

## **VALIDATING THE EFFECTS OF PLANT CATALYST IN FERTILIZER REDUCTION ON TOMATO YIELDS IN KANO STATE, NIGERIA**

### **Introduction**

PlantCatalyst® is a 47-year-old, Rapid, City, South Dakota-based, international and climate smart, food security company that empowers smallholder farmers in developing countries and throughout the United States to sustainably increase profit-per-hectare by increasing crop yield, reducing reliance on expensive, toxic fertilizers, and reducing deforestation. Specifically, PlantCatalyst® helps farmers improve their agricultural yield by 30%, reduce fertilizer use by 50%, reduce grow times by 1 - 7 days, provide greater resistance to diseases and drought, increase germination rates, and expand root growth. Since 1973, small and large farmers, gardeners, and professional growers all over the world have been using PlantCatalyst® to grow crops in a more sustainable way and to increase profit per-hectare by increasing crop yield and reducing CO<sub>2</sub> emissions and fertilizer amounts (ZARI 2017).

### **Statement of the Problem**

Dr. Willard's water is a Plant Catalyst which has been in use since 1973 in America to enhance the utilization of nutrients and to improve cellular absorption and retention in plants. PlantCatalyst® is new to Nigeria. The major agricultural challenges of Northern Nigeria are economic and climate related issues; such as reducing soil fertility, pollution, droughts, floods among others which reduces vegetable yields and hence increase cost of agricultural production. Therefore, efforts to address these limitations need to be achieved and Dr. Willard's PlantCatalyst® will go a long way in mitigating these problems. During the 2020 farming season, Syngenta Foundation for Sustainable Agriculture (SFSA) Nigeria tested the PlantCatalyst® on Tomato plant in Kano state.

The operational strategy of SFSA Nigeria focuses on smallholders, productivity, and markets. The Foundation works with partners in developing countries and emerging markets. SFSA aim is to help smallholder farmers become more professional growers by extending science-based know-how, facilitating access to quality inputs, and linking smallholders to markets in profitable ways. This adds value to rural communities, and sustainably improves food security.

### **Objectives of the Experiment**

- i. To determine the efficacy of PlantCatalyst® at different fertilizer application rate on tomato yield.
- ii. Estimate the profitability analysis of tomato plants across the treatments.

## Materials and Methods

The experiment was carried out in Wasai, Mingibri LGA and Yanshado, Dawakin tofa LGA all in Kano state, between August 2020 and January 2021.

To know the average year round climatic conditions in [Kano](#) click [here](#). The crop used for the experiment was [Chibli](#), a tomato variety from Syngenta vegetable Nigeria.

### Experimental set up.

The seedlings were raised in seedling trays using cocopeat as the medium of growth. While in the green house all necessary agronomic practices were carried out.

Transplanting was done 21 days after sowing in an already prepared field.

### Plot layout

The field was divided into four plots to accommodate the four treatments as shown below.

