THE EFFECT OF BIOGAS SLURRY ON YIELD AND QUALITY OF OATS AND FESCUE PLANTED IN MACUBENI, EASTERN CAPE, SOUTH AFRICA

N Matyholo - Mapeyi and

J Gambiza

Province of the EASTERN CAPE
RURAL DEVELOPMENT AND AGRARIAN REFORM

WATER RESEARCH COMMISSION

RHODES UNIVERSITY
Where leaders learn

INTRODUCTION

- The low quantity and poor quality of forage in rangelands- the dry season is one of the major factors limiting livestock production in the smallholder sector.
- The growing of fodder species and use of inorganic fertilizer is a commonly used strategy to increase fodder quantity, BUT BIOSLURRY-organic

OBJECTIVES

- To study the effect of biogas slurry on quality of oats and fescue
- To study the effect of biogas slurry on quantity of oats and fescue
- To introduce a new cost effective source of bioenergy that is environmentally friendly to the ecosystem in rural community

MATERIALS AND METHODS

- Study site
  - Macubeni in Lady Frere in the Eastern Cape
- 40 km south west of Indwe and 20 km north of Lady Frere - Malahleni local municipality in the Chris Hani district municipality 27^0 01-16` E and 31^0 27-36’ S
- The average rainfall is 501-600 mm per annum
- The soil types of the selected sites are a mosaic of mudstones and sandstones with dolerite intrusions (Shackleton and Gambiza, 2008)
- The soils are stony and shallow

METHODOLOGY

- Annual legume and grass (ALG) were arrow leaf clover, *Trifolium vesiculosum* and oats, *Avena sativa* species that were grown together per treatment. Perennial legume and grass (PLG)-were white clover, *Trifolium repense* and fescue, *Arundicenae festuca* grown together in a treatment. In 2012 and 2013 slurry was applied to treatment/plots seven weeks after planting and then fortnightly thereafter until the third cut on the soil surface between forage

METHODOLOGY CONT.

- Twenty litres of water were applied to no slurry treatments
- Slurry was applied once and incorporated into the soil in 2014 and slurry treatments (PLGs and ALGs) were irrigated; the zero slurry applied (PLGo and ALGo) were not irrigated. Treatments were applied in a factorial design with three replicates
- Forage was harvested - 1m^2 quadrat in the centre of each treatment
- Forage was cut three times per year in May (cut 1), July (cut 2) and September (cut 3) each year

RESULTS AND DISCUSSION

Table showing 2012 average DMY per treatment (kg/ha)

	ALGo	ALGs	PLGo	PLGs
Ct1	4077^{b}	2668^{a}	2531^{a}	3827^{b}
Ct 2	782.5^{c}	402.2^{a}	599.9^{b}	565.0^{b}
Ct 3	2660^{bc}	1908^{a}	2167^{ab}	2758^{c}

Table showing 2012 K content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	3.82^{a}	5.03^{ab}	6.92^{b}	5.89^{b}
ct 2	1.553^{a}	1.771^{ab}	1.866^{bc}	1.96^{c}
ct 3	1.432^{a}	1.708^{ab}	1.898^{bc}	2.282^{c}

Table showing 2012 P content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	0.261^{ab}	0.3^{b}	0.246^{a}	0.312^{a}
ct 2	0.25^{a}	0.25^{a}	0.25^{ab}	1.35^{b}
ct 3	0.249^{a}	0.254^{a}	0.245^{a}	0.255^{a}

RESULTS AND DISCUSSION CONT

Table showing 2012 CP content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	11^{a}	13.51^{ab}	15.55^{bc}	16.97^{c}
ct 2	7.12^{a}	7.86^{a}	10.77^{b}	10.32^{b}
ct 3	7.04^{a}	7.92^{a}	10.68^{b}	10.41^{b}

Table showing 2012 Tot N content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	1.76^{a}	2.161^{ab}	2.487^{bc}	2.714^{c}
ct 2	1.138^{a}	1.257^{a}	1.723^{b}	1.651^{b}
ct 3	1.126^{a}	1.268^{a}	1.709^{b}	1.666^{b}

RESULTS AND DISC. CONT.

Table showing 2013 average DMY per treatment (kg/ha)

	ALGo	ALGs	PLGo	PLGs
ct 1	4285^{b}	4110^{b}	3220^{a}	2642^{a}
ct 2	4419^{a}	4504^{a}	4582^{a}	4060^{a}
ct 3	5229^{b}	4425^{a}	5016^{a}	4895^{a}

Table showing 2013 K content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	2.06^{b}	1.488^{a}	1.286^{a}	1.364^{a}
ct 2	1.241^{ab}	1.594^{b}	1.164^{a}	1.043^{a}
ct 3	2.498^{a}	2.689^{ab}	2.865^{ab}	3.079^{b}

Table showing 2013 P content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	0.269^{ab}	0.301^{b}	0.208^{a}	0.217^{a}
ct 2	0.1783^{bc}	0.2224^{c}	0.1239^{a}	0.1496^{ab}
ct 3	0.26^{a}	0.23^{a}	0.213^{a}	0.229^{a}

RESULTS AND DISC. CONT.

