A LONG TERM STUDY ON THE CLIMATE SMART AGRICULTURE CONCEPT APPLIED TO TOBACCO, MAIZE AND GROUNDNUT CROPS IN MALAWI

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Agenda

Introduction

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Climate-Smart Agriculture (CSA) is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices, such as reduced and no-tillage, cover crops, mulching, crop rotation and prescribed grazing. is a way of farming that conserves the natural resources of soil and water, resulting in improved and sustainable production.

CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas.

CSA supports the FAO Strategic Framework 2022-2031 based on the Four Betters: better **production**, better **nutrition**, a better **environment** and a better **life for all,** leaving no one behind.

Objectives

- To evaluate the effect of CSA on soil chemistry changes through the time.
- To evaluate the effect of CSA on quality and yield of tobacco, maize and groundnut throughout the time.
- To evaluate the economic impact of the implementation of CSA practices in Malawi

Materials and methods

Location: Central Malawi at Mpale Farm in Dowa District - from 2017 to 2023

Treatments:

- ❑ Crop rotation: Tobacco – Maize – Groundnut
- ❑ Soil preparation: Conventional; Minimum Tillage; No-Tillage
- ❑ Cultivar/variety:
    - Burley Tobacco: BRK4
    - Maize: SC 719
    - Groundnut: CG 7 & CG 9
- ❑ Design: RCB x 3 Replications

Materials and methods

- Fertilization:
  - Burley Tobacco:

Basal:	400 Kg/Ha 14:15:18 + ME + 12% Lime
Side-dressing:	150 Kg/Ha Urea
Side-dressing:	100 Kg/Ha CAN

  - Maize:

Basal:	200 Kg/Ha 23:10:5 + ME + 19% Lime
Side-dressing:	200 Kg/Ha Urea

  - Groundnut

Basal:	100 Kg/Ha 6:20:24 + ME + 13% Lime

Materials and methods

Subsoiling, plowing and ridges building were done before starting the trial in CY 2017.

Precise measurements of row ridges and plant spacing, evenness of depth and size of planting basins are all important aspects of CSA. Planting was done on the same beds each season, provided they have been constructed correctly the first time. The key benefit of this is the reduction of compaction, which will then only occur on the inter-row spaces and not on the crop lines.

Soil management cost

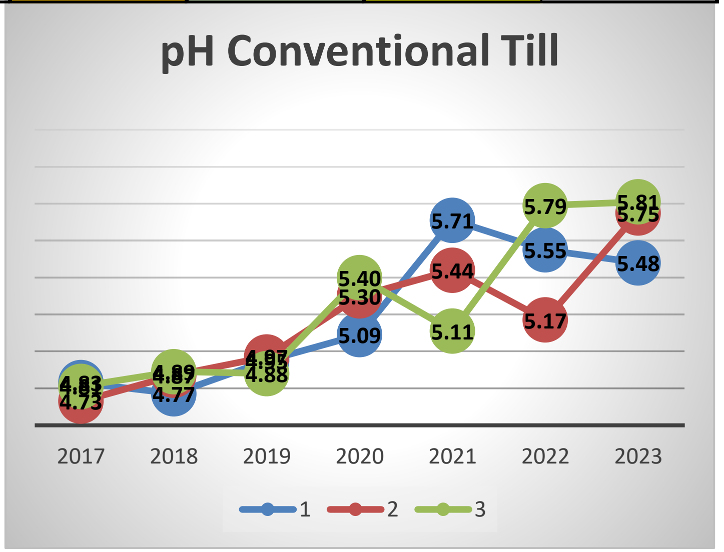
						No-till	Min-till	Conventional
	Labor days	Re-entry	Rate/ Labor day MK	Total MK	USD	USD	USD	USD
Land Clearing	8	1	3,050	24,400	$ 23.28	**$ -**	**$ -**	**$ 23.28**
Ridging/Box Ridges	30	1	3,050	91,500	$ 87.31	**$ -**	**$ -**	**$ 87.31**
Banking	15	1	3,050	45,750	$ 43.65	**$ -**	**$ -**	**$ 43.65**
Weeding	15	4	3,050	183,000	$ 174.61	**$ 43.65**	**$ 43.65**	**$ 174.61**
Mulching	8	1	3,050	24,400	$ 23.28	**$ 23.13**	**$ 23.13**	**$ 23.13**
						$ 66.78	**$ 66.78**	**$ 351.98**

