



# DRAWBAR POWER TESTS

WHY?

# IMPLEMENT WORK RATES

Equipment / Working	HR required / HR needed*			Speed / Speed km/h	Number Working
	Front end / Terra gross	Low end / Lun gross			
1. Field subsoiler / Scraper 75 mm Deep / Day 20 = 80% Walls / Wycle	1.8 m	34	38	8.0	80
	3.0 m	36	40	8.0	80
	3.6 m	40	44	8.0	80
	3.7 m	40	44	8.0	80
	4.2 m	45	49	8.0	80
	4.5 m	48	52	8.0	80
	5.0 m	50	54	8.0	80
	6.0 m	60	66	8.0	80
2. Light disc harrow / Light disc standard 63 mm Deep / Day 20 = 80% Walls / Wycle	1.8 m	34	38	8.0	80
	3.0 m	36	40	8.0	80
	3.6 m	40	44	8.0	80
	3.7 m	40	44	8.0	80
	4.2 m	45	49	8.0	80
	4.5 m	48	52	8.0	80
	5.0 m	50	54	8.0	80
	6.0 m	60	66	8.0	80
3. Heavy disc / Heavy disc 100mm or more deep / 1.50 mm Deep / Day 20 = 80%	3.0 m	70	80	8.0	80
	3.6 m	80	90	8.0	80
	4.2 m	100	110	8.0	80
	4.5 m	120	130	8.0	80
	6.0 m	150	160	8.0	80
4. Chain drag / Balling drag 200 mm deep / Day 20 = 80% opening / opening 20 = 80% Walls / Wycle	2.2 m	80	80	2.0	80
	3.0 m	80	80	2.0	80
	3.4 m	80	80	2.0	80
	4.0 m	80	80	2.0	80
	4.2 m	80	80	2.0	80
	4.5 m	80	80	2.0	80
	5.4 m	80	80	2.0	80
	6.0 m	80	80	2.0	80

# Soil type

## Kilowatt required

Implement	Sand	<u>Sa.Im</u>	<u>Cl.Im</u>
2,2m Chisel pl.	38	48	60
3.66 <u>Mouldb.</u>	138	160	200
8-row Planter	66	60	58

