PROMOTING NUTRIENT RECOVERY & REUSE
NITROGEN POLLUTION & FARMING

Without nitrogen (N) plants cannot grow. Earth's nutrient cycle relies on bacteria and some plant species (e.g. legumes) to convert unreactive atmospheric nitrogen into reactive forms making it available to other plants and other lifeforms. But human activity has led to an over-abundance of nitrogen in the environment which has significantly disrupted this natural process, resulting in huge negative effects on ecosystems and humans alike.

The overuse of synthetic nitrogen fertilisers and the global expansion of the livestock sector as an important source of organic fertilisers are the main sources of human-generated nitrogen pollution – followed by fossil fuel combustion and biomass burning. Today human activity converts more nitrogen from the atmosphere into reactive forms than all of the Earth's natural processes combined [1]. And much of this new reactive nitrogen is not taken up by crops, rather it pollutes our water, soil, and air – the very natural resources farmers rely on.

Alongside biodiversity and climate change, the leakage of nutrients such as nitrogen into the environment poses one of the greatest threats to food security and human health, yet to date action to remediate the issue has not been effective enough.

WHAT IS THE SITUATION?

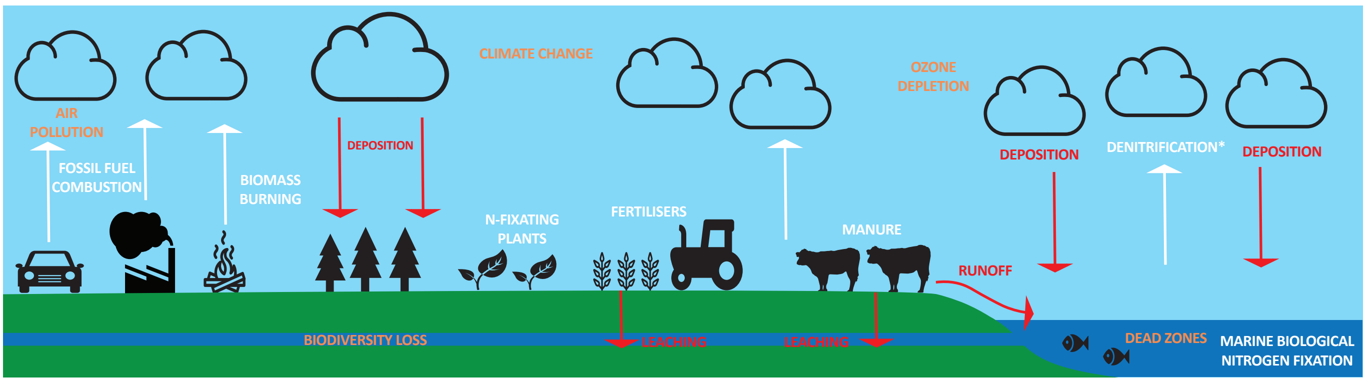
Since the advent of industrial agriculture in the 20th century, synthetically-produced mineral nitrogen fertilisers have been used to make crops grow faster and increase yields. But not only does manufacturing them use 2% of the world's energy [2], these fertilisers often pose huge risks for our environment and human health.

Huge amounts of fertilisers end up running off fields and contaminating rivers, waterways, groundwater and the oceans – resulting in an explosive overgrowth of plants and algae which depletes oxygen levels in water, killing aquatic life. While manure does have environmental value as organic fertiliser, the excessive concentration of animal production in certain areas has resulted in unsustainable levels of manure, meaning our air and soils are also being polluted with unhealthy levels of ammonia (NH^3) – one of the main forms of surplus reactive nitrogen in the environment. Nitrogen pollution's impact on biodiversity is also staggering. An overabundance of nitrogen means that, for example, plants that require nitrogen-rich environments may become invasive and out-compete rarer species that are adapted to grow on soils with low nitrogen availability. High nitrogen deposition may therefore result in changes to vegetation and fauna composition, and overall biodiversity loss [3].

In relation to human health, the reduced quality of the drinking water, which is drawn from these polluted waterways, results in public health problems and increased costs to make water safe for us to drink. Increased levels of ammonia (NH^3) means more polluted air, which leads to respiratory diseases and hurts crop yields.

