

COMPACTION ACTION!

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real agriculture

Sirius Satellite 147: Rural Radio

WHEAT PETE'S WORD

1-844-540-2014

@WheatPete

Ontario Compaction Team

Fieldcropnews.com

Ian McDonald and Alex Barrie, OMAFRA

Jake Kraayenbrink, AgriBrink

Greg Stewart, Maizex

Peter Johnson, Real Agriculture

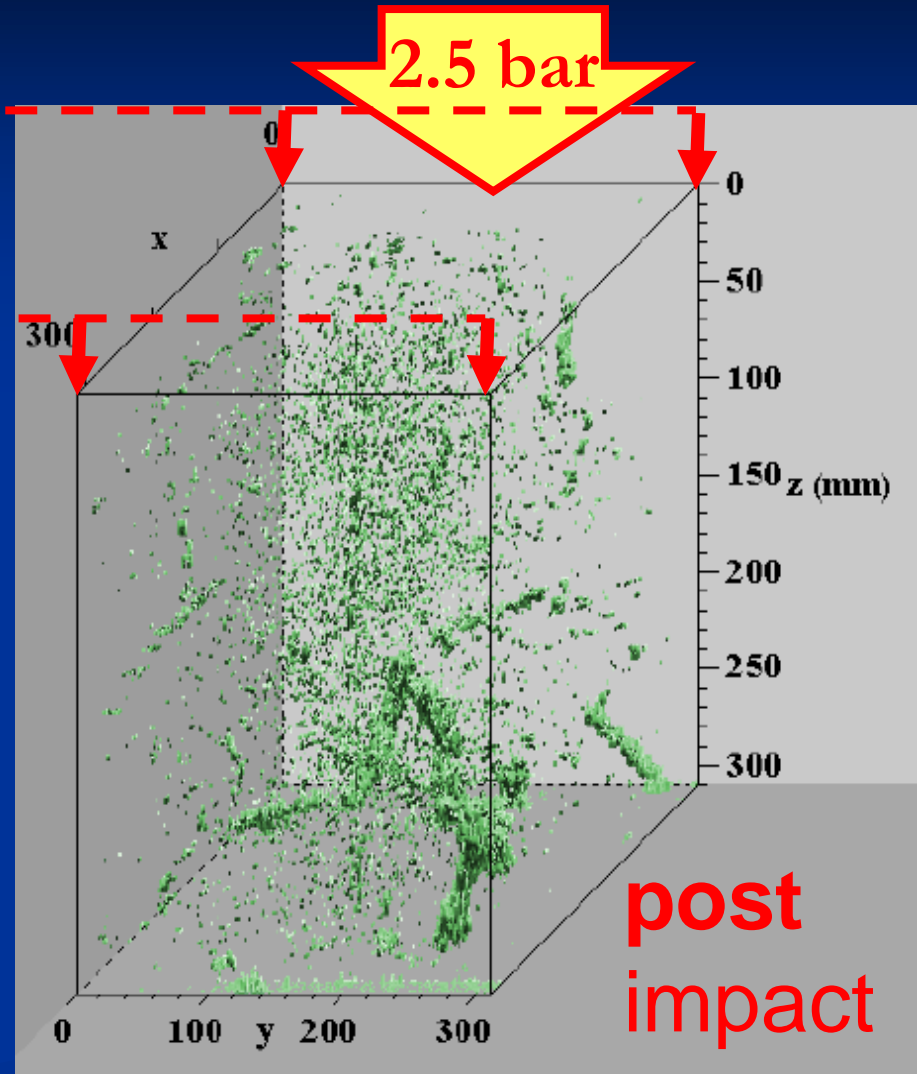
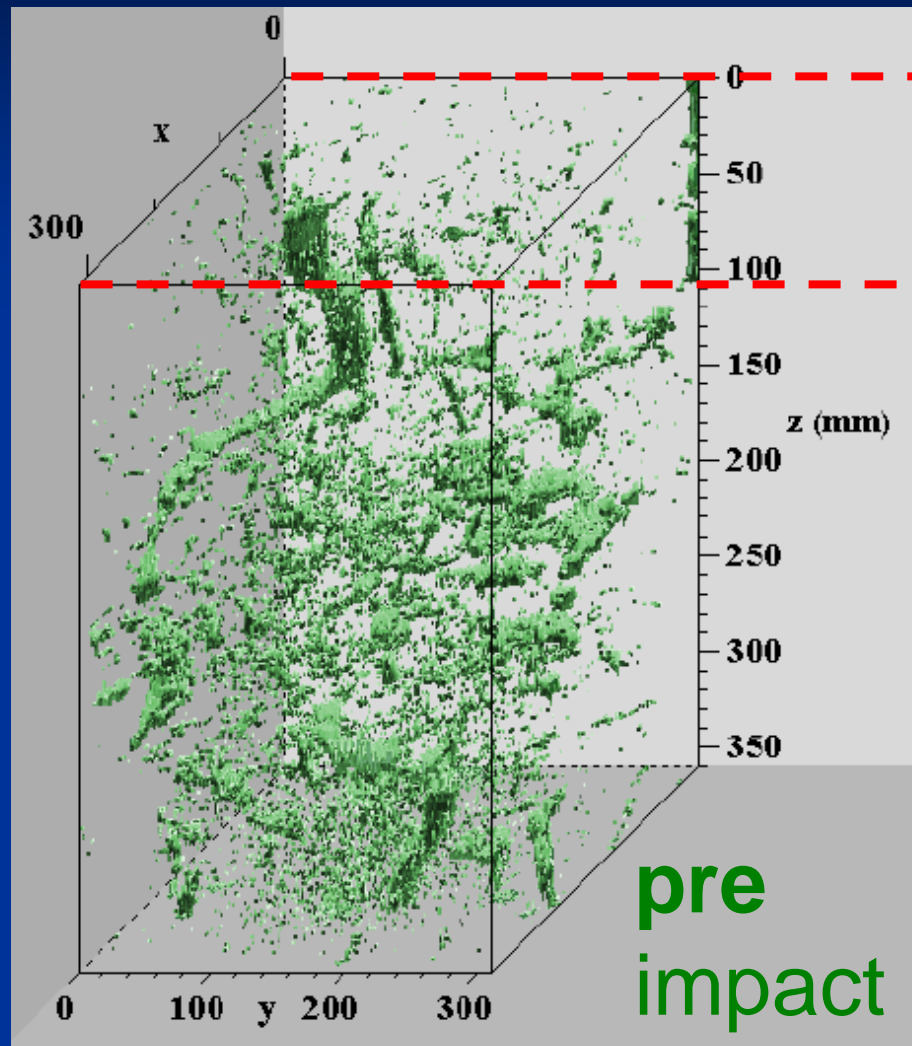
MANY MORE

Compaction Action, Sept 7th, 2017



We can compact a soil
within seconds,
but it takes decades for
it to recover.

Soil compaction = Reduction in porosity



Split tile?
30 ft centres





Photo: Jason Casselman

@WheatPete

A photograph of a field with a combine harvester track visible in the distance. The field is covered in dry, yellowish-brown grass and some green weeds. The track is a dark, straight line running from the foreground towards the horizon. The sky is clear and blue.

36" tracked combine
23.1R26 rears 25 psi

Photo: Jason Casselman

@WheatPete

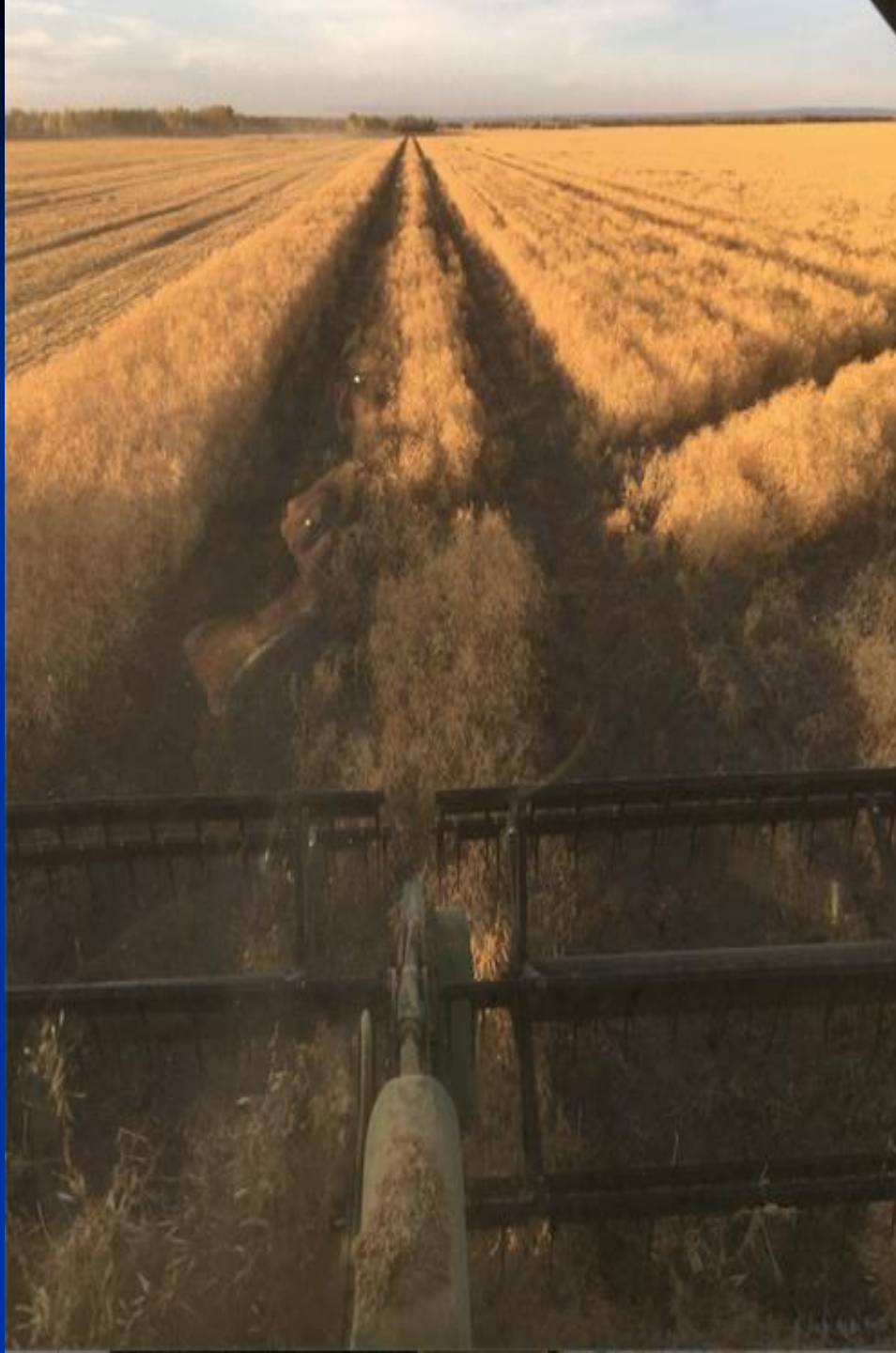
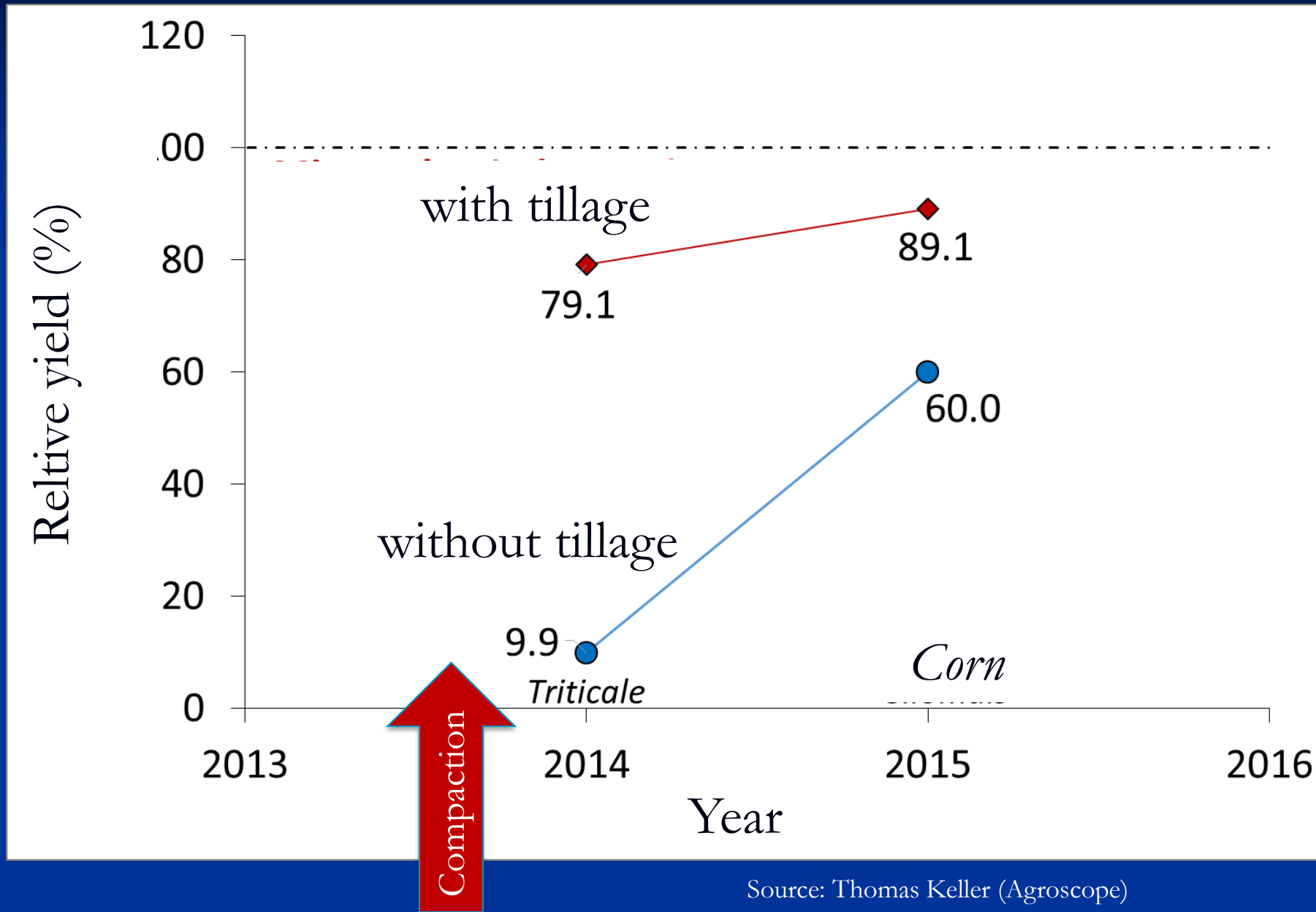


Photo: Jason Casselman

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Compaction and plant growth – yield



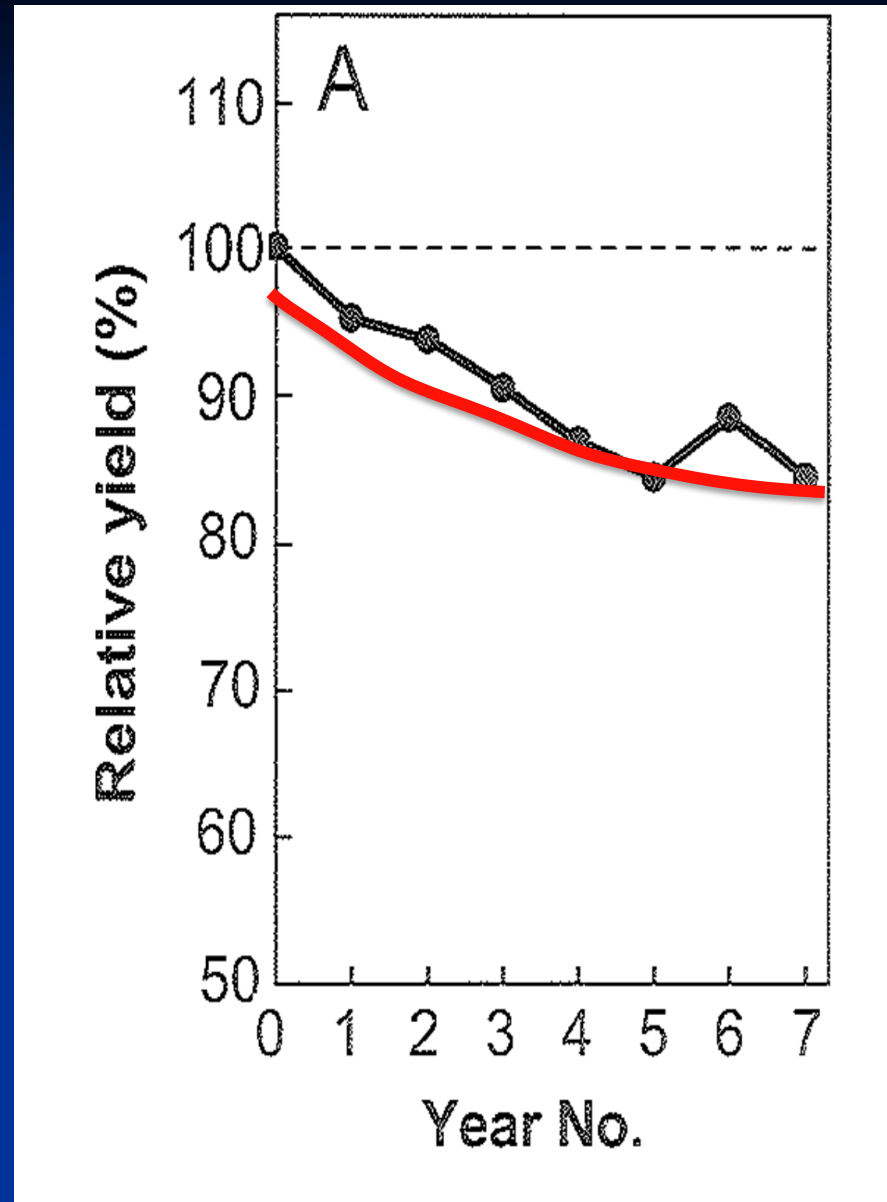
Source: Thomas Keller (Agroscope)

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Compaction!