# TESTS IN THE 70's/80's



# TESTS IN THE 70's/80's



# Testing of new generation implements



# Mechanization Planning

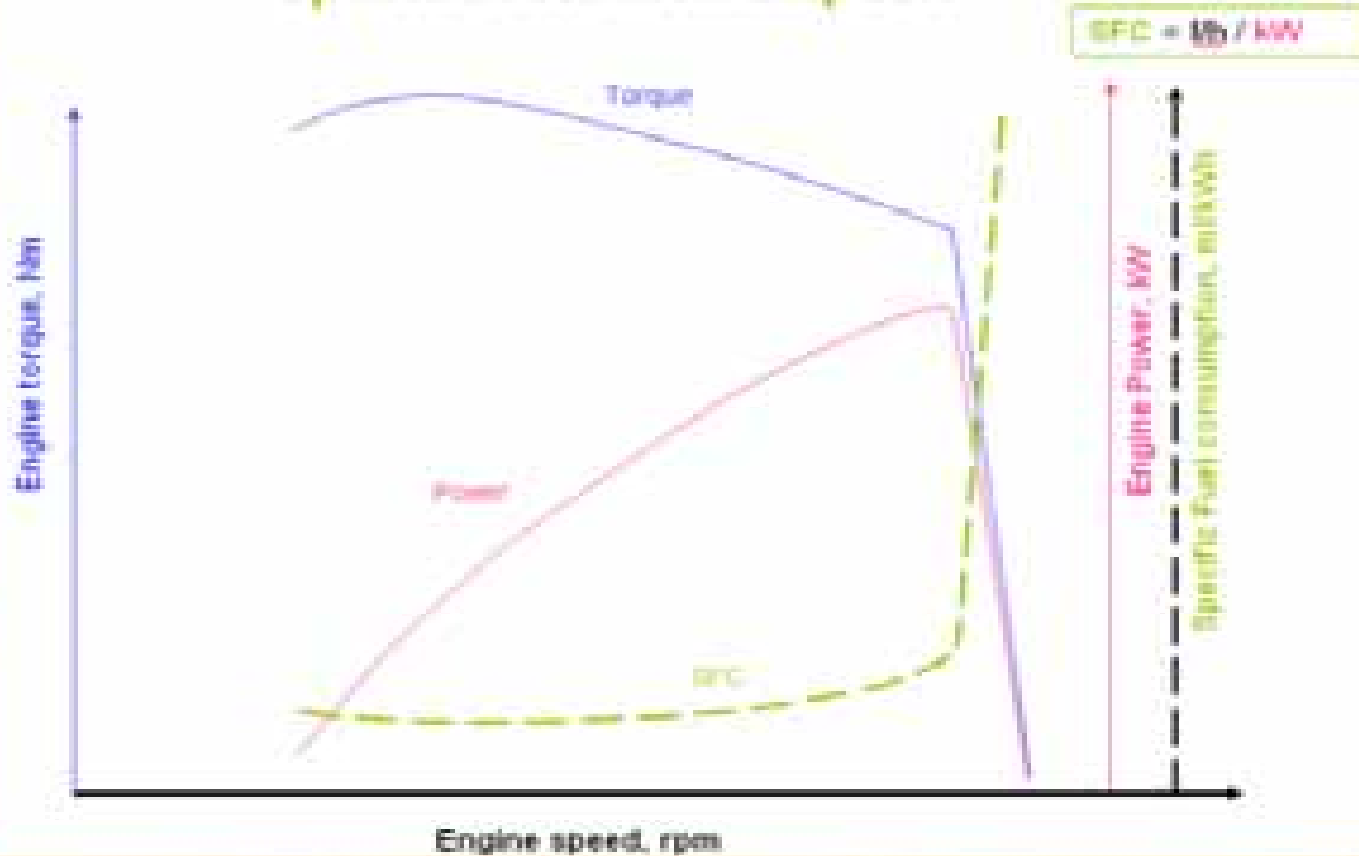


# Implement/Tractor matching



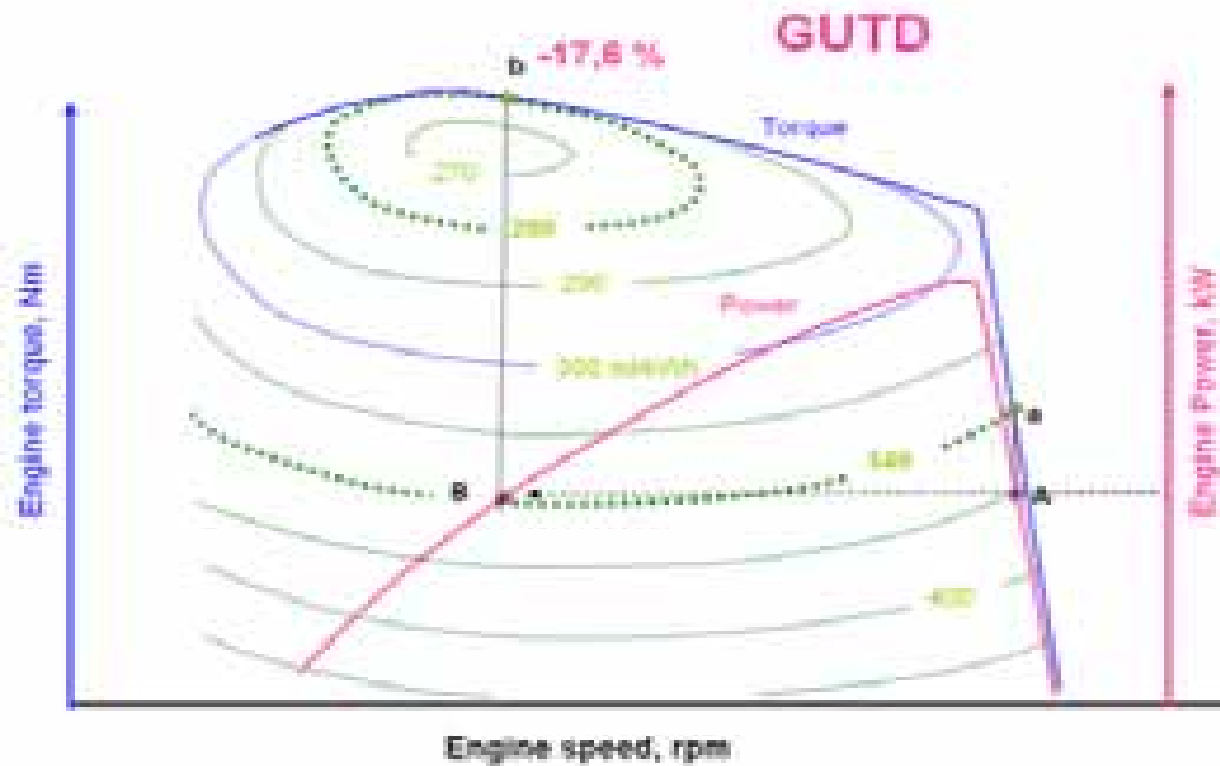
# Diesel Engine performance

## Specific fuel consumption



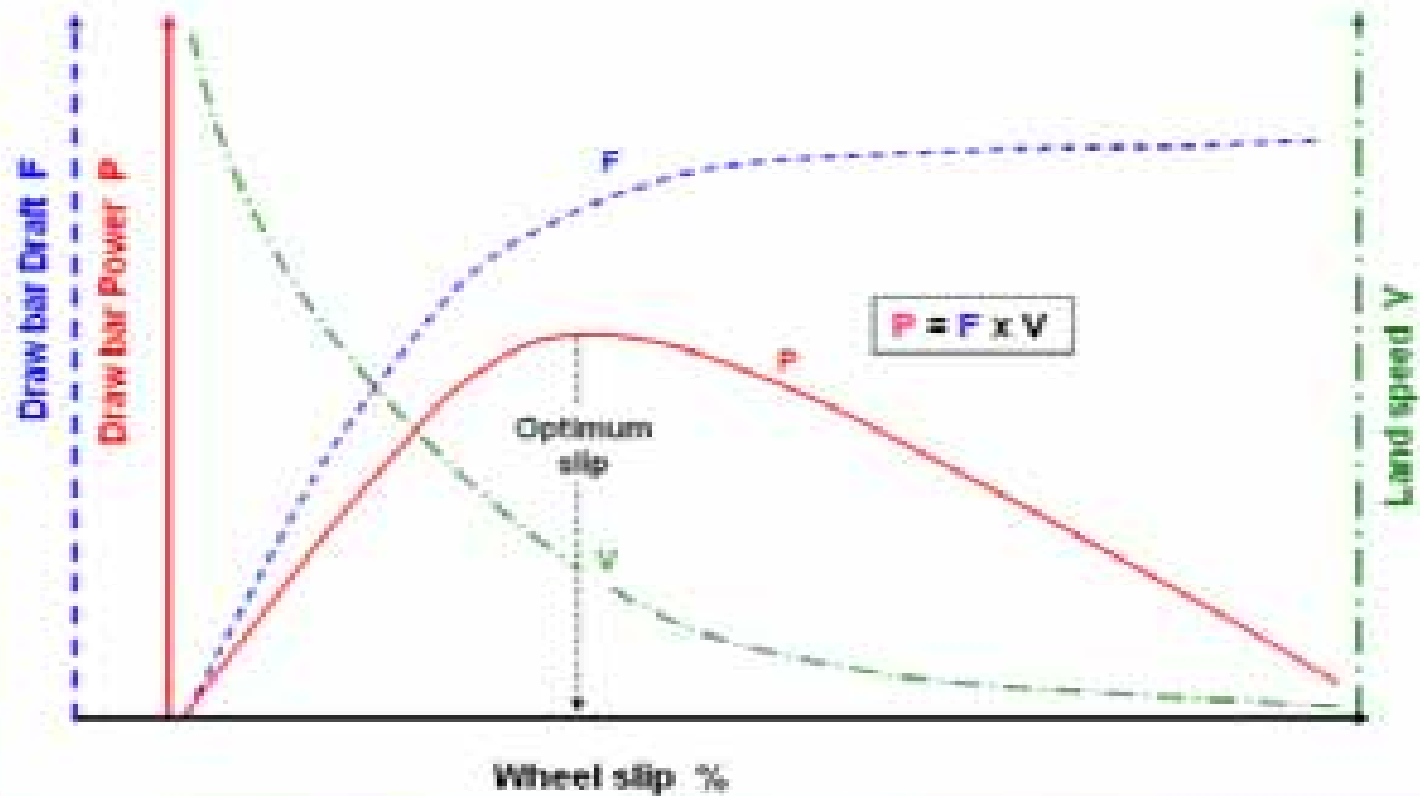
# Diesel Engine performance

“Gear Up, Throttle Down”.



