Technology and mechanization of beet harvest

- Club of Bologna -

- Hanover, 13.11.2023 -

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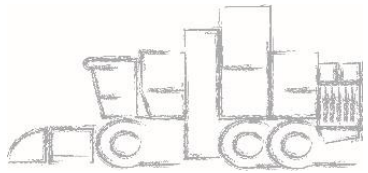
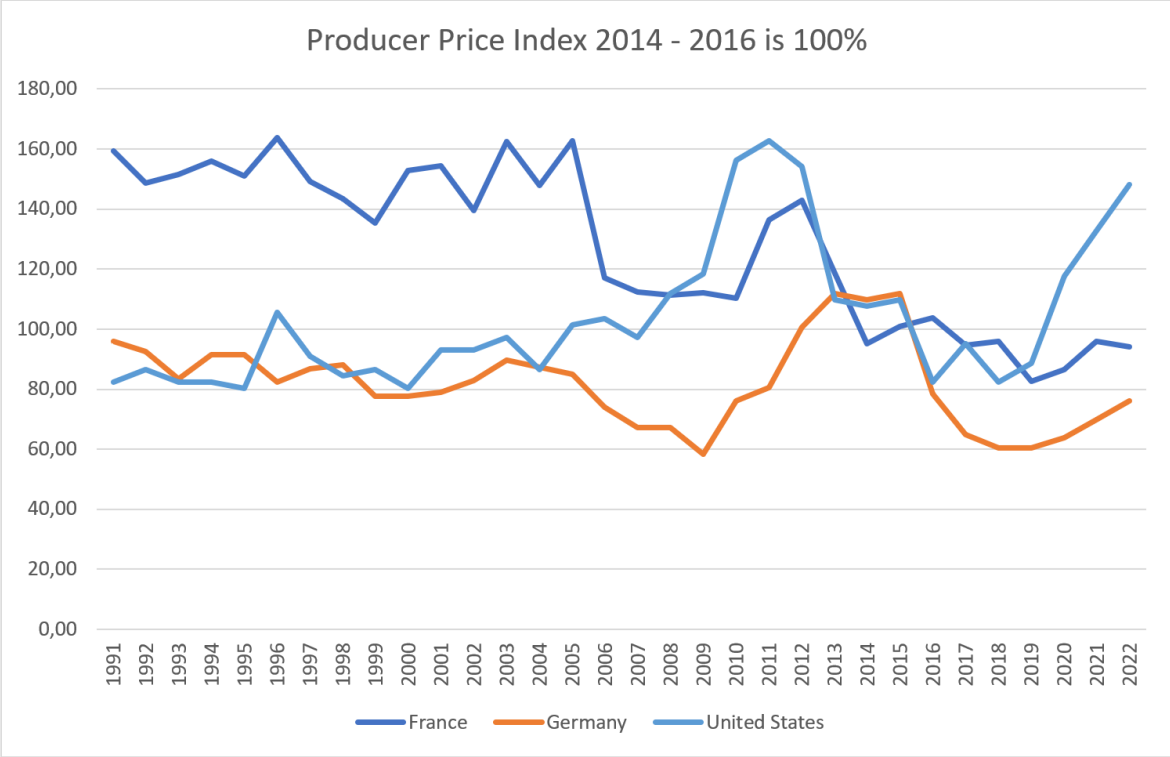
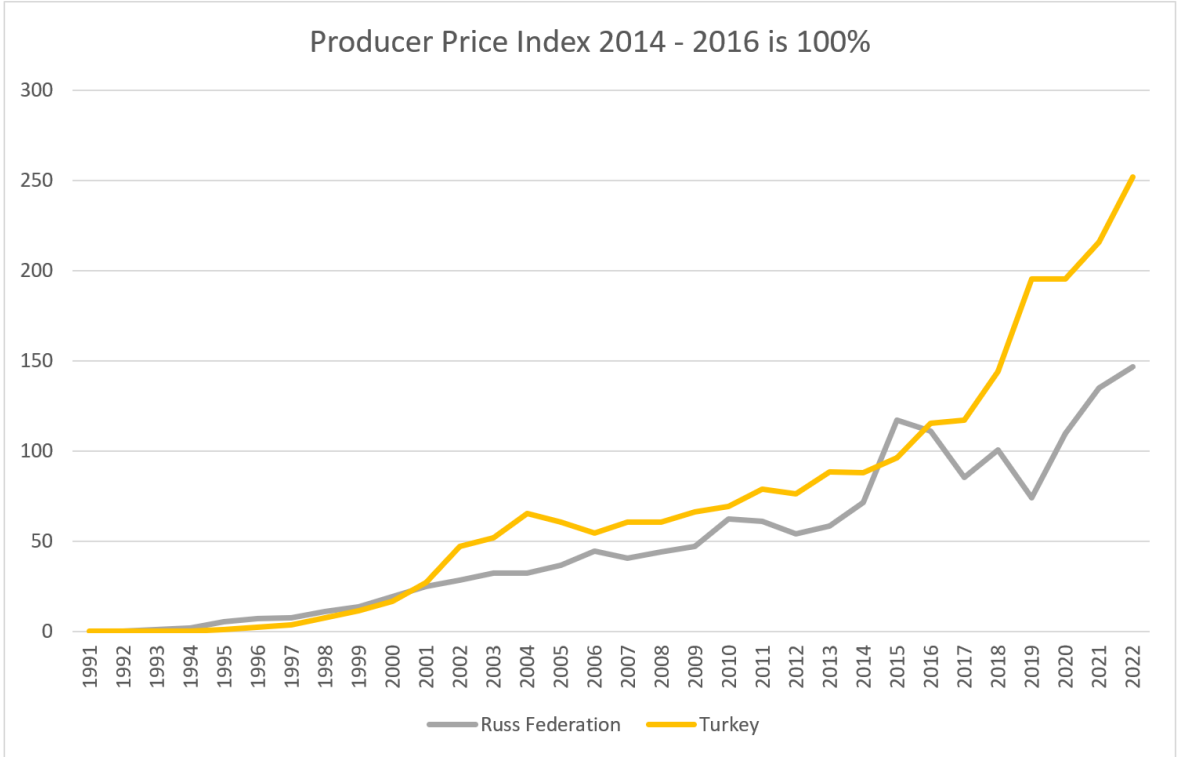