Machine	Trafficked Area (%)	Yield Reduction Prediction (200 bu/ac No-Till corn Base)			
		Normal		Wet	
		Trafficked yield	Field Ave	Trafficked yield	Field Ave
Grain Cart	14	175	196	148	193
36 row Planter	6.7	190	199	171	198
16 row Combine	17.1	176	196	150	192
Manure Application	44.7	189	195	168	186

Surface Compaction

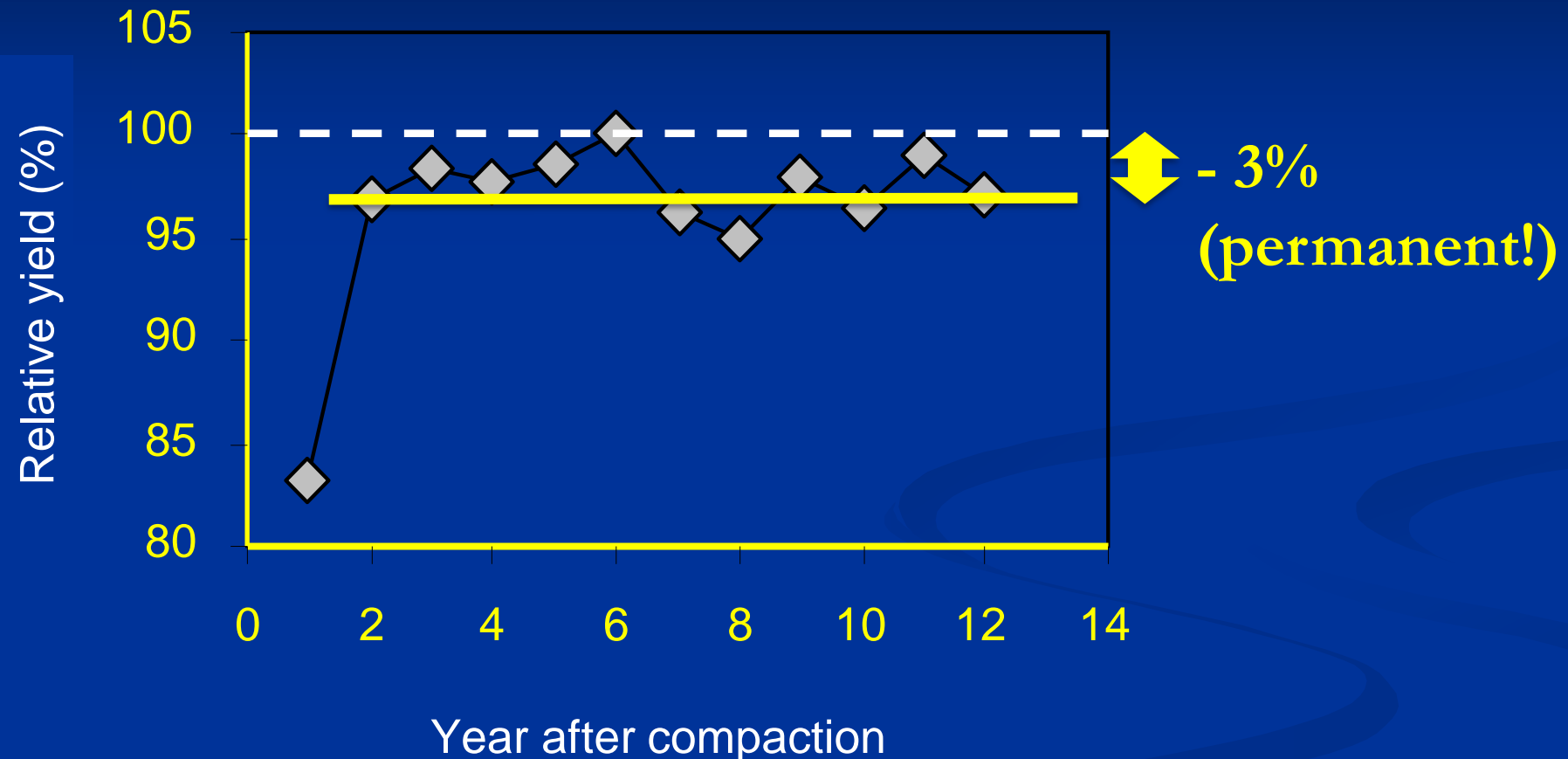


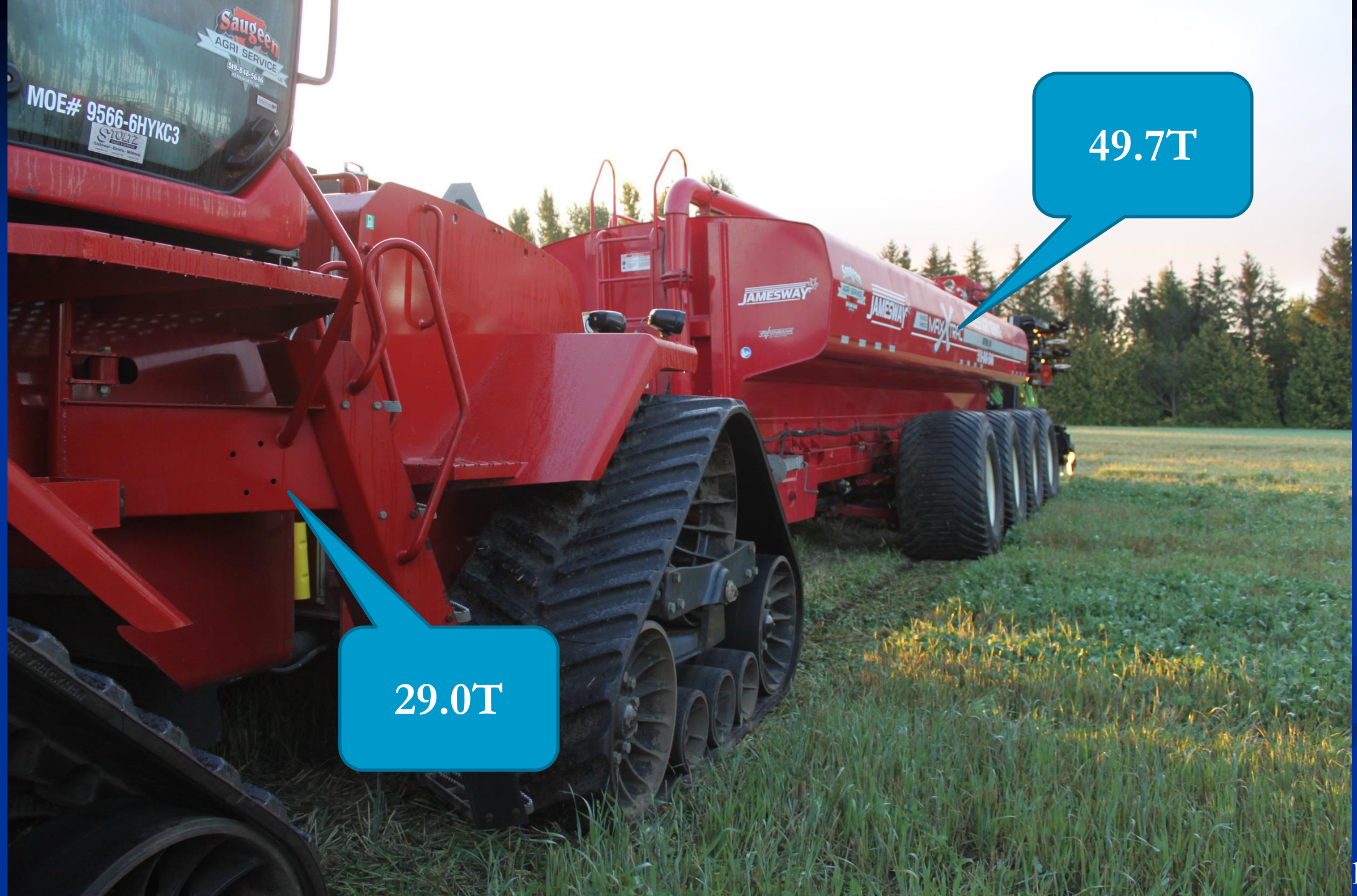
accumulated
loss - 20%

Effect of repeated traffic
with minor topsoil
compaction on crop yield

Håkansson I (2005) Machinery-induced compaction of arable soils, incidence – consequences – counter-measures. SLU, Uppsala, Reports from the Division of Soil Management. No. 109, 154 pp.

Effect of singular subsoil compaction on crop yield





29.0T

49.7T

Common Field Equipment Axle Loads

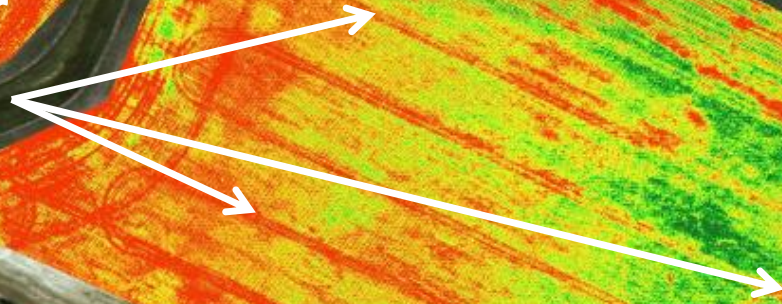
Equip. Type	Axle Load (tons/axle)
4WD tractor, 200hp	7.5
4WD tractor, 325hp	13
4WD tractor, 530hp	18
Terragator Rear Axle	12-18
Manure Tanker 4,200 gal	10-12
Manure Tanker 7,200 gal	17-18
Combine 12 row	24
Grain Buggy 720 bu	22
Grain Buggy 1200 bu	35-40

Equipment Axle Loads

Legal Axle Load Limit on Roads

- 11 tons (10 tonne)/axle
- Goal is not to destroy roads
- Roads purpose built to carry load
- Bigger weights on a “biological ecosystem”?
- General ag recommendation is <10 ton/axle (used to be 5 t/axle)

NDVI Image
Early July
Corn
Showing
Sprayer
Tracks!



Identifying Man- / Machine-made Vs.
Natural variability



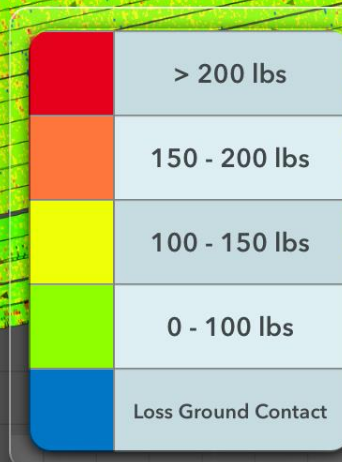
Boakes

Corn 2014

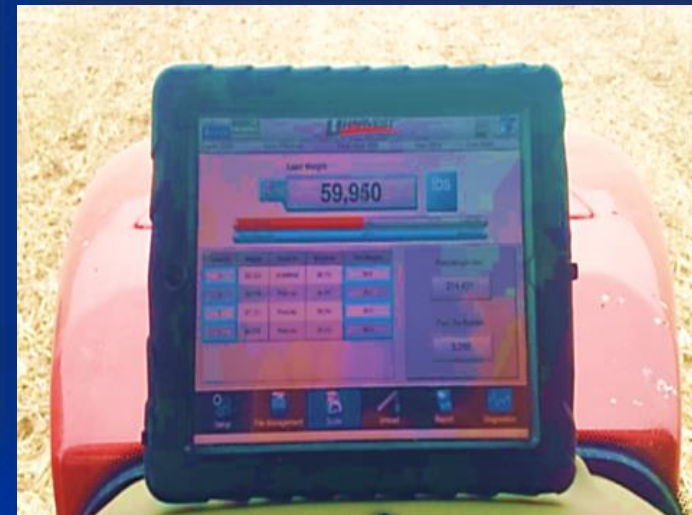
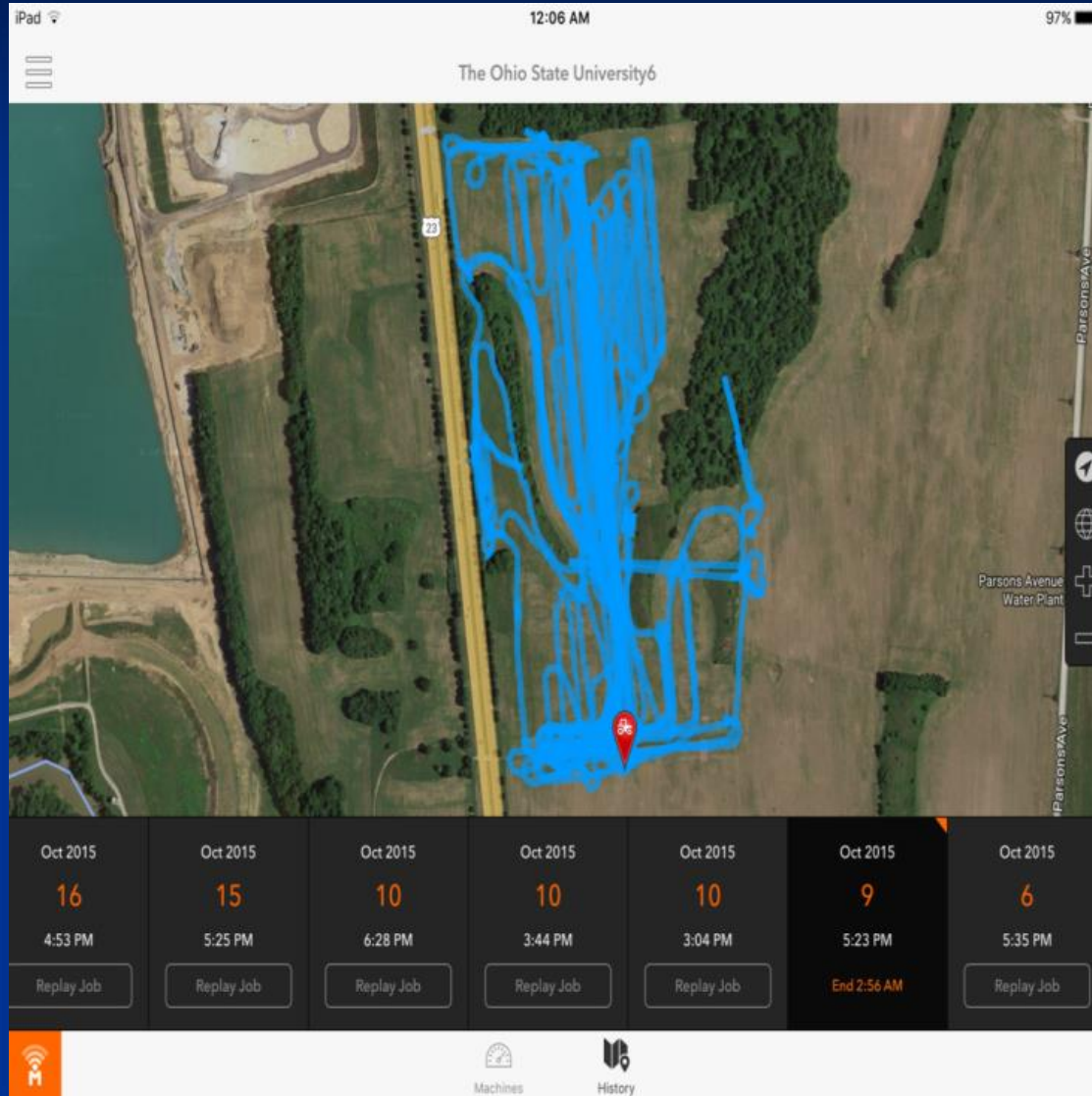
Down Force



