



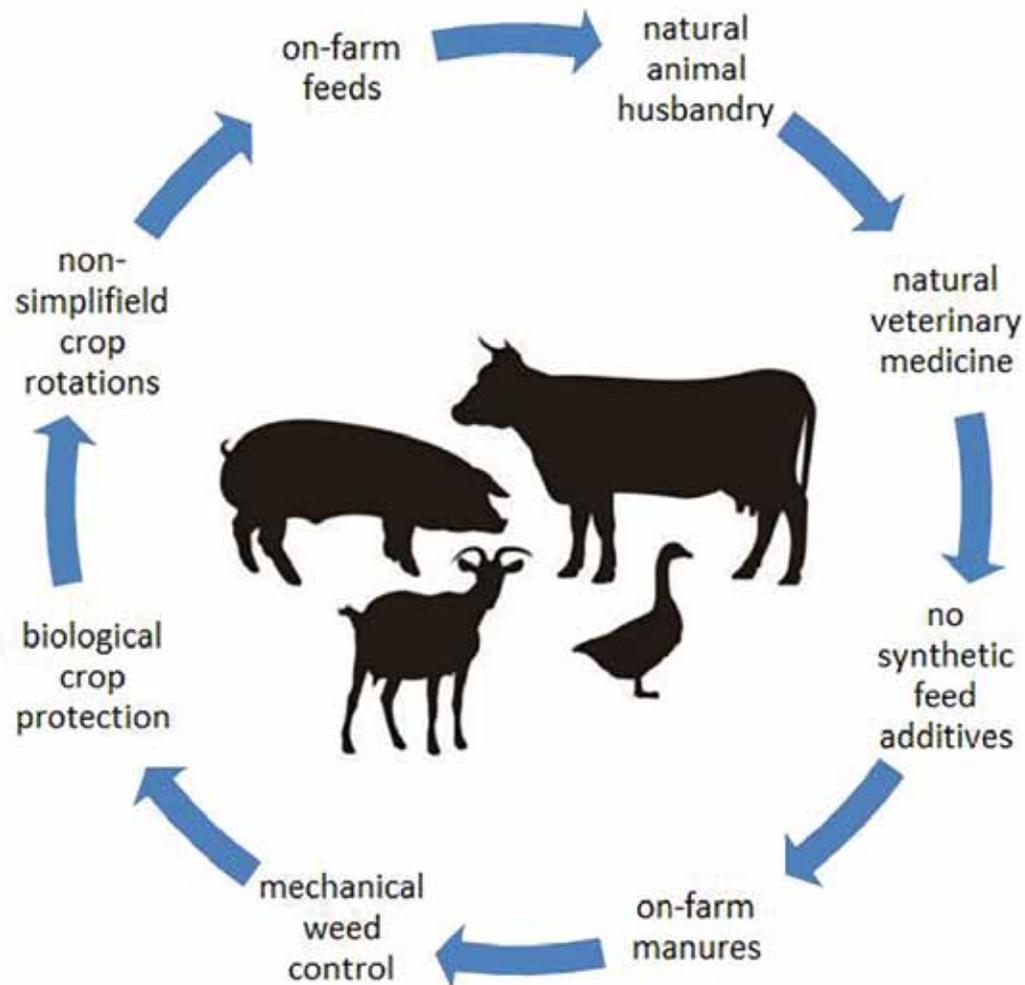
Improvement of farm productivity by preventing nitrogen and phosphorus leaching from soil to water



Gliwice 2017

Coalition Clean Baltic

Fertilization of agricultural land is a commonly used agronomic practice to increase yielding. Unfortunately, on conventional farms on average only 50% of the nitrogen supplied with fertilizers is utilized by crops, which means that half of the nitrogen compounds are released into the environment and enter the waters (surface and underground), causing economic loss to the farmer and problems in the aquatic environment. There are also smaller losses of phosphorus compounds, but extremely harmful for the environment. Therefore it is important to properly balance fertilizers rates, taking into account relevant application times and soil conditions.



