

# Evaluation of the German Fertilisation Ordinance and recommendations for better implementation

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# Structure

1. Implementation of Nitrates Directive in Germany
2. Proposals for amending the Fertilisation Ordinance
3. Obligatory nutrient balances as a key element
4. Discussion

# Introduction – some information about Germany



- 81,7 million inhabitants
- 16,7 million hectare farm land = 50% of total land (70% crops, 30% grassland)
- Intensive farming: 7 t wheat/hectare  
0,8 livestock units/hectare

## Environmental problems of farming:

- Water pollution  
(nutrients, pesticides)
- Gas emissions (green house gases, ammonia)
- Soil erosion
- Loss of biodiversity and landscape quality



# Implementation of Nitrates Directive in Germany

- The German „Action Programme“ is implemented nation-wide through the Fertilisation Ordinance , revision „every 4 years“
- Political objectives to reduce N and P emissions into the environment:
  - Water Framework Directive (nitrate/phosphate pollution)
  - Nitrates Directive ( $\text{NO}_3$  concentration  $< 50$  mg/l)
  - NEC directive ( $\text{NH}_3$  emissions,  $< 550$  kt p.a.)
  - German sustainability strategy (max. 80 kg N surplus/ha)
  - Biodiversity strategy (reduce diffuse N emissions)
  - Greenhouse gas mitigation ( $\text{N}_2\text{O}$ )
- A key requirement: N net surface balance  $< 60$  kg N/ha
- However, N fertiliser a central input to steer farm productivity

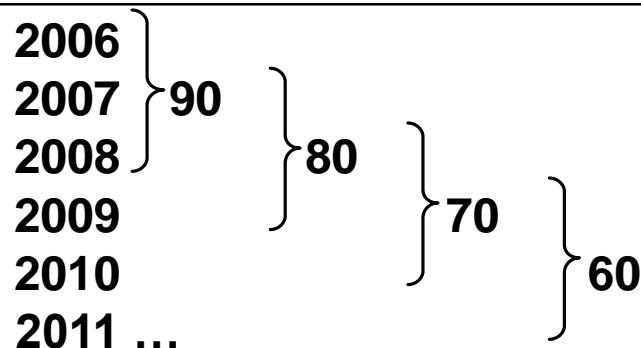
# N net surplus < 60 kg N per hectare as indicator for good practice

- N-surplus = potential emission of N compounds into the environment, better indicator than N input
- Phasing-in until 2011, stepwise reduction
- “Net” means deducting N losses from manure
- so far no sanctions, no enforcement

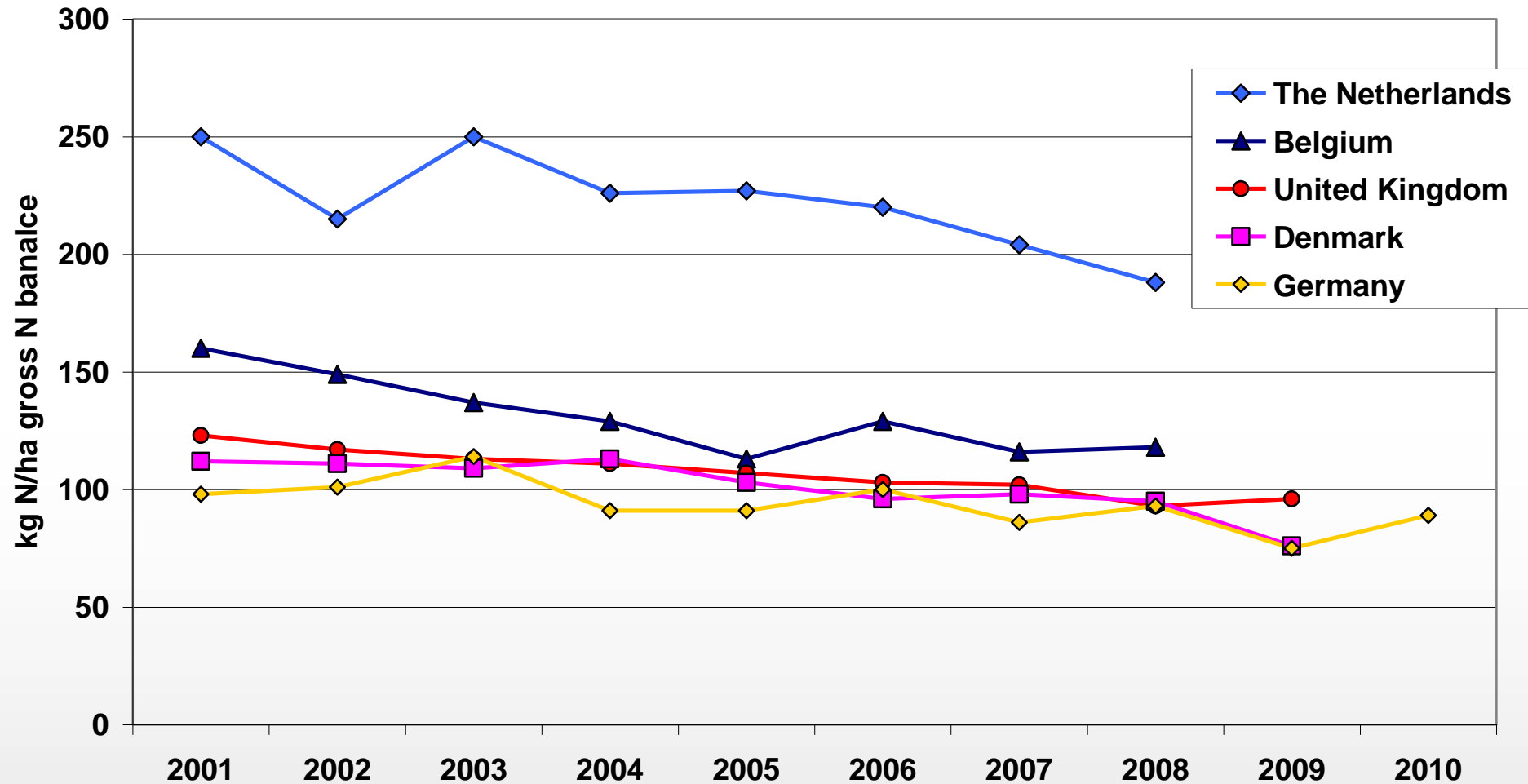
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**N net surplus in kg N per ha**  
**Target values according to DüV**  
**3 year average (§6 (2) 1)**