THE REACTIVE NITROGEN CYCLE

SOURCES OF REACTIVE NITROGEN | REACTIVE NITROGEN PROCESSES | CONSEQUENCES OF REACTIVE NITROGEN



* Microbially-facilitated process where nitrate is reduced
Data from WWF report 'Nitrogen: too much of a vital resource'

FACTS AND FIGURES

A NITROGEN DEPOSTION IS THE THIRD MOST IMPORTANT DRIVER OF TERRESTRIAL BIODIVERSITY LOSS

B THE OVERALL COST OF WATER POLLUTION FROM NITROGEN AND PESTICIDES IS 1.5 BILLION EUROS IN FRANCE

CASE STUDIES

One way to tackle the damaging impact of nitrogen pollution on people and planet is by recovering organic matter such as animal manure, sewage waste and food chain waste and processing it into a form suitable to fertilise crops – preventing it from leaking into water, the air, or the atmosphere, or ending up in landfill [4]. The recovery of 100% of the nitrogen, phosphorus and potassium found in food, animal and human waste streams could contribute nearly 2.7 times more nutrients than the number contained in mineral fertilisers [5]. In the EU, 40% of organic waste still ends up in landfill [6]. Increasing the rate of organic waste collection and recovery of post-consumer nutrients could reduce farmers' reliance on mineral nitrogen fertilisers.

FOOD CHAIN WASTE In Milan, a pioneering food waste collection scheme recovers organic materials and reuses them to produce energy and compost. Decayed organic material is used as a fertiliser. A recent study found that high value processing of residual organic waste in Amsterdam could lead to 900,000 tonnes of material savings and a reduction of 600,000 tonnes in CO^2 emissions annually for the city. These benefits can be generated through separate collection of organic waste and enhanced nutrient and energy recovery (e.g. biorefineries).

SEWAGE In 2001, a Swiss study showed that if 100% of the consumed nutrients that were excreted as waste by humans were captured in household sewage, then nearly 30 million tonnes of nitrogen, 5 million tonnes of phosphorus and 12 million tonnes of potassium could be recovered globally – this represents about a third of the annual total global demand for fertiliser. [9]

ANIMAL MANURE The success of nutrient recovery and reuse from manure heavily depends on the livestock density in the farm. As with mineral fertilisers, if levels exceed sustainable limits, we are faced with the same environmental and health problems. Good nutrient recovery and reuse from manure in Europe is therefore intrinsically linked with the evolution of the livestock sector and demand for animal products. There are limits to how much plants can absorb from manure's organic matter and therefore nitrogen recycling from manure should in no way be used as a pretext to relax restrictions on nitrate levels in soil and water, nor should it be used to incentivise growth in the meat sector. Exceeding sustainable limits of manure is not circular and leads to leakages which are environmentally harmful. Successful nitrogen recovery from manure goes hand in hand with levels of production and consumption of animal products that are in line with ecological limits within a given region and sustainable diets. [8]

POLICY RECOMMENDATIONS

- Set local targets to decrease overall release of nitrogen into the environment with a view to staying in line with ecological limits
- Manage the EU's nutrient cycle in a more resource-efficient way – as agreed in the EU's 7th Environment Action Programme (EAP) – by promoting the sustainable management of agricultural ecosystems through the development of Nutrient Recovery and Reuse (NRR) systems in agriculture Develop a Nutrient Recovery and Reuse (NRR) system in agriculture
- End harmful Common Agricultural Policy (CAP) subsidies that push for ever more intensification of farming practices and start the transition to sustainable practices and away from intensive meat and dairy farms
- Set a progressive taxation system for pesticides and mineral fertilisers (which could form an extra source of revenue from polluters for sustainable farming)

Develop an Integrated Approach to Nitrogen Management in the EU to:

> Ensure cost recovery from polluters of water ecosystems and enforce the polluter pays principle on farms
> Improve nutrient use efficiency in production
> Reduce over-consumption of animal protein and promote healthier, more balanced diets
> Reduce food chain waste by setting food reduction targets in waste laws and tackle this issue better in the future CAP
> Shift from fossil fuels to sustainable energy sources such as solar and energy and increase energy efficiency, particularly in transport
> Ensure full compliance with the Nitrates Directive to prevent excessive levels of nitrates pollution in ground and surface waters and oppose any amendment to it that would allow for higher levels of manure spreading in already polluted areas
> Implement strict requirements at national level to limit ammonia, in line with the National Emissions Ceilings (NEC) Directive

FOR MORE INFORMATION

Emily Macintosh, EEB Communications Officer | emily.macintosh@eeb.org; Tel: 0032 2 274 10 86
References available here: http://bit.ly/2uFt57z

EEB European Environmental Bureau

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