Exhausted Earth

How fertiliser corporations destroyed the nitrogen cycle and how to fix it

FOODRISE

Contents

Executive summary

While nitrogen is essential for all life on Earth, industrial farming practices since the Green Revolution have unleashed a flood of synthetic fertilisers that has overwhelmed Earth's natural nitrogen balance. We are now beyond the "safe operating space for humanity", with devastating consequences for people's health, biodiversity and the climate. Nitrogen pollution has well and truly Exhausted Earth but the companies causing it are targeting growth, putting us on a collision course with ecological breakdown.

This isn't new. Scientists and policy makers have warned about nitrogen pollution for more than 50 years. Since the 1970s, alarms have grown louder, and there have been numerous national and international efforts to tackle the crisis. The EAT–*Lancet* Commission's recent report delivers the starkest warning yet: the nitrogen crisis is a food systems crisis. To achieve healthy, just diets within planetary boundaries, surplus nitrogen must be halved, meaning that agricultural nitrogen inputs need to be cut by more than one-third (42%) by 2050.[1]

Yet instead of shrinking, nitrogen fertiliser output continues to rise. Production has surged by one-fifth (20%) since 2009, when the first planetary boundary assessment was published and scientists first warned that Earth's nitrogen boundary had been breached.[2]

Turning the tide on this unbridled growth of nitrogen fertilisers will require significant effort, ambitious political leadership and regulatory interventions. As the EAT–*Lancet* Commission warns, the biggest obstacle isn't technology or awareness – it's powerful corporations determined to protect their profits and block change.

Foodrise presents this report to break through one of the toughest barriers to change: corporate power. We expose an industry that has long operated in the shadows but whose activities have set off a visible cascade of environmental, public health and social harms. Flying in the face of the science, it has increased output and deployed a full suite of underhand tactics to maintain business-as-usual and protect its profits.

Our findings reveal that the nitrogen fertiliser industry, like other agribusiness sectors, is highly concentrated, with just a handful of corporations controlling the global nitrogen fertiliser market. The top three alone – Yara, CF Industries and Nutrien – accounted for over one-third (34.6%) of global nitrogen fertiliser production in 2022, raking in nearly $40 billion from their sales of nitrogen fertilisers.[3] With revenues this high, it is no surprise that all three nitrogen giants plan to ramp up their production even further.

We hold nitrogen fertiliser corporations collectively responsible for today's nitrogen crisis, because they have actively derailed efforts to tackle it, ignoring all historical and current warnings about the harmful impacts of their products. In order to evade accountability, they have deflected responsibly for the crisis onto farmers and doubled down on an insidious narrative that they 'feed the world'.

In recent years, fertiliser companies have spent millions of dollars lobbying governments to promote false solutions and block meaningful change.[4] The nitrogen fertiliser lobby has expanded its presence at the United Nations climate negotiations, with triple the number of delegates from major nitrogen producers attending COP30, compared with COP26.[5]

The nitrogen crisis is a food systems crisis, and the nitrogen fertiliser industry is best understood as a key player in the animal-industrial complex. It is the connecting point between two highly damaging industries: the fossil fuel industry, which supplies the nitrogen fertiliser industry with the natural gas required for fertiliser manufacture, and the livestock industry, to which it supplies feed grown with nitrogen. Foodrise calls for urgent, decisive action from political leaders to halt the nitrogen fertiliser industry in its tracks. We want political leaders to use all policy and regulatory tools available to drive the transition to healthy, just and sustainable food systems, as envisaged by the EAT–*Lancet* Commission.

That means listening to peasant farmers, who already have the solutions – not to agribusiness lobbies who don't – and redirecting public subsidies. It also means giving teeth to existing domestic and international initiatives to tackle the nitrogen crisis, enforcing them, and moving beyond 'nutrient loss' reduction targets. Governments must set measurable, year-on-year reduction targets for nitrogen production, in line with the EAT–*Lancet* recommendations.

Nitrogen fertiliser corporations do not feed the world, they fail it. For too long, they have put their profits before our Earth and our food. It's time for our political leaders to rein in, require redress from, and begin shrinking this industry before the window of opportunity closes.

Glossary

Agroecology – An approach to design and manage sustainable food and farming systems, which applies both ecological (the relationship between plants, animals, humans and the environment) and social principles.[6] La Via Campesina states that agroecology is "the coexistence of all living beings" and "the basis for peasant agriculture and food sovereignty".[7]

Ammonia (NH_3) – A chemical compound consisting of nitrogen and hydrogen. A colourless gas with a distinct odour, it is corrosive and acutely toxic. Ammonia is produced both naturally from bacterial processes and synthetically. It is used in many industrial applications, including the production of synthetic nitrogen fertilisers.

Ammonium nitrate – A salt compound of ammonia and nitric acid. It is used in explosives and as nitrogen fertiliser.[8]

Animal-industrial complex – The closely linked industries intertwined with the socio-economic system engaged in intensive livestock production and its supplier and customer industries, including animal feed, agrochemicals such as nitrogen fertilisers, natural gas, hydrogen and biomethane production.[9]

Biogeochemical boundary – Defined by the Stockholm Resilience Centre as the limit on human interference with the planet's nitrogen and phosphorus cycles to maintain the Earth system's stability.[10] It is a planetary boundary that has been transgressed, primarily due to the use of fertilisers in agriculture and industrial processes, which disrupts the natural nutrient balance and can cause harm to ecosystems and human well-being.

Blue hydrogen; blue ammonia – Hydrogen or ammonia produced from fossil gas where carbon capture and storage has been applied to at least some of the production process.[11]

Calcium Ammonium Nitrate (CAN) – A widely used inorganic fertiliser. It is a mixture of ammonium nitrate and a calcium carbonate or dolomite filler, providing both nitrogen and calcium to soil.[12]

Calcium Nitrate (CN) – Calcium nitrate is an inorganic nitrate salt of calcium. It has a role as a fertiliser.[13]

Eutrophication – The addition of nutrients to water in lakes and rivers, which encourages plant growth that can take oxygen from the water and kill fish and other animals.[14] The primary causes of eutrophication are nitrate fertiliser run-off, nutrients from animal wastes and human sewage.[15]

Fertiliser – A substance (either organic or synthetic) that is added to land or soil to increase its productivity. Synthetic fertilisers are derived from mineral or fossil fuel extraction. The three primary nutrients needed for plant growth – nitrogen (N), phosphorus (P), and potassium (K) – form the basis of industrial agricultural fertilisers.

Food sovereignty – The right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems.[16]

Global South – A term traditionally used to refer to economically disadvantaged nation-states. In recent years, the term has been increasingly employed to refer to spaces and peoples negatively impacted by contemporary capitalist globalisation[17].

Green hydrogen; green ammonia – Hydrogen or ammonia produced with renewable energy through the electrolysis of water molecules.[18]

Green Revolution – Significant increase in the production of food grains, especially wheat and rice during the mid-20th century driven by the introduction of high-yield crop varieties and the use of chemical inputs including fertilisers and pesticides.[19]

Haber–Bosch process – An industrial process that enables the industrial-scale production of ammonia, a chemical compound that contains nitrogen.[20] It is highly energy intensive and associated with high levels of greenhouse gas emissions. Named after the two German chemists who developed it in the early 20th century, Fritz Haber and Carl Bosch.

Harmful industry playbook – Refers to a set of tactics used by harmful industries such as synthetic fertiliser producers; tobacco, oil and gas; and arms manufacturing to downplay the public harms they cause in order to protect their profits and social licence to operate.

Inorganic fertiliser, mineral fertiliser, synthetic fertiliser – Fertilisers made through chemical and industrial processes.[21]

Nitrogen – An essential element and critical nutrient for plant growth, a constituent of all living matter, and a key part of the Earth's atmosphere. However, human activities cause excessive release of reactive nitrogen compounds such as ammonia and nitrate which pollute air, soil and water – harming ecosystems, human health and contributing to climate change.

Nitrogen cascade – Describes the chain of negative environmental effects that occur when human activities produce reactive nitrogen compounds such as ammonia and nitrogen oxides from fertilisers and energy production.

Nitrogen cycle – The natural cycling of nitrogen through the Earth's atmosphere, biosphere and geosphere. This cycle involves various processes including nitrogen fixation, ammonification, nitrification and denitrification, which convert nitrogen into different chemical forms.

Nitrogen fertiliser – Human-made fertiliser derived from ammonia and used primarily in the form of urea or ammonium nitrate. Produced using fossil fuels through an energy-intensive industrial process that converts nitrogen gas from the atmosphere into ammonia (see **Haber–Bosch process**). Accounts for approximately 59% of global fertiliser production.[22] Also referred to as synthetic or inorganic.

Nitrogen fixation – Any natural or industrial process that causes free nitrogen (N_2), which is a relatively inert gas plentiful in air, to combine chemically with other elements to form more reactive nitrogen compounds such as ammonia, nitrates or nitrites. Human activities, such as making fertilisers and burning fossil fuels, have significantly altered the amount of fixed nitrogen in the Earth's ecosystems. According to some estimates, by 2030 the amount of nitrogen fixed by human activities will exceed that fixed by microbial processes.[23]

Nitrogen surplus – The difference between nitrogen inputs and nitrogen removed from a system. It is an indicator of the potential nitrogen losses from agriculture to the environment.[24]

Nitrogen use efficiency (NUE) – Nitrogen use efficiency of the agri-food system is defined as the quantity of food (except seafood) divided by total input of new nitrogen (synthetic and biological fixation).[25]

Nitrous oxide (N_2O) – A potent greenhouse gas, 273 times more effective than carbon dioxide at trapping heat in the earth's atmosphere on a 100-year timescale (GWP100).[26] Emitted from industrial processes, fuel combustion and, most commonly, agricultural soils treated with manure and synthetic nitrogen fertilisers.

NPK – Stands for nitrogen (N), phosphorus (P) and potassium (K). They are the three primary nutrients needed for plant growth and form the basis of industrial agricultural fertilisers.[27]

Nutrient – Chemical elements such as nitrogen, phosphorus and potassium that improve growth and productiveness of plants.[28]

Nutrient pollution – The process whereby too many nutrients, mainly nitrogen and phosphorus, are added to bodies of water, causing excessive growth of algae.[29]

Phosphorus fertiliser – Originates from phosphate rock, a sedimentary deposit that has accumulated over millions of years. This rock is treated with acid, typically sulphuric acid, to produce phosphorus-based fertilisers. The biogeochemical boundary includes phosphorus, which is a finite resource whose overuse is of major concern. Accounts for approximately 25% of global fertiliser production.[30]

Planetary boundaries – Geophysical limits to the processes that regulate the stability and resilience of the Earth's systems. According to the Stockholm Resilience Centre, the current framework consists of nine biophysical processes, and the boundaries for each represent a scientifically based 'safe' level of human interference. The boundaries collectively represent the limits of the "safe operating space for humanity".[31]

Planetary Health Diet – A diet recommended by the EAT–*Lancet* Commission which is rich in plants, grains, fruits, vegetables, nuts and legumes, with moderate amounts of fish, dairy and meat. It is designed to support optimal health outcomes and reduce environmental impacts and nutritional deficiencies of most current diets and can be applied globally for different populations and different contexts.[32]

Polluter pays principle – The 'polluter pays' principle is the notion that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment, rather than the harms being borne by the public.[33]

Potassium fertiliser – Made mainly from natural mineral salts mined underground or extracted from lakes. Accounts for approximately 17% of global fertiliser production.[34]

Safe operating space – An Earth system state that enables humanity to develop and thrive for generations to come. The safe operating space ensures that crucial Earth system processes remain within boundaries that support global stability, resilience and life-support functions.

Sulphate – Sulphate is defined as an inorganic salt. Sulphate and sulphuric acid products are used in the production of fertilisers.[35]

Synthetic fertiliser – See **inorganic fertiliser**.

Urea – A nitrogenous compound made from ammonia and carbon dioxide, used for nitrogen fertilisers.[36]

Urea Ammonia Nitrate (UAN) – A liquid fertiliser produced by combining urea, nitric acid and ammonia – with a nitrogen content in a typical range of 28–32%.[37]

Introduction: The nitrogen crisis is a crisis of the corporate food system

The use of nitrogen fertilisers in agricultural production – the main source of nitrogen emissions to the environment – has caused such severe pollution that the "safe operating space" threshold for nitrogen defined by the Stockholm Environment Institute in its groundbreaking planetary boundaries framework has been breached.

The 2025 *EAT–Lancet Commission on healthy, just and sustainable food systems* estimates that the **nitrogen surplus must be halved** and **agricultural nitrogen inputs must be cut by more than one-third** within the next 25 years to avoid catastrophic impacts on the integrity of the planet's life-supporting systems and the global food system. Its report puts the food system boundary[a] for nitrogen surplus at 57 teragrammes (57 million metric tons) per year. However, it currently stands at 119 teragrammes (119 million metric tons)[38] – in other words, over double what it should be. To achieve a level of 57 teragrammes (Tg) surplus nitrogen, the nitrogen surplus will need to decline by 3% per year to 2050. This means that agricultural nitrogen inputs will need to be reduced to 134 Tg per year from their current level of 233 Tg per year, a 42% reduction by 2050.[39]

With such significant cuts in nitrogen surplus and agricultural nitrogen inputs needed to return to within planetary boundaries, efficiency interventions alone will not suffice. Instead, global nitrogen fertiliser production will need to reduce year-on-year until 2050 – that is to say, nitrogen fertiliser producers will need to shrink their collective global output.

