



## **How do EurAgEng and agricultural engineers contribute to innovation for sustainable intensification of Agriculture**

Eberhard Nacke – EURAGENG Paris, 22.2. 2015

# Worlds productive agricultural area is clearly limited

Still, there are more challenges to come

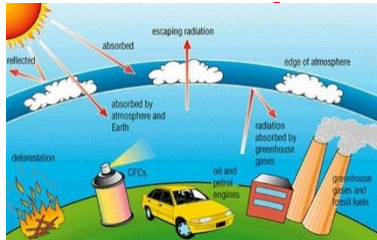
Water Shortage



Weather Extremes



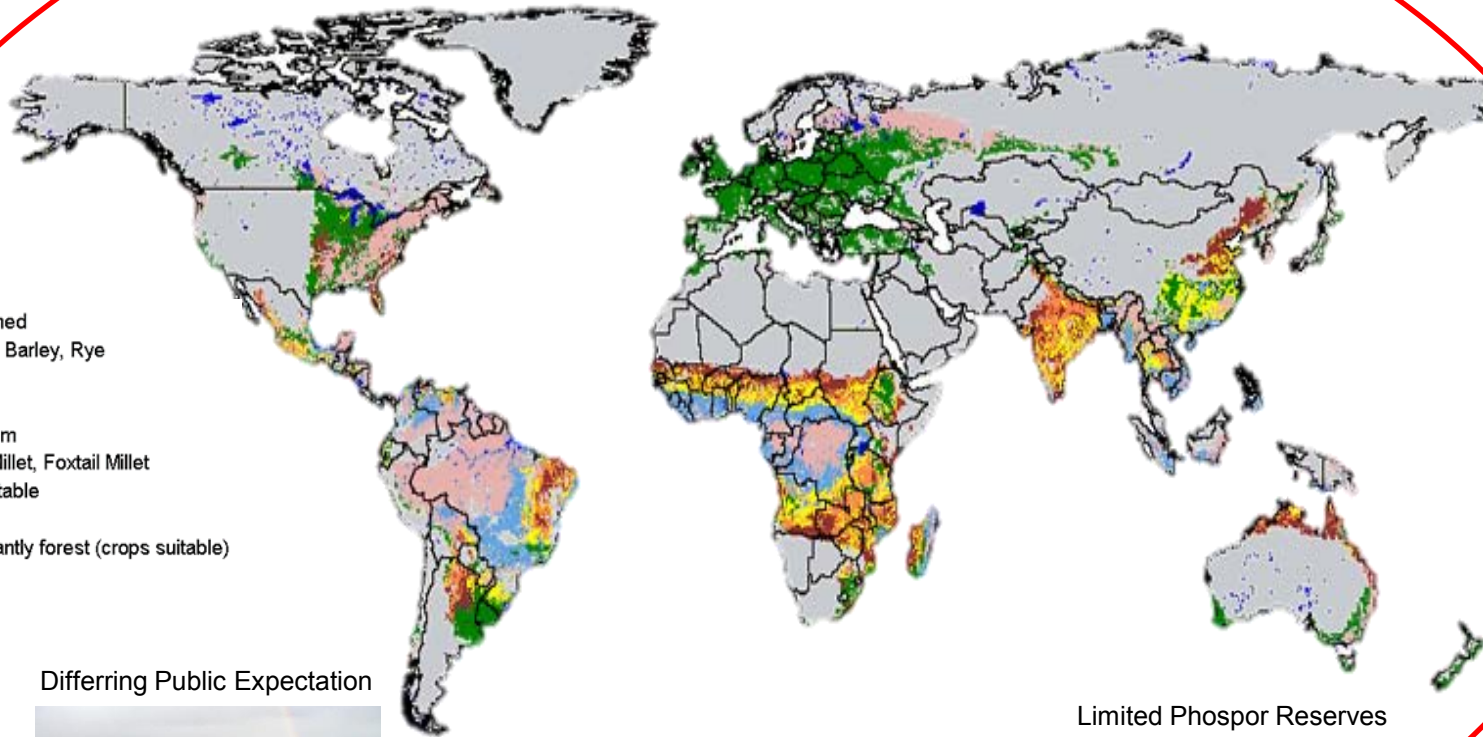
Climatic Change



Differring Public Expectation



Good suitability for cereal cultivation  
(without irrigation)

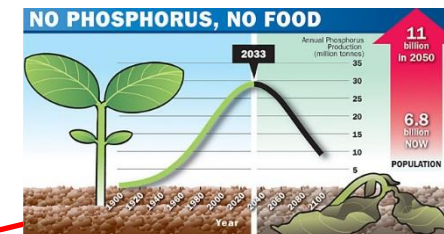


- Undefined
- Wheat, Barley, Rye
- Rice
- Maize
- Sorghum
- Pearl Millet, Foxtail Millet
- Not suitable
- Water
- Dominantly forest (crops suitable)

Limited Labour Availability



Limited Phosphor Reserves



Population Growth



Changing Nutrition Habits



Limited Fossil Energy



## Management of Shortages is the main driver of Future Farming Progress

- **Productivity**
- **Efficiency**
- **Precision**
- **Proven Quality**

➤ **Management**

Increase productivity  
of farmland

Use water more efficiently

Use fertilizer more  
efficiently

Reduce greenhouse gas  
emissions of agriculture

Avoid losses

...

