

Growth and Yield of Soybean (*Glycine max* (L.) Merr) AS Influenced by Organic and Inorganic Fertilizers

By

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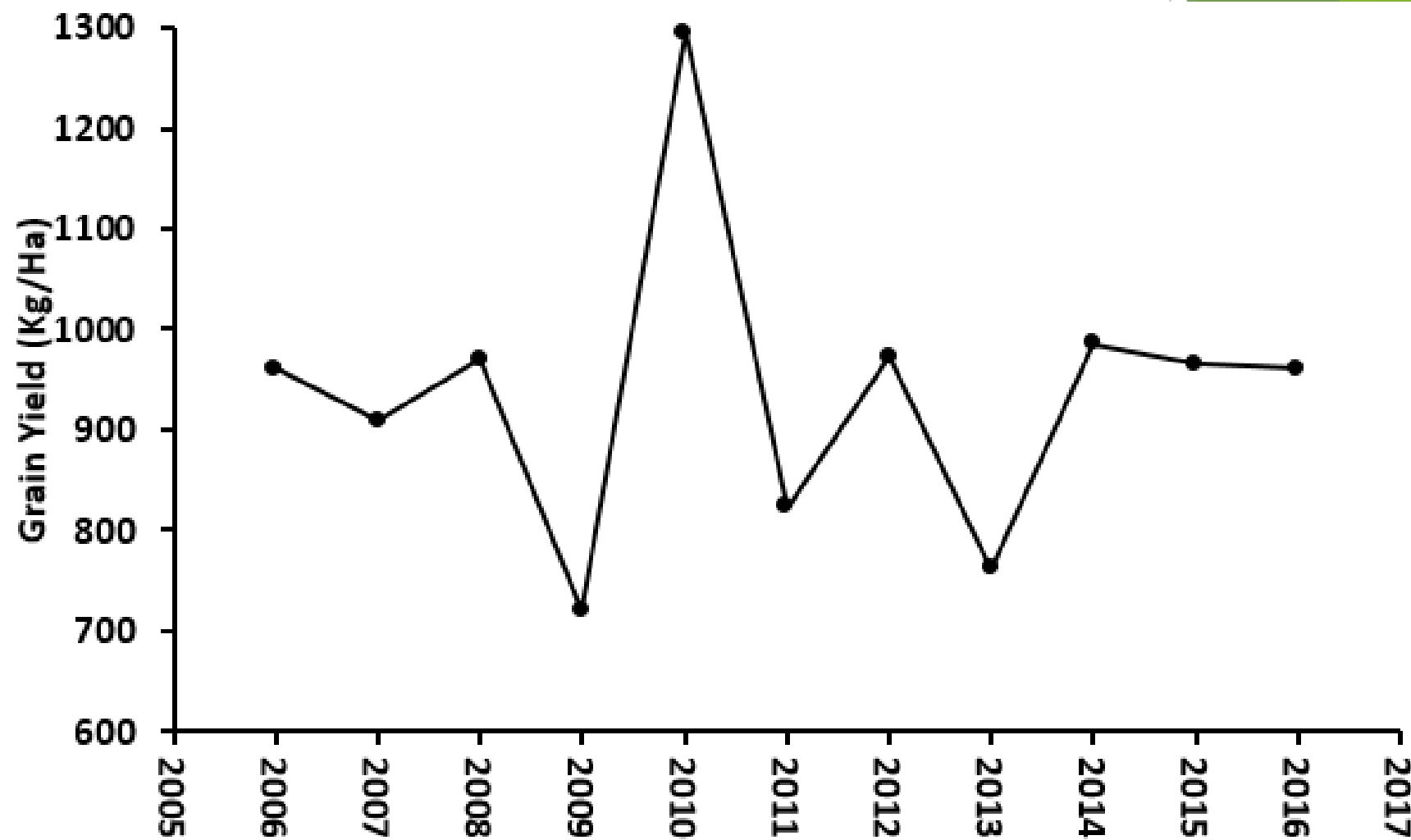
INTRODUCTION

- ▶ Soybean (*Glycine max* (L.) Merr) is a legume that grows in tropical, subtropical, and temperate climates.
- ▶ Nigeria is the largest producer of Soybean in Sub-Saharan Africa (SSA), followed by South Africa..
- ▶ Soybean was domesticated in the 11th century around Northeast of China.
- ▶ It is believed that it might have been introduced to Africa in the 19th century by Chinese traders along the East coast of Africa (Jones, 2003).