Results

Tobacco | Maize | Groundnut

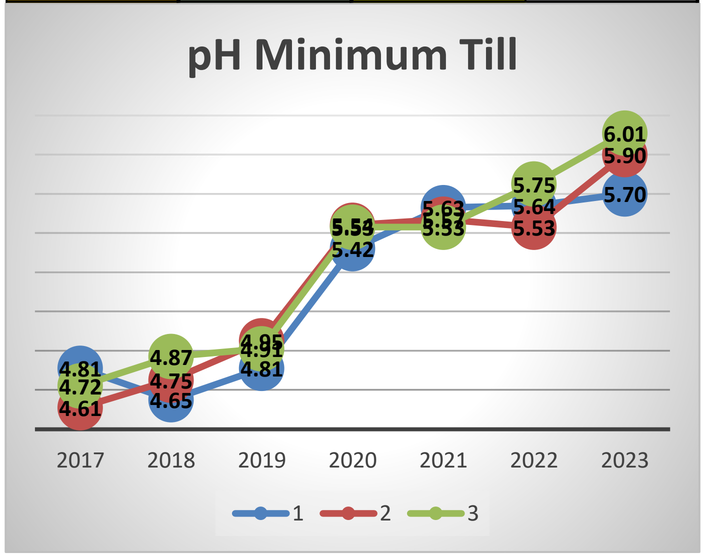
CONVENTIONAL TILLAGE

pH	1	2	3	Avg
2017	4.83	4.73	4.81	4.79
2018	4.77	4.87	4.89	4.84
2019	4.95	4.97	4.88	4.93
2020	5.09	5.30	5.40	5.26
2021	5.71	5.44	5.11	5.42
2022	5.55	5.17	5.79	5.50
2023	5.48	5.75	5.81	5.68



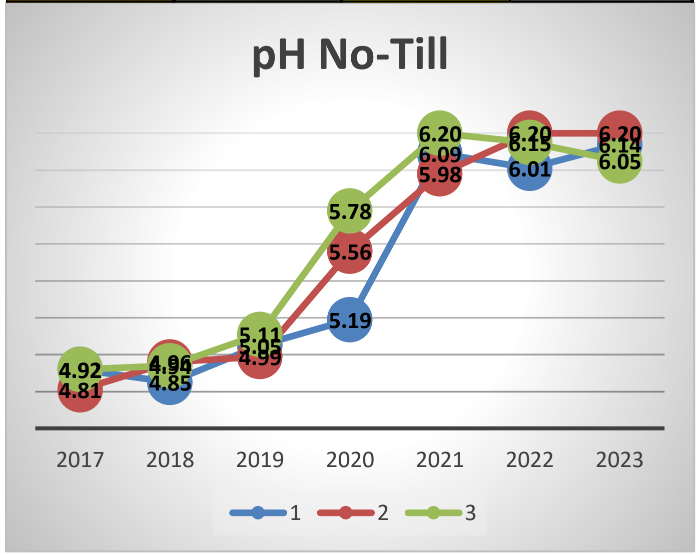
MINIMUM TILLAGE

1	2	3	Avg
4.81	4.61	4.72	4.71
4.65	4.75	4.87	4.76
4.81	4.95	4.91	4.89
5.42	5.54	5.53	5.50
5.63	5.57	5.53	5.58
5.64	5.53	5.75	5.64
5.70	5.90	6.01	5.87



NO- TILLAGE

1	2	3	Avg
4.92	4.81	4.92	4.88
4.85	4.96	4.94	4.92
5.05	4.99	5.11	5.05
5.19	5.56	5.78	5.51
6.09	5.98	6.20	6.09
6.01	6.20	6.15	6.12
6.14	6.20	6.05	6.13