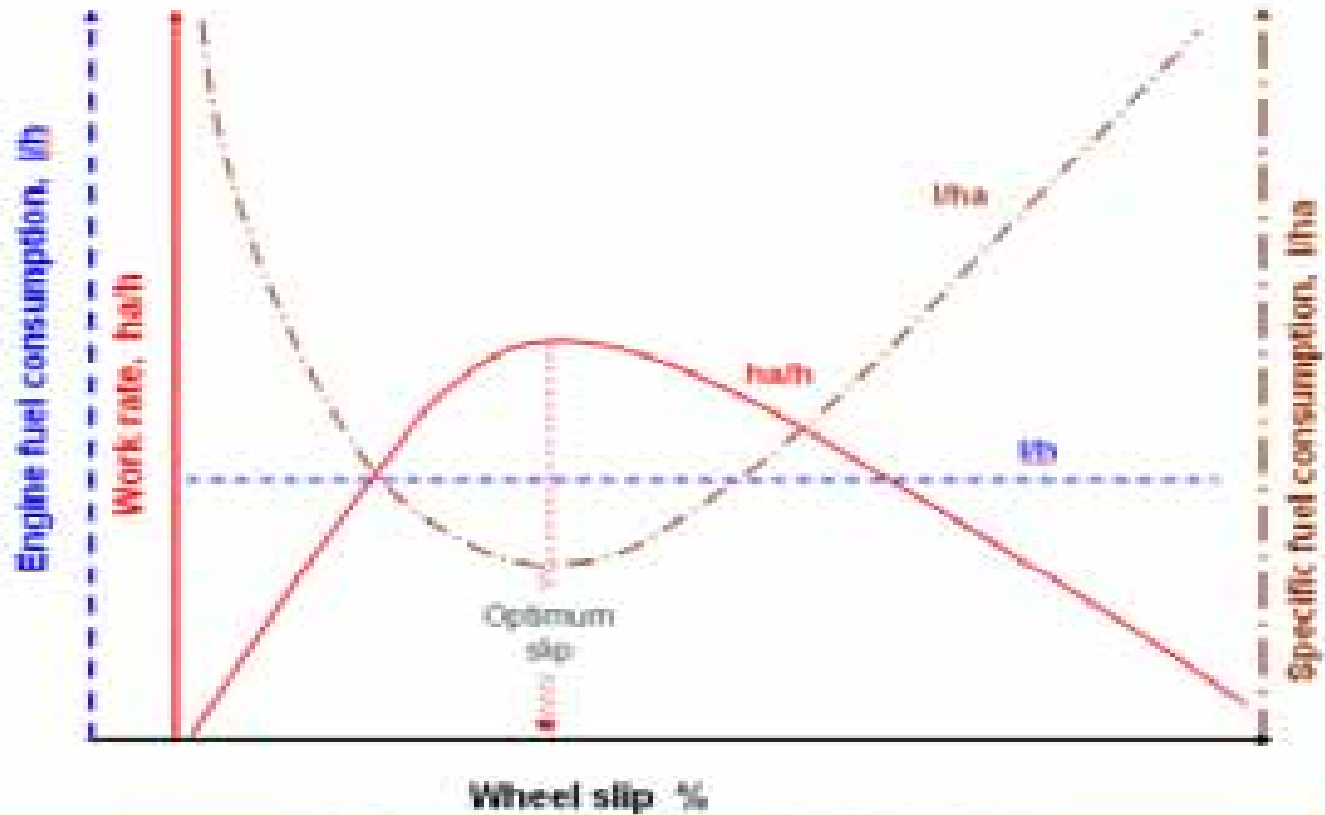
# TRACTION PERFORMANCE

Draw bar Power, Draft and Land speed vs. Wheel slip



# TRACTOR PERFORMANCE

Field SFC vs wheel slip @ constant engine power



# TRACTION PERFORMANCE

- Soil type
- Soil moisture content
- Soil clay percentage
- Working depth
- Wheel/Nose weight
- Tyre pressure

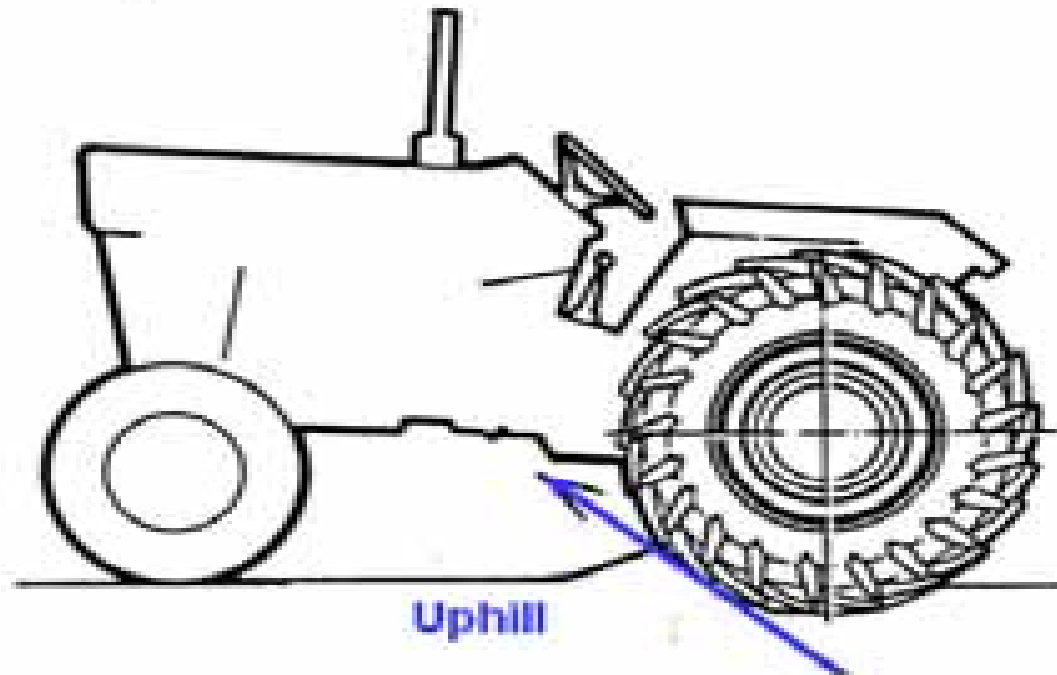
# TRACTION EFFICIENCY

## Engine Power vs Drawbar Power

- Rolling resistance
- Wheel slip
- Wheel ballast
- Soil hardness
- Tyre pressure

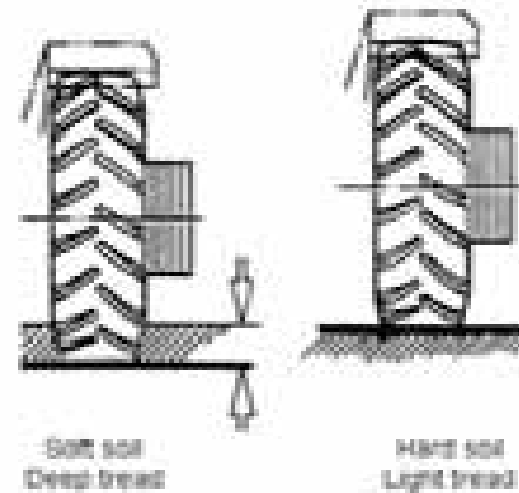
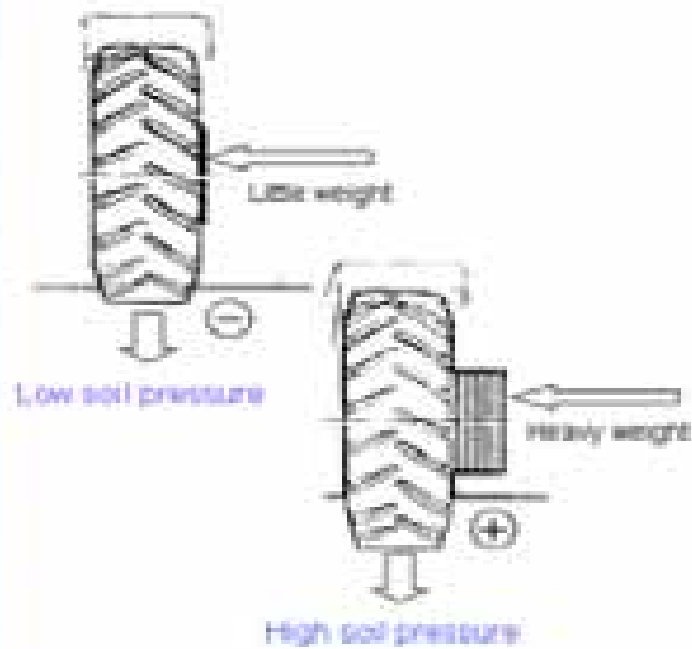
# TRACTION PERFORMANCE