## **Management of Shortages is the main driver of Future Farming Progress**

- **Productivity**
- **Efficiency**
- **Precision**
- **Proven Quality**

- **Management**

**Sustainable  
Intensification  
of Agriculture**





Modern Agriculture may be frightening to the general public

Public understanding differs often widely from farming reality





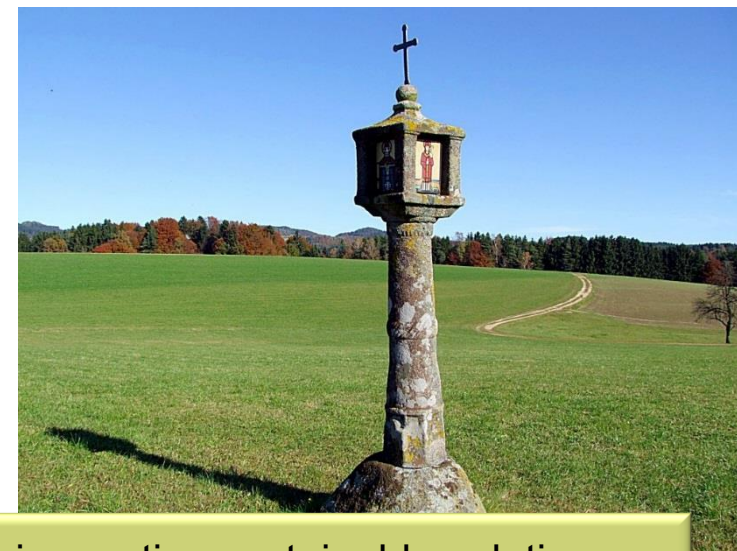
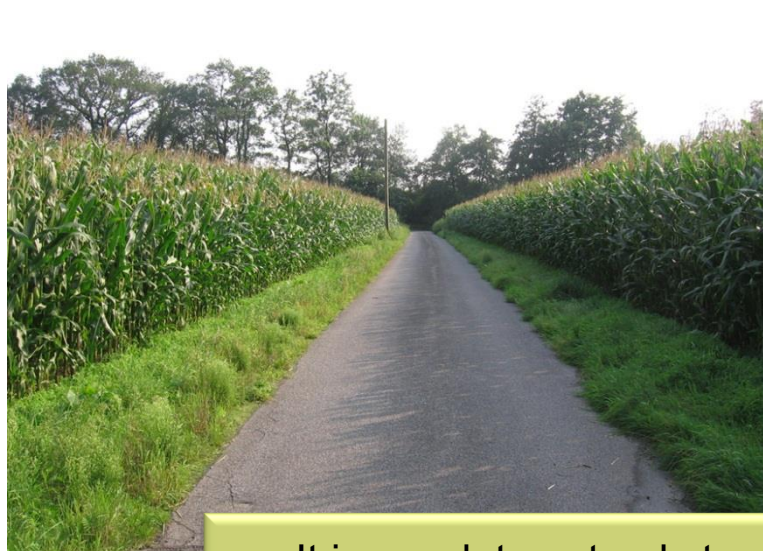
# Public expectation differs often widely from farming reality



