



THE EFFECT OF LIQUID LIME ON SOIL pH CORRECTION FOR IMPROVED YIELDS AND QUALITY OF FLUE-CURED TOBACCO IN MALAWI

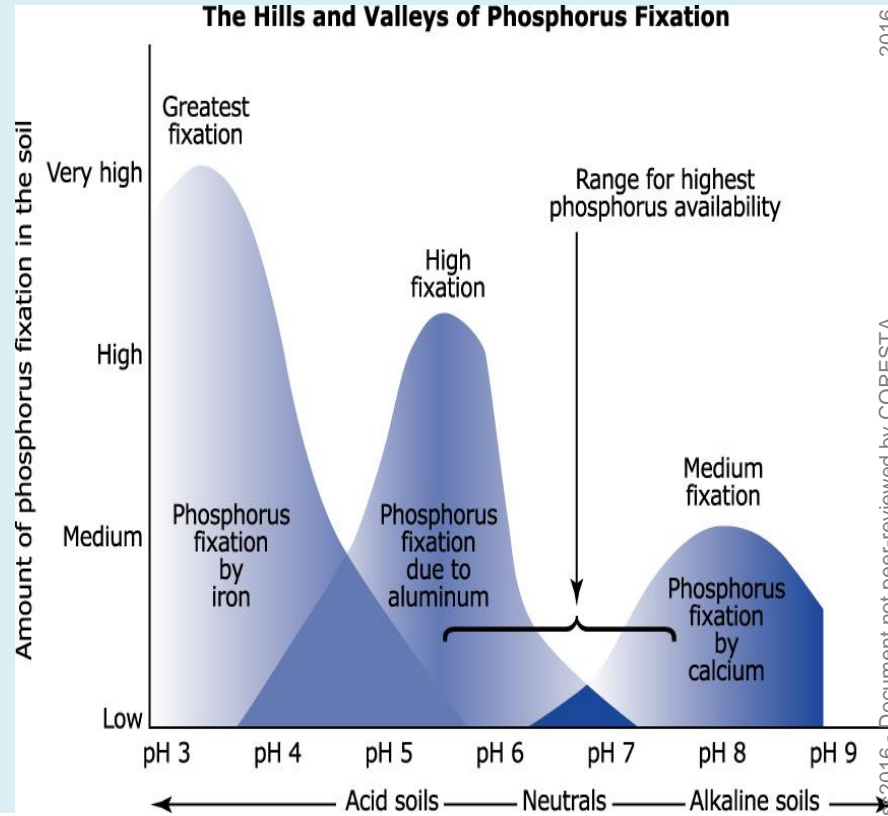
YAONA P. MTONGA – AGRONOMIST

PRESENTATION OUTLINE

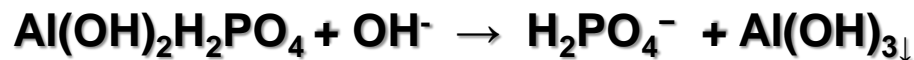
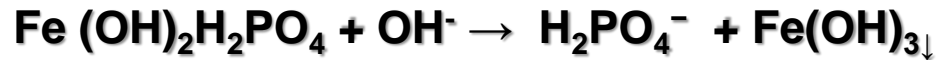
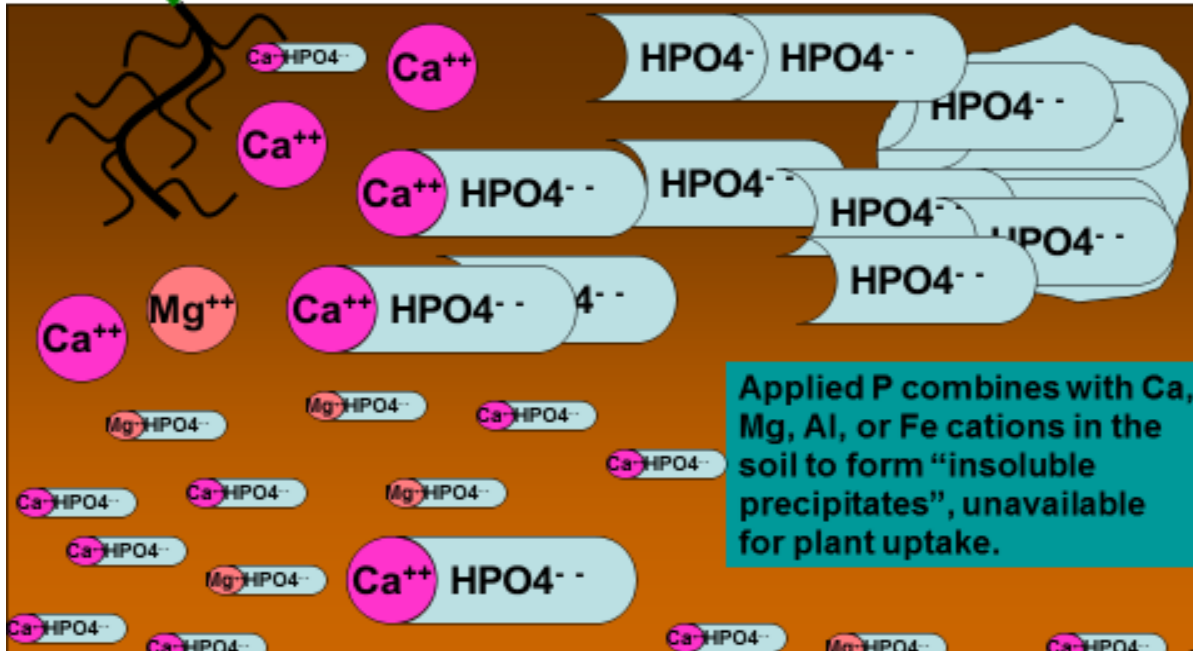
- **Introduction**
- **Objectives**
- **Materials and Method**
- **Findings**
- **Summary**