## Rolling resistance



# TRACTION PERFORMANCE

## Soil hardness and ballasting

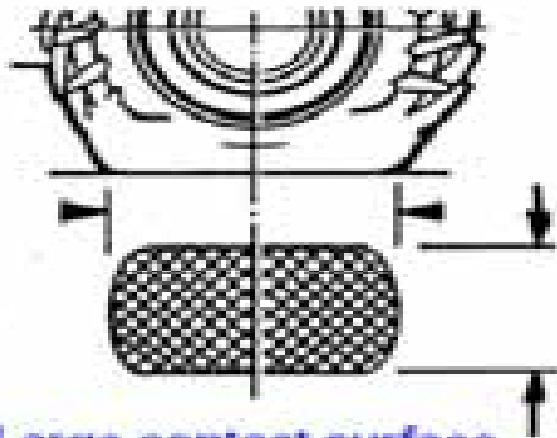


# TRACTION PERFORMANCE

## Rolling resistance and tyre pressure



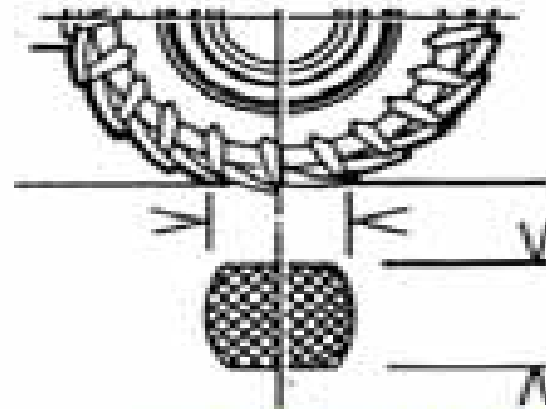
Low tyre pressure



Large contact surface  
Low soil pressure



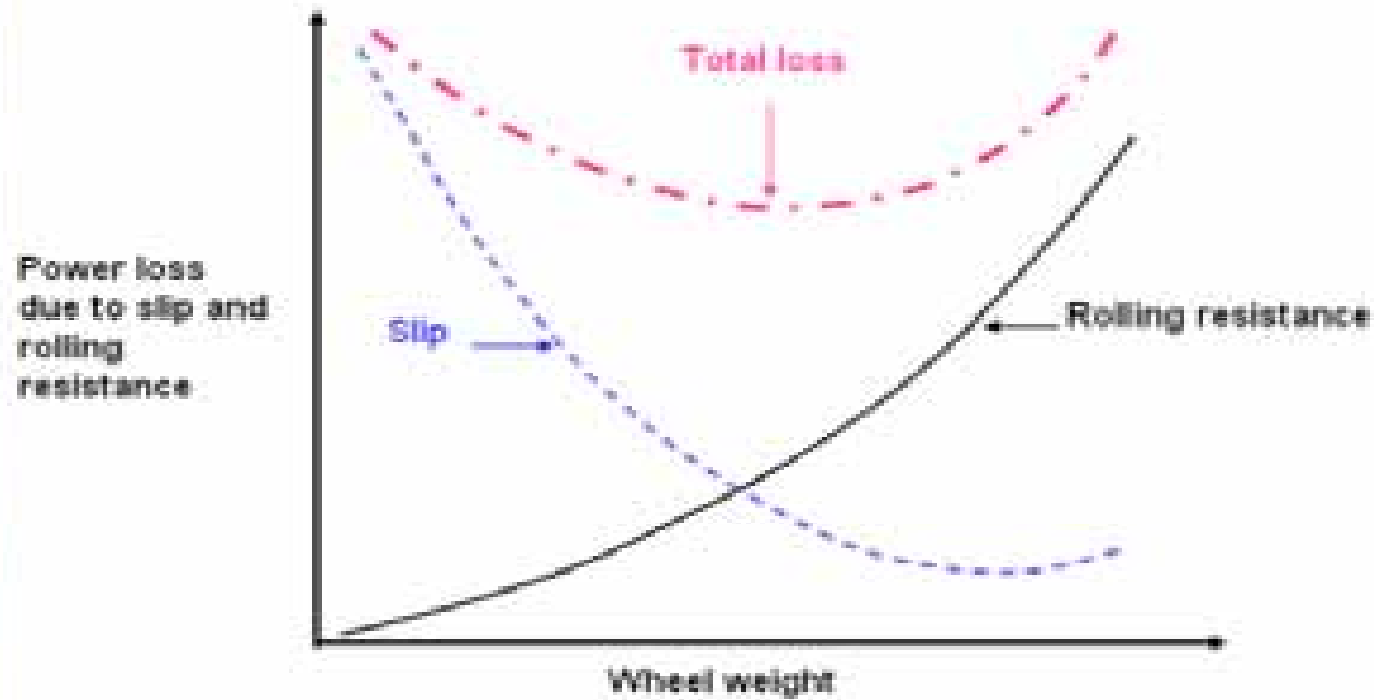
High tyre pressure



Small contact surface  
High soil pressure

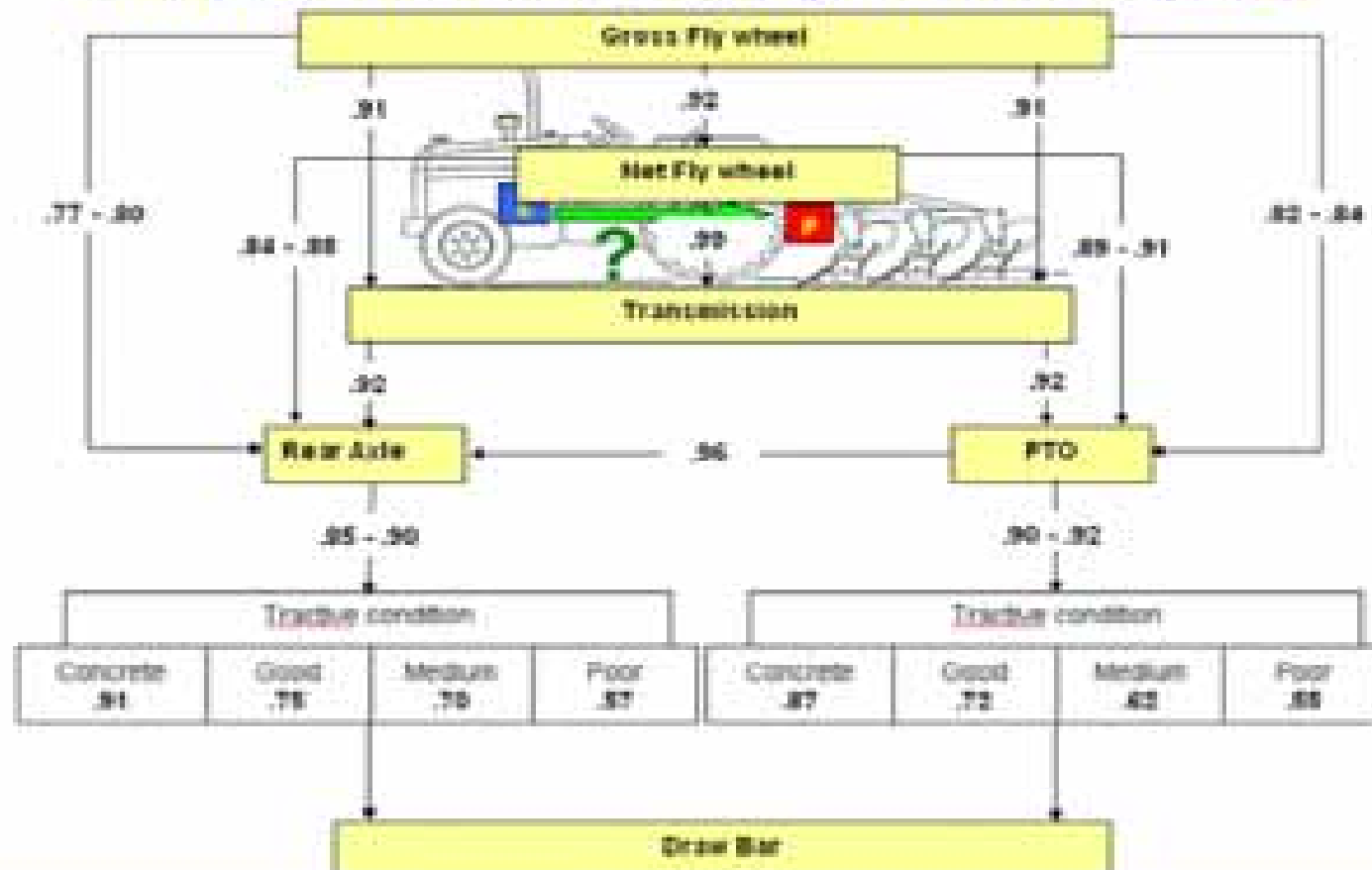
# TRACTION PERFORMANCE

## Wheel ballasting, rolling resistance and slip



# TRACTOR PERFORMANCE

## Power distribution through a tractor (Zoz)



# NEW DRAWBAR TESTS



# TEST TEAM

- Maize Trust
- Grain SA
- North West Co-op
- IAE (Mechanization team)

# TEST LOCATION

- Lichtenburg – Sandy Loam soils
- Koster - Clay loam soils
- Mareetsane – Sandy soils

# IMPLEMENTS TESTED

- Trailed offset disc
- Field Span
- One way disc
- Trash handi-cult cultivator
- Chiselplough (DLB12)