■ USES AND PRODUCTION CONSTRAINTS.

- ❖ The crop has been described as the world's chief source of edible vegetable oil and high protein feed for livestock which compares favourably with animal protein source containing all the essential amino acid required by man (Manral and Saxena, 2003).
- ❖ Soybean is called a miracle golden bean because of its nutritive value, especially as a substitute or complement of protein in human diet.
- ❖ Despite its importance, low yields ($<1 \text{ t ha}^{-1}$ in tropical Africa) and a shortage of fertilizer constrain the ability of some countries to increase production (IITA, 2008).

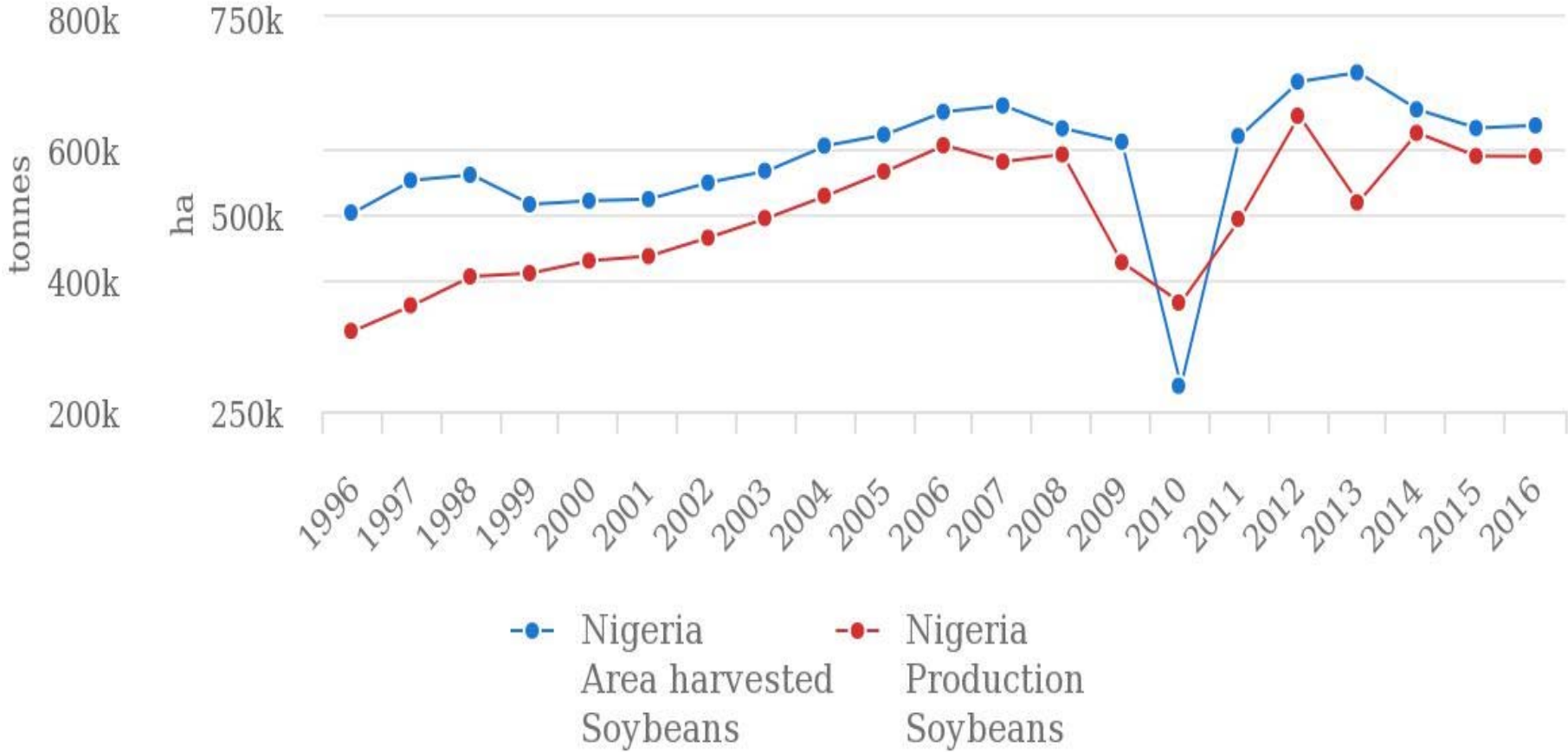
YIELD PER HECTARE



PRODUCTION

Production/Yield quantities of Soybeans in Nigeria

1996 - 2016



Source: FAOSTAT (Oct 30, 2018)