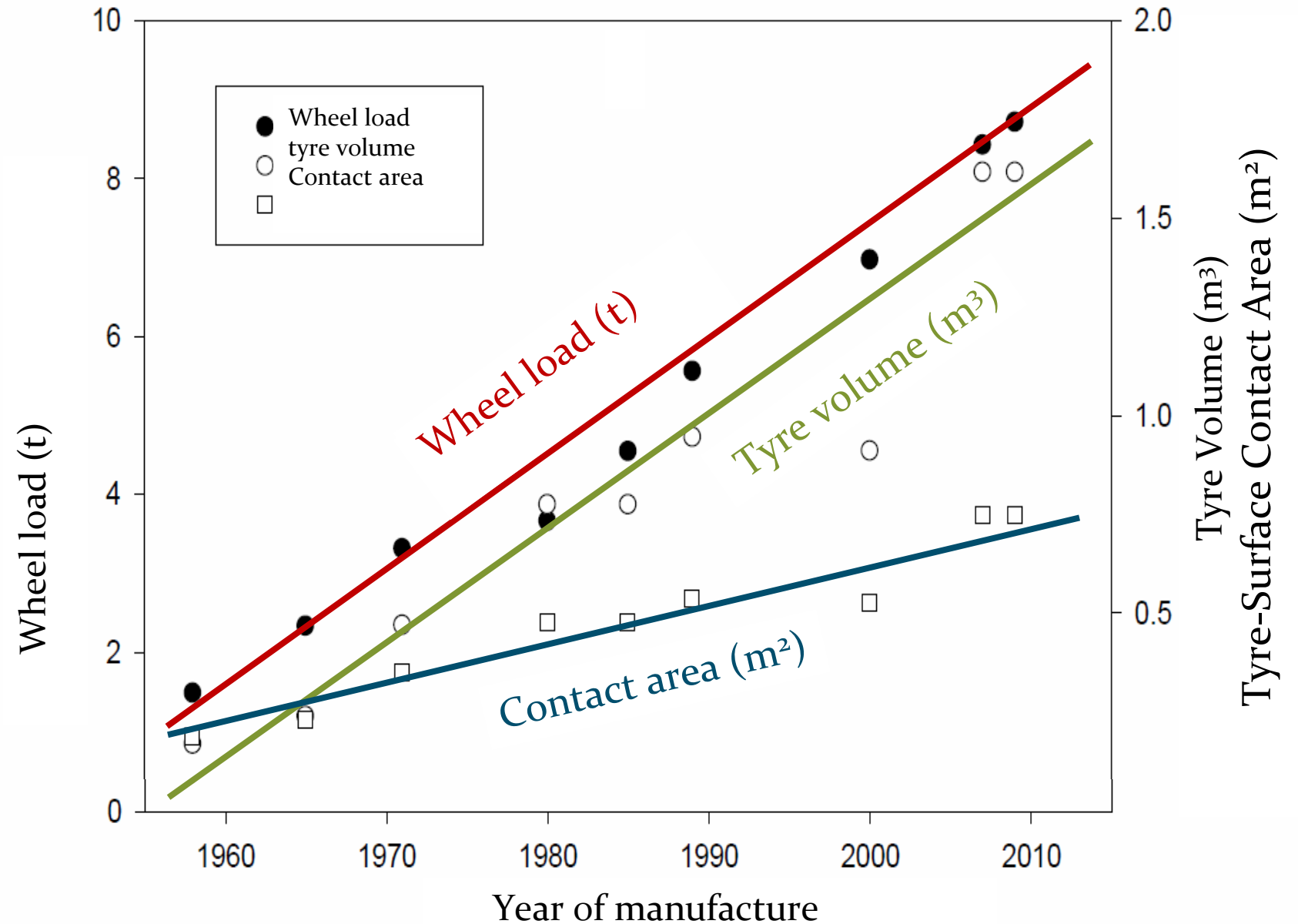
Delta Force
Down
Pressure
Monitoring



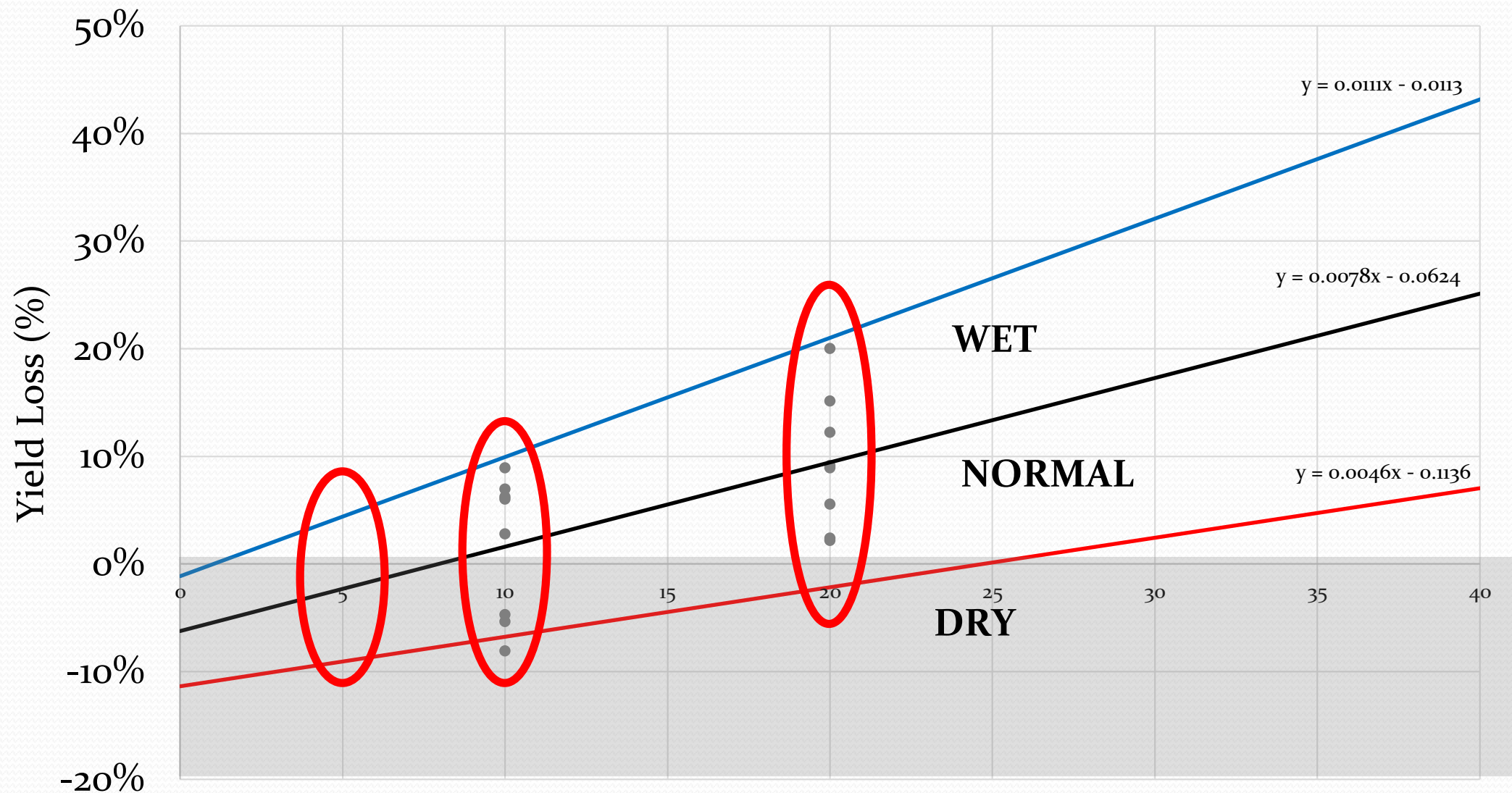
Heavy Loads at Harvest



Increased Weight!



Yield Loss vs. Axle Load – Corn



Why Mo

Elgin SCIA Compaction Day Aug 8, 2019

FARMSMART PRESENTS:

COMPACTIONSMART

WE ALL HAVE IT, LET'S MANAGE IT!

Friday, January 20, 2017

RIM Park,
Manulife Financial Sportsplex,
Forbes Hall, 2001

University Ave. E., Waterloo, ON



Scott Shearer



John P. Fulton

Food, Agricultural and Biological
Engineering , The Ohio State University

COMPACTION ACTION

www.ifao.com



Compaction Video Series:

[Compaction Action Day Overview](#)

- [1. Tires vs Tracks](#)
- [2. Tire Pressure and Compaction](#)
- [3. Skinny vs Wide Tires](#)
- [4. Control Traffic on Your Fields](#)
- [5. Farmers Talk: Ken Nixon and Shawn Schill](#)
- [6. Matthias Stettler on Compaction](#)

Data Results

Please Note — It's important to read both of documents below to correctly interpret the results.

Understanding Soil Compaction

Interpreting Data Results

Dundas SCIA Compaction Day Aug 29, 2019










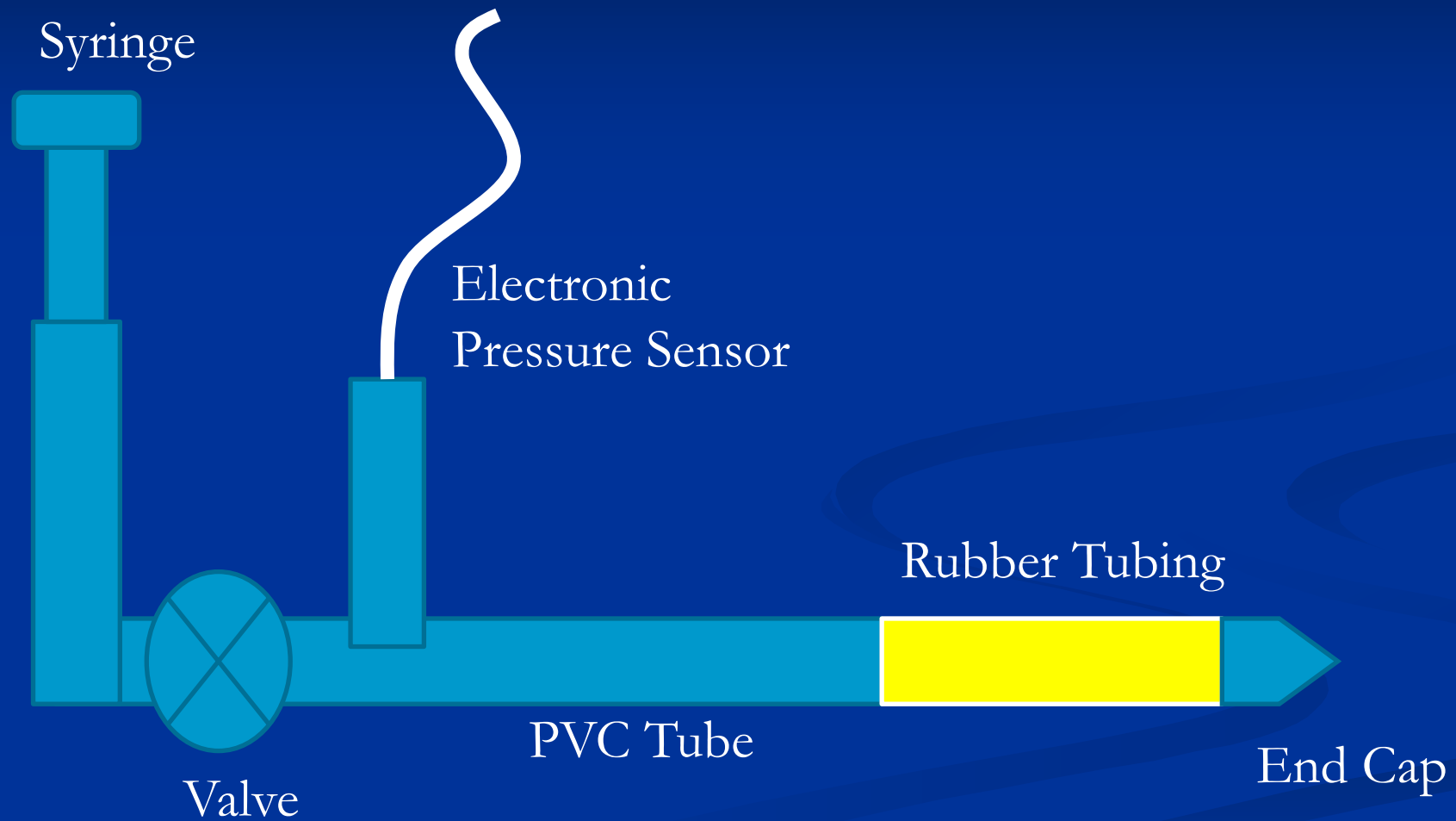


A man with a beard and glasses, wearing a grey t-shirt with 'Royals ATHLETIC' and blue jeans, is kneeling in a grassy field. He is holding a long, thin, brown soil sample in his hands, examining it closely. In the foreground, a pair of hands wearing blue gloves is also holding the soil sample. The background shows a large brown barn and some trees. The text 'Alex Barrie, OMAFRA Engineer' is overlaid on the right side of the image.

Alex Barrie,
OMAFRA
Engineer



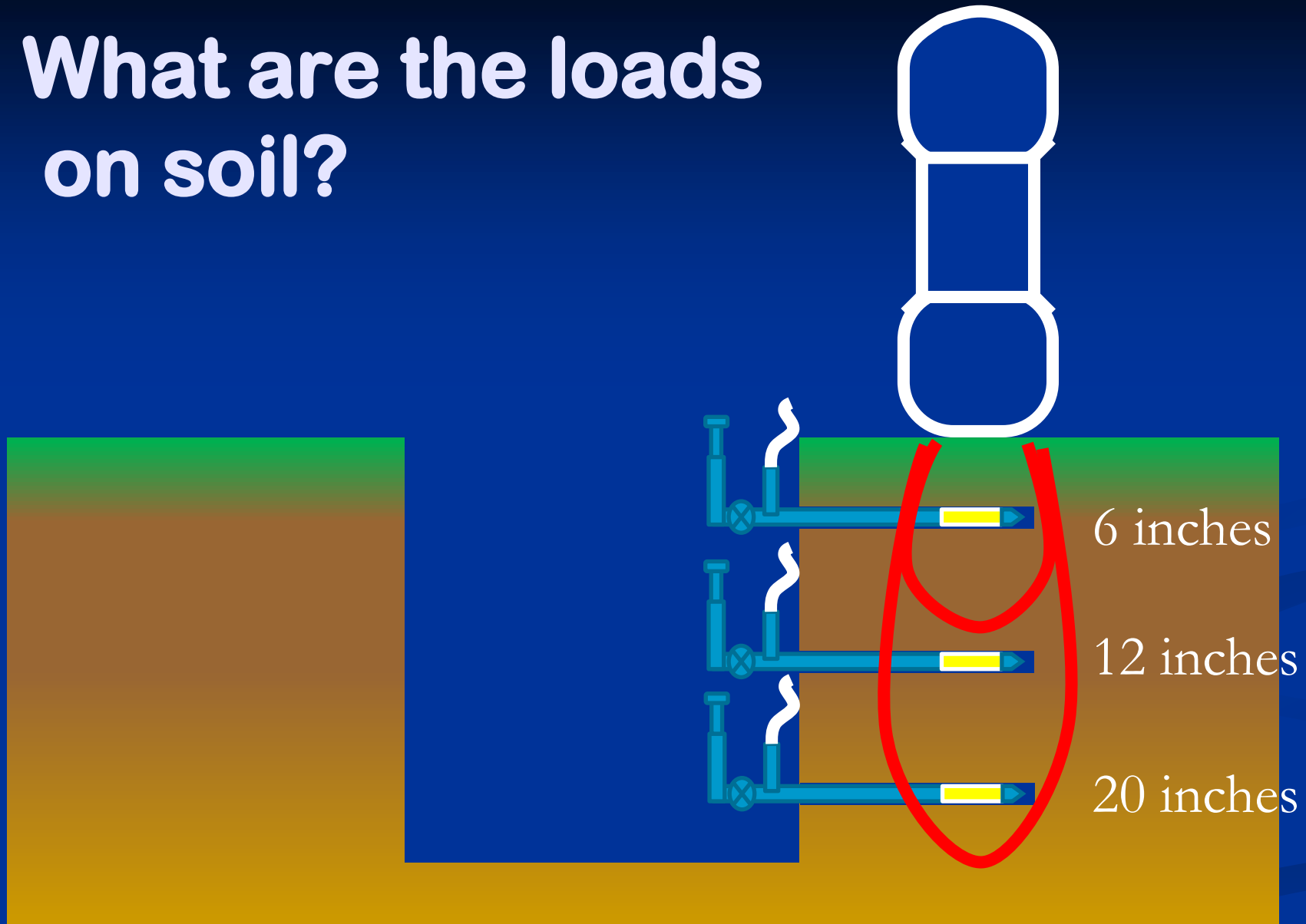
Boling Probe

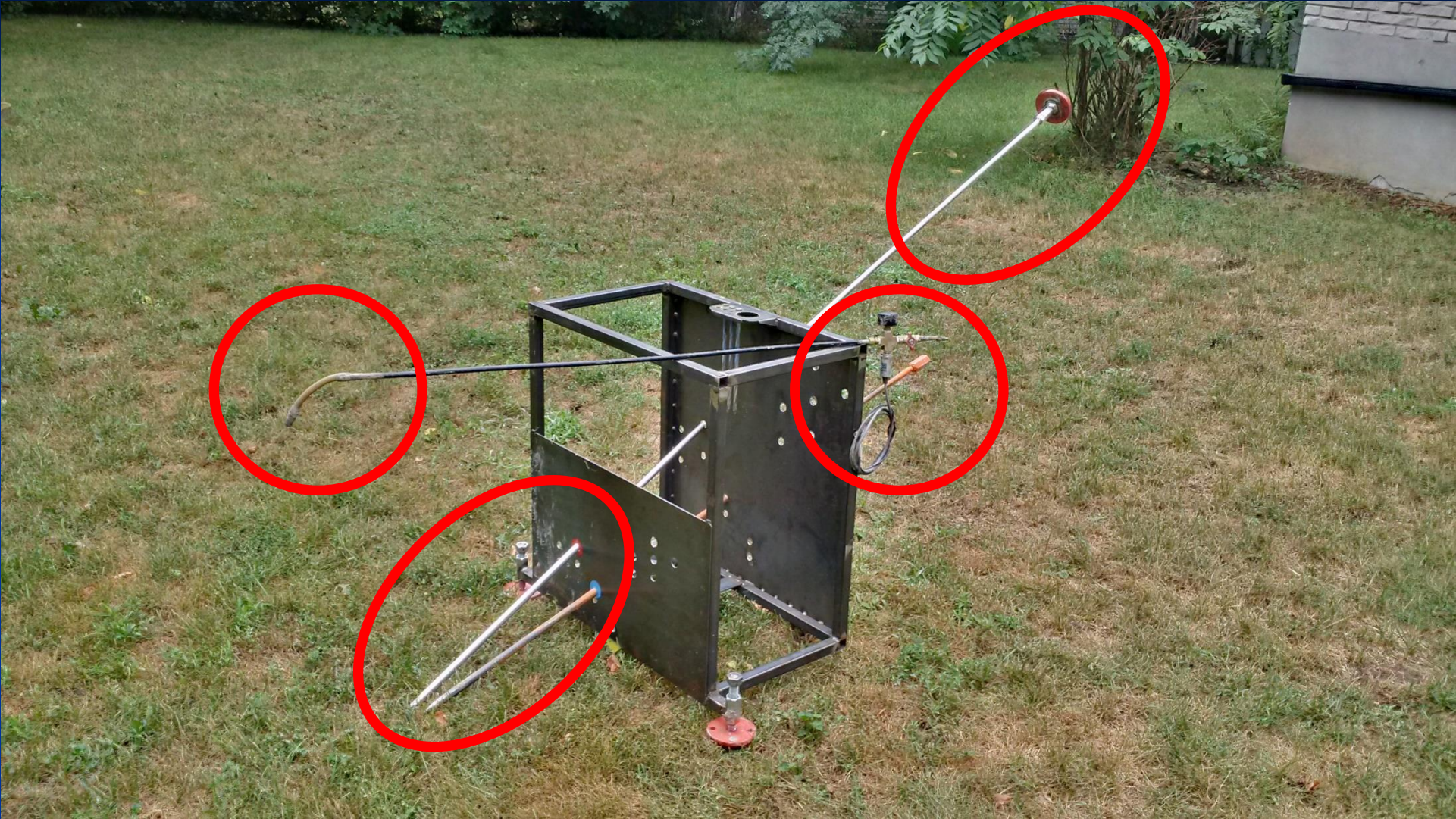


What are the loads on soil?