- Chiselplough (DLB19)
- Ripper super 25 with different shares

# IMPLEMENTS TESTED

- Mouldboard plough (18", 4 share)
- Paraplow (2 share)
- Vibro Flex chisel plough

# TEST CONDITION

- ALL TESTS AT OPTIMUM OPERATING SPEED AND NORMAL WORKING DEPTH

# INSTRUMENTATION

# 3-POINT HITCHED DYNAMOMETER



# IN-LINE DRAWBAR DYNAMOMETER



# PTO DRIVEN IMPLEMENTS



# MEASURING FORWARD SPEED



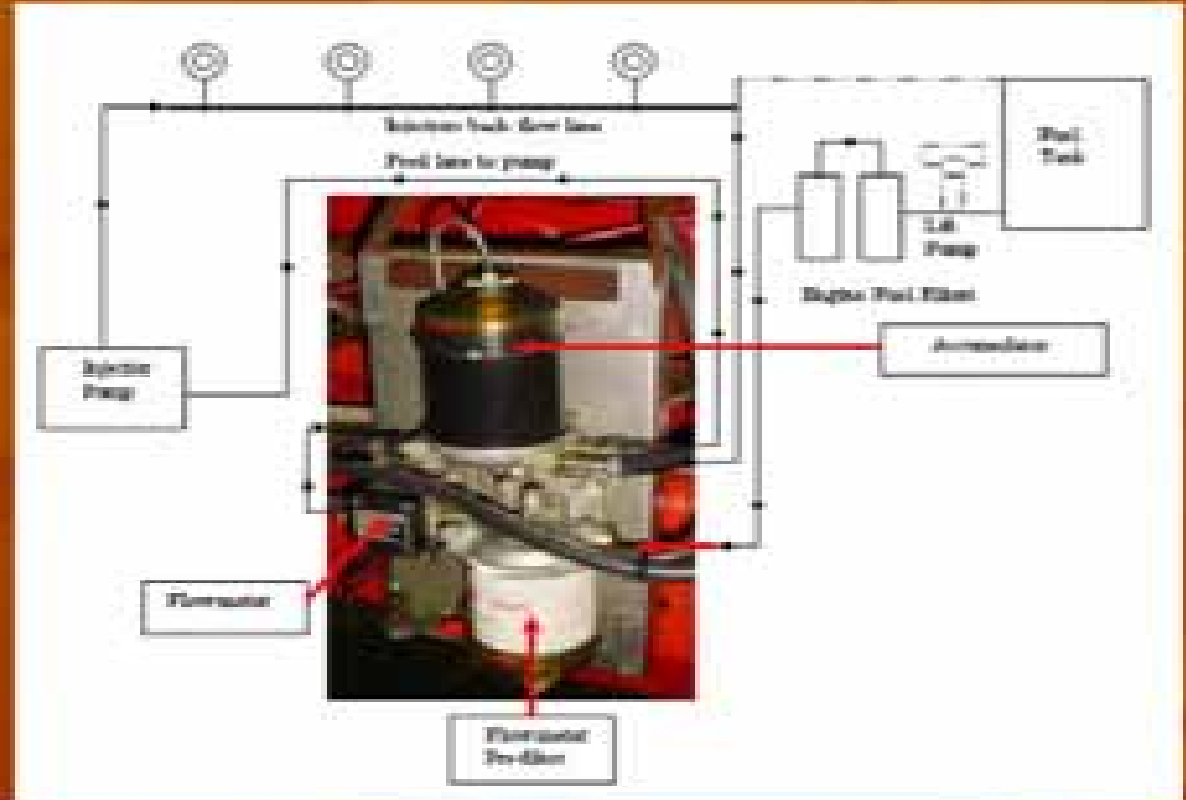
# MEASURING P.T.O. SPEED



# MEASURING WHEEL SLIP



# MEASURING FUEL CONSUMPTION



# MEASURING IMPLEMENT WORKING DEPTH



# SOIL PROFILE METER



# EDAQ DATA LOGGER



# RADIO UNIT AND POWER SUPPLY



# PROCESS CONTROL



# DATA LOGGER



e| **DAQ**  
*lite*

SoMat eDAQ-lite

# DATA LOGGER HARDWARE SETUP

TCE v3.11.0 build 227 [C:\Documents and Settings\Irrigation\My Documents\Landini\_01.tce]

File Test Control PCS Setup Preferences View Window Help

Hardware Setup [100000 Hz]