On current trends and without regulatory intervention, the targets recommended by the EAT-*Lancet* Commission will be impossible to achieve: according to the UN Food and Agriculture Organization (FAO), agricultural use of synthetic nitrogen fertilisers grew by 40% from 2010 to 2020.[40]

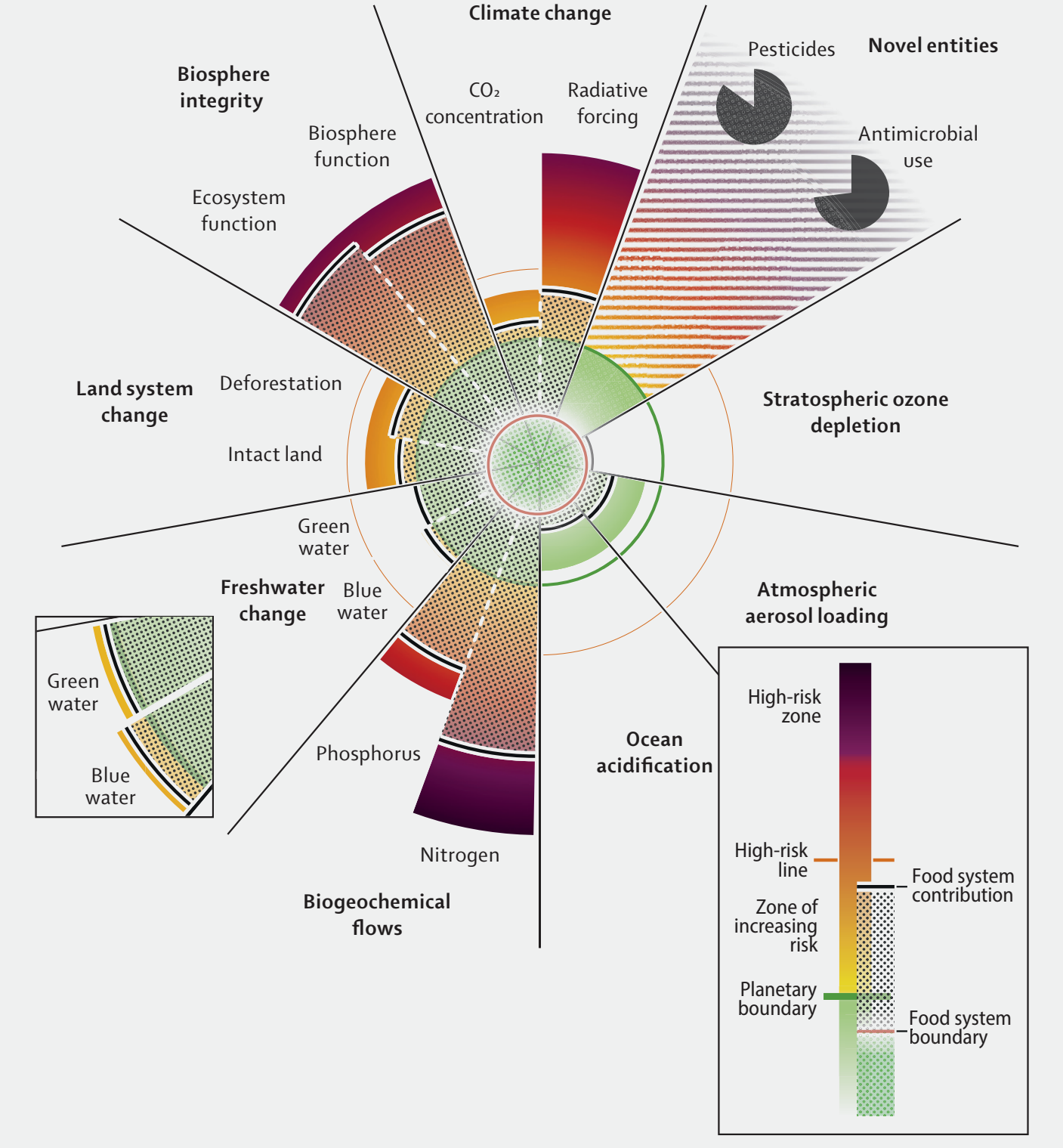
Globally, agriculture accounts for 650,000 deaths (or 20% of mortality related to poor air quality). This is largely due to nitrogen pollution from fertilisers.[41] In addition, the massive use of synthetic nitrogen fertilisers is fuelling industrial meat and dairy production, impeding the necessary dietary transition called for by the EAT–*Lancet* Commission and scientific bodies the world over.

If no action is taken, the world's population will continue to suffer the effects of unsustainable food systems which underpin unhealthy diets, causing many avoidable diseases and approximately 15 million avoidable deaths a year.[42] These effects will be distributed unequally, with some populations – particularly in Sub-Saharan Africa, India, and parts of South and central America – far less able to access the nutrition they need than wealthier populations in high-income countries.[43] Not only that, without deliberate intervention, the significant and widespread environmental impacts of food systems will continue to worsen, potentially irreversibly, with devastating consequences.

Food systems are the single largest driver of environmental degradation, above all other areas of human activity. The Stockholm Resilience Centre's seminal Planetary Boundaries framework defines a "safe operating space" for humanity within the Earth system by identifying nine critical environmental processes that, if disrupted, could lead to irreversible changes.[44] The 2025 edition, which was updated for the EAT–*Lancet* report, shows that food is the "single largest cause of planetary boundaries transgressions, driving the transgression of five of the six breached boundaries": land system change, biosphere integrity, freshwater change, biogeochemical flows of nitrogen and phosphorus pollution, and climate change (*see Figure 1*).[45]

a The EAT-Lancet Commission proposes the food system boundary for surplus nitrogen be equal to the planetary boundary because most sources of nitrogen are attributed to food systems (e.g. agriculture, aquaculture and wastewater).

Figure 1: Status of food system pressures across all nine planetary boundaries



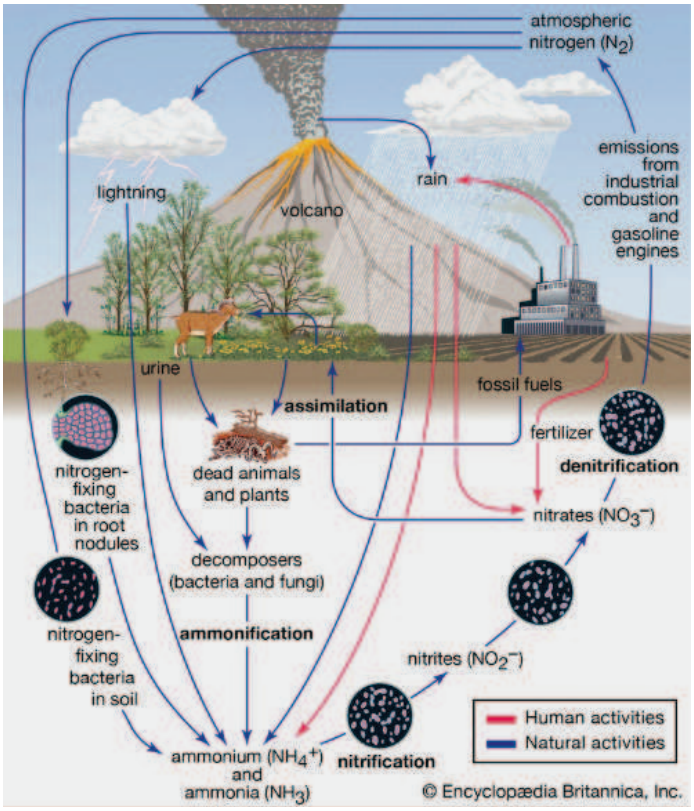
Source: Stockholm Resilience Centre

If action *is* taken to implement the EAT–*Lancet*'s Commission's comprehensive recommendations, the global food system can transform to provide access to good, nutritious food for all, within planetary boundaries. This is the Planetary Health Diet (PHD) – low in animal-sourced protein, rich in plants, and flexible to different palates and cultures.

The urgency of implementing the EAT–*Lancet* Commission's recommendations at pace cannot be understated, because, even if implemented, the world would "barely [...] return to the safe space for freshwater use and climate", and worse, the biogeochemical boundary would still be transgressed albeit with "substantially reduced pressure".

Nitrogen makes up 78% of the earth's atmosphere and is a crucial building block for life. The natural cycling of nitrogen through the Earth's atmosphere, biosphere, and geosphere involves various processes including nitrogen fixation, ammonification, nitrification and denitrification, which convert nitrogen into different chemical forms.[46]

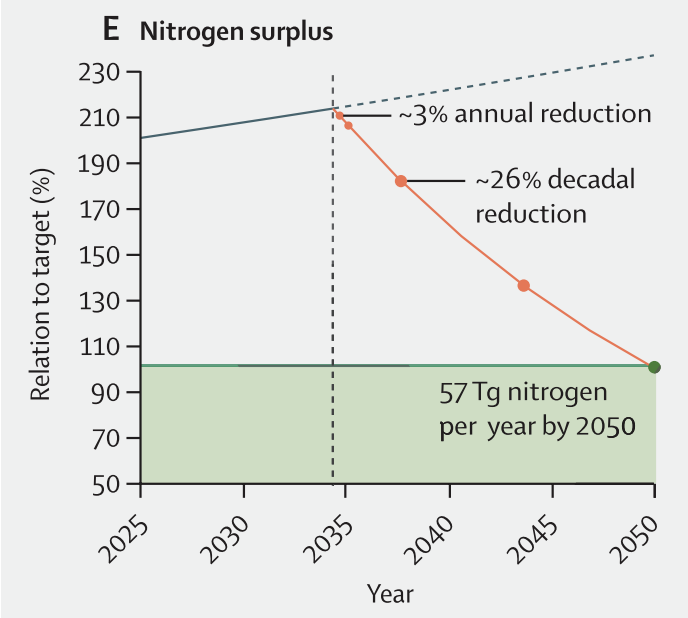
Figure 2: Nitrogen and the nitrogen cycle[47]



Source: Brittanica

The disruption to the nitrogen cycle is chiefly caused by the introduction of nitrogen fertilisers which creates an excess of nitrogen, polluting local environments and putting the natural nitrogen cycle out of kilter.[48] This has happened in several parts of the world, including Asia, Europe and North America, with severe consequences on human and environmental health (see section 'The fertiliser corporations profit while we all pay'). Another key source of nitrogen pollution is animal manure. Together, nitrogen fertilisers and animal manure are the biggest source of nitrogen pollution to the environment and account for three-quarters of total anthropogenic nitrous oxide (N_2O) emissions in the last decade, driving climate change and ozone depletion.[49] The gains from reducing nitrogen fertilisers – mitigating climate change, reducing ozone depletion and reducing pressure on the nitrogen cycle – are therefore significant.

Figure 3: EAT–*Lancet* Commission's proposed trajectory and associated annual and decadal rate of change for nitrogen surplus to 2050[50]



Source: EAT-*Lancet*

In Part 1 of this report, we identify the nitrogen corporations that dominate the global nitrogen fertiliser market and broke the nitrogen cycle. In Part 2, we analyse six tried-and-tested tactics used by the nitrogen fertiliser corporations to cement their hegemony in the food system, all of which closely resemble those deployed by the oil and gas or tobacco industries. This leads us to conclude in Part 3 that meaningful steps to rein in nitrogen fertiliser output will not come from the nitrogen industry itself, but from governments. We therefore put forward four recommendations to political leaders for urgent, decisive and ambitious action to rein in the nitrogen fertiliser corporations, for healthy, just and sustainable food systems.

Part 1: It's time to shine a spotlight on the nitrogen fertiliser corporations

The nitrogen fertiliser industry is lucrative, concentrated and growing

The use of fertilisers to support plant growth has a long history, ranging from enriching soil with organic matter such as compost or manure, or using nitrogen-fixing crops to convert atmospheric nitrogen into a usable form by crops.[51] This method led to a natural limit of available nitrogen in agriculture – and created a ceiling for crop yields. But the discovery of the Haber–Bosch process in the 1910s was to smash through that ceiling *(see Annex I: Haber–Bosch process)* by enabling the creation of human-made or synthetic nitrogen fertiliser, which we refer to simply as nitrogen fertilisers in this report.[52]

Image 1: Tractor spreading fertiliser

Source: Shutterstock

Image 2: Bags of fertiliser

Source: Shutterstock

The widespread production and use of nitrogen fertilisers after the Second World War was to radically transform agriculture: Together with crop hybridisation, dwarfing and the use of chemical pesticides, nitrogen fertilisers powered the Green Revolution. This lead to a dramatic increase in crop yield and much greater global food security (*see Image 3 for an example of promotion of nitrogen fertilisers to farmers*).