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# National gross N surface balance in kg N per hectare in Germany and other EU Member States

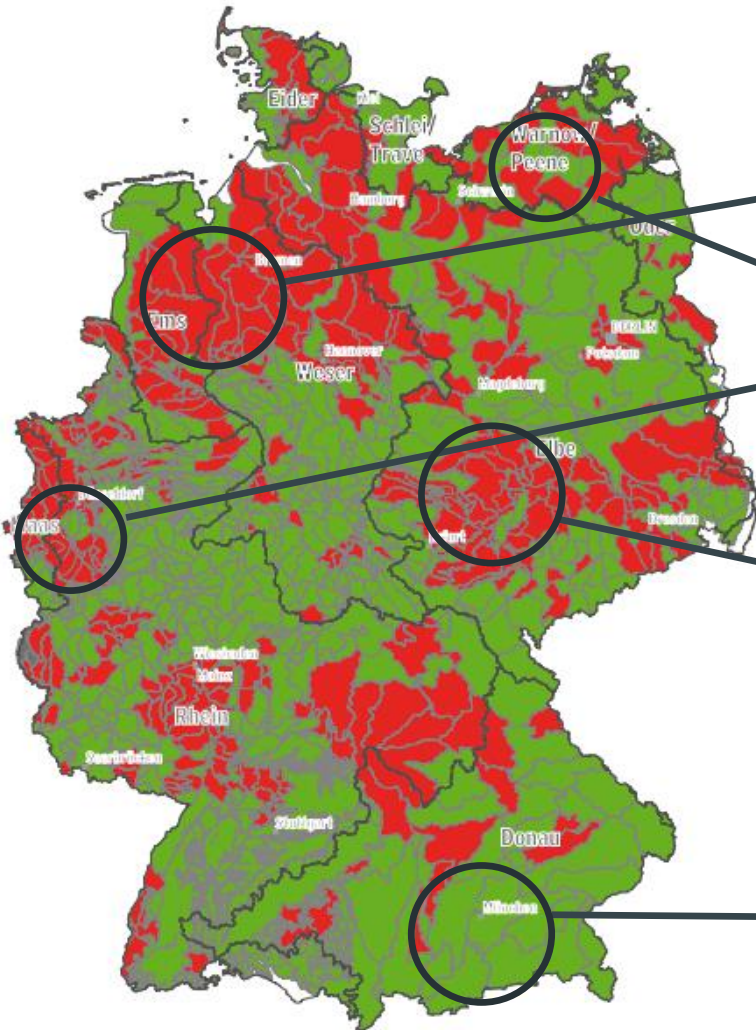


Source: EUROSTAT [http://epp.eurostat.ec.europa.eu/cache/ITY\\_SDDS/DE/aei\\_pr\\_gnb\\_esms.htm](http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/DE/aei_pr_gnb_esms.htm)

# Change of the German ,farm gate balance‘ 1990 - 2010

	in kg N/ha UAA	diff. 2010-1990
Fertiliser		-26,34
N deposition		-1,4
N fixation		-1,33
Seeds		-0,31
Feed (inland)		6,06
Feed (import)		-3,66
<b>Sum of inputs</b>		<b>-26,98</b>
plant products		17,47
livestock products		7,04
<b>Sum of outputs</b>		<b>24,51</b>
<b>Reduction of N balance</b>		<b>-51,49</b>