Global markets changes





Source: https://www.fao.org/faostat/en/#home

- Western markets under pressure by lower prices = pressure on harvesting process
- Changing Regions changes environmental conditions!
- Level of Skillness of driver different.

Conditions change again

- restrictions in chemical plant protection and resistances to chemicals allow weeds again
- new diseases requires adaptations of harvesting

Source: Gerhard Meißner

The Challange in Sugar beet Ecosystem

Shortage of skilled drivers

- Shortage of available drivers
- lacking in experience due to new regions
- reduced readiness for active improvement

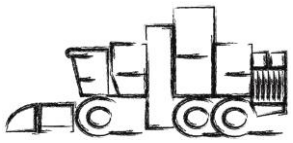
Respect for nature

- European Union's Green Deal
- common goal to protect our environment (soil, water,…)

Production costs under pressure

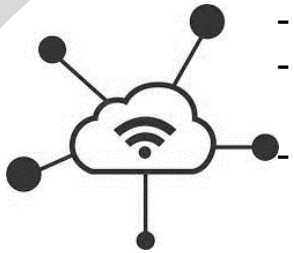
- increased energy, fertilizer prices
- low production prices due to political corrections

Harvest conditions



- limits in plant protection products and resistances allow weed again
- Harvest windows are becoming shorter due to climate change
- new diseases arise (SBR)

Digitalisation



- potential in Remote maintenance
- compatibility and exchangeability of data is key
- missing standards are a threat

Answers for the beet harvest Challenge

Driver Shortage

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Production process under pressure

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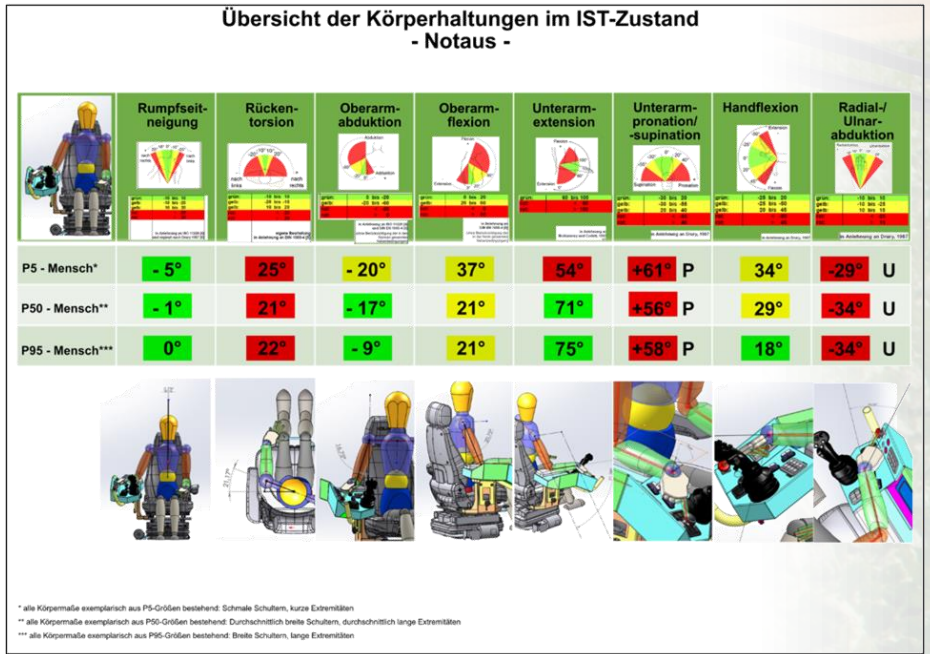
Focus on the driver

Launch of a new cabin to:

- Attract motivated drivers
- Deep ergonomic optimization for non-fatiguing working conditions (positioning, lighting, AirCon, …)
- Comfort features