1. Quartal 2013  
**1.098.385**  
Verkaufte Auflage

**Landlust**

By far the most successful  
print media launched in 20  
years

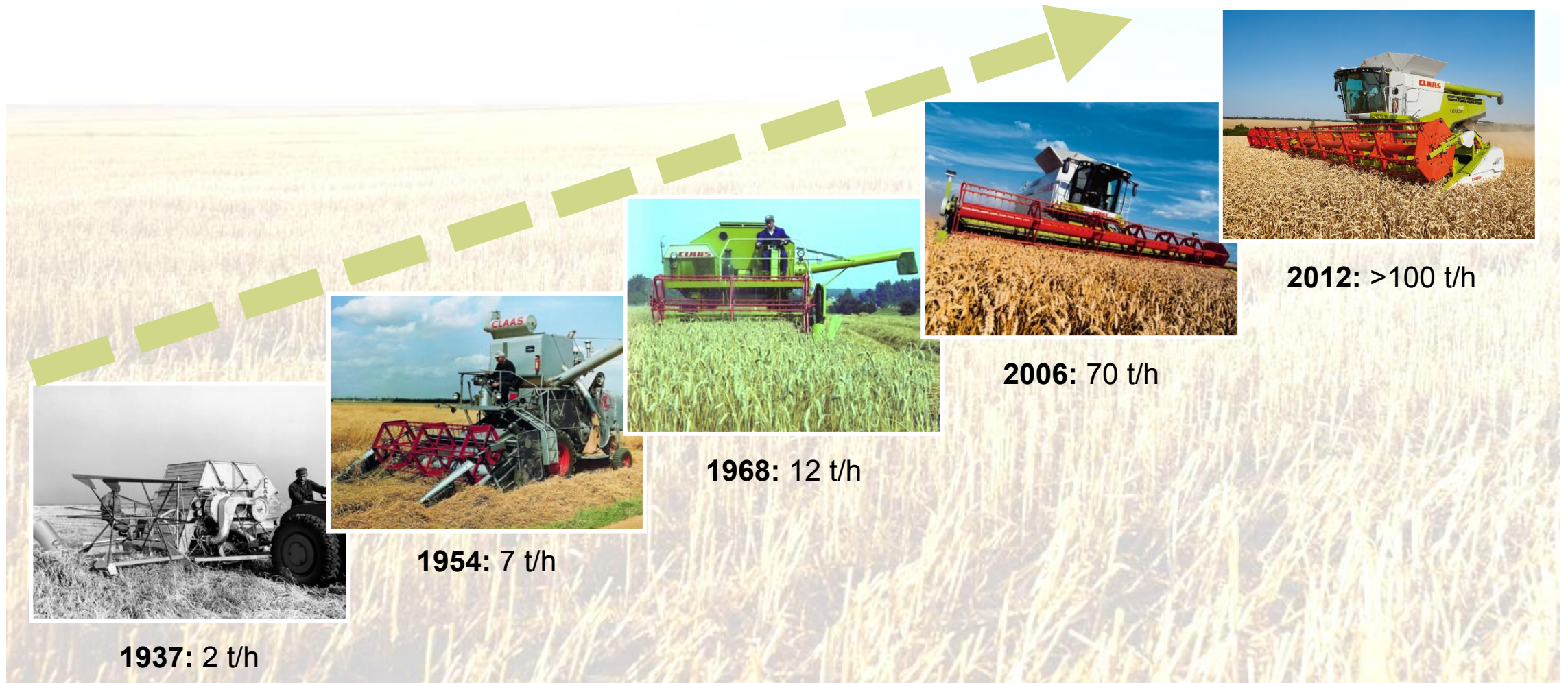


It is our duty not only to develop innovative sustainable solutions,  
but as well to explain modern agriculture to the public



