Effect of applying sewage sludge to SRC willow

***Alistair McCracken**, Linda Walsh, Paul Moore & Chris Johnston**

Agri-Food and Biosciences Institute, Northern Ireland

**Rural Generation Ltd*

Injection of sludge into the ground

Applied at cut back and during first year of growth

Agri-Food and Biosciences Institute

Analysis of sludge

CONSTITUENT	Value	CONSITUENT	Value
Dry matter	31.3%	Conductivity	1310 mS cm-1
pH	5.63	Ash	26.8%
Nitrogen (TON)	2.231%		
Ammonia/DM	0.673%	Boron	70.2 mg Kg^{-1}
Nitrogen in DM	2.339%	Cadmium	1.0 mg Kg^{-1}
Calcium	7359 mg Kg^{-1}	Cobalt	3.8 mg Kg^{-1}
Magnesium	1757 mg Kg^{-1}	Copper	144 mg Kg^{-1}
Potassium	1406 mg Kg^{-1}	Iron	2992.5 mg Kg^{-1}
Phosphorous	11270 mg Kg^{-1}	Lead	58.9 mg Kg^{-1}
Sodium	3648 mg Kg^{-1}	Manganese	80.0 mg Kg^{-1}
Zinc	414.5 mg Kg^{-1}	Molybdenum	15.6 mg Kg^{-1}

Nitrogen loading

- One tonne sludge contains **7 Kg N**
- Current permitted application rate to agricultural land, irrespective of crop, is **170 Kg ha^{-1}**
- Therefore sludge is applied at **24 t ha^{-1}**

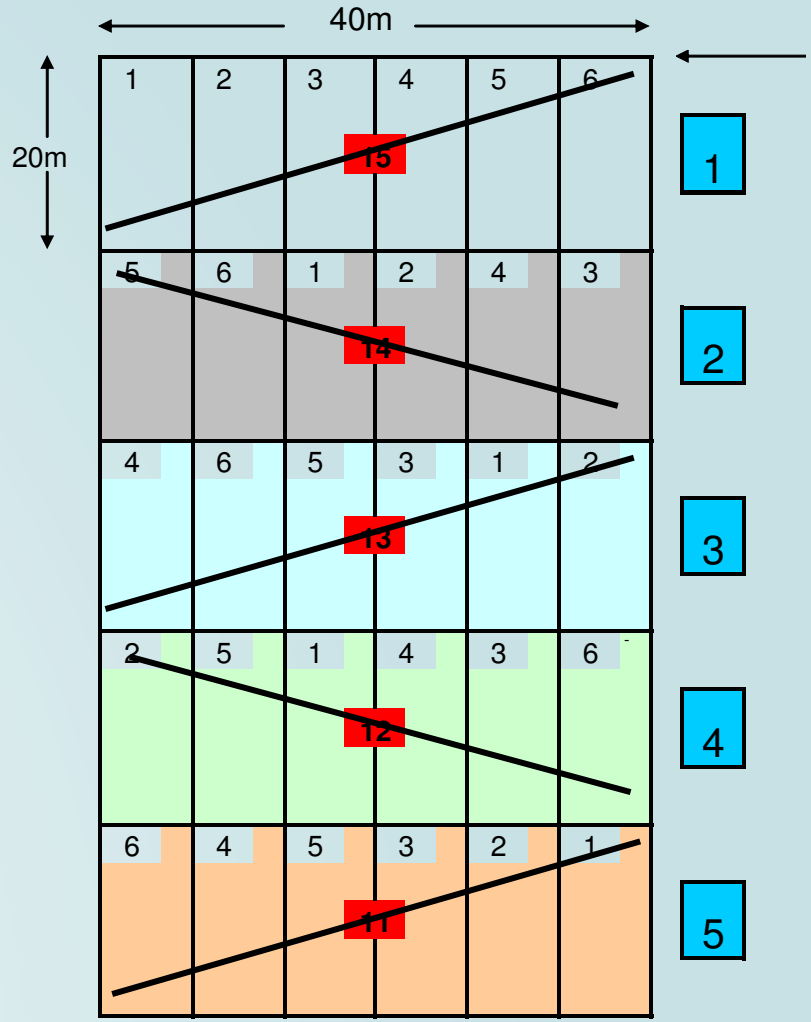
Brook Hall Sludge Trial

Sludge Treatments

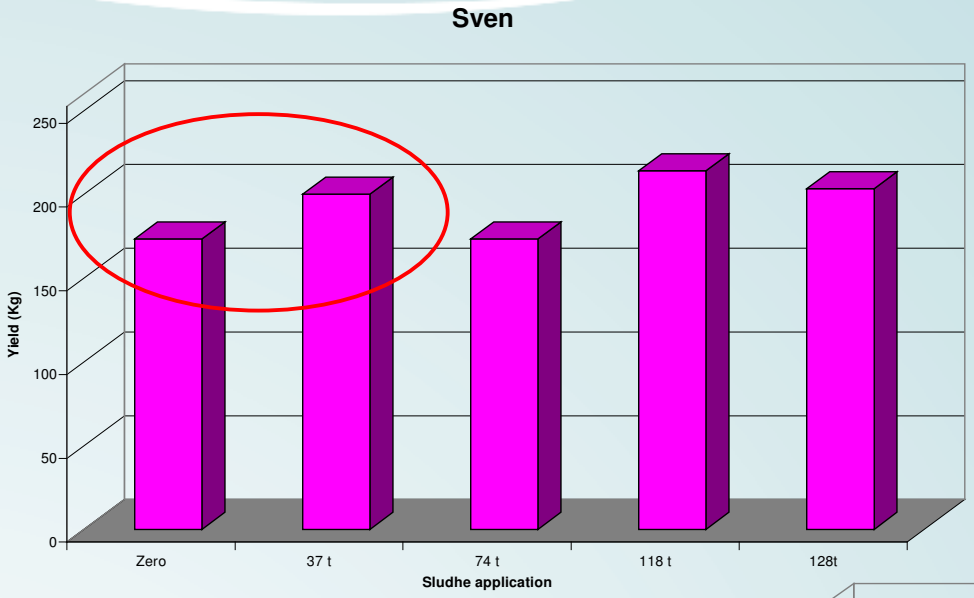
A	Zero
B	37t/ha 01July05
C	74t/ha 01July05
D	74t/h 01July05+ 44t/h 06 Dec 05 (118t/h)
E	74t/h 01 July05+ 44t/h 06 Dec05 +10t/ha 27 Mar 06 (128t/ha)

