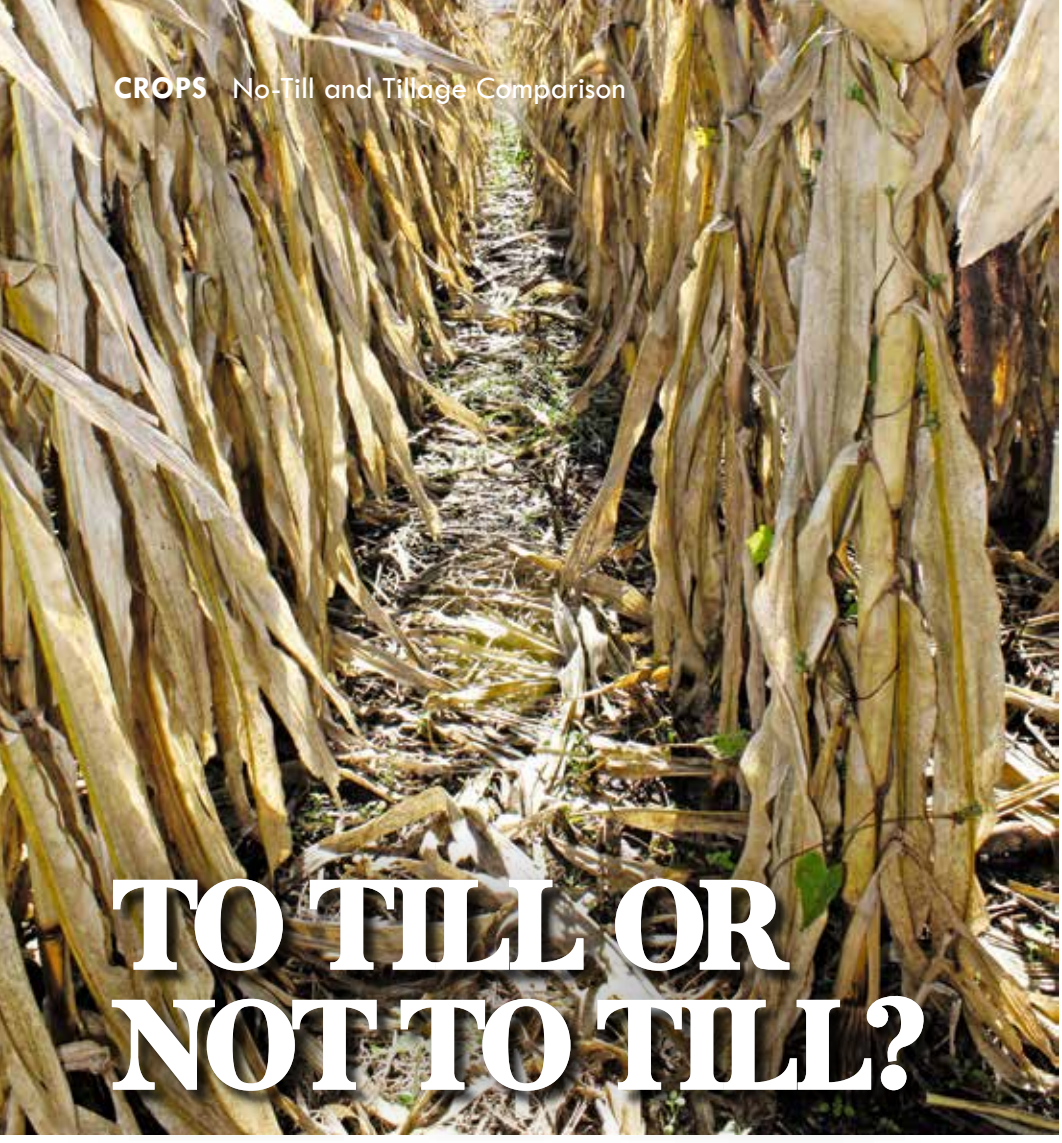


TO TILL OR NOT TO TILL?

Farmer's analysis has the answer

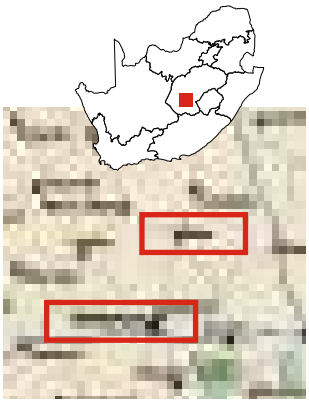
Agricultural economist and part-time farmer, **Dr Philip Theunissen**, provides a detailed efficiency and cost comparison between conventional tillage and no-till maize crops. **Lloyd Phillips** reports.

ABOVE: A no-till maize land covered in crop residue.
PHOTOS: FW ARCHIVE

In 2010, Dr Philip Theunissen made the decision to plant crops on his 153ha farm near Bethlehem in the Free State, so he ordered what he thought was a conventional tillage planter. To his surprise, the Jumil planter arrived with an additional crate of no-till accessories. Storing this crate on his farm, Philip planted his crops conventionally.

