

# 10 Years of ULTRAFLEX Technologies

VDI - 22 January 2015



**FIELDS OF INNOVATION**

**MICHELIN** Bring agriculture even further.



# TOPICS

- Challenges in AG tires Technology
- What is Ultraflex Technology
- Impact on yield and vehicle performances
- Next challenges





# Challenges for agricultural tires



Auteur/Scé:  
P. Vervaeet

Classification: D3

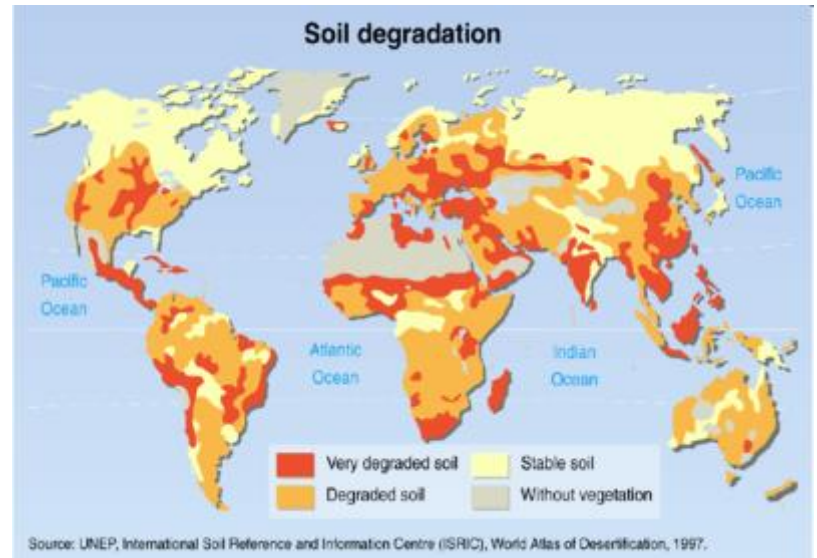
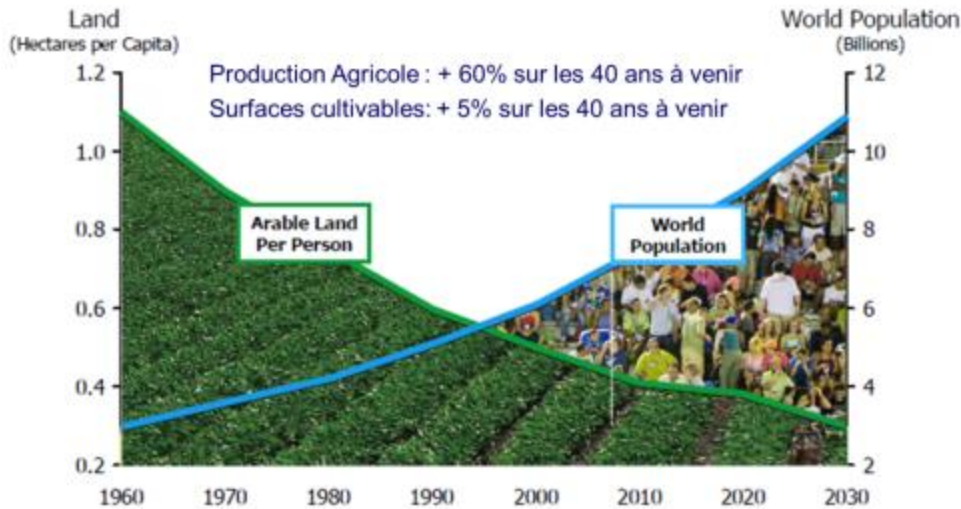
Conservation : WA

Date de création : 17/12/2014



Ref fichier/sujet:  
Conf. VDI 23/1/15

# Michelin AG R&D : Market context and trends





# Michelin AG R&D : Market context and trends

- Productivity : increase of loads, speed, power, tool size



- Simplification of the practices, No Tillage...



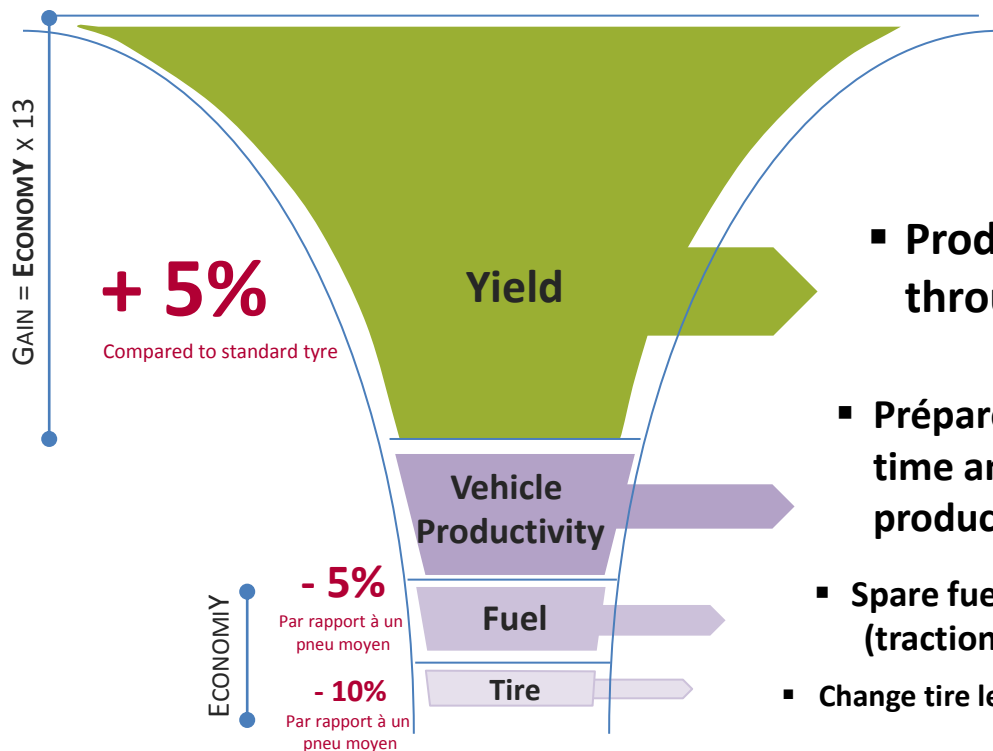
- Genetics



- Window to do the job
- Autonomous machines



# Bringing Value Through Tires :



- Produce more yield per surface of land through more fertile soils (compaction)
- Prépare, seed, spray and harvest at the optimum time and the optimal speed thanks to improved productivity (traction, load capacity)
- Spare fuel through better efficiency of the tire (traction, slippage, rolling resistance)
- Change tire less often : wear, puncture resistance, ....