The basis for good practices is nutrient recycling in the farm.
[own materials by PKE]

In this brochure, we will look at the issue of nutrients leaching – nitrogen and phosphorus into the environment, we will propose measures to limit this process and indicate how big the financial losses borne by farmers are and the ways to reduce them.

What is the leaching of nutrients?



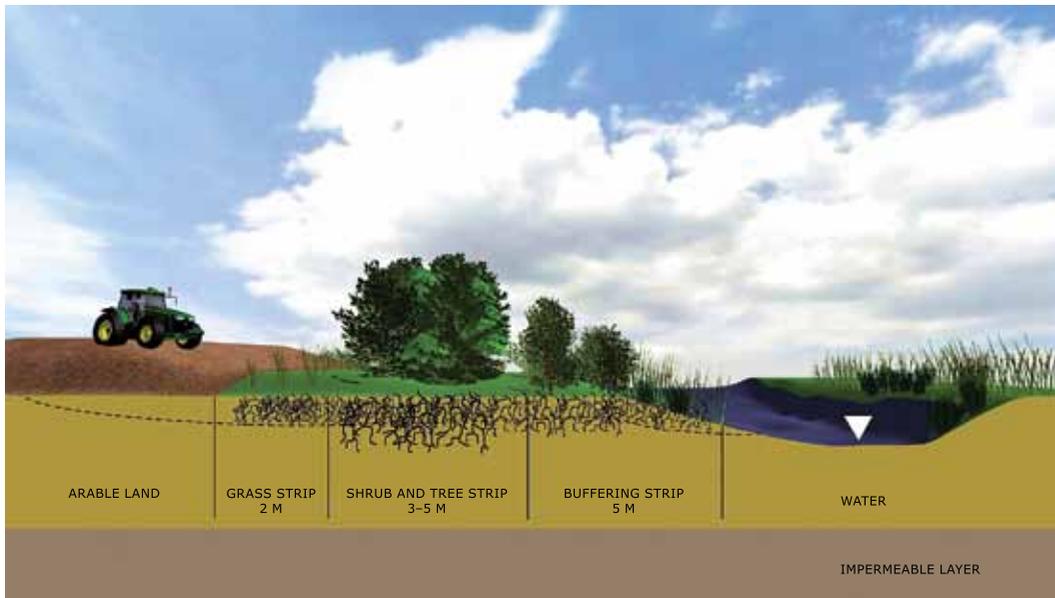
Aerial view of a cyanobacterial bloom in the Baltic Sea.
[By Envisat satellite [CC BY-SA 3.0-igo (<http://creativecommons.org/licenses/by-sa/3.0-igo>)], via Wikimedia Commons]

It is a process that is unfavourable to farmers and harmful to the environment, consisting in the elimination nutrients, mainly nitrogen (N) and phosphorus (P), into ground- and surface water. The main effect of this process is a progressive

surface water eutrophication. The influx of nutrients into water reservoirs and rivers causes an increased algal growth, as a result of which the amount of light reaching water vegetation is reduced (or in extreme cases completely blocked). This process causes the disappearance of vegetation and animals – fish, crustaceans, as well as amphibians, reptiles and consequently also other species in the food chain. Surface waters affected by eutrophication lose their ability to self-regulate and the ecosystem gradually dies. In ground water, dissolved nitrogen compounds cause poisoning.

What limits the absorption of nitrogen and phosphorus from fertilizers?

- Acidification of soil affects negatively fertilization efficiency
- A small amount of humus in the soil
- Soil erosion
- Leaching through atmospheric precipitation into groundwater
- Improper crop rotation
- Unbalanced doses and wrong time of fertilization.



Deep-reaching tree and shrub roots will constantly (since they are perennials) capture the nutrients, including surplus of N and P, leached from arable land and moving with ground waters (above the impermeable layer) e.g. in the direction of water courses and basins.
 [base on monograph "Ecological Agriculture as the Means of Environment Protection" Józef Tyburski, Zbigniew Szwejkowski, Katarzyna Glińska-Lewczuk]

Why can agricultural holdings be a source of pollution?