INTRODUCTION

- **Soil pH**
- **Too low or too high soil pH– leads to fixation and precipitation of P,**
- **At high pH, Phosphate (-) is fixed by cations Ca^{2+} and Mg^{2+}**
- **At low pH, Phosphate (-) is fixed by cations Fe^{3+} and Al^{3+}**
- **Only 5 to 20 % of applied P is utilized**



Phosphate Fixation



INTRODUCTION CONT'D

- **Liming adoption rate is 2%**

Why low adoption

- **Application of 40 x50kg bags (2.0 tons) of dry calcitic lime is scary**
- **Application of lime nine months before transplanting is not practical**
 - **farmers channel all their energies to current crop rather than future one.**
- **This method is very costly as it involves early tractor land ploughing**
- **With unavailability of tractors liming is almost non-existent.**
- **Cumbersome because the lime is manually broadcasted no machinery**

INTRODUCTION CONT'D

- **Two liquid-liming agents were investigated**
- **MAG-LIME-FLO (Calcium and Magnesium bicarbonate) 10 litres/ha**
- **CAL-LIME-FLO [Calcium carbonate, CaCO_3] 12.5 litres per ha**

INTRODUCTION CONT'D

Qualities of liquid-liming agents

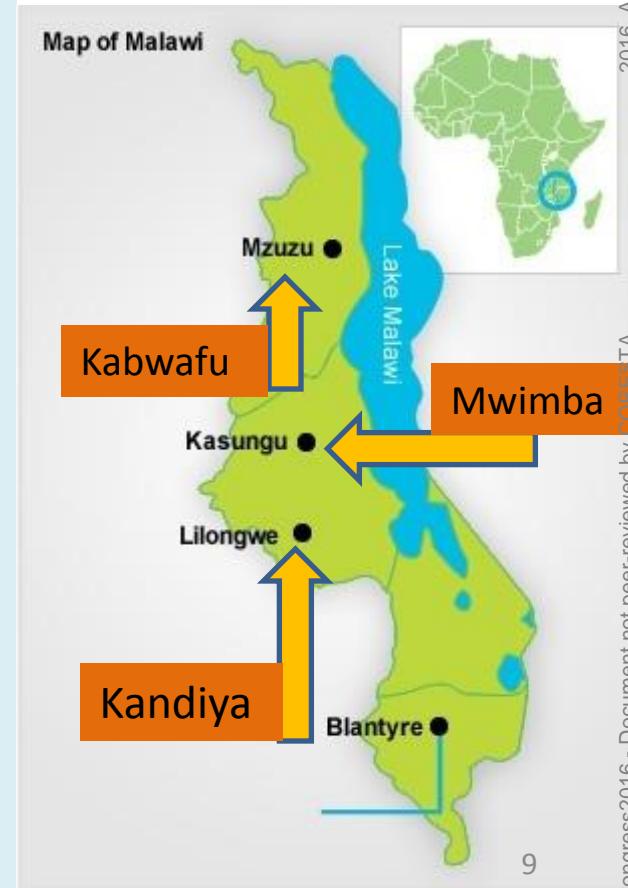
- In liquid form, fast acting due to very small average particle sizes of 2 to 15 microns which are able to move down the soil profile quickly
- Is said to increase the soil pH by 1 to 1.3 pH units within 6 to 10 weeks
- Easily applied through the transplanting water

OBJECTIVE

- **To investigate the effectiveness of liquid lime**
 - **On correcting soil pH**
 - **On improving availability of nutrients**
 - **On the attainment of higher yields and better quality of flue-cured tobacco.**

MATERIALS AND METHODS

- **SITES:** 2 sites in Central Malawi (Mwimba and Kandiya); 1 site in Northern Malawi (Kabwafu)
- **Duration:** 2014-2016



MATERIALS AND METHOD

- **5 treatments arranged in RCBD**
- **5 replications**
- **Gross plot – 4 rows, spaced at 1.2 m between rows, 0.6 m spacing between plants (48 plants/plot in total)**



Treatment	Rate per Ha	Amount in Grams or Mls /Plant	Method and Time of Application
CAL–LIME–FLO	12.5L	0.890ml	Drench 0.890ml of the mixture/ plant in the planting hole at transplanting.
DRY CALCITIC LIME	2.0 tons	143g	Dollop 143g of the powder on both sides at transplanting
MAG – LIME – FLO	10.0	0.719ml	Drench 0.719ml of the mixture/ plant in the planting hole at transplanting.
UNTREATED (NIL)	-	-	Tobacco grown without any liming agent application for pH correction

TREATMENT EFFECTING

- Liquid lime was applied in transplanting water in the planting hole before covering