# Groundwater bodies in bad chemical conditions due to nitrate pollution



**High livestock density,  
sandy soils**

**Crop farming, loam or  
clay soils**

**Crop farming, loess  
soils, very low rainfall**

**High livestock density,  
loam or clay soils,  
grasslands, high rainfall**



# Proposals for amending the Fertilisation Ordinance

**Agreed on by a national working group for evaluation in 2012**

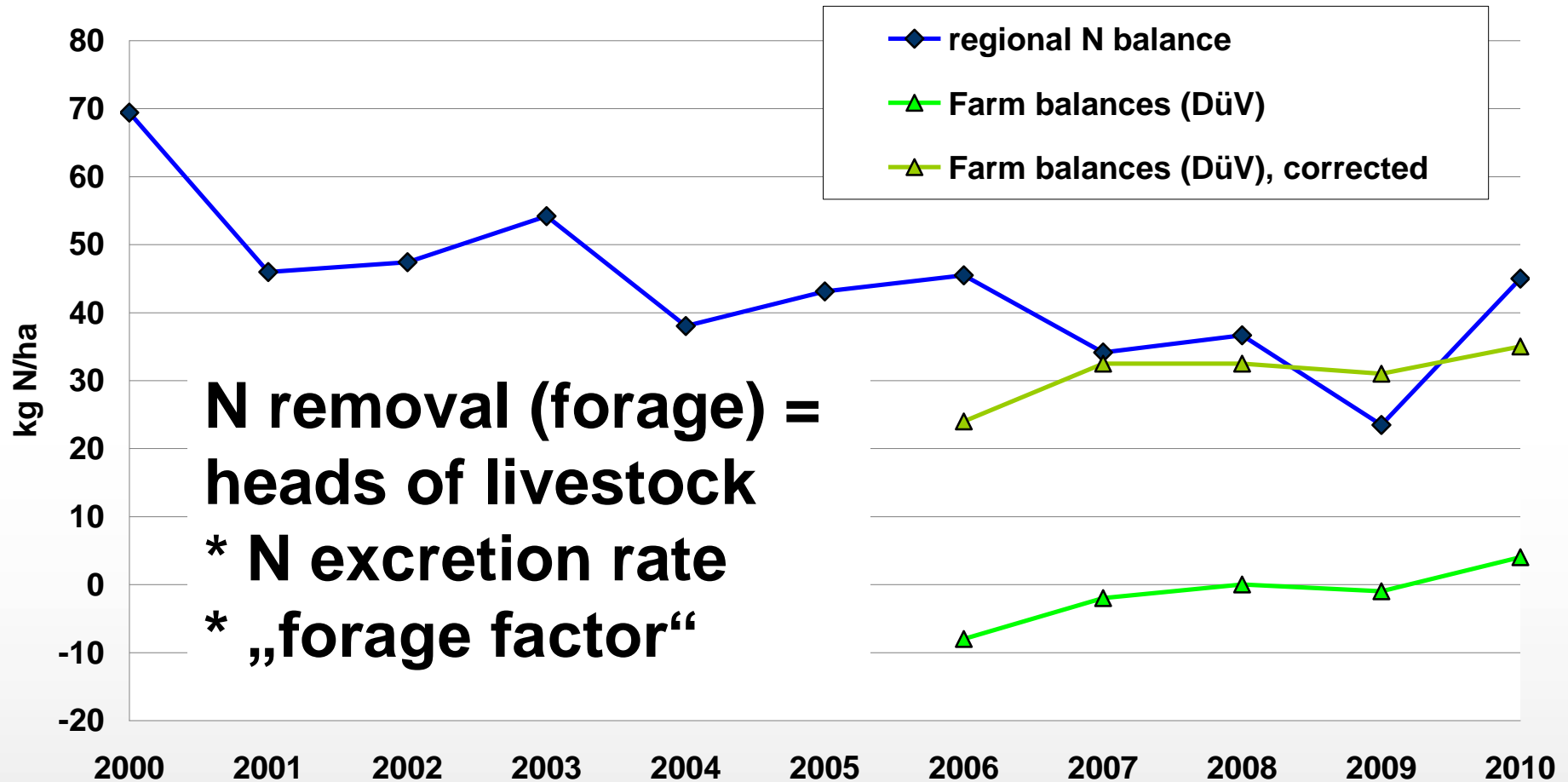
- **Fertiliser planning to be better documented, harmonised guidelines, no obligatory maximum total N input**
- **Banning times to be extended on arable land: after harvest of main crop (except rape, grass, catch crops)**
- **Slurry spreading with better technology (immediate incorporation into the soil, trailing hose / shoes)**
- **Improved calculation of N balance, sanctions for exceeding 60 kg N/ha surplus, P balance = 0 if soil P is high**
- **Extending the 170 kg N/ha threshold for animal manure to all organic N fertilisers (biogas digester residues, compost, etc.)**
- **Improving the enforcement**

# Proposals for amending the Fertilisation Ordinance

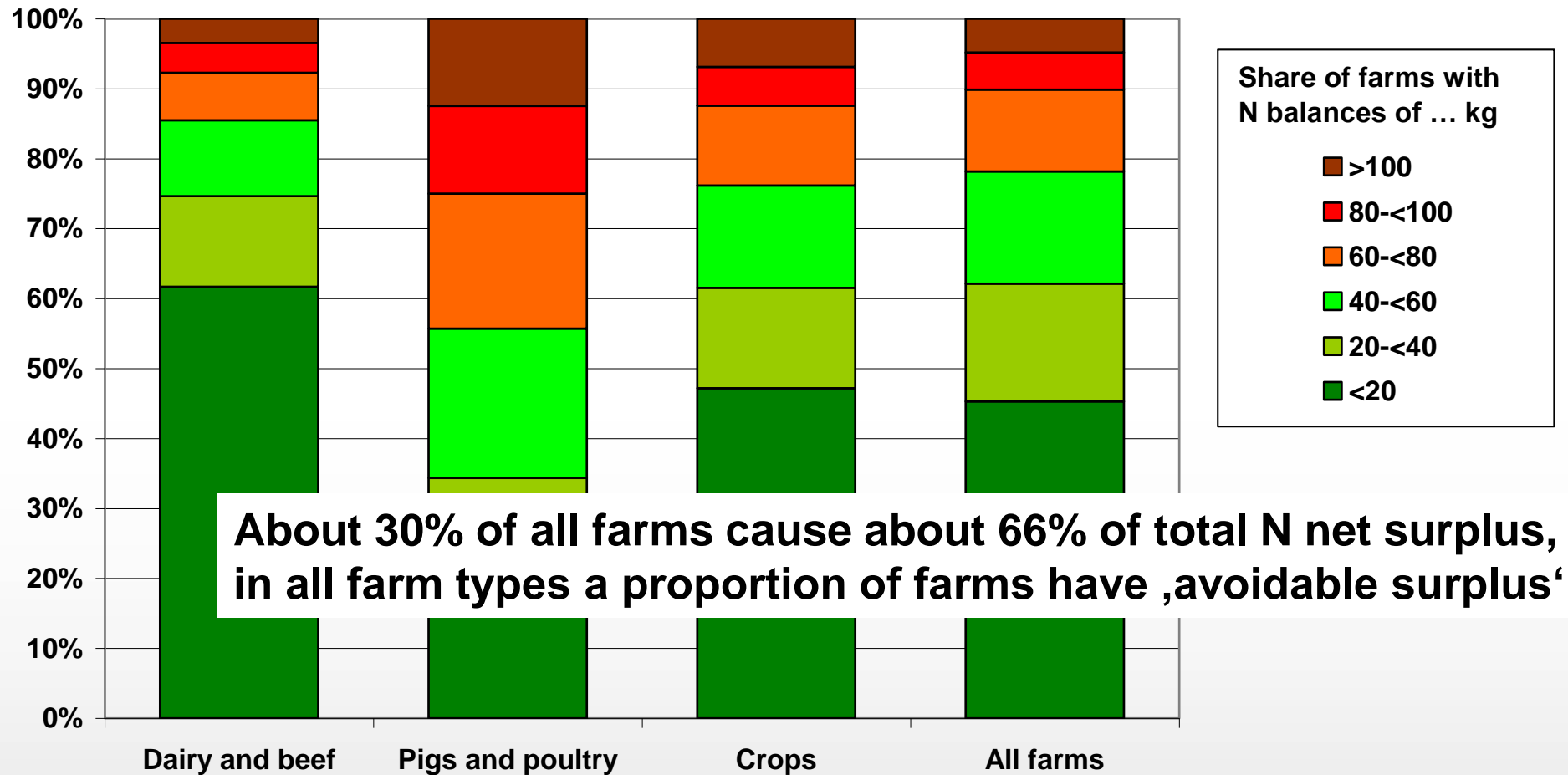
## Discussed amendments (9/2015)