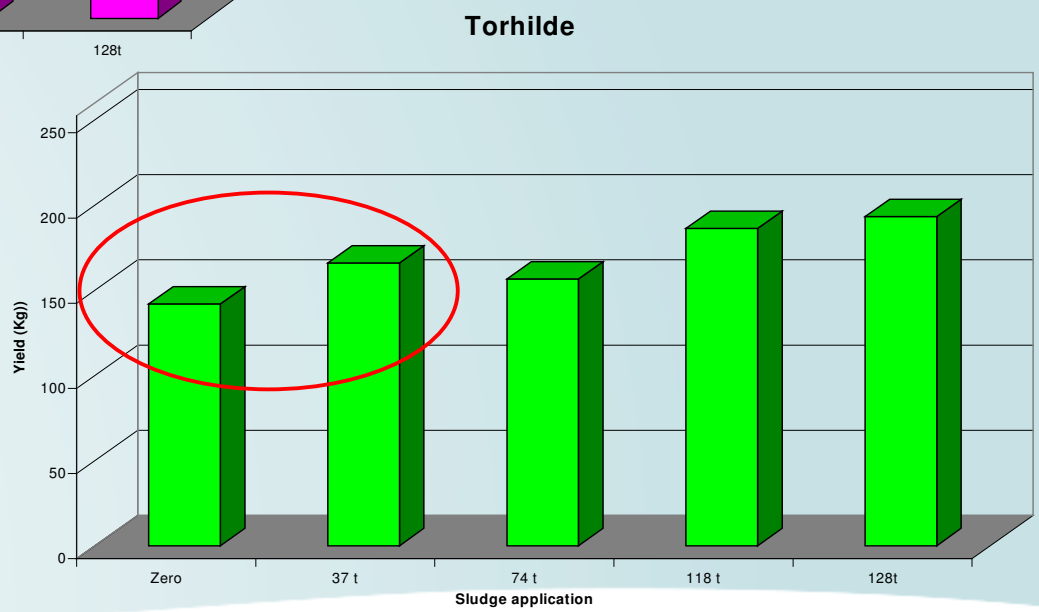
Clones

1 Ashton Stott
2 Ashton Parfitt
3 Tora
4 Sven
5 Torhilde
6 Olaf

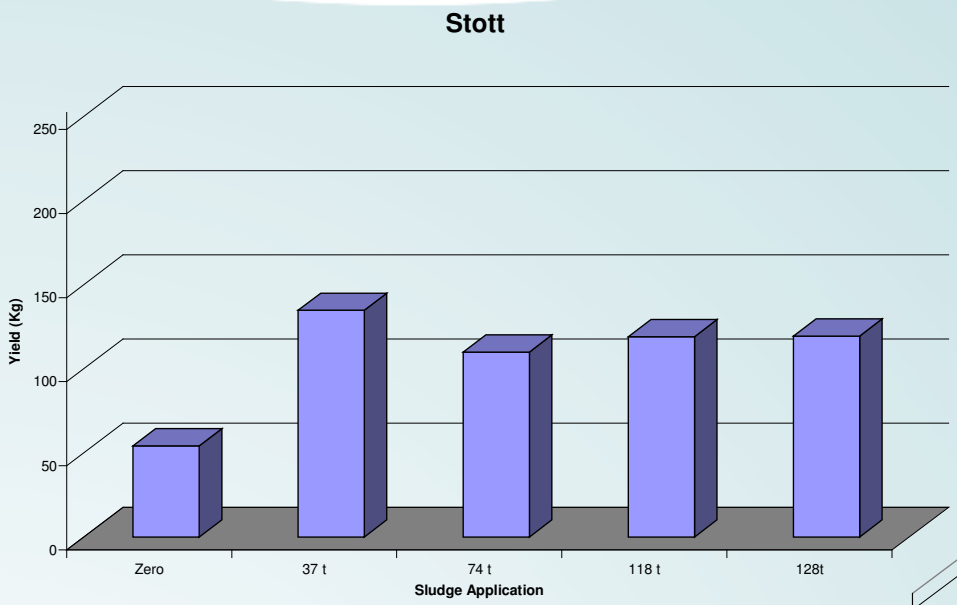


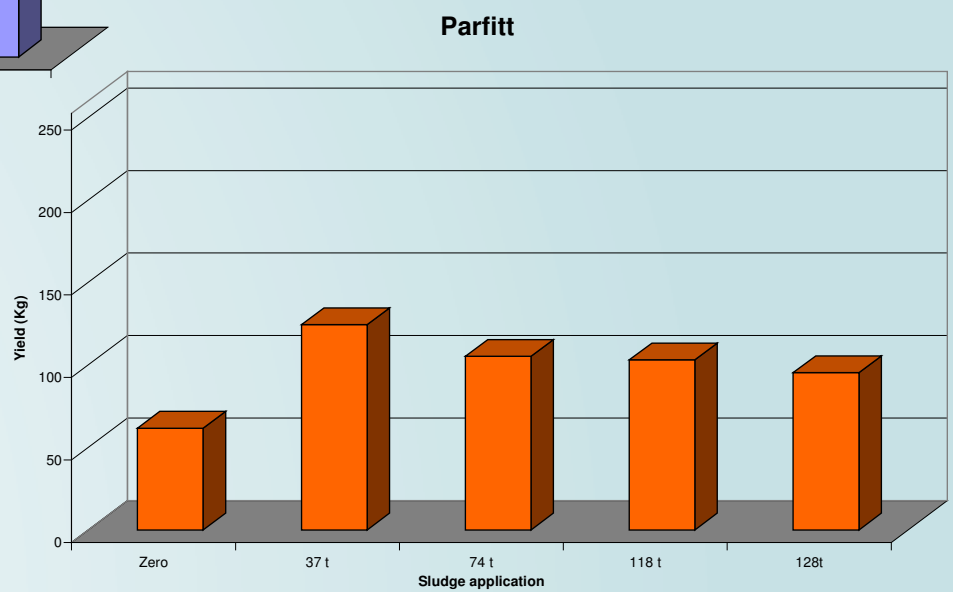
Effect of sludge of yield



