Closing the mineral cycles at farm level – Good practices to reduce nutrient losses in Wielkopolskie

Causes and effects of nutrient losses in the region and good practices

Photo: Polish Green Belt

Poznań, Poland

13 November 2014

Presentation overview

- Aim and objectives of the project
- Approach taken in the project
- Overview of Wielkopolskie
- Impact of nutrient losses on farm, economy and the environment
- Achievements made by the region to address nutrient losses
- Good practices at farm level

General information on the project

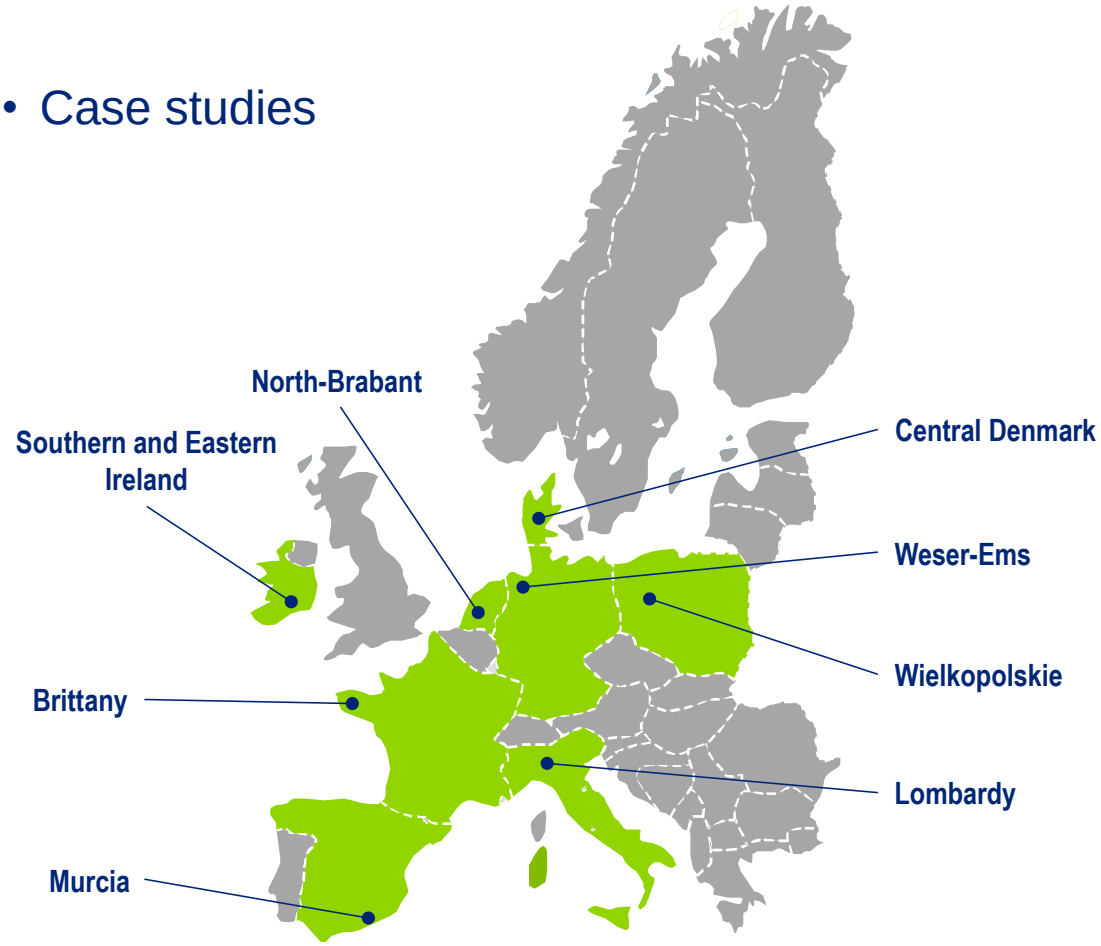
- Project team:
  - BIO by Deloitte (co-leader)
  - Ecologic Institute (co-leader)
  - AMEC
  - DTU
  - Universita degli studi di Milano
  - Wageningen UR, LEI

- More information on project website: http://www.ecologic.eu/10532

Aims, objectives and overall approach

- Identify most promising measures to improve use of nutrients and reduce negative impacts

- Case studies



- Dissemination of the findings
  - Leaflets developed for each of the 8 regions
  - Four regional conferences
    - Portlaoise, Ireland – 28th October
    - Murcia, Spain – 04th November
    - Milan, Italy – 05th November
    - Poznań, Poland – 13th November
  - Final conference in Brussels – 18th November

Overview of Wielkopolskie

- 57% of total regional area dedicated to agriculture, including 81% of arable land (2013)
- 73% of the arable land dedicated to cereals (2013)
- 15% of national cattle population (2013)
- 36% of national pig population (2013)
- Warta river flowing into the Szczecin lagoon (and the Baltic Sea).