What are the loads on soil?









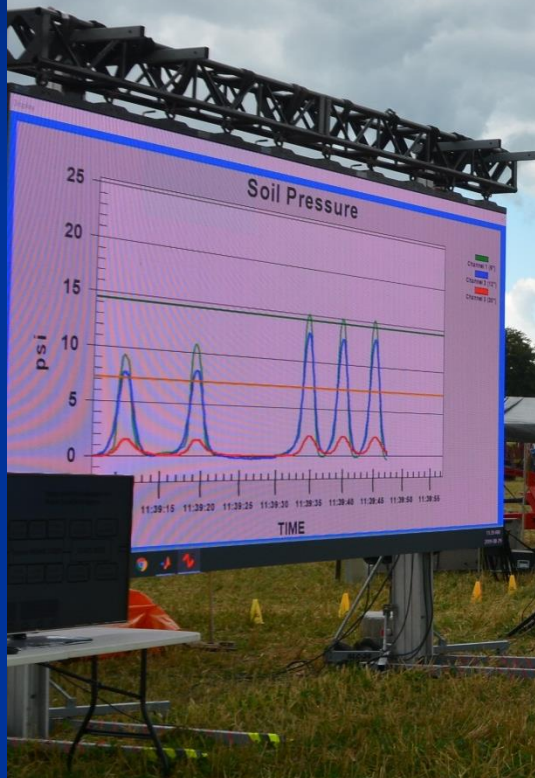


CB12











Soil Strength

Soils are extremely variable, but the average “safe stress limit” is considered as:

≈ 14.5 psi (1 Bar) for topsoil

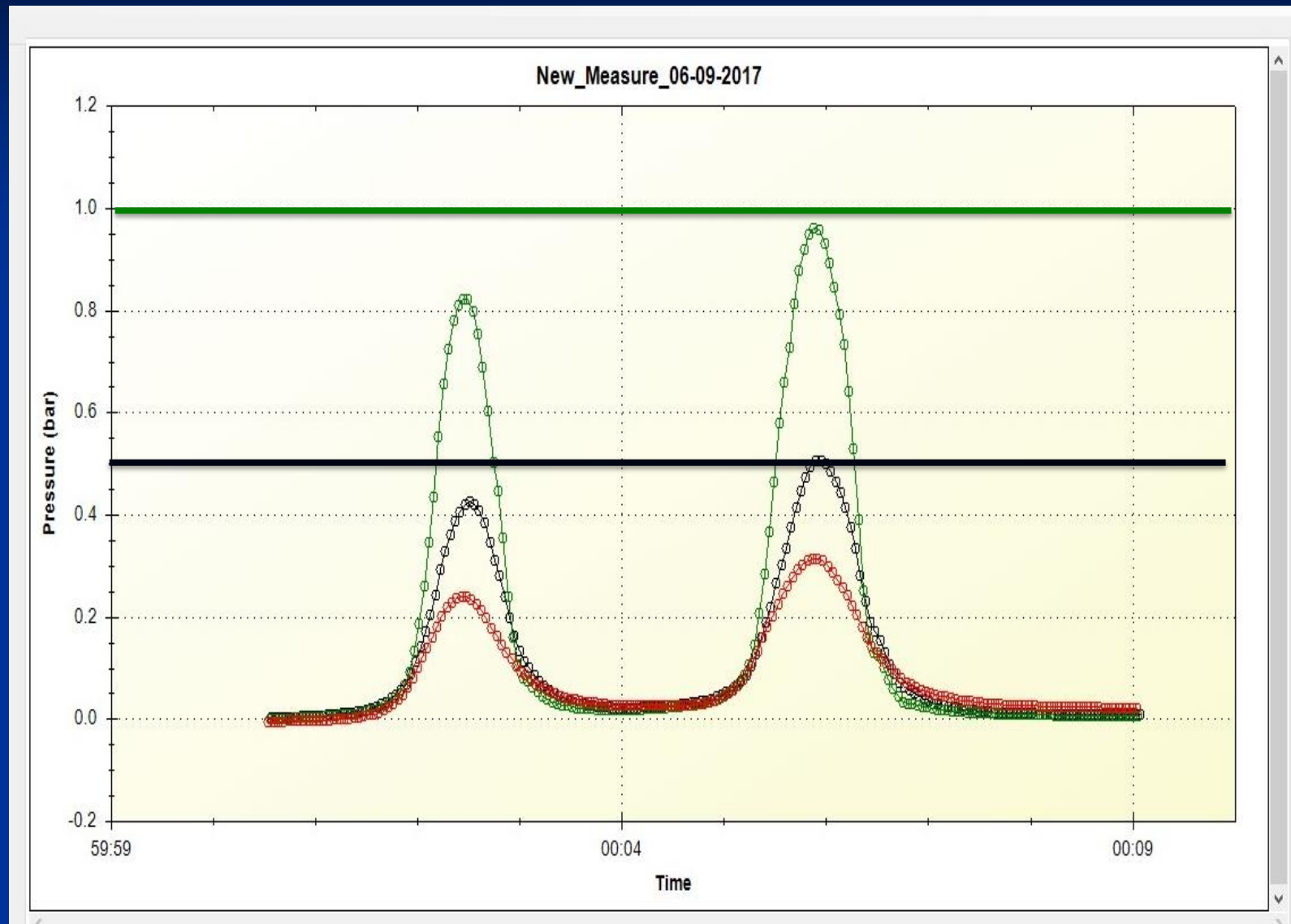
≈ 7.25 psi (0.5 Bar) for subsoil



Compaction Action!

- Equipment fully loaded: maximum risk
- Equipment weighed
- Tire pressure set based on weight, speed
- Select equipment tested at road inflation pressure and field pressure

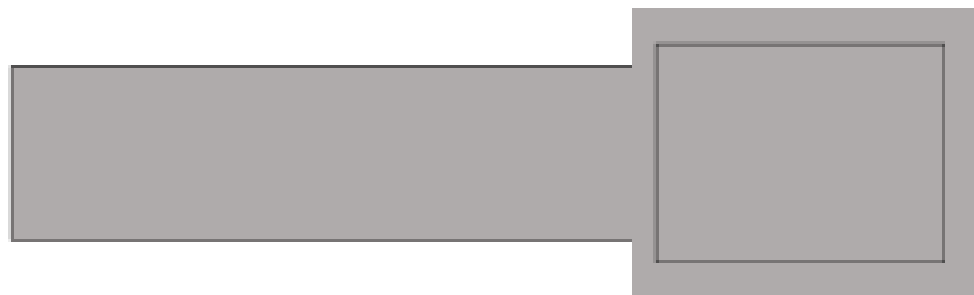
Understanding the graphs





600/70R30
13 PSI
3311 KG

710/70R42
12 PSI
4581 KG

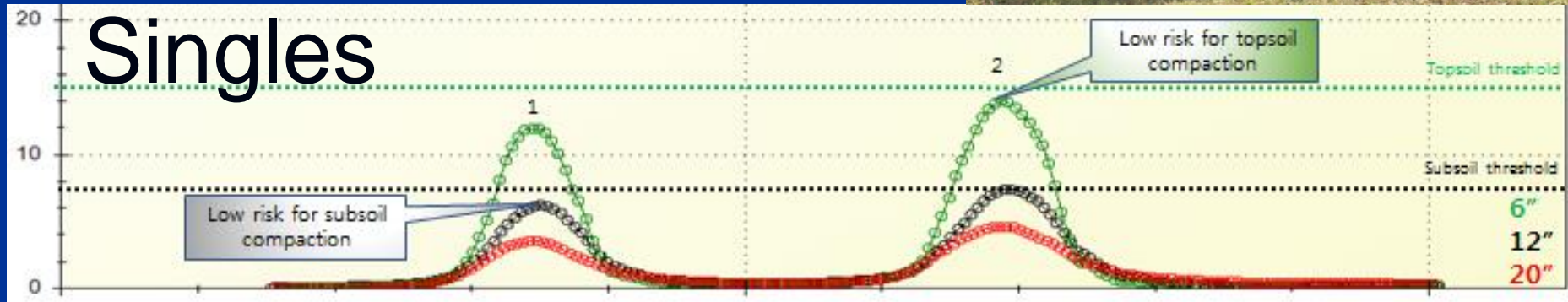


SENSOR LOCATION

600/70R30
9/9 PSI
1111/2540 KG

710/70R42
9/9 PSI
1179/3130 KG

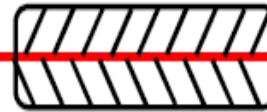
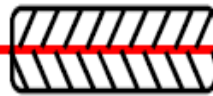
Fronts: 600/70R30
Rears: 710/70R42
Singles: 13/12 psi front to back
Duals: 9 psi all