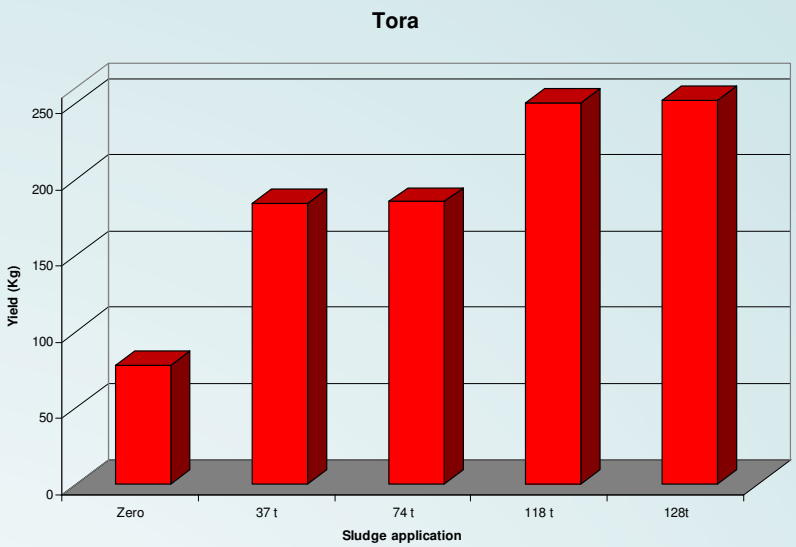


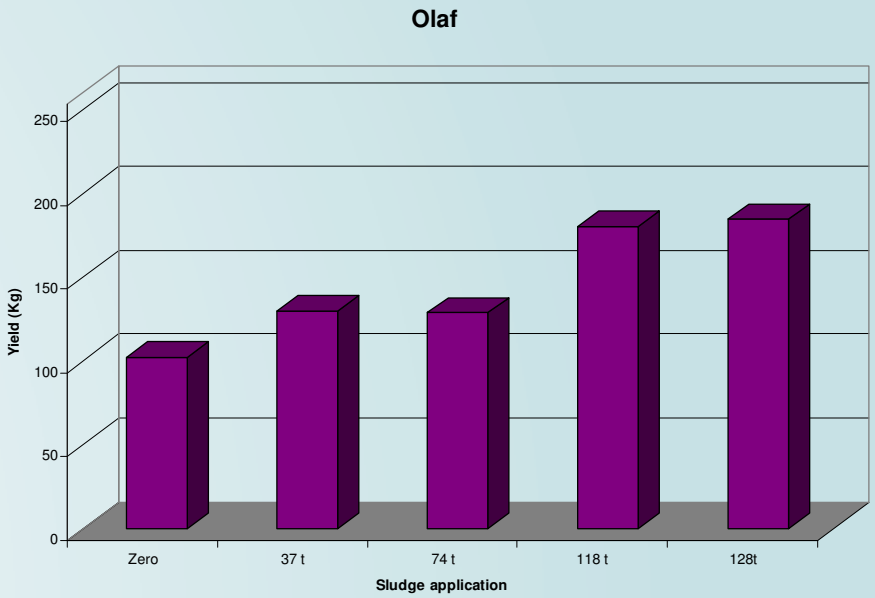
Effect of sludge of yield



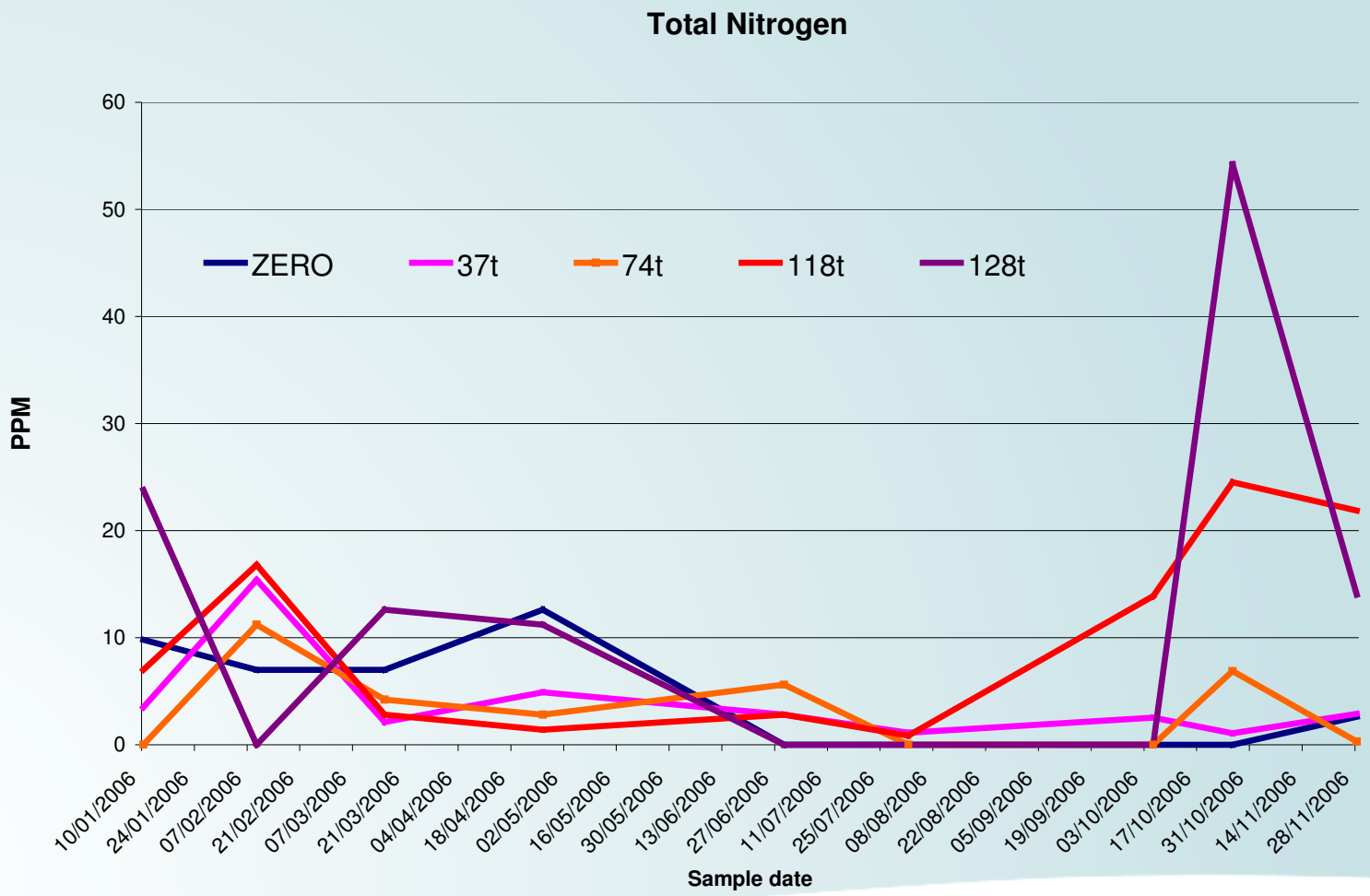


Effect of sludge of yield

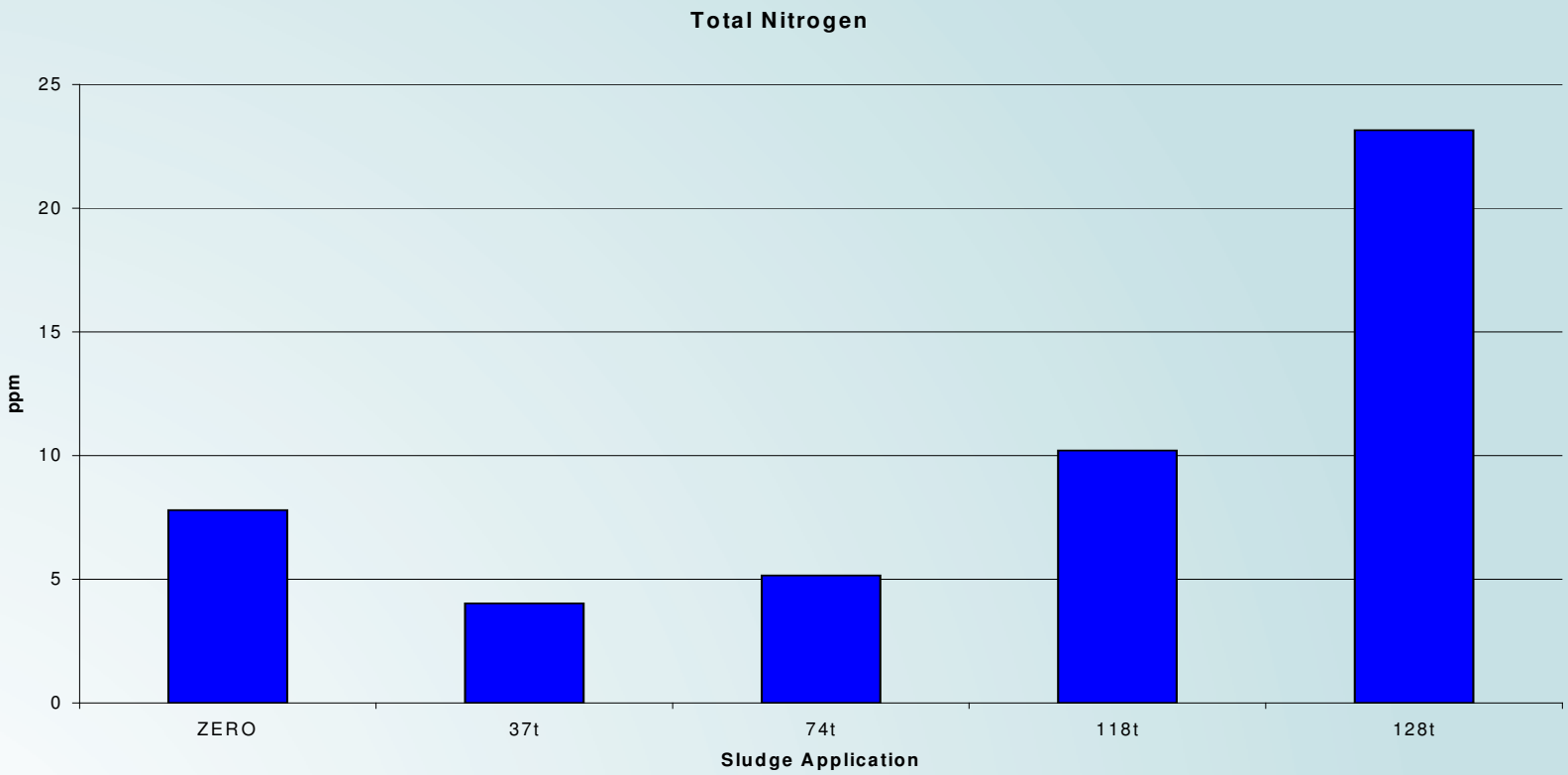




