

**Final demonstration plot report on the impact of Apex 10 on tomato performance and yield**

**Background**

TechnoServe partnered with Natures Wonder, an agro-company to carry out multi-location field trials to determine the effect of Apex 10 on the performance and yield of both tomatoes and rice. In light of this, the YieldWise project established demonstration plots across project states.

Apex 10 is an organic based bio-stimulator that boosts bioactivity and improve the performance of chemical or organic fertilizers. Apex 10 does not provide Key nutrient elements and thus cannot be used as substitute for fertilizers.

The trial plots were established across 14 locations in Kano, Jigawa, Katsina and Plateau states. in the month of June (wet season), while 4 other plots were established in Kaduna state in September. –

**Methodology**

The project adopted an experimental approach by establishing both treatment and control plots of 400m<sup>2</sup> and APEX 10 was applied to the treatment plots based on two trial methods as explained below:

1. In the first method, 125ml of APEX 10 solution was applied at seed planting; the second dose of 125ml was applied 30 days after planting and the third dose of another 125ml was administered 30 days later, i.e. 60 days after seed planting (Nursery establishment) – a total of 375ml per treatment plot. Only 70 percent of the fertilizer requirement was applied. The control plot was established close to the treatment plot in order to maximize comparability. APEX 10 was not applied to the control plot and 100 percent of fertilizer requirement was applied.
2. In the second method, the two APEX 10 applications were considered only: At seed planting and at day 30 at the dosage of 125ml per application - a total of 250ml per treatment plot. Similar to the fertilizer application adoption in option 1, 70 percent of fertilizer requirement was adopted for treatment plots and 100 percent was adopted for control plots. All the plots were established using best agronomic practices (use of quality fertilizers, fungicides, pesticides, staking etc.), with APEX 10 being the only variable between treatment and control plots.

**Treatment and control plot findings and comparison with 2018 demo plot findings**

Observations were made and data was collected at every stage of the tomato growth cycle, taking into cognizance the following parameters: average number of leaves, germination percentages, plant survival after transplanting, plant height, stem girth, leaves colors, average number of flowers, average number of fruits, yields, price of tomatoes and the general observational differences between both treatment and control plots. The average outcomes at the developmental stage for some of the aforementioned parameters are provided in the table 1 and 2 for treatment plots and table 3 for control plot:

**Table 1: Apex 10 Application using method 1: three applications of APEX 10**

Stages of Production	Plant Height (cm)	Stem Girth (Poor/good/excellent)	Leaves Color (pale/green)	Average No. of Leaves	Average No. of Flowers	Average No. of fruit
Nursery Stage (2 weeks)	8	Excellent	Green	3		
Transplanting stage (3 weeks)	16	Excellent	Green	7		
Vegetative (6 weeks)	32	Excellent	Green	16	6	
Flowering & Fruiting (9 week & above)	40	Good	Green	32	18	14
<b>Date of APEX 10 application</b>	<b>Quantity applied (ml)</b>		<b>Method of applications</b>			
29/06/2019	125ml		seed treatment at planting			
30/07/2019	125ml, 11kg NPK		Foliar spray after transplanting			
29/08/2019	125ml, 11kg NPK		Foliar spray after second application			
<b>General observation on APEX 10</b>	There was a rapid and vigorous growth, the crop became healthy, darker green and bushy compared to the control plots					

**Table 2: Apex 10 Application using method 2: two applications of APEX 10**

Stages of Production	Plant Height (cm)	Stem Girth (Poor/good/excellent)	Leaves Color (pale/green)	Average No. of Leaves	Average No. of Flowers	Average No. of fruit
Nursery Stage (2 weeks)	8	Excellent	Green	4		
Transplanting stage (3 weeks)	21	Excellent	Green	9		
Vegetative (6 weeks)	30	Excellent	Green	15	4	
Flowering & Fruiting (9 week & above)	48	Good	Green	31	22	12
<b>Date of APEX 10 and NPK application</b>	<b>Quantity applied (ml/kg)</b>		<b>Method of applications</b>			
9/7/2019	125ml,		seed treatment at planting			
8/8/2019	125ml, 11kg NPK		Foliar spray 30 days a week after transplanting, Dibbling at 3 week after transplanting			
29/08/2019	11kg NPK		Dibbling at 3 week after 2 <sup>nd</sup> application			
<b>General observation on APEX 10</b>	There was a rapid and vigorous growth, the crop became healthy, darker green and bushy compared to the control plots					

From Tables 1 and 2 above, average germination percentage of plots treated with APEX 10 at planting was 92 percent both high and low Apex 10 rate exhibited rapid growth and high number of leaves with dark green coloration and healthy condition from nursery to fruiting stages. This was slightly in contrast with the control plots across all locations. Although there was healthy development of plants on the control plots across board, the treatment plots showed a relatively better performance.

Table 3 shows the findings from the control plots. An average of 79 percent germination rate was observed and the plant stands had a relatively lesser vigor compared to the treatment plots. The plant heights and the number of leaves as well as flowers at week 9 were less than what was observed in the treatment plots.

