



Introduction

In third world countries, maize (*Zea mays* L.) grain yields are generally below 2 Mg ha⁻¹. The poor planting method employed results in increased competition between neighboring plants, consequently reducing grain yield and increasing the quantity of seeds used, with the associated cost. The combined effect of seed distribution and within row spacing on grain yield and nitrogen (N) uptake needs to be clearly understood.

Objective

To determine the significance of maize grain yield difference between 1, 2 & 3 seeds per hill

Materials and Methods

- Sites-Years: Lake Carl Blackwell (LCB) and Efaw Research Station near Stillwater, OK in 2012-2013
- Treatment Structure: Randomized complete block design, 3 replications; and a factorial treatment structure of 1,2 & 3 seeds per hill at 0.16, 0.32, & 0.48m inter-row spacing were used
- Pre-plant N at 130kg N ha⁻¹, uniform rate.
- Maize planting done using a pointed stick and mechanical hand planter (Figures 1&2)
- NDVI measurements at V4, V6, V8 maize growth stages with a GreenSeeker™. Light Interception at V6 Maize growth stage using Line Quantum light sensor
- Analysis of Variance and least significant difference was used for means separation



Figure 1. Maize Planting with the mechanical hand planter



Figure 2. Maize being planted with a pointed stick

Results

Table 1. Analysis of Variance for the treatment means for NDVI, IPAR, Yield and N uptake for all years and location.

Sources of Variation d.f		2012		2013
		Efaw	LCB	Efaw
Location				
		Significance level		
NDVI V4	9	**	ns	**
NDVI V6	9	ns	ns	***
NDVI V8	9	ns	ns	***
IPAR	9	ns	ns	***
Yield	9	***	ns	***
N Uptake	9	***	ns	***

** , *** significant at 0.05 and 0.01 probability levels, respectively; ns not significant

Table 2. Interaction effect between number of seeds per hill and Inter-row Spacing on maize grain yield and N uptake at Efaw 2012 & 2013.

Interaction effect		2012		2013	
		Yield (Mg ha ⁻¹)	2013	2012	2013
Seeds x Spacing				N uptake(Kg ha ⁻¹)	
1	0.16	11.1a	9.0a	138.6a	102.4a
1	0.32	6.8c	4.0e	86.0c	49.7e
1	0.48	6.5c	4.3e	77.3c	53.4ed
2	0.16	10ba	7.8ba	113.3bac	85.4bc
2	0.32	10.6a	6.5c	137.7a	79.1c
2	0.48	7.4bc	5.6d	91.5bc	64.1d
3	0.16	9.6ba	7.4bc	113.7bac	91.3bac
3	0.32	11.3a	7.2bc	136.4a	81.8c
3	0.48	11.7a	7.0bc	146.3a	78.5c

Least Significant difference ($\alpha=0.05$). Means with same letter are not significantly different