DATA ANALYSIS

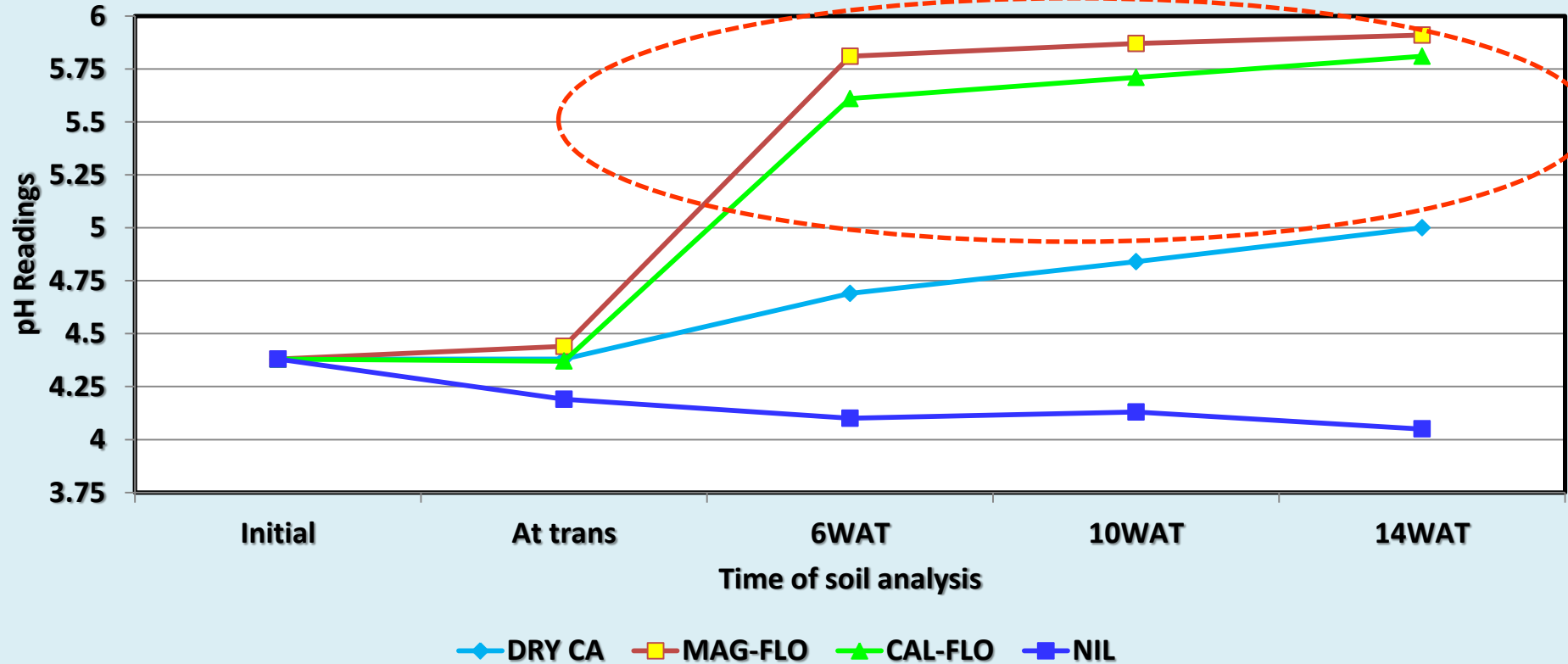
- **All the data collected was subjected to Analysis of Variance (ANOVA)**
- **Significant means were separated using Least Significant Difference at 5% level of significance**

DATA COLLECTION

- **pH assessment at ploughing, at transplanting, 6, 10, and 14 weeks after transplanting**
- **Initial and final soil chemical analysis**
- **Cured yield, stand counts, stem diameter, root volume, leaf area and plant height.**

RESULTS

Influence of Liming Materials on the soil pH at three sites across two seasons (2014-2016)