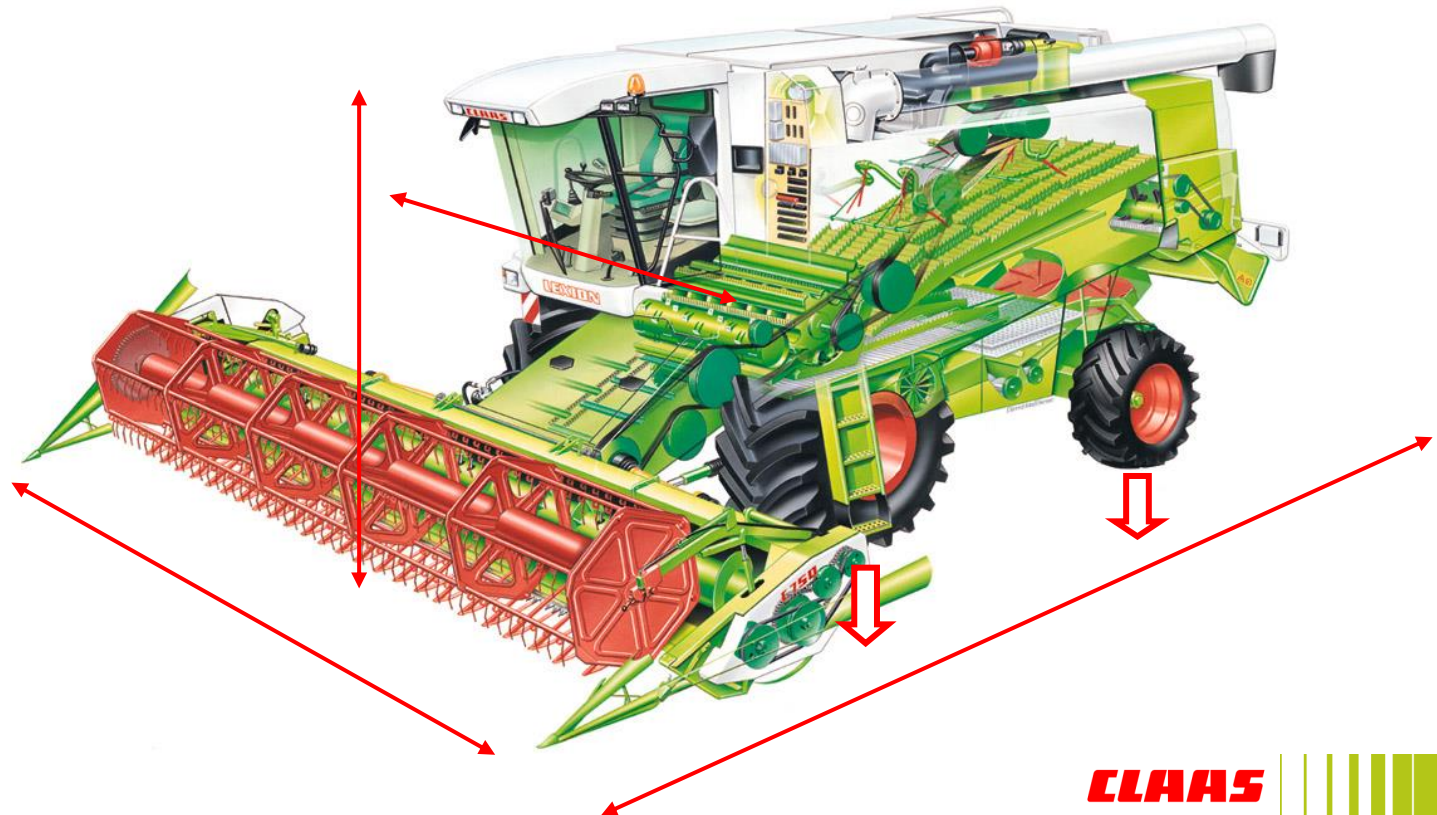


# 100 years of CLAAS - Efficiency as main driver for growth



Size matters...

...but there may be other solutions







- Digital Agriculture will enable agriculture to reach a new level of professionalism, efficiency, and precision
- Permanent availability of data and information about machines, persons, processes, environmental data, markets, prices...
- Worldwide, wherever, whenever, to whom ever
- Innovation speed of the digital world is very high and it is increasingly impossible to foresee future developments
- Knowledge based process optimization instead of focus on individual machines will drive future progress in agriculture



# Precision Farming of the 90's...

...too many illusions?

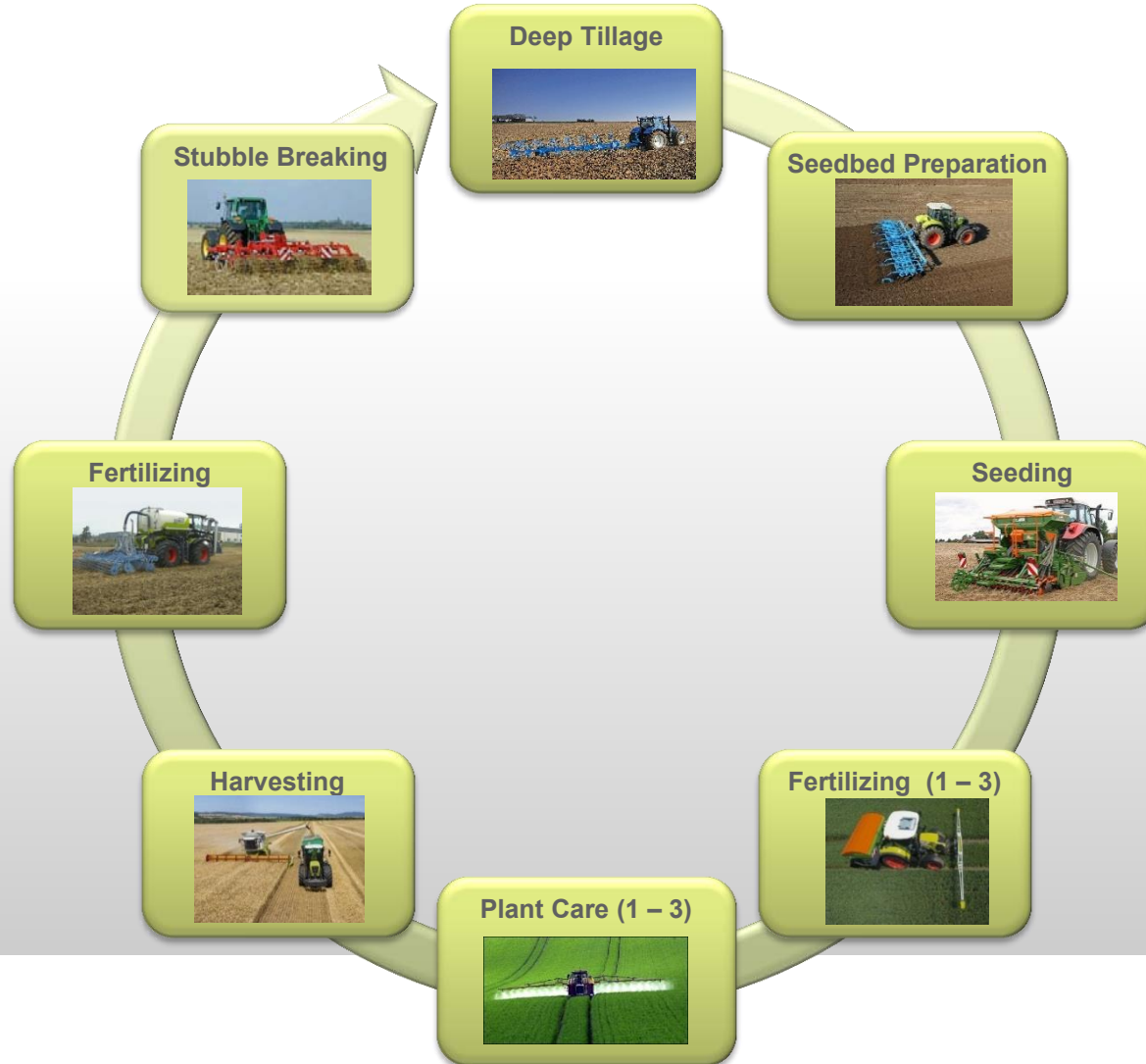




What brought us the break through for industry?