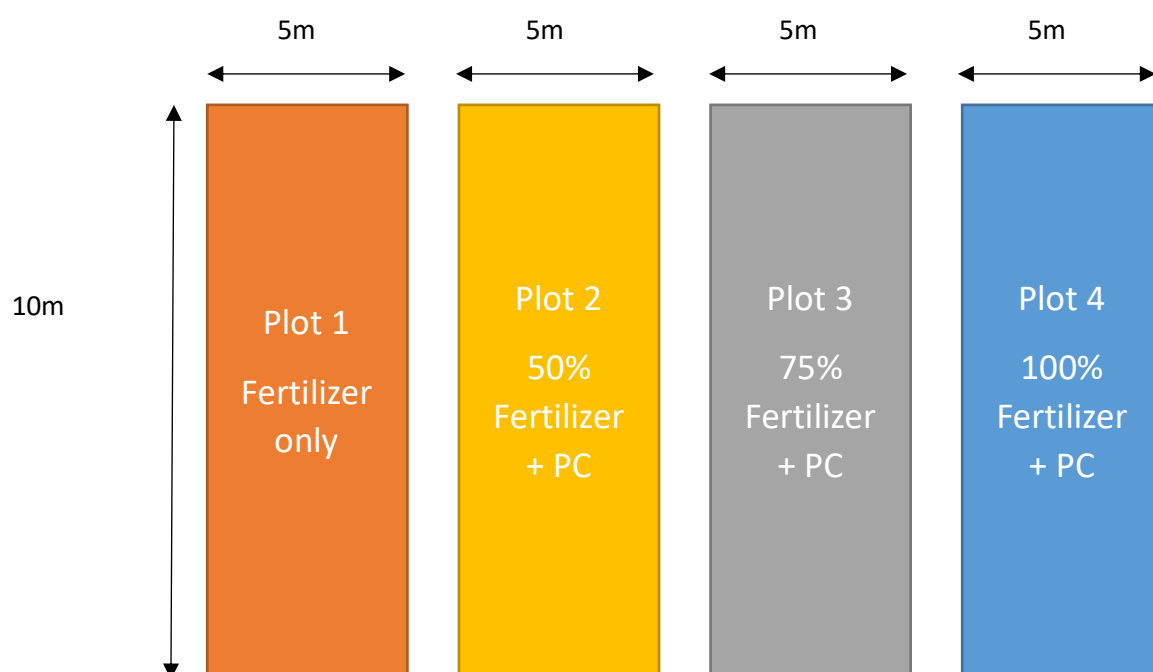


Fig. 1 Experiment layout design

### Plant population and spacing

Each plot contained an average of 138 plant stands at a spacing of 0.6 x 0.6m

## Treatments

The idea behind the construction of treatments structure was the sufficient knowledge that the PlantCatalyst® was not designed to replace fertilizer but rather to serve as an addition to nutrient or fertilizer application. The tomato plants were laid out in a Complete Randomized Block Design (CRBD) with two (2) replications and followed the treatment structure shown in the table below.

<b>Treatments</b>	<b>Treatment Combination of Fertilizer and PlantCatalyst®</b>
1	was the control, it was treated with only 100% fertilizer application
2	50% fertilizer application and 30mls of PlantCatalyst® in 16 liters of water
3	75% fertilizer application and 30mls of PlantCatalyst® in 16 liters of water
4	100% fertilizer application and 30mls of PlantCatalyst® in 16 liters of water

## PlantCatalyst® Application

After transplanting, 30mls of PlantCatalyst® was mixed in 16liters of water and sprayed as a foliar treatment on plot 2,3, and 4 weekly for 8 consecutive weeks.

## Summary of Results and Discussion

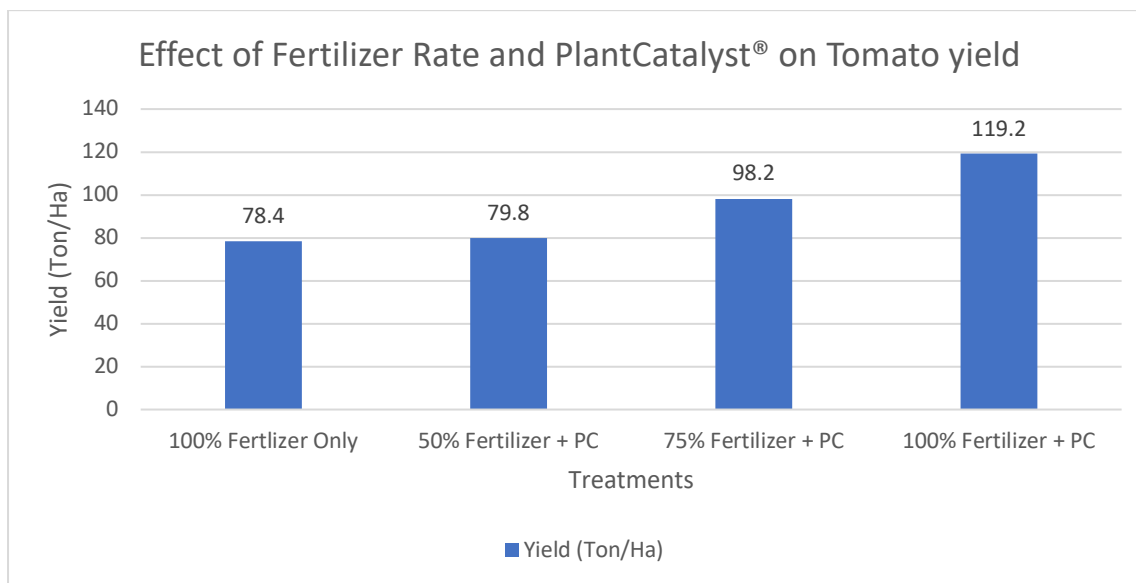


Fig. 2: Effects on tomato yield

From Figure 2 above, 100% fertilizer usage with the recommended PlantCatalyst® rate gave the best result with the total yield of 119.2ton/ha, followed by 75% fertilizer usage with recommended PlantCatalyst® rate with 98.2ton/ha, 50% Fertilizer usage with recommended PlantCatalyst® rate gave 79.8ton/ha above the use of 100% fertilizer usage without PlantCatalyst® (0% PlantCatalyst®) 78.4ton/ha. This result proves that the addition of PlantCatalyst® increases the yield above the use of 100% fertilizer usage only.