CA-FLO-LIME



MAG-FLO-LIME

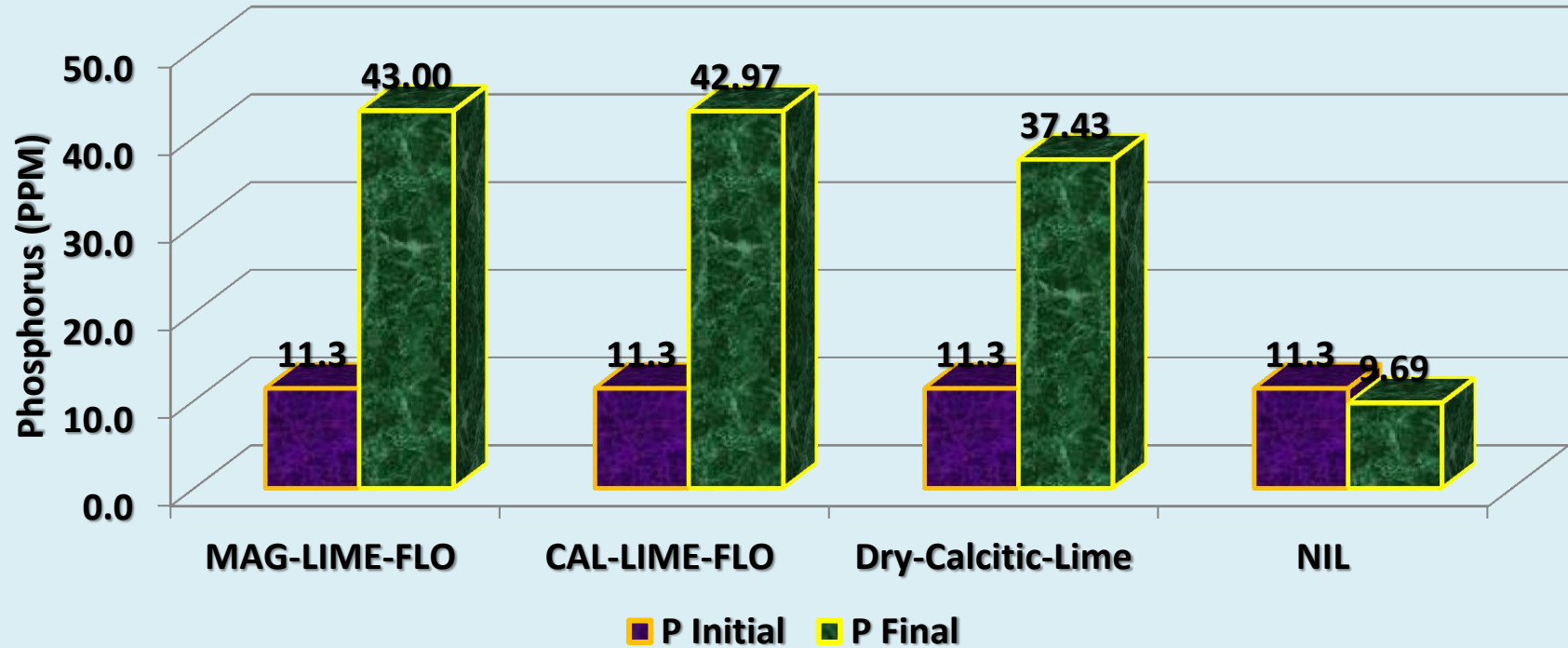


DRY-CA-LIME

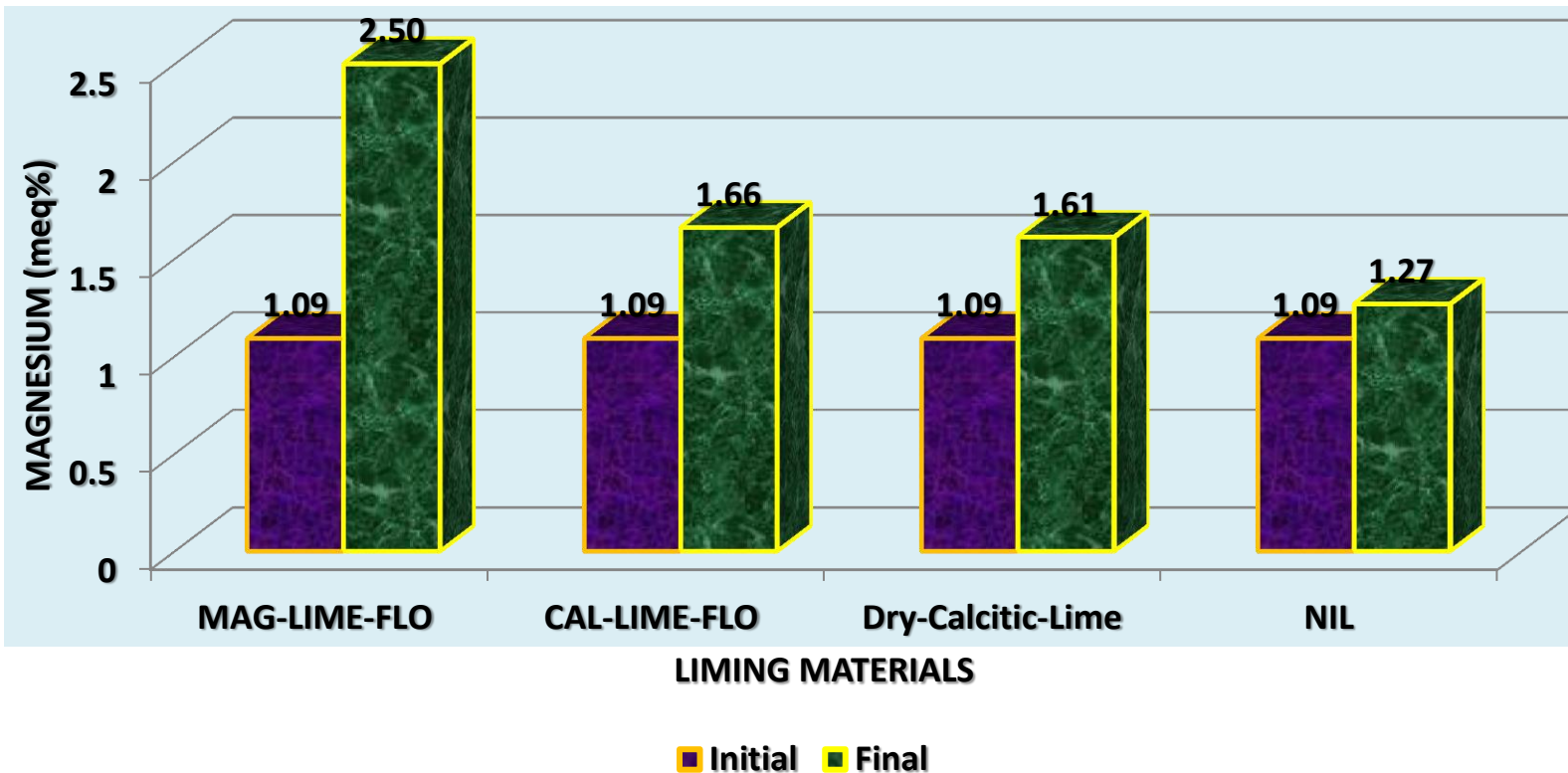


Untreated portion

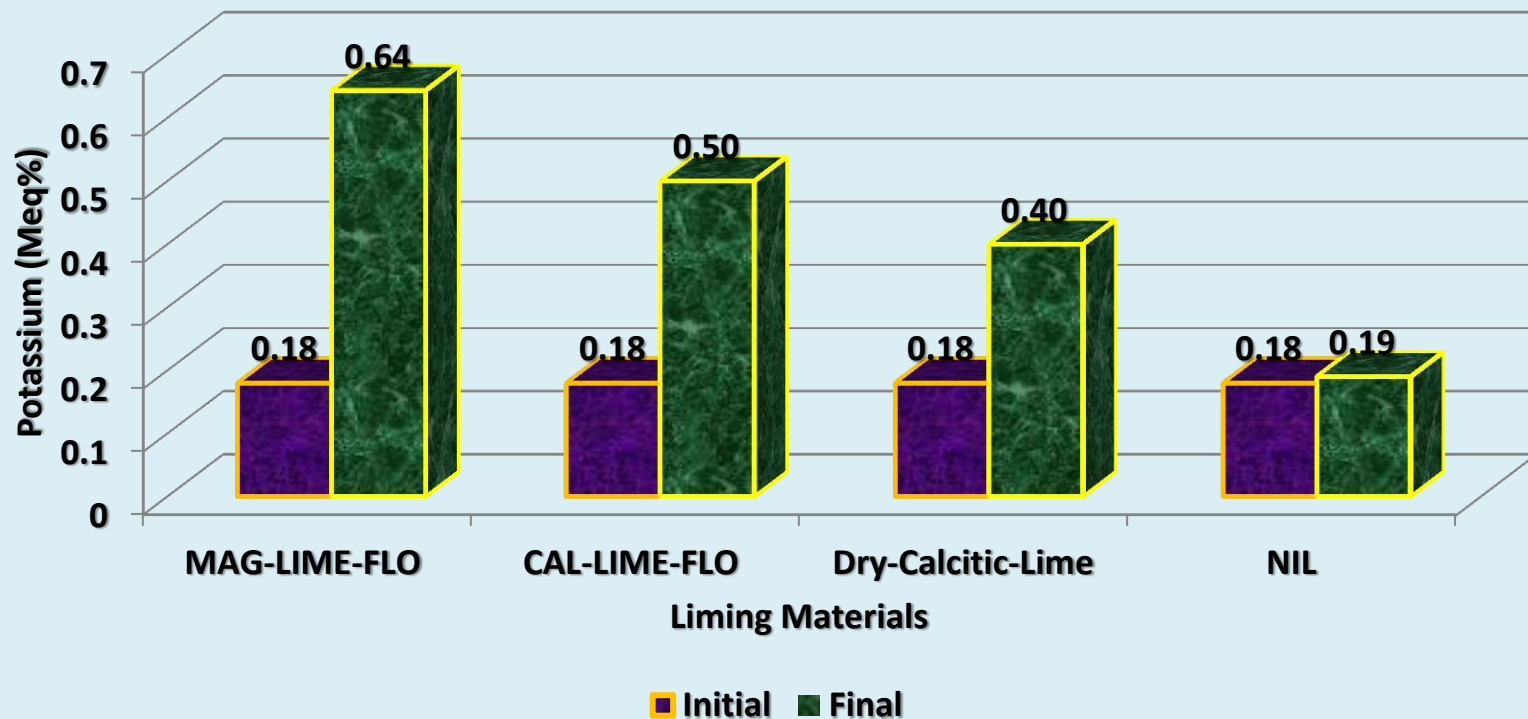
Influence of Liming Materials on