- Fertiliser planning to be better documented, harmonised guidelines, **obligatory** maximum total N input
- Banning times to be extended on arable land: after harvest of main crop (except: **plus cereals after cereals**)
- Slurry spreading with better technology (immediate incorporation into the soil, trailing hose / shoes)
- Improved calculation of N balance, sanctions for exceeding **50 kg N/ha surplus**, P balance = **10 P<sub>2</sub>O<sub>5</sub>**, **forage losses ≤25%**
- Extending the 170 kg N/ha threshold for animal manure to all organic N fertilisers (biogas digester residues, compost, etc.)
- Improving the enforcement, **better access to data**
- **More requirements in vulnerable zones, e.g. 40 kg N/ha**

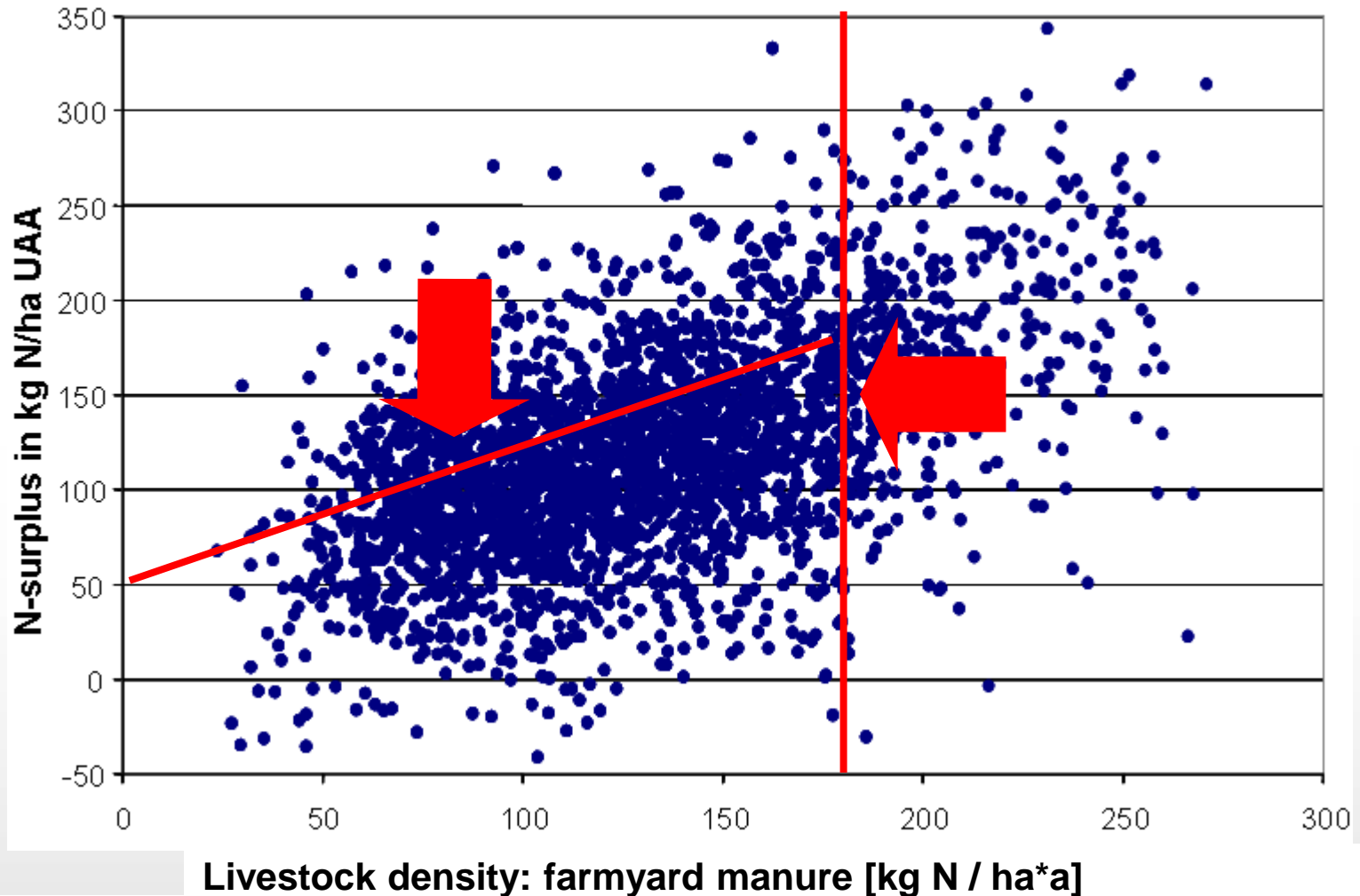
# Improved calculation of N removal through forage (roughage, i.e. grass, silage maize etc.)



