Tillage Effect on Growth and Yield of Corn and Soybean: First Season Results

Jason O. Williams and Nsalambi V. Nkongolo
Department of Agriculture and Environmental Sciences, Lincoln University, Jefferson City, MO

INTRODUCTION

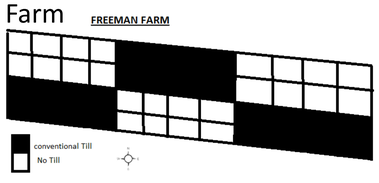
Corn and soybean yield has been of utmost importance for a long time due to the varied use of both crops. Of equal importance, are growth parameters they can give an insight into the health of the crops and possible yield. Cultivating a crop in a No Till or Conventional till system might affect the grain yield and hence the rationale for this experiment. (Defelice, 2006)

MATERIALS & METHODS

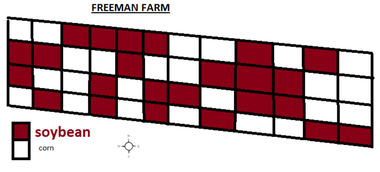
SAMPLE AREA: Freeman Farm, Jefferson City, MO
Soil: Waldron silty-clay,
Laboratory Techniques:

- a 10 acre field was divided into three blocks with each block representing a replication. In each rep, 8 plots of Corn and 8 plots of soybean were established .
- The following plant growth parameters were measured for each crop during the growing season: plant height, leaf area, number and weight of ears/pods, number and weight of leaves, weight of stalk.
- 4m2 of soybean and four corn rows were harvested and calculated at the end of the season. Final yields were extrapolated

Layout of Tillage at Freeman Farm



Plot Layout at Freeman Farm



Leaf Area Machine

RESULTS

Corn

- Mean values for all the growth parameters were higher in the No Till treatment, however the results are not statistically significant except for ear weight.
- Grain yield was higher in CT plots (statistically significant)

Soybean

- The Conventional Tillage Treatment only yielded better results in leaf area, leaf weight and pod weight.
- However none of the results were statistically significant

Table of Growth Statistics for Tillage

PARAMETER	TILLAGE	MEAN	ST. DEV.	MIN.	MAX.	P-VALUE
yield	Nt	57kg/plot	9.7	42.2	73	0.05
	Ct	65 kg/plot	8.2	51.5	76.1	
Plant HT	Nt	274 cm	14.42	256.0	300.0	0.8
	CT	272cm	15	246	300	
Leaf area	NT	5242cm2	639.23	4320.9	6656.6	0.3
	CT	5037cm2	438.8	4364.8	5690	
No. of ears	NT	1.66	0.65	1	3	0.8
	CT	1.60	0.67	1	3	
Ear wt.	NT	145g	33.9	75.5	196.6	0.03
	CT	113g	48.1	8.1	174.5	
Leaf wt.	NT	43g	8.1	27.5	58.5	0.8
	CT	42g	6.1	31.4	50.6	
Stalk wt	NT	136g	27.5	106.5	207.2	0.6
	CT	131g	19.2	96.3	158.3	

Correlations (Pearson)
No till Corn vs. Yield

	area	earnum	hght	lfwt.	Stkwt.
earnum	0.0287				
P-VALUE	0.9295				
hght	0.3257	-0.3001			
	0.3016	0.3432			
lfwt	0.8676	0.2748	0.2948		
	0.0003	0.3873	0.3523		
stkwt	0.3769	0.4114	0.5329	0.6044	
	0.2272	0.1839	0.0744	0.0374	
yield	0.3082	-0.2540	0.3491	0.3121	0.4262
	0.3297	0.4257	0.2660	0.3234	0.1671

Conventional Till Corn vs. Yield

	area	earnum	hght	lfwt	stkwt
earnum	-0.1449				
P-VALUE	0.6707				
hght	0.1018	0.4549			
	0.7659	0.1598			
lfwt	0.6374	-0.1072	-0.1022		
	0.0349	0.7537	0.7650		
stkwt	0.6614	0.0403	0.3453	0.2163	
	0.0267	0.9064	0.2983	0.5230	
yield	0.0722	0.3065	0.0013	0.1432	0.0564
	0.8329	0.3593	0.9970	0.6745	0.8692

Correlations (Pearson)
No Till Soybean vs Yield

	area	hght	lfwt	stkwt	podno	podwt	lfnum
hght	-0.0287						
P-VALUE	0.9295						
lfwt	0.6527	0.1653					
	0.0214	0.6076					
stkwt	0.6751	0.2683	0.9619				
	0.0160	0.3991	0.0000				
podno	0.8182	0.0333	0.4738	0.5564			
	0.0011	0.9182	0.1197	0.0603			
podwt	0.6690	0.1664	0.9159	0.9173	0.4090		
	0.0174	0.6053	0.0000	0.0000	0.1867		
lfnum	0.9098	-0.2128	0.7499	0.7203	0.7288	0.6683	
	0.0000	0.5067	0.0050	0.0082	0.0072	0.0175	
yield	-0.0917	-0.4164	-0.1035	-0.0573	-0.0547	0.0976	-0.1446
	0.7769	0.1782	0.7489	0.8595	0.8658	0.7629	0.6538

Conventional Till Soybean vs. Yield

	area	hght	lfwt	stkwt	podno	podwt	lfnum
hght	-0.1759						
P-VALUE	0.5846						
lfwt	0.8831	0.0221					
	0.0001	0.9456					
stkwt	0.8126	0.1434	0.9178				
	0.0015	0.6567	0.0000				
podno	0.7618	-0.1014	0.9114	0.7615			
	0.0040	0.7538	0.0000	0.0040			
podwt	0.7817	-0.0410	0.8425	0.7626	0.9279		
	0.0027	0.8994	0.0006	0.0039	0.0000		
lfnum	0.8004	-0.3154	0.5404	0.5032	0.3157	0.3607	
	0.0018	0.3180	0.0697	0.0954	0.3174	0.2494	
yield	0.2619	0.2019	0.0334	-0.0476	-0.0525	0.0154	0.3969
	0.4109	0.5292	0.9179	0.8833	0.8714	0.9622	0.2014

Table of Soybean Growth Statistics for Tillage

PARAMETER	TILLAGE	MEAN	ST. DEV.	MIN.	MAX.	P-VALUE
yield	Nt	99.8kg/plot	73.7	57.4	330.8	0.7
	Ct	90.0kg/plot	9.5	76.5	107.5	
Plant HT	Nt	109.1	8.7	96	122	0.3
	CT	104	12.1	82.0	126.0	
Leaf area	NT	1820	1003.4	734.5	43.69	0.8
	CT	1947	955.2	582.6	3446.8	
No. of pods	NT	24.8	59.3	4.2	213.0	0.3
	CT	7.9	4.2	2.9	18.1	
pod wt.	NT	33.8	12.3	16.3	54.0	0.9
	CT	35.5	17.8	12.1	81.9	
Leaf no.	NT	75.8	33.0	37.0	150.0	0.7
	CT	71.3	30.8	34.0	127.0	
Leaf wt.	NT	8.2	2.8	5.0	13.8	0.7
	CT	8.8	4.1	3.3	16.6	
Stalk wt	NT	16.1	5.8	9.0	27.9	0.9
	CT	15.5	9.4	1.0	34.9	

CONCLUSION

- Corn growth parameters are not affected by Tillage
- Corn produces better yield in CT treatment
- Soybean growth and yield are not affected by Tillage
- There is no correlation between any of the growth parameters and final yield
- However, more experiments need to be carried out

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USDA
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National Institute of Food and Agriculture

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