the Available Phosphorus at three sites across two seasons (2014-2016)



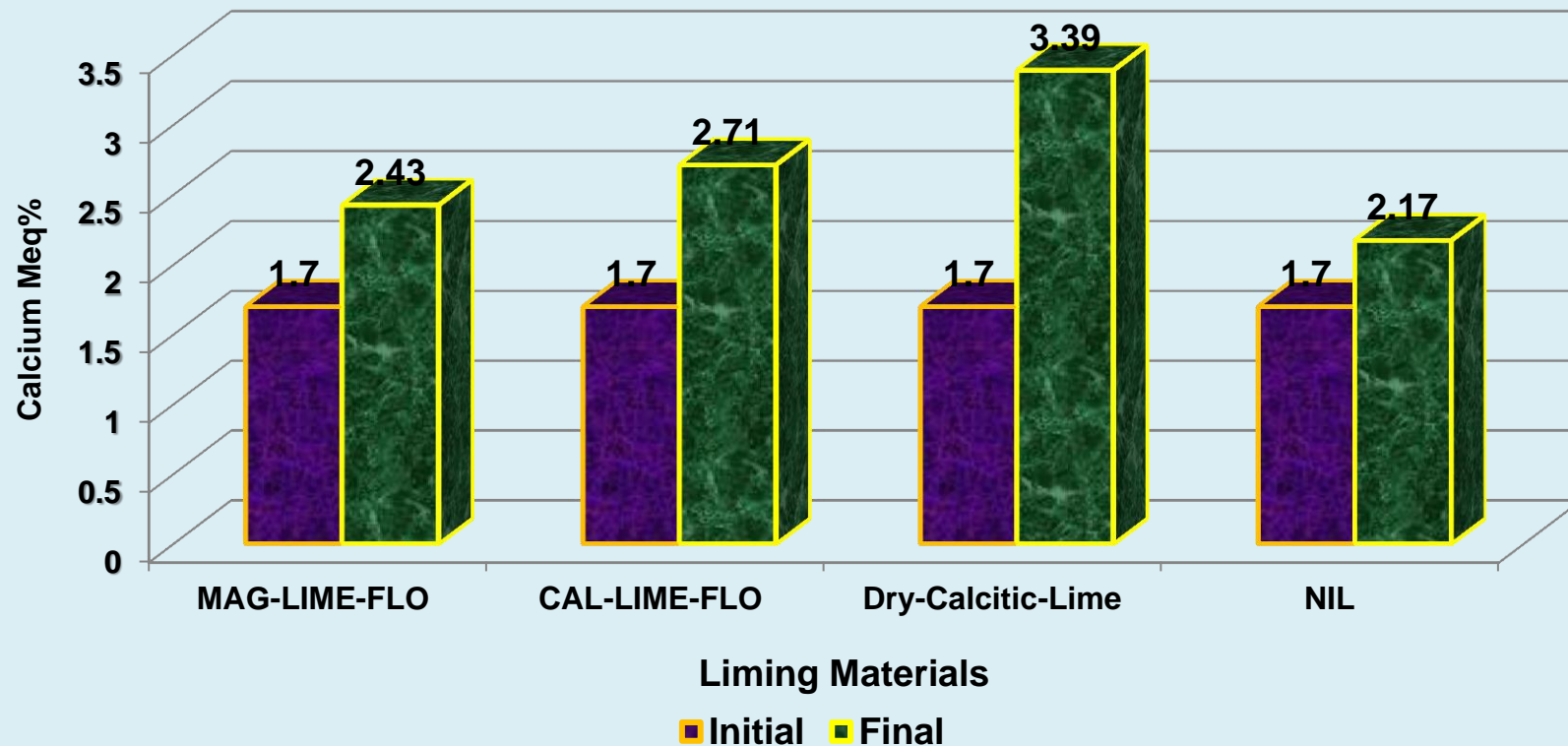
Influence of Liming Materials on the Exchangeable Magnesium at three sites across two seasons (2014-2016)