Node	Connector	Card type	Serial #	Code	Hardware Specifics
155.240.244.26	MPB	Main Processor	ELMPB.01-0537	v5.4	ECHs=3 [Expansion=2.5 Hz] LINUX EXO
155.240.244.26	MPBser	MPB Serial Bus	ELMPB.01-0537	n/a	ECHs=3 [Not Configured]
155.240.244.26	Power	Power Controller	ELPWR.03-0537	v2.2	ECHs=2
155.240.244.26	HLSS_1	High Level SS	ELHLS.04-4444	v1.1	ECHs=0 [Smart Ch=2]
155.240.244.26	Brq_1	Bridge	ELBRG.02-0820	v1.2	ECHs=0
155.240.244.26	Brq_2	Bridge	ELBRG.02-0832	v1.2	ECHs=0
155.240.244.26	DIO_1	Digital I/O	ELDIO.01-2435	v1.6	ECHs=1 [No GPS Clocking]
155.240.244.26	GPS_1	GPS (DIO)	ELDIO.01-2435	v1.6	ECHs=1 [GPS]
155.240.244.26	StdTC_1	Thermocouple	ELTCB.01-0142	v1.0	ECHs=1 [Expansion Board=None]

# TRANSDUCER CHANNEL SETUP

## Transducer and Message Channel Setup

ID	Connector	Channel	Rate	Cal Date	Channel Specifics
Wreck Depth	155.240.244.26:Brq_2.c04	Bridge	500	08/07/16	[FR32] FS=500/500 mm Filt@ 167 Hz
Larm_A_Trek	155.240.244.26:Brq_1.c01	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Larm_A_Vest	155.240.244.26:Brq_1.c02	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Larm_A_Lat	155.240.244.26:Brq_1.c03	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Larm_B_Trek	155.240.244.26:Brq_1.c04	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Larm_B_Vest	155.240.244.26:Brq_2.c01	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Larm_B_Lat	155.240.244.26:Brq_2.c02	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Uarm	155.240.244.26:Brq_2.c03	Bridge	500	08/04/22	[FR32] FS=1000/1000 um/m Filt@ 167 Hz
Wheel_Speed	155.240.244.26:DIO_1.a001	Digital Input (DIO)	2500	n/a	[JIna0] FS=0/1 logic
Fuel	155.240.244.26:DIO_1.a003	Digital Input (DIO)	2500	n/a	[JIna0] FS=0/1 logic
PTD	155.240.244.26:DIO_1.a004	Digital Input (DIO)	2500	n/a	[JIna0] FS=0/1 logic
lat	155.240.244.26:GPS_1.v001	GPS (DIO)	50	07/09/14	[FR32] FS=90/90 Degrees
lon	155.240.244.26:GPS_1.v002	GPS (DIO)	50	07/09/14	[FR32] FS=180/180 Degrees
altitude	155.240.244.26:GPS_1.v003	GPS (DIO)	50	07/09/14	[FR32] FS=10000/100000 Meters
speed_m	155.240.244.26:GPS_1.v004	GPS (DIO)	50	07/09/14	[FR32] FS=0/655.25 m/s
mag	155.240.244.26:GPS_1.v005	GPS (DIO)	50	07/09/14	[FR32] FS=0/255



# TEST PROCEDURE

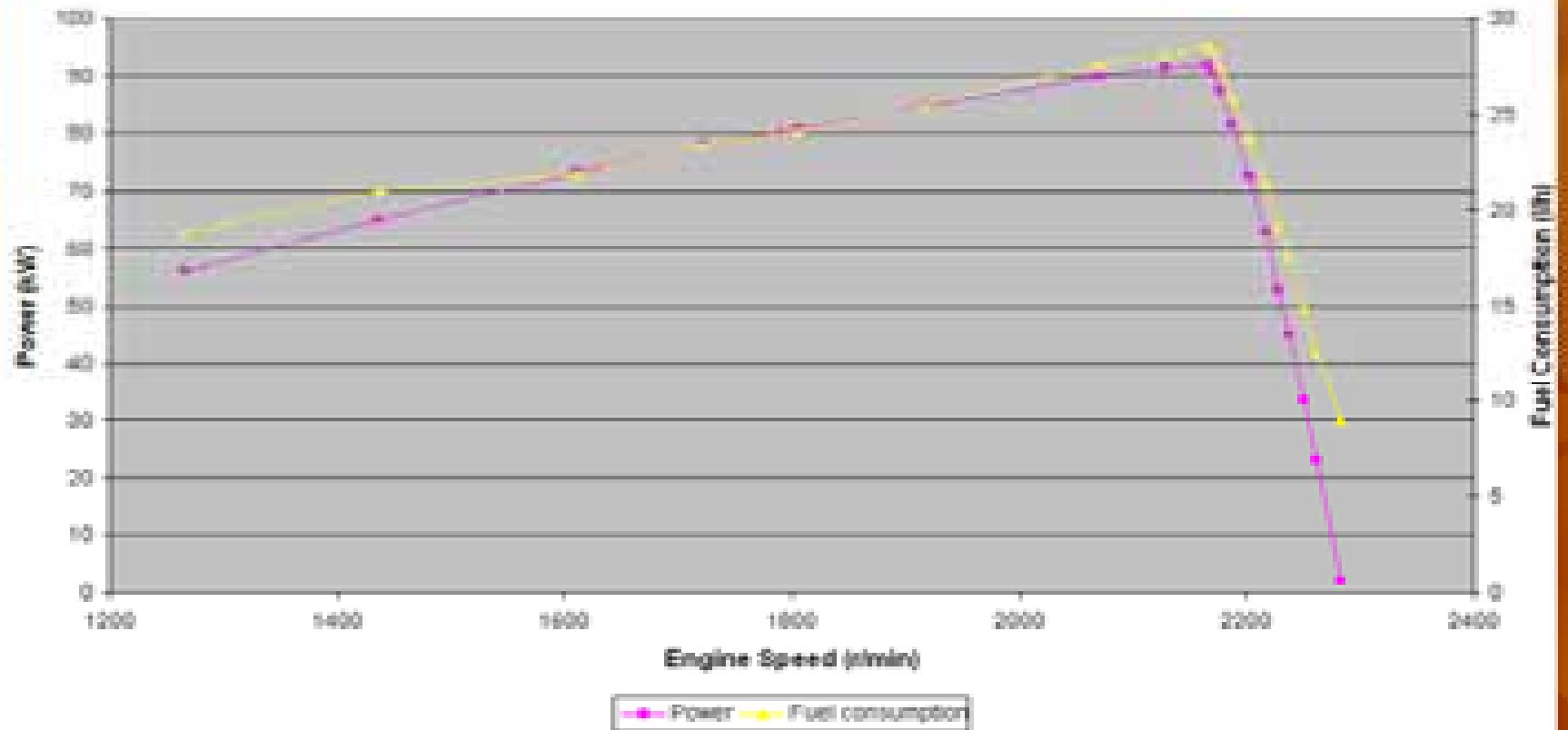
# SOIL CHARACTERISTICS

- Take soil samples between 0-250 & 250-400 mm
- Do penetrometer tests
- Determine soil moisture content
- Determine soil clay %