Case of a cereal farm in France  
(220 ha)



# The Way to Ultraflex Technology



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Classification: D3

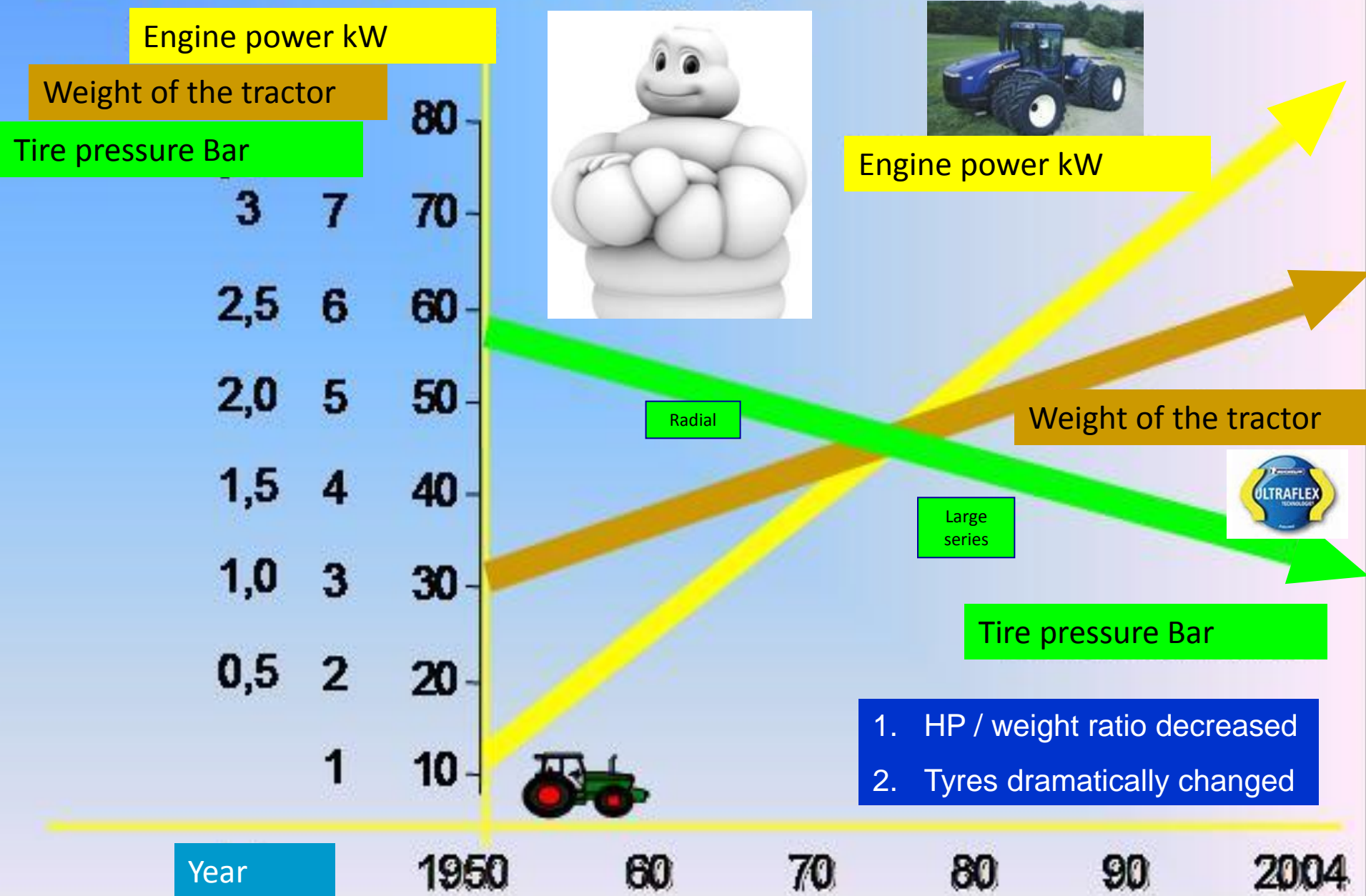
Conservation : WA

Date de création : 17/12/2014



Ref fichier/sujet:  
Conf. VDI 23/1/15

# Evolution of tyres related to tractors

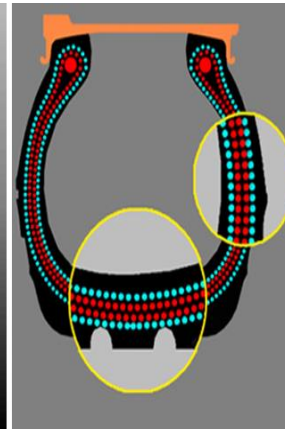
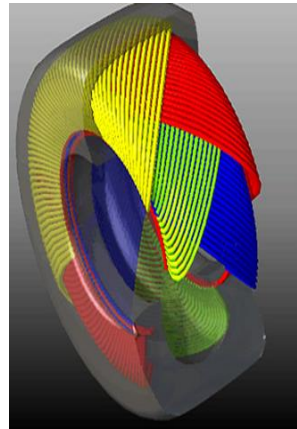


1. HP / weight ratio decreased
2. Tyres dramatically changed

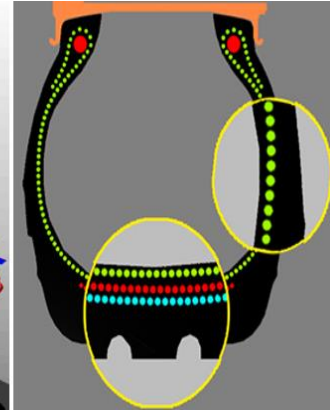
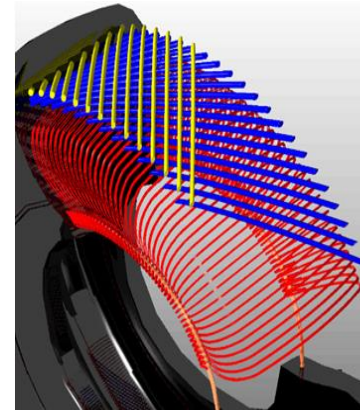


# 1st STEP : RADIAL TECHNOLOGY

Michelin invented radial in 1946 and propose its first agricultural radial tire in 1970 , bringing further tire performances: fuels saving, less compaction, better productivity, longevity, and comfort.



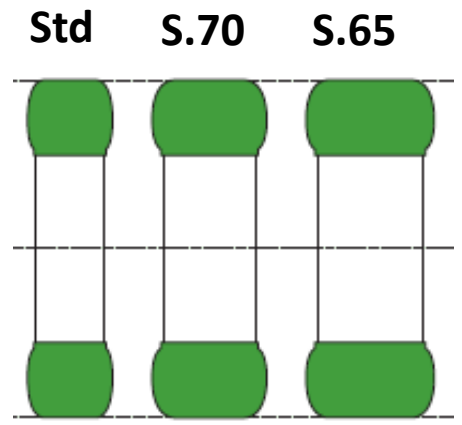
diagonal





radial



# 2nd STEP : WIDER TIRES

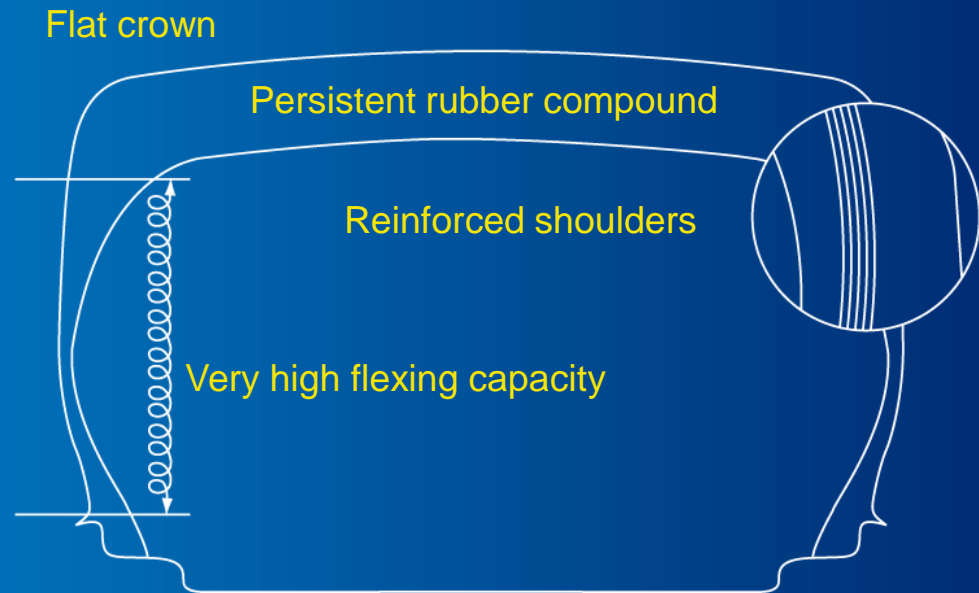


|                              | Standard  | S.70   | S65  |
|------------------------------|---|--|--|
| Dimension<br>(1,85 m – 38’') | 520/85 R38<br>AgriBib   | 580/70 R38<br>OmniBib  | 650/65 R38<br>MultiBib   |
|                              |  |  |  |
| Load at 1bar                 | 2485 kg.  | 2720 kg.   | 2955 kg.   |
| P. for 3400 kg               | 1,6 b   | 1,4 b.   | 1,25 b.  |