TON in borehole samples (January – December 2006)



Effect of sludge on soil nutrients

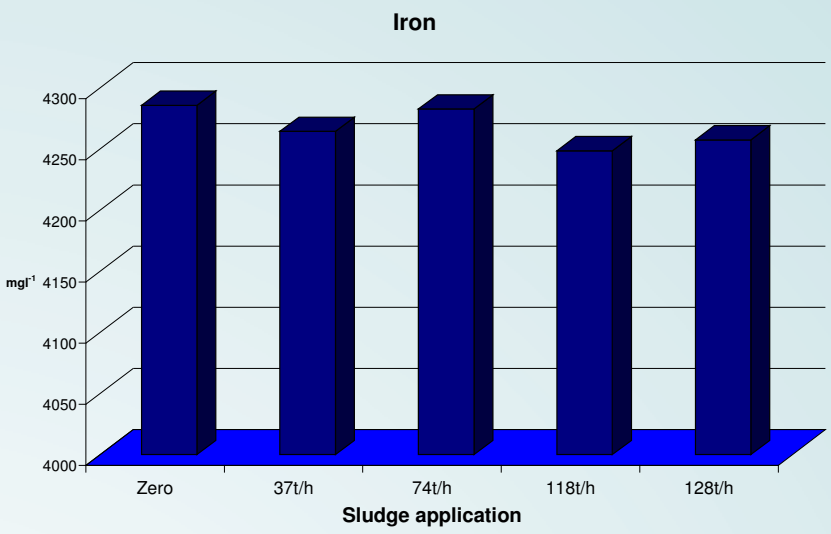


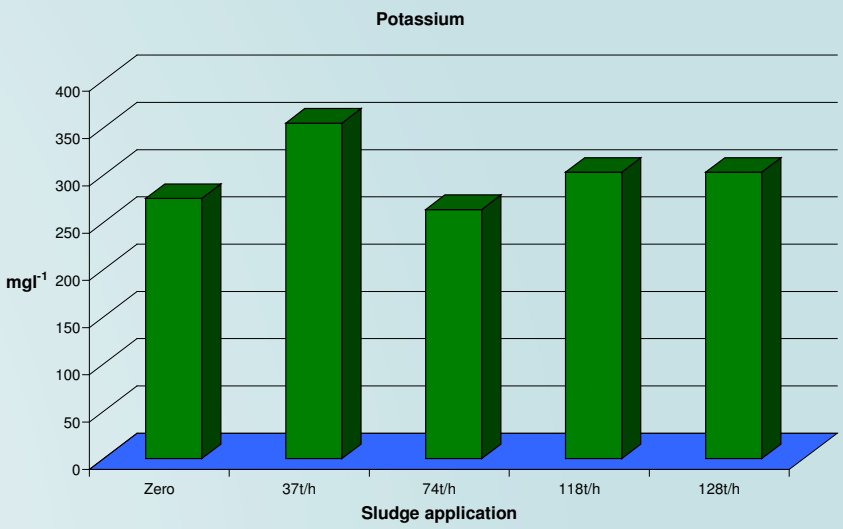
Mean total nitrogen concentration in boreholes samples over a 12 month period