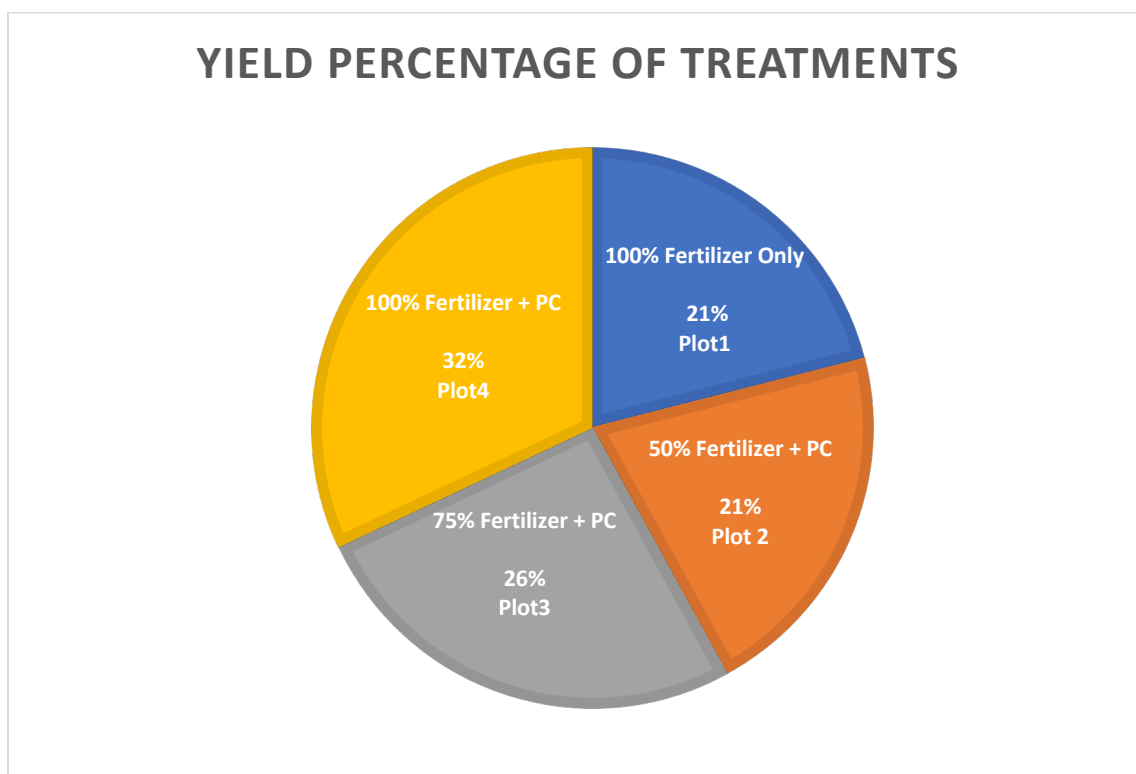


Fig. 3: Yield Percentage of Treatments

The result above shows that 100% fertilizer with the recommended PlantCatalyst® constituted 32% of the total yield, while 75% fertilizer rate with the recommended plant catalyst contributed 26%, 50% fertilizer with PlantCatalyst® and only 100% fertilizer application had 21% each of the total yield. There is no **significant difference between ‘Plot 1’ and ‘Plot 2’ in terms of yield.**

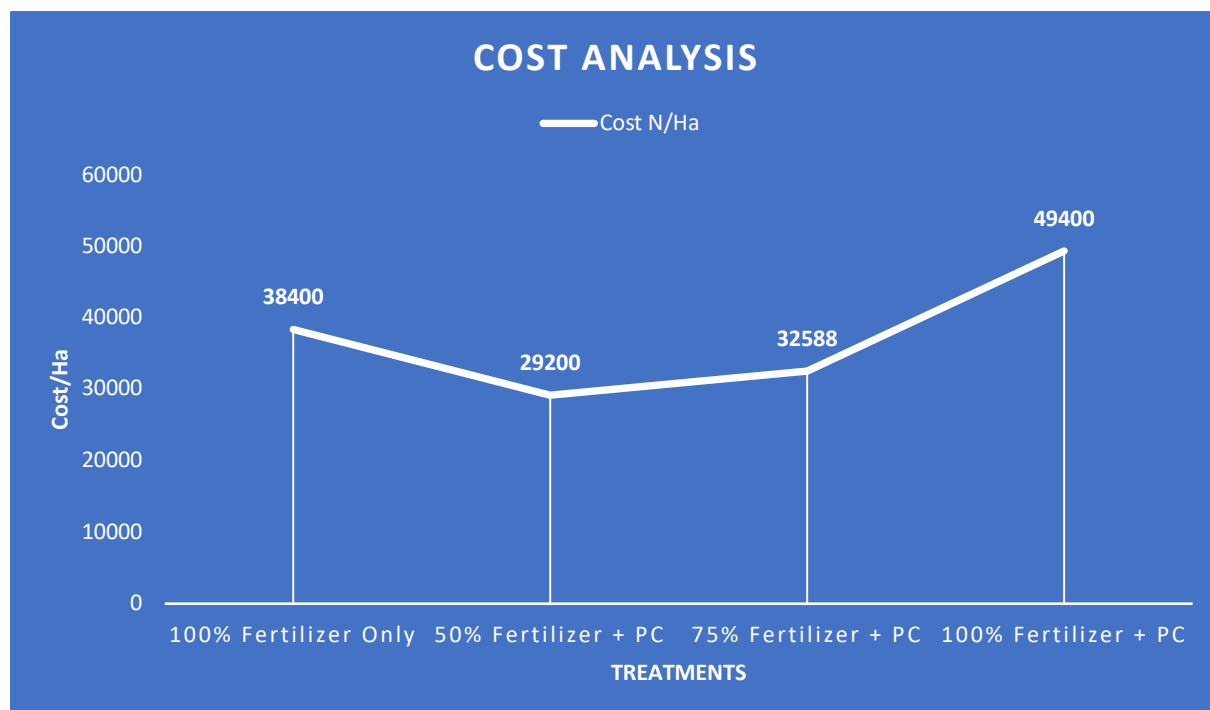


Fig. 4: Cost analysis of fertilizer rate by plant catalyst on tomato yield (₦)