## The package of technologies

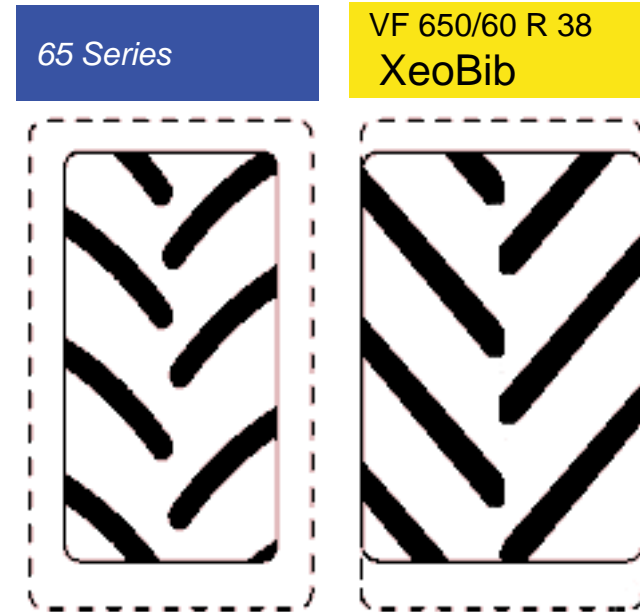
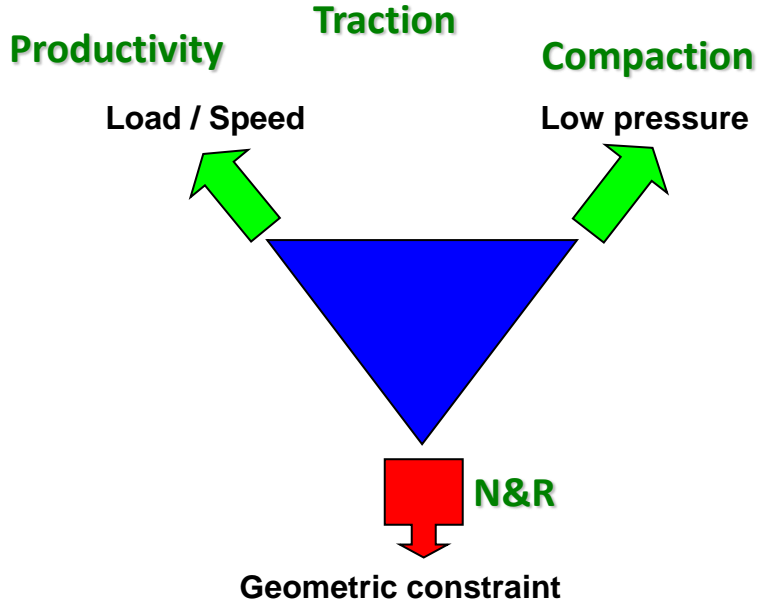
- The MICHELIN Ultraflex casing is sturdy and flexible at the same time.
- The casing accepts a lower tyre pressure – without limiting endurance or load capacity.
- The tyre`s sidewalls feature a very high flexing capacity. The result: a larger footprint and more contact to the soil.



# Michelin AG R&D : ULTRAFLEX



Constant pressure road & field, no bonus load for lower speed

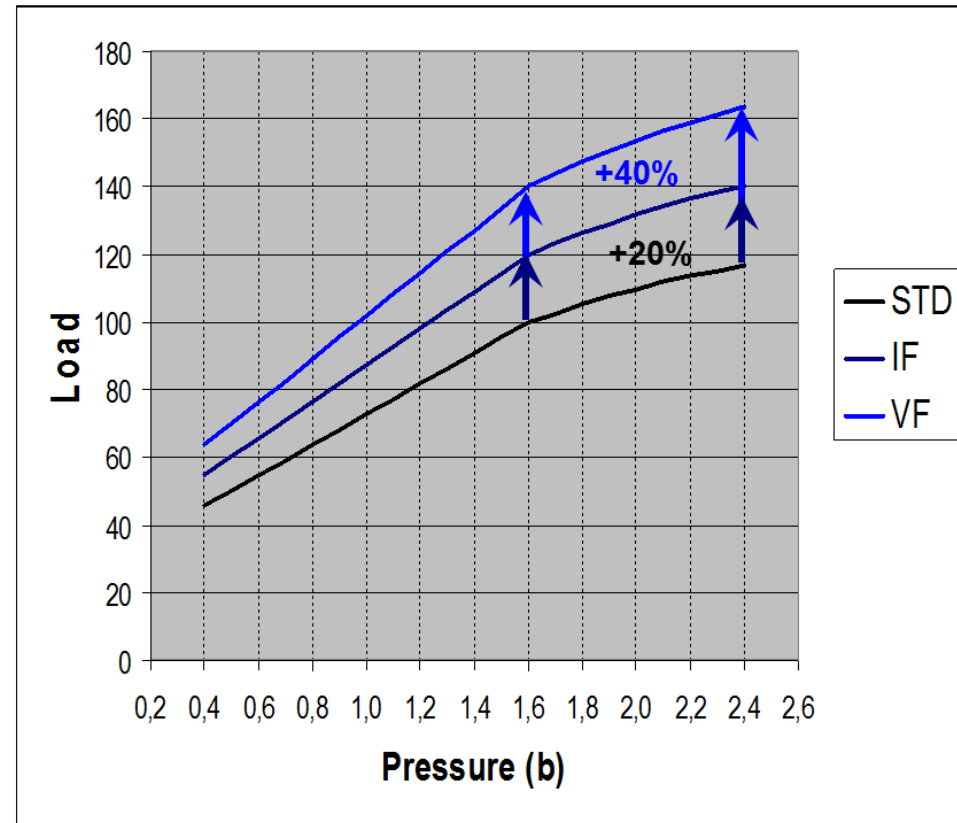
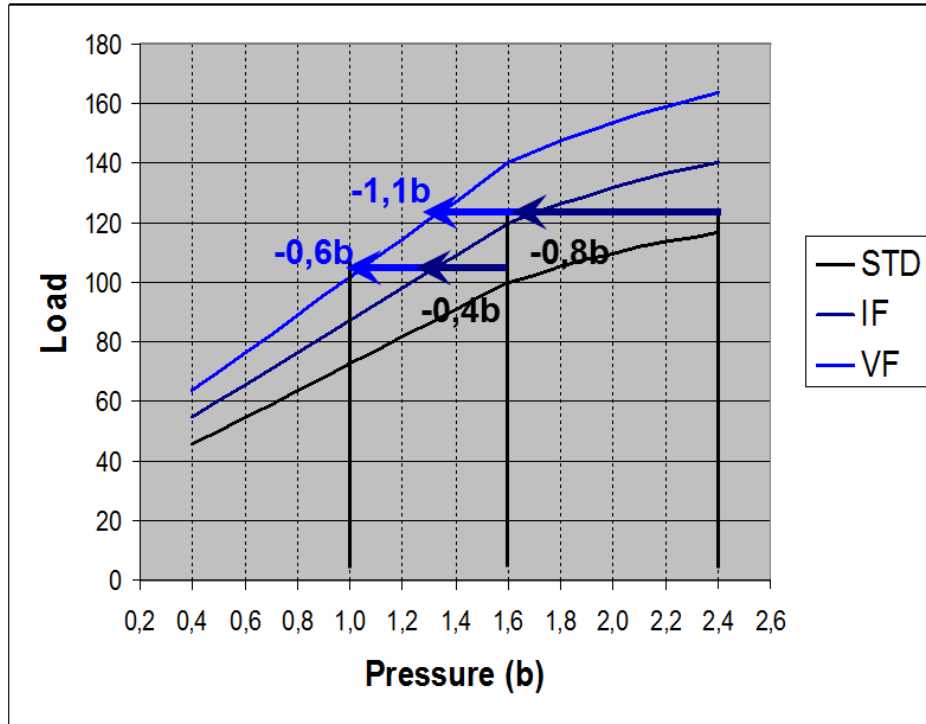