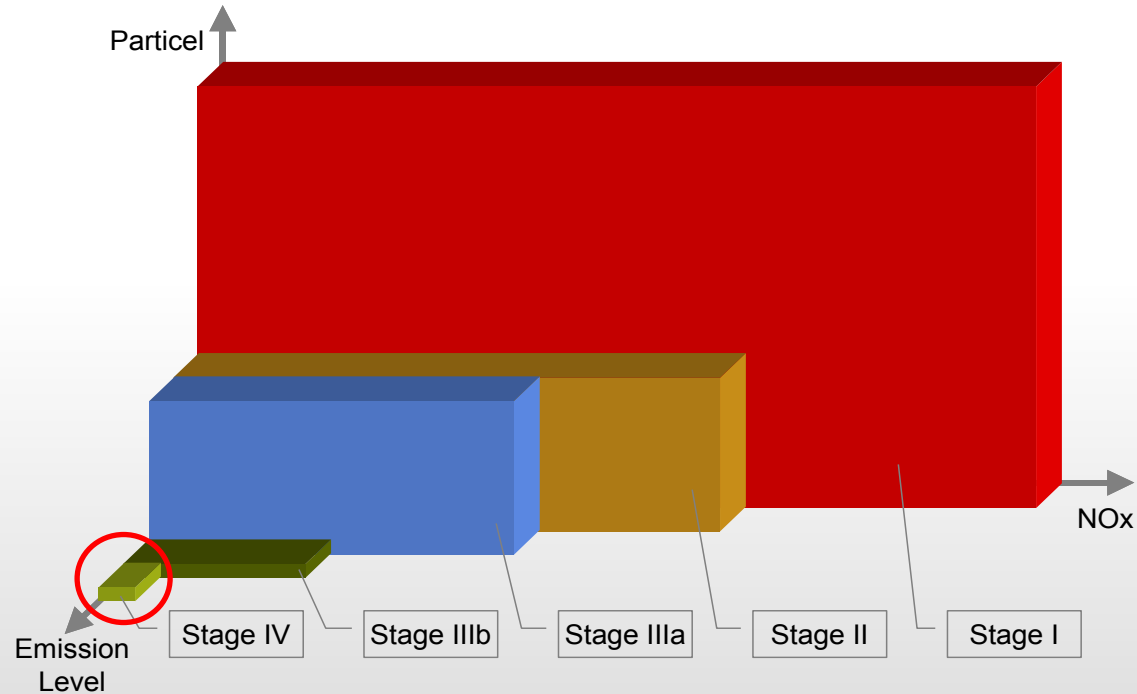


## Look for wholistic solutions





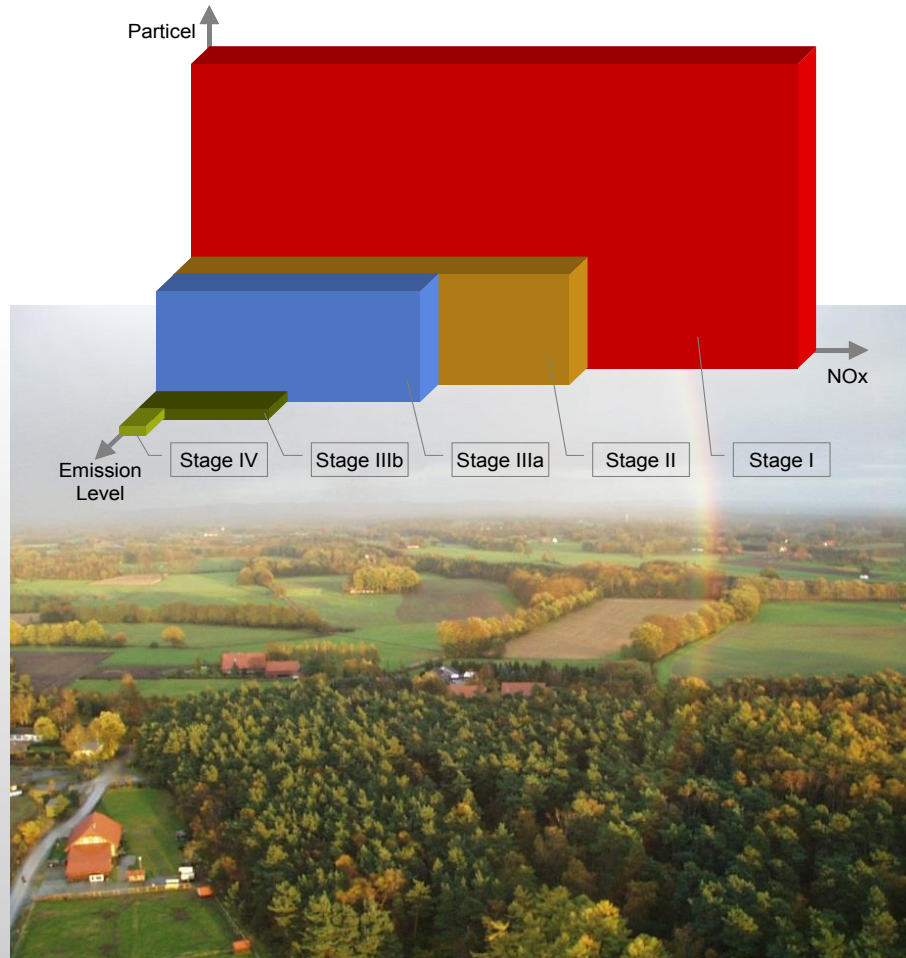
We are forced to cope with EU and NA emission regulations



