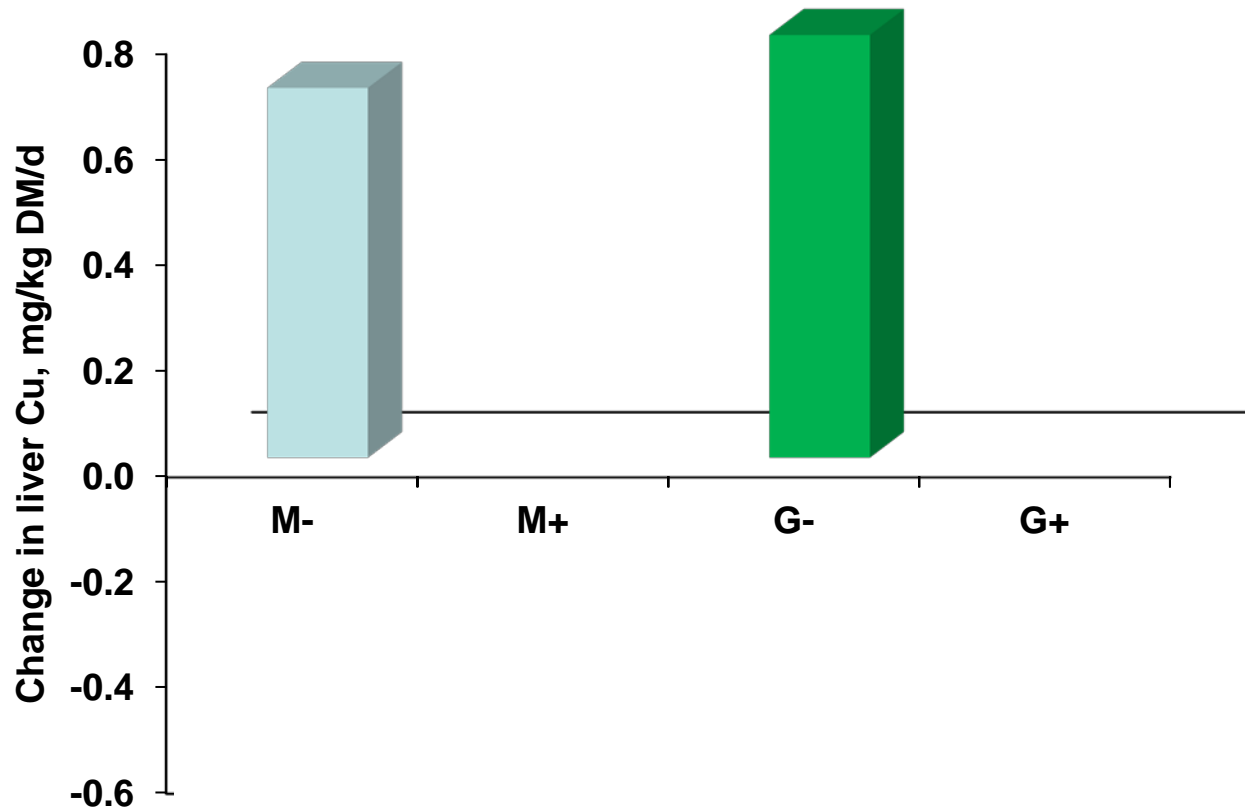
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Milk yield, kg/d	38.9	37.9
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Plasma Cu	14.3 $\mu\text{mol/L}$	13.7 $\mu\text{mol/L}$
Plasma Cp:Cu	1.4	1.4
Milk SCC, \log_{10}	1.39	1.67

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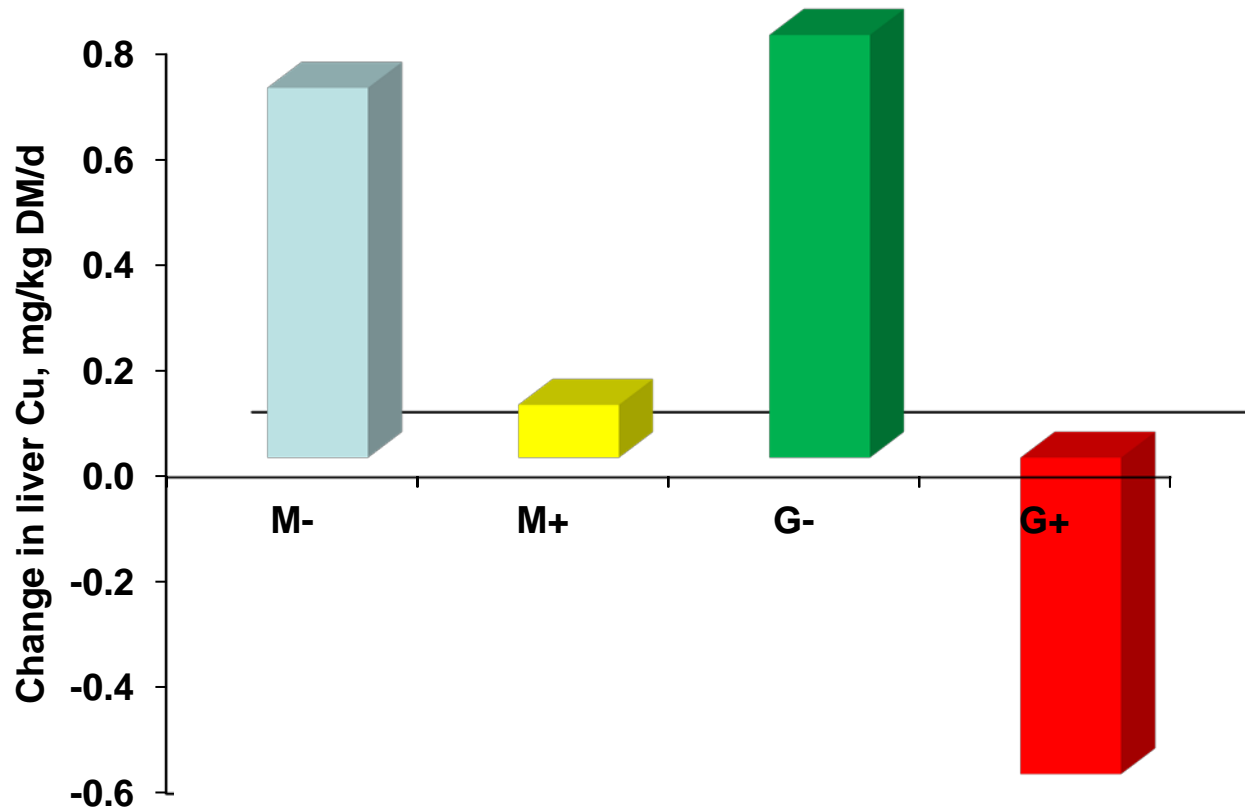


Change in liver Cu, mg/kg DM/d





Change in liver Cu, mg/kg DM/d





Conclusions

- Most minerals are supplemented well in excess of requirements (even on organic herds)
- For Cu, the current industry recommendation of 20 mg/kg DM is more than sufficient for most diets
- Forage source affects Cu status, but less of an effect of Cu source
- Plasma samples not a good indicator of Cu status
- One person needs to be responsible for the mineral nutrition and include supply from all sources

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AHDB

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