“Threats of land use on groundwater resources”

is it …

***threats from* land use on groundwater?**

or

threats for farms *because of* groundwater?

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Farmers are the primary managers of rural areas

- The countryside extends often right up to the very start of the city
- Farmers are main actors in the use of water and their production have an impact on groundwater

➡ Farmers play a vital role in water management in the countryside and in peri- and urban areas.

They must be part of any solution.

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Threats *from* land use on groundwater resources; Nitrate

- Groundwater is vulnerable both to point sources of pollution and diffuse sources;
  - nitrate pollution, mainly as diffuse pollution from land use
  - point source pollution might come from intensive livestock husbandry and slurry stores.
- Good agricultural practices reduce the Nitrate content in the ground water significantly.

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Significant reductions in nitrate in groundwater

- In Denmark planning for the protection of the drinking water resources has taken place since the 1980'ties.
- This planning has had a significant positive effect on the nitrate load in the groundwater.
- A number of practices in agriculture has been changed (regulation on manure handling, 10 pct. below economic optimum of N, etc).

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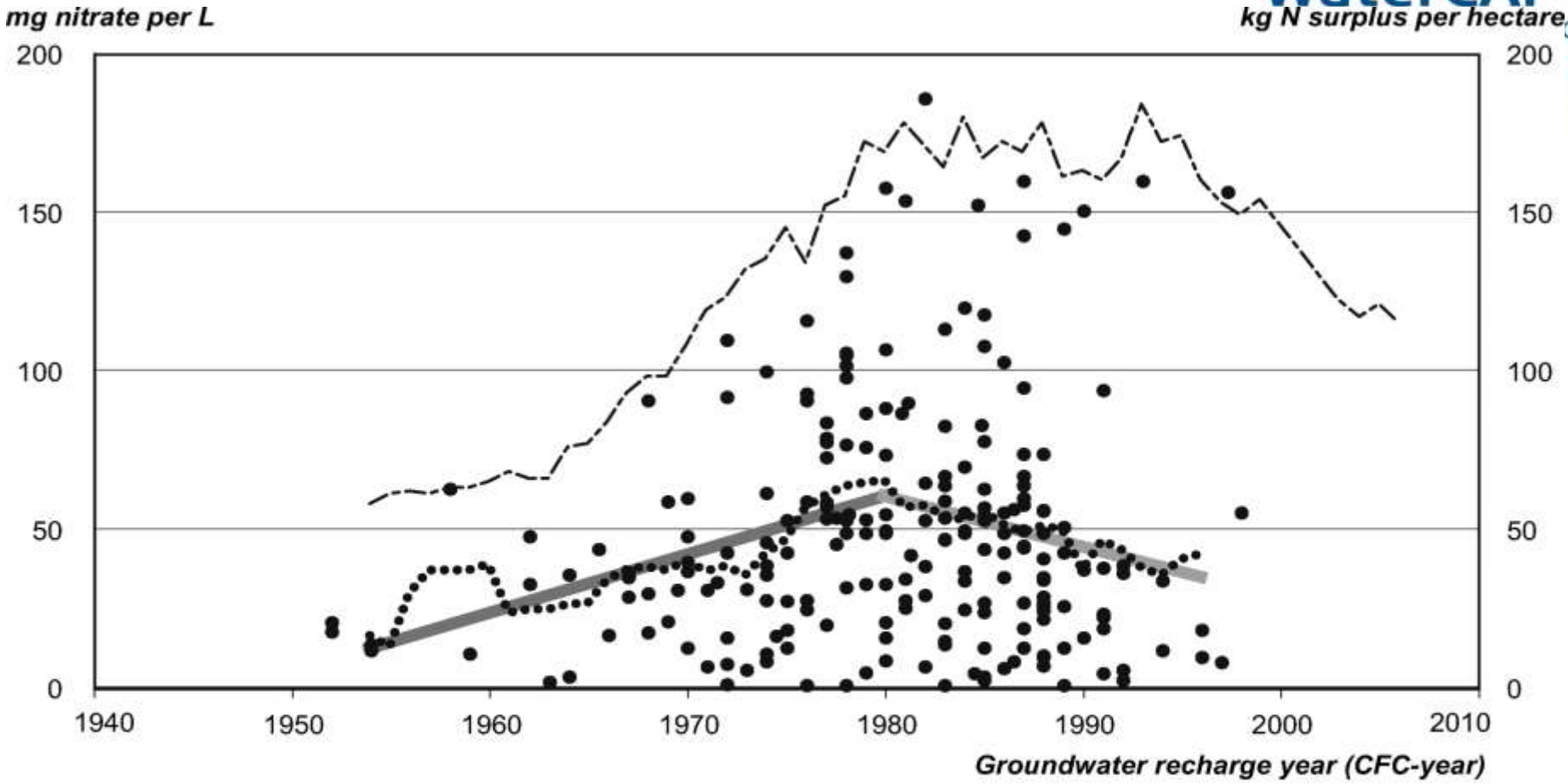
The effort has had an effect