Within less than 2 decades,  
engine emissions will be  
reduced by 85% (HC) or even  
96% (NOx, Particles)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
>560kW (EPA only?)	Stage 2 / TIER2			Stage ?/TIER4i							
130kW<P<560kW	Stage IIIa/ TIER3			Stage IIIb/ TIER4i			Stage IV/ TIER4				
75kW<P<130kW	Stage IIIa/ TIER3				Stage IIIb/ TIER4i			Stage IV			
56kW<P<75kW	Stage IIIa/ TIER3				Stage IIIb/ TIER4i			Stage IV			

# Problem?

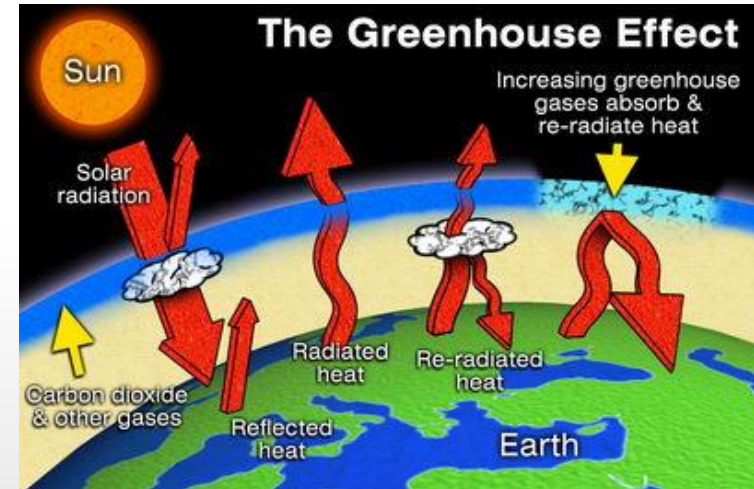
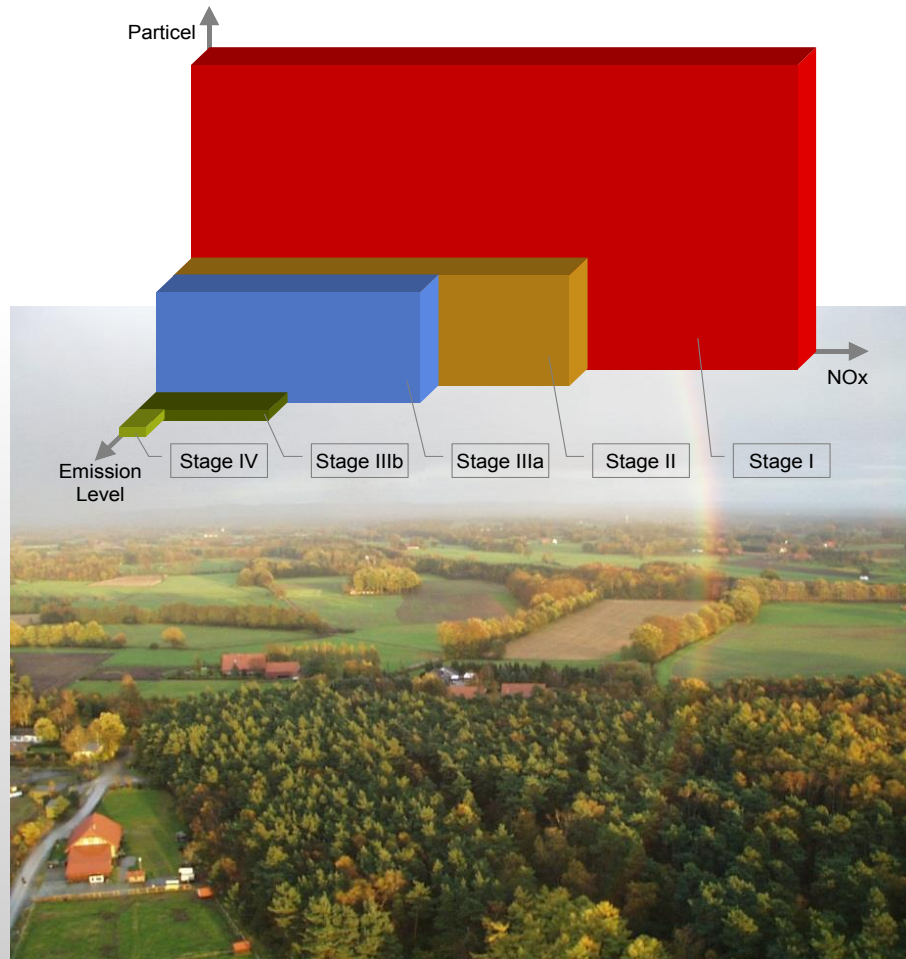