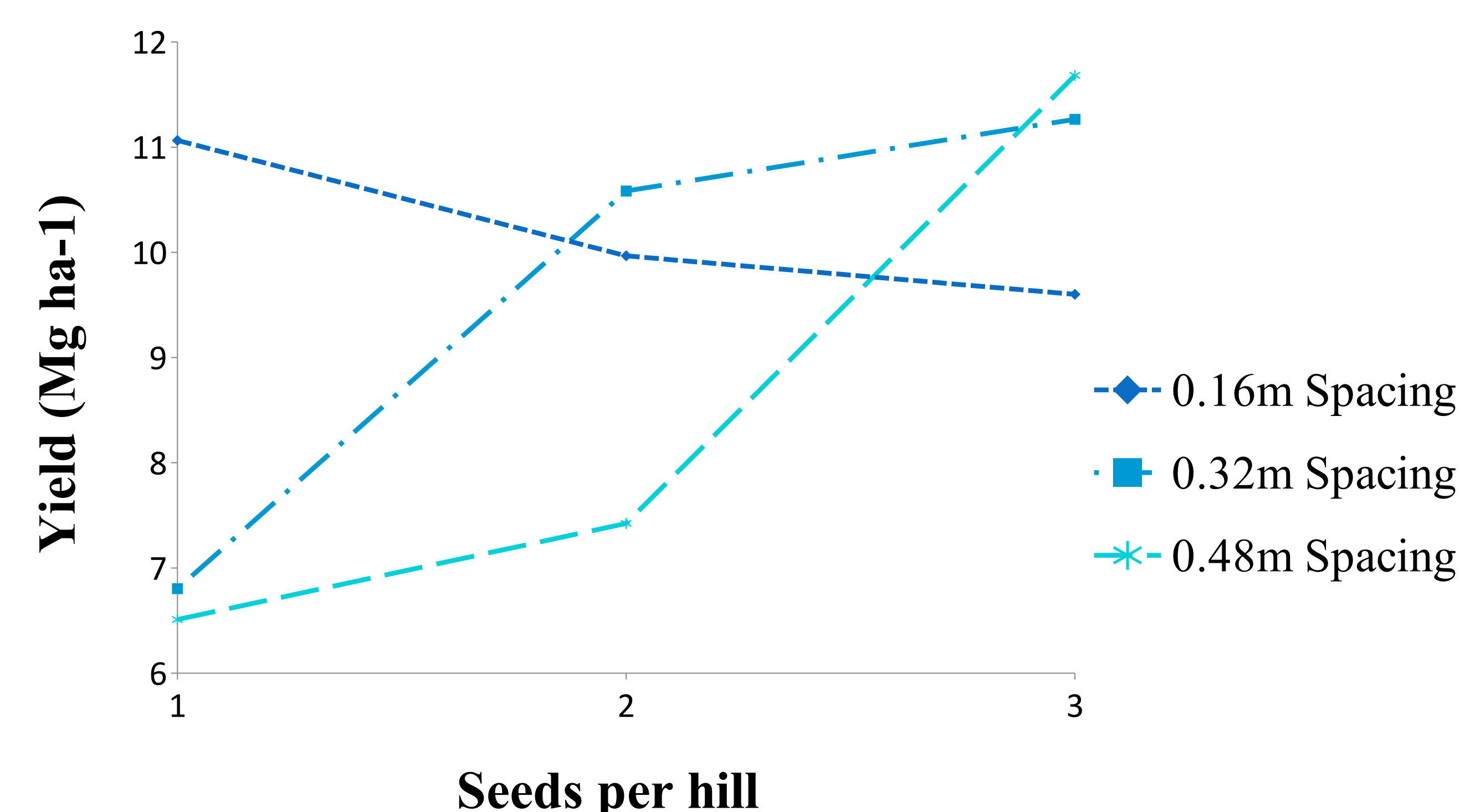


Figure 3. Interaction between number of seeds per hill and inter-row spacing at Efaw, OK. 2012.