Image 3: Fertiliser promotion to farmers in the 1950s[53]

Source: Internet Archive

The moment in the 1970s when industrial-scale production of nitrogen surpassed natural nitrogen fixation can be understood as a turning point in agriculture – the moment when agriculture became an industrial process and farming became agribusiness.[54] While previously the challenge had been nitrogen deficiency and low crop yields, nitrogen surplus became the new concern, creating a host of environmental and health problems.

The Center for International Environmental Law (CIEL) estimates that in the period between 1961 and 2023, global production and use of nitrogen fertilisers grew at least ninefold from 12.9 million tonnes (Mt) in 1961 to 120 Mt in 2023.[55] These are the figures we use throughout this report. Industry data suggest even greater volumes: the International Fertilizer Association estimates that nitrogen production was 163 Mt in 2023, and it projects a 5% growth rate to 2025, to over 171 Mt.[56] The growth of the industry shows no sign of abating.

Today, nitrogen fertilisers account for nearly 60% of commercial fertilisers produced globally.[57] (*see Table 1*). This report focuses on nitrogen fertilisers: while the mining of phosphorus and potassium come with their own considerable environmental impact, nitrogen fertilisers are particularly harmful due to their reliance on fossil fuels, nitrogen pollution at use and the disruption to the nitrogen cycle.

Nitrogen fertilisers include many different types of products, sometimes mixed with other nutrients such as sulphur, phosphorus or potassium in varying proportions (*see Table A1 in Annex II*). Urea is the main nitrogen fertiliser product, containing 46% nitrogen; other common nitrogen products include ammonium nitrate and calcium nitrate.[58]

Image 4: Fertiliser being applied to field

Source: Shutterstock

Nitrogen fertilisers are used worldwide. Asia is the world's largest fertiliser market, accounting for 58% of global nitrogen consumption in 2023, two-thirds of which went to China and India.[59] Europe accounts for 15%, North America 13% and Latin America 10%, while the whole continent of Africa accounts for less than 5% of global nitrogen consumption.[60]

The type of nitrogen fertiliser also varies worldwide. Urea is the most used fertiliser in warmer climates; UAN (a liquid fertiliser containing urea and ammonium nitrate) is mainly used in North America; while nitrates are mainly used in Europe. In the US ammonia is also used as a direct source of nitrogen in agriculture.[61]

Table 1: The Big 3 fertilisers: nitrogen, phosphorus and potassium

Synthetic Nitrogen (N) fertilisers *59% of global fertiliser production*[62]	**Phosphorus (P) fertilisers** *25% of global fertiliser production*[63]	**Potassium (K) fertilisers** *17% of global fertiliser production*[64]
Produced using fossil fuels through an energy-intensive industrial process that converts nitrogen gas from the atmosphere into ammonia. 3–5% of global annual natural gas consumption is used to produce nitrogen fertiliser.[65]	Originate from phosphate rock, a sedimentary deposit that has accumulated over millions of years. This is treated with acid, typically sulphuric acid, to produce phosphorus-based fertilisers.	Made mainly from natural mineral salts mined underground or extracted from lakes.

Regardless of the type of product used, there is no doubt that the nitrogen fertiliser industry is big business: nitrogen fertilisers are applied to agricultural land in vast quantities around the world, and the nitrogen fertiliser industry predicts significant growth in its capacity.

The nitrogen fertiliser industry, much like other agribusiness sectors, has a long industry of mergers and acquisitions over the years.[66] Today, a dozen or so corporations dominate the global market (*see Figures 4-7 below)*. The top three producers – CF Industries, Yara International and Nutrien – have long histories, with the founding of their predecessor companies – Central Farmers Fertilizer Company, Norsk Hydro and W.S. Clark and Royster – stretching back to the 1940s, 1900s and 1870s respectively (*see Annex III*). Together these three nitrogen fertiliser giants account for over one-third (34.6%) of global nitrogen fertiliser production, raking in nearly $40 billion in revenue from their sales of nitrogen fertilisers in 2022 (*see Methodology, Table M1)*.

But remarkably little is known about this industry which is foundational to global food production, and most people, including policy makers, would struggle to name the key nitrogen fertiliser corporations. With their identity largely unknown, they have hitherto escaped scrutiny and have not been held to account for the environmental and social harms they cause. We aim to change that.

By shining the spotlight on nitrogen fertiliser corporations, we seek to apply the same scrutiny to these companies as has been directed towards the tobacco and fossil fuel industries over the past 60 years.

Several factors complicate our task. First, publicly available information on the sector, including market data and key corporate players, is complex, patchy and inconsistent. For example, companies may operate across multiple fertiliser segments, not just nitrogen. They may also produce precursors to nitrogen fertiliser such as ammonia, some of which may go to other industrial uses. In addition, the proportion of revenue from nitrogen fertiliser compared to other products is not always disclosed in company reports. Comparable year-to-year data is not always available. This muddies the waters and means that it is impossible to categorically state that the corporations we profile in this briefing are the largest nitrogen fertiliser producers globally. However, we have identified the three largest producers with a high degree of confidence (see *Figures 4, 5 and 6*) and we are also confident that the other eleven companies we profile (*see Figure 7*) are some of the world's largest players, many with production sites in different locations and global distribution, even if the list may not be exhaustive. More information on methodology and data limitations can be found in *the 'Methodology' section*.

Figure 4: CF Industries profile

CF Industries: *The world's largest producer of nitrogen fertiliser*

Headquarters: Northbrook, Illinois, USA

Nitrogen fertiliser production (2024): 12.5 million tons (excluding ammonia)[67]

Total revenue from nitrogen fertiliser (2024): $5.4 billion[68]

CF Industries operates the world's largest ammonia production factory in Donaldsonville, Louisiana, and sells nitrogen fertiliser products across North America, South America, Europe and Australia.[69]

CF Industries lists its common shares on the New York Stock Exchange. Its largest shareholders include multinational investment companies Vanguard, Blackrock and State Street.[70]

How it started: CF Industries was originally Central Farmers Fertilizer Company, founded in 1946 by nine farm cooperatives in the Midwest region of the United States.[71] The company started to produce nitrogen fertiliser a decade later, and in 1970 changed its name to CF Industries.[72] Since 2005, CF Industries has been a publicly traded corporation, acquiring additional facilities and expanding its nitrogen production capacity.[73]

Nitrogen: CF Industries uses the Haber–Bosch process to produce ammonia which it sells directly, as well as using it to produce granular urea and urea ammonium nitrate solution (UAN), and non-fertiliser products including diesel exhaust fluid (DEF).[74] CF Industries operates 16 ammonia plants across North America, with a total average capacity of 10.4 million tons per year.[75]

Figure 5: Yara International profile

Yara International: *Europe's largest fertiliser company and nitrogen producer, and the world's largest trader and shipper of ammonia*[76]

Headquarters: Oslo, Norway

Nitrogen fertiliser production (2024): 19.4 million tons[77]

Total revenue from nitrogen fertiliser (2024): $12.1 billion[78]

Yara operates 26 production plants supplying fertiliser to 140 countries, and sells its fertiliser products through over 10,000 branded retail outlets across the world.[79]

Its largest shareholder is the Norwegian government, which controls over 40% of Yara through shares held by the Ministry of Trade, Industry and Fisheries, and by Norway's Government Pension Fund.[80]

How it started: Yara was established in 1905 as Norsk Hydro. Its first factory in Norway began by producing nitrogen fertiliser, and introduced NPK fertiliser production in 1938.[81] Norsk Hydro established its first ammonia production factory in 1955, and went on to expand its production and offices globally.[82] Yara de-merged from Norsk Hydro in 2004 and became an independent company listed on the Oslo Stock Exchange, now operating across five continents.[83]

Nitrogen: Yara sources the majority of its ammonia through its own production using the Haber–Bosch process, and the rest from third party suppliers.[84] Yara manufactures several products directly from ammonia, and also uses it to produce nitrates, NPK, nitric acid and urea, which are used to create additional fertiliser products.[85] Yara produced 8.1 million tons of ammonia in 2024, and set a target to increase this to 8.6 million tons in 2025.[86]

Figure 6: Nutrien profile

Nutrien: *The world's largest fertiliser producer, and the third-largest producer of nitrogen fertiliser*

Headquarters: Saskatoon, Canada

Nitrogen fertiliser production (2024): 10.7 million tons[87]

Total revenue from nitrogen fertiliser (2024): $4.3 billion[88]

Nutrien operates a global network of production, distribution and retail, selling its fertiliser products and services in over 50 countries.[89]

Nutrien lists its common shares on the New York and Toronto Stock Exchanges, with its largest shares held by the Royal Bank of Canada, Blackrock and Vanguard.[90]

How it started: Nutrien was formed in 2016 through the merger of two major Canadian fertiliser companies: PotashCorp and Agrium.[91] Valued at $36 billion USD post-merger, the company has since acquired Brazilian fertiliser company Casa do Adubo, increasing its expansion into South America.[92]

Nitrogen: Nutrien produces nitrogen at nine facilities across Canada, the United States and Trinidad.[93] Its core products include ammonia- and urea-based fertilisers, as well as a product called Environmentally Smart Nitrogen (ESN), which it claims helps to improve nitrogen use efficiency.[94] Nutrien has an annual ammonia production capacity of 7.3 million tons.[95]

Figure 7: Other major nitrogen fertiliser players

Company	Company Profile	Production of nitrogen fertilisers	Revenue (USD)
ACRON	**Headquarters:** Moscow, Russia Acron Group describes itself as "a major mineral fertiliser producer in Russia and globally", and manufactures a range of nitrogen fertiliser products including ammonia, urea, AN and NPK.[96]	**2024**: 2.8 million metric tons ammonia, 2.1 million metric tons urea[97]	**Total revenue 2024:** $2.1 billion[98]
EuroChem	**Headquarters**: Zug, Switzerland EuroChem claims to be one of only three fertiliser companies globally which produces nitrogen, phosphate and potash.[99] It operates several nitrogen production plants, including in Russia and Belgium.[100] EuroChem was founded by Russian billionaire Andrey Melnichenko, who was placed under European sanctions in 2022 following Russia's invasion of Ukraine.[101]	**2024:** 6.2 million metric tons nitrogen fertilisers[102]	**Total revenue 2021:** $10.2 billion[103] **Revenue from nitrogen fertiliser 2021:** $3.5 billion[104]
Fertiglobe	**Headquarters:** Abu Dhabi, UAE Fertiglobe claims to be the largest producer of nitrogen fertilisers in the Middle East and North Africa (MENA) region, and the largest exporter of urea and ammonia (combined) by sea in the world.[105] Fertiglobe was founded in 2019 by the Abu Dhabi National Oil Company (ADNOC) and OCI Global, and is now majority owned by ADNOC.[106]	**2024:** 3.7 million tons ammonia, 4.3 million metric tons urea[107]	**Total revenue 2024**: $2.0 billion[108]
Grupa Azoty	**Headquarters**: Tarnów, Poland Grupa Azoty claims to be the second-largest producer of nitrogen and compound fertilisers in the EU.[109] Originally founded by the President of Poland in 1927, it is majority owned by the Polish Treasury which holds a 33% stake in the company.[110]	**November 2023 (one month):** 282,000 metric tons nitrogen fertilisers[111] **January 2024 (one month):** 199,000 metric tons nitrogen fertilisers[112]	**Total revenue 2024:** $3.5 billion[113]
Koch Fertilizer	**Headquarters**: Wichita, Kansas, United States Koch Fertilizer began producing ammonia in 1968 and now distributes more than 12 million tons of fertilisers every year.[114] Koch Fertilizer is part of Koch Inc, an American multinational conglomerate and the second-largest private company in the United States after Cargill.[115]	Not given	Not given
OCI Global	**Headquarters**: Amsterdam, Netherlands OCI Global is one of Europe's largest producers and distributors of ammonia and nitrogen fertiliser, operating multiple production facilities across the Netherlands and the United States.[116]	**2024:** 4.8 million metric tons ammonia and methanol combined[117]	**Total revenue 2024:** $4.1 billion[118] **Revenue from nitrogen fertiliser 2024:** $3.2 billion[119]