# Distribution of net N balances at farm level



# High variance of N surplus in farms with similar structures – scope for increasing N efficiency



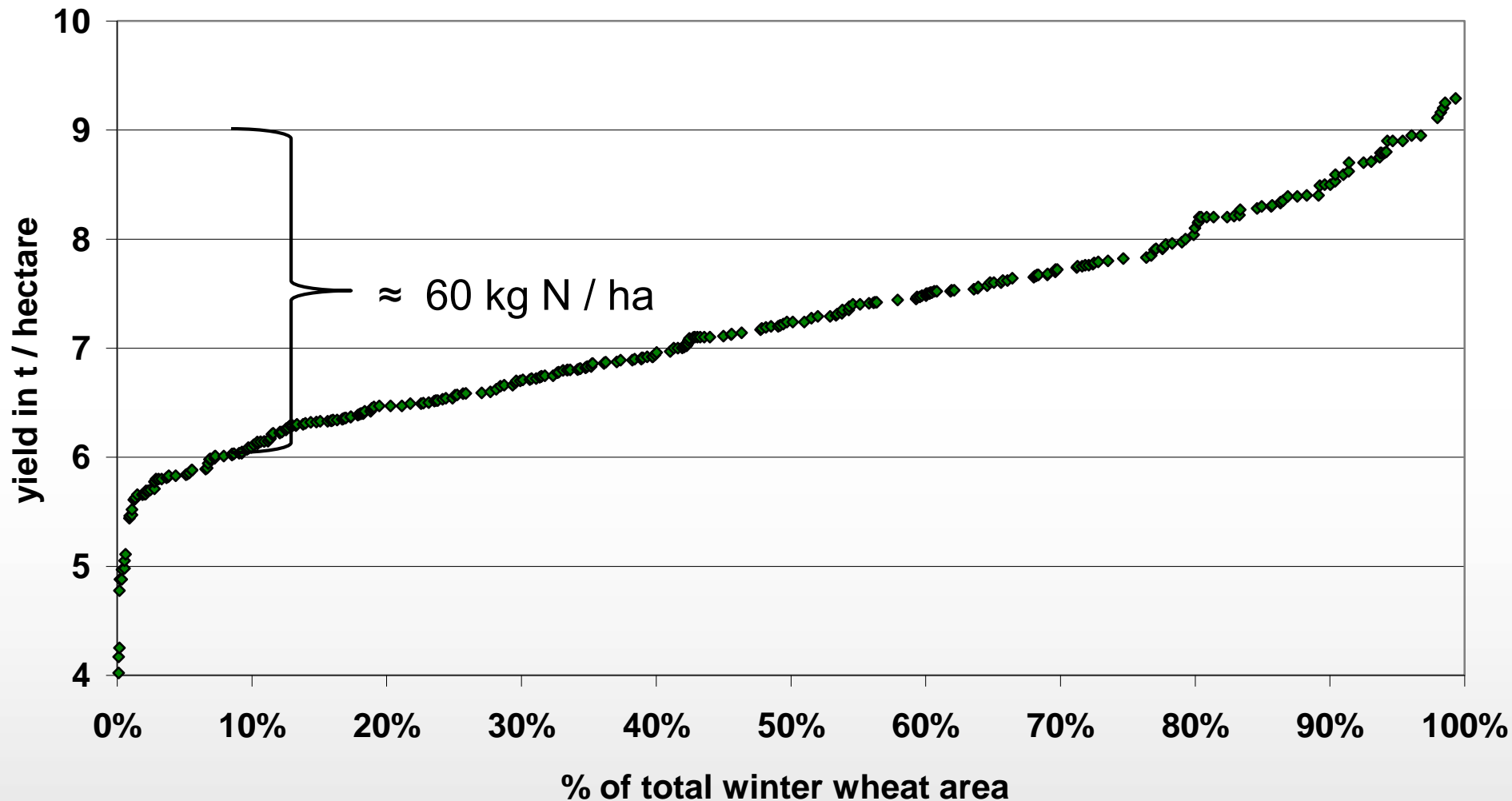
# Data for calculation and verification of obligatory nutrient balances and fertiliser plans

	<b>nutrient (surface) balance</b>	<b>fertiliser plan</b>
Mineral N input	real input	≈ planned + real input
Manure N input	heads x excretion – loss	=
livestock numbers	livestock register	=
excretion rates, losses	standard rates	=
legume N fixation	area x standard rate	=
other N input	receipts/accounts	=
Cultivated area	area register / IACS	=
N removal with harvest	real yields	≠ standard yields
Marketed crops	receipts/accounts	≠ standard yields
Cereals etc. for feeding	plausibility checks	≠ standard yields
Higher N content (wheat)	receipts/accounts	=
Forage crops	consistent with excretion	≠ standard yields (?)