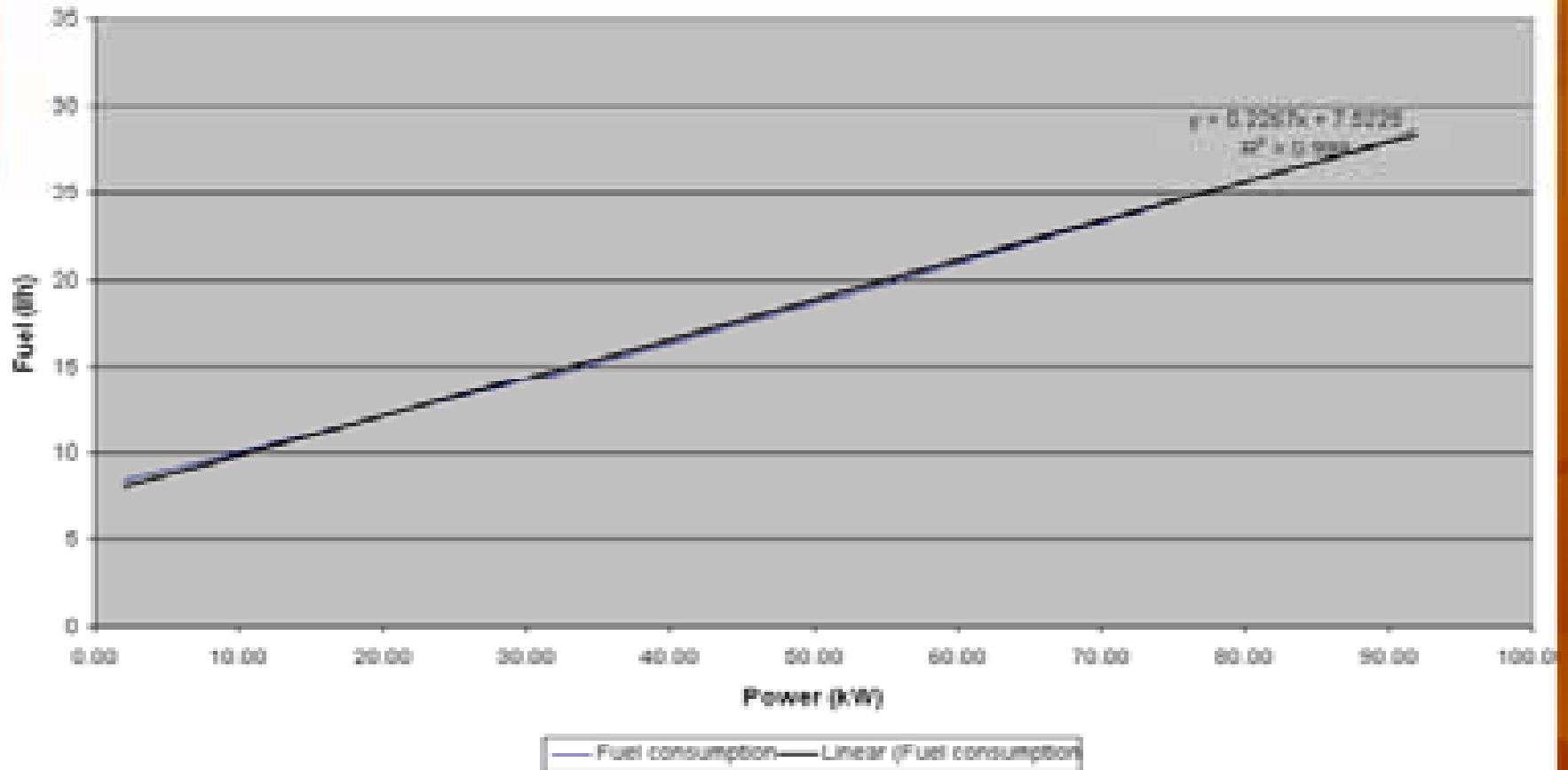
# TEST PROCEDURE

- Engine power test
- Set implement
- Zero calibrate bridge channels
- Measure drawbar power at optimum speed
- Measure soil disturbed
- Download data from data logger
- Compile test report using glyphworks