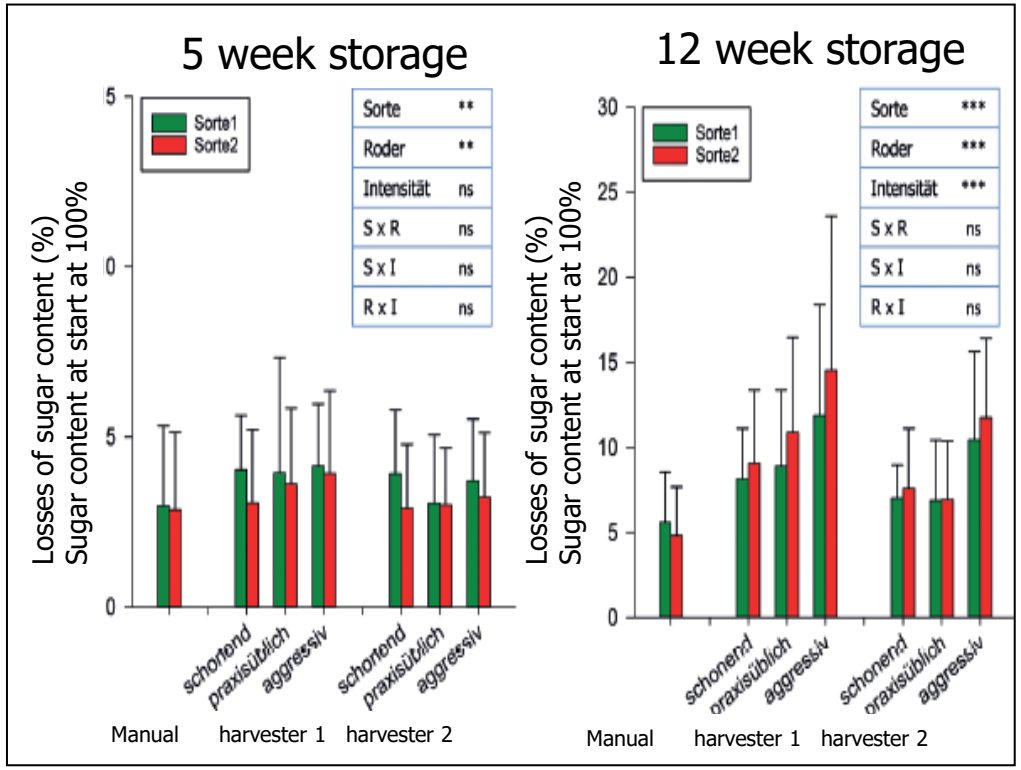


Übersicht der Körperhaltungen im IST-Zustand
- Notaus -

	Rumpfseit-neigung	Rücken-torsion	Oberarm-abduktion	Oberarm-flexion	Unterarm-extension	Unterarm-pronation/ -supination	Handflexion	Radial-/ Ulnar-abduktion
P5 - Mensch*	- 5°	25°	- 20°	37°	54°	+61° P	34°	-29° U
P50 - Mensch**	- 1°	21°	- 17°	21°	71°	+56° P	29°	-34° U
P95 - Mensch***	0°	22°	- 9°	21°	75°	+58° P	18°	-34° U

* alle Körpermaße exemplarisch aus P5-Größen bestehend: Schmale Schultern, kurze Extremitäten
** alle Körpermaße exemplarisch aus P50-Größen bestehend: Durchschnittlich breite Schultern, durchschnittlich lange Extremitäten
*** alle Körpermaße exemplarisch aus P95-Größen bestehend: Breite Schultern, lange Extremitäten

Motivated drivers and harvester setup as potential



Source: Rodersystemvergleich. Göttinger Zuckerrübentagung 2017

-	Δ storage time	≙ 110 €/ha
-	Δ harvesting system	≙ 75 €/ha
-	Δ harvester setup	≙ 100 €/ha
-	Δ variety	≙ 65 €/ha

Assumptions:
30 €/t, 18% sugar content, 75 t/ha

- Harvester setup as potential.
- Access to not used potential of machines by driver assistant systems!

Intelligence for machine setup!

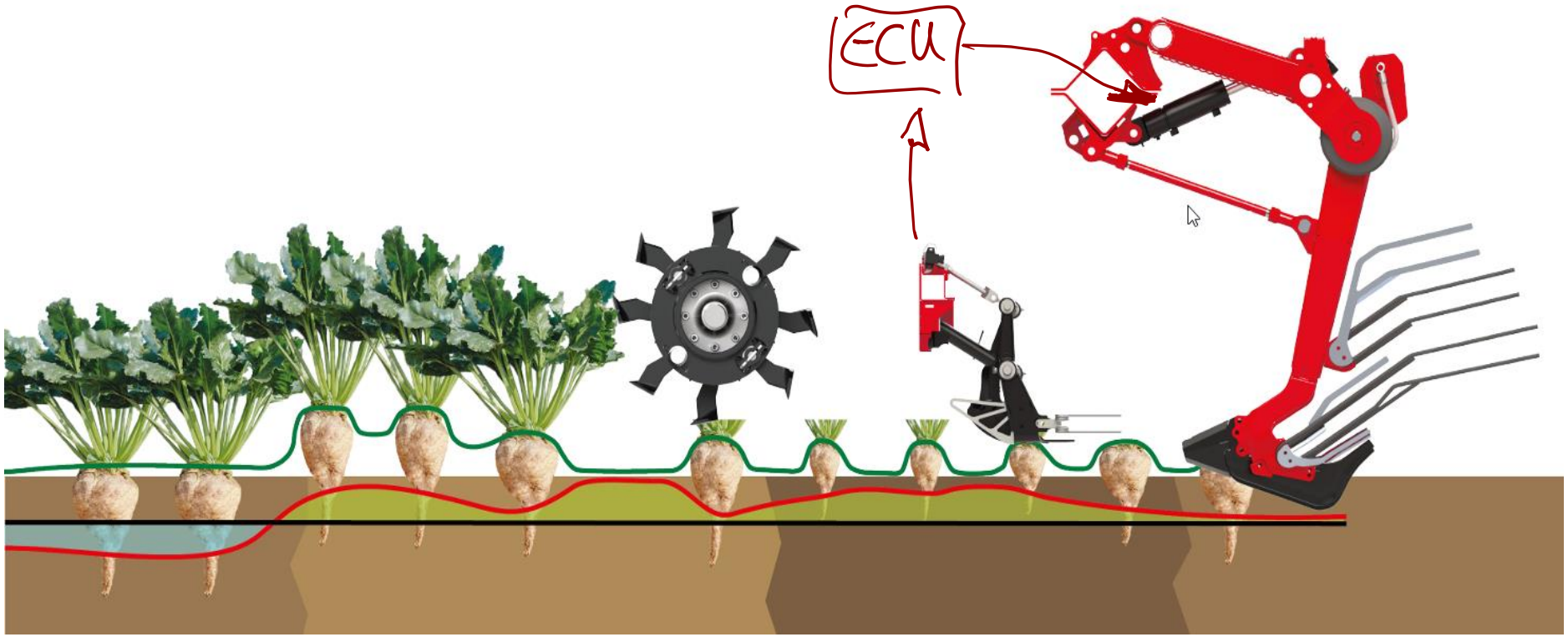
Difference in crop yield and size caused by variabilities in soil
(e.g.: gravel, sand, loam ….)