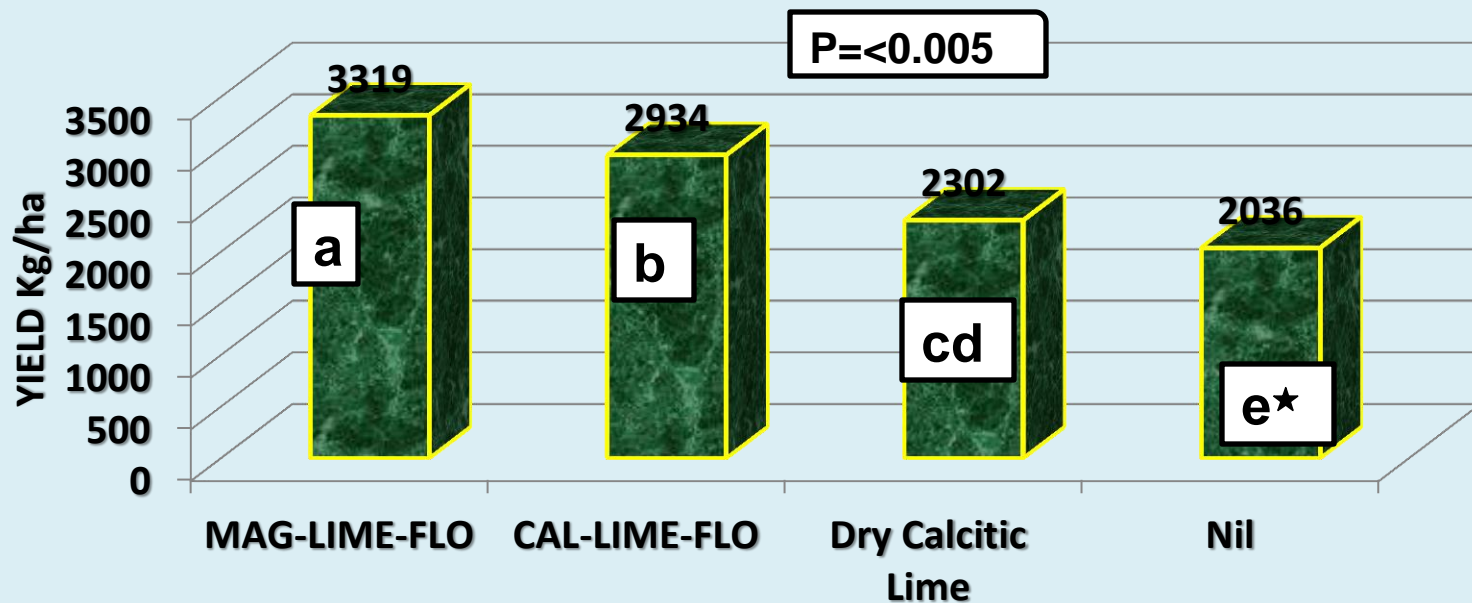
Influence of Liming Materials on the Exchangeable Potassium at three sites analyzed across years 2014-2016



Influence of Liming Materials on the Exchangeable Calcium at three sites across seasons (2014-2016)