- ✓ Considerable increase of production cost for Ag machinery and subsequently cost increase for farmers
- ✓ Unidirectional concentration of engineering efforts on engines and engine adaption
- ✓ Misallocation of resources and lack of innovation in other areas
- ✓ Restraint of competition
- ✓ Contribution to prevent climatic change?



# Problem?

...air pollution has been on the agenda of EU and EPA, not climatic change



Future legislation initiatives will focus most likely on reduction of CO<sub>2</sub> and other GHG

## The Challenge

Current legislation does not cover  
a reduction of GHG emissions



## The Solution??

EU (and EPA) will establish new engine  
emission legislation after 2020, which  
will not concentrate on particles, but on  
CO<sub>2</sub> emissions.



Reduction of CO<sub>2</sub>-emissions = minimize engine emissions of CO<sub>2</sub>?

?



**1 liter Diesel converts into  
2,65 kg CO<sub>2</sub>**

- Bearings?
- Transmission?
- Drivetrain?
- Knife sharpening?
- Corn Cracker-efficiency?
- Tire inflation?
- Reduction of losses?
- ...



# Process efficiency and CO<sub>2</sub> emissions

Machines in agriculture may be optimized individually

However, they are not working independently from each other





# Process efficiency and CO<sub>2</sub> emissions

- Tractors do emit CO<sub>2</sub>
- However, the very reason is the job of the implement behind, or the combination of tractor and implement

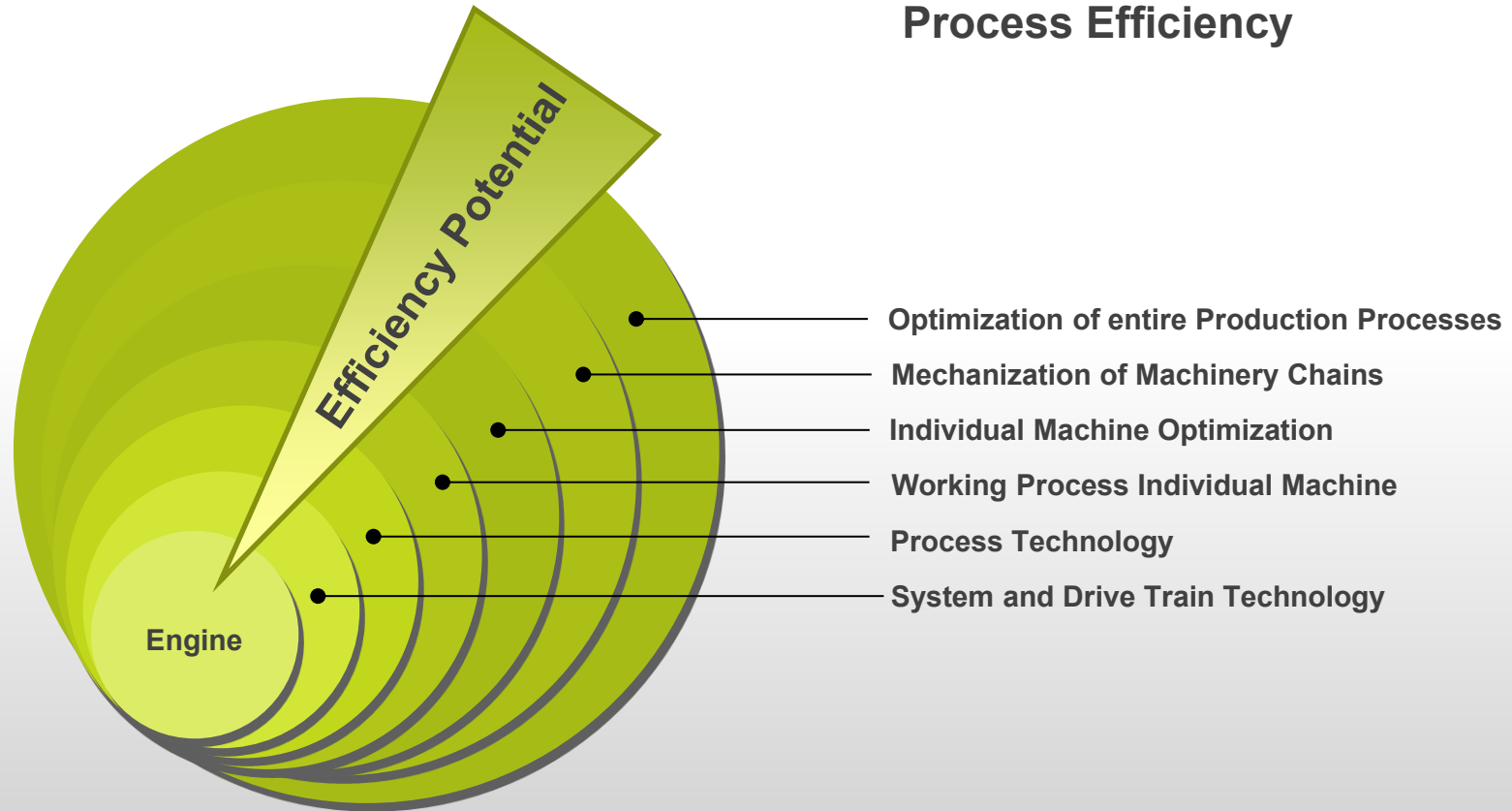
- All components in a mechanization chain are relevant - not just engine carrying vehicles