Company	Company Profile	Production of nitrogen fertilisers	Revenue (USD)
OSTCHEM	**Headquarters:** Horlivka, Ukraine OSTCHEM describes itself as a leading global producer and exporter of nitrogen fertiliser, ranking third and fourth for its nitrate and ammonia production capacities respectively.[120] OSTCHEM is part of the Ukrainian conglomerate Group DF, a leading European investor in the chemical industry.[121]	**2024:** 1.8 million metric tons nitrogen fertilisers[122]	Not given
PHOSAGRO®	**Headquarters**: Moscow, Russia PhosAgro describes itself as one of the world's leading phosphate-fertiliser companies, but also operates one of Russia's largest production facilities for NPK, ammonia and ammonium nitrate.[123] PhosAgro's founder Andrey Guryev resigned as CEO in 2022, following his inclusion in the EU's sanctions list.[124]	**2024:** 2.6 million metric tons nitrogen fertilisers[125]	**Total revenue 2024:** $6.3 billion[126]
PUPUK INDONESIA HOLDING COMPANY	**Headquarters**: Jakarta, Indonesia PT Pupuk Indonesia (Persero) claims to be the largest nitrogen-based fertiliser producer in Asia Pacific, the Middle East and North Africa.[127] It operates 14 urea plants, 13 ammonia plants and 18 NPK plants across Indonesia, and distributes fertiliser across Indonesia and worldwide.[128] It is part of the state-owned Pupuk Indonesia Group.[129]	**2024:** 11.6 million metric tons nitrogen fertilisers[130]	**Total revenue 2024:** $4.9 billion[131]
سابك sabic Agri-Nutrients	**Headquarters**: Jubail Industrial City, Saudi Arabia SABIC Agri-Nutrients describes itself as a leading global fertiliser producer, and manufactures a range of fertiliser products including ammonia and urea, as well as phosphate.[132] Formerly the Saudi Arabian Fertilizer Company (SAFCO), it was established by the Saudi Arabian government in 1965, and is now majority owned by the Saudi chemical manufacturing company SABIC.[133]	**2024:** 8.2 million metric tons nitrogen fertilisers[134]	**Total revenue 2024:** $2.9 billion[135]
URALCHEM	**Headquarters:** Moscow, Russia Uralchem claims to be one of the world's largest producers and exporters of nitrogen, potash and complex fertiliser, as well as Russia's biggest producer and supplier of ammonium nitrate.[136] It has a production capacity of over 3 million tonnes of ammonia, 3 million tonnes of ammonium nitrate, and 1.2 million tonnes of urea.[137] As of February 2023 its parent company, the Uralchem Group, owned 93.94% of the shares of TogliattiAzot together with its affiliates.[138] TogliattiAzot is a petrochemicals company which produces a range of fertiliser products including ammonia and urea.[139] It operates the world's largest ammonia transportation pipeline – linking ammonia manufactured in Togliatti with the Ukrainian port of Odessa (now closed, and partially damaged as a result of Russia's invasion of Ukraine).[140]	Not given	Not given

The fertiliser corporations profit while we all pay

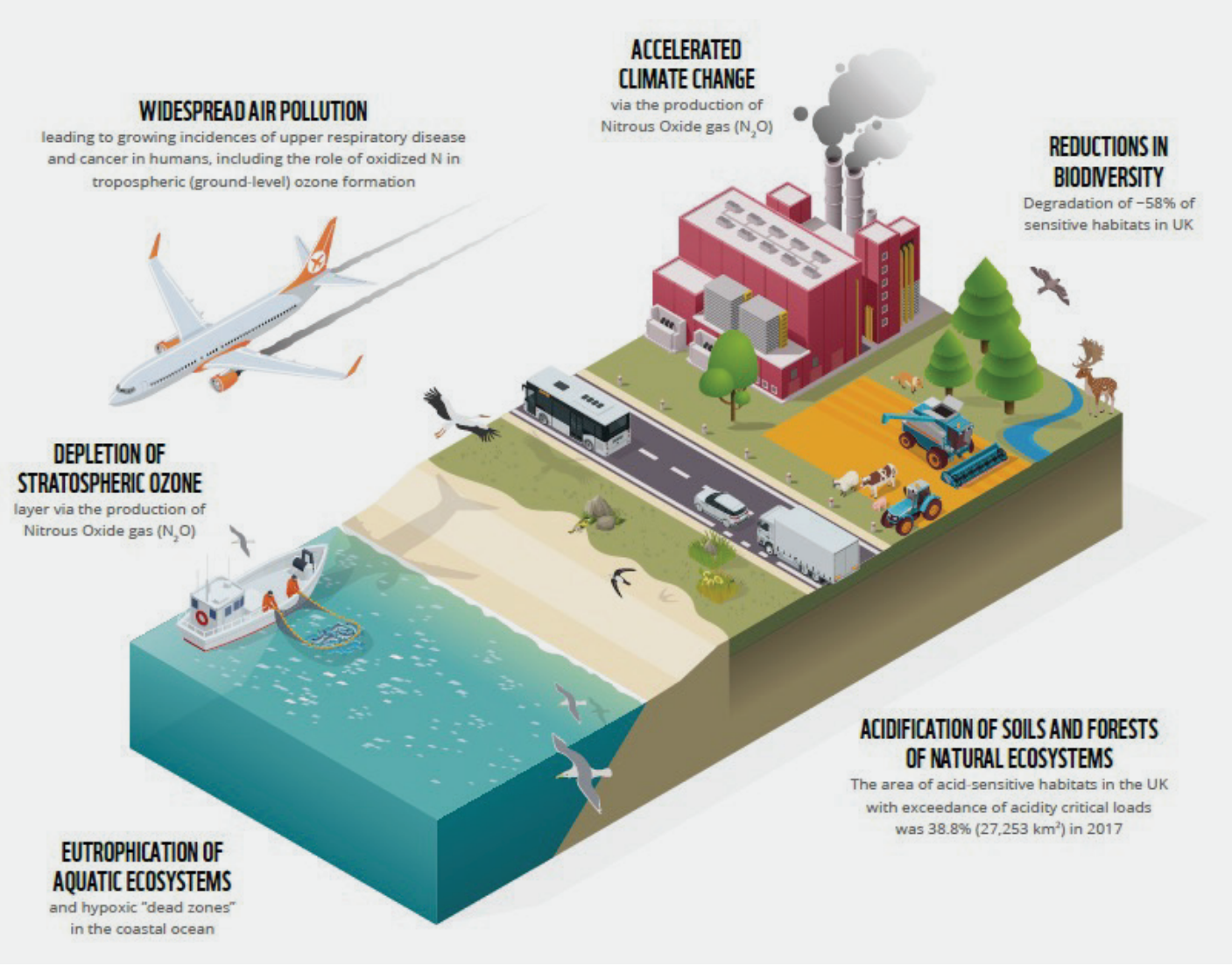
"Nitrogen pollution is one of the most pressing pollution issues facing humanity, threatening our environment, health, climate and ecosystems."

United Nations Environment Programme 2024[141]

While the business of nitrogen production is highly profitable for the state or private owners of these corporations, the billions they make from their products come at a heavy cost to society.

These costs come from what scientists have coined the 'nitrogen cascade', which describes the chain of negative effects that occur when excess nitrogen is unleashed into the environment.[142] These range from air pollution to accelerated climate change, biodiversity loss, depletion of stratospheric ozone, acidification and eutrophication (*see Figure 8, Box 1 and Image 5*).

Figure 8: The cascade of environmental impacts from excess nitrogen[143]



Source: WWF UK (2021) Nitrogen: Finding the Balance

Box 1: Dead zones: As horrible as they sound

The excessive use of nitrogen fertilisers causes nutrients to leach into freshwater and ultimately marine systems, leading to eutrophication. This nutrient leaching leads to algal blooms, which block sunlight and deplete oxygen, creating areas known as 'dead zones'.[144]

This can lead to mass mortality events, damaging or destroying local ecosystems.[145] This process also produces large amounts of dead biomass, which is further respired by microbes, releasing carbon dioxide (CO_2) and fuelling further climate change and aquatic oxygen depletion.[146] Oxygen depletion results in increased CO_2, which exacerbates local ocean acidification[147] The additional ocean acidification further compromises the biosphere integrity of marine life forms and ecosystems.[148]

Image 5: Eutrophication

Source: Shutterstock

This nitrogen cascade has direct and devasting impacts on human health: the EAT–*Lancet* Commission states that nitrogen pollution from agriculture is exposing five billion people – more than half of humanity – to unclean water, contaminated above safe levels as defined by the World Health Organization.[149] Nitrogen pollution is connected to adverse reproductive effects, cancers, thyroid diseases and birth defects.[150]

Although a complex exercise, there have been attempts to quantify these costs. In the UK for example, WWF has estimated that nitrogen pollution causes £2.5 billion in financial losses annually, to which must be added a staggering £10.9 billion in non-economic costs in the form of social, cultural and environmental loss.[151]

Box 2: Breakdown of cost of nitrogen pollution in the UK[152]

Breakdown of costs of nitrogen pollution in the UK

Description	Amount
Economic costs (refer to quantifiable financial losses)	£2.5 billion per year
Non-economic costs (refer to social, cultural, or environmental loss)	Estimated cost of £10.9 billion per year of societal costs due to nitrogen pollution in the UK

Breakdown of non-economic losses

Description	Amount
Agricultural related human health costs	£2.4 billion
Biodiversity	£4.4 billion
Climate change greenhouse gases (N_20)	£1.38 billion
Crop damage via ground level ozone	£0.99 billion
Drinking water contamination via nitrate	£0.45 billion
Energy use in N Fertiliser production	£0.87 billion
Human health effect of UV lights from high-level ozone depletion	£0.08 billion

Globally, according to the United Nations Environment Programme, a staggering $200 billion in losses and damages are incurred yearly as a result of nitrogen pollution (2018 figures).[153]

The fertiliser giants are generating private profits while the costs are borne by the public and the planet, a classic example of externalisation of costs, or privatised profit and socialised losses. And this is just in times of peace: war tends to be a boon time for the nitrogen fertiliser industry, and an opportunity to reap further profit, at the expense of farmers and the public (*see Box 3*).

Box 3: How times of war are often a boon time for the nitrogen fertiliser industry

The origins of the fertiliser industry are rooted in conflict. Mass-produced synthetic fertilisers emerged in the aftermath of the first world war as wartime needs brought breakthroughs in chemistry and shifts in industrial priorities.[154] A century on, the industry's fortunes remain deeply interwoven with conflict as it cashes in on price shocks linked to geopolitical conflict. Fertiliser companies also produce and distribute chemicals such as nitric acid, which is essential for making explosives and propellants.[155]

There are multiple examples of fertiliser companies oiling the cogs of conflict. For example, during the occupation of Norway in the Second World War, Norsk Hydro, predecessor company to Yara, profited significantly from supplying aluminium to the Nazi regime to be used in the German Luftwaffe's aircraft.[156]

Nitrogen fertiliser corporations can also profit from price shocks during times of conflict by unreasonably inflating the cost of their products or strategically restricting supply to push up prices.

In the year Russia invaded Ukraine (2022), the cost of raw materials (specifically natural gas) soared and fertiliser companies reaped enormous windfall profits.[157] The governments of the G20 countries saw their fertiliser costs rise by 189% in 2021 and 288% in 2022 compared with 2020.[158] According to the Institute for Agriculture and Trade Policy (IATP), between 2020 and 2022 the combined profits of the largest fertiliser companies surged by more than 440% – from just under $13 billion to over $57 billion.[159]

Similarly, the Energy & Climate Intelligence Unit (ECIU) estimates that fertiliser company (Yara, CF Industries, Origin Enterprise PLC) profits leapt 500% in 2022 relative to 2020, when record gas prices helped push fertiliser prices to an all-time high.[160] The most commonly used fertiliser, ammonium nitrate, was £719 per tonne in 2022, compared to £217 per tonne in 2020.[161] Norwegian fertiliser giant Yara's European division alone recorded profits of £578 million in 2022, compared to £123 million in 2020, with CF Industries making a gross margin of £1.28 billion on ammonia production in 2022, compared to £133 million in 2020.[162]

To these direct impacts of the nitrogen fertiliser industry must be added the indirect impacts caused by the industry's reliance on fossil fuels: with nitrogen fertiliser production accounting for 3–5% of global natural gas use, the nitrogen and fossil fuel industries[b] are intrinsically linked and share the same interests.[163] They must therefore both be held to account for the warming induced by industrial, fossil fuel driven agriculture.

With nitrogen fertilisers foundational to industrial agriculture much in the same way as oil and gas is foundational to the economy as a whole, reliance on nitrogen fertilisers is shaping geopolitical relationships and funding the war efforts of hostile nations (*see Box 4*).

"Europe is a net importer of fertilisers. 40% of imports come from Russia and Belarus. Since last year, Russia has imposed a 10% export tax on those fertilisers. With this, Europe is directly financing the war in Ukraine."

Yara International, as stated during a roundtable discussion at the European Parliament

With such a heavy price to society, it is remarkable that the fertiliser corporations have maintained their social license to operate. This is partly a function of the significant market power they wield and the deployment of a range of tactics, which are described in the following section.