Figure 4 above shows that **50% Fertilizer rate + Recommended Plant catalyst is most profiting treatment with least treatment cost of ₦29,200**, followed by 75% Fertilizer + PC with ₦32,588, 100% Fertilizer only had the cost of ₦ 38400 and lastly 100% Fertilizer + Recommended Plant catalyst had ₦49,400.

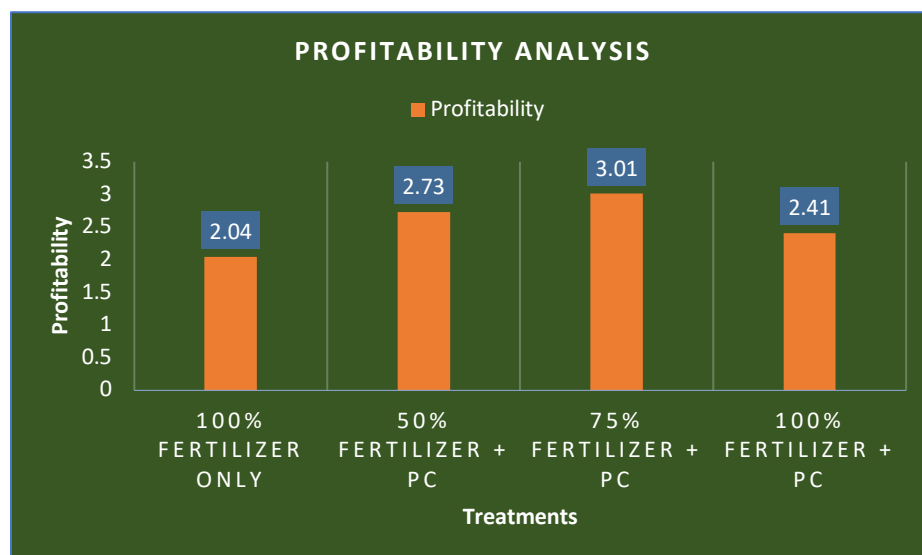


Fig. 5: Profitability analysis

Figure 5 above shows the profitability analysis of tomato yields across the treatments. 75% Fertilizer rate + PlantCatalyst® gave the highest profitability rate with 3.01. 50% Fertilizer rate + PlantCatalyst® with 2.73 is the second most profitable, while 100% Fertilizer rate + PlantCatalyst® gave 2.41 and finally 100% Fertilizer rate only gave 2.04.

The profitability was calculated using the yield weight (Kg)/cost of production.

$$\text{Plot 1} = \frac{78400}{38400} = 2.04$$

$$\text{Plot 2} = \frac{79800}{29200} = 2.73$$

$$\text{Plot 3} = \frac{98200}{32588} = 3.01$$

$$\text{Plot 4} = \frac{119200}{49400} = 2.41$$

From this result, farmers can be advised to practice between Treatment 2 (50% Fertilizer rate + PlantCatalyst®) and Treatment 3 (75% Fertilizer rate + PlantCatalyst®) depending on their economic capability.

### Conclusion and Recommendation

The result proves that 100% Fertilizer rate + Recommended PlantCatalyst® gave the highest tomato yield in Tons/Ha. 50% Fertilizer rate + Recommended PlantCatalyst® gives the same yield as 100% Fertilizer rate Only. The most profitable treatments are 50% fertilizer + PlantCatalyst® and 75% Fertilizer rate + PlantCatalyst® as compared to Only 100% fertilizer and 100% fertilizer + PlantCatalyst®.

**Therefore**, using PlantCatalyst® is a cost reduction option to be recommended for the smallholder farmers, this will significantly increase their profitability at sales season and reduce the amount of fertilizer usage.