Resultados

Tobacco | Maize | Groundnut

CONVENTIONAL TILLAGE

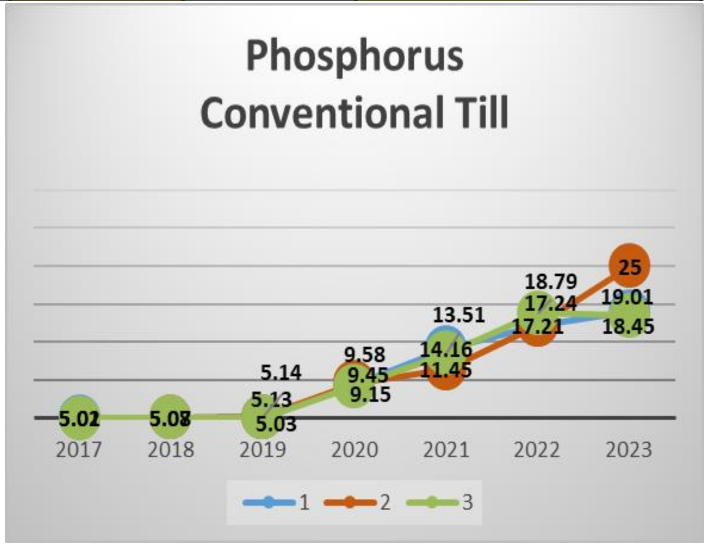
P	1	2	3	Avg
2017	5.02	4.91	5.01	4.98
2018	4.97	5.07	5.08	5.04
2019	5.13	5.14	5.03	5.10
2020	9.45	9.58	9.15	9.39
2021	14.16	11.45	13.51	13.04
2022	17.21	17.24	18.79	17.75
2023	19.01	25.00	18.45	20.82

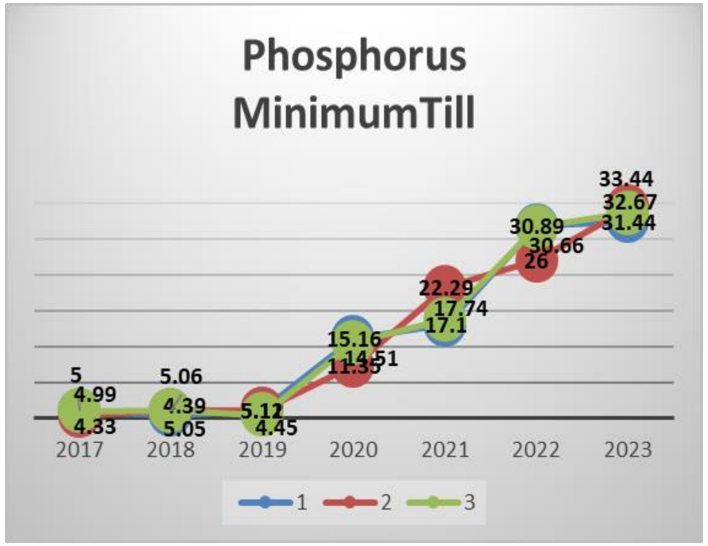
MINIMUM TILLAGE

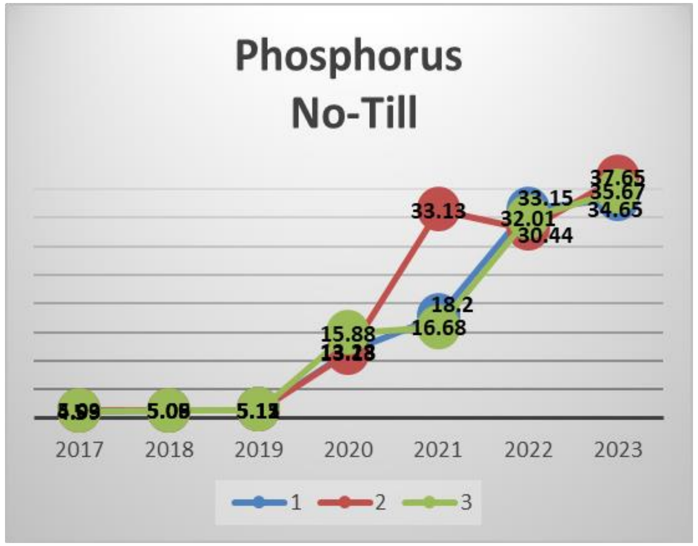
1	2	3	Avg
5.00	4.33	4.99	4.77
4.39	5.05	5.06	4.83
5.11	5.12	4.45	4.89
15.16	11.35	14.51	13.67
17.10	22.29	17.74	19.04
30.89	26.00	30.66	29.18
31.44	33.44	32.67	32.52