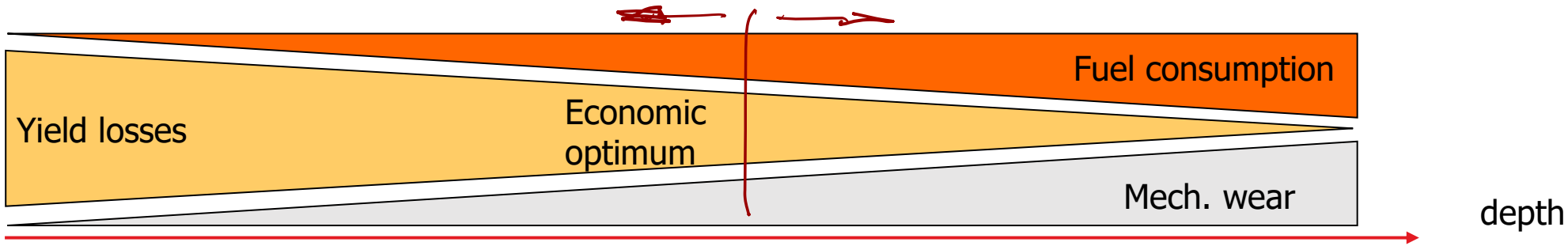
=> Continuous adaptation along the drive lane to changing conditions and yields as key to improve harvesting quality

=> driver assistant systems to support and assure optimal parametrization

Quelle: www.bayernviewer.de

Automatic single row depth adjustment



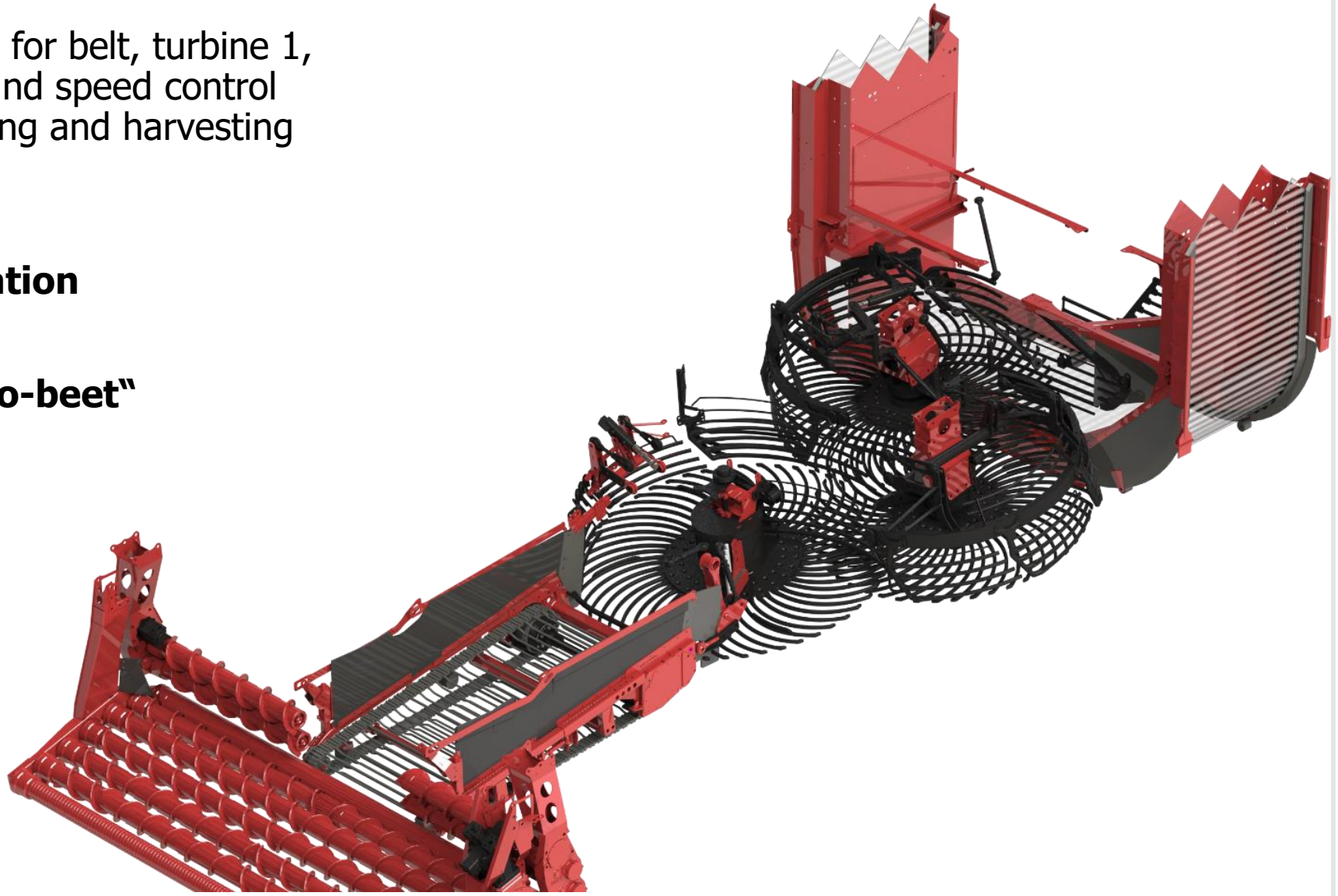


Adaptive Cleaning plus

- Independent hydraulic drives for belt, turbine 1, 2 & 3, closed loop pressure and speed control enables reliably a high cleaning and harvesting capacity