Farming problems related to ground-water

- Droughts
- Limiting factor for crop protection products and fertilization due to pesticides, nitrogen (and phosphorus)
  - (even that it might come due to flooding of the sewage system and wastewater ends up in the groundwater)
- Extra restrictions
  - in areas with drinking water resources
  - in field boundaries

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Farmers part of the solution

- Farming with water - the farmer as water managers
- Less use of water, pesticides, phosphorus and nitrogen
- Constructions of buffer zones and water bassins, growing willow and elephant grass, etc.
- Catchment based cooperation

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Threats of landuse *because of the* groundwater resources

- Too bad and lack of groundwater threats agricultural production -> need for sustainable water management for food production

No food because of no possibilities for fertilizing and irrigation -> This ecosystem service diminish…

→ It takes a holistic view on groundwater management. Competing demands on ecosystem services need to be balanced.

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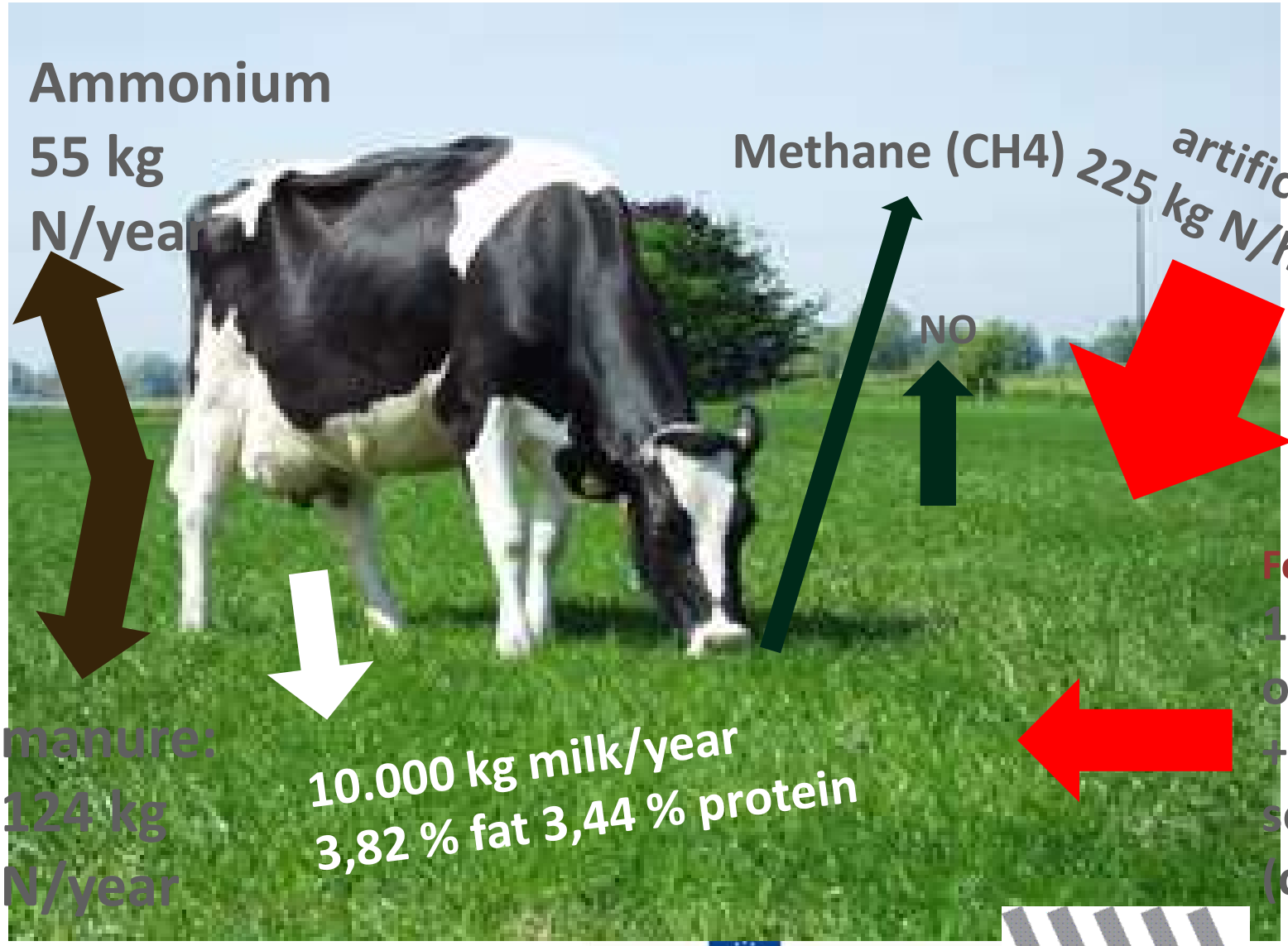
Showcase: FARM LAND USE makes a difference