SENSOR LOCATION

600/70R30
13 PSI
3311 KG

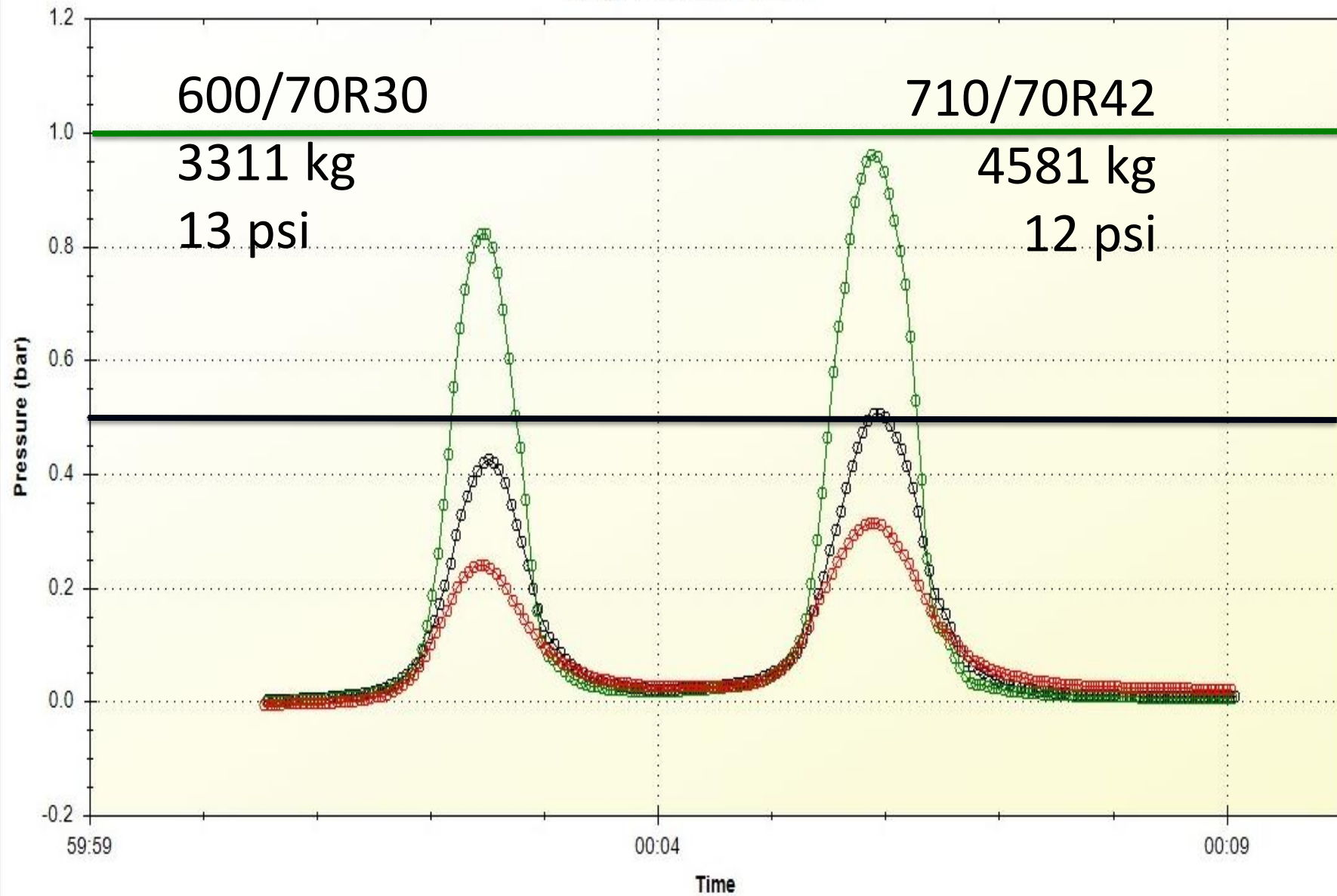
710/70R42
12 PSI
4581 KG



600/70R30
9/9 PSI
1111/2540 KG

710/70R42
9/9 PSI
1179/3130 KG

New_Measure_06-09-2017



SENSOR LOCATION

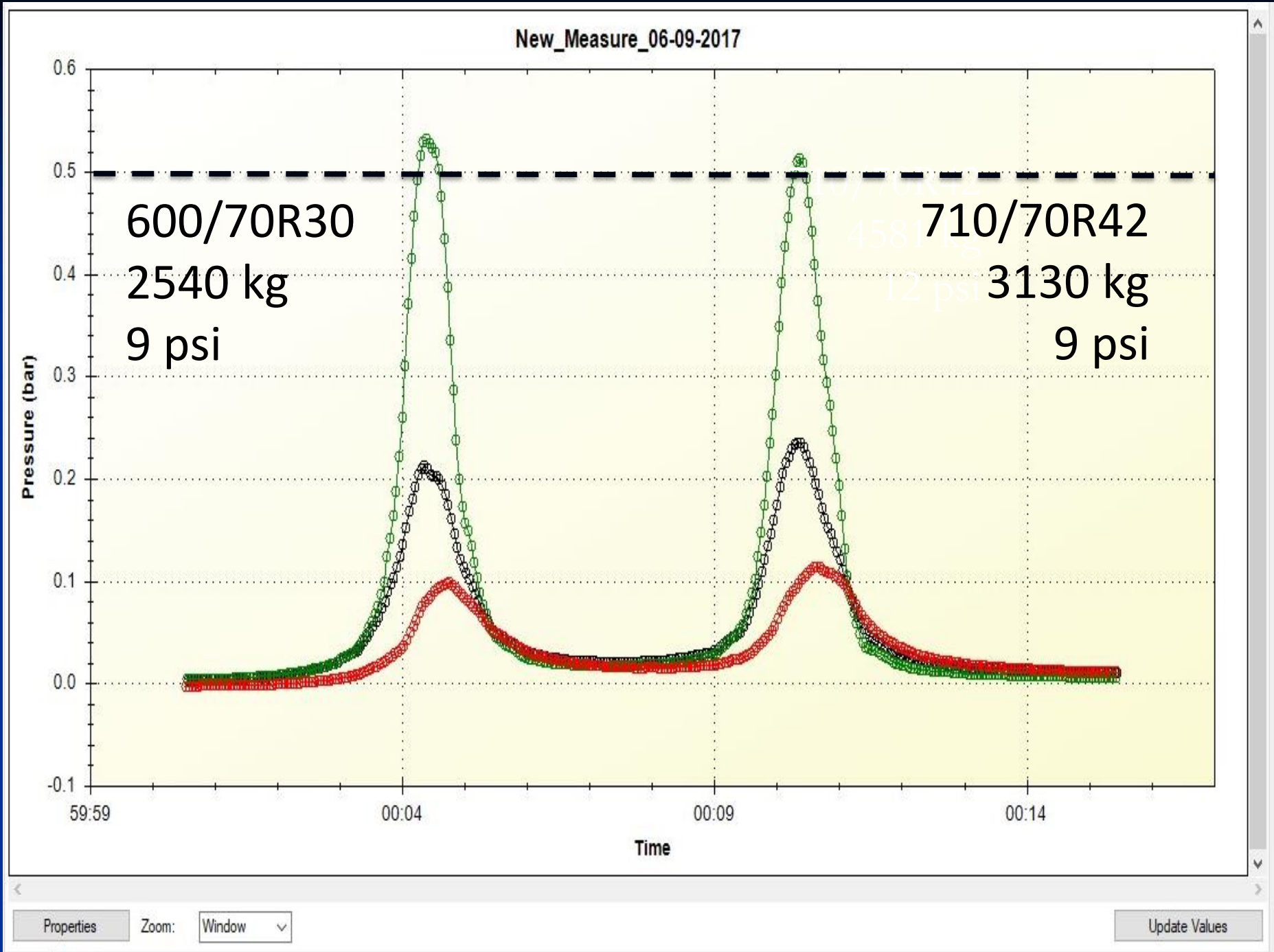
600/70R30
13 PSI
3311 KG

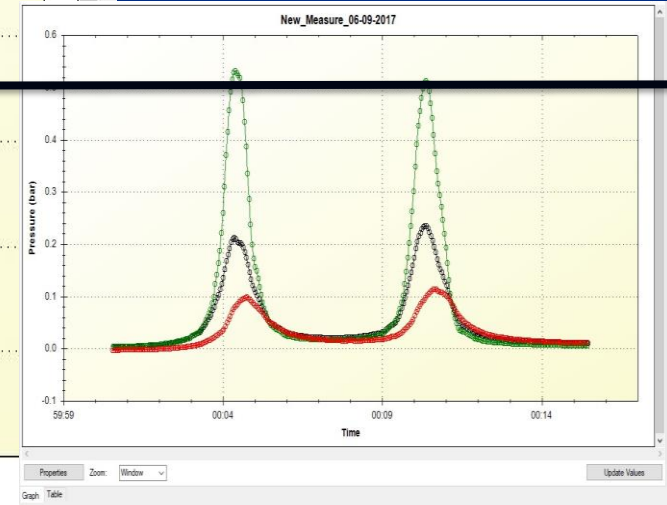
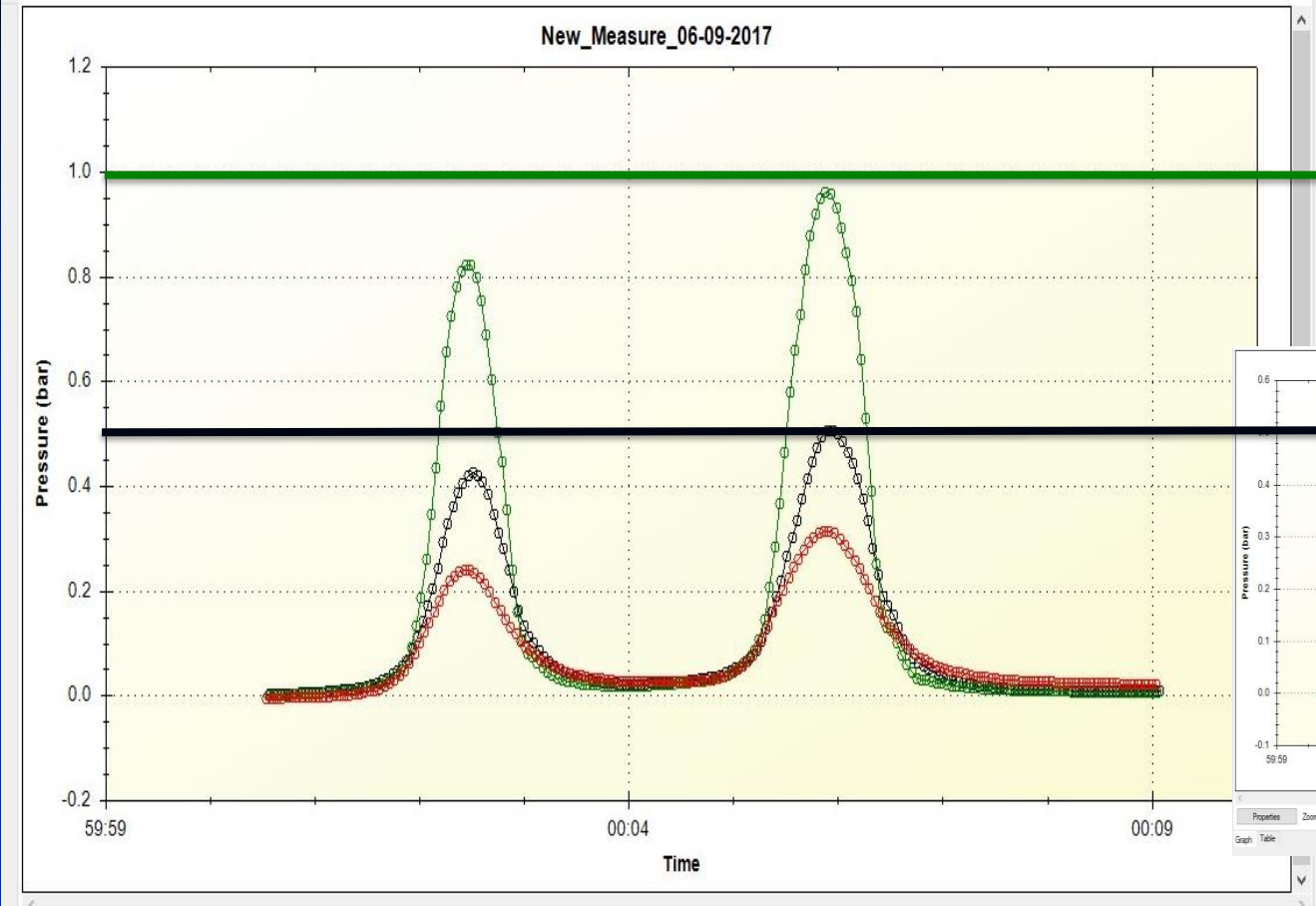
710/70R42
12 PSI
4581 KG



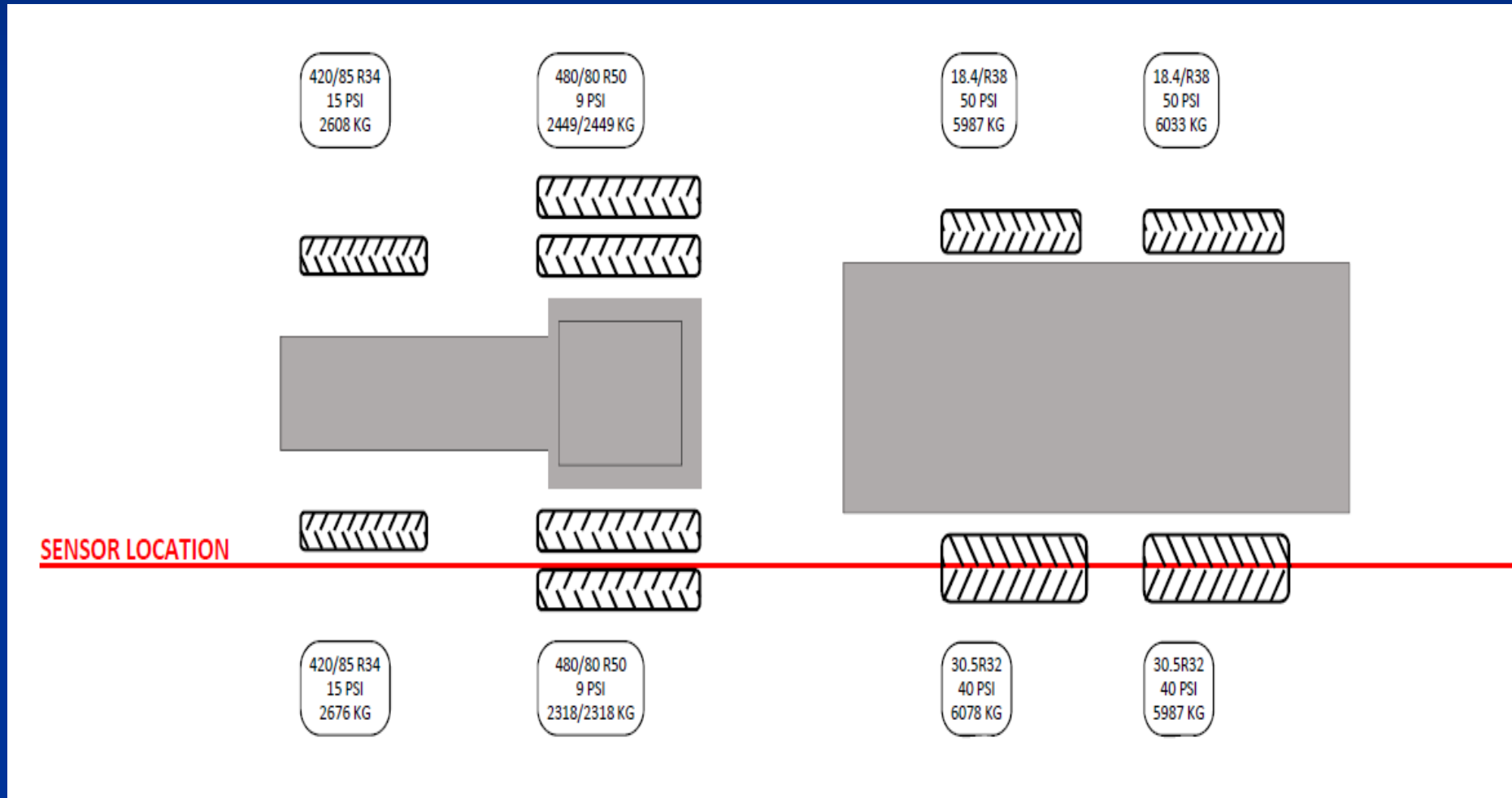
600/70R30
9/9 PSI
1111/2540 KG

710/70R42
9/9 PSI
1179/3130 KG

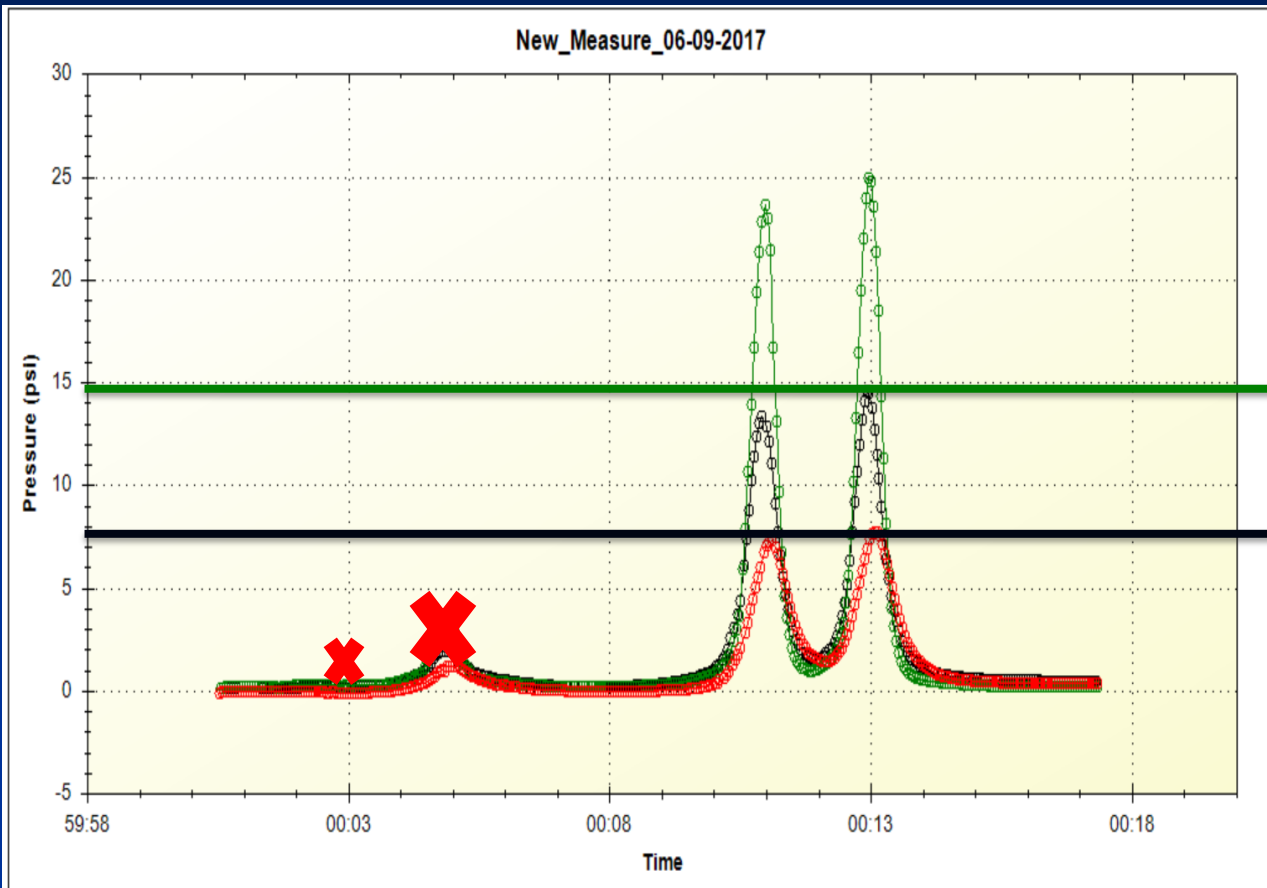




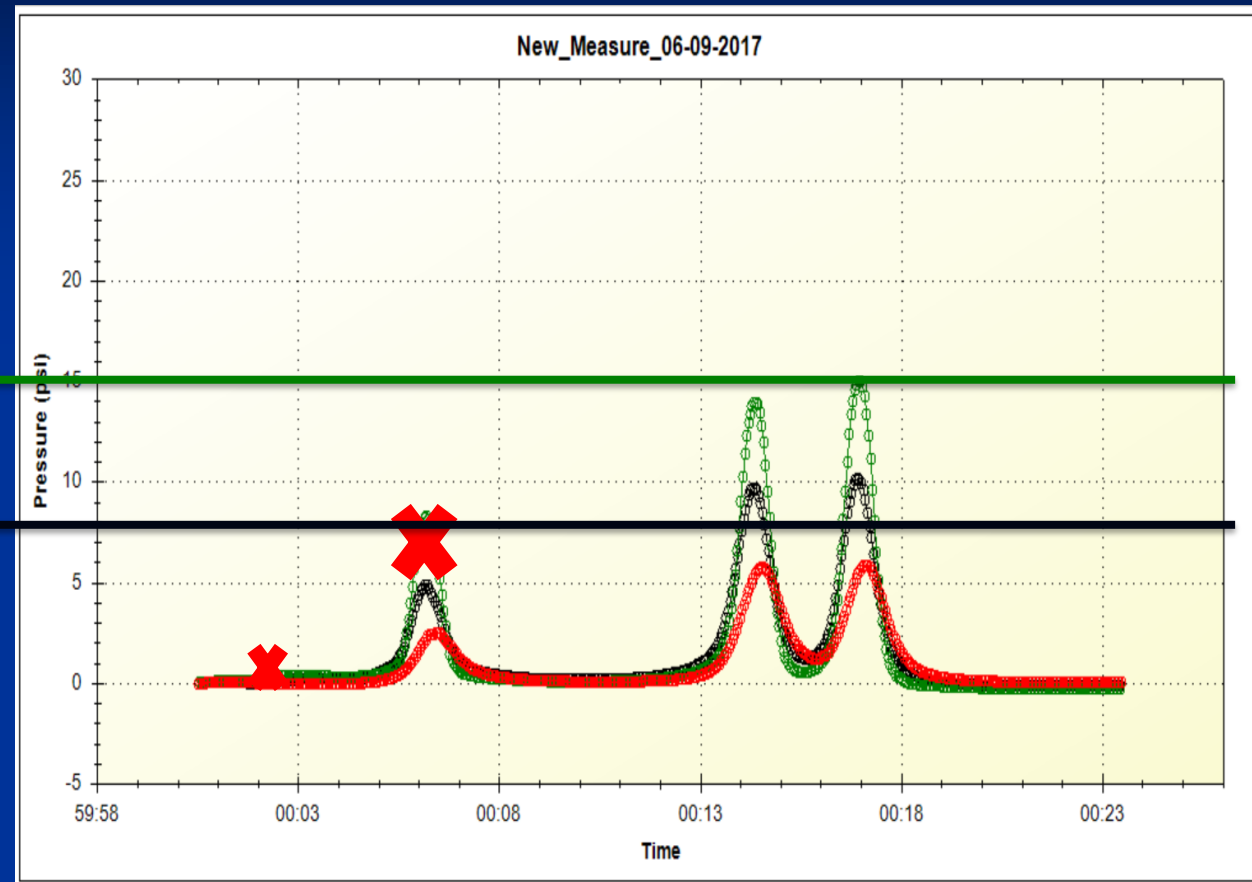
Road: 40 psi (2.75 Bar)
Field: 15 psi (1.03 Bar)



