

# **AN ECONOMIC ANALYSIS OF PRECISION APPLICATION OF LIME AT REDUCED RATES**

**Presenter**

**Kalinda Chester**

**Contributors**

**Mulungu Kelvin, Tembo Gelson and Kabwe Stephen**

# Layout

- Introduction
- Methods and Materials
  - Procedure
  - Economic/Profitability analysis
- Results
- Conclusion

# Introduction

- Soil acidity is among the problems that affect crop production in Zambia.
- The problem is not only limited to the regions that were initially known to be acidic but present in almost all parts of Zambia
- This is a result of different land use practices that farmers engage in

# Introduction continued

- Liming is the most known and accessible method of preventing and ameliorating the acidity problem
- The practice is not however very much embraced by small scale farmers in Zambia
- Farmers say it's expensive and difficult to get and they don't see the benefits
- Conservation Farming Unit has recommended reduced rates so as to reduce on the unaffordable rates
- Study done to determine the profitability of lime application at reduced rates and the synergistic benefits with other nutrient sources like compost and manure.

# Methods and Materials

- Datasets from GART and CFU, Magoye and Batoka stations for the agricultural season, 2008/2009 were used
- Main treatments were five fertilizer application rates with D compound and Urea while liming and none liming were the sub treatments
- The fertilizer rates were  $100\text{kg ha}^{-1}$  DC only,  $200\text{ kg/ha DC} + 100\text{ kgha}^{-1}$  urea,  $300\text{ kg ha}^{-1}$  DC+ $200\text{ kg ha}^{-1}$  urea,  $400\text{kg ha}^{-1}$  DC + $300\text{kg ha}^{-1}$  urea,  $500\text{ kg ha}^{-1}$  DC +  $400\text{ kg ha}^{-1}$  urea
- . Lime rate was  $500\text{ kg ha}^{-1}$

# Procedure

- Analysis of variance done to determine which factors had contributed yield of maize, groundnuts and soybeans
- Factors analyzed in a partial factorial design so as to determine the effect of their interactions on yield.
- Model was developed and was used to determine the synergistic benefits through the interaction of the terms and determine the incremental (in yield) effect of lime

$$Y_{pqr} = \mu + \tau_p + \beta_q + \delta_r + (\tau\beta)_{pq} + (\tau\delta)_{pr} + \varepsilon_{pqr}$$

# Economic/profitability Analysis

- Financial gains calculated based on the the marginal analysis technique proposed by CIMMTY (1998)
- Cost of lime varied (purchase and application)
- The incremental benefits were computed as

Net incremental benefits = (yield \* estimated field price) – (field costs of all inputs)

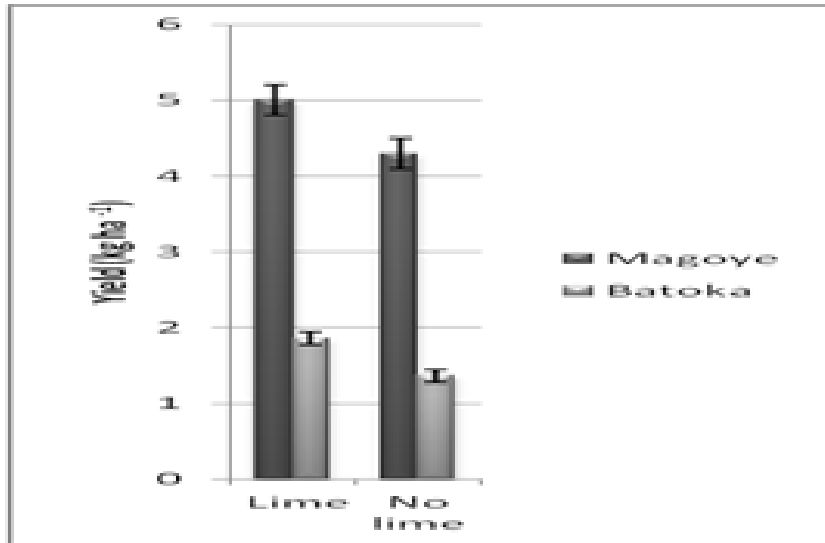
# Results

**Table 1: Partial factorial ANOVA results for compost, lime and fertilizer under maize, Groundnuts and Soybeans 2008-2009**