NO- TILLAGE

1	2	3	Avg
4.99	5.03	5.00	5.01
5.09	5.06	5.05	5.07
5.12	5.11	5.15	5.13
13.28	13.13	15.88	14.10
18.20	33.13	16.68	22.67
33.15	30.44	32.01	31.87
34.65	37.65	35.67	35.99



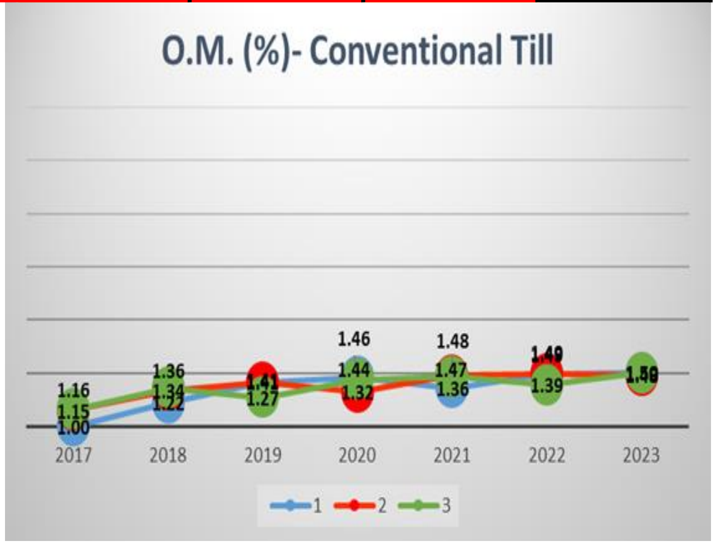


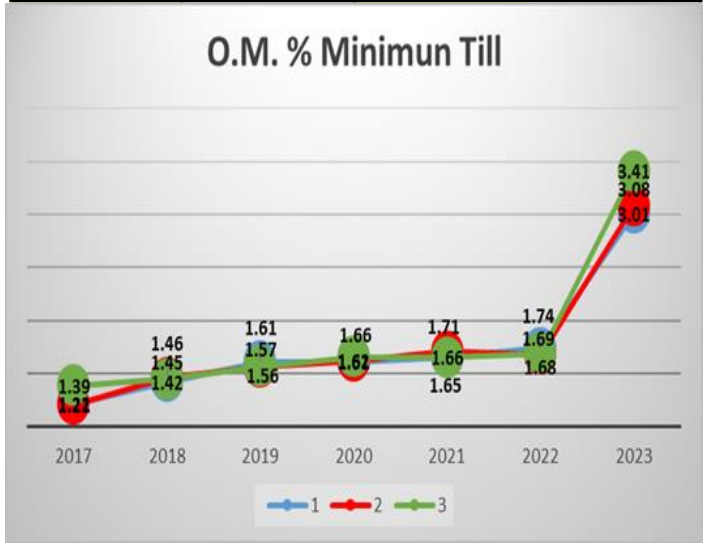


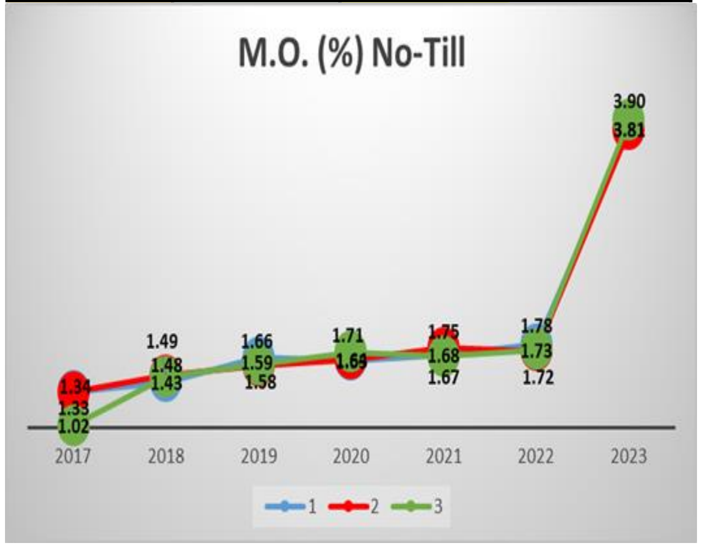
Results

Tobacco | Maize | Groundnut

O.M.	CONVENTIONAL TILLAGE				MINIMUM TILLAGE				NO- TILLAGE			
	1	2	3	Avg	1	2	3	Avg	1	2	3	Avg
2017	1.00	1.15	1.16	1.10	1.22	1.21	1.39	1.27	1.34	1.33	1.02	1.23
2018	1.22	1.34	1.36	1.31	1.42	1.46	1.45	1.44	1.43	1.49	1.48	1.47
2019	1.41	1.41	1.27	1.36	1.61	1.56	1.57	1.58	1.66	1.58	1.59	1.61
2020	1.46	1.32	1.44	1.41	1.61	1.62	1.66	1.63	1.63	1.64	1.71	1.66
2021	1.36	1.48	1.47	1.44	1.66	1.71	1.65	1.67	1.68	1.75	1.67	1.70
2022	1.49	1.49	1.39	1.46	1.74	1.68	1.69	1.70	1.78	1.72	1.73	1.74
2023	1.50	1.48	1.50	1.49	3.01	3.08	3.41	3.17	3.81	3.81	3.90	3.84

