

Sustainable Utilization of Nutrients From Biosolids using canola as an energy crop

Dr Firew Beshah
Assoc. Prof. Nichola Porter
Assoc. Prof. Roger Wrigley



Project overview

- **Aim:** to maximise the utilisation of a waste product (biosolids) to produce a profitable end product (canola oil for energy production)
- **Research Question:** What is the maximum amount of oil which can be produced from Canola without contamination of the soil with either nutrients, heavy metals or pathogens?

Experimental Design & Biosolids Treatments

- 2 biosolids Types
- 6 treatments in triplicate
- 12 m² plot
- Randomized blocked design

C	45	F	65	25	5
5	F	45	25	65	C
25	5	65	C	F	45

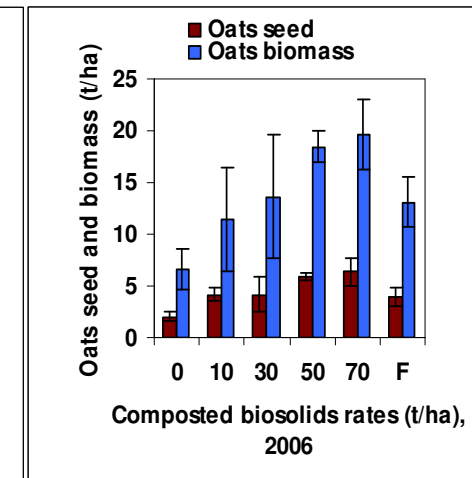
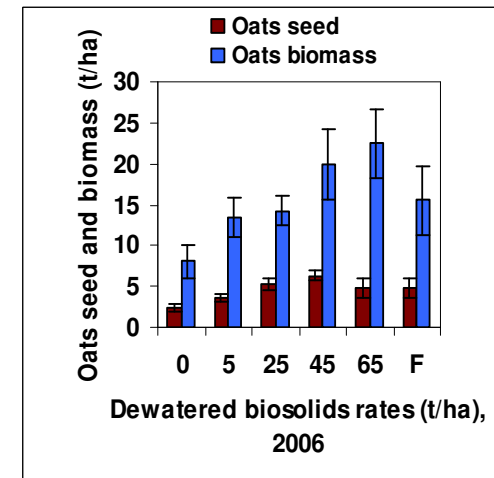
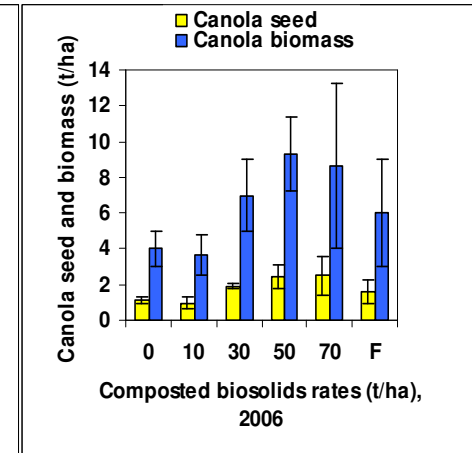
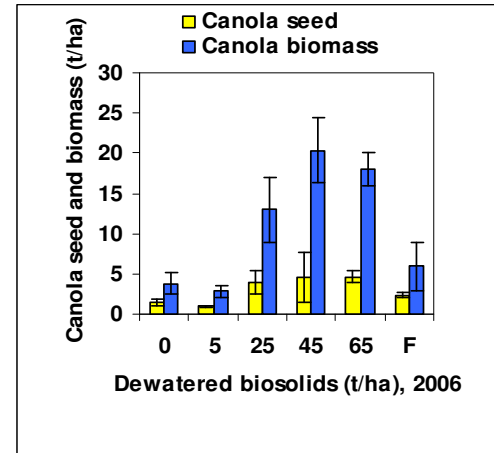


SAMPLING PROCEDURES

- Soil/Biosolids sampled before and after experiment
- Plants sampled at 4-5 leaf stage for canola and at 5-6 tillering stage for oats for nutrient analysis
- Seeds of canola and oats sampled after crop harvest
- Soils cores taken for leaching tests