Challenges in Wielkopolskie

- Nitrogen and phosphorus transfers related to various human activities such as agriculture and industry

- High nitrogen & phosphorus load in fresh and marine water
  - Eutrophication of lakes, lagoons, and the Baltic Sea
  - 65% of tested groundwater samples in the region above 50 mg NO_3^-/L

- Emissions of ammonia in the air
  - 4% of national emissions of ammonia
  - Acid rain and soil acidification, particularly in forest areas

- Causes for nutrient losses
  - Intensive farming practices and urban and industrial waste water
  - Other risks factors (climate, soil)

Photo: A. Kozlowska, 2012

Impacts of nutrient losses

- On farms
  - Fertiliser costs
  - Costs for manure spreading
  - Costs for maintaining soil fertility (e.g. liming)
  - Crop yields
- On the wider economy
  - Costs for drinking water treatments and quality monitoring
  - Costs for algae removal
  - Effects on tourism (bathing restrictions) and recreational activities (e.g. fishing)
  - Effects on public health
- On the environment
  - Effects on water bodies – eutrophication, phytoplankton proliferation
  - Effects on biodiversity & ecosystems

Photo: Federacja Zielonych GAJA

Photo: Wojewódzki Inspektorat Ochrony Środowiska w Poznaniu, Poznań 2013

Achievements

- National Code of Agricultural Good Practices (2004)
- National Fertiliser and Fertilising Act (2007)
- New NVZ designation for 2012-2016 in Wielkopolskie

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SEA REGION

- Co-coordination of the Priority Area « Nutri » of the EU Strategy for the Baltic Sea Region
- Research on integrated and organic production methods
- Project “Self evaluation concerning nutrients by farmers in Poland”
  - Education of farming advisors
  - Proposition of good practices by farmers

Photo: Federacja

Photo: Wojewódzki Inspektorat Ochrony Środowiska w Poznaniu, Poznań 2013

Good practices (1)

- Separate manure liquid and solid phase
  - Separation by sedimentation, mechanical separation, coagulation-flocculation
  - Liquid fraction:
    - Easiest penetration of the slurry in the soil → reduced ammonia emissions
    - High amount of ammonia → directly assimilated by crops
    - N:P ratio well suited for forage crops
  - Solid fraction:
    - Possible composting -> Stable fertiliser material rich in N and P

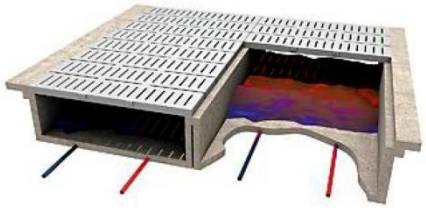
Photo: Mukhtar et al. (1999)

Photo: Nova Scotia Agricultural College

- Cost-savings for less fertilisers used
- Composting requires regular aeration
- Requires consideration of the (higher) nutrient content during application to avoid over-fertilisation
- Costs for the purchase of a separator and additional labour

Good practices (2)

Photo: Alberta Agriculture, Food and Rural Development, 2005



Photos: E. Sindhöj, L. Rodhe 2013

- Cool slurry
  - Decreases ammonia emissions
  - Cost-savings from less purchase of fertilisers
  - Energy-savings in case of installation of heat exchangers connected to storage units
  - Requires temperature control of manure/slurry storage units through proper insulation and cooling with plates and pipes
  - Requires consideration of the higher nutrient content during manure/slurry application to avoid over-fertilisation
  - Costs for infrastructure changes

Good practices (3)

Photos: Marek Samojeden, 2011

- Extend N fertilisation management plan for all agricultural sites and develop P fertilisation management plan
  - Adjusts the amount of fertilisers applied to crop needs and the amount of nutrients available in the soil
  - Less nutrient losses
  - Cost-savings from less purchase of fertilisers
  - Requires calculation of the farm nutrient balance through using an appropriate tool & considering crop type, nutrient content of fertilisers, soil quality, previous crop
  - Costs for soil, residue and manure analyses & increased management efforts

Good practices (4)

- Use appropriate application techniques
  - – Band application or injection techniques
  - – Accurate spreading, highly reduces ammonia volatilisation
  - – Costs savings from more efficient fertiliser use
  - – Requires consideration of the higher amount of nutrients available in the soil to avoid over-fertilisation
  - –Costs of equipment purchase or rental
  - –Risk of compaction due to heavy machinery

Photos: P. Nawalany in Pietrzak et al (2012)

Photo: IPCC in Kaasik, 2012

Good practices (5)

Photo: L. Zimny, 2012

- Use catch crops to reduce nutrient leaching
  - Cover the soil with catch crops, e.g., in winter
  - Reduces nitrogen leaching and run-off, in particular on sandy soils
  - Reduces the risk of soil erosion and loss of P
  - Improves soil structure and fertility
  - Increases soil organic matter
  - Reduces the need for fertilisers for the next crop in case of incorporation
  - Costs for seeds & additional labour for seeding and ploughing

Good practices (6)

Photo: S. Owenius in Pietrzak et al (2012)

- Construct sedimentation ponds to retain nutrients from run-off water
  - Small sedimentation basin and a wetland filter covered by typical wetland plants
  - Retains soil particles and nutrients (in particular P) from run-off water
  - Reduces nutrients by transformation and plant uptake
  - Slows down the flow of run-off water
  - Costs for labour to increase the soil level or widen a section of a ditch

Further good practices

- Adapt feeding techniques to reduce nutrient loads in manure:
  - Adjust the amount of feed: phase feeding
  - Reduce the amount of crude protein
  - Process feed
  - Use additives such as amino-acids and phytase
- Increase the height of manure storage heaps to increase manure compaction under its own weight
  - Need for proper equipment such as telescopic loader
- Prefer conservation tillage (especially for large farms)
- Increase the water retention capacity of soil by improving the soil structure and increase the soil organic matter content
  - Use organic fertilisers while reducing the overall amount of fertiliser applied
  - Incorporate crop residues or mulching

Questions?

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