Soil losses of nitrogen and phosphorus originating from mineral and organic fertilizers are caused by:

- No prior analysis of soil minerals content and no balancing of fertilizer doses which do not correspond to actual crop needs
- Fertilization at the wrong time
- Using too high rates of fertilizers at the same time
- Lack of a buffer zone to protect watercourses and reservoirs.

In addition, organic fertilizers can enter the environment uncontrolled as a result of:

- Lack of sealed liquid manure tanks and manure slabs for solid fertilizers with insufficient capacity adjusted to the size of livestock
- Unreasonable delay in ploughing/mixing fertilizers with soil immediately after spreading on the field surface
- Excessive grazing of pastures
- Water contamination by faeces of animals which have free access to watercourses and reservoirs.

How to save the nutrients in the soil?

To prevent losses of nutrients, and therefore save money, you should:

- At least once every 5 years perform soil analysis for nutrient and humus content
- Observe the dates of fertilization and fertilize in appropriate weather conditions
- Do not grow crops in a simplified crop rotation
- Wherever possible using catch crops to bind the remaining nitrogen to the biomass in order to protect against leaching
- Increase the amount of humus by growing green manures to be ploughed
- In areas with steep slopes, introduce soil tillage across the slope to prevent erosion, or to establish permanent plantations and/or permanent grasslands

- Liquid fertilizers should be stored in sealed containers and manure must be stored on a manure pad with rain protection (nonwoven cover)
- Fencing pastures in order to hamper access for animals directly to watercourses and reservoirs
- Fertilize the soil with organic fertilizers, where nitrogen compounds are gradually mineralized and are better assimilated by crops and soil biota
- Establish crop rotation where shallow and deeply rooted crops will be grown alternatively
- Ploughing as late as possible at the end of the year
- Mixing organic fertilizers to the soil as quickly as possible (limit nitrogen losses by as much as half!)
- On sandy soils, replace sand with clay on bottom for compost heap
- Create vegetative buffer zones around water reservoirs and watercourses for filtration and slowing down of nutrients runoff
- Planting bushes and trees as buffer strips to reduce soil erosion
- Use small retention, i.e. retention of water on the farm and taking care of existing as well as creating new pools, ponds, small water reservoirs, preserving natural wetlands.

Be prudent and remember that the goal of the representatives of trading companies producing fertilizers is to maximize sales rather than optimize the fertilization on your farm.

Phosphorus in the outflow from agricultural land occurs in a form associated with soil particles or in the form of organic suspended matter. Protecting soil from erosion is crucial in the context of phosphorus runoff to surface water.

The following practices limit this process:

- Diversification of the crop land use structure with a significant share of perennial crops
- High share of catch crops including under-sowing throughout the year
- Reduction of the area for wide-row crops (e.g. beet and maize) to minimize soil erosion
- Sustainable fertilization including no P-surplus.

Soil pH and economic losses on the farm

It is estimated that on average due to acidification of soils yield losses in Poland are about 4.3 cereal units per hectare.

The average efficiency of using nitrogen compounds from synthetic fertilizers is only 50%. Improving the use up to 70%, as a result of optimizing fertilization, soil pH regulation and good agricultural practices, would allow to save 20kg N/ha per year at a dose of 100kg N/ha.

Finally, it should be emphasized that the use of fertilizers in excess of the actual needs of crops not only lowers the efficiency of nutrient assimilation by the crops, but also leads to excessive pollution and too rapid growth of plant tissues. This leads to an increased susceptibility of crops to diseases. In addition, excessive fertilization generates additional costs, which can be reduced, among others by: stabilizing the acid-base balance (liming) of the soil, crop rotation with carefully selected pulses and leguminous species or using "small retention" systems.

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**By reducing losses of fertilizers from the farm,
you save money and take care of the environment.**

Use them for a vacation at the seaside by a clean Baltic Sea!



Photo: K. Chomacka

**We are all responsible for the quality of our environment –
you are too! You can make a real difference for the world
we live in. Start acting!**

DEVELOP YOUR AWARENESS OF ECOLOGY
so that both you and the environment can benefit.



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You can find us on:



Our mission statement: Supporting sustainable development, saving and improving the environment,
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After reading the brochure, hand it over to someone who is interested in the subject!