+24%

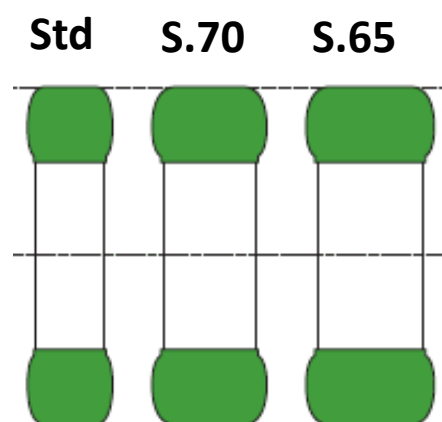









# NEW NORMS FOR IMPROVED FLEXION TIRES : IF and VF



# 3rd STEP : FLEXIBLE TIRES



|                              | Standard  | S.70   | S65  | Ultraflex   |
|------------------------------|---|--|--|---|
| Dimension<br>(1,85 m – 38’') | 520/85 R38<br>AgriBib   | 580/70 R38<br>OmniBib  | 650/65 R38<br>MultiBib   | IF650/60R38<br>XéoBib   |
|                              |  |  |  | <br> |
| Charge à 1bar                | 2485 kg.  | 2720 kg.   | 2955 kg.   | 3900 kg.  |
| P. Pour 3400 kg              | 1,6 b   | 1,4 b.   | 1,25 b.  | 0.8 b.  |

2004 : solution for tractors

➔ 2014 : covering the whole agricultural cycle

**MICHELIN**  
**AxioBib**  
For tractors  
over  
220 hp



**MICHELIN**  
**XeoBib**  
For tractors  
from  
80 to 220 hp



**MICHELIN**  
**CerexBib**  
For harvesting  
machinery



**MICHELIN**  
**SprayBib**  
For sprayers



**CargoXBib**  
For trailers





# Ultraflex on trailers



## CargoXBib For trailers

Pressures down to 0,8  
bars  
Adapted to CTIS





# NEW PERFORMANCES

## A) SOIL COMPACTION





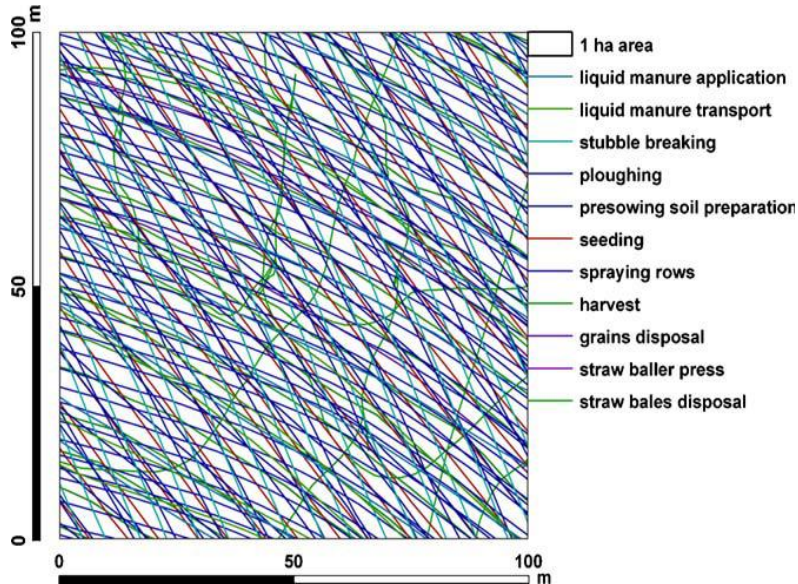
## Result: **Less soil compaction**

The larger footprint distributes the pressure thus reducing soil compaction and rutting.



# Traffic on agricultural soils

(studies with Harper Adams University)



Winter wheat in the Czech Republic

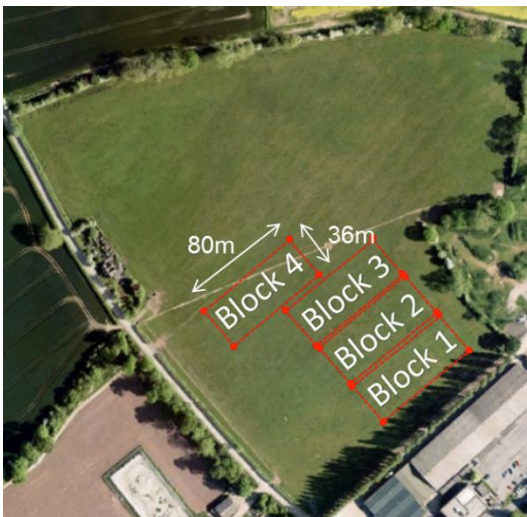
% of field covered by tyres footprint  
in 1 year

Deep Tillage = **86%**

Shallow Tillage = **65%**

Zero Tillage = **45%**

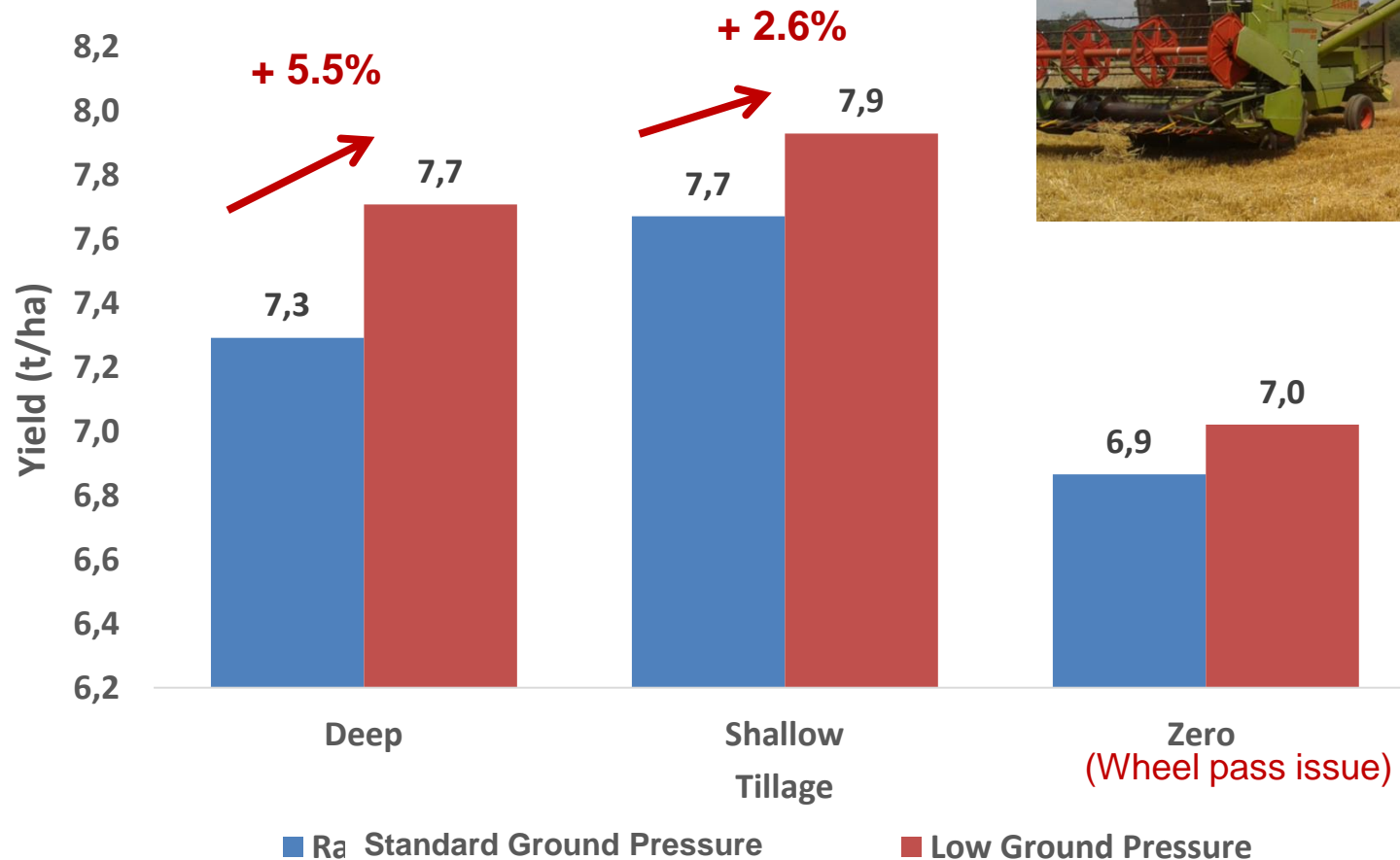
(Kroulík *et al.*, 2009)