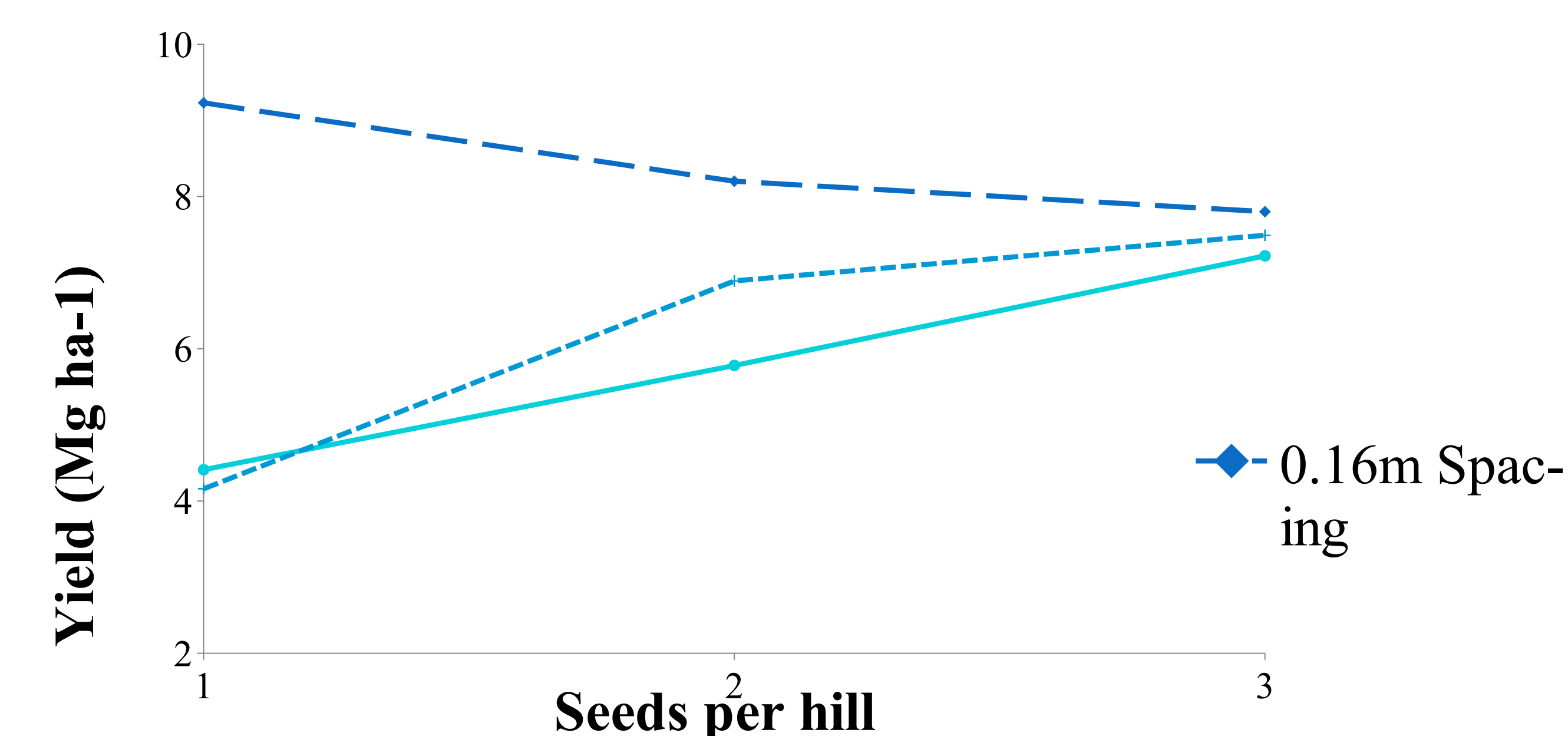


Figure 4: Interaction between number of seeds per hill and inter-row spacing at Efaw, OK. 2013.