## APPENDIX 1

### PHOTO GALLERY



Nursery



Land Preparation



Transplanted seedlings





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Flowering



Fruiting



Harvesting



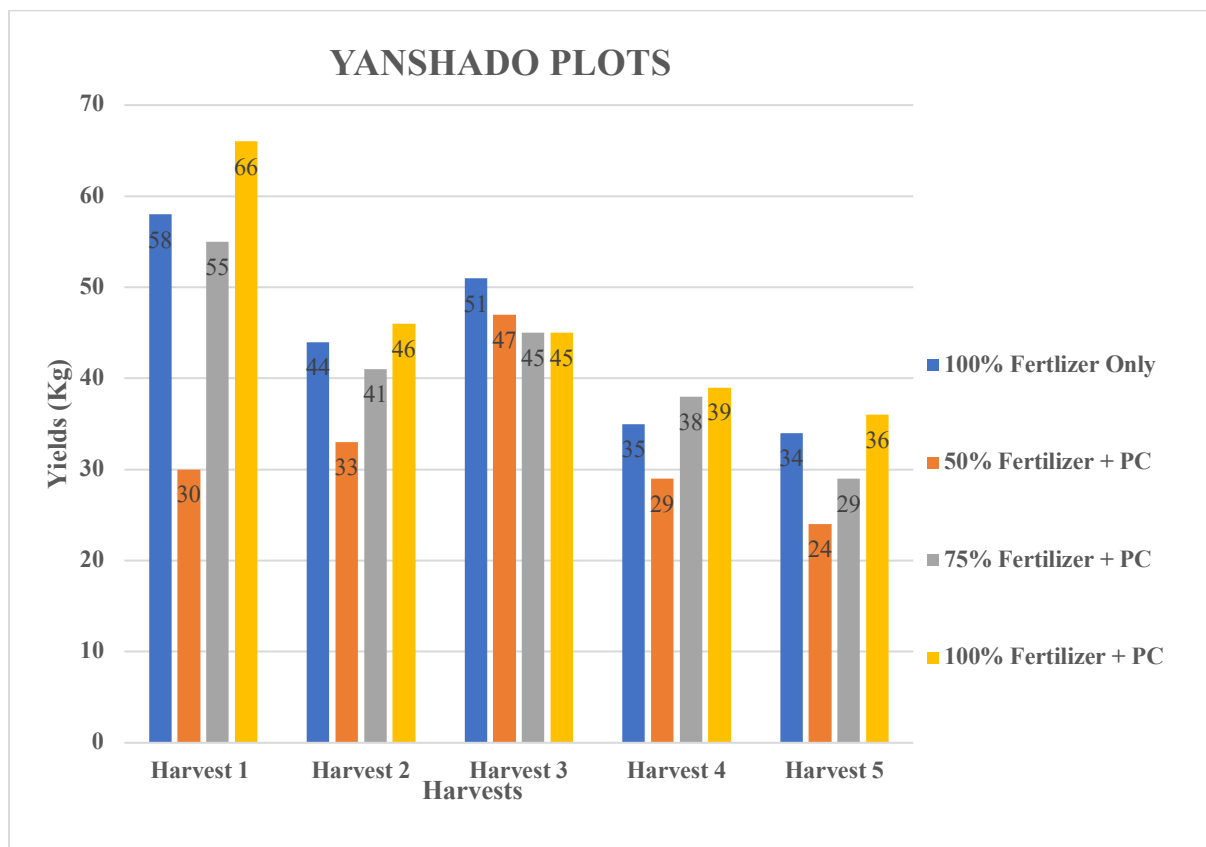
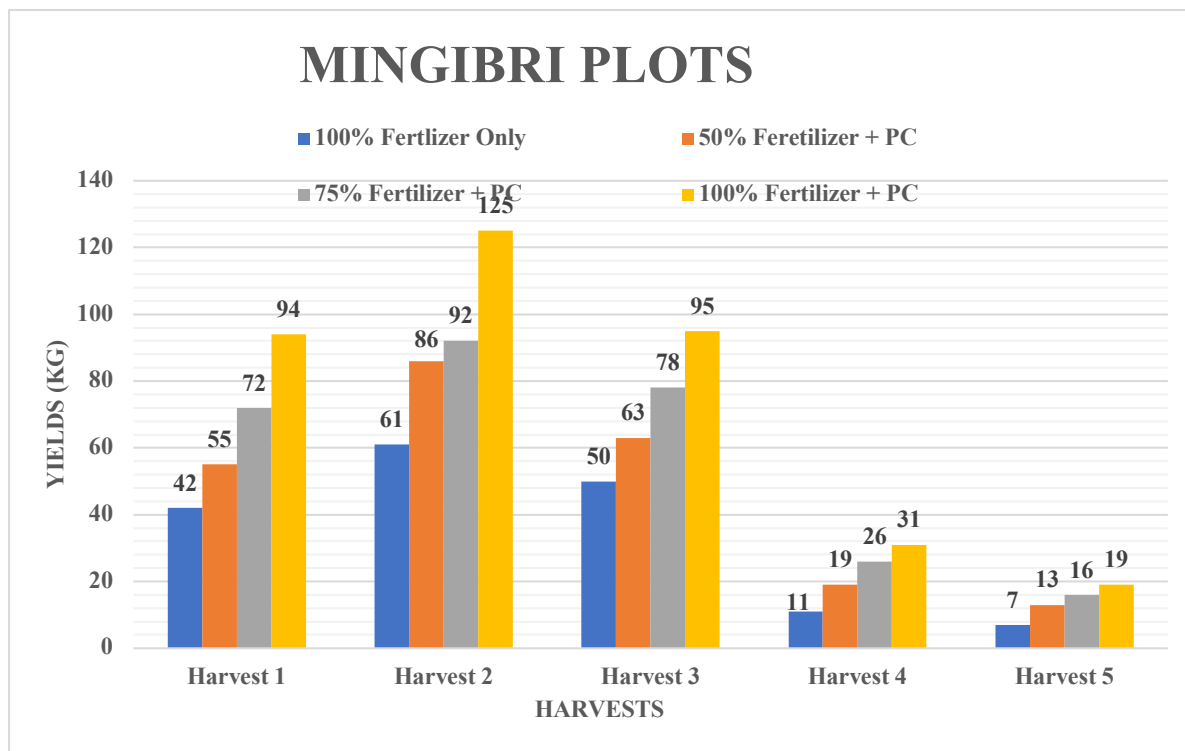
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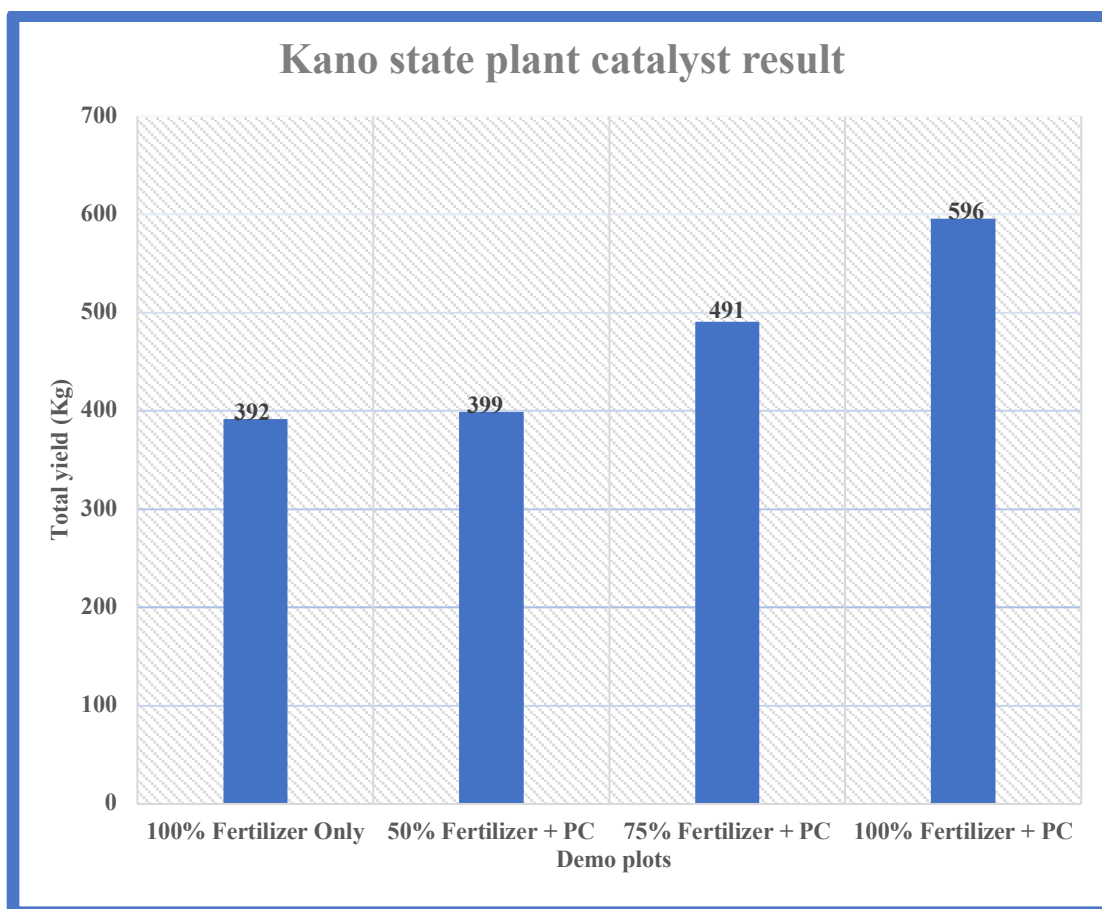
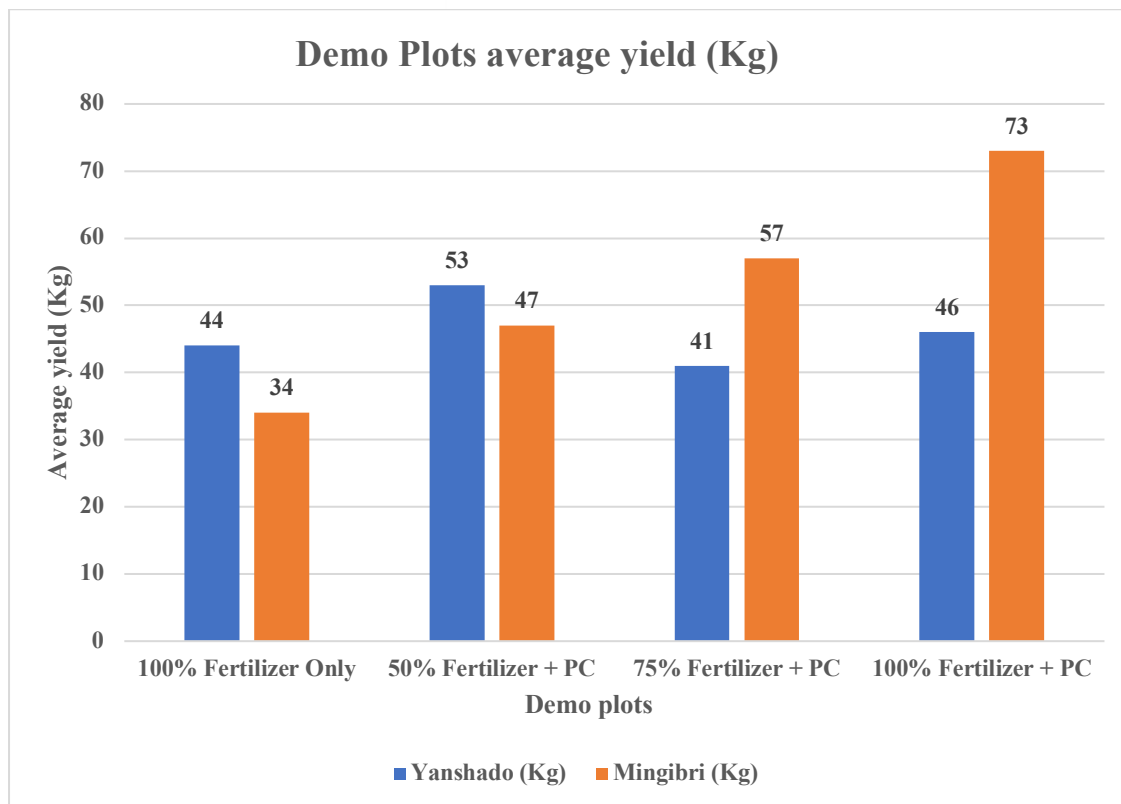