Field study at Harper Adams  
University

# Results 2013: Wheat Crop Yields

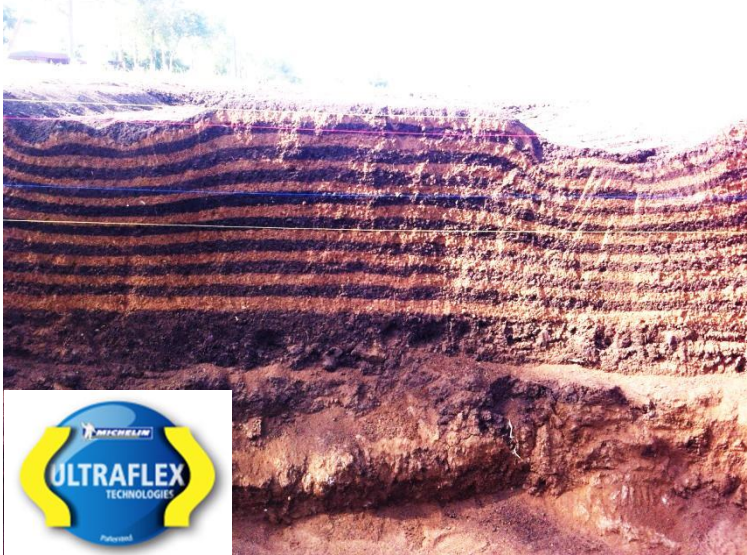
(studies with Harper Adams University)





# Our commitment to help feeding the growing population

- Continuous Progression of sales of Michelin Ultraflex Technology will lead to significant improvement of yield by 2020



*Corn from low compaction zone*



*Corn from high compaction zone*

➔ The increased yield will provide the equivalent of an additional 1 million ha during this period, the size of Netherlands arable soil



# NEW PERFORMANCES

## B) LOAD CAPACITY



# MORE LOAD IS POSSIBLE BY...



## ... USING BIGGER TIRES



710/70R38 171D  
(1,96 m.)



710/70R42 173D  
(2,08 m.)



## ... UPGRADING TECHNOLOGY



710/70R42 173D



IF 710/70R42 179D



VF 710/70R42 184D



# MICHELIN SPRAYBIB : Greater load capacity



**40% heavier**

Heavier load at same pressure compared to standard tyre



| Ex                    |            |          |                 |
|-----------------------|------------|----------|-----------------|
| Sizes                 | Technology | Pressure | Load            |
| 420/95 R 50           | Standard   | 3.6 b    | 5150 kg         |
| IF 420/95 R 50        |            |          | 6300 kg         |
| <b>VF 420/95 R 50</b> |            |          | <b>7,300 kg</b> |





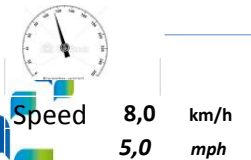
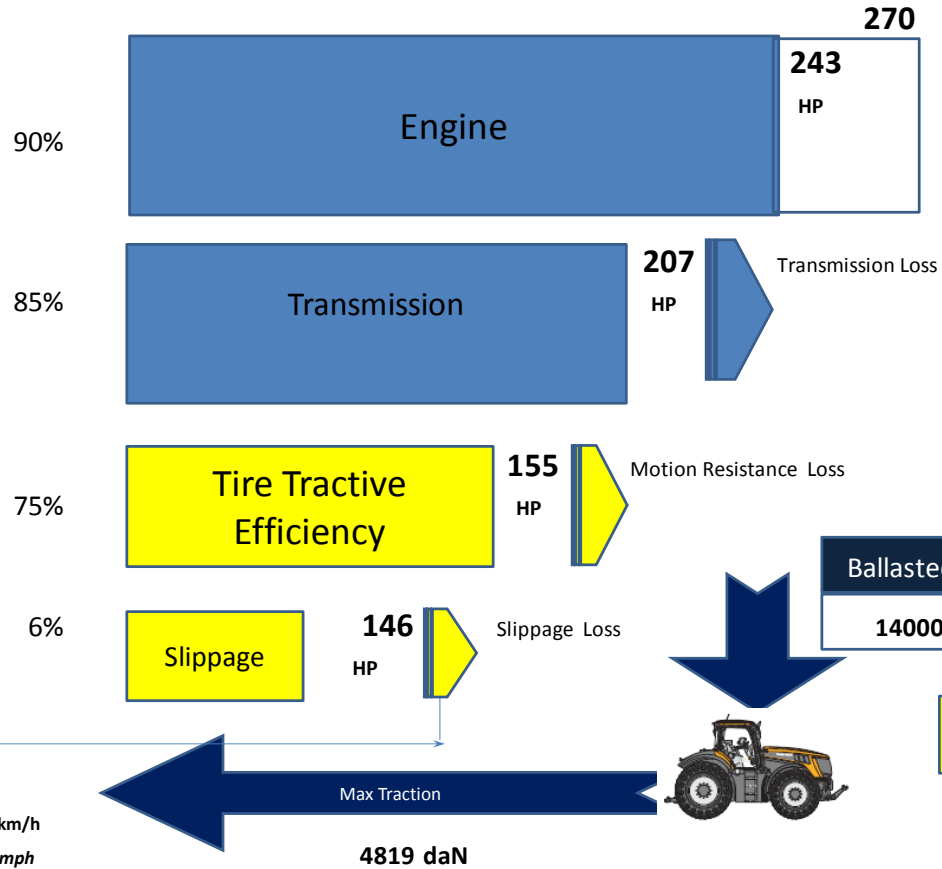
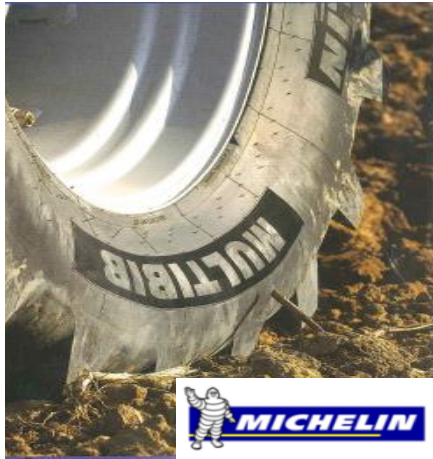
# NEW PERFORMANCES