- **Automatic load compensation**

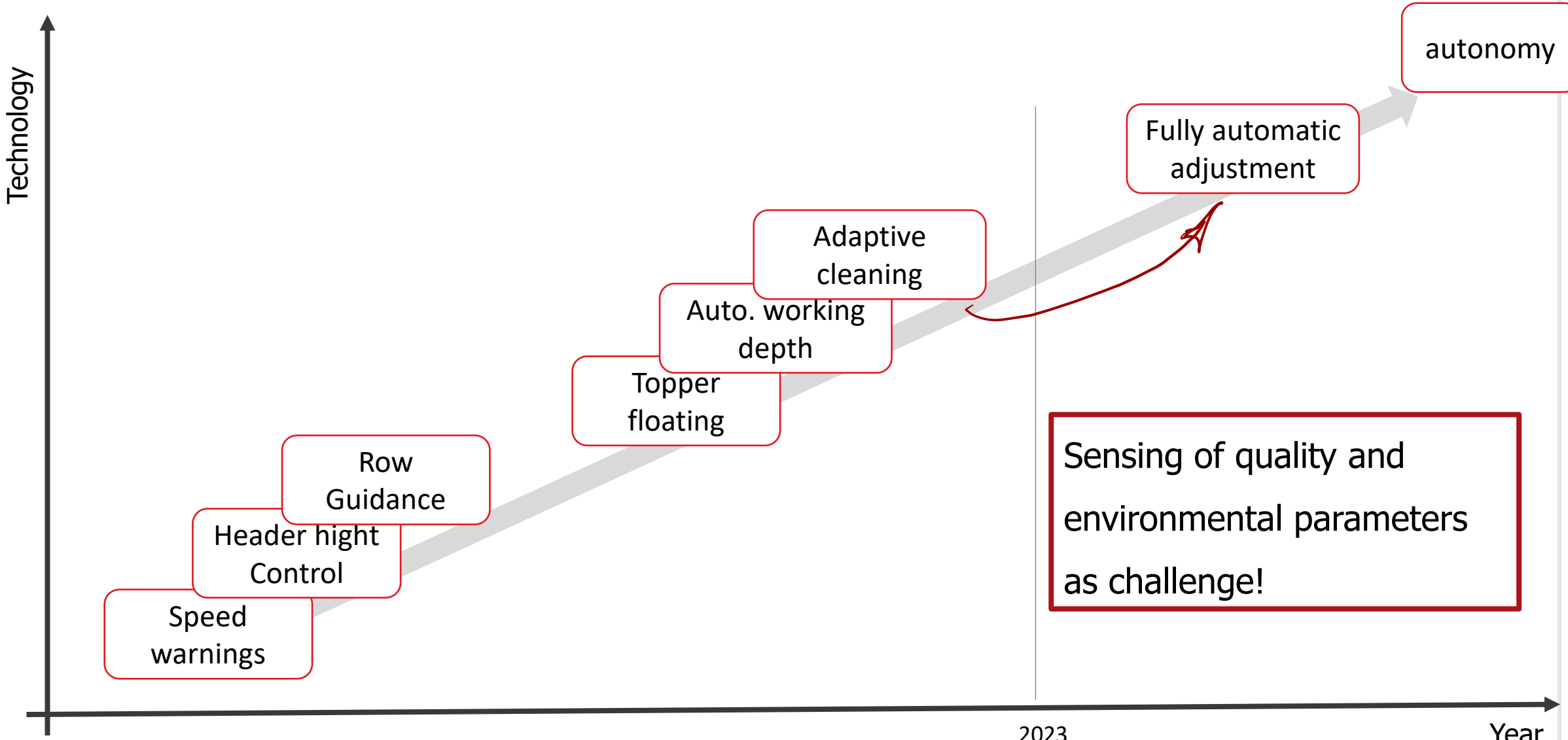
- **Cleaning strategy „beet-to-beet“ instead of „beet-to-steel“**



Testing harvester settings

- **Driver assistant systems are Saving yield as contribution to the farmers earnings!**

Assistant systems in harvesting equipment



Transfered from Herzlitzius, AgEng 2004 Leuven

Focusing on Total Cost of Ownership

- Upgrade the main wear zones by
  - new materials, forged or special steel
  - design
- Optimised maintenance by
  - increased service intervals
  - sensor based filter replacement on demand

- **TCO as contribution to reduce processing costs.**

Answers for the beet harvest Challenge

Respect for nature

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Harvest conditions

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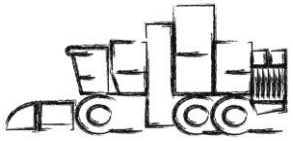
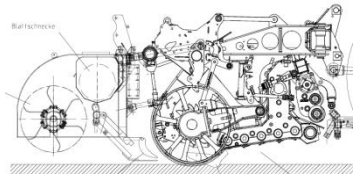