- **Main difference is the calculation of yields**
- **Verification of real yields versus usefulness of standard yields**

# Is assumption of standard yield and N input useful?

## Yields of winter wheat in the German regions (2010)



# Discussion

- **Integrated abatement strategy needed, curbing N surplus while increasing N use efficiency and avoiding negative impacts on productivity**
- **N balance as indicator for good practice:**
  - **20-30% of all farms beyond 60 kg net N surplus per hectare**
  - **Sectoral reduction of up to 10-15 kg N per hectare**
  - **Significant contribution to reduce N loads into water bodies**
  - **Reduction of NO<sub>3</sub> concentration not sufficient for all regions, e.g. if denitrification and/or groundwater recharge is low**
  - **Crucial points: verification of mineral N input and yields, manure im- /exports (online register, e.g. in Lower Saxony)**



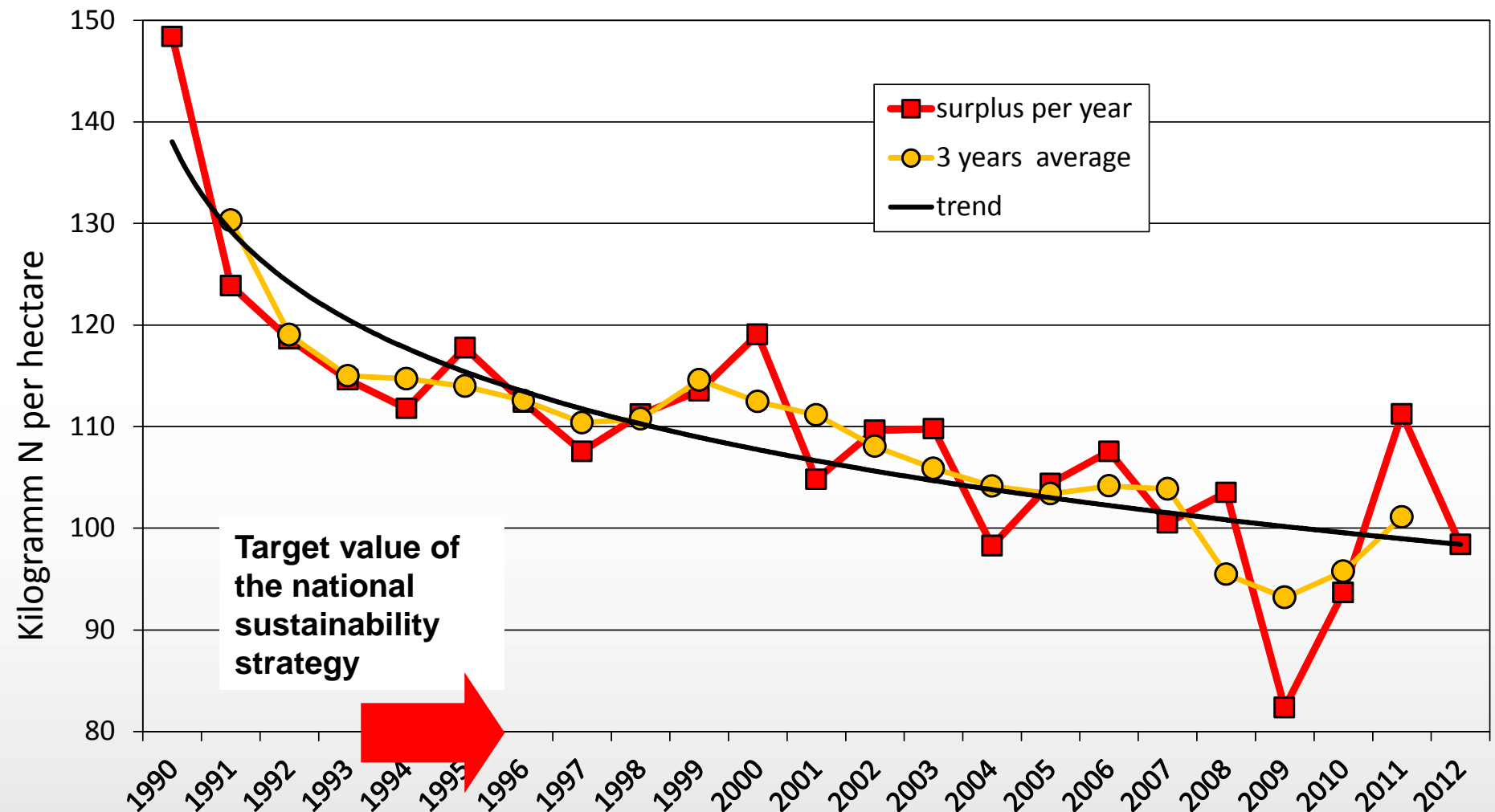
Thank you for your attention



Contact: [bernhard.osterburg@ti.bund.de](mailto:bernhard.osterburg@ti.bund.de)