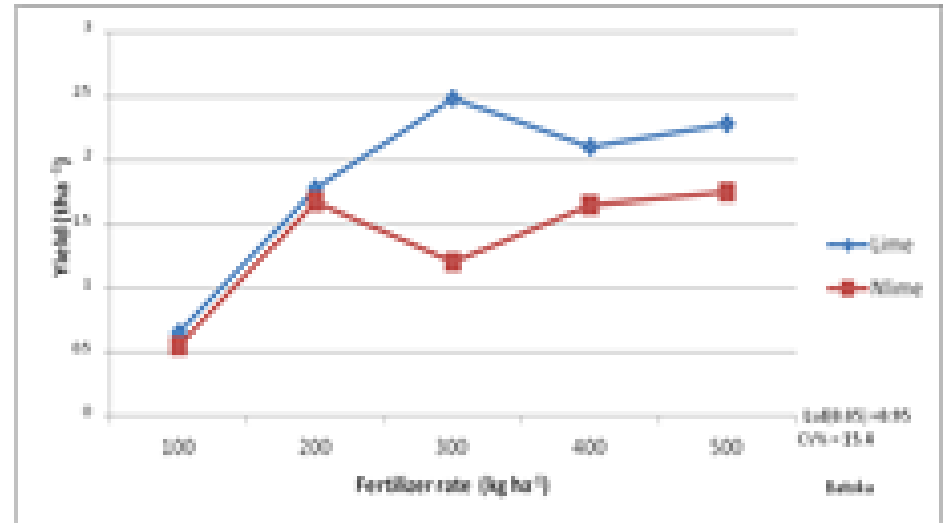
Treatment	Maize		Groundnuts		Soybeans	
	F-test	P-value	F-test	P-value	F-test	P-value
<b>Compost only</b>	1.62	0.2506	7.73	0.0320**	0.20	0.6742
<b>Lime only</b>	0.02	0.9058	13.65	0.0102**	8.09	0.0294**
<b>Fertilizer only</b>	2.75	0.1481	12.43	0.0124**	0.06	0.8092
<b>Lime x compost</b>	0.06	0.8122	1.17	0.3209	0.01	0.9325
<b>Lime x fertilizer</b>	0.38	0.5584	0.35	0.5748	7.20	0.0363**



# Response of Maize yield to liming



*Effect of liming on maize grain yields.*



*Interaction effect of lime and fertilizer on maize grain yields at Batoka*

# Financial Benefits of Lime Use at Reduced Rates

	Maize		Soybeans		Groundnuts	
Treatment	Costs that Vary* (ZMK/ha)	Net benefits* (ZMK/ha)	Costs that Vary* (ZMK/ha)	Net benefits* (ZMK/ha)	Costs that Vary* (ZMK/ha)	Net benefits* (ZMK/ha)
<b>Control</b>	0	4752000	0	8852000	0	2173500
<b>Lime only</b>	48550	4236000	48550	9647450	48550	2277950
<b>Compost only</b>	273750	5118000	273750	9186250	273750	2215700
<b>Compost and Lime</b>	322300	4915000	322300	8661700	322300	2723250
<b>Fertilizer only</b>	1885000	3517000	1885000	8123000	1885000	1022000
<b>Fertilizer and Lime</b>	1933000	3780000	1933000	696450	1933000	649450

# Recommendations and Conclusion

- There is need to encourage smallholder farmers to consider applying lime to the soil for increased maize grain yields
- The benefits attained in yields of maize after applying lime could be more to offset the cost of purchasing and transportation of lime
- Application of lime increased maize yield by 16.3% from 4.4 to 5.0t ha<sup>-1</sup> at Magoye and by 36% from 1.4 to 1.9t ha<sup>-1</sup> at Batoka
- The extra gain due to liming and fertilizer application rate was US\$ 338