## C) FUEL EFFICIENCY



# FUEL CONSUMPTION

1/3 of the power on the wheel goes to tyre or tyre/soil interaction



**BALLASTING RATIO**

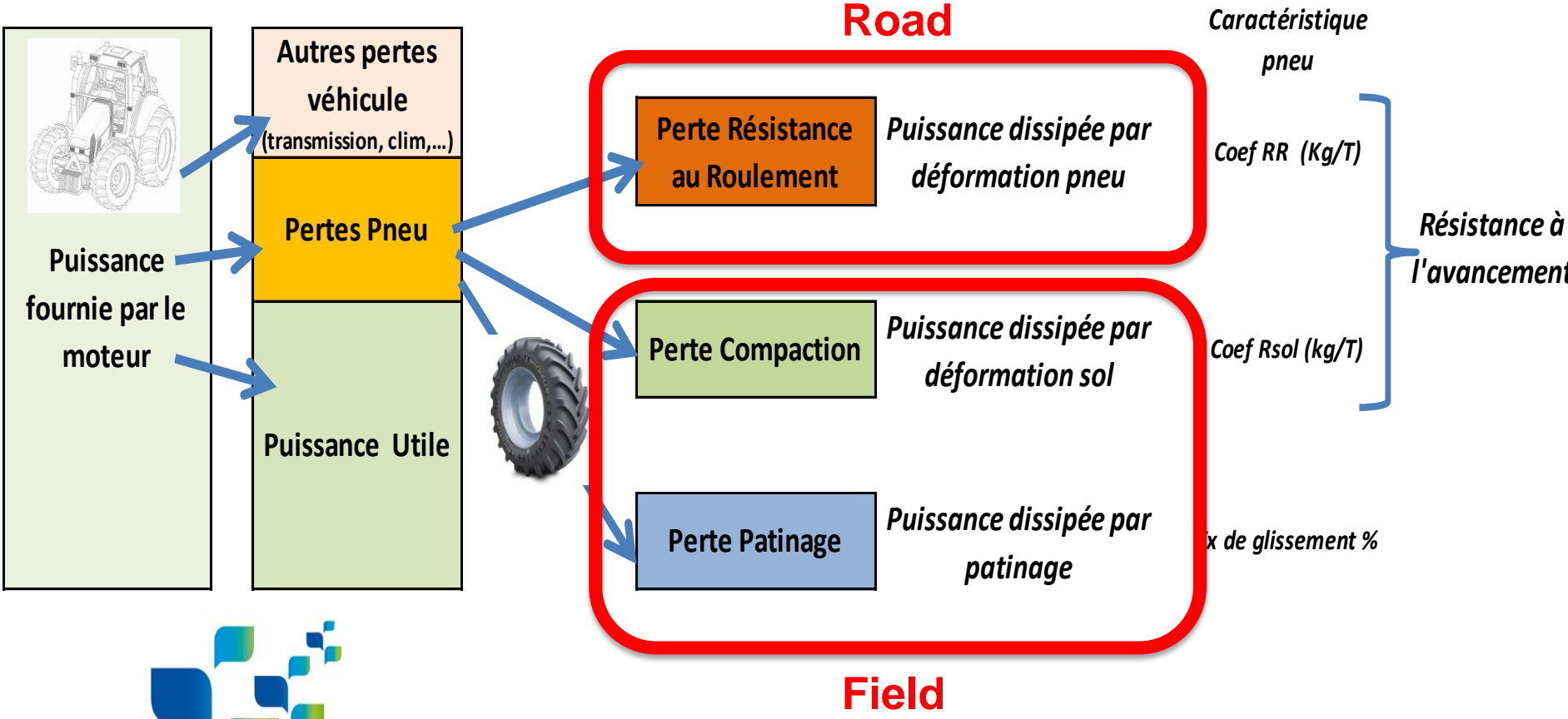
|            |            |
|------------|------------|
| <b>52</b>  | kg/HP eng. |
| <b>114</b> | lb/HP eng. |
| <b>61</b>  | kg/HP pto  |
| <b>134</b> | lb/HP pto  |