Box 4: How Russia profits from the world's appetite for nitrogen fertilisers

Russia is a major producer and supplier of nitrogen-based fertilisers – as of August 2025, it produced more than 20% of the world's fertiliser and supplied around 25% of the EU's fertiliser imports.[164] Its global market share is expected to increase to 25% by 2030[165] and its production capacity could increase by 30% by 2030.[166]

Major Russian producers of nitrogen fertiliser include Acron Group, EuroChem, PhosAgro and Uralchem. While EuroChem transferred its headquarters from Moscow to Zug, Switzerland in 2015, the others remain headquartered in Moscow.[167]

While Western nations introduced a raft of sanctions on Russian businesses and private citizens (including fertiliser company executives) in the wake of the 2022 invasion of Ukraine, Russian fertiliser companies continued to supply their products without restrictions, increasing the wealth of several key individuals with close links to Russian fertiliser giants. A joint statement by the EU, United States and United Kingdom governments in November 2022 stated that: "**We have always been clear that the target of our sanctions is Russia's war machine and not the food or fertiliser sectors**" and called on "our global partners, and on the actors, industries and services involved in agricultural trade [...] **to bring Ukrainian and Russian food and fertiliser to meet acute demand**; and to continue to advance the accessibility of food to all".[168]

In 2025, the European Commission adopted a proposal to impose tariffs on a number of agricultural products from Russia and Belarus, as well as on certain nitrogen-based fertilisers.[169] The UK introduced additional import duties for nitrogenous fertilisers from Russia and Belarus as of July 2025.[170]

Direct contributions to the war in Ukraine:

- Two factories run by **EuroChem** supply chemicals to Sverdlov, a massive munitions facility in Dzerzhinsk which is the only significant Russian manufacturer of the plastic explosives HMX and RDX used in artillery and missiles.[171] EuroChem's Nevinnomysskiy Nitrogen plant in southwest Russia has sent at least 38,000 metric tons of acetic acid to Sverdlov during the Ukraine war. A second EuroChem facility, Novomoskovskiy Nitrogen, sent nearly 5,000 metric tons of nitric acid to Sverdlov in the same period. According to Reuters calculations, based on scientific literature and reviewed by an explosives expert, 5,000 tons of nitric acid could be used to make 3,000 tons of RDX, enough to fill 500,000 large-calibre artillery shells.
- **Uralchem** provided the same munitions facility, Sverdlov, with more than 27,000 metric tons of ammonium nitrate.[172] Ammonium nitrate is used to make HMX and RDX, and is also mixed with TNT to produce an explosive called Amatol. Uralchem also supplied 6,000 metric tons of nitric acid from its nitrogen fertiliser plant in Berezniki to Sverdlov.[173]

b While the focus in this report is on multinational fertiliser companies, it's important to acknowledge that global oil and gas majors, which produce fossil feedstocks for agrochemicals as well as the fossil fuels that power fertiliser production, also stand to benefit and profit from increased production and use of fertilisers. Foodrise is informed by and recommends consulting excellent research and analysis on the fossil fuel industry's role in driving fertiliser production by CIEL and Les Amis de la Terre (see references section).

Part 2: Nitrogen fertiliser corporations use the harmful industry playbook to profit from pollution

The EAT–*Lancet* Commission explicitly identifies corporate control and concentration as a threat to people's agency within food systems: "Concentrated firms' capacity to raise prices for seeds, fertiliser, grain, or packaged foods impacts people's access to food and influences which food they can and cannot consume"[174] and "The high degree of corporate concentration across food systems remains an intractable governance issue."[175] Corporate power undermines public interests and is wielded through tactics such as directly lobbying government officials, sponsoring scientific studies that align with companies' commercial interests, disseminating misinformation aimed at discrediting independent scientific evidence, or co-opting public-private partnerships to shape discourse in ways that reinforce their legitimacy and market power.[176]

As highlighted in the previous section, the global nitrogen fertiliser industry has undergone a series of mergers and acquisitions over the past century which have resulted in a few large firms dominating the market. According to the EAT–*Lancet* Commission, "Most economists agree that the likelihood of firms exercising market power increases when the top four firms control over 40% of the market"[177] and as we have shown, the top three alone control 34.6% of global nitrogen fertiliser production.[178] This power helps explain how nitrogen fertiliser companies have shaped the policy agenda to their advantage. Aware for many years of the deep and widespread harms caused by their products, the nitrogen fertiliser corporations have nonetheless continued business-as-usual, increasing production year-on-year. While lack of scrutiny has enabled their business to thrive while the harms mount up, evidence also suggests that the nitrogen fertiliser giants have taken a page out of the tobacco or oil and gas industry playbooks.

Over the years, nitrogen fertiliser corporations have ignored, deflected and distracted: in this section, we show how they have masterfully deployed six tried-and-tested tactics to protect their business and growth their profit at all costs.

Tactic 1: Ignore science, ignore policy

Long before the seminal Planetary Boundaries framework, scientists were sounding the alarm about the devastating consequences of excess nitrogen in the environment. These were noted as far back as the 1800s but became a pressing issue with the mass production and use of nitrogen fertilisers during the Green Revolution.[179]

In the late 1940s, reports first came out of many lakes in Europe undergoing eutrophication; coastal eutrophication was reported in Moriches Bay, New York, in the 1950s and became a persistent national scourge over the following decades.[180] By the late 1960s, Lake Erie was declared "dead" due to eutrophication caused by industrial pollution and nutrient run-off from agricultural fertilisers and sewage effluent (*see Image 6*).[181] Many other water bodies suffered the same fate, resulting in such environmental disasters as the huge Gulf of Mexico Dead Zone.

By the time of the landmark 1972 United Nations Conference on the Human Environment in Stockholm, the environmental impacts of fertiliser use were well documented and recognised. At the conference, "The environmental effects of pesticides and fertilisers were mentioned by several speakers, some of whom urged the development of safe and cheap alternatives to those pesticides and fertilisers that had been found to be harmful".[182] The final report recommended that governments and multilateral bodies "strengthen and co-ordinate international programmes for integrated pest control and reduction of the harmful effects of agro-chemicals".[183]

Image 6: Dead fish in Lake Erie

Source: Shutterstock

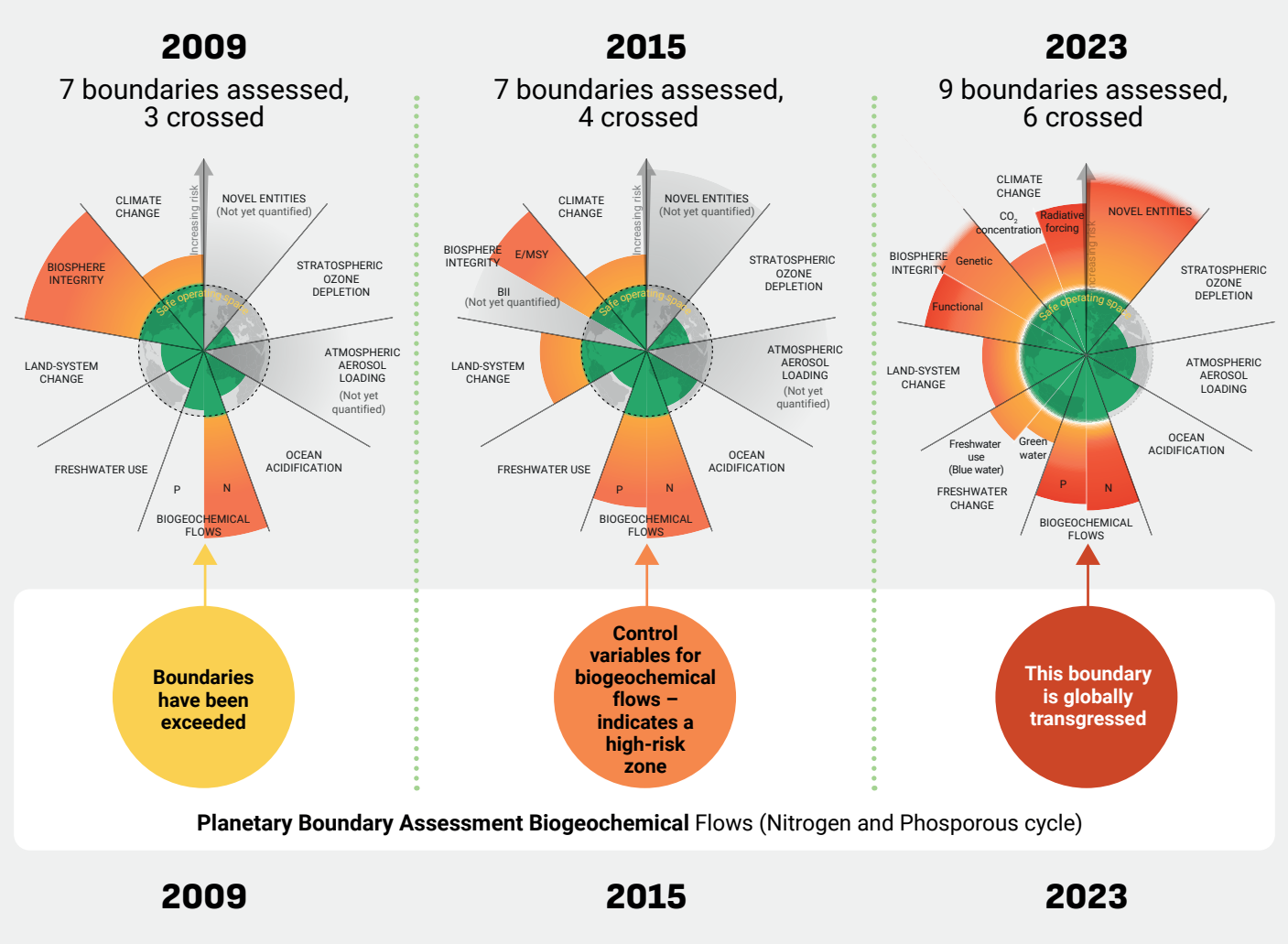
Evidence of excess nitrogen's harms further expanded after the 1970s, culminating in the landmark 1997 academic study on *Human Alteration of the Global Nitrogen Cycle*.[184] This detailed how human activities, specifically fertiliser use and fossil fuel combustion had nearly doubled the rate of nitrogen input into the global nitrogen cycle and identified nitrogen as a global environmental pollutant on a par with CO_2.

The United Nations Environment Programme's (UNEP) 2014 *Year Book* highlighted the importance of excess reactive nitrogen in the environment;[185] four years later, UNEP's influential *Frontiers – Emerging Issues of Environmental Concern* report for 2018/19 stated that the *Year Book*'s conclusions were alarming, "not just because of the magnitude and complexity of nitrogen pollution, but also because so little progress has been made in reducing it".[186] UNEP's Acting Executive Director, Joyce Msuya, characterised the development of nitrogen fertilisers as "the beginning of our long-term interference with the Earth's nitrogen balance," noting that "Every year, an estimated US$200 billion worth of reactive nitrogen is now lost into the environment, where it degrades our soils, pollutes our air and triggers the spread of 'dead zones' and toxic algal blooms in our waterways".[187]

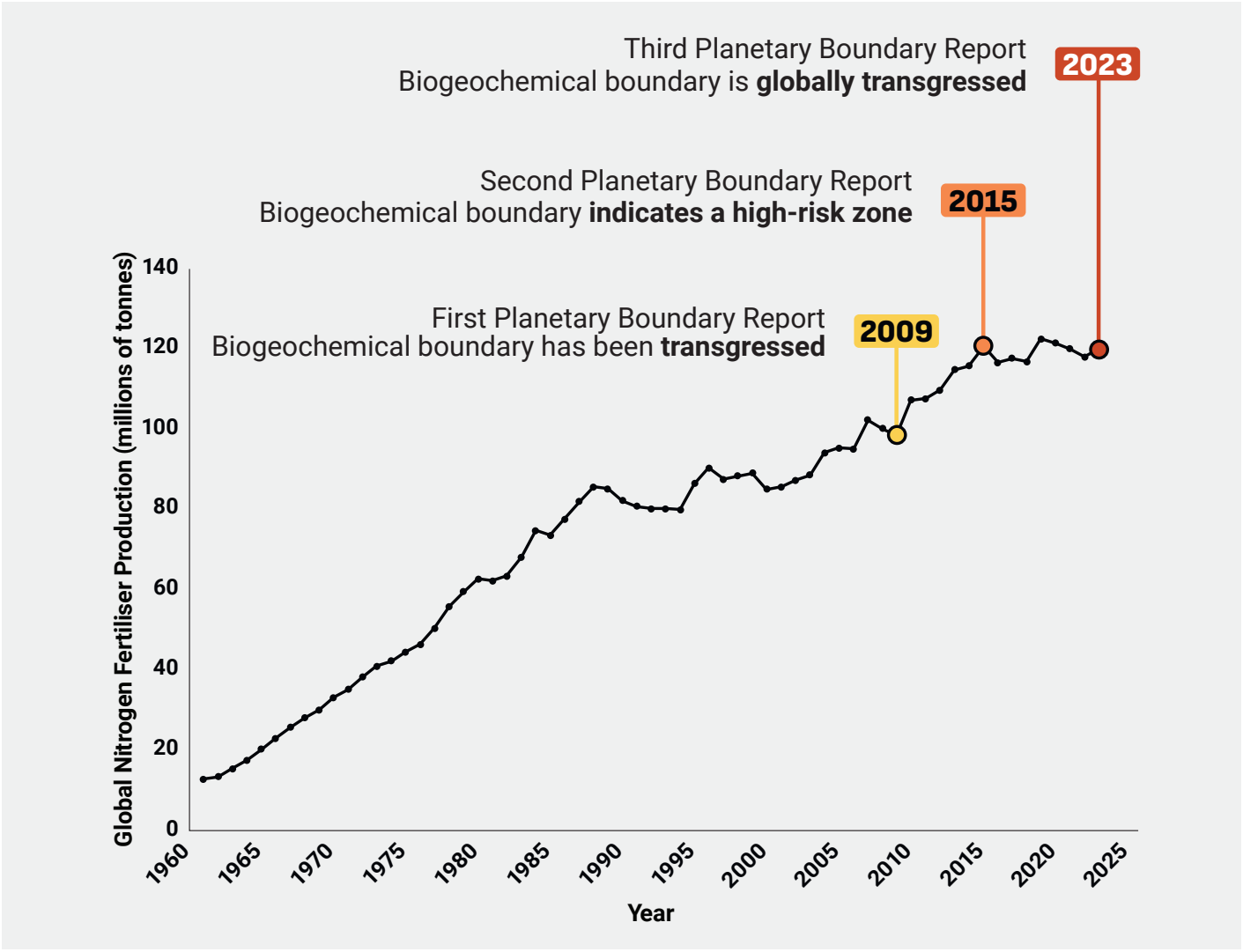
The evidence of nitrogen fertiliser disrupting the nitrogen cycle is as irrefutable as the evidence that burning fossil fuels is warming the climate. And the response to this evidence by nitrogen fertiliser companies has been much the same as the response of the oil and gas industry: ignore the science, keep on growing production and profits, regardless of impacts on the integrity of life-supporting planetary systems.