Improve dead weight of harvesters

Bj. 2000

KR45 with BS

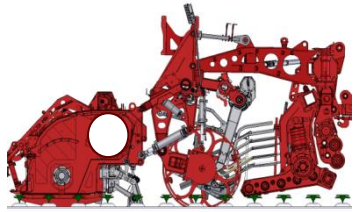


883 kg/row

Material &
Machine design
-19%

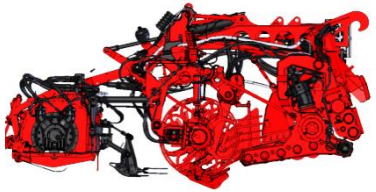
Bj. 2020

HR3-6 with KOS I



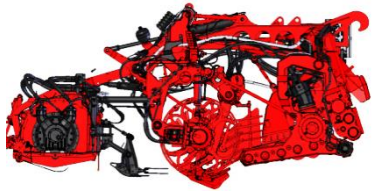
675 kg/row

HR3-9 with KOS I



588 kg/row

HR3-12 with KOS I



585 kg/row

-33,7%

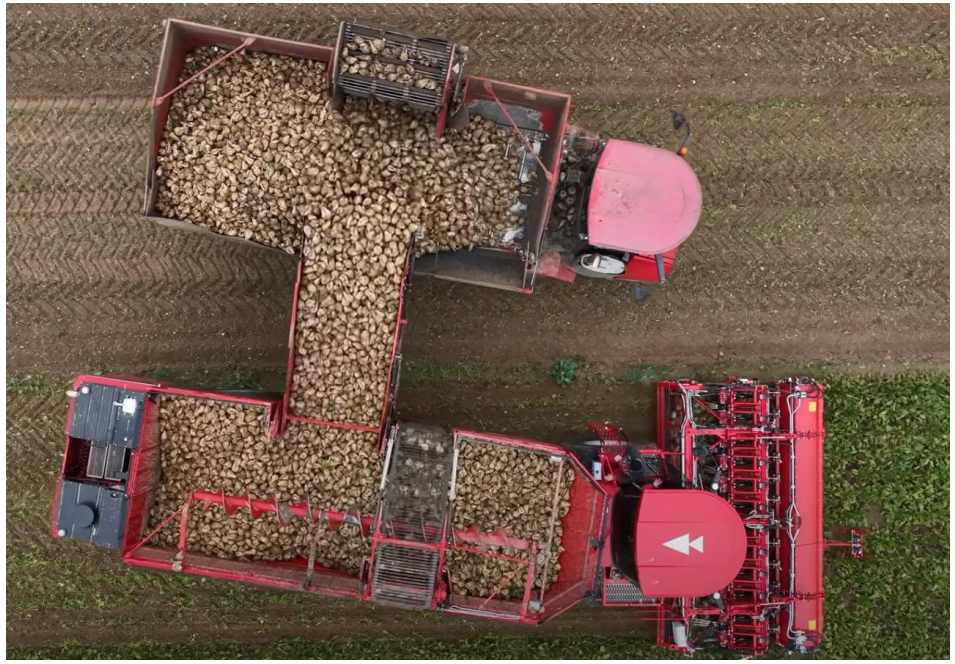
Working width
-13%

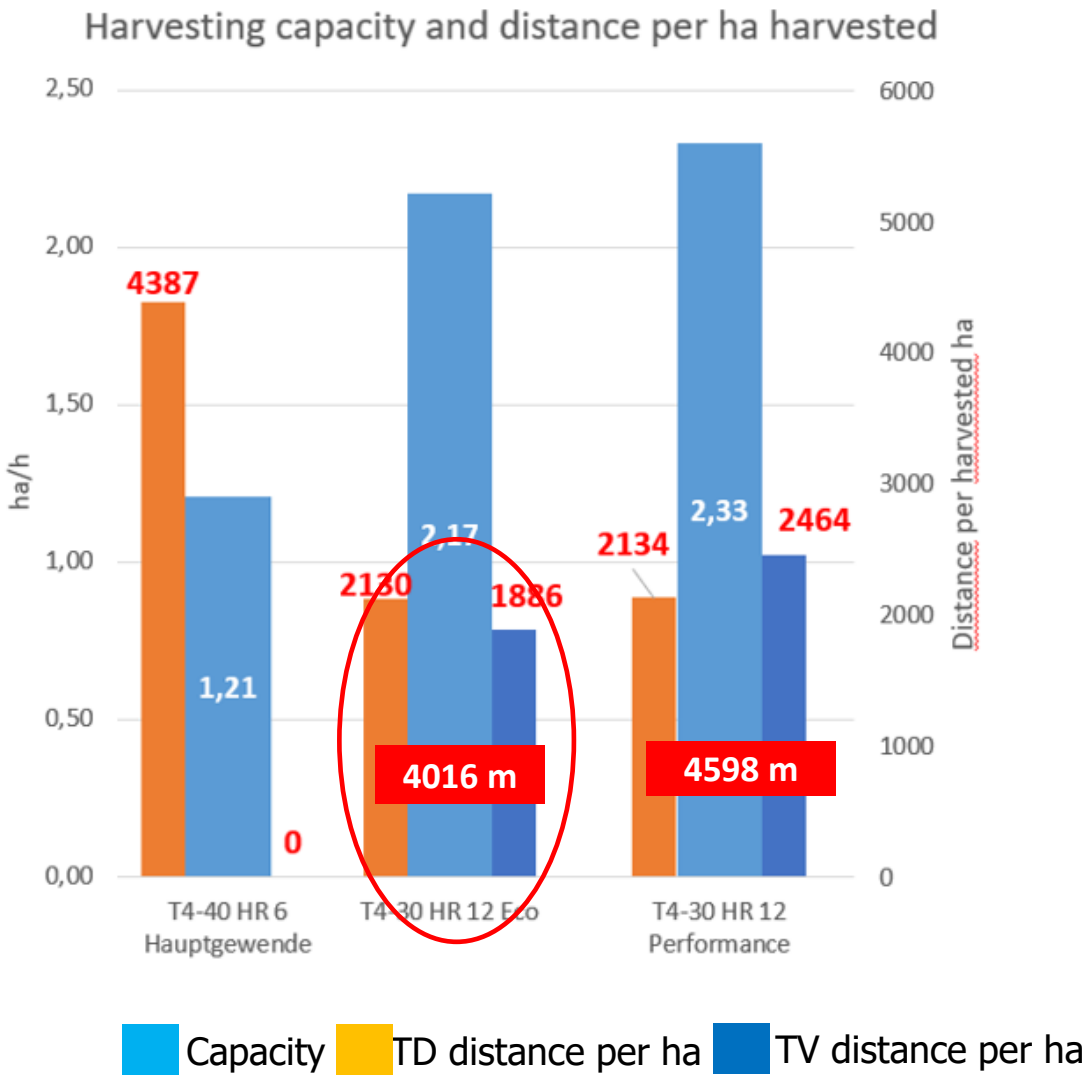
Weight reduction by:

- Weight optimized design as clear requirement!
- Use of high strengthend materials
- Load-appropiate design

Field logistics as a solution?!

- Soil protection by uncoupling yield, field length and bunker volume
- Soil protection by reduced in field distances and high transport speeds
- High capacity for short harvesting windows



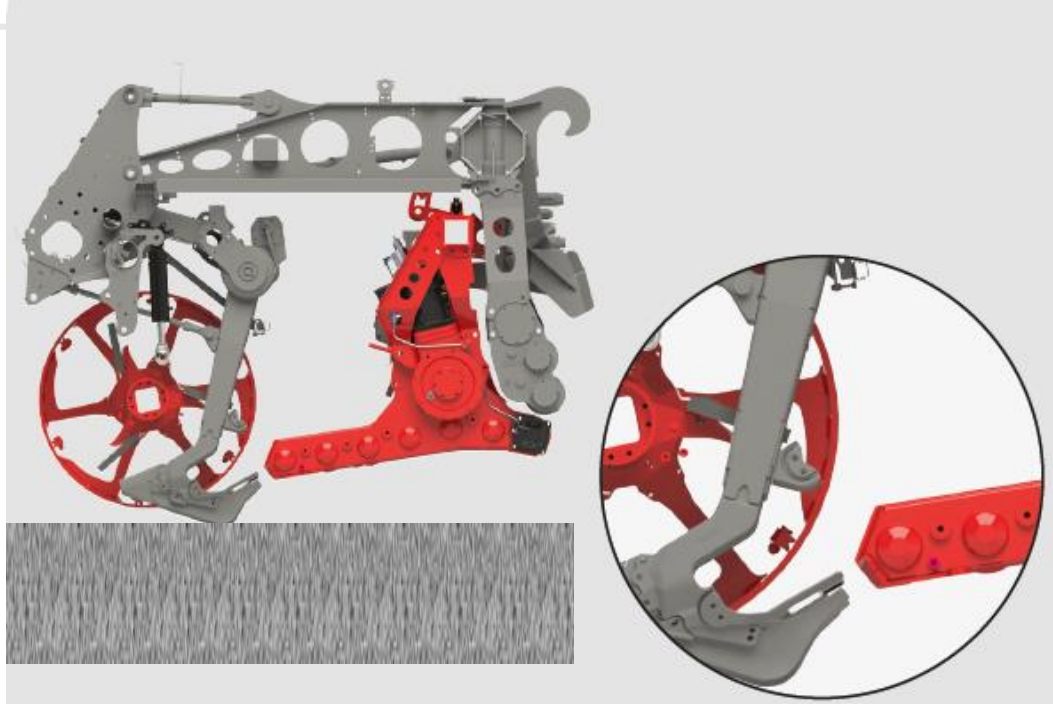


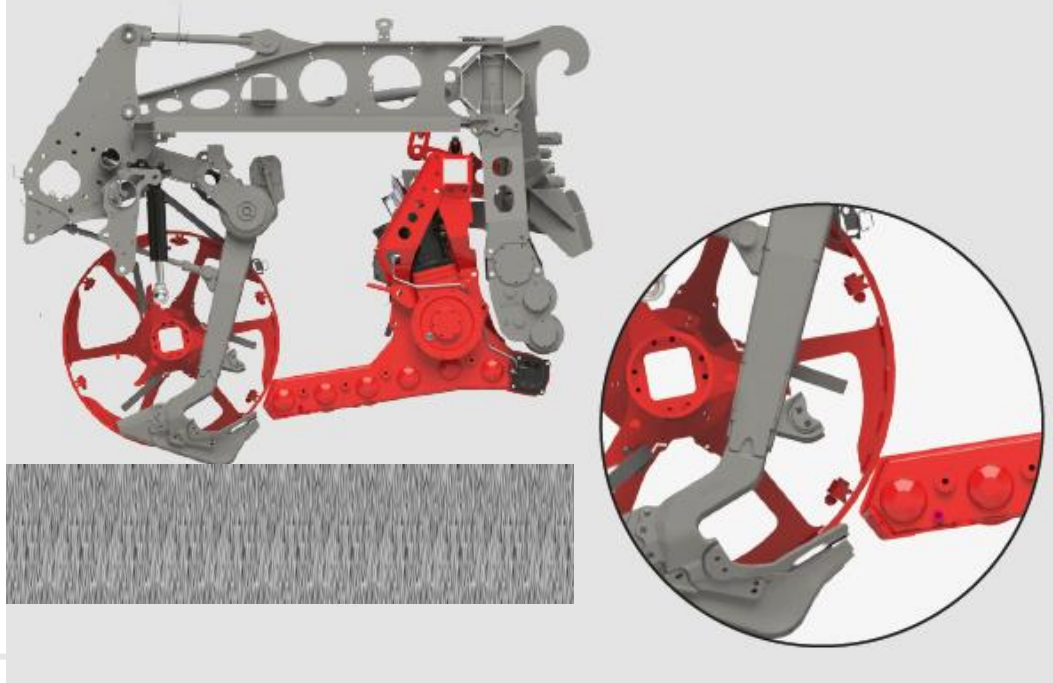
More adaptability for different soils and conditions