Soil water analysis

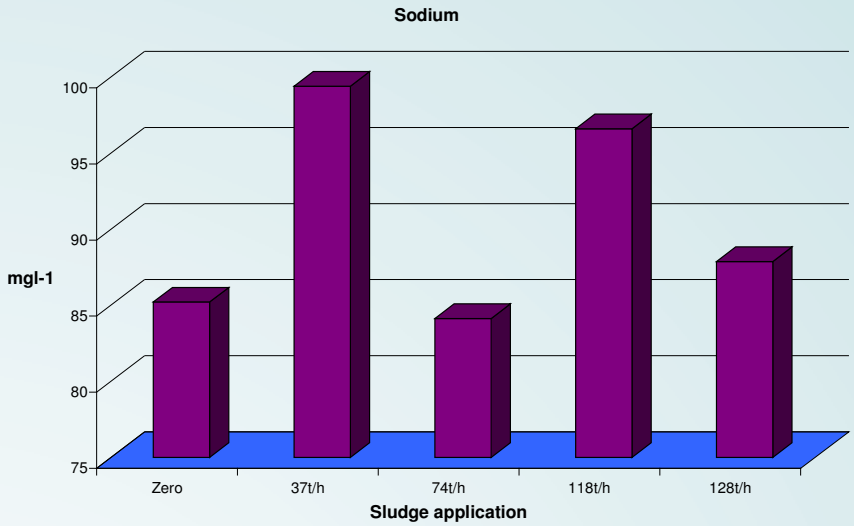
Aluminum
Boron
Calcium
Cadmium
Cobalt
Copper
Iron
Potassium
Magnesium
Manganese
Molybdenum
Sodium
Phosphorus
Lead
Selenium
Zinc

