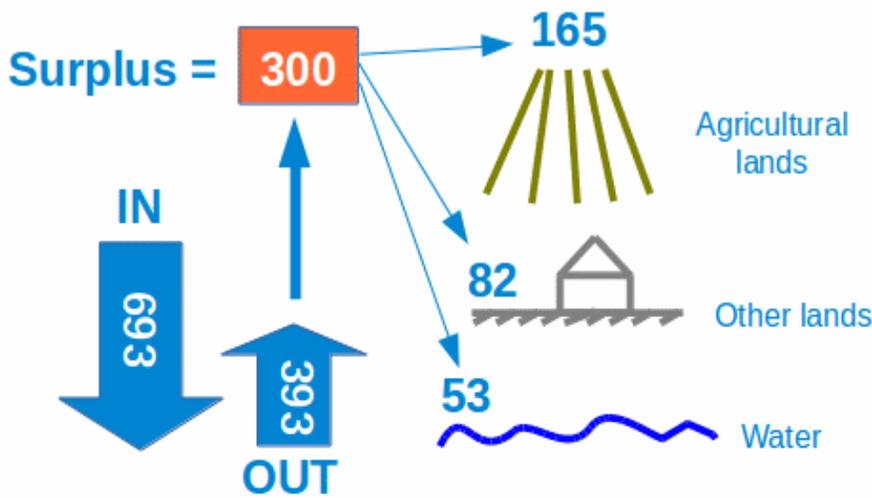


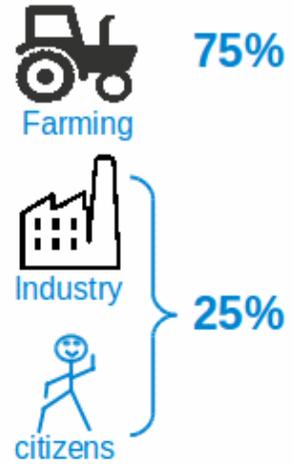
Nitrogen in the Netherlands: problem or opportunity?

Yearly surplus in soil and water



(in million kg, 2013 numbers)

Sources



Water issues



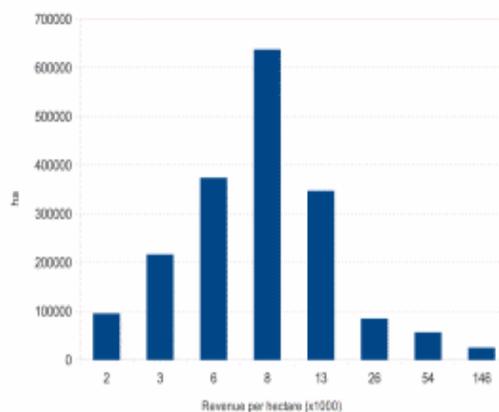
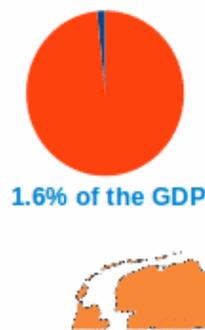
Costs of Water System Management

€ 1.3 billion

Paid by:



Agriculture and economy



Wide range of economic productivity with average €11.000 per hectare

Increasing nutrient use efficiency and economic productivity of Dutch farms will keep The Netherlands the global leader in water management and agriculture

Derk Kuiper, Good Stuff International, 12 November 2015 – derk@goodstuffinternational.com

Good Stuff International (GSI) recently developed the WaterData4Action service. To showcase WaterData4Action, it was applied to understand the environmental, social and economic effects of nitrogen use in the Netherlands as a foundation to develop positive action to curb negative effects and bank on opportunities. GSI is aware that the use of organic and artificial fertilisers in the agriculture sector is a sensitive issue. That is why the analysis was conducted using publicly available data, information and tools to enable full verification of the analysis. A full list of sources used is given as footnotes.

In the Netherlands every year there is an accumulation of nitrogen (N) in soils, for 2013 this was 247.000 tonnes of N. Almost 70% of the accumulation, or 165.000 tonnes occurs in soils under agriculture¹. This means that every hectare of arable land has an average annual nitrogen surplus of 73 kg². Also, from every hectare, an average of 23 kg of nitrogen runs off to surface water and or leaches into the groundwater. This means that on average 96kg of nitrogen per hectare are lost from the agricultural system by accumulation in the soil and emission and leaching to water, each year. This is 36% of the total nitrogen that is applied every year.