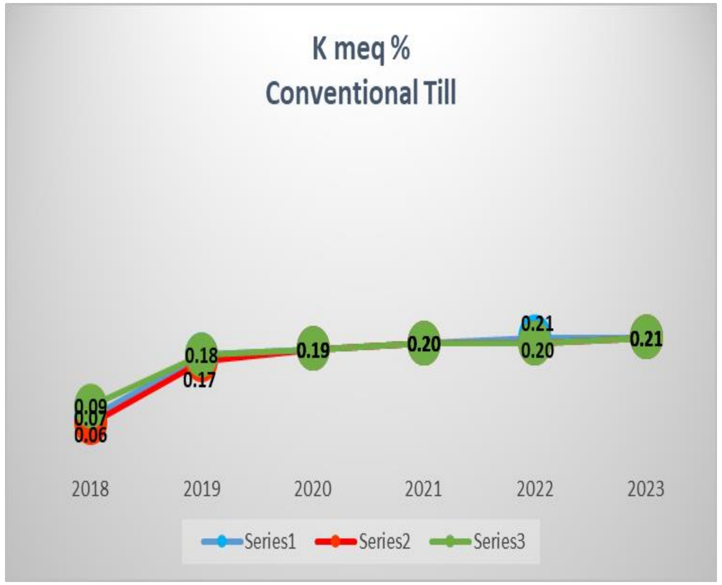


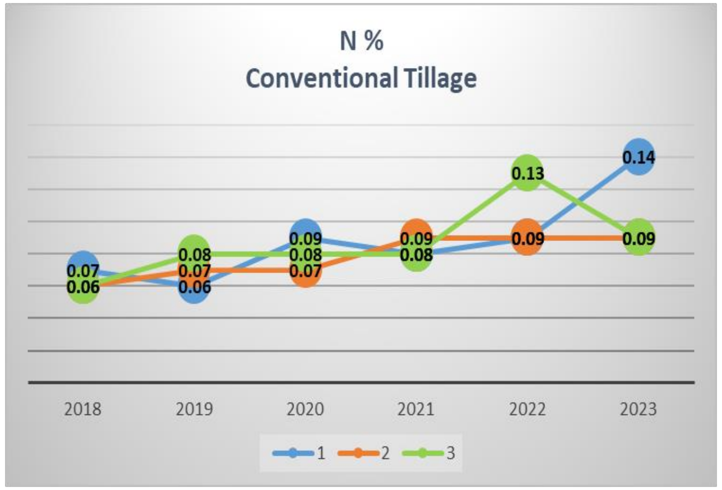




Results

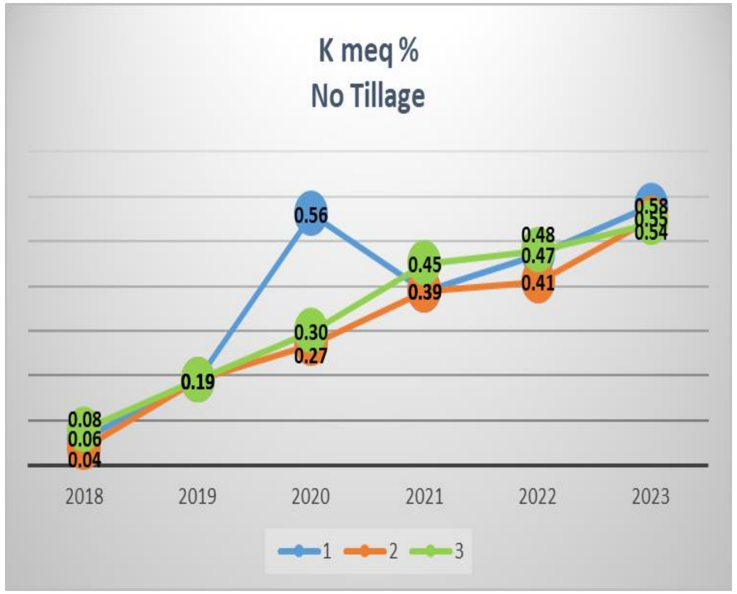
CONVENTIONAL TILLAGE

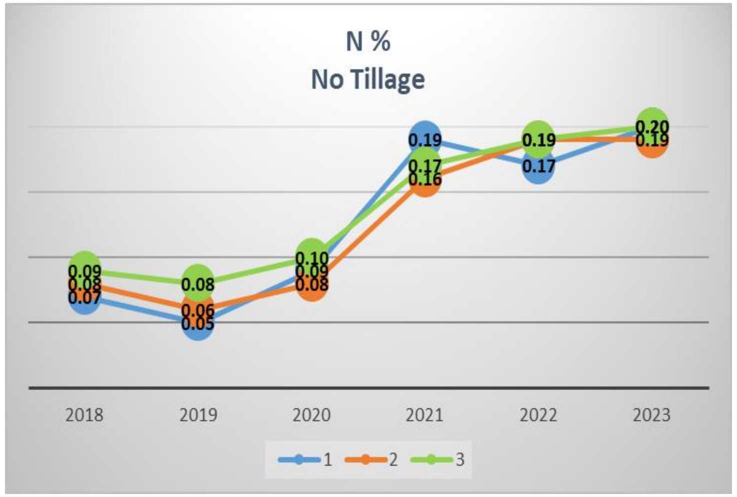




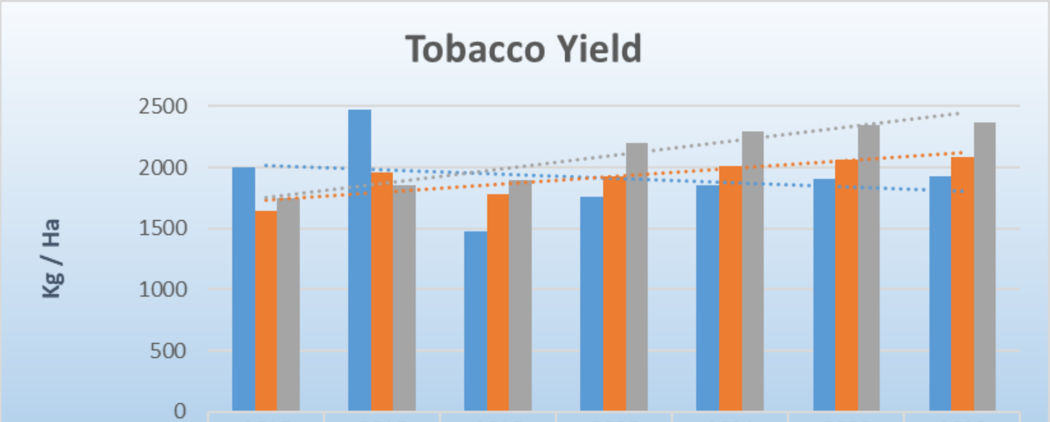
MINIMUM TILLAGE

NO- TILLAGE

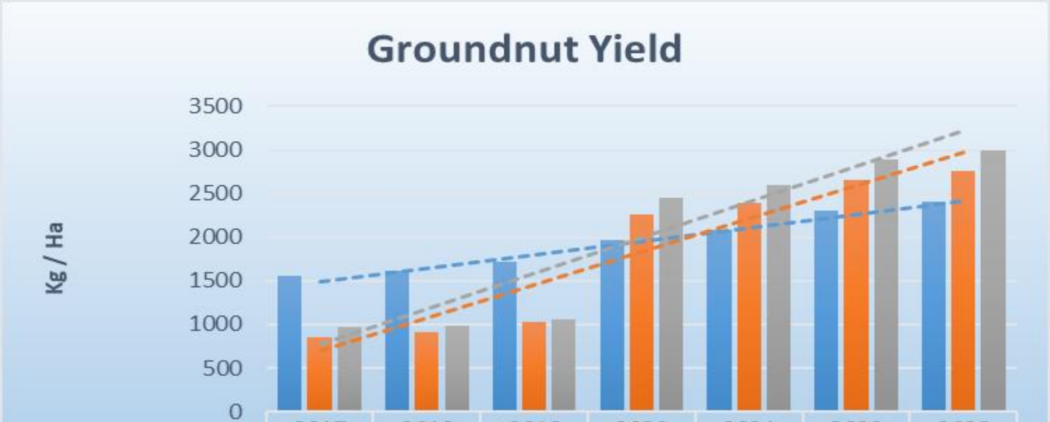




Results



	2017	2018	2019	2020	2021	2022	2023
Conventional	2001	2476	1474	1760	1851	1901	1922
Minimum Till	1641	1959	1783	1924	2015	2065	2086
No till	1744	1848	1893	2200	2291	2341	2362



	2017	2018	2019	2020	2021	2022	2023
Conventional Till	1561	1611	1721	1960	2080	2310	2400
Minimum Till	848	912	1032	2254	2392	2656	2760
No till	976	990	1064	2450	2600	2887	3000

	2017	2018	2019	2020	2021	2022	2023
Conventional Till	4006	5898	5900	4901	4999	5025	5100
Minimum Till	3842	3900	3989	5979	6098	6131	6222
No till	3374	3754	3800	6534	6665	6700	6800

- CSA in tobacco is sustainable and outperform conventional over time for assessment of phenotype parameters as well as yield and quality
- Presumably correction of soils' chemistry imbalance by implementing CSA results in maize and groundnut yield increase over time
- By reducing CoP and increasing yield, it has favorable economic impact

Conclusions:

- Soil's chemistry as indicators of fertility improved with CSA practices
- Tobacco quality and yield have improved over time with CSA practices while remained stable under conventional soil management practices.
- Lowering labor cost while maintaining or improving soil fertility by applying CSA practices proved to be sustainable, contributing to improve agronomic performance by increasing yield and quality, altogether have a positive impact in farmers economic.

Thank You

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