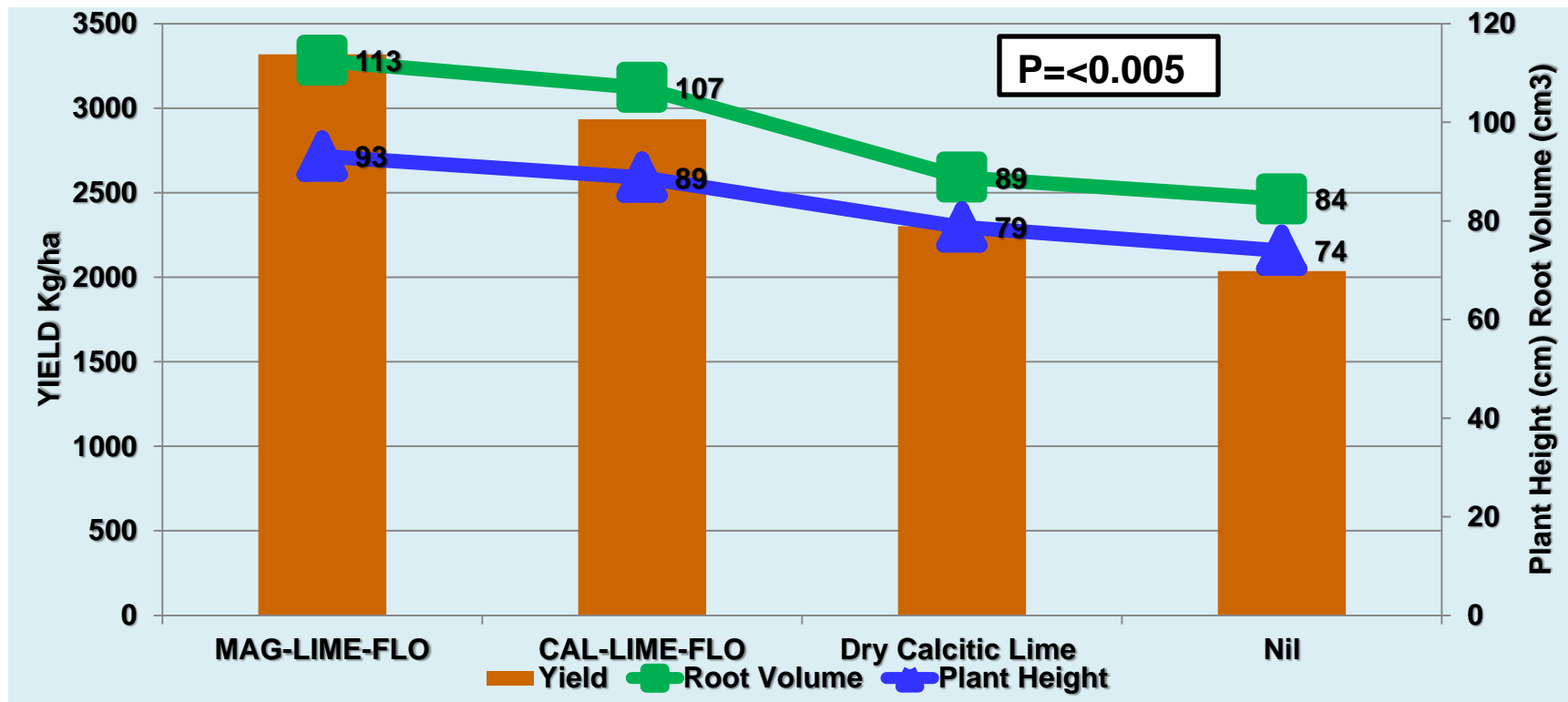


Influence of Liming Materials on the Cured Leaf Yield at three sites across two seasons (2014-2016)