While decreasing since the 1990s when the EU Nitrates³ and Water Framework Directives⁴ came into force, the surplus of nitrogen still leads to higher average concentrations than the norms for surface waters⁵. In groundwater of boggy and clayey soils, the decrease in nitrogen concentrations has been substantial and is below the norm now. But, the groundwater of sandy soils in the Central and Southern part in the Netherlands, but especially in the South, still has substantially higher concentrations than the norm.⁶

While the trend is that levels of nitrogen surpluses in the soils, ground and surface waters are decreasing since the legislations were implemented, progress is stalling⁷. This may be the result of large nitrogen stocks in the soils that are slowly reaching the ground and surface water. Or it may be that the loads of nitrogen are still too high. A quick calculation shows that in order to dilute the nitrogen that runs off and leaches to an acceptable surface water standard⁸, we need 5300 million cubic meter of water, or 17% of the total Dutch rain that falls in a year⁹. In the summer season more than half of the country (especially the sandy part) has a rainfall deficit¹⁰. This means that especially in summer season, rain can not dilute nutrient concentrations in surface waters and as a result concentrations in surface

¹ Stikstof en Fosfor in Nederland: <http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=37655&D1=18-39&D2=0&D3=a&HD=120905-1213&HDR=G1,G2&STB=T> retrieved on 20 October 2015

² Number of hectares of arable land, 2247754 (<http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=70262ned&D1=26&D2=0,4,11,52,77,102,412,696&D3=3-6&VW=T>)

³ EC, 1991, Nitrates Directive, http://ec.europa.eu/environment/water/water-nitrates/index_en.html

⁴ http://ec.europa.eu/environment/water/water-framework/index_en.html

⁵ PBL, 2014, De kwaliteit van het Nederlandse oppervlaktewater beoordeeld volgens de Kaderrichtlijn Water (KRW). De KRW-beoordeling uitgesplitst naar verklarende overzichten, Planbureau voor de Leefomgeving, Den Haag, 2014

⁶ 5e Nederlandse AP betreffende de Nitraatrichtlijn (2014 – 2017), 02 December 2014, retrieved on 20 October 2015,

<https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2014/12/02/5e-nederlandse-ap-betreffende-de-nitraatrichtlijn-2014-2017/5e-nederlandse-ap-betreffende-de-nitraatrichtlijn-2014-2017.pdf>

⁷ Willems, W. J. et al. (2012), Evaluatie Meststoffenwet 2012: syntheserapport, Den Haag: Planbureau voor de Leefomgeving retrieved from <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2012-evaluatie-meststoffenwet-2012-hoofdrapport-624.pdf> on 10 November 2015,

⁸ EU standard of 10 mg of nitrate per liter of water

⁹ KNMI, 2014, Jaaroverzicht weer in Nederland 2013. De Bilt

¹⁰ KNMI, 2015, Doorlopend neerslagoverschot, retrieved on 20 October 2015, <http://www.knmi.nl/nederland-nu/klimatologie/geografische-overzichten/neerslagoverschot>

and ground water go up at least temporarily. The combination of nutrient rich waters with warmth and long hours of daylight causes algae and invasive pest plants to grow rapidly, deteriorating water quality further and even obstructing river courses and canals.

It is not surprising that water managers in The Netherlands, mention nitrogen pollution of ground and surface water bodies as a key environmental issue that directly increases the costs of the management of surface and ground water. In 2015, 48% of the costs for water system management are paid by owners of real estate while citizens pay 40% and land owners 12%.¹¹. This suggests that the lion share of the costs for managing the nitrogen pollution from the agricultural sector, is paid by citizens and owners of build real estate.

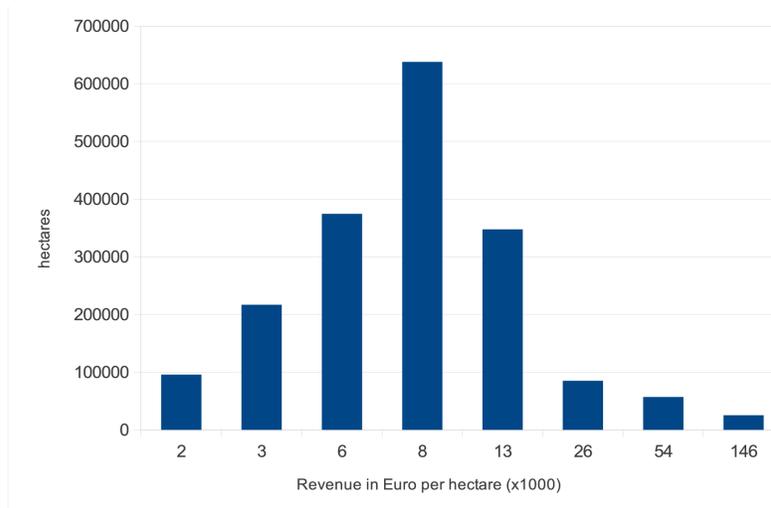


Figure 1: Average revenues in 1000 Euro per hectare of agricultural land in The Netherlands¹²

Taking the economic perspective a bit further, in 2014 the total economy (GDP) of the Netherlands had a volume of 661 billion Euro. In the same year, the agriculture sector added 1.6% to this Gross Domestic product¹³. Currently, the agriculture sector uses 44% of the surface area of the Netherlands. The economic productivity of the agricultural lands varies widely from 2.000 – 146.000 Euro per year per hectare with an average of 11.000 Euro per hectare per year (see the figure 1). This suggests that the sector is highly versatile in its practices, including those for fertility management. The evaluation of the manure policy in 2012 reported this as well¹⁴.