"During my first summer crops season, it took me almost eight days to plough, disc and plant 22ha of soya beans. Being a part-time farmer, I had to do all this work myself. I quickly grew frustrated at the fact that getting this crop into the ground was taking me so long and keeping me away from my other work," he says.

The following summer, Philip decided to see if fitting the no-till accessories to his planter would speed up the planting process.



LLOYD PHILLIPS

DR PHILIP THEUNISSEN

With no additional preparation, he began planting his crop lands as soon as these accessories were fitted to the implement.

"I didn't really know what I was doing," he admits. "All I wanted to find out was if planting using no-till technology and practices would save me time. To my great surprise, it took me only two days to get 22ha of soya beans planted, and my soya beans yielded almost exactly the same as the conventionally planted crop of the previous summer!"

Intrigued by these results, Philip determined to find out more about the cost, efficiency and investment return differences between growing crops using conventional tillage practices and using no-till practices. Being an agricultural economist as well as a part-time farmer, he was especially interested in obtaining answers.

TRIAL CROPS

By lucky concidence, one of Philip's clients in the Free State's Reitz district was planning to plant trial plots on his own farm

FAST FACTS

It took Dr Philip Theunissen only two days to plant 22ha soya beans using a no-till method compared with almost eight days using conventional tillage.

Philip and his son, Ruhan, conducted a detailed financial comparison analysis of no-till and tillage maize production.

The no-till production proved to be more cost- and labour-efficient, and produced a greater gross income.

to carry out a similar comparison on maize. Philip asked him to record all the details of these trials and volunteered to do an in-depth analysis of the results, working with his son, Ruhan, a mechanical engineer and also a part-time farmer. The farmer agreed and went to work. Several months later, the Theunissens had the data they needed and used it to produce a financial comparison of conventional tillage and no-till maize crops.

"The trial plots were next to each other, and the soil type, rainfall, temperatures, and other aspects were exactly the same. This was during the 2013/2014 summer production season," Philip explains.

COST SIMILARITIES

Several costs remained the same for both the no-till and the conventional tillage maize production trials:

- Seed costs: R1 254/ha
- Fertiliser costs: R1 918/ha
- Pest control: R37/ha
- Crop insurance for 5t/ha: R271/ha
- Harvest costs: R463/ha
- Transport costs for the maize harvest: R342/ha

COST DIFFERENCES

Listed below are the cost differences between producing no-till and conventional tillage maize. The differences calculated either indicate that the no-till production cost more (indicated by a '-,' thereby showing a loss of x), or cost less (indicated by a '+,' thereby showing a gain of x) in a particular production area.

- **Weed control**

No-till: R1 077/ha
Tillage: R858/ha
Difference: -R219/ha

Financial comparisons between conventional tillage and no-till in a 2013/2014 summer maize trial

	No-till	Conventional	Difference
Yield: (t/ha)	7,5	6,9	
Price/t in rand	1 750	1 750	
Rand per year per:	**Hectare**	**Hectare**	
Produce sales	13 125	12 075	
Gross production value	R13 125	R12 075	R1 050
Seed	1 254	1 254	
Fertiliser (transportation/t included)	1 918	1 918	
Weed control	1 077	858	
Pest control	37	37	
Harvest cost	463	463	
Direct Expenses	R4 749	R4 530	-R219
Crop insurance for 5t/ha at 3,1%	271	271	
Transport	342	342	
Variable Cost	R613	R613	R0
Machinery cost	**900**	**1 538**	
• Fuel	252	550	
• Depreciation and repairs	630	962	
• Operator cost	18	26	
Interest	**213**	**203**	
Allotted expenses	R1 113	R1 741	R628
Total expenses	R6 475	R6 884	R409
Enterprise margin	R6 650	R5 191	R1 459

Fuel and labour efficiency comparison

	No-till		Conventional	
	Diesel (l/ha)	Labour (h/ha)	Diesel (l/ha)	Labour (h/ha)
Tasks				
Discing	-	-	10,50	0,39
Chisel ploughing	-	-	15,80	0,47
Burn-down spraying	1,40	0,16	-	-
Planting	5,90	0,50	5,90	0,50
Pre-emergence spraying	1,40	0,16	1,40	0,16
Top dressing	1,90	0,20	1,90	0,20
Post-emergence spraying	1,40	0,16	1,40	0,16
Harvesting	9,00	0,35	9,00	0,35
Total	21,00	1,53	45,90	2,23
Efficiency				
Yield (t/ha)	7,5	7,5	6,9	6,9
Diesel (l/t)	2,8	-	6,7	-
Labour (minutes/t)	-	12	-	19