## Landini 130



## Engine Power vs Fuel Consumption



# SET WORKING DEPTH



# ZERO CALIBRATION



# DRAW POWER TEST



# MEASURE SOIL DISTURBED



# MEASURE SOIL DISTURBED



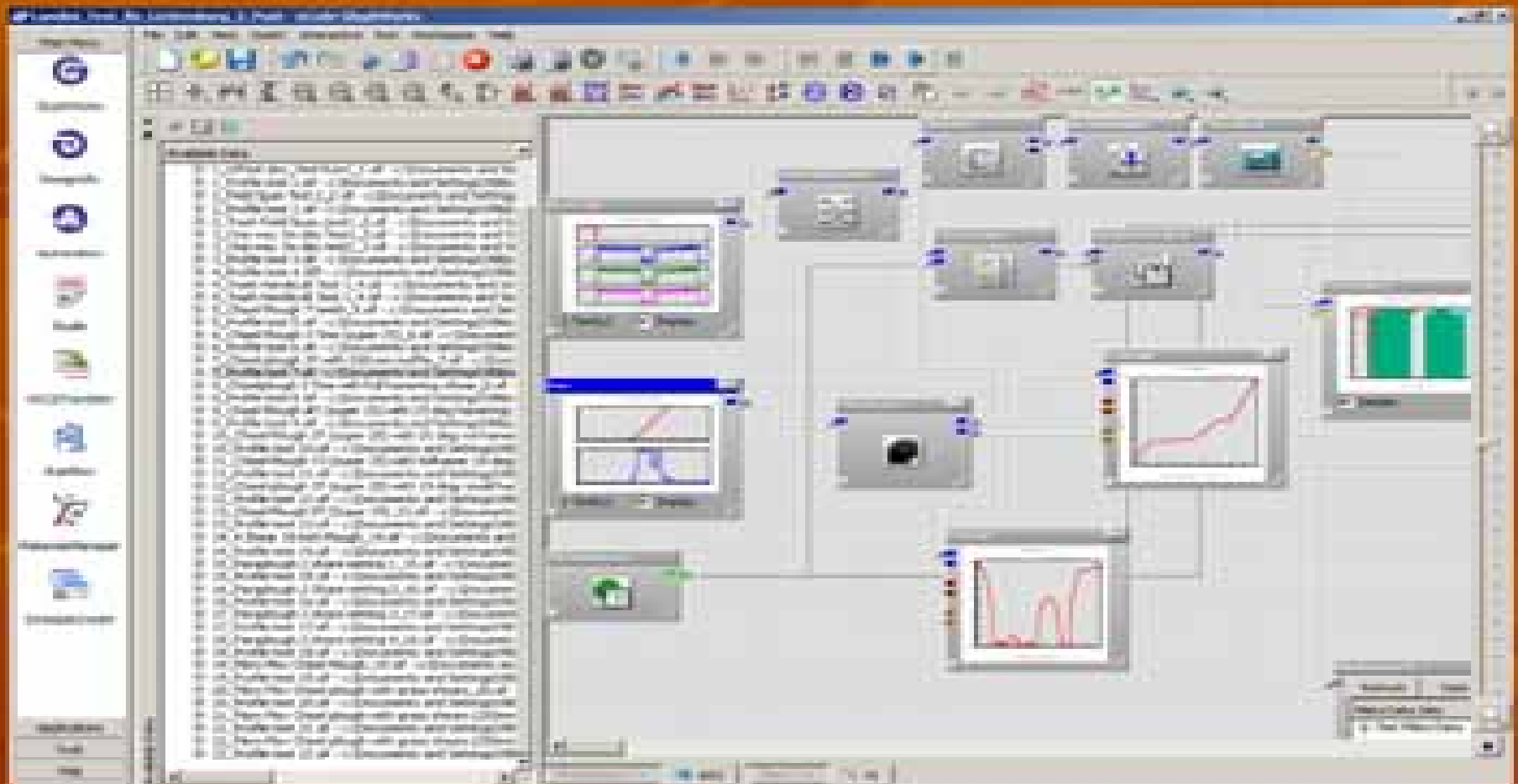
# VIEW TEST DATA WITH IN-FIELD

# READ DATA WITH INFIELD



# COMPILE TEST REPORT WITH GLYPHWORKS

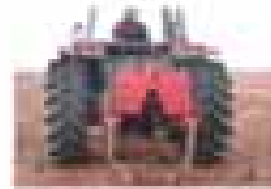
# COMPILE REPORT





# Implement Test Report

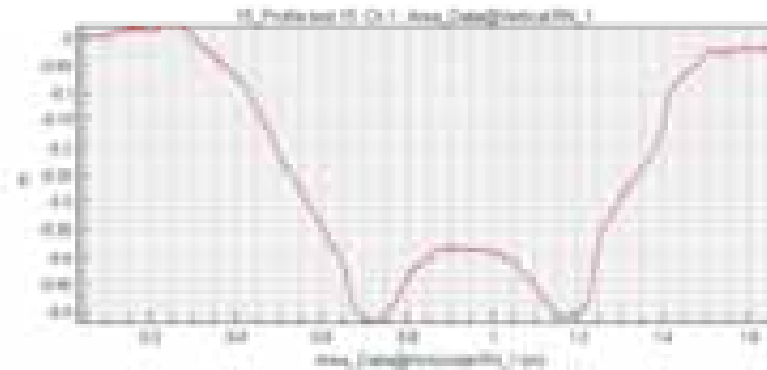
Date : 04/09/19  
Location: Lichtenberg  
Test Engineer: ARC-4J  
Farmer: H van Veen  
Implement Type: Ploghough (PT)  
Implement Make: Rover  
Test Description: Test at optimum speed  
Working Depth: 50mm  
Soil Classification: Sandy Loam  
Soil Type: Lichtenberg  
Clay\_Percentage: 14  
Soil Moisture Content : 6.7



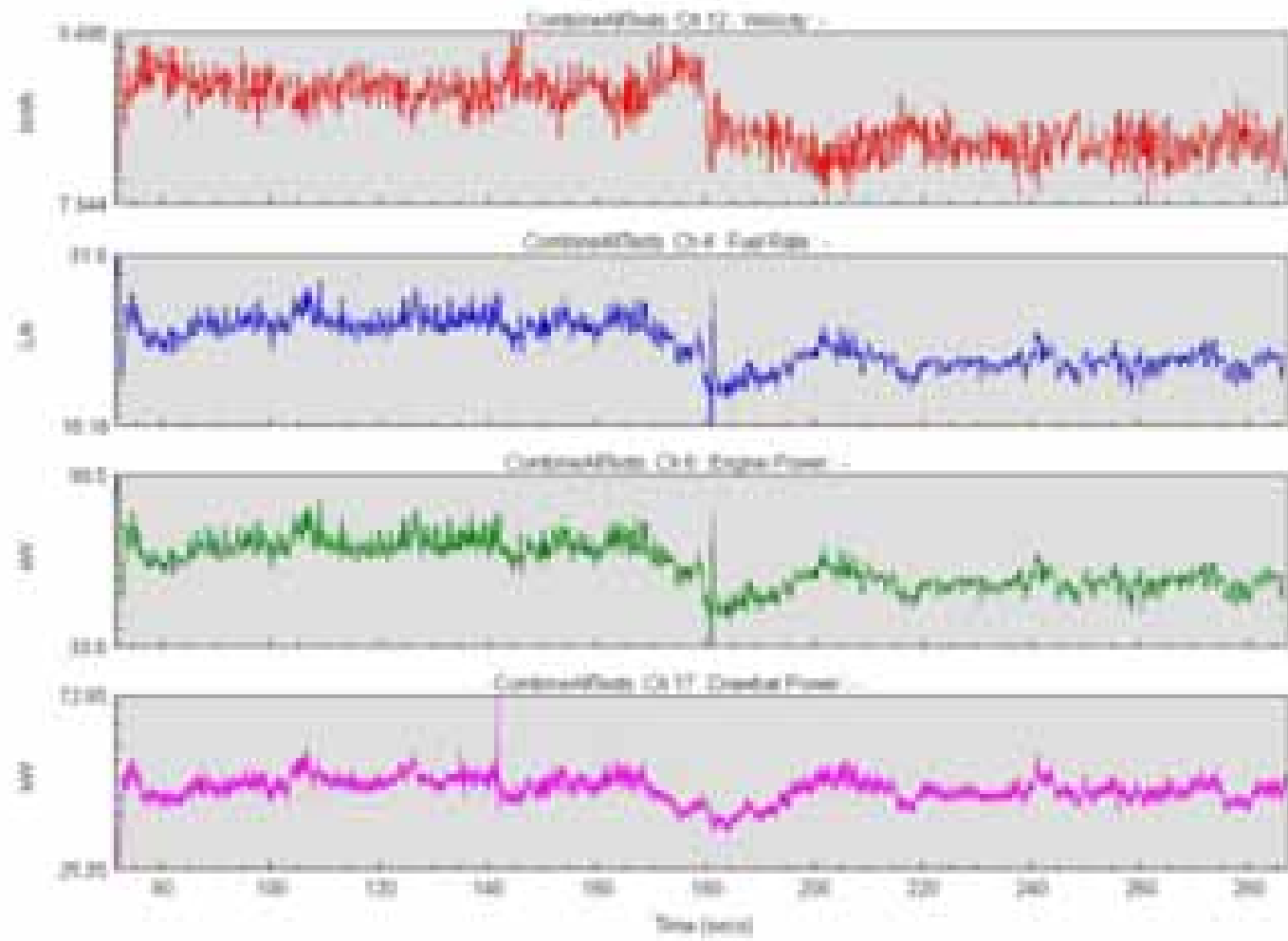
Data Value Table

Name	Parameter	Units
Forward Speed	7.934	km/h
Fuel Rate	23.57	l/h
Specific Fuel	16.49	l/ha
Work Rate	14.26	ha/day
Engine Power	64.82	kW
Tractor Power	27.38	cv
Wheel Slip	4.35	%
Implement Efficiency	79.1	percent

Area Profile



### Time History Graphs



# THANK YOU