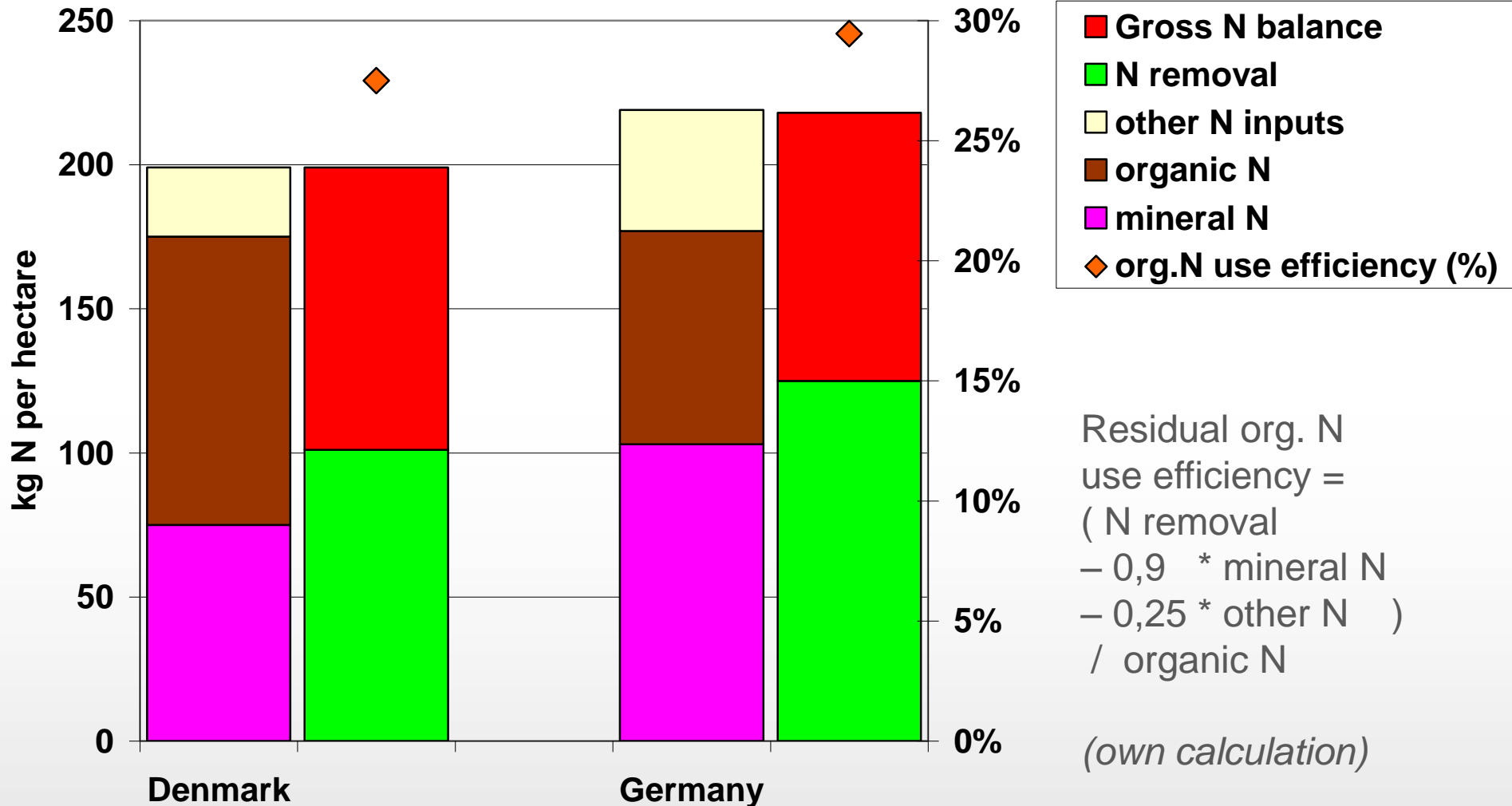
Livestock  
production  
(stable)