11 Water Boards, revenues and taxes, <http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=71974ned&D1=a&D2=l&HD=090212-1348&HDR=G1&STB=T> retrieved on 20 October 2015

12 Landbouw; economische omvang naar omvangsklasse, bedrijfstype <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80785NED&D1=a&D2=a&D3=0&D4=a&HDR=T,G3,G2&STB=G1&VW=T> retrieved on 20 October 2015

13 Bbp, productie en bestedingen; kwartalen, waarden, nationale rekeningen <http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=82601ned&D1=0-63&D2=0,2&D3=96-101&VW=T> retrieved on 20 October 2015

14 Willems, W. J. et al. (2012), Evaluatie Meststoffenwet 2012: syntheserapport, Den Haag: Planbureau voor de Leefomgeving retrieved from <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2012-evaluatie-meststoffenwet-2012-hoofdrapport-624.pdf> on 10 November 2015,

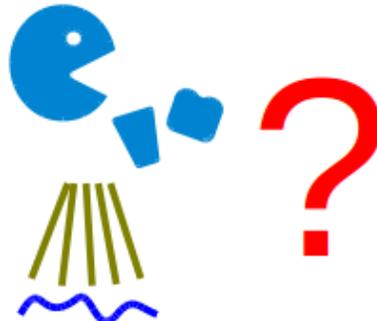
In 2050: much more food needed with same land and water, how?

2015



+70%

2050



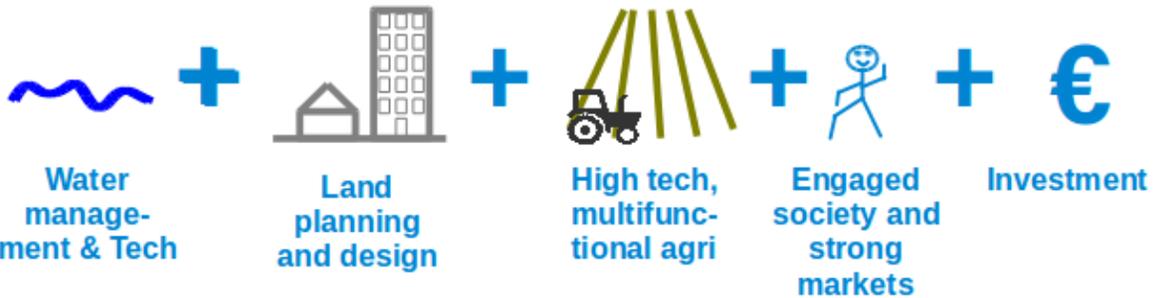
+0%



INCREASE

Nutrient use efficiency
Water use efficiency
Land productivity

Action: bring sectors together, innovate and invest



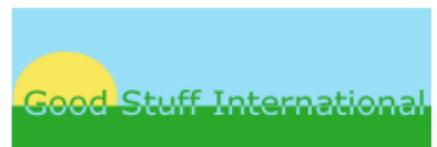
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If we bring back to mind the inefficiency of nitrogen use of the sector, the associated high contribution to groundwater and surface water pollution as well as the relative low level of payment of taxes for water management, it is clear that there is a need to change the current practice in at least a part of the agricultural sector. The required change is not a challenge but an opportunity. Feeding a world population of 9.1 billion people in 2050 will require raising overall food production by some 70 percent between 2015 and 2050¹⁵. This requires agriculture all around the world to become extremely more efficient and productive.

The Netherlands should literally invest in this opportunity and reinvent and reshape its own agricultural sector as an example for the world. To do this, we need to bring together several key fields of expertise that the country is known for, including but not only 1. agricultural knowledge and technology, 2. water management expertise, 3. planning and design and 4. entrepreneurship and investment. And, not only the global market for agricultural produce and commodities will exhibit rapid growth, it is to be expected that the market for knowledge and technology on water management and agriculture will also rapidly increase. Both these valuable markets are too good an opportunity for the Netherlands to let slip away.

In The Netherlands there are many initiatives¹⁶ working on the transition of agriculture, improving the nutrient and water efficiency as well as overall agri water management but it seems they all have their own focus areas, may even compete or work at different scales and are disconnected. The key outcome of the analysis above is that the urgency of increasing global nutrient and water use efficiency while increasing overall land productivity is a opportunity. The next action is to bring together initiatives and knowledge institutes to move towards integrated innovative solutions. And actually this is not only the case for the Netherlands but also for Germany¹⁷ and wider Europe.

15 FAO 2009, High level Expert Forum "How to feed the world in 2050", Rome, Italy.

16 Examples are: NWP Nutrient Platform for Phosphate, Agrofood Brabant, LTO Deltaplan Agrarisch Water Beheer

17 Mekonnen M., Hoekstra A.Y., 2015, Global Gray Water Footprint and Water Pollution Levels Related to Anthropogenic Nitrogen Loads to Fresh Water, Environmental Science and Technology.