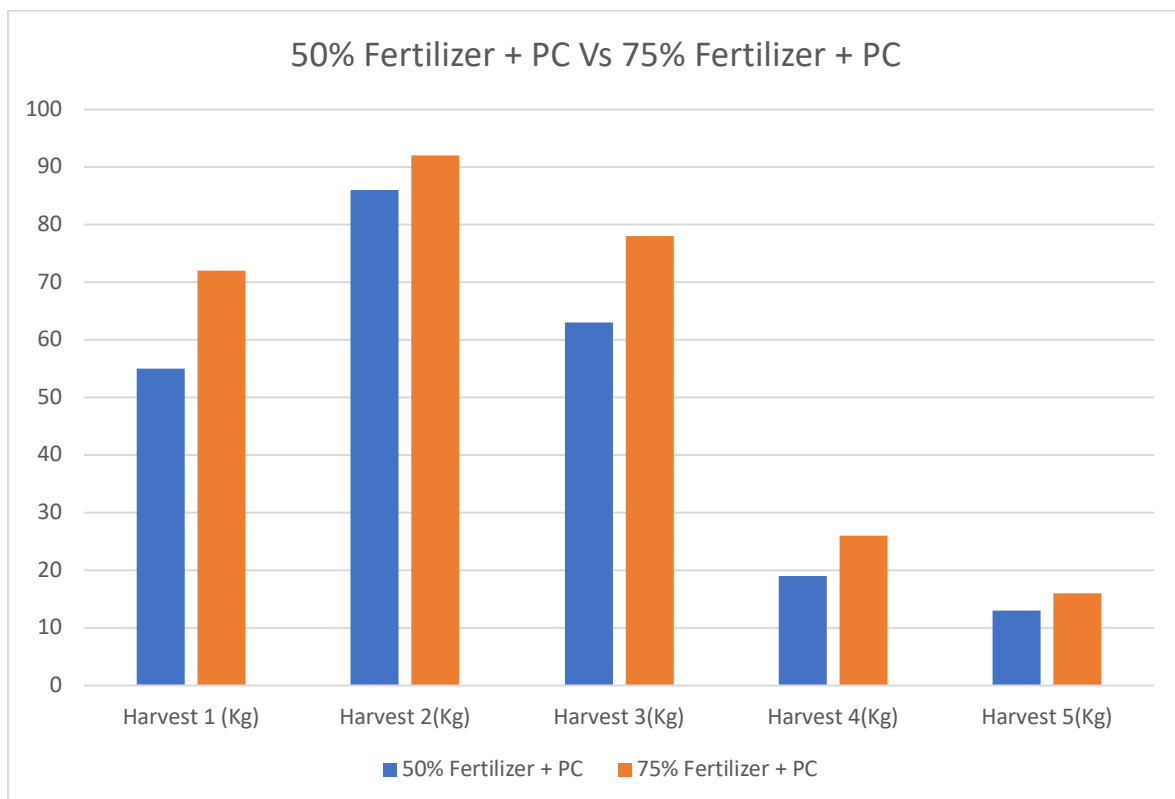
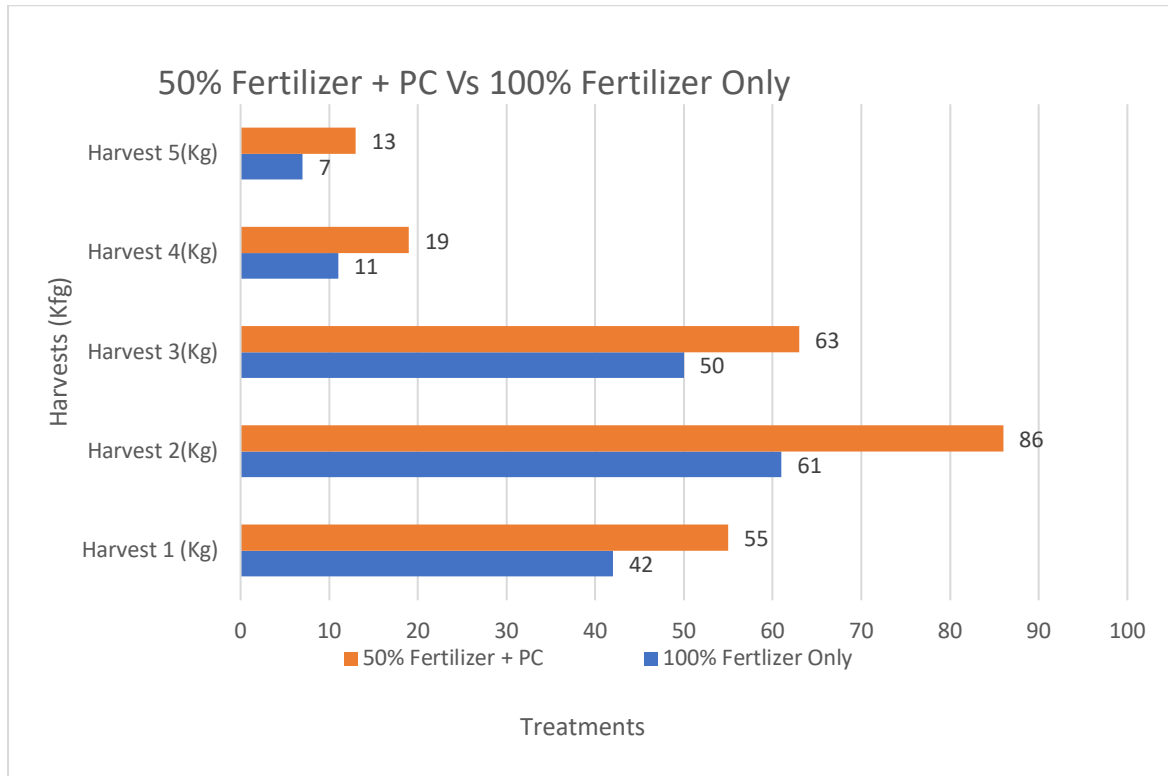
APPENDIX 2