JUSTIFICATION

- ▶ Poultry manure is very cheap and effective as a good source for Nigerian sustainable crop production, but its availability remains an important issue due to its bulky nature while inorganic fertilizer is no longer within the reach of resources of poor farmers due to its high cost (Rahman, 2000).
- ▶ Among the means available to achieve sustainability in agricultural production, organic manure and bio fertilizer play an important and key role on the desired soil properties and exerts a beneficial effect on all soil characteristics (Soleimanzadeh and Ghooshchi, 2013).
- ▶ One of the ways of increasing nutrients status is by boosting the soil nutrient content either with the use of organic materials such as poultry manure, other animals waste and the use of compost with or without inorganic fertilizers (Dauda *et al.*, 2008).

OBJECTIVES OF THE RESEARCH

- ▶ To Determine the Effect of Poultry Manure on the Growth and Yield of Three Varieties of Soybean.
- ▶ To Determine the Effect of NPK on the Growth and Yield of Three Varieties of Soybean.
- ▶ To Determine the Effect of Combination of Poultry Manure and NPK on the Growth and Yield of Three Varieties of Soybean.
- ▶ To Determine the Varietal Response to above Treatments.

MATERIALS AND METHODS

► The experiment sites

The Screen House of the Department of Agronomy, Faculty of Agriculture Bayero University, Kano, Nigeria.

Coordinates BUK Farm = N11.97978 E008.41923

► Treatments and experimental design

(control, 244.44 kg ha⁻¹ NPK, 10 t ha⁻¹ poultry manure, 5 t ha⁻¹ poultry manure + 244.44 kg ha⁻¹ NPK, and 2.5 t ha⁻¹ poultry manure + 355.55 kg ha⁻¹ NPK).

- These were factorially combined and laid in a Completely Randomized Design (CRD) with three replications.
- Forty-five perforated pots were filled with top soil with each pot weighing 14kg.
- The organic fertilizer was applied one week before sowing.
- The inorganic fertilizer was applied two weeks after sowing.

DATA COLLECTION AND ANALYSIS

- Parameters were taken on 3 tagged plants per pot at 5, 7 and 9 weeks after sowing and the average were calculated.
- ▶ **Plant Height (cm)**
- ▶ **Number of branches plant⁻¹**
- ▶ **Leaf area plant⁻¹ (cm²)**
- ▶ **Number of pods plant⁻¹**
- ▶ **Grain weight plant⁻¹ (g)**
- ▶ **100 seed weight (g)**
- **Data Analysis**
 - ▶ The data collected were subjected to Analysis of Variance (ANOVA) using Statistical Analysis System (SAS).
 - ▶ The treatment means was computed using Student-Newman-Keuls (SNK) method.

Table 1. Physico – Chemical Properties of Soil of the Experimental Site

Soil variable	Composition
Particle size distribution (%)	
Sand	67
Silt	17
Clay	16
Textural class	Sandy loam
Chemical properties	
pH (water)	7.78
pH (CaCl ₂)	6.93
Organic Carbon (%)	1.40
Total Nitrogen (%)	0.03
Available Phosphorus (ppm)	5.11
Exchangeable bases	
Potassium (<u>Cmol/kg</u>)	0.27
Sodium (<u>Cmol/kg</u>)	0.18
Calcium (<u>Cmol/kg</u>)	1.30
Magnesium (<u>Cmol/kg</u>)	1.37

Table 2. Effect of Variety and Fertilizer Rate on Plant Height, Number of Branches Plant⁻¹ and Leaf area Plant⁻¹ of Soybean at 5, 7 and 9 Weeks after Sowing