WaterCAP Taskforce

Footprint

1 hectare fodder on the farm
+ 1 hectare somewhere else (concentrate)

What you do not see

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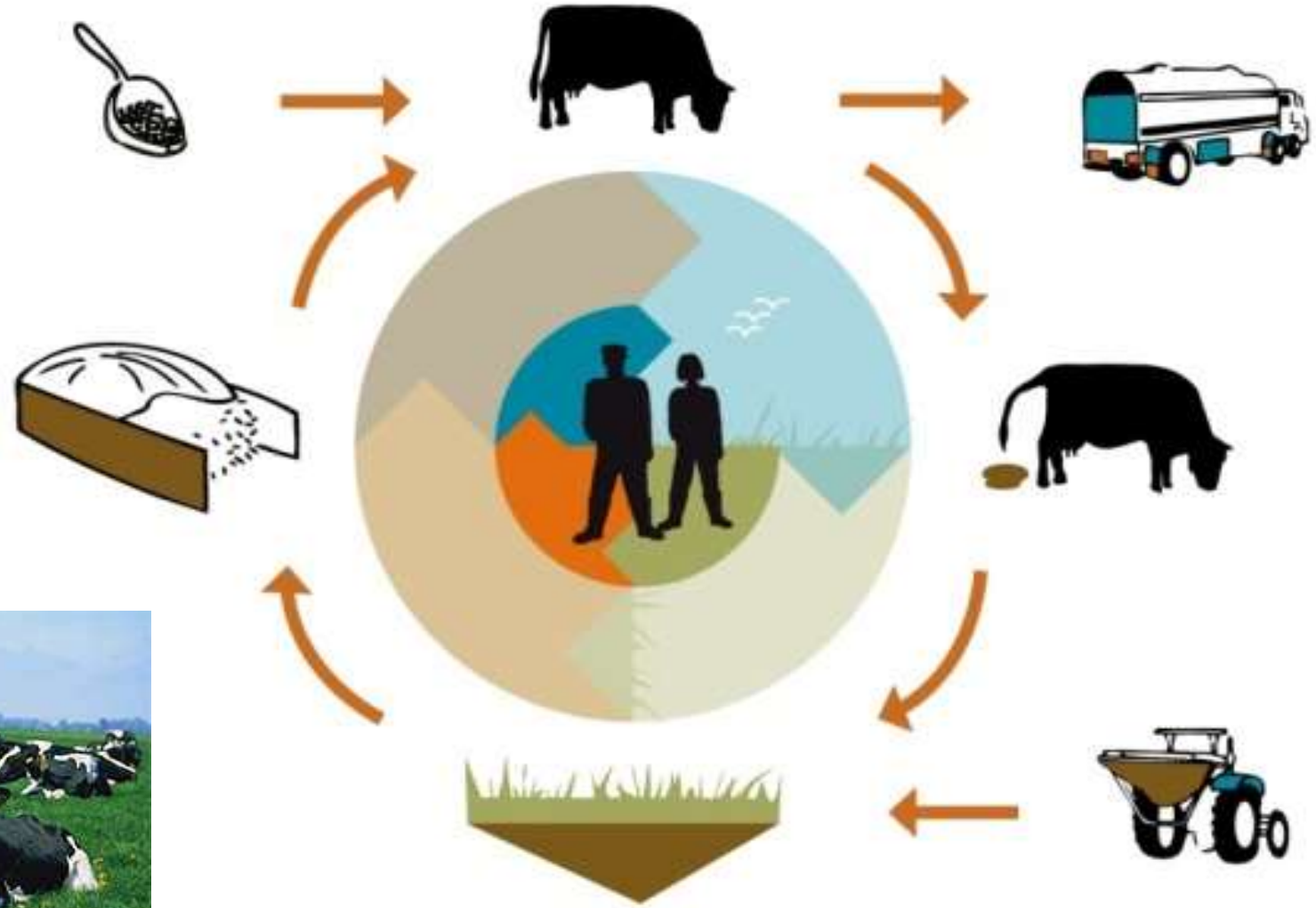
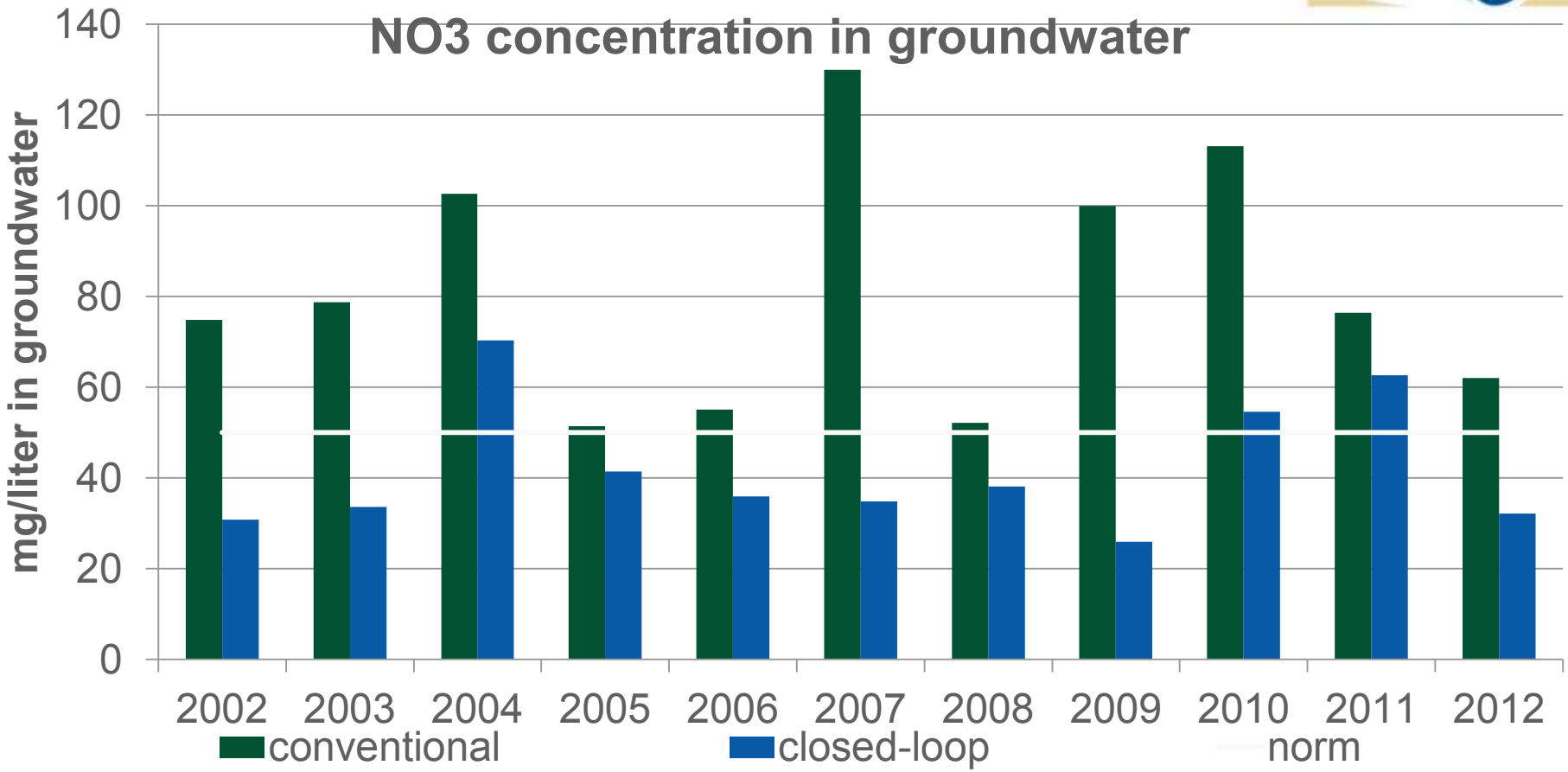
Key: MORE EFFICIëNT CYCLE of NUTRIENTS
→ reduced farm cost + cleaner water