When the first Planetary Boundary assessment came out in 2009, nitrogen fertiliser corporations produced 98.6 million metric tons of fertilisers.[188] Six years later, with the second assessment, this had gone up to 120.9 million.[189]

Figure 9: How the Nitrogen fertiliser corporations continued to increase production despite warnings from scientists[190]



Source: Stockholm Resilience Centre (2023)



With extensive evidence of harm and no sign of it abating, policy makers have sought to rein in nitrogen pollution since the last decades of the 20th century.

The European Union, which is "beyond the safe operating space for nutrients" has taken a raft of measures to regulate nutrient emissions since the 1990s (*see Box 5*) – but these have failed to contain the problem.[191] China has also begun to take steps to address its "historically profligate" use of synthetic nitrogen fertilisers, but has yet to identify the right mixture of policies.[192] In the United States, there have been calls for measures to force the synthetic nitrogen fertiliser industry to improve product efficiency in the same way that car manufacturers have been required to improve their fuel efficiency,[193] but nutrient emissions remain persistently high.[194] Canada for its part has set a national emission reduction target of 30% below 2020 levels from fertilisers by 2030, committing to "work with fertiliser manufacturers, farmers, provinces and territories, to develop an approach to meet it".[195] However, Canada's direct emissions associated with synthetic nitrogen fertiliser application have increased by approximately 60% since 2005 and are projected to keep increasing.[196]

Box 5: European Union initiatives to regulate nutrient run-off and fertilisers

Intensification of agriculture, largely driven by unsustainable inputs of fertiliser, has resulted in widespread nutrient pollution across Europe with detrimental effects on biodiversity and human health.[197] 2021 data shows that more than 30% of surface waters, 14% of groundwater and 80% of marine waters in the EU are negatively affected by excess nutrients.[198]

In the 1990s, indiscriminate use of fertilisers by farmers and concerns about nitrogen run-off led to the EU Nitrates Directive (1991) which is nested under the Water Framework Directive (2000). These set rules for agricultural practices to limit the loss of nutrients to water, including limiting livestock intensity requiring member states to develop policies to reduce nitrogen and phosphorus emissions from farming, along with monitoring nutrient levels in water bodies. [199,200]

National governments are asked to designate sensitive zones known as Nitrate Vulnerable Zones (NVZs). Within these areas, protection measures such as capping the use of nitrogen-based fertiliser must be adopted to mitigate the risk of contamination.[201] Denmark was a frontrunner, reducing both its nitrogen fertiliser and manure usage between 1990 and 2011 through a series of policies in conjunction with monitoring and enforcement. [202] Use of nitrogen fertiliser was nearly halved and manure use reduced by approximately 7%.[203] Even so, Danish agricultural production remained relatively stable during that time.[204]

However, the Nitrates Directive has failed to deliver the requisite reductions in synthetic nitrogen fertiliser and the European Commission reports that improvement of nitrate pollution has stalled in the past decade.[205,206]

The European Environmental Bureau (EEB) states that "implementation and enforcement of the Nitrates Directive is far from satisfactory and, instead of directing measures to the root causes of pollution, derogations have been granted to the most livestock-intense countries and regions".[207] According to EEB, an important step towards remedying this would be for the European Commission to develop an Integrated Nutrient Management Action Plan to set out the path for how the EU should meet its already agreed targets to cut nutrient losses in half by 2030.[208]

These national and regional efforts are nested within multilateral and global initiatives to tackle nitrogen pollution that have developed since the 1972 Stockholm conference. In the last decade, three notable international agreements and conventions have been adopted:

- The **Colombo Declaration on Sustainable Nitrogen Management** was signed by 15 countries at the 2019 launch of the UN Global Campaign on Sustainable Nitrogen Management in Colombo, Sri Lanka.[209] Signatories committed to developing and implementing comprehensive policies on sustainable nitrogen management as well as developing national roadmaps for sustainable nitrogen management, with an ambition to halve nitrogen waste by 2030.[210]

- The **Kunming–Montreal Global Biodiversity Framework** was adopted at the Convention on Biological Diversity's 15th Conference of the Parties in 2022. Target 7 aims to reduce pollution from excess nutrients, including nitrogen, by at least 50% by 2030.[211]

- **United Nations Environment Assembly resolution 5/2: Sustainable Nitrogen Management** is a resolution adopted by representatives from 193 countries in 2022.[212] It encourages Member States to accelerate efforts to significantly reduce nitrogen waste globally by 2030 and beyond through the improvement of "sustainable nitrogen management" and also encourages Member States to share information on national action plans "as available, according to national circumstances".[213]

National and international initiatives, targets, action plans, policies and legislation all clearly acknowledge the nitrogen crisis and the imperative to act on it, without delay. They all share something else in common: none of them have worked and the nitrogen crisis continues to worsen. This is because all efforts to date fail to address the root cause of nitrogen pollution: the fact that the global dozen nitrogen fertiliser corporations continue to fuel overproduction and overuse of synthetic nitrogen fertilisers. Meeting nitrogen reduction goals would require reverting this growth trend. But, since the nitrogen industry has not been adequately reined in by governments, the nitrogen corporations have simply ignored international targets and declarations and ploughed on with business-as-usual.

Tactic 2: Shift responsibility to others

Unable to refute the undeniable evidence of the harm their products cause, nitrogen fertiliser companies have sought to present themselves as a partner to governments' and policy makers' endeavours to address nitrogen pollution. One of the main ways they have done this is by deflecting responsibility for the harms of nitrogen onto their customers – i.e., farmers – and then offering to help them use their products more responsibly, efficiently and sustainably. This approach is strikingly similar to the oil and gas companies' enthusiastic embrace of the notion of 'carbon footprints' which unfairly shifted responsibility for the emissions impacts of the use of oil and gas from corporations to individuals.

By touting the potential to reduce nitrogen pollution through more efficient use of their products, the nitrogen fertiliser corporations get to appear both to be part of the solution sought by policy makers, and on farmers' side. For example, on its website, Yara addresses farmers directly, stating that "Improving nitrogen fertiliser efficiency is one way your farm can become more productive, profitable and sustainable". Better still, 'selling efficiency' can become a whole new revenue stream – that is, for nitrogen fertiliser corporations, not farmers. Yara sells its *N-Sensor*, a tractor-mounted, real-time, variable-rate nitrogen sensor to measure and adjust the crop nitrogen requirement as the fertiliser spreader passes across the field.[214] It also has a partnership with American agricultural machinery firm John Deere, whereby farmers are able to monitor the development of their crops and nitrogen uptake, using Yara's own online platform.[215] This data is then shared with John Deere to develop a farmer work plan that syncs with John Deere machinery, no doubt locking farmers into business contracts with both corporations.[216]

Image 7: Yara N-Sensor

Source: Wikimedia Commons

For its part, Nutrien has developed its '*4R*' programme for farmers. The 'Rs' stand for right source, right rate, right time and right place. It offers farmers a financial incentive to "improve your nitrogen efficiency" through crafting a 4R plan and reducing emissions as a result.[217]

As for OCI Global, it offers some planning and educational apps to farmers, stating on its website that "farmer education is essential to ensure nitrogen fertiliser application is optimised for both production and environmental protection" – implying that nitrogen pollution is the fault of poorly trained farmers, that it will be solved through training, and that they are keen to be part of the solution through offering said training.[218]

This egregious claim deflects responsibility for the nitrogen crisis away from the corporations. It also distracts from the fact that the way nitrogen fertiliser is applied at a farm level makes no difference to nitrogen pollution overall if corporations continue to produce and supply it at the same or higher rate. OCI Global shows no signs of slowing its output and the company reported an 11% year-on-year increase in revenue for its continued operations in the first half of 2025 compared with the first half of 2024.[219] Meanwhile, Yara plans to continue increasing its production, setting an ammonia production target of 8.6 Mt for 2025, compared with 8.1 Mt produced in 2024.[220] All nitrogen fertiliser corporations reviewed for this report state they intend to increase their shareholder value – couched, for example, as delivering "superior value" and "long term" value for Nutrien.[221] These growth and profit ambitions confirm that the nitrogen fertiliser corporations' efficiency initiatives aim to distract and greenwash, rather than reduce nitrogen pollution.

Nitrogen fertiliser companies' attempts to evade responsibility for their impacts are all the more shocking as huge volumes of nitrogen fertiliser do not serve their intended purpose. The concept of Nitrogen Use Efficiency (NUE) is instructive here. The NUE of agriculture is defined as the quantity of food (except seafood) divided by the total input of new nitrogen, including synthetic and biological fixation.[222,223] Estimates of the NUE of the food system vary in different regions of the world and for different crops, and are hard to reliably estimate. NUE values have to be interpreted in relation to productivity (nitrogen output) and nitrogen surplus (i.e., the difference between N input and N output).[224]

The EAT–*Lancet* Commission quotes a study which put the global NUE average at 0.48 whereas the United Nations Environment Programme estimated the average to be 0.20 (in 2018).[225] [226] What these estimates mean is that only 48% to 20% – less than half to one-fifth – of the new nitrogen introduced for food production is transformed into food. Some 52% to 80% is wasted to the environment. In other words, more than half, and up to 80% of nitrogen fertiliser inputs cause harm, and less than half and as little as 20%, creates value. Starkly put, this means that nitrogen fertiliser corporations are knowingly profiting from pollution, selling a product that is up to 80% pollution, with as little as 20% serving its intended use for crop growth.

"Considering the whole food chain, only around 20 per cent of the (reactive) nitrogen added in farming ends up in human food. This implies that a worrying 80 per cent is wasted as pollution."

United Nations Environment Programme, 2018[227]

And yet the nitrogen fertiliser corporations continue to blame nitrogen pollution on farmers, all the while knowingly selling them a product that is largely wasted. In its response to the European Commission's public consultation on soil health, Yara states that "Plant nutrients are essential […] to feed crops to nourish humans, guarantee quality yields and to ensure soil fertility in the long run. They are not per se a source of diffuse soil pollution; it only happens when plant nutrients are not applied according to good practice and to the needs of the crops".[228]

Pretending to work with farmers to improve the efficiency of nitrogen fertiliser application while being in the business of primarily selling excess nitrogen pollution goes beyond deflecting responsibility and greenwashing and is in fact a startling act of deception.

Tactic 3: Lobby to capture

Much like the oil and gas industry, nitrogen fertiliser corporations are committed to stave off any government intervention that could curtail their business and profit. They spend considerable resources lobbying, to shape policy and regulatory environments in their favour. Individual corporations lobby government and public institutions directly or through industry bodies such as Fertilizers Europe, the Fertilizer Institute or the International Fertilizer Association (*see Box 6*).