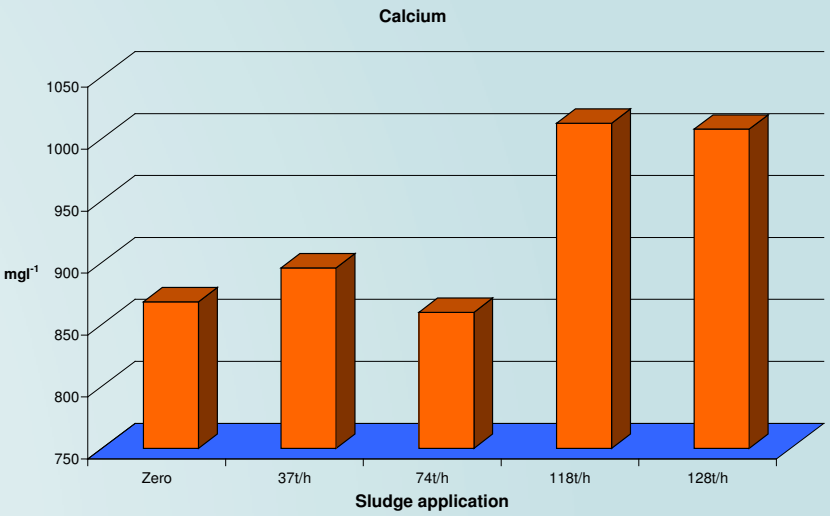
Iron & Potassium



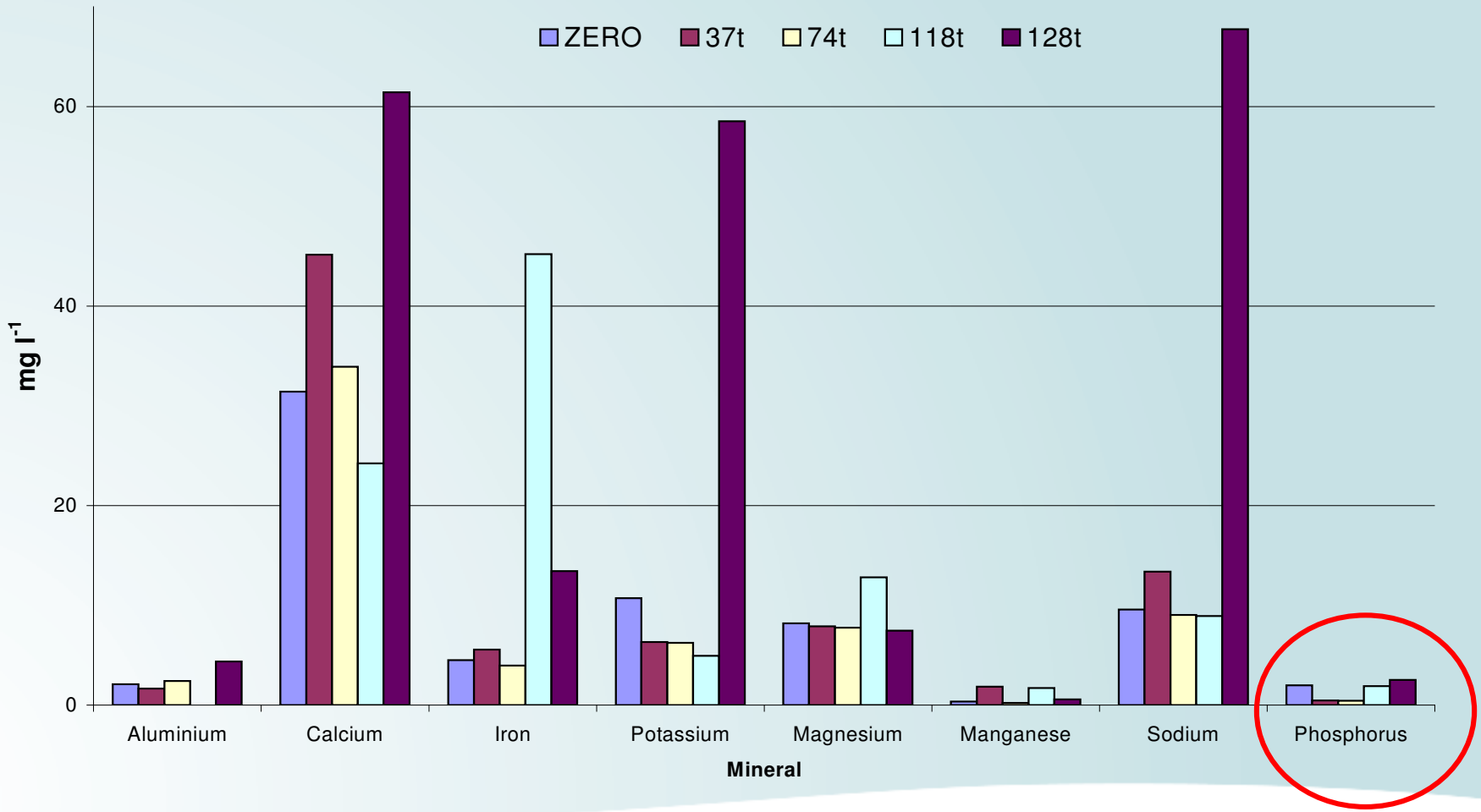


Sodium & Calcium

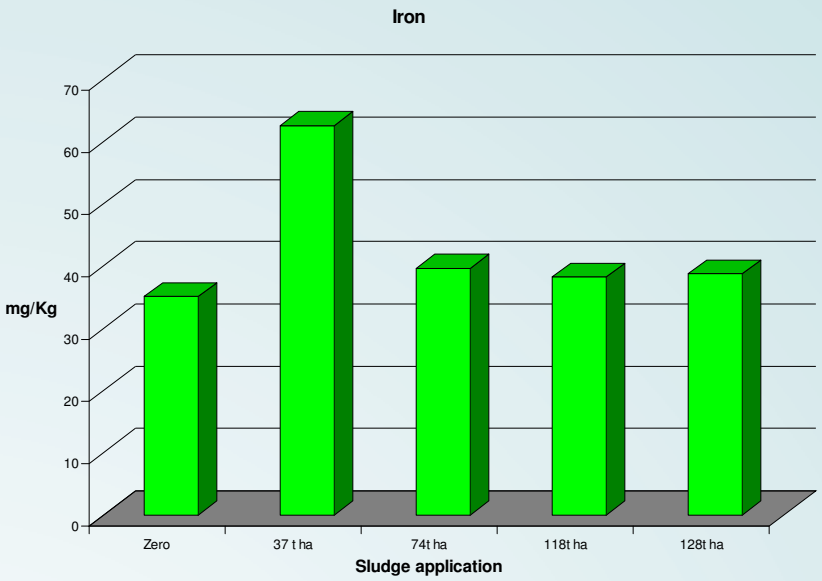


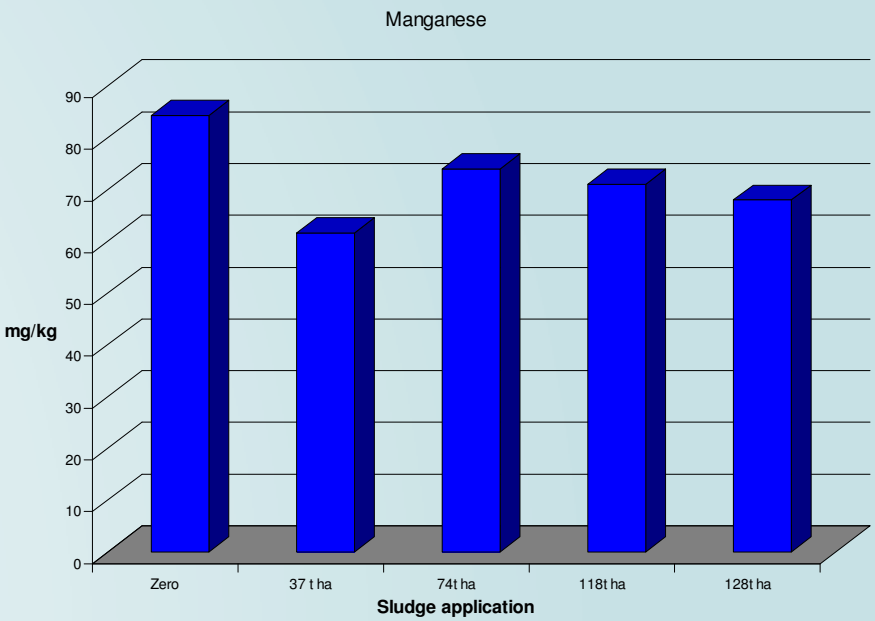


Borehole results (minerals)