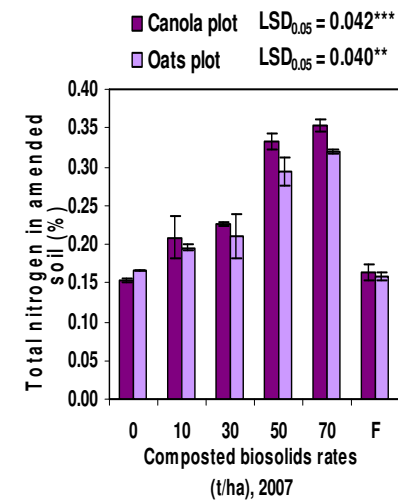
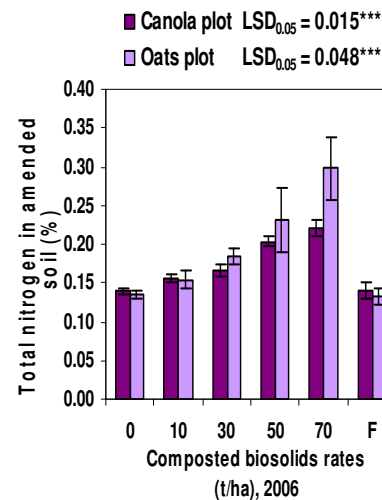
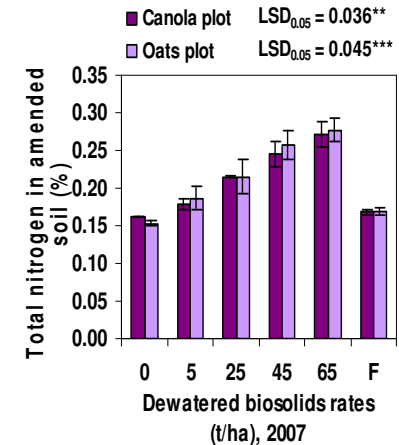
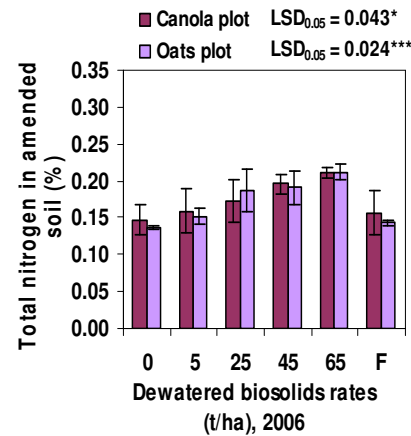


Effect of Biosolids on Crop Yields



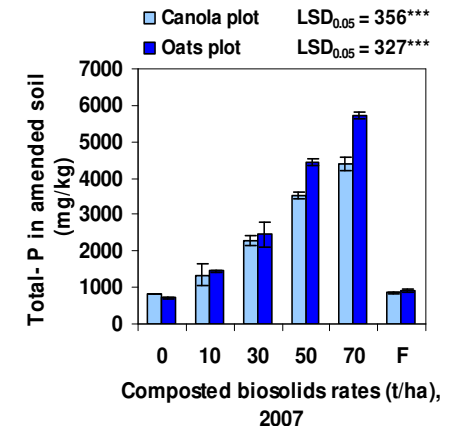
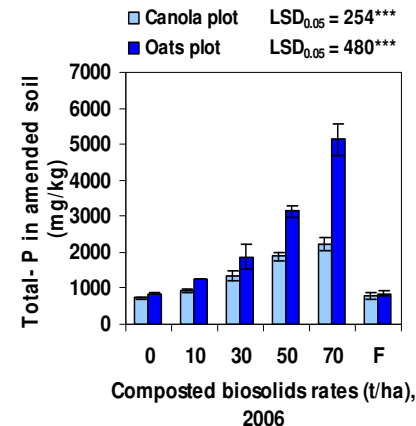
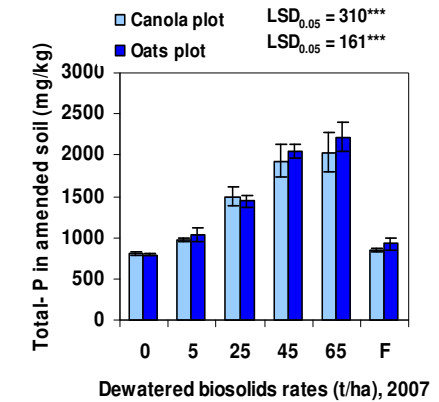
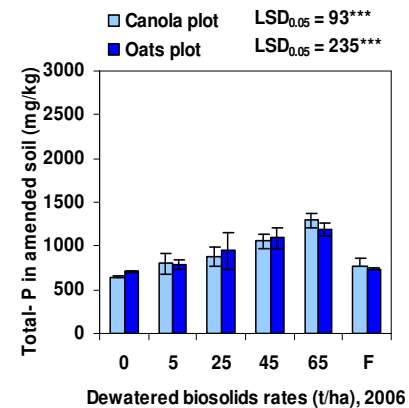
Changes in TN in soil over 2 years