Tomato Yield Data For Plant Catalyst Demo												
Harvest	Only Fertilizer			50% Fertilizer + PC			75% Fertilizer +PC			100% Fertilizer + PC		
	Yanshado(kg)	Mingibri(kg)	Total	Yanshado(kg)	Mingibri(kg)	Total	Yanshado(kg)	Mingibri(kg)	Total	Yanshado(kg)	Mingibri(kg)	Total
1	57.5	42	99.5	30	55	85	54.5	72	126.5	66	94	160
2	44.25	61	105.25	32.5	86	118.5	41	92	133	46	125	171
3	51	50	101	47	63	110	45	78	123	44.5	95	139.5
4	34.5	11	45.5	29	19	48	37.5	26	63.5	39	31	70
5	34	7	41	24	13	37	28.5	16	44.5	36	19	55
	<b>221.25</b>	<b>171</b>	<b>392.25</b>	<b>162.5</b>	<b>236</b>	<b>398.5</b>	<b>206.5</b>	<b>284</b>	<b>490.5</b>	<b>231.5</b>	<b>364</b>	<b>595.5</b>

APPENDIX 3







## REFERENCES

Syngenta Foundation for Sustainable Agriculture Nigeria Website  
(<https://www.syngentafoundation.org/nigeria>)

Zambia Agriculture Research Institute (2017) Evaluating the effects of the PlantCatalyst® on biological and financial yield of Maize, Cotton, Soybean and Groundnuts. *A Report on the validation of Dr. Willard's plant catalyst in Chipata.*