Result: Nitrate emissions reduced

[*province of Drenthe, Netherlands*]



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Potential lower emissions for province Drenthe

- performance top 20% compared to average
- savings upscaled over 66.000 ha in Drenthe

- lower N soil surplus : **4.224 ton N** in NO_3
  - top 20% at 91 kg/ha performes 64 kg/ha lower than average 155 kg N/ha
- lower ammonia emissions: **500 ton N** in NH_3
  - 5 kg N/10.000 kg milk x 1 billion kg (33 instead of 38 kg N)
- lower P soil surplus: **1.056 ton P_2O_5**
  - top 20% at 5 kg/ha performes 16 kg P2O5/ha lower than average 21 kg P2O5/ha

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Upscaling
Performance based Rewarding

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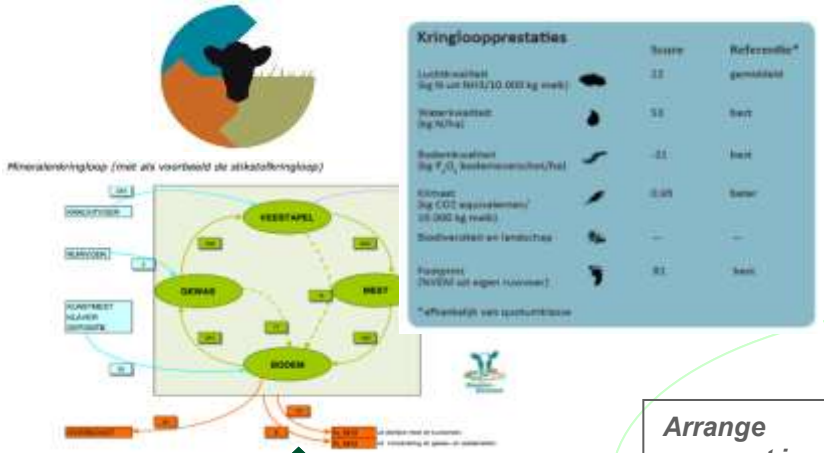
1. Collect Farm data → efficiency N+P



2. Improve via workshops, trips and farmers

Personal advice for training etc.

Arrange payment in Euro or farm development rights

Certify quality via formal trainers and 'diplome'

Negotiate reward for performance

3. Transparancy in resultats: certificate

4. Negotiate reward for improvement!

- organize delivery to farm
- more production space for farm
- premium from waterboard
- farm publicity + "licence to produce"