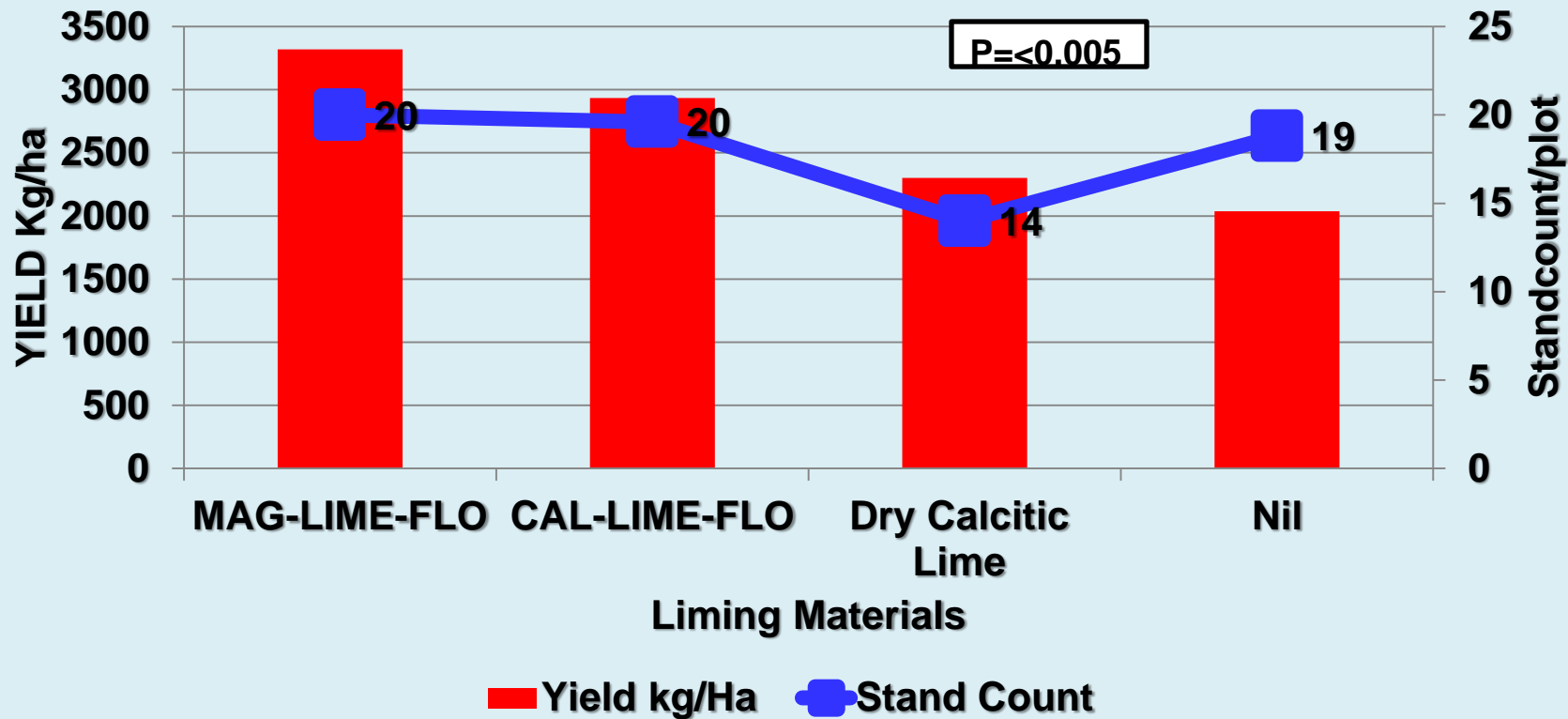


* Means separated using Duncan's Multiple Range Test

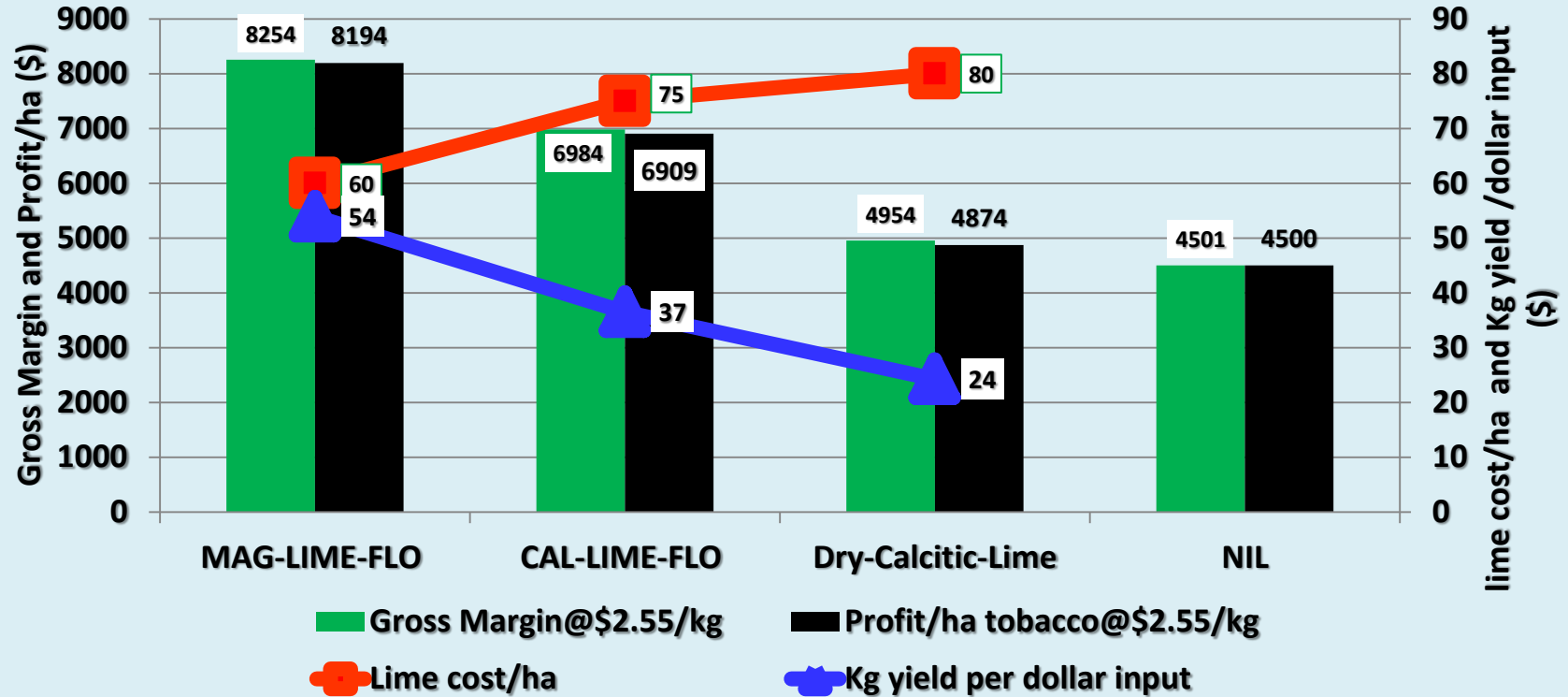
Influence of Liming Materials on the Root Volume and Plant Height at three sites across two seasons (2014-2016)



Influence of Liming Materials on the Stand Count at three sites across two season (2014-2016)



Income versus Expense analysis of Liming Materials



TRIAL SUMMARY

- The MAG-LIME FLOW and CAL-LIME-FLOW increased the pH of the soil by 14% and 15% at six weeks and by 25% and 23% at the end of harvest respectively
- These pH changes improved the available (P), (K), (Ca) and (Mg) by 73%, 59%, 77% and 56% respectively.
- MAG-LIME-FLO was better at pH correction than CAL-LIME-FLO. It also improved availability of P, K, Mg, followed CAL-LIME-FLO.

TRIAL SUMMARY

- **MAG-LIME-FLO and CAL-LIME-FLO significantly outperformed the yields from the Nil plots by at least 84% and 50% respectively**
- **MAG-LIME-FLO had 45% more gross returns per hectare while CAL-LIME-FLO had a 36% more gross return over the Nil plots.**

CONCLUSION

- **This study therefore suggests that using liquid limes corrects the pH levels relatively quicker within the same season.**
- **Liquid lime is an economically viable option for low resource growers who lack basic machinery for liming and are limited by financial resources.**

THANK YOU