Box 6: Major Fertilizer Industry Associations

Fertilizers Europe: Fertilizers Europe (FE) is a trade group which represents the interests of the majority of mineral fertiliser manufacturers in the EU including **Grupa Azoty**, **Yara** and **OCI Global**.[229]

The Fertilizer Institute: The Fertilizer Institute is one of the key lobby groups for the US fertiliser industry. It represents every segment of the fertiliser supply chain, and its members include **EuroChem**, **Nutrien**, **Yara**, **CF Industries** and **SABIC**.[230]

International Fertilizer Association: The International Fertilizer Association is a global body which has approximately 400 members (including **Koch Industries**, **Yara** and **Sabi**) and accounts for approximately 70% of world mineral fertiliser production.[231]

The resources involved in the nitrogen fertiliser's industry lobbying efforts are considerable. We found that in 2023, major nitrogen fertiliser companies spent $4.1 million on lobbying the US, and €3.05 million lobbying the EU, for a total (in USD) of over $7.5 million.[232] In the same year, industry bodies Fertilizers Europe and The Fertilizer Institute spent $1.7 million and €0.7 million lobbying the US and EU respectively – for a total (in USD) of over $2.5 million.[233] Combined, these fertiliser companies and industry groups combined spent at least $5.8 million lobbying the US and €3.75 million lobbying the EU in 2023 – for a total (in USD) of over $10 million.[234]

With such large budgets at their disposal, nitrogen fertiliser corporations are very comfortable in the corridors of powers: Grupa Azoty has met the European Commission at least 8 times since 2020, while Yara has met the Commission at least 40 times in that same time period.[235] In addition to these meetings, the corporations and their industry groups are assiduous respondents to consultations on new strategies and proposed legislation.

We reviewed the consultation responses of fertiliser industry lobby groups and individual corporations to several progressive EU policy initiatives, including the 'Farm to Fork' Strategy, the EU Green Deal, the Nitrates Directive and the EU Soil Health law proposal – and found that the nitrogen fertiliser industry consistently opposes any government interventions that could help tackle the environmental and climate crises. Some common themes emerge in the industry's approach to consultations.

First, **the industry is keen to appear constructive, positioning itself as the expert in the room, ready to provide solutions to policy makers** – provided that is, that the nitrogen fertiliser corporations do not need to change their business in any way. In its response to the 'Farm to Fork' strategy for example, Fertilizers Europe is happy to "strongly recommend" that the EU Commission "aim at further reducing nutrient losses in the EU" – but only "instead of setting arbitrary reduction targets for fertilizers".[236] This creates the impression that Fertilizers Europe is seeking to advance the Commission's agenda – while the use of the word "arbitrary" implies that policy proposals are best left to the experts in the room – themselves. And as experts, they are ready to put forward interventions of their own: "a target of increasing the Nitrogen Use Efficiency (NUE) in the EU by 10% by 2030" knowing only too well that such a target will not, as we have seen, meaningfully reduce nitrogen use.[237] Or they readily commit to concepts such as "the realisation of the Circular Economy".[238] All these consultation responses serve the purpose of making the industry look like it is advising policy makers in good faith to help them craft effective legislative proposals – when in reality, the industry consistently deflects from proposals that might constrain its business.

Second, **the industry pretends it is already acting on the issues policy makers are seeking to address through policy or regulation**. Trade bodies acknowledge theirs is a polluting industry – but say they've cracked it. For example, in its response to the EU Green Deal consultation Fertilizers Europe assures that the European fertiliser industry has already "evolved into a global leader on sustainable developments".[239] Grupa Azoty states that the EU fertiliser producers have "already made significant contribution to lowering their greenhouse gas emissions".[240] The message is clear: we are not the problem here. In the context of this specific consultation, this translates to support for a proposed carbon border adjustment mechanism, which would present a cost to global competitors. If the fertiliser industry is able to show that it is taking steps to tackle its environmental impacts, this implies that it can self-regulate and that there is no need for further policy or regulatory intervention. In fact, Grupa Azoty is explicit on this point, when – despite reams of evidence on the nitrate pollution of water – it boldly states in its response to the Nitrates Directive consultation that "the impact of applicable regulations is sufficient".[241]

Third, even if the nitrogen fertiliser industry is willing to recognise the need to address nitrogen pollution, it consistently makes the case for business-as-usual **citing uncertainty, data inconsistency or methodological complexities**. In its response to the soil health consultation for example, Yara decries the "lack of a scientifically standardized framework" and cautions against "one-sizes-fits-all and one-out-all-out methodologies".[242] The message is clear: any change in the nitrogen fertiliser industry, even if deemed desirable or necessary by policy makers, is simply too complex, too risky, too onerous to entertain. The safer bet is to stick with business-as-usual.

Fourth, in its consultation responses, **the nitrogen fertiliser industry presents itself as the voice of famers, pretending it's on their side** – while, in reality, as seen in the previous section, it shifts blame to farmers and puts the onus on them to change their behaviour. In its consultation response to the 'Farm to Fork' strategy, Fertilizers Europe urges policy makers not to adopt measures that "would condemn countries in Central and Eastern Europe to have suboptimal agriculture forever".[243] Yara states in its response to the Nitrates Directive consultation that "the way forward should be on promoting and incentivising best practices and reducing farm-level bureaucracy".[244] At the same time, Yara states that plant nutrients are not "per se a source of diffuse soil pollution; it only happens when plant nutrients are not applied according to good practice and to the needs of the crops" – and that nitrogen pollution will therefore be solved through "optimised fertilisation", that is to say by farmers, rather than fertiliser corporations.[245] Grupa Azoty calls for "a greater focus on improving regulation and knowledge exchange in the agricultural community".[246] According to fertiliser companies, the industry itself cannot and does not need to change.

Fifth and finally, while the fertiliser industry might acknowledge the concerns of policy makers, **it seeks to block action through invoking the TINA doctrine**: There is No Alternative. This is why Fertilizers Europe reminds policy makers in its response to the EU Green Deal consultation that its activities are "of paramount socio-economic and thus political importance", implying that any efforts to restrict the industry would be at governments' own peril.[247] If all else fails, the industry is not averse to some space-filling with platitudes or irrefutable facts. It is in that vein that Yara reminds us in its Nitrates Directive consultation response that "Nutrients, such as nitrogen, are essential for food production".[248]

So far, the fertiliser industry's efforts appear to have paid off: progress on curbing the overuse of nitrogen fertilisers has been blocked and the growth of the industry has continued unabated. The EU's 'Farm to Fork' strategy can best be described as a missed opportunity – or a success for agribusiness and the trade associations that represent it. One of the central pillars of the European Green Deal under the first Presidency of Ursula von der Leyen, this strategy contained a target to reduce nutrient losses from both organic and mineral fertilisers by at least 50% by 2030, while ensuring no deterioration in soil fertility. Meeting this target would have led to a projected reduction in fertiliser use of at least 20% by 2030. Regrettably, this wording does not appear in the EU Vision for Agriculture and Food, published in February 2025 – following intense corporate lobbying to water down the EU's ambitions to drive a transition to a more sustainable food system.

Nitrogen fertiliser companies' lobbying activities extend well beyond the EU. Our research shows that company executives are also turning out in significant numbers to UN climate summits (*see Box 7*).

Box 7: Nitrogen fertiliser lobbyists turn out in force at COP30

While the lobbying of the oil and gas industry has been well documented, little attention has been paid to the influence of the fertiliser industry on international climate negotiations.

We analysed participation at every United Nations climate summit since COP26 in 2021, and found that lobbyists from major nitrogen fertiliser companies have attended every single one. Our analysis found that 17 were in attendance at COP30 in Brazil – that's more than triple the number of lobbyists compared with COP26.[249]

Even more concerningly, every single representative from the nitrogen fertiliser industry participated in COP30 as a country delegate.[250] Compared with the 'observer' badges typically granted to NGOs, country badges offer greater access and power to influence the negotiations.

COP28 in Dubai maintains the record for the industry's biggest turnout, with 48 representatives from eight major nitrogen fertiliser producers: EuroChem, Fertiglobe, Nutrien, OCI Global, PhosAgro, Pupuk Indonesia, Uralchem and Yara International.[251]

This outnumbered the individual official delegations of Nauru (21), Cook Islands (19), Niue (24), Micronesia (26) – all South Pacific small island developing states experiencing some of the deadliest impacts of climate breakdown.[252]

While fewer fertiliser lobbyists attended COP30, the contingent was dominated by three major nitrogen producers: Pupuk Indonesia, Uralchem and Yara International.[253] Yara has maintained a consistent presence over the years, with Bernhard Mauritz Stormyr, its Vice President of Sustainability Governance, attending every climate summit since COP26.[254]

The continued presence of these lobbyists enables them to control the narrative around nitrogen fertiliser, and to water down, influence and obstruct policy change.

The fertiliser industry continues to escape meaningful regulation, having convinced regulators, despite all evidence to the contrary, that fertilisers are "essential and safe".[255]

Tactic 4: Shape public discourse, research, education

In addition to lobbying governments and international institutions to shape policy in their favour and evade regulation that might restrict their activities, nitrogen fertiliser corporations aim to cement their social legitimacy and licence to operate in other, arguably more insidious, ways.

The three largest nitrogen fertiliser giants are regular conference sponsors. For example, all three sponsored the 2025 World Fertilizer Conference in Chicago, which purports to be "the most important business and networking event for the global fertilizer industry".[256] Among other global conferences, Yara is a gold tier sponsor of the European Hydrogen Week Expo and Conference 2026, whose stated aim is to "advance this clean technology […] and achieve a carbon-neutral future".[257] This sponsorship entitles Yara to put forward a speaker for a panel discussion at the event's High-Level Policy Conference.[258] Sponsorship money talks: funding these events is about setting the agenda and shaping the terms of the debate about the industry.

In addition to conference sponsorships, CF Industries, Yara and Nutrien are sponsors of the Ammonia Energy Association – a non-profit organisation that "promotes the responsible use of ammonia in a sustainable economy" – and sit on the Association's board.[259] Yara and CF Industries are also founding partners in the IFA's Sustainable Fertilizer Academy, which was established in 2022 as a "global learning platform to support the transition toward more sustainable and responsible fertiliser systems".[260] These endeavours purport to promote sustainability. In reality, they push the fertiliser industry's commercial agenda – a classic case of astroturfing.

The three nitrogen fertiliser giants also spend considerable sums to support – or shape – the research agenda. Nutrien for example was a top-tier sponsor of the 2024 Canadian Society of Soil Science conference, which "encourages soil scientists to think about how we can safeguard the vital resource of soil into the future".[261] And beyond specific sponsorship of academic conferences, Nutrien has a

long history of donating considerable sums to academic institutions. In 2020, it contributed $10 million to Colorado State University's College of Agricultural Sciences, to "support innovative research in sustainable agriculture".[262] A newly remodelled building at the College has been renamed the Nutrien Agricultural Sciences Building.[263] In February 2025, Nutrien announced a $15 million donation to the University of Saskatchewan, to be used to establish the Nutrien Centre for Sustainable and Digital Agriculture.[264]

In total, Nutrien will have invested over $50 million dollars in the university, ensuring, in its own words, a future employee "pipeline" – or graduates schooled only in synthetic, fertiliser-reliant, fossil fuel agriculture.[265]

Box 8: Nitrogen fertiliser industry funded research

In October 2025, Yara Clean Ammonia, a subsidiary of Yara International, co-funded (alongside the Research Council of Norway, Equinor and others) a research paper published in Nature: 'Uncertain climate effects of anthropogenic reactive nitrogen'.[266]

This was in response to a study published in July 2024: 'Global net climate effects of anthropogenic reactive nitrogen'.[267] In response to the original study, the paper co-funded by Yara states: "Gong et al. reported a net negative direct radiative forcing (RF) of Nr in the year 2019 relative to the year 1850. We argue that their estimates and associated uncertainties of individual Nr climate effects, most notably aerosol, ozone and methane RF, do not reflect the current state of the art."[268] Citing uncertainty, the paper concludes: "A range of models are needed to quantify the climate effects of anthropogenic Nr".[269]

It is striking that the paper concludes with a call for further research and modelling, which is reminiscent of the calls for further research from the oil and gas industry over the years, delaying the case for climate action on the basis the science was not 'settled'. Academic exchange is healthy and necessary, to test evidence and progress research agendas, but industry-backed research which overstates uncertainty and appears to favour inaction must be understood for what it is: a clear delay tactic.

The shaping of minds starts early. In February 2025, Nutrien announced a $100,000 sponsorship to develop a crop-growing themed role-playing exhibit at the Children's Museum of Northern Colorado.[270] The museum's Executive Director described how "children will grow and harvest play-ready crops, simulating a 'farm kid' experience".[271] While sponsorship of a children's museum may sound laudable, it is also ensuring the younger generation is exposed to and therefore normalises the type of food production that requires Nutrien's products. The sponsorship appears even more nefarious when one considers that this same younger generation will need to contend in adulthood with the consequences of a nitrogen cycle that has been broken by the overuse of synthetic fertilisers, including those produced by Nutrien.

Tactic 5: Proffer false solutions

As the harmful effects of the nitrogen crisis become impossible to deny, and policy makers set targets for reducing nitrogen emissions and pollution, fertiliser companies want to look like they're taking action – especially as they stand to pocket public money.

Greenhouse gases are emitted in vast quantities during both the production and the use of nitrogen fertilisers. Nitrogen fertiliser contributes approximately 2% of global greenhouse gas emissions. More than 38% of fossil fertiliser emissions come from its production alone, which is highly energy-intensive, with field emissions and transportation making up the rest.[272] Nitrous oxide, the greenhouse gas released by nitrogen fertilisers when applied to the field, is nearly 300 times as powerful as CO_2 (*see Annex IV*).