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THE SECOND CYCLE

- 1st nutrient cycle to be ‘closed’ is on-farm

- **2nd nutrient cycle to be ‘closed’ is regional: consumer-producer**

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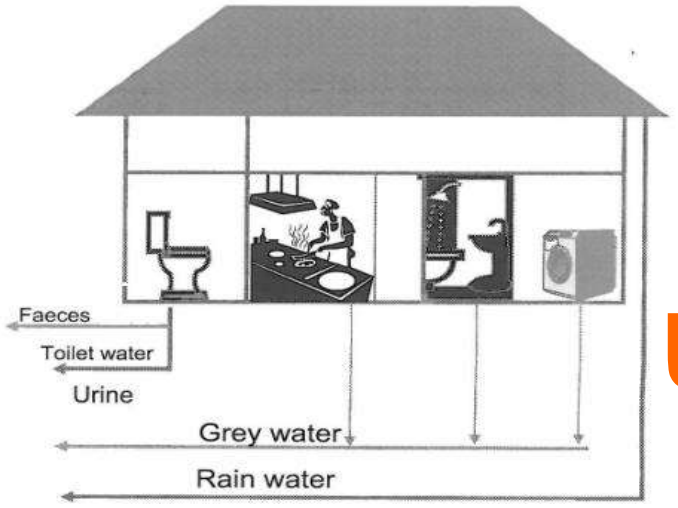
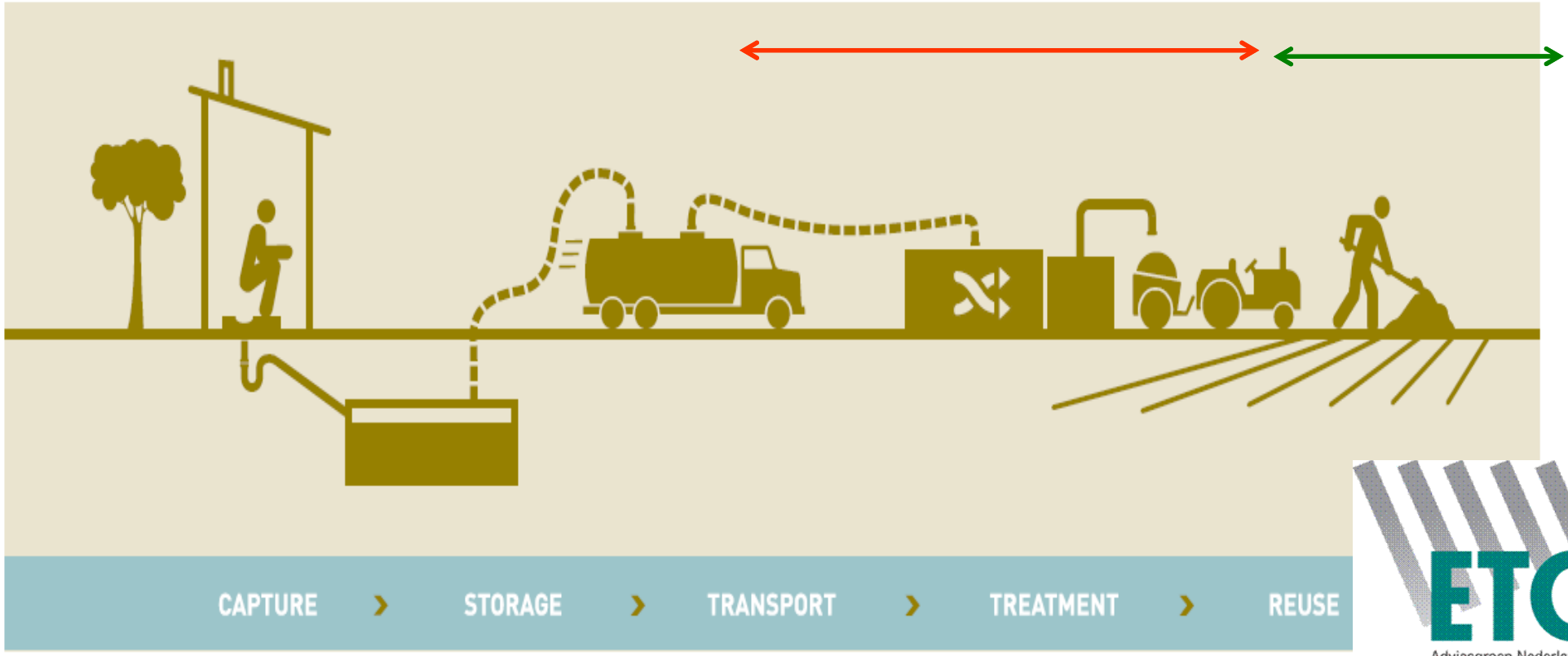
Separate collection and treatment of flows



Recycling Waste = Urban-Rural Linkage

Create value from Waste



- So the *farmers* both have *farming problems* because of the groundwater challenges and *are part of the solution to the problems*

- Thanks for listening

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