**Table 3:** Control plots with normal fertilizer usage without APEX 10

Stages of Production	Plant Height (cm)	Stem Girth (Poor/good/excellent)	Leaves Color (pale/green)	Average No. of Leaves	Average No. of Flowers	Average No. of fruit
Nursery Stage (2 weeks)	6	Good	Green	4		
Transplanting stage (3 weeks)	12	Good	Green	7		
Vegetative (6 weeks)	20	Good	Green	10	2	
Flowering & Fruiting (9 week & above)	35	Good	Green	29	10	3
<b>Date of APEX 10 and NPK application</b>	<b>Quantity applied (ml/kg)</b>		<b>Method of applications</b>			
9/7/2019	10 Kg of NPK		Dibbling method at 5 days after transplanting			
30/7/2019	10 Kg of NPK		Dibbling at 3 week after 1 <sup>st</sup> and 2 <sup>nd</sup> applications			
8/8/2019	12 Kg of NPK		Dibbling at 3 week after 3 <sup>rd</sup> application			
<b>General observation on APEX 10</b>	The crop vigor and coloration is not as excellent as that of treatment plots					

### Comparison of Apex 10 treatment plots with 2018 YieldWise demo plots

A comparison with YieldWise project's 2018 wet season demo plot data shows that overall, the Apex 10 treatment plots showed a better performance than conventional fertilizer usage. In 2018, the seedlings attained an average height of 11cm at 2 weeks after sowing, which is slightly higher than 8cm which was recorded on the Apex 10 treatment plots. This may have been due to a number of reasons such as weather and edaphic factors.

However, at flowering stage (9 Weeks After Sowing), data showed that Apex 10 treatment plots performed considerably better at an average height of 40cm and 48cm for methods 1 and 2 respectively, compared to the average height of 33.8cm that was recorded in 2018. Flower

formation commenced at about 6 weeks after transplanting on both Apex 10 plots and the 2018 demo plots. Further comparison of the Apex 10 trial plots and the control plots / 2018 demo plots, as well as conclusions on general performance will be made on the completion of harvest.

### Crop Yield

Harvest was conducted between October and December 2019. Across the trial plots, harvest was carried out nine times, while the control plots were harvest eight times at an interval of 5 days. Although fruit maturity on both the treatment and control plots occurred at the same time, there was noticeable differences in the yields. Matured fruits were harvested at the turning stage to minimize the incidence of on-farm losses on both the treatment and control plots.

The treatment plots yielded an average of 963.2kg (extrapolated 24mt per hectare), while the control pots yielded an average of 768.7kg (extrapolated 19.2mt per hectare). This implies the treatment plots yielded 25 percent more than the control plots as a result of the use of Apex 10. Similarly, it was further found that the average yield from the Apex 10 plots were considerably higher than the average of 684.12kg (extrapolated 17.13mt per hectare) which was recorded during 2018 demo plot activities.

### Cost-benefit analysis of the use of Apex 10

This section presents an analysis of the returns on investment for Apex 10.

During the experimental trial, 375ml of Apex 10 was used on each treatment plot, measuring 400m<sup>2</sup>. Apex 10 costs ₦2,500 (\$6.9) per litre, this means that the 375ml used per trial costs ₦937.5. A total of 32kg of NPK fertilizer which costs ₦5,120 was used on each control plot, whereas, for the treatment plot, the quality of fertilizer used was reduced by 30 percent, meaning that only 22.5kg of NPK fertilizer, which cost ₦3,600 was used. All other inputs were uniformly used on both the experimental and control plots. Table 4 shows the breakdown of inputs used on both treatment and control plots.

**Table 4:** Input Cost breakdown for treatment and control plots

Treatment plot (400 Sqm)				Control plot (400 Sqm)		
S/N	Input used	Quantity	Cost(₦)	Input used	Quantity	Cost(₦)
1	Chibili seed	1500	3,100	Chibili seed	1500	3,100
2	Touchdown	160ml	775	Touchdown	160ml	775
3	NPK	22.5Kg	3,600	NPK	32Kg	5,120
4	Ridomil	150g	1,260	Ridomil	150g	1,260
5	Ampligo	30ml	600	Ampligo	30ml	600
6	Actara	8g	700	Actara	8g	700
7	Karate	100ml	1,000	Karate	100ml	1,000
8	Labour cost	---	10,000	Labour cost	---	10,000
9	Apex 10	375ml	937.5			
	Total Cost	---	<b>21,972.5</b>	Total Cost	---	<b>22,555</b>

The tomato harvested from both treatment and control plots was sold at an average price of ₦73 per KG. An average of ₦70,300 was realized per treatment plot, while an average of ₦56,140 was generated per control plot.

The returns on investment for the treatment and control plots was calculated as follows

$$GR = Q * P$$

$$NR = GR - TC$$

$$ROI = (NR/TC) \%$$

Where:

GR = Gross revenue

P = Price per Kg

Q = Quantity of tomato produced

TC = Total cost (only the cost of fertilizers and Apex 10 was used in this analysis)

NR = Net returns

ROI = Returns on Investment.

#### ROI Analysis for treatment plots

Q = 963.2 kg
P = ₦73
TC = ₦21,972.5
GR = 963.2 x ₦73 = ₦70,313
NR = ₦70,313 – ₦21,972.5 = ₦48,340.5
ROI (%) = (₦48,340.5/₦21,972.5) *100 = 220%

#### ROI Analysis for control plots

Q = 768.7 kg
P = ₦73
TC = ₦22,555
GR = 768.7 x ₦73 = ₦56,115
NR = ₦56,115 – ₦22,555 = ₦33,560
ROI (%) = (₦33,560/₦22,555) *100 = 149%

### Conclusion

Based on outcomes from both the treatment and control plots, it can be concluded that Apex 10 contributes significantly to the development and performance and yield of tomato. Finding also showed that there was no observable difference in the performance of the treatment plots based on Apex 10 application method. The treatment plots also exhibited increased plant vigor as well as lesser incidences of disease attack. Finally, the analyses presented above shows that Apex 10 significantly contributed to tomato yields and increased the returns on investment by a significant margin. The treatment plots generated an average ROI of 220%, while the control plots generated a lower ROI of 149%.

Stage	Treatment Plot	Control Plot
Nursery		

3  
weeks





6  
weeks



9  
weeks