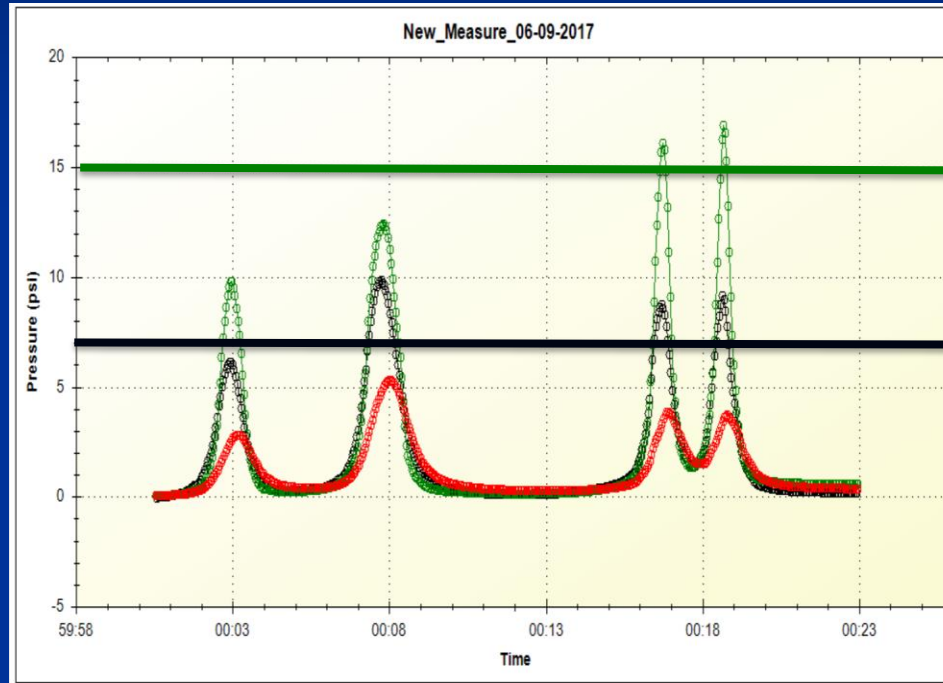
Road



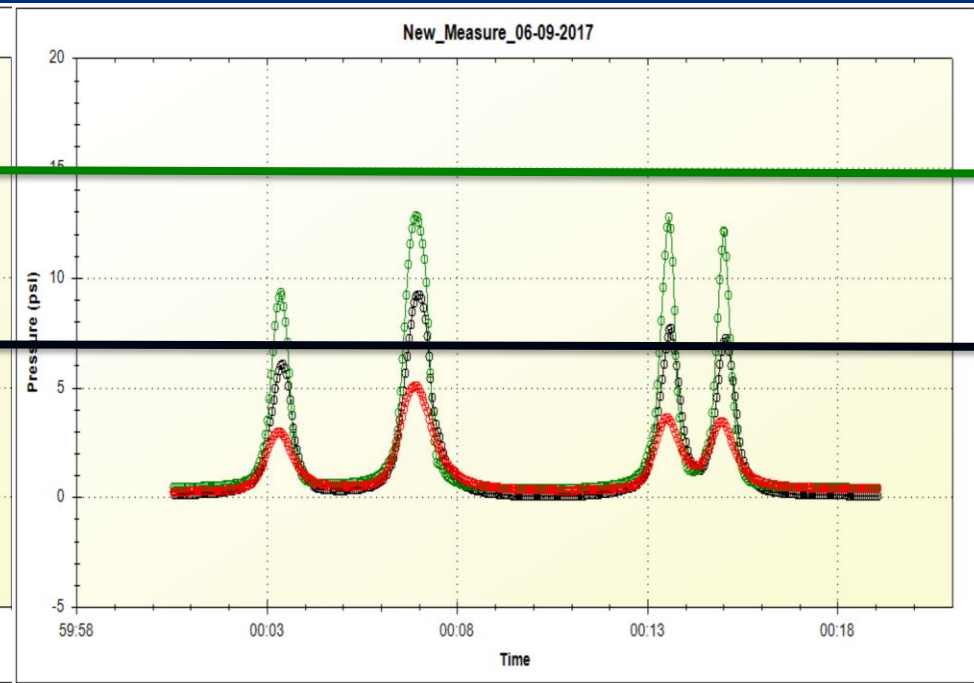
Field



Bias Ply vs Radial Tire (Big Square Baler)



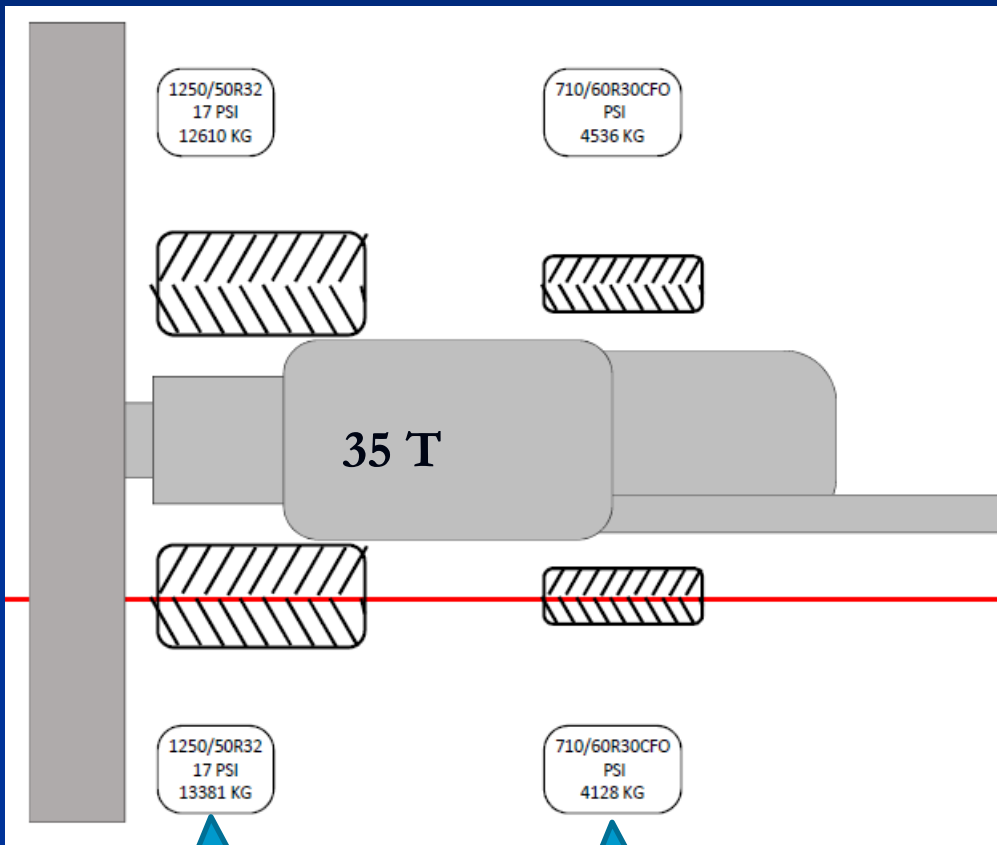
Bias Ply



Radial



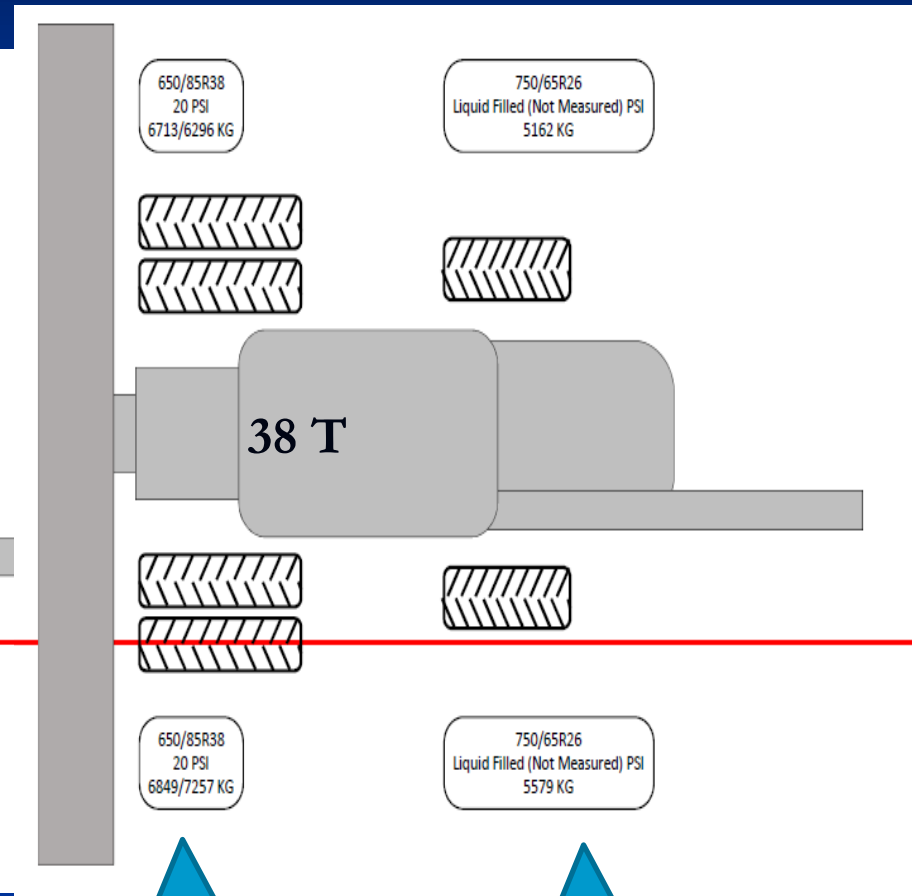
Big Singles



13.3T/17 PSI

4.1T/loaded

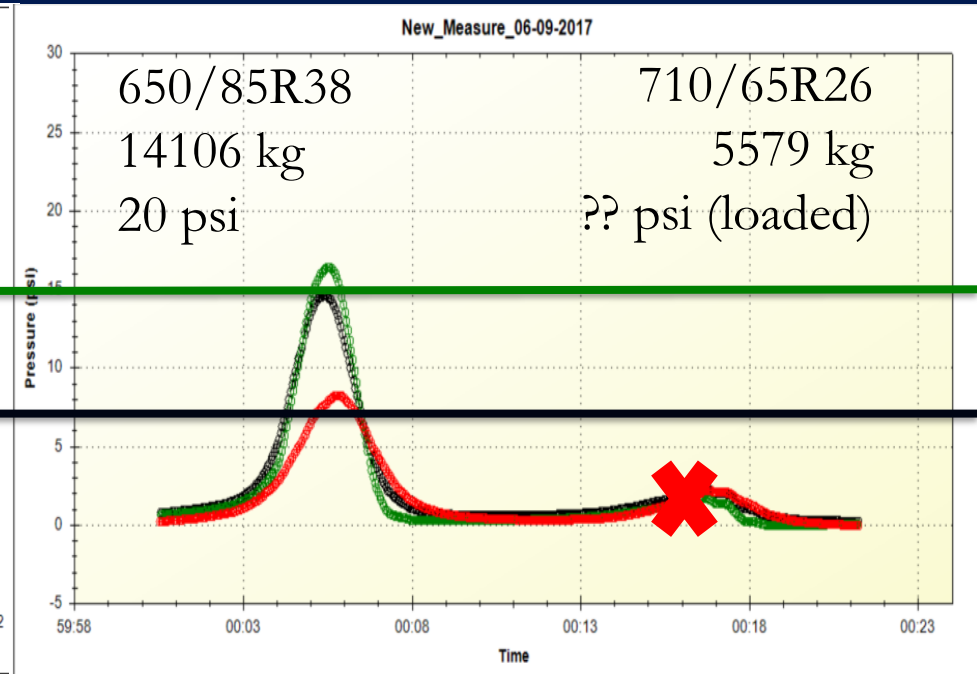
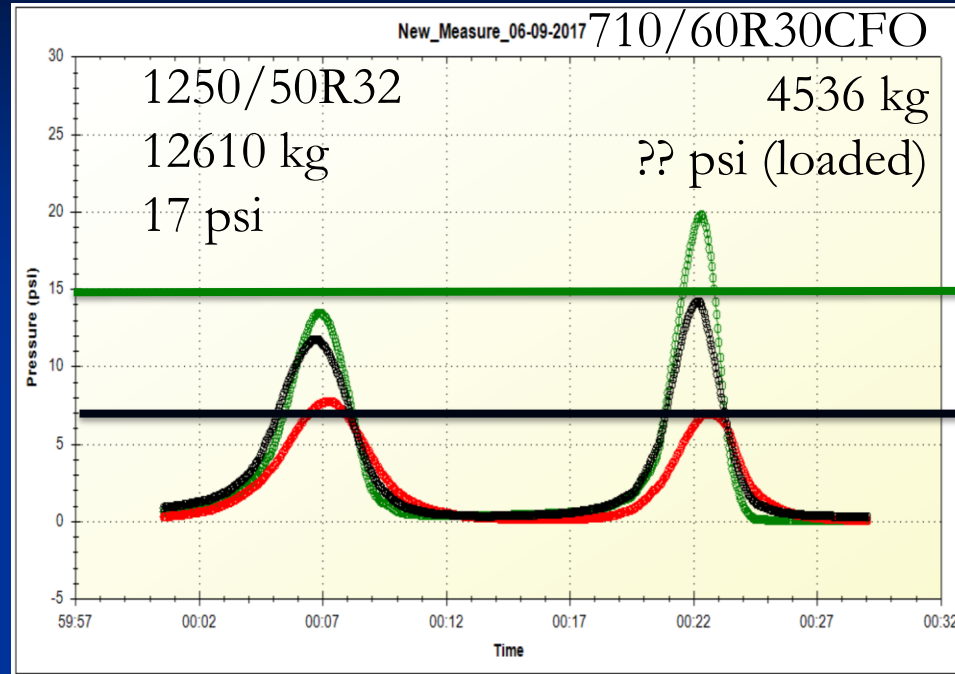
Duals