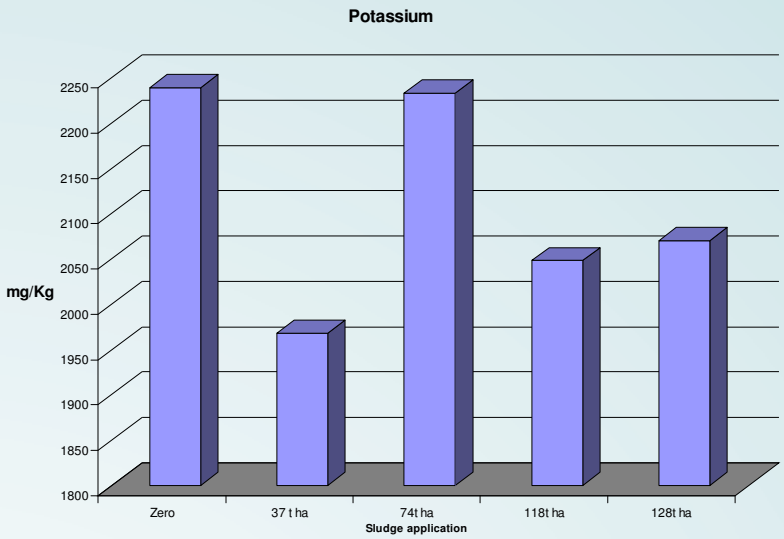


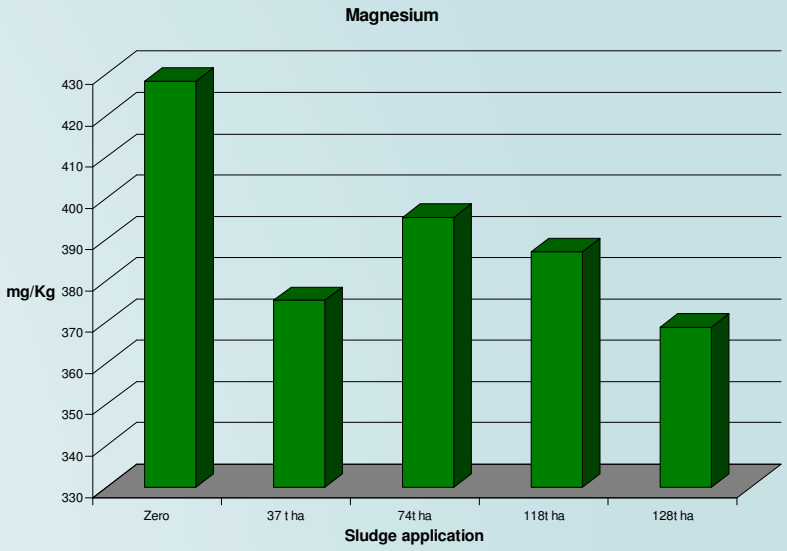
Tissue (wood) analysis





Tissue (wood) analysis

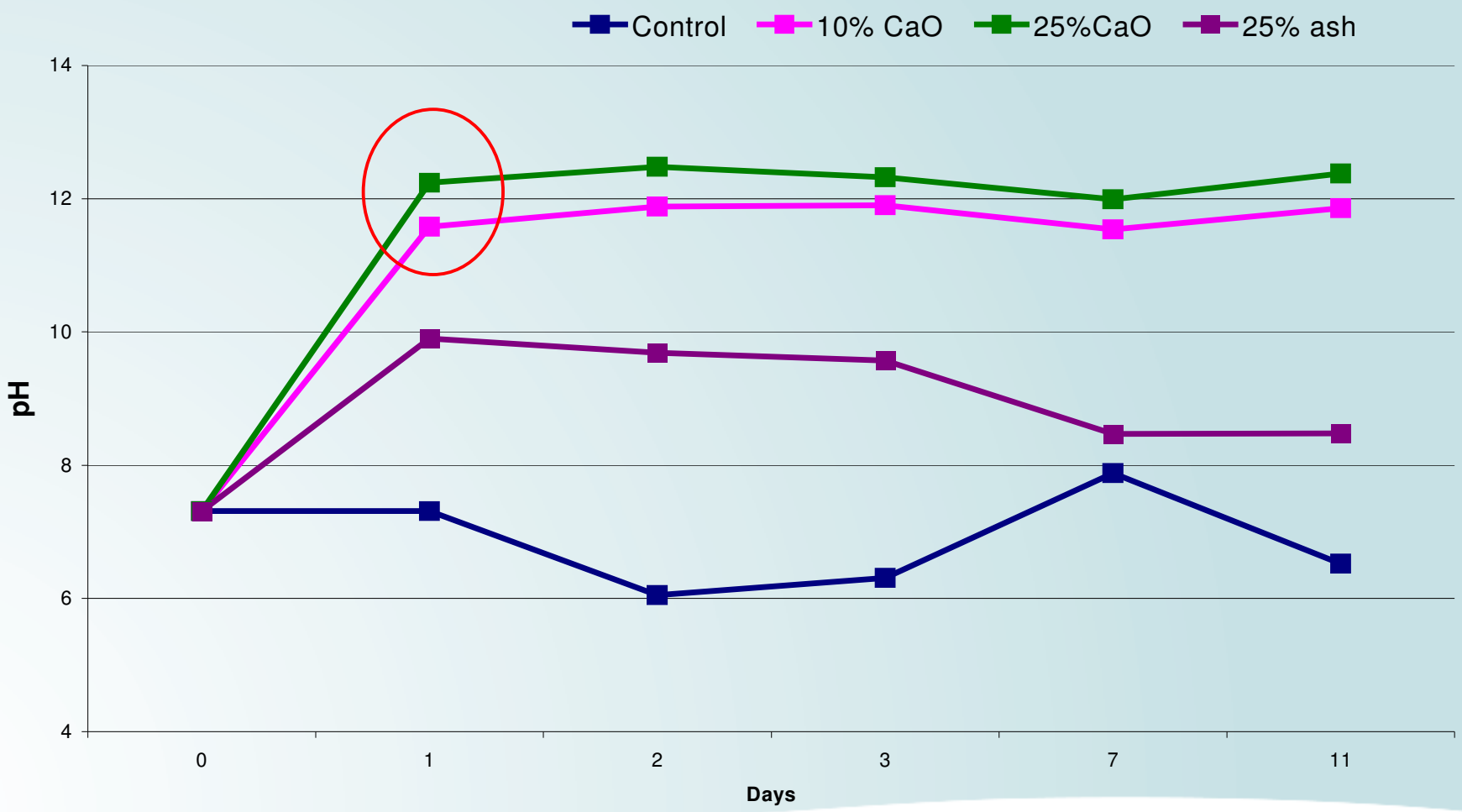




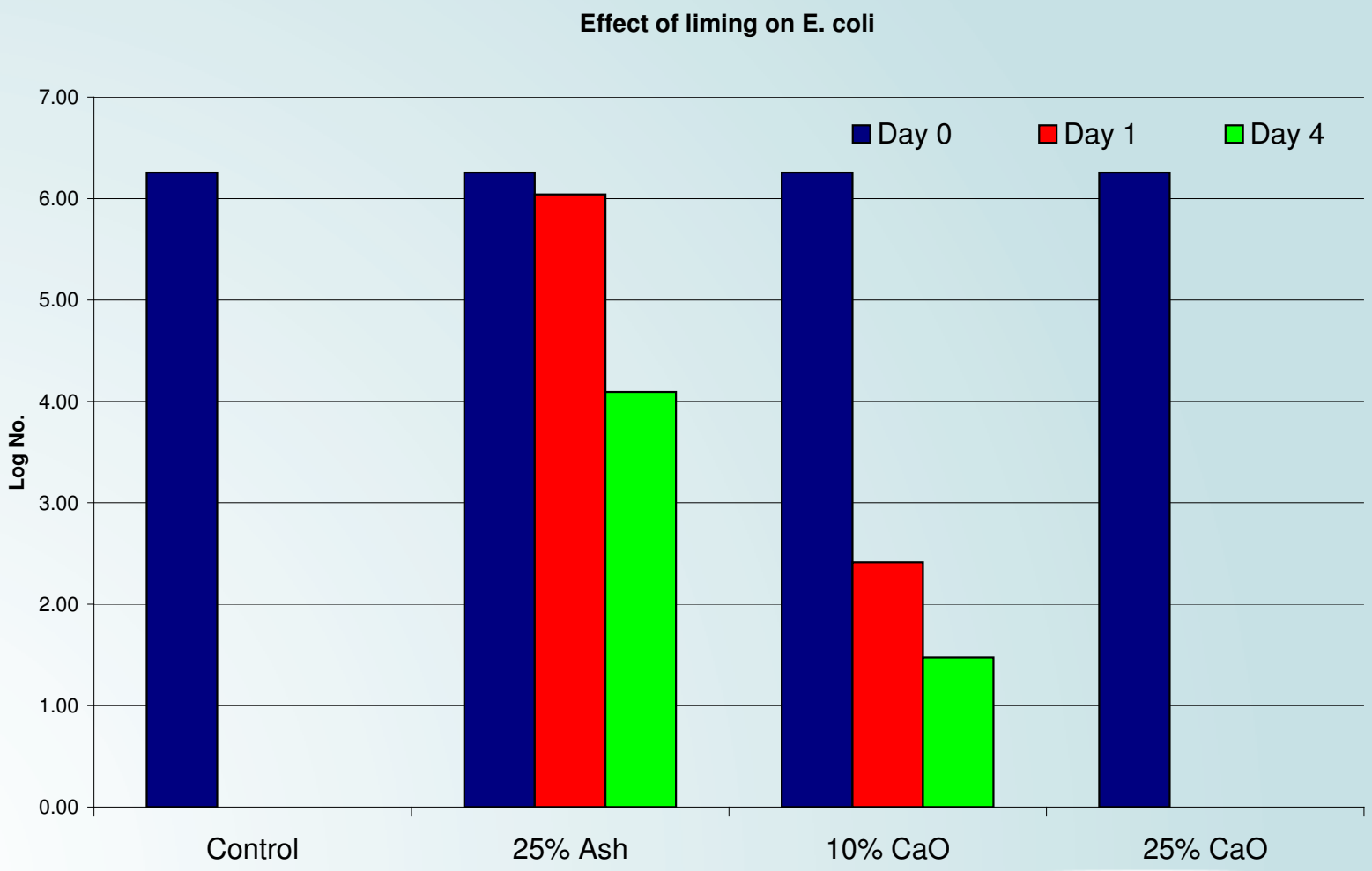
Untreated sludge

- Sludge is not treated before injection to soil
- Changes in legislation have required the sludge to be treated in order to reduce pathogen numbers

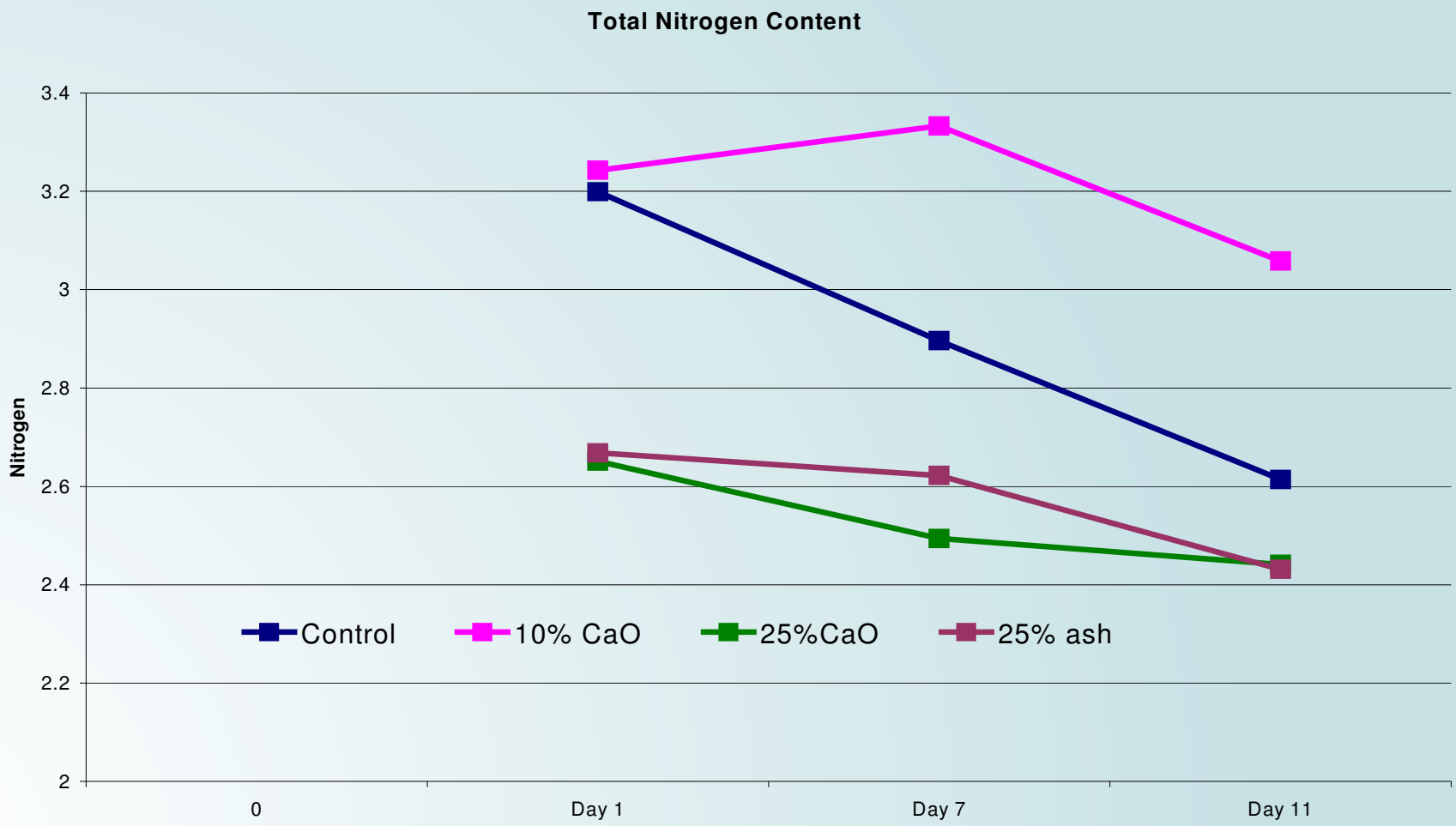
Effect of liming on pH



Pathogen kill



Change in Total Nitrogen



Application of sludge to conventional forestry is not governed by the nitrates directive in the same way

Conclusions

- Economic advantages
- Environmentally sustainable
  - Long term impacts on soil nutrition and fauna
- Governed by strict EU and national legislation
  - Sometimes a problem in the interpretation of that legislation

Acknowledgments

- Dept. Agriculture & Rural Development, NI
- Agri-Food & Biosciences Institute
  - Science staff
  - Field staff
  - Laboratory staff
- Rural Generation Ltd
- Environment and Heritage Service (Water Service) NI