How to reach the best result

for the environment

## Process Efficiency





## Conclusion for a CO<sub>2</sub> strategy of the Industry

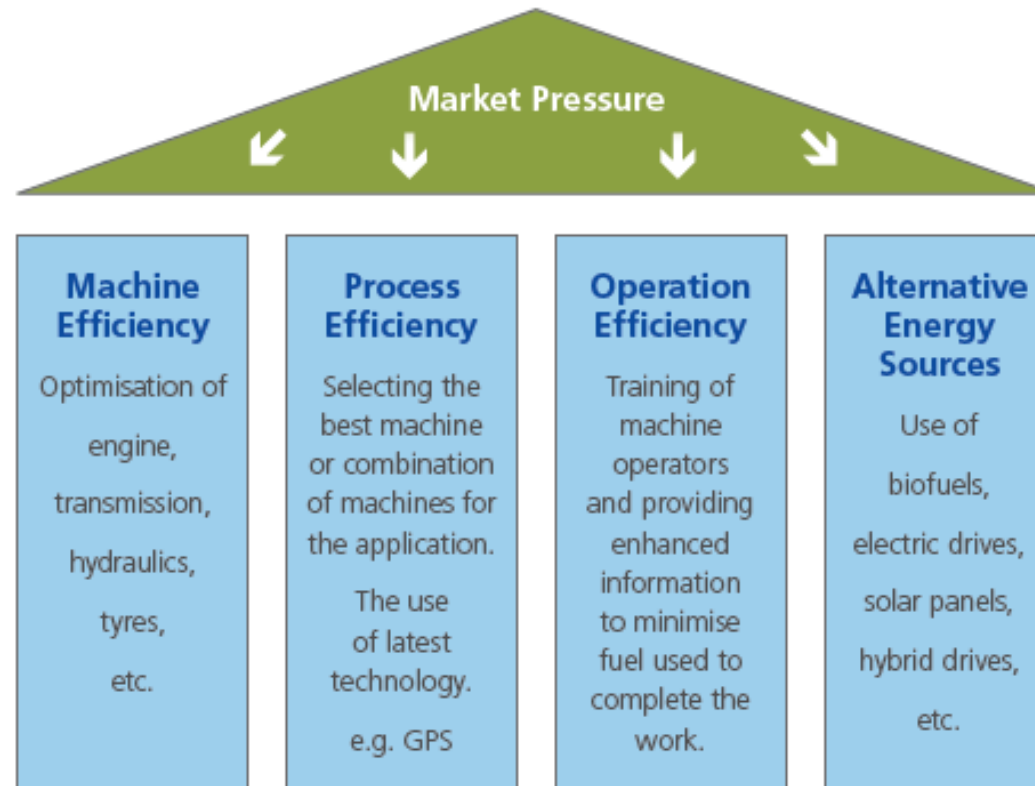
- **CO<sub>2</sub> emission reduction offers many opportunities for high tech solutions**
- CO<sub>2</sub>-reduction potential on engines is limited
- Extending current emission regulations to CO<sub>2</sub> would lead to a major misallocation of engineering resources and limit the competitiveness of the industry
- Many aspects of machines offer additional potential
- In agriculture, it makes no sense to look at individual machines.
- The optimum for the environment will only be achieved, if CO<sub>2</sub> emissions of entire process chains are optimized, as process elements in agriculture do show lots of interdependencies
- Agricultural processes are result oriented. The only benchmark, which makes sense as a standard is **CO<sub>2</sub>-emissions per ton of grain-equivalent produced**



## Conclusion for a CO<sub>2</sub>-strategy:

Market driven approach instead of legislation enforcement

Development of a voluntary commitment of the agricultural industry to reduce CO<sub>2</sub> emissions of mechanization processes, based on 4 pillars





- High Tec solutions may get public applaus just as well as unrealistic romantic dreams about sustainability



**Fawn detection by drones**







We need **BALANCE** to reach the water

- High Tec solutions may provide tremendous opportunities to cope with global challenges
- But we need to concentrate on solutions, which are not just economically attractive, but which are do effectively cope with the challenge of limited global resources

- Sustainability is a question of balance between today's needs and the needs of our great-grandchildren to be able to live as good as we do