6.9T/20 PSI

5.6T/loaded

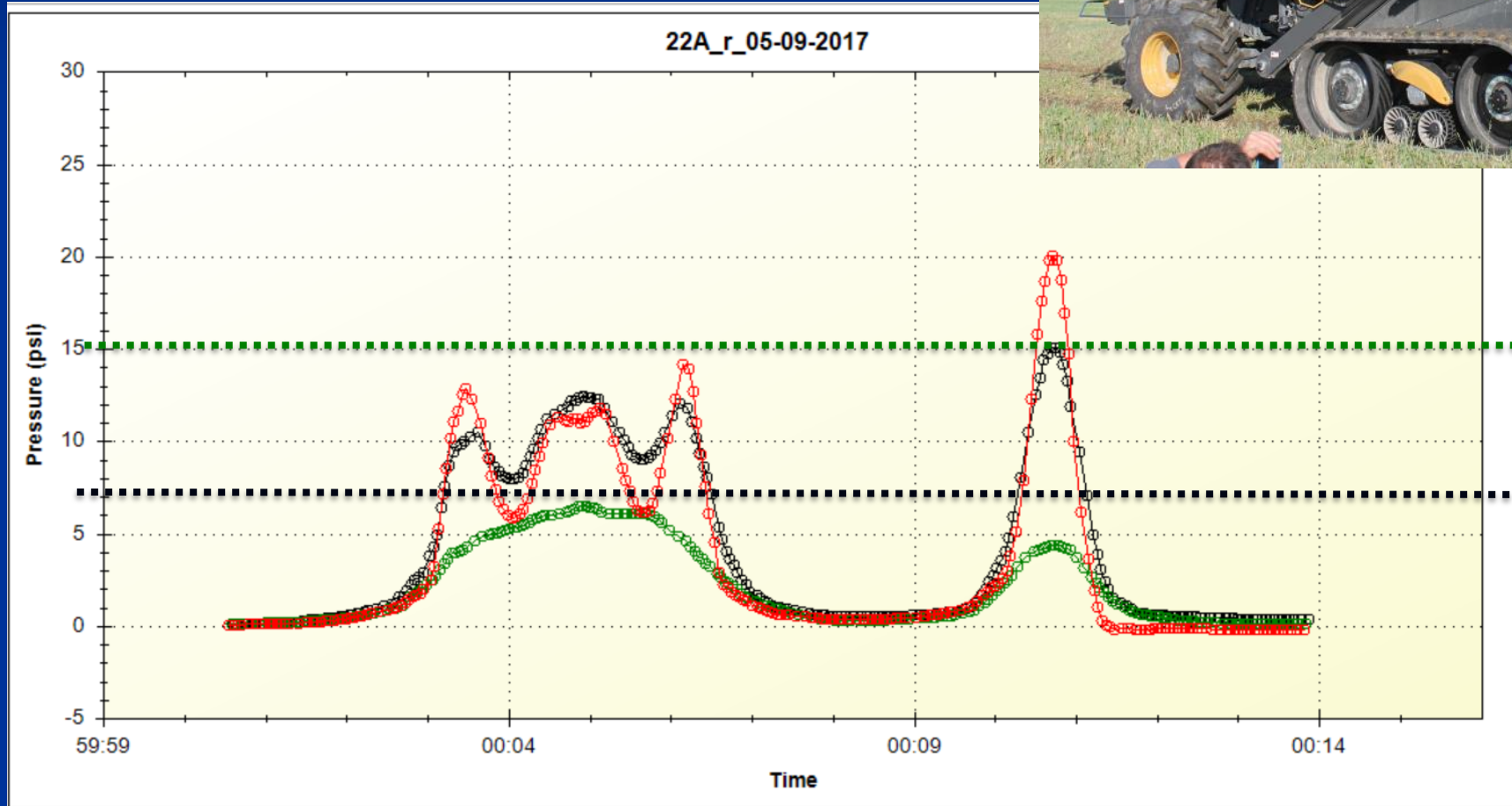
Big Singles



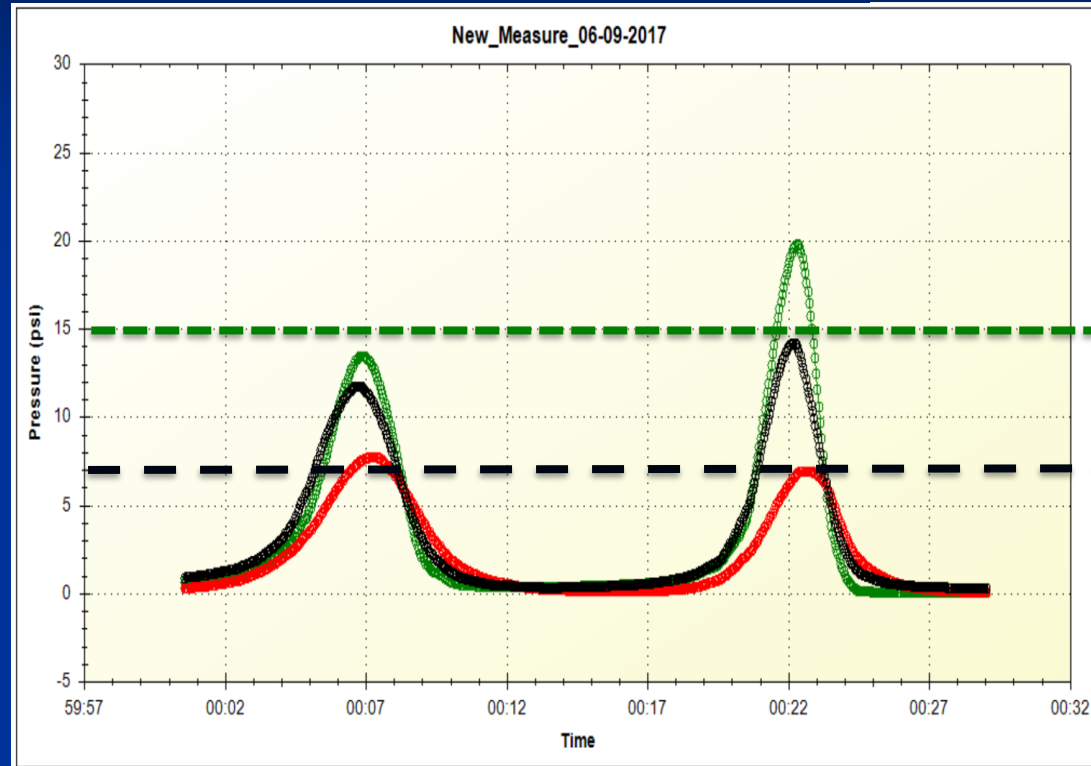
	Front	Rear
6 " (Topsoil)	13.8 psi (0.95 Bar)	19.6 psi (1.35 Bar)
12 " (Subsoil)	11.6 psi (0.8 Bar)	14.5 psi (1.0 Bar)
20" (Drainage)	7.97 psi (0.55 Bar)	7.25 psi (0.5 Bar)

Front	Rear
16.7 psi (1.15 Bar)	-
14.5 psi (1.0 Bar)	-
7.9 psi (0.55 Bar)	-

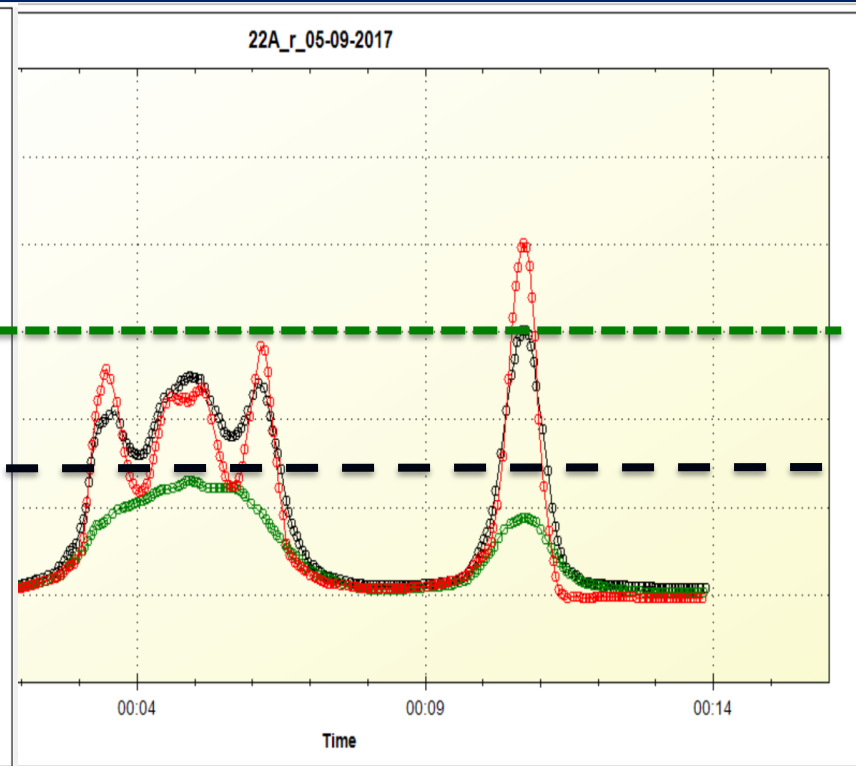
Tracked Combine



Big Singles

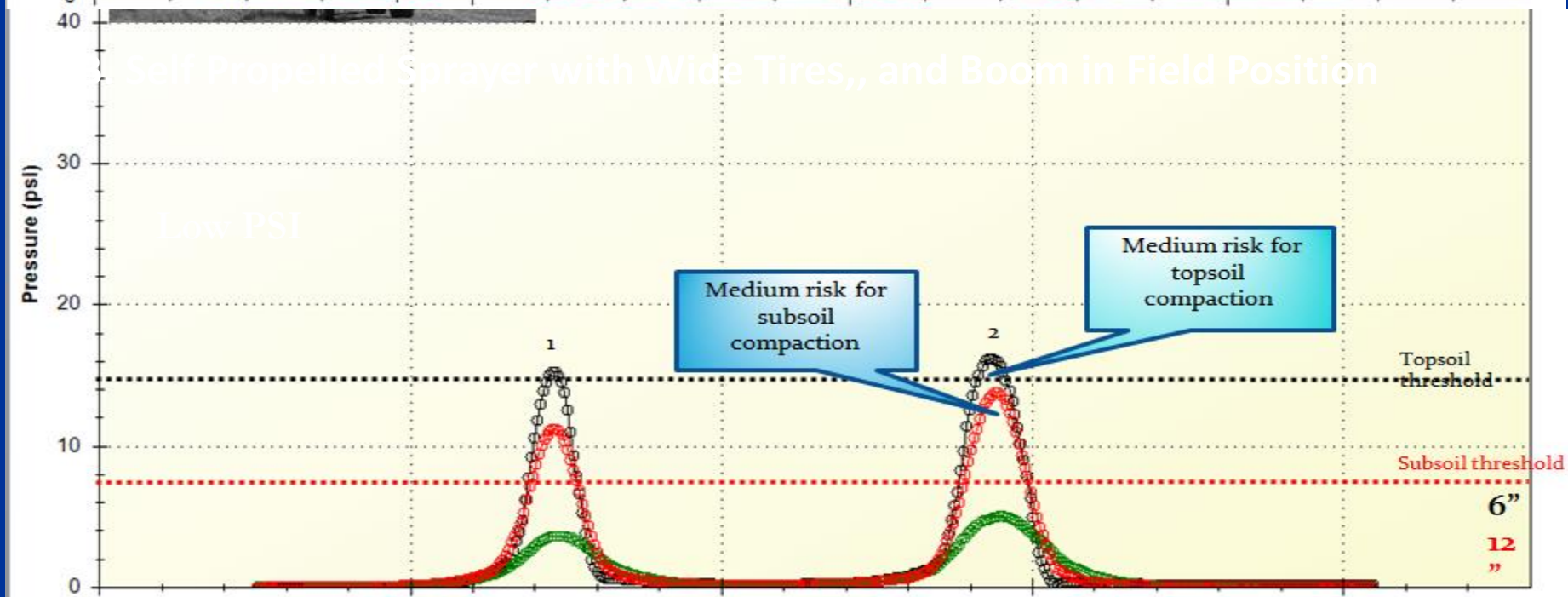
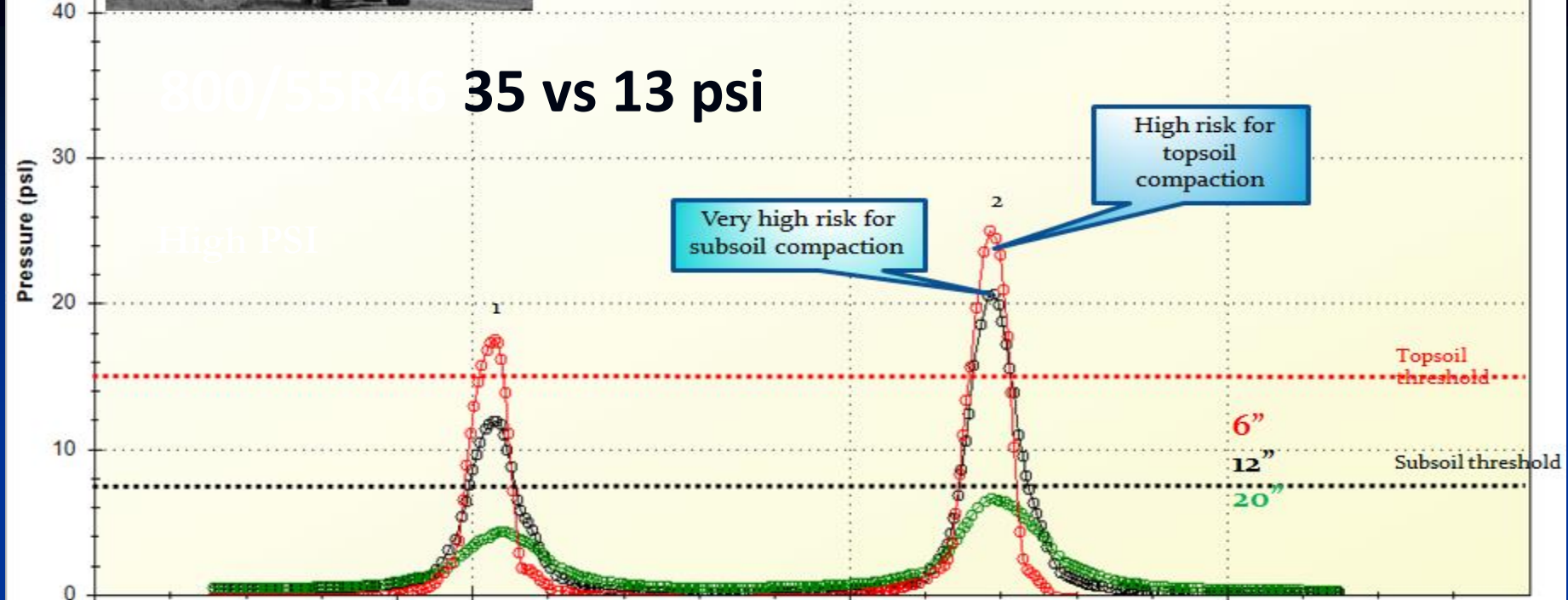


Tracks



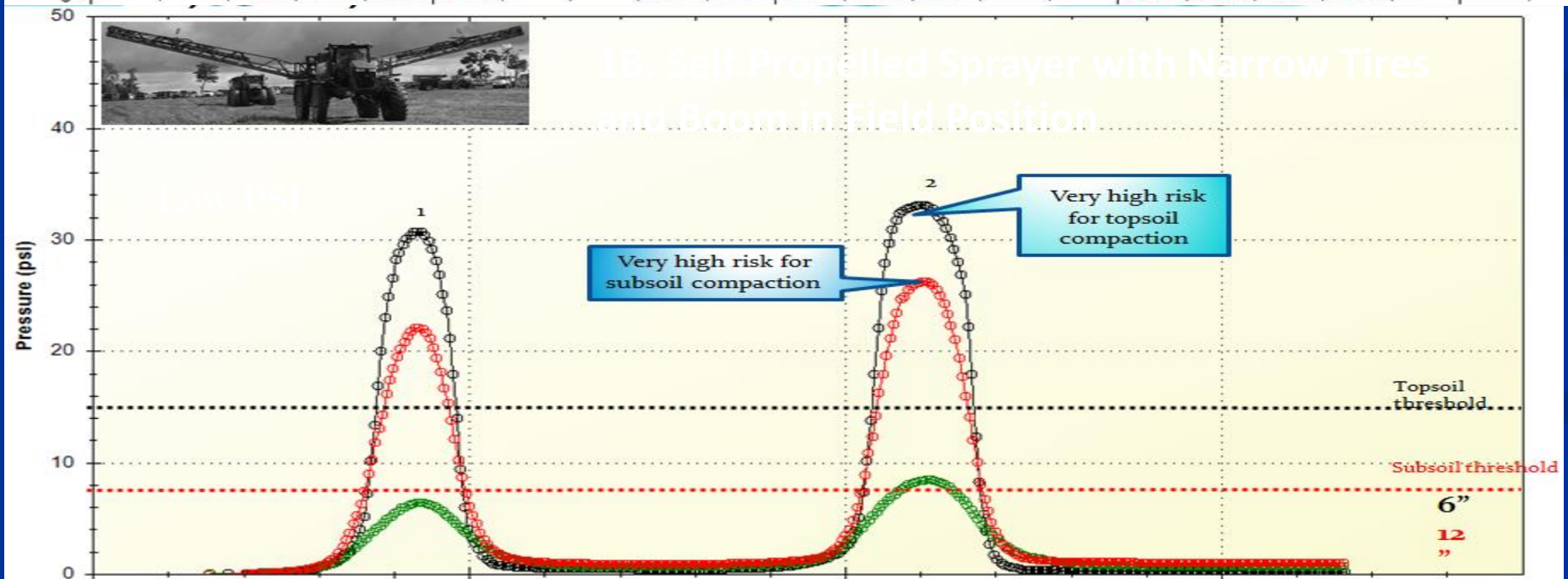
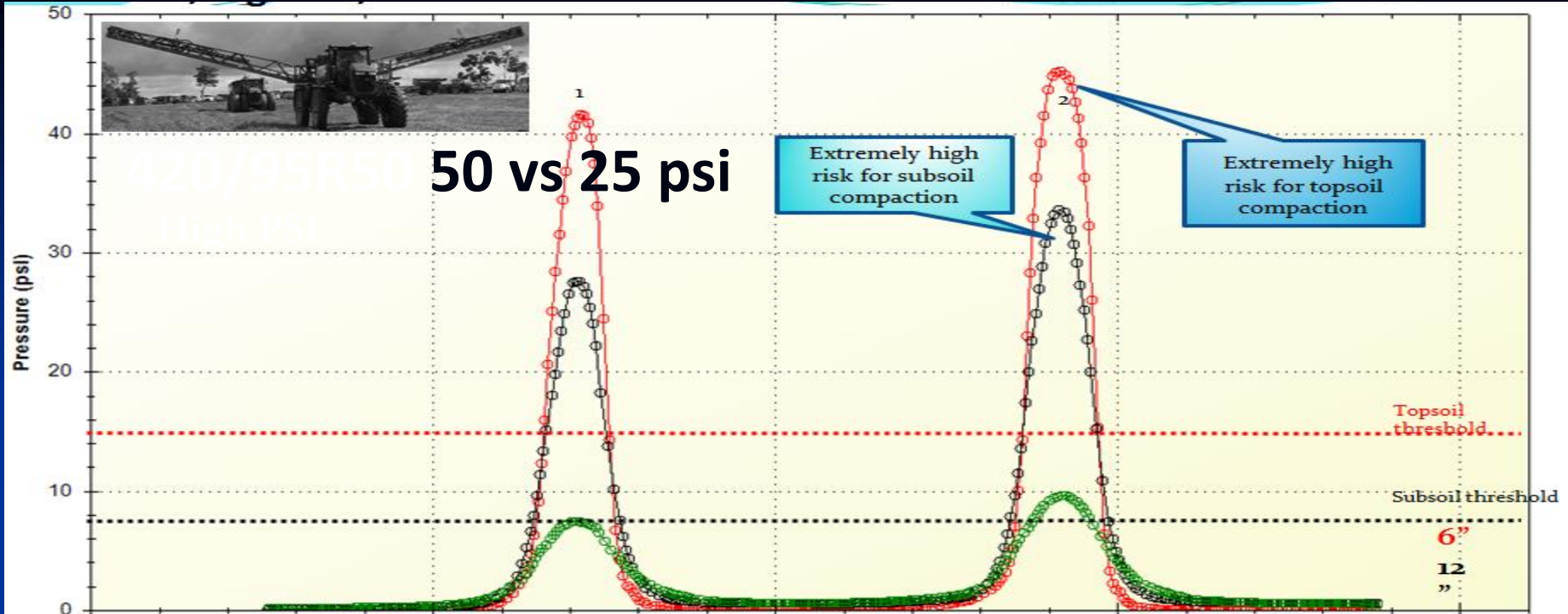
Tires:	800/55R46
Front (1)	Rear (2)
3970 kg	6600 kg
35 vs 13 psi	