# Development of the farm gate balance for the German farm sector

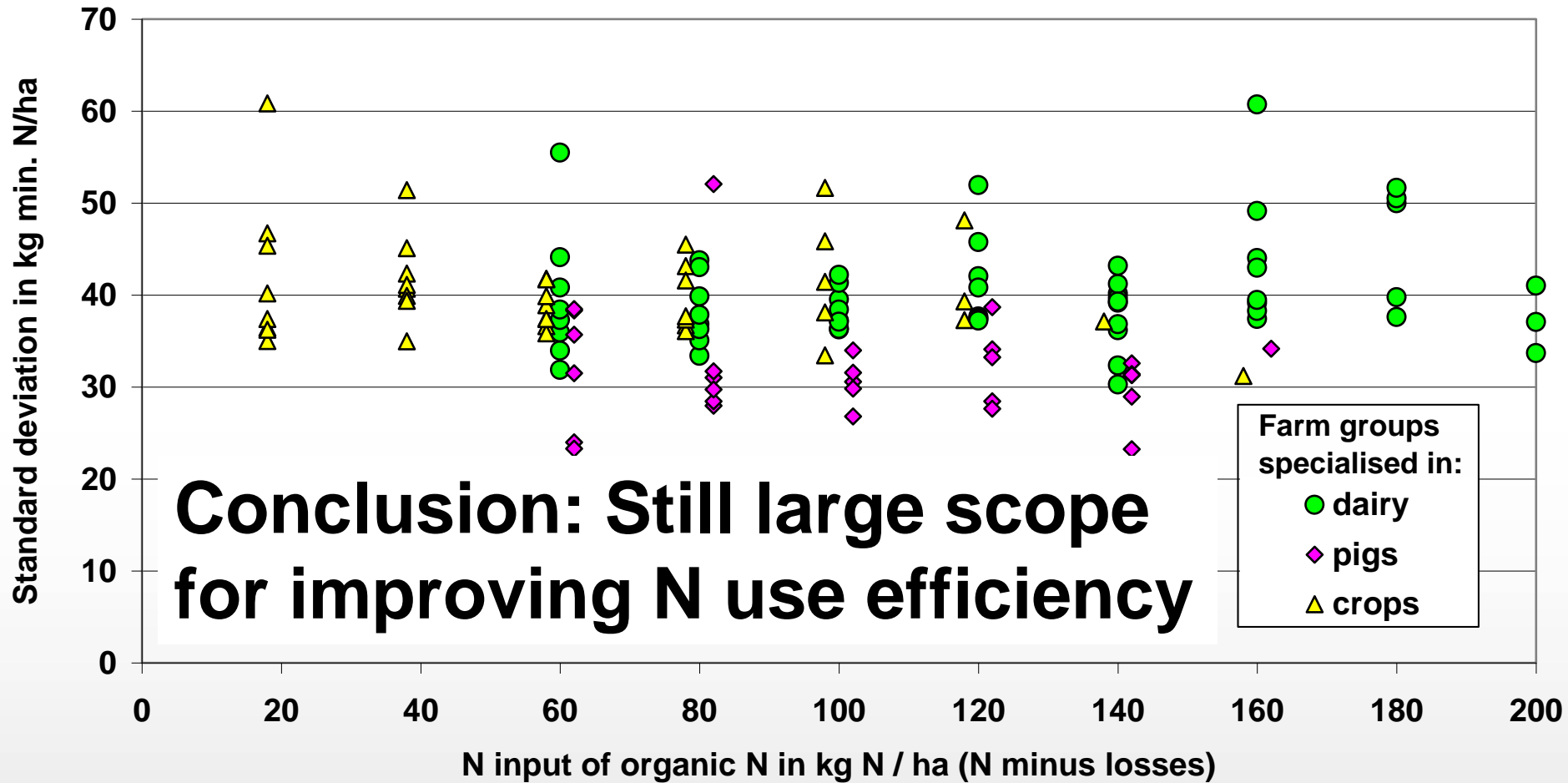


# Gross N balance 2005-2008 according to EUROSTAT

## Denmark and Germany



# Variance of N mineral fertiliser input per hectare in homogeneous farm groups



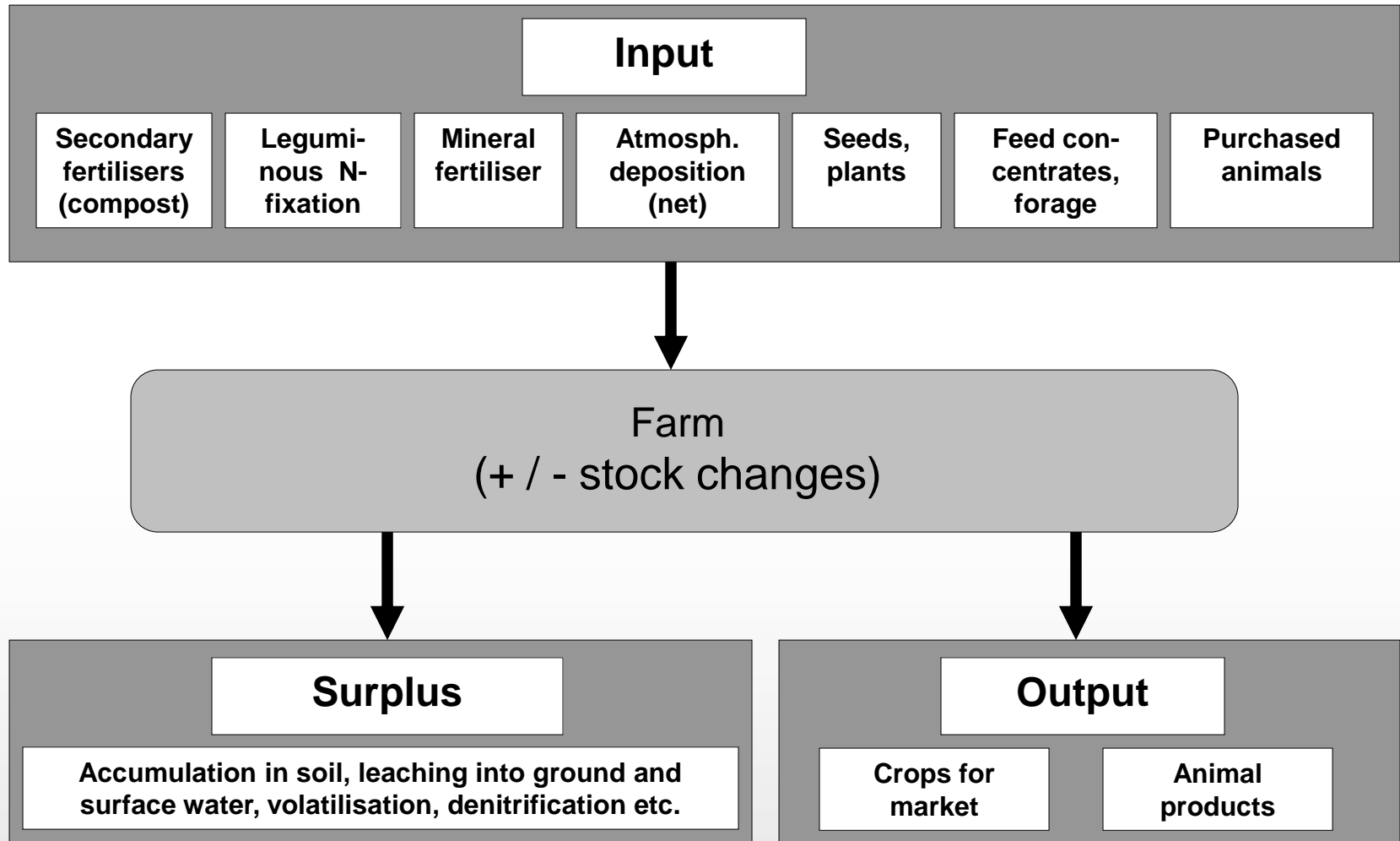
# Data sources

	Suitability	Plausibility	Availability at farm	Acceptance by	Reliability	Controllability	Administrative effort
farm accountancy data	++	+	+	0	+	+	0
farm accounts for branches	++	++	-	+	0	++	++
IACS	+++	+++	+++	+++	+++	+++	++
Livestock register	+++	+++	+++	+++	+++	+++	++
Trade register, receipts	+++	++	++	++	-	++	++

+ most appropriate  
 0 average  
 - less appropriate

- Data sources available, but cross-checking necessary
- incentives for unregistered trade / purchase ?
- Manure im- and export: better register needed
- Challenge: reduce admin. effort and increase reliability

# Farm Gate Balance



# Surface and Stable Balance