Treatment	Plant height Weeks after Sowing			Branches plant ⁻¹ Weeks after Sowing			Leaf area Weeks after Sowing		
	5	7	9	5	7	9	5	7	9
Variety (V)									
TGX 1835-10E	32.85	48.39	57.23b	3.26	5.03a	5.70a	60.26a	64.70a	79.07a
TGX 1987-62F	32.27	48.05	66.76a	2.80	4.13b	4.90b	45.33b	63.11a	75.06a
TGX 1740-2E	31.91	50.39	67.08a	3.00	3.97b	4.62b	42.96b	51.65b	57.29b
SE ±	1.352	1.637	1.840	0.147	0.227	0.246	3.641	3.695	3.116
Fertilizer (F)									
Control	21.25c	37.89b	55.27b	3.26	5.03a	5.70a	35.26c	49.86b	65.60
244.44 kg ha ⁻¹ NPK	31.76b	53.62a	67.55a	2.80	4.13b	4.90b	48.19abc	50.63b	67.40
10 t ha ⁻¹ Poultry manure	24.86c	39.04b	55.67b	3.00	3.97b	4.62b	45.21bc	56.39b	66.50
5 t ha ⁻¹ PM + 244.44 kg ha ⁻¹ NPK	42.63a	56.62a	69.13a	1.47	2.27b	2.46b	54.89ab	62.93b	71.68
2.5 t ha ⁻¹ PM + 355.55kg ha ⁻¹ NPK	41.20a	57.55a	70.83a	3.26	5.03a	5.70a	64.03a	79.30a	81.20
SE±	1.745	2.114	2.375	2.800	4.130	4.900	4.700	4.770	4.023
Interaction									
V × F	*	NS	*	NS	NS	NS	NS	**	NS

Means with the same letter (s) are not significantly different at 5% level of probability using Student-Newman-Keuls Test (SNK).

* = Significant at 5%

** = Highly significant at 1%

Table 3. Chemical Properties/Composition of Poultry Manure (PM)

Nutrients	Composition
pH (water)	8.50
pH (CaCl ₂)	8.17
Organic carbon (%)	85.79
Total Nitrogen (%)	0.08
Total Phosphorus (ppm)	20.89
Potassium (mg/kg)	250
Magnesium (mg/kg)	250
Calcium (mg/kg)	450
Sodium (mg/kg)	250

Table 4. Effect of Variety and Fertilizer rate on Number of Pods Plant⁻¹, Grain Weight Plant⁻¹ and 100 Seed Weight of Soybean

Treatment	Number of Pods Plant ⁻¹	Grain Weight Plant ⁻¹ (g)	100-Seed weight (g)
Variety (V)			
TGX 1835-10E	17.83b	4.06a	8.53a
TGX 1987-62F	21.76a	1.87b	6.88b
TGX 1740-2E	19.61ab	3.46a	9.07a
SE ±	0.776	0.333	0.290
Fertilizer (F)			
Control	16.28c	3.08	7.62
244.44 kg ha ⁻¹ NPK	19.58bc	2.62	8.21
10 t ha ⁻¹ Poultry manure	17.14c	2.77	7.75
5 t ha ⁻¹ PM + 244.44 kg ha ⁻¹ NPK	20.98b	4.08	8.42
2.5 t ha ⁻¹ PM + 355.55 kg ha ⁻¹ NPK	24.69a	3.09	8.80
SE±	1.001	0.430	0.375
Interaction			
V × F	NS	NS	**

Means with the same letter (s) are not significantly different at 5% level of probability using Student-Newman-Keuls Test (SNK).

** = Highly significant at 1%

NS = Not significant

Table 5. Interaction between Variety and Fertilizer on Leaf Area (cm²) at 7 WAS

Variety	TGX1835-10E	TGX1987-62F	TGX1740-2E
Fertilizer			
Control	29.81c	45.62bc	28.98c
244.44 kg ha ⁻¹ NPK	74.97ab	55.72abc	66.36abc
10 t ha ⁻¹ Poultry manure	59.49abc	59.96abc	49.71bc
5 t ha ⁻¹ PM + 244.44 kg ha ⁻¹ NPK	64.61abc	70.83abc	53.35bc
2.5 t ha ⁻¹ PM+355.55kg ha ⁻¹ NPK	94.63a	83.40ab	59.86abc
SE±	8.262		

Means within and across column followed by the same letter (s) are not significantly different at 5% level of probability using Student-Newman-Keuls Test.

CONCLUSION

- Variety TGX1835-10E Performed better than other varieties tested.
- Combination of 2.5 t ha⁻¹ of poultry manure and 355.5 kg ha⁻¹ of NPK proved to be superior to other rates and combinations of fertilizers.

ACKNOWLEDGEMENT

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T H A N K

Y O U