Additional adaptabiltity at Feeler wheel shaft

- Horizontal adjustable position (rear - front)
- For different soil conditions
- No losses in front the shares during light conditions,

  no problems to lift beets on the frist roller at wet conditions





Answers for the beet harvest Challenge

Digitalisation

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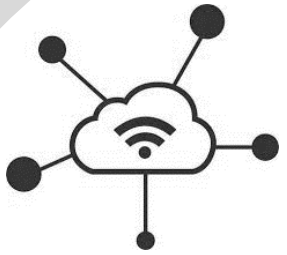
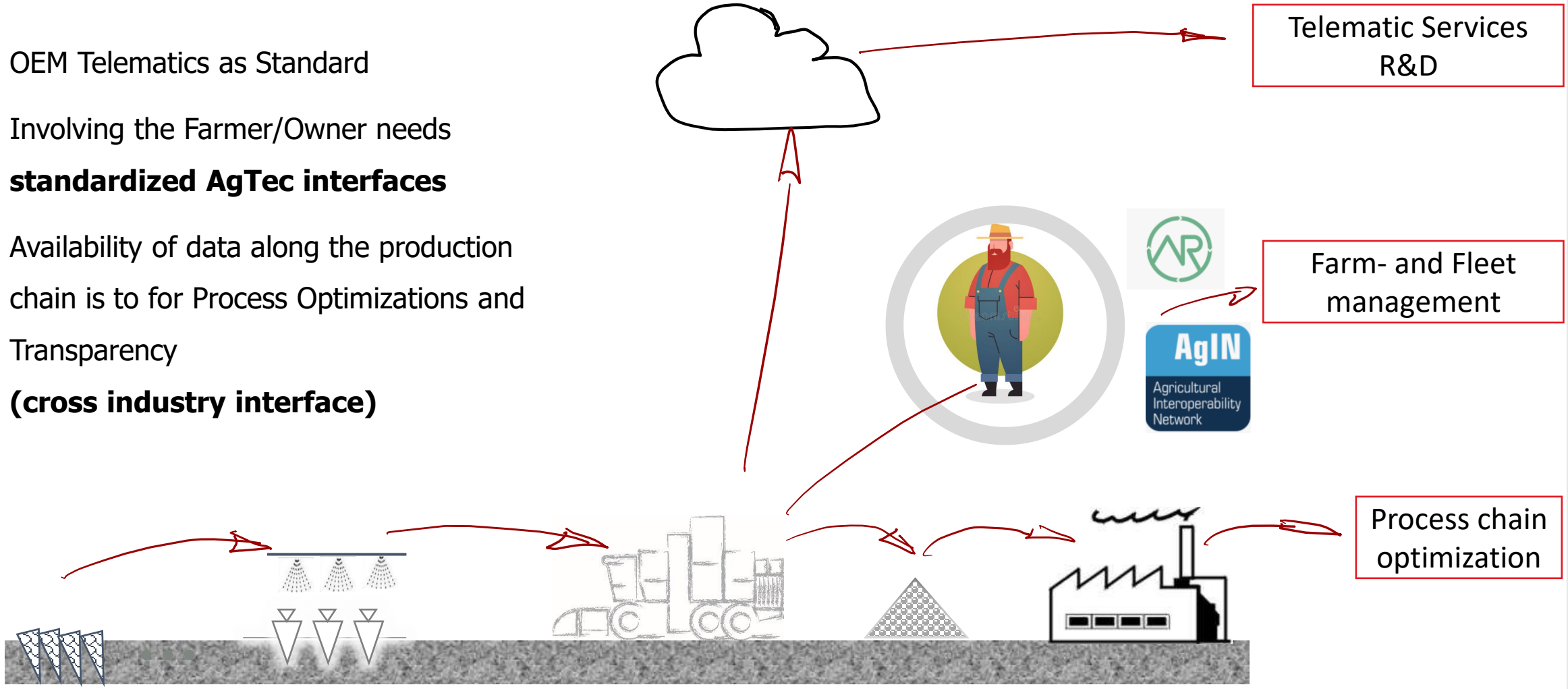


Telematics

The enabler for different communication lines.

- OEM Telematics as Standard
- Involving the Farmer/Owner needs **standardized AgTec interfaces**
- Availability of data along the production chain is to for Process Optimizations and Transparency **(cross industry interface)**



Summarizing answers for the beet harvest Challenge

Driver Shortage

=> Ergonomic comfortable cab
=> Driver assistant systems for automatic adjustment

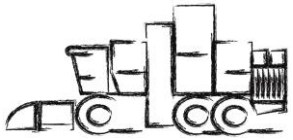
Respect for nature

=> weight optimized design
=> fieldlogistics

Production process under pressure

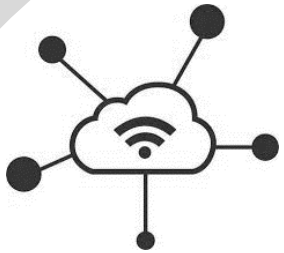
=> TCO improvement as cost contribution
=> yield contribution by optimized harvest

Harvest conditions



=> Adaptability to conditions in different regions (weed, soil preparation, …)
=> working width

Digitalisation



=> Key potential to vertically integrate in production chain

Thank you for your attention.