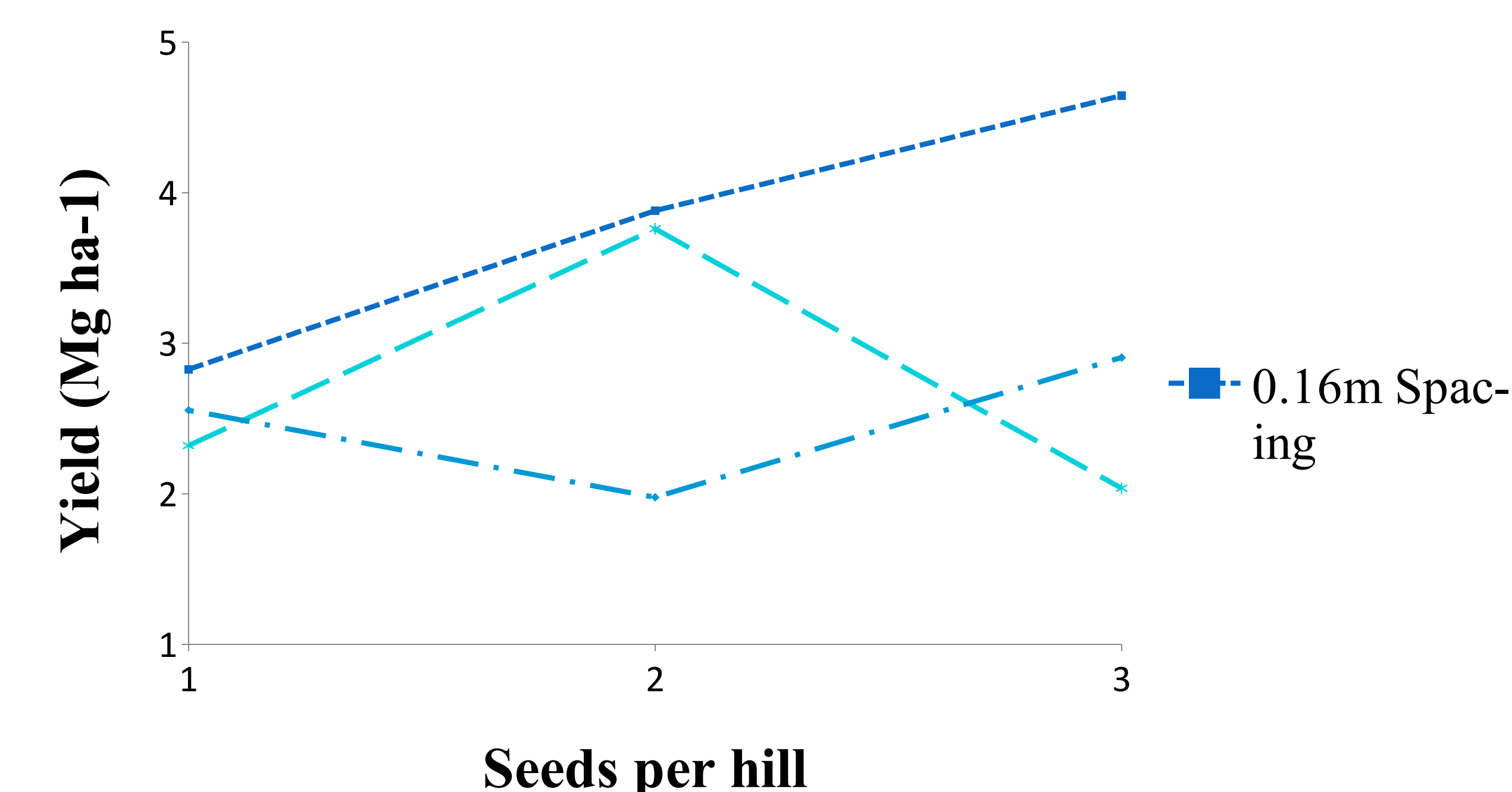


Figure 5: Interaction between number of seeds per hill and inter-row spacing at LCB, OK. 2012.

- NDVI and IPAR increased with number of seeds per hill by 9 and 14%, respectively
- NDVI and IPAR decreased with plant spacing by 10 and 11%, respectively.
- Grain yield decreased at 0.16m spacing due to increasing plant competition and increased at both 0.32 and 0.48m inter-row spacing (Figures 3&4)
- Grain yield at 0.16m spacing was higher than at other inter-row spacing, considering all years and location
- Nitrogen uptake decreased at 0.16m and increased at 0.48m spacing,

Conclusions

- Maximum maize grain yield and N uptake are attained with one seed per hill.
- Both grain yields and N uptake can be reduced if more than 1 seed is placed in the same hill by 12 - 15%.
- Placing one seed per hill at 0.16m requires only 33% of the seeds in comparison to planting 3 seeds per hill at same inter-row spacing.
- Yield and economic benefits were sufficient to support production of maize at 0.16 m inter-row spacing with one seed per hill by third world farmers.

Acknowledgments

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