Tires:	420/95R50
Front (1)	Rear (2)
4540 kg	7120 kg
50 vs 25 psi	



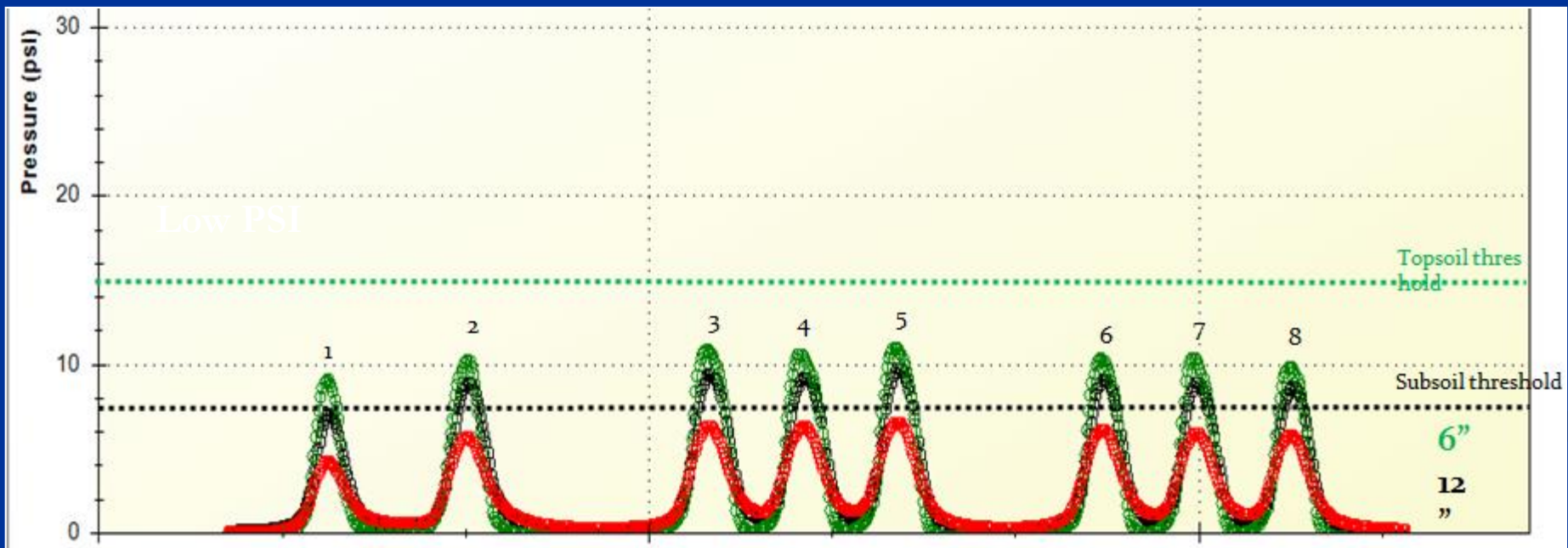
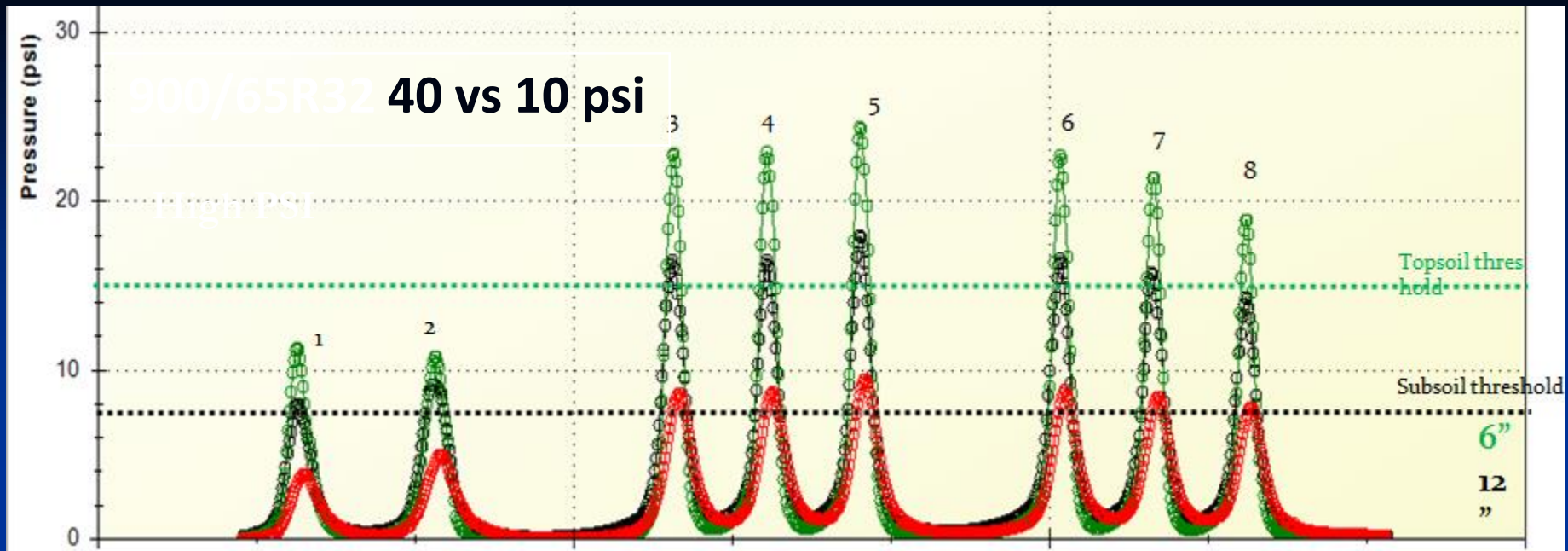


710/60R38	900/65R46	900/65R32	900/65R32
1	2	3-5	6-8
3928 kg	5888 kg	Avg 7155 kg	Avg 6275 kg
16 psi	13 psi	40 psi	40 psi



710/60R38	900/65R46	900/65R32	900/65R32
1	2	3-5	6-8
3928 kg	5888 kg	Avg 7155 kg	Avg 6275 kg
16 psi	13 psi	10 psi	10 psi







Tires: Bias- Radial- IF- VF

- Bias versus Radial

- IF: Increased Flex

20% more weight OR 20% less pressure

- VF: Very high Flex

40% more weight OR 40% less pressure

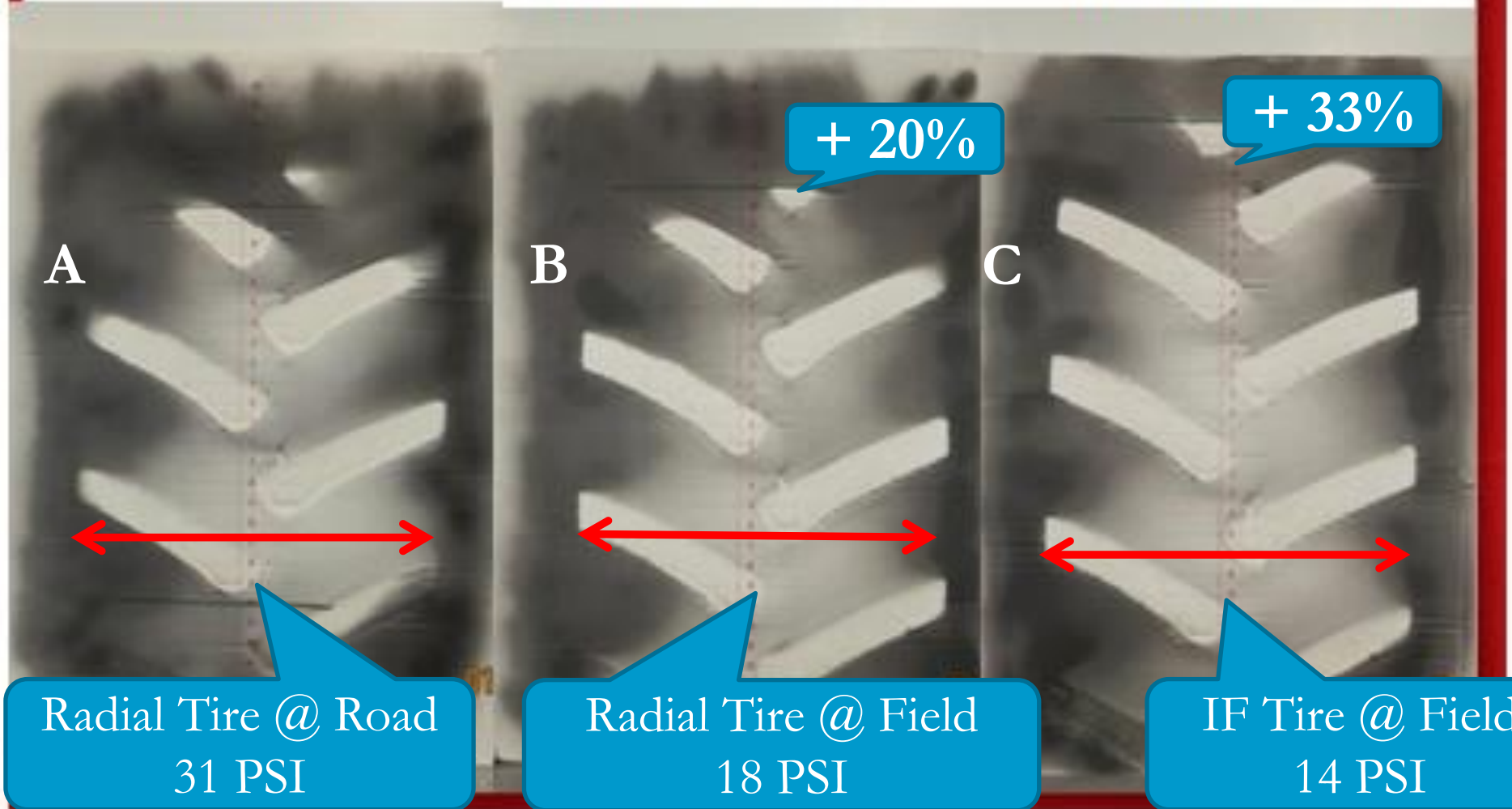
- Central Tire Inflation Systems (CTIS)?

480/80R50 Footprints

Axle Load: 24,500 lbs
Over inflated: 31 PSI
Footprint length: 20 in

Axle Load: 24,500 lbs
Standard inflation: 18 PSI
Footprint length: 25 in

Axle Load: 24,500 lbs
IF inflation: 14 PSI
Footprint length: 29.75 in



Tires: Size, Volume, Technology

520/70 R34 148D TL OMNI

MSPN: 29601

40 mph 65 km/h	30 mph 50 km/h
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3,750 lbs	3,950 lbs
1,700 kgs	1,790 kgs
4,390 lbs	4,620 lbs
1,990 kgs	2,095 kgs
5,030 lbs	5,290 lbs
2,280 kgs	2,400 kgs
5,670 lbs	5,950 lbs
2,570 kgs	2,700 kgs
6,310 lbs	6,620 lbs
2,860 kgs	3,005 kgs
6,940 lbs	7,300 lbs
3,150 kgs	3,310 kgs

If You Aren't Optimizing You Are Losing!

- Safety
- Tire wear and failure
- Fuel economy
- Soil Compaction
- Crop Damage
- Increased Input Costs
- Decreased returns

at low torque.
max road speed.
20% consult Michelin)

ations	Rims (preferred in bold)
olling mference	
92.4 in	DW16L
87 mm	DW18L, W18L, W16L, DW15L, W15L
	Tube MSPN
	71039
	Tube CAI
	170150
nterline d Depth	Minimum Dual/Triple Spacing
7/32nd	25.6 in
53 mm	651 mm

4,730 kgs

2.0 bar

Why is Tire Pressure so Important?

$40 > 38 =$
 $2 \text{ psi} =$
 5%

2 psi; No
“Big
Deal”
right?

■ 40 vs 20 vs 10 vs 8 psi

50%
reduction

50%
reduction

2 psi = 20%
reduction

■ Increase contact patch

■ Distribute the load

Good Tires?

“FLOTATION”!



550/60-22.5

Compaction Fighting Tools

Properly inflated radials can be
BETTER than over inflated
VF tires!



Central Tire Inflation System

- 15% less fuel

1000 hrs, 20 l/hr = 20 gal @ 0.80 = \$2400

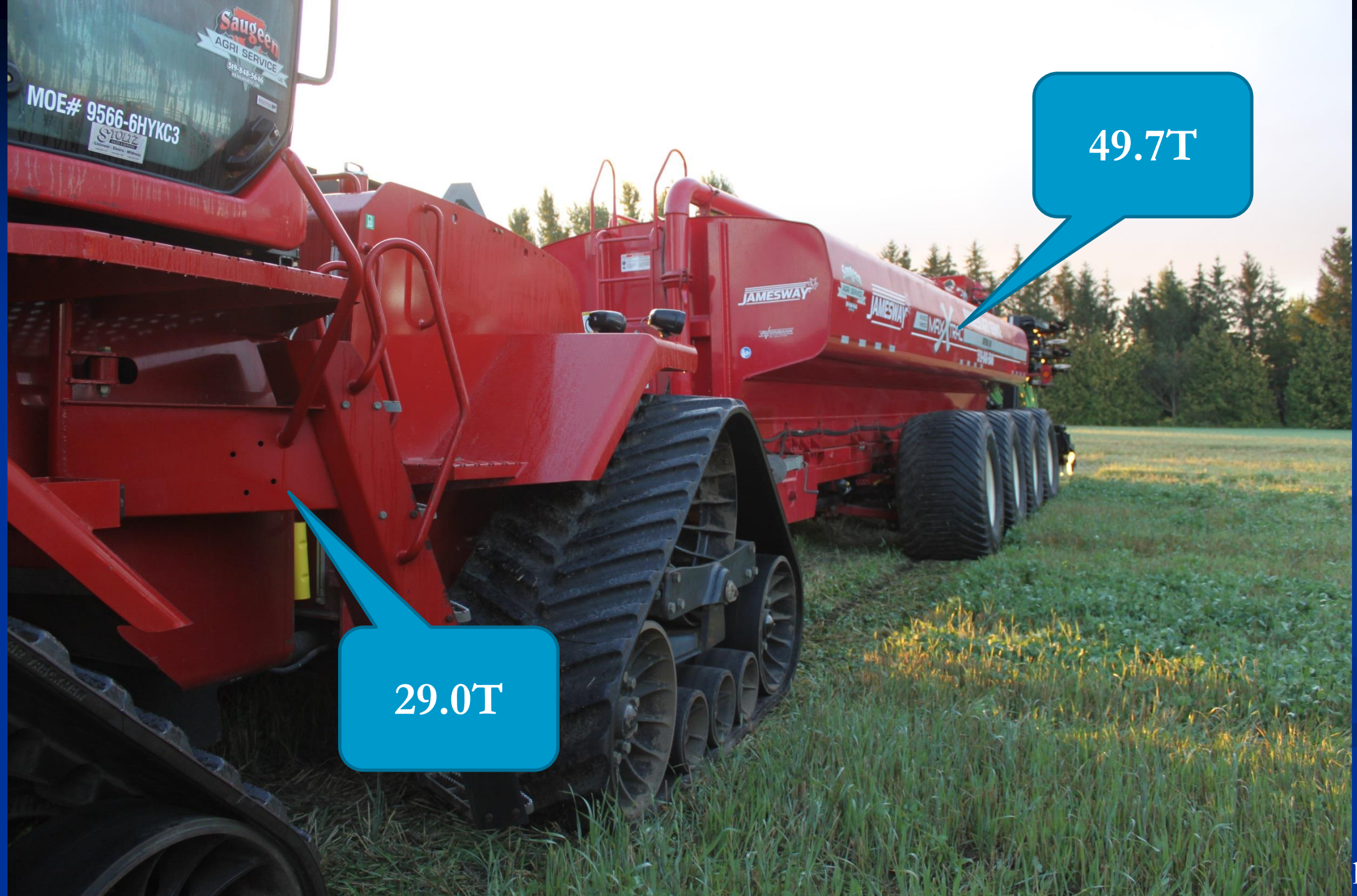
- 20% less tire wear

- 20% longer life

50¢ = 1000 hr (one year)

\$400 - \$133/yr/tire X 4 = \$533

~~\$3000/year~~



29.0T

49.7T

Take ACTION on COMPACTION!

- Weight is the enemy
- Tires, pressures, tire technology
 - Tracks?
 - Axles
 - CTIS!