Overall machinery and land investment comparison

	No-till	Conventional	Difference
Capital	**R20 968**	**R26 650**	**R5 682**
• Machinery	R5 968	R11 650	
• Land (R12 000/ha)	R15 000	R15 000	
Enterprise Margin	**R6 650**	**R5 191**	**-R1 459**
Return on investment (ROI)	32%	19%	13%

RIGHT: The economic comparisons of no-till and conventional tillage maize production on a farm in the Free State.
INFORMATION COURTESY OF DR PHILIP THEUNISSEN

- **Overall machinery costs**

No-till: R900/ha, with a fuel cost of R252/ha, depreciation and repairs cost of R630/ha and operator costs of R18/ha;
Tillage: R1 538/ha, with a fuel cost of R550/ha, depreciation and repairs cost of R962/ha and operator costs of R26/ha;
Difference: +R638/ha, with a fuel cost difference of +R298/ha, depreciation and repair cost difference of +R332/ha and an operator cost difference of +R8/ha.

- **Total yield**

No-till: 7,5t/ha
Tillage: 6,9t/ha
Difference: +0,6t/ha

CLOSSARY

No-till: The planting of crops by direct seeding without ploughing. Herbicides are used as necessary to control weeds (Definition: Dictionary.com/Random House Dictionary).

Conventional tillage: A tillage system using cultivation as the major means of seedbed preparation and weed control. It typically includes a sequence of soil tillage, such as ploughing and harrowing, to produce a fine seedbed, and to remove the plant residue from the previous crop (Definition: OECD Glossary of Statistical Terms).

Cover crop: A temporary vegetative cover that is grown to provide protection for the soil and the establishment of plants, particularly those which are slow- growing (Definition: OECD Glossary of Statistical Terms).

- **Production efficiencies**

Philip and Ruhan found that no-till maize production was more fuel- and labour-efficient than tillage maize production.

"To produce the 7,5t/ha average yield of no-till maize required 2,8ℓ diesel/t, and 12 minutes labour per ton. To produce the 6,9t/ha average yield of conventional tillage maize required 6,7ℓ diesel/t and 19 minutes labour per ton," Philip explains.

Thus the overall diesel volume and labour requirements were as follows:

- **Diesel volume used**

No-till: 21ℓ/ha
Tillage: 45,9ℓ/ha
Difference: +24,9ℓ/ha

- **Labour hours**

No-till: 1,53h/ha (113 min/ha)
Tillage: 2,23h/ha (143 min/ha)
Difference: +30 min/ha

GROSS INCOME

The 2013/2014 season's maize price was R1 750/t. Thus, gross incomes generated, calculated as yield (in tons) multiplied by maize price per ton, were:
No-till: R13 125/ha
Tillage: R12 075/ha
Difference: +R1 050/ha (This is 8,7%/ha more than the income generated by the tillage crop).

"Taking into account all of the production expenses versus the gross income, the no-till maize generated a net profit of R6 650/ha, which was R1 459/ha more than the conventional tillage maize's net profit of R5 191/ha," Philip explains.

RETURN ON INVESTMENT

Finally, Philip and Ruhan compared the return on investment (ROI) between the no-till maize and the conventional tillage maize in the trials. This required them to extrapolate comparisons up to 250ha each of these maize production systems to generate meaningful figures.

- **Machinery investment**

No-till: R5 968/ha
Tillage: R11 650/ha
The land price was calculated at R15 000/ha and the total land and machinery investment therefore amounted to:
No-till: R20 968/ha
Tillage: R26 650/ha
Difference: +R5 682

"Based on all of the production costs in the trials against the net profits, the ROI for the no-till maize was 32%, in comparison with the 19% ROI for the conventional tillage maize," says Philip.

TOP LEFT: According to Philip, the return on investment of no-till maize was 13% higher than that of conventional tillage.

TOP: No-till maize production is more fuel-efficient with average diesel usage of 21l/ha compared with 45,9l/ha used with conventional tillage.

ABOVE: The total machinery investment for no-till maize was R5 682/ha less than the machinery investment per hectare for tillage maize.

In sum, therefore, the ROI of no-till maize was 13% higher than that of conventional tillage.

LEARNING FROM THE ANALYSIS

Philip says that if he had possessed these comparisons before he started crop farming, he would have immediately adopted the no-till production methods. Not only did the no-till maize produce a higher gross income, it was generally more cost- and labour-efficient than the conventional tillage maize crop.

"I would, however, have first planted a cover crop on the lands I was planning on planting to summer grains. This would have provided the start to the important organic soil cover that no-till requires. On this, I would have planted my first crop," Philip says.

- *Email Philip at philip@computus.co.za. This presentation was given at the No-Till Club's No-Till Conservation Agriculture Information Day in Hilton, KwaZulu-Natal, on 21 April 2016.* ■ FW

ABOVE: A crop being ploughed – Magnum 380 CVT & Turbo Till.

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Caption: ℓ

FW

ABOVE:
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