- Significant increase in TN in soil
- Composted biosolids had greater effect than dewatered biosolids



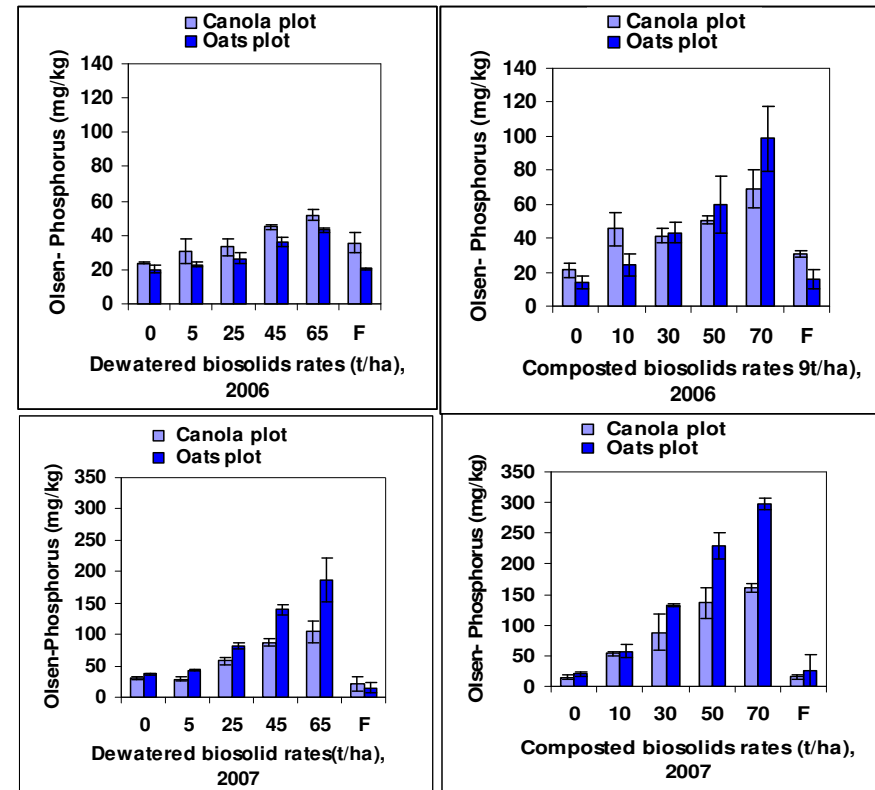
Changes in TP in biosolids amended soil

- Biosolids significantly increased total-P in soil
- Residual P from composted biosolids highest
- Total-P levels in oats plots was significantly higher than canola plots