Table showing 2013 CP content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	15.4^{b}	14.92^{b}	9.85^{a}	9.52^{a}
ct 2	10.01^{ab}	12.26^{b}	7.26^{a}	7.79^{a}
ct 3	9.56^{ab}	7.71^{a}	10.95^{ab}	11.43^{b}

Table showing 2013 Tot N content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	1.88^{ab}	2.39^{b}	1.58^{a}	1.52^{a}
ct 2	1.601^{ab}	1.961^{b}	1.161^{a}	1.246^{a}
ct 3	1.529^{ab}	1.234^{a}	1.752^{ab}	1.828^{b}

RESULTS AND DISC. CONT.

Table showing 2014 average DMY per treatment (kg/ha)

	ALGo	ALGs	PLGo	PLGs
ct 1	2495^{ab}	2486^{ab}	2678^{b}	1941^{a}
ct 2	5090^{b}	3931^{a}	4375^{ab}	4521^{ab}
ct 3	2110^{a}	2175^{a}	2195^{ab}	2552^{b}

Table showing 2014 K content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	2.502^{a}	2.685^{ab}	2.865ab	3.079^{b}
ct 2	1.492^{b}	1.829^{c}	1.085^{a}	1.336^{ab}
ct 3	1.462^{a}	1.458^{a}	1.351^{a}	1.406^{a}

Table showing 2014 P content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	0.261^{a}	0.229^{a}	0.213^{a}	0.229^{a}
ct 2	0.089^{a}	0.126^{a}	0.092^{bc}	0.125^{c}
ct 3	0.186^{ab}	0.253^{b}	0.193^{a}	0.166^{a}

RESULTS CONT.

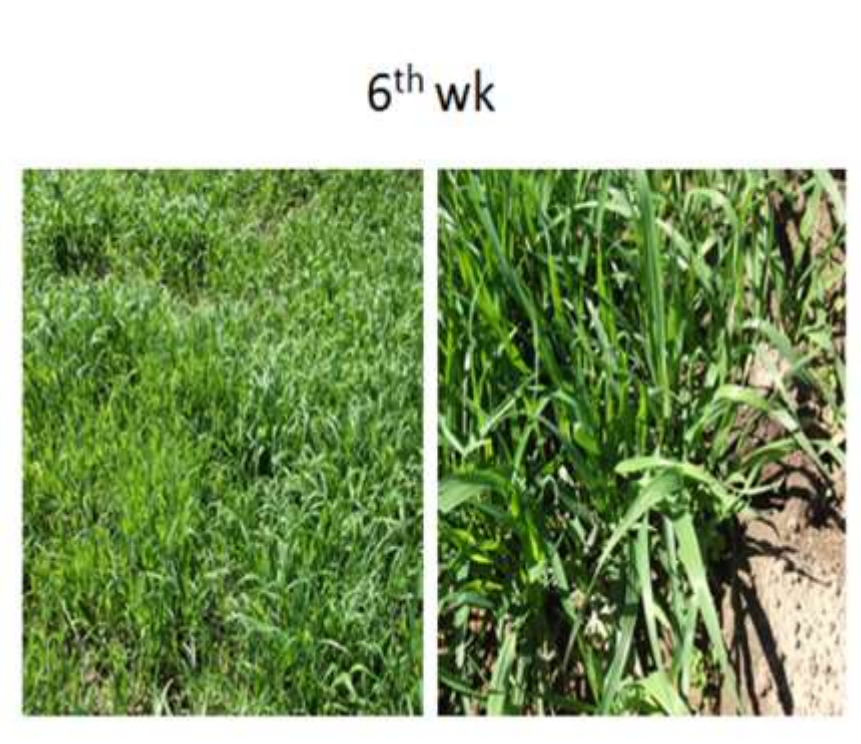
Table showing 2014 CP content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	9.55^{ab}	7.72^{a}	10.95^{ab}	11.43^{b}
ct 2	6.94^{b}	8.77^{c}	5.07^{a}	6.35^{ab}
ct 3	8.07^{a}	8.06^{a}	9.34^{a}	7.16^{a}

Table showing 2014 Tot N content of oats and fescue per treatment (%)

	ALGo	ALGs	PLGo	PLGs
ct 1	1.529^{ab}	1.234^{a}	1.752^{ab}	1.828^{b}
ct 2	1.11^{b}	1.403^{c}	0.811^{a}	1.016^{ab}
ct 3	1.292^{a}	1.289^{a}	1.494^{bc}	1.145^{a}

RESULTS CONT.



CONCLUSION AND REMARKS

- DMY significant differences-2012
- 2013/14 –dry
- Irrigation was not enough
- Legumes were impossible to measure-performance
- Scorching vs limiting moisture
- Site differences in DMY

CONCLUSION AND REMARKS CONT.

- Non slurry treatments outperformed slurry applied-perennial and annual sp.
  - Less N than required
  - Measuring slurry N each year
  - Dry and cold winter
  - Follow up trial on different levels of slurry N
  - Labour intensive, but cost effective
  - Site differences in yield were due individual participant management and exposure to wild vermin and chickens (enclosure cages)

Thank You

Province of the EASTERN CAPE
RURAL DEVELOPMENT AND AGRARIAN REFORM

WATER RESEARCH COMMISSION

RHODES UNIVERSITY
Where leaders learn