**TRACTION POWER RATIO**

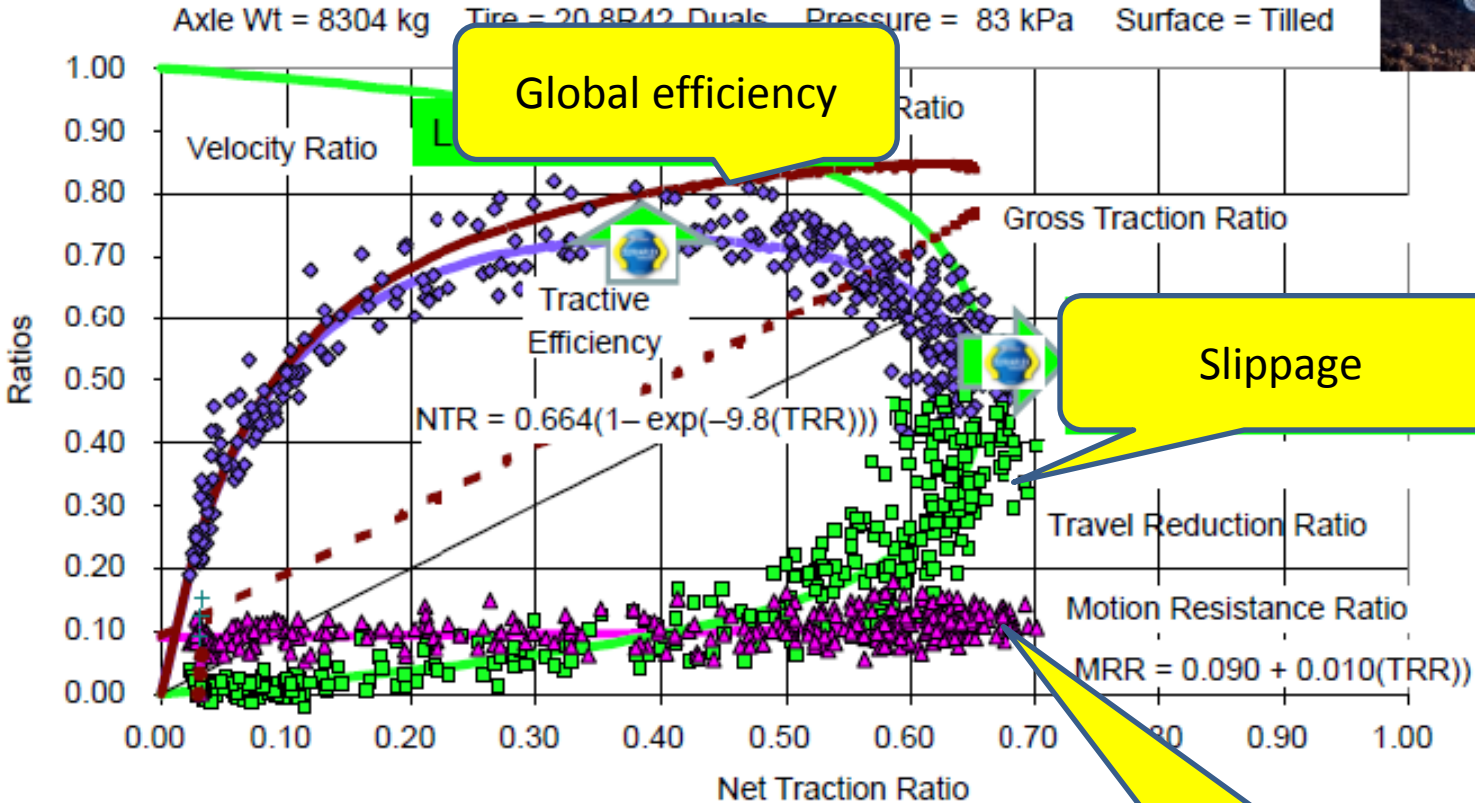
**54%**



# Tire energy dissipation : 3 sources



# Tire Power Delivery Efficiency Study from literature



POWER DELIVERY EFFICIENCY: A VALID MEASURE  
 OF BELT AND TIRE TRACTOR PERFORMANCE

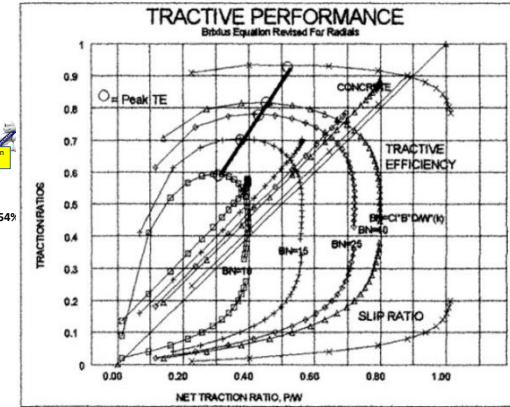
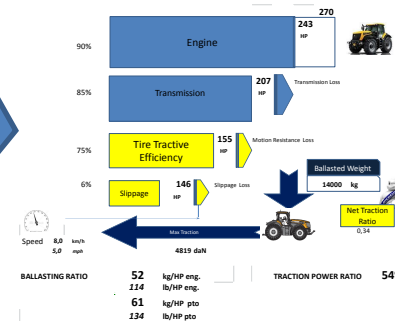
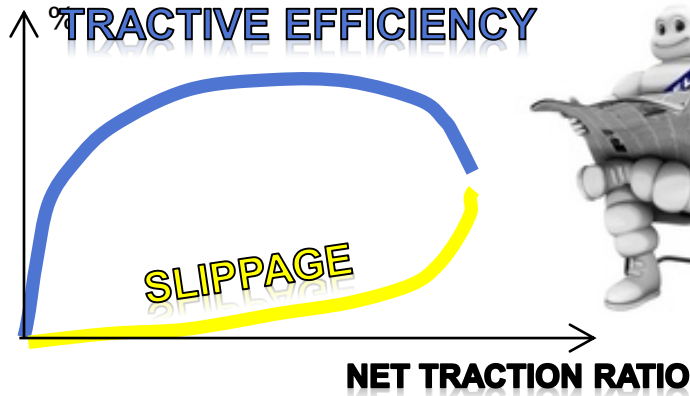
F. M. Zoz, R. J. Turner, L. R. Shell

Motion resistance  
 (internal dissipation in tyre + soil deformation)

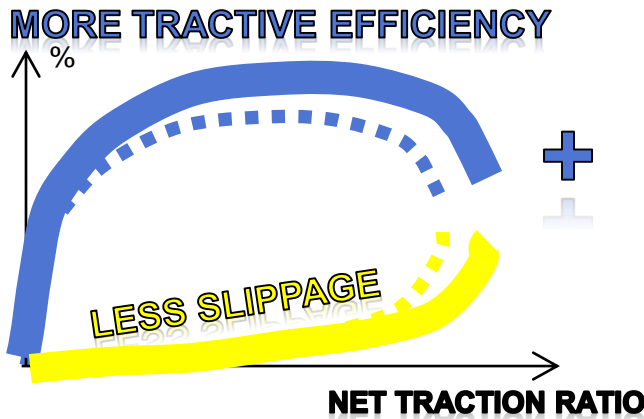




# FUEL CONSUMPTION AG TYRES IN SOFT SOIL



**LESS TIRE PRESSURE GIVES ...**



**LESS SOIL  
COMPACTION**

**... BETTER YIELD**

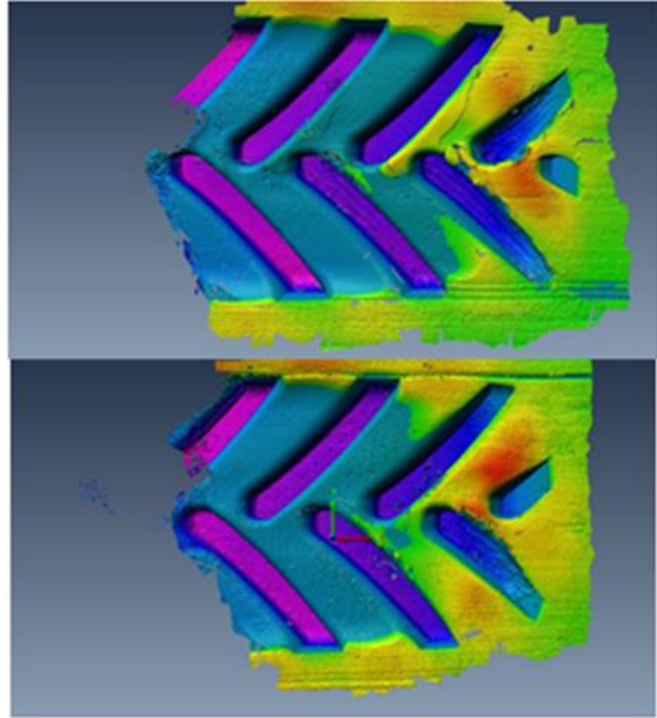


# NEW PERFORMANCES

## D) TRACTION POWER

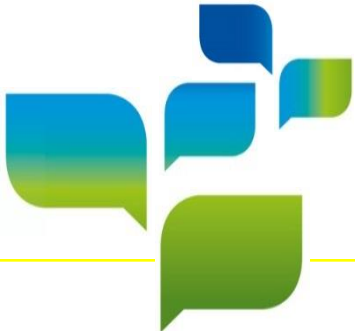


# Michelin AxioBib transfers the power to the ground

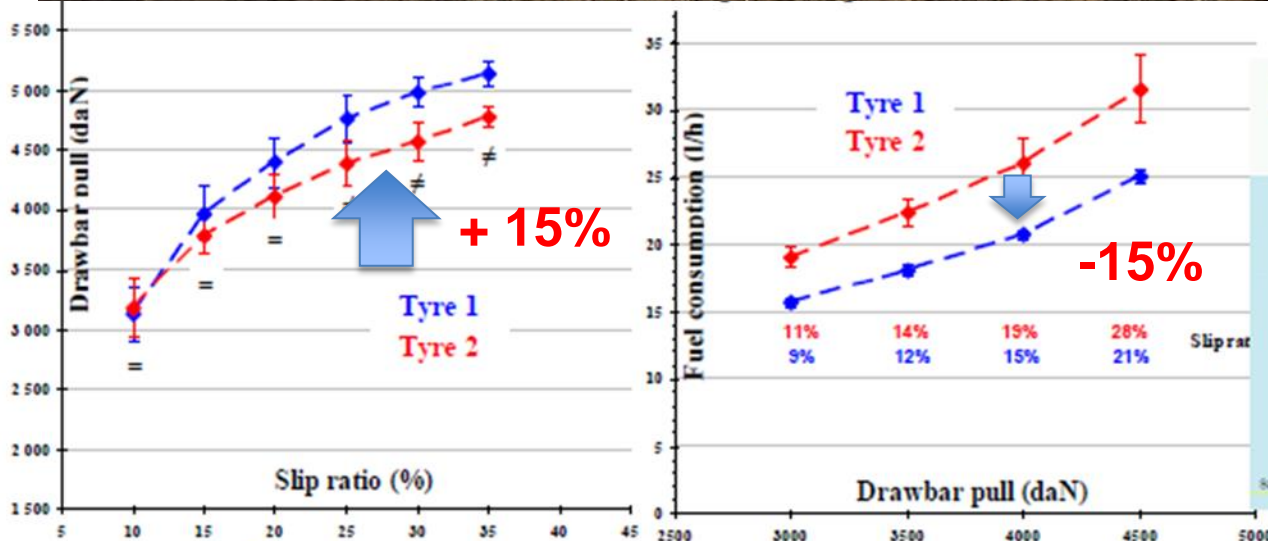


0,9 bar → 4642 cm<sup>2</sup> (+ 22 %)