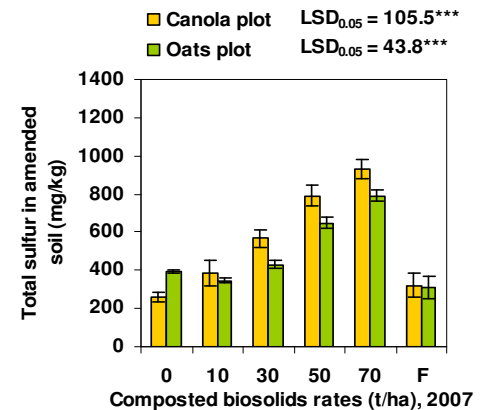
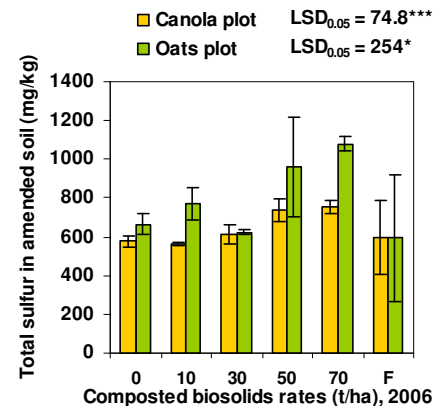
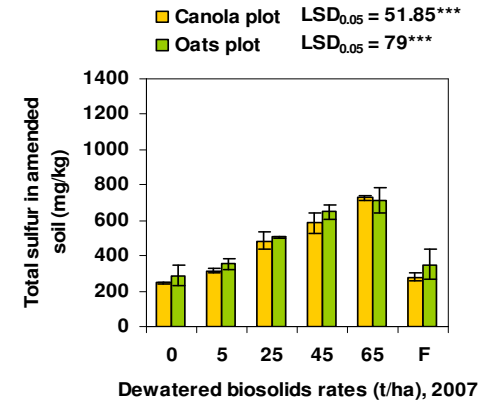
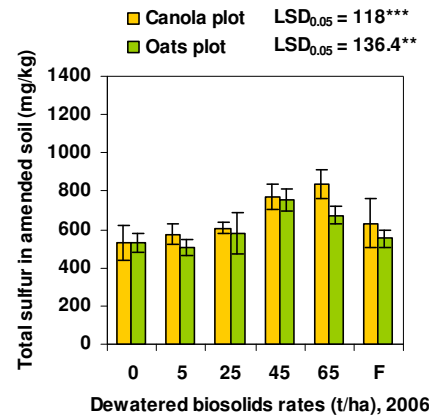
Changes in Olsen- P levels in biosolids amended soil over 2 years

- Both biosolids types increased Olsen-P
- Composted biosolids had greater effect than dewatered



Effect of biosolids on total sulfur

- Composted biosolids had greatest effect
- Reapplying both biosolids types in 2007 significantly increased the sulfur status of the soil



Canola seed analysis for N, P, S and Oil

Table Effect of dewatered and composted biosolids application rates on N, P, S and oil concentrations in canola seed.

Effect of dewatered biosolids				
Dewatered rates (t/ha)	TN (%)	P µg/ g	S µg/ g	Oil (%)
0	2.91	6200	3400	46.5
5	3.08	7800	3400	45.2
25	3.47	8600	4200	42.2
45	3.6	8300	4200	41.9
65	4.16	9100	4600	37.2
F	3.19	5600	3900	43.9
Effect of Composted biosolids				
Composted rates	TN (%)	P	S	Oil (%)
0	2.91	6200	3400	46.5
1043.9	2.97	8600	3200	45.4
30	2.81	8200	3200	47.5
50	3.13	8900	3800	44.5
70	3.22	8700	3800	43.4
F	3.19	5600	3900	



CONCLUSIONS

- Application of biosolids significantly increased the N, P and S status of the soil and thus increased seed and biomass yields
- The response of canola was greater than oats, with dewatered biosolids having larger effect than composted biosolids
- Biosolids loading rates also increased the N, P and S levels in canola seed, however it decreased the oil concentrations
- By applying 65 t/ha dewatered biosolids annually, 1700kg oil/ha can be produced

Demonstrating results to end users



ACKNOWLEDGMENTS

- Staff of Western Water at Surbiton Park
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