Std : 1,2 bar → 3813 cm<sup>2</sup>



# Traction / slippage tests



VDI Wissensforum AgEng 2009

Tractors IV - Test

Methodological precautions for tractor fuel consumption's measurement

Jean-François FORISSIER, Agricultural Tests Manager, Michelin Group, Clermont-Ferrand (France)

Saturday, 07 November 2009







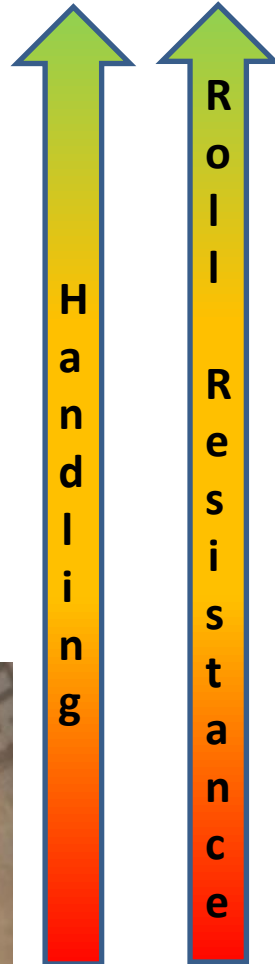
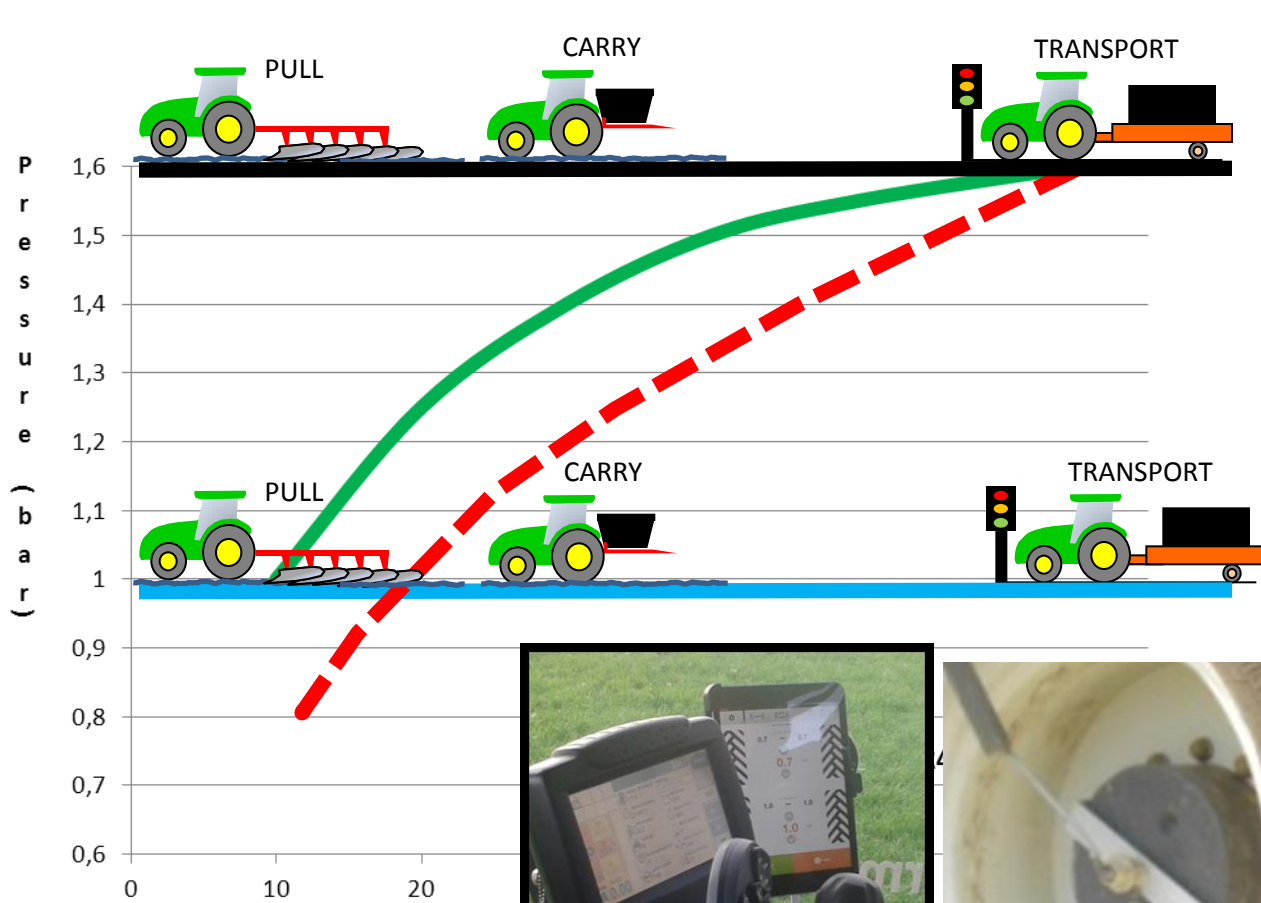
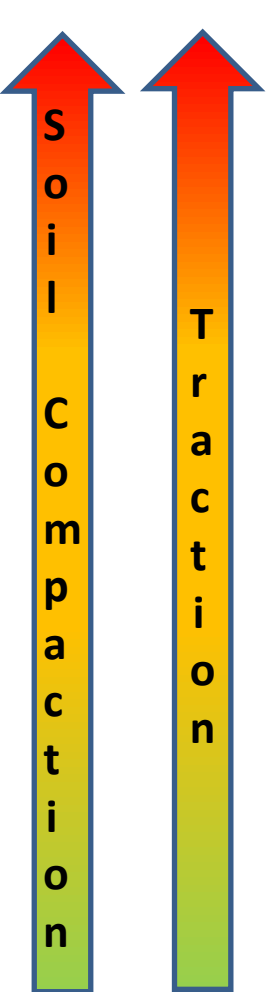
**FIELDS OF INNOVATION**  
**MICHELIN** Bring agriculture even further.

# FUTURE STEPS

## Our vision

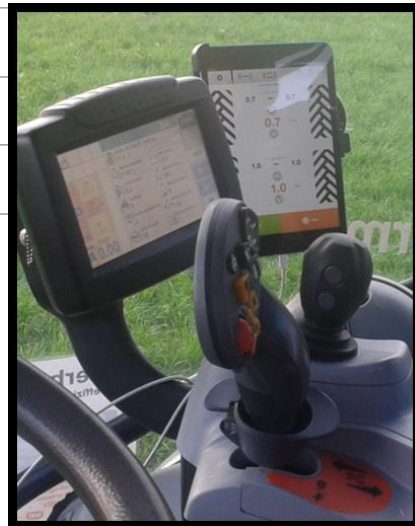


# Michelin AG R&D : Central Tyre Inflation System



VF (constant pressure road – field)

CTIS : the good pressure at any time



# CTIS

- Possibility to express full benefits of ULTRAFLEX
  - Less time to go from field to road pressure
- Complexity of pressure choice
- SMART tire For continuous optimisation of tire performances