The production of nitrogen fertilisers also requires large amounts of fossil fuel as a feedstock – 70% of all nitrogen fertiliser is made from fossil gas (and nearly all the rest from coal).[273] An estimated 4% of the world's gas supply in 2020 was used to make ammonia, which is the precursor to nitrogen fertilisers (approximately 70% of the ammonia produced globally is earmarked for fertilisers).[274]

It is widely accepted that reducing the emissions intensity of nitrogen fertiliser production is critical if the Paris climate

targets are to be met – or at least to slow the pace of emissions and global heating. And while targets and policies to reduce nitrogen production at source have hitherto been lacking, there are targets, policy and regulatory action on emissions. Therefore, the nitrogen fertiliser corporations must appear to be on decarbonisation pathways. Yara, for example, is proud to state that it intends to "drive the green shift [...] by producing ammonia with significantly lower emissions".[275] SABIC for its part states it intends to "establish a foothold in the evolving low-carbon ammonia sector".[276] And OCI claims to be "reducing the embedded carbon footprint of nitrogen fertilizers by using alternative feedstocks and carbon capture and storage".[277]

These claims are based on the industry's purported pursuit of blue and green hydrogen to produce ammonia. Blue hydrogen is produced mainly from natural gas and therefore remains fossil fuel based. Carbon capture and storage (CCS) is used to reduce carbon dioxide emissions from the production process, but it doesn't avoid the creation of greenhouse gases.[278]

"'Blue' hydrogen is a marketing scam, pure and simple. [...] The best any plant has done for net CO_2 capture is 25% to 30%, and that's before the very potent methane [leaks]."

Robert Howarth, Professor of ecology and environmental biology at Cornell University[279]

Green hydrogen is made by using clean electricity from renewable energy sources, such as solar or wind power, to electrolyse water. Electrolysers use an electrochemical reaction to split water into its components of hydrogen and oxygen, emitting no carbon dioxide in the process.[280] Green hydrogen currently makes up a small percentage of overall hydrogen, because production is expensive. As such, it must be reserved as a priority for sectors which have fewer alternatives, such as steel making.[281] Scaling up green hydrogen would be very energy-intensive and put significant pressure on renewables infrastructure and water supply, as well as presenting serious challenges for storage and transport. For either type of hydrogen, given its low density, compressing or liquefying it for transport requires a significant amount of energy.[282]

In addition, in many countries – particularly in the those of the Global Majority – the renewable energy plants needed to produce green hydrogen are built on agricultural land, destroying jobs in small-scale farming and threatening biodiversity in these areas. In Namibia, South Africa and Maghreb, large renewable energy projects producing green hydrogen have been described as 'green neocolonialism' by local activists, as local agricultural land, water and energy resources are monopolised for the benefit of European countries, depriving local populations of their basic needs.[283]

In summary, while both blue and green hydrogen are put forward as promising approaches to decarbonise nitrogen fertiliser production, there are numerous challenges associated with their deployment at scale and it remains the case that almost all (98%) synthetic nitrogen fertiliser is made from fossil fuel.[284]

Not only are blue and green ammonia a false solution to the nitrogen fertiliser industry's emissions problem, they are also a false solution **to the wrong problem**. The scaled-up use of blue or green hydrogen will not address the central issue associated with the overproduction and overuse of nitrogen fertilisers, namely the environmental nitrogen surplus and the significant greenhouse gas emissions generated during the use phase.

Despite this, many policy makers have bought into the green and blue hydrogen hype as a solution to fertilisers' fossil fuel problem, and have channelled considerable funds in the form of loans and subsidies to support the development of 'clean' hydrogen projects and 'low-carbon' nitrogen fertilisers (*see Box 9*).

Box 9: EU support for 'clean hydrogen' and 'low carbon' nitrogen fertilisers

In 2022, the European Investment Bank, the lending arm of the European Union, lent €53 million to Iberdrola Green Hydrogen, a Spanish company, to fund a green hydrogen plant to supply the fertiliser industry.[285] In 2025, it also lent €116 million to a fertiliser plant in Paraguay.[286] This money will go towards the construction and operation of a 'low carbon' fertiliser plant producing 260,000 tonnes of Calcium Ammonium Nitrate (CAN) fertiliser. According to the project objectives: "The purpose is to demonstrate the possibility to implement a production process fully powered by renewable energy in one of the most carbon-intensive industrial sectors, the production of nitrogen fertiliser."[287]

In 2025, the European Commission's Innovation Fund granted over €75 million to a project that aims to become Europe's first industrial ammonia plant entirely operated on renewable hydrogen power.[288] This project is coordinated by Fertiberia, a Spanish company that works on green hydrogen, crop nutrition and low-carbon ammonia among other things.[289] The ammonia produced from this facility will be used in fertilisers.[290]

Governments' enthusiasm for blue and green hydrogen is a boon time for the nitrogen fertiliser corporations. Indeed, it enables them both to clean their image – if not their business – while cashing in on generous public subsidies and expanding into new markets on their so-called decarbonisation pathway.[291] In the last four years alone for example, Yara and partners received subsidies to develop green hydrogen plans to the tune of AUD$42.5 million (US$27.6 million) from the Australian government and NOK 283.25 million (US$28 million) from Norway's state enterprise Enova.[292, 293]

For the nitrogen fertiliser corporations, the channelling of public funds in their direction must be understood primarily as a profit enhancing additional revenue stream, rather than an opportunity to develop and scale less emissions-intense production. This is apparent in the way nitrogen fertiliser corporations have discreetly exited certain projects when opportunities for better returns lay elsewhere (*see Box 10).*

Box 10: Yara and BASF Exit from the Gulf of Mexico

In June 2023, Yara and German chemical giant BASF announced, with much fanfare that they planned to build a "low carbon blue ammonia production facility" in the US Gulf Coast Region, where carbon dioxide (CO_2) generated from the production process would be captured and permanently stored in the ground.[294] The plant would have total capacity of 1.2 million to 1.4 million tons per year and benefit from Inflation Reduction Act (IRA) incentives.[295] Yara estimated that IRA tax credits, including $85 per tonne of CO_2 stored, would represent about $150 in tax credit per tonne of ammonia produced; Reuters quoted Magnus Krogh Ankarstrand, president of the Yara Clean Ammonia subsidiary, as saying that "U.S. taxpayers would effectively subsidise removing CO_2 from ammonia which is then exported for European use."[296]

Both companies already operate in the region, with an ammonia plant at BASF's site in Freeport, Texas. According to investigative news outlet ProPublica, people living in Freeport face an incremental lifetime cancer risk of "1 in 450 or 22 times the EPA's acceptable risk" due to the pollution emitted by the surrounding industry.[297]

The blue ammonia site was meant to supply fuel for the region's maritime transport. However, the two partners chose to "scrap the project" in August 2025 due to "growing uncertainty", but without fully explaining the nature of that uncertainty.[298]

In the only other details provided, Yara claimed the decision was prompted by the companies' focus on initiatives seen as bringing "the highest potential to achieve their respective value creation goals".[299] This suggests the decision was a commercial one, rather than one influenced by environmental or health concerns.

The decision to cancel the blue hydrogen project in the US Gulf was met with a 4.8% increase in Yara's shares.[300]

While the nitrogen fertiliser corporations claim to have made progress in reducing emissions, substantial emissions still occur following application of nitrogen fertilisers. So even if green and blue hydrogen were to live up to their hype, they would not prevent the cascade of destruction that comes when vast amounts of human-made nitrogen are used on fields and unleashed into the environment.

But the nitrogen fertiliser corporations prefer to ignore this inconvenient truth, ramping up production even as they cash in on climate subsidies.

Tactic 6: All the while, double down on dubious claims

As we have seen, the nitrogen fertiliser corporations are no strangers to using deflection and distraction to suit their growth agenda. But this is not always enough, and at times, the industry's tactics are best described as deception. This is an industry that unleashed the nitrogen cascade of destruction, and yet Yara states that part of its mission is to "protect the planet". It further has an ambition to "positively impact nature in the value chain: soil health, biodiversity, water, air quality, and land-use change".[301] This is the industry that has caused the transgression of the biogeochemical planetary boundary – and yet PhosAgro states that it strives "to create (our) fertilisers in a safe and environmentally friendly way, ensuring sustainable growth in agricultural production worldwide".[302] A nitrogen fertiliser industry that 'positively impacts nature' or 'sustainably grows' is simply not possible: scientists know this, policy makers know this, nitrogen fertiliser corporations know this, and yet they choose to boldly peddle these deceptive statements.

But the boldest deception of all is the nitrogen fertiliser industry's claim that 'it feeds the world'. The nitrogen fertiliser corporations all make a version of this claim. SABIC claims to "support nutritional needs through increased agricultural productivity of food and fibre".[303] EuroChem claims to "help farmers put food on tables for more than 350 million around the world".[304] Pupuk Indonesia states that it is "Committed to Ensuring Food Security in Indonesia".[305] OCI states that "The world relies on nitrogen fertilizers to grow crops and feed 4 billion people".[306] Nutrien's tagline is "Feeding the Future" and it refers to "the global challenge of feeding nearly 10 billion people by 2050".[307] It states: "The necessity of nitrogen for crop yield supports a strong and growing demand source for nitrogen fertilizers."[308] Yara tell us that it was "founded in 1905 to solve the emerging famine in Europe" and that its mission is to "responsibly feed the world".[309]

These claims are extremely useful for the nitrogen fertiliser industry as they are hard to argue against: a challenge to the nitrogen fertiliser industry suddenly sounds like a vote for hunger and famine. And while the widespread use of nitrogen fertilisers may indeed have helped to secure food security in the early days of the Green Revolution, the context today is fundamentally different: as seen, we are now living outside the planetary safe operating space for humanity. Today, production and use of nitrogen fertiliser make it harder and harder – not easier – to produce food, by furthering climate breakdown, soil acidification and water pollution.

The claim that nitrogen fertilisers feed the world simply does not withstand scrutiny. We need to consider *what crops* are being grown using nitrogen fertiliser, and *for whom*.

Corn is the primary US feed grain, accounting for more than 95 percent of total feed grain production and use. It has become the largest consumer of nitrogen fertiliser, driven by animal feed and bioethanol production.[310] Almost two-thirds (64%) of US corn production are used for animal feed.[311]

In Europe, cultivation of wheat and other cereals like barley dominate nitrogen use. Nearly two-thirds of the EU's cereals are used for animal feed.[312]

> **"The primary use of N in crops [...]is not directly to feed people: 80% of the N harvest in European crops provides feeds to support livestock"**
>
> Mark A. Sutton, NERC Centre for Ecology and Hydrology, and Hans van Grinsven, PBL Netherlands Environmental Assessment Agency[313]

Both the livestock and the nitrogen fertiliser industries have grown massively since the 1960s (*see Figure 10*).

Figure 10: Meat, Dairy and Fertiliser Production (1961–2021)[314]

	1961	2021
Meat	70.57 million tonnes	351.28 million tonnes
Dairy	344.17 million tonnes	940.39 million tonnes
Nitrogen fertiliser production	12.94 million tonnes	120.21 million tonnes

Image 8: Concentrated Animal Feeding Operation

Source: Shutterstock

The relationship between the growth of the livestock and nitrogen fertiliser industry should be understood as causal: the nitrogen fertiliser corporations produce animal feed that services the livestock industry. The nitrogen fertiliser corporations are therefore the enablers of one of the most destructive industries in the world, one that has significant and well-documented adverse impacts on biodiversity, soil depletion, climate change and public health. And to the effects of nitrogen use to grow animal feed must be added the effects of manure produced by livestock – thus compounding the disruption caused to the nitrogen cycle by the nitrogen fertiliser corporations.

The nitrogen fertiliser industry is best understood as a key player in the animal-industrial complex and the connecting point between two highly damaging industries: the fossil fuel industry, which supplies the nitrogen fertiliser industry with the natural gas required for fertiliser manufacture, and the livestock industry, to which it supplies feed grown with nitrogen. **Nitrogen fertiliser corporations do not feed the world, they fail it.**

Part 3: Ambitious political leadership is required to address the nitrogen crisis

In addition to corporate interests, the EAT–*Lancet* Commission identified another critical barrier to healthy, just and sustainable food systems: "insufficient political leadership".[315] All too often, governments have capitulated to corporate power. And with nitrogen fertiliser corporations intent on business-as-usual, political leadership is desperately needed for fast and drastic reductions in human-made nitrogen. **Foodrise respectfully presents four asks to political leaders to turn the tide on the nitrogen crisis**.

Ask 1: Drive the shift to the Planetary Health Diet

"Agricultural diversification and nutrient management [...] can reduce nutrient losses to the environment and improve NUE, with some increased – and chiefly neutral – yield effects. [...] Keeping nitrogen and phosphorus within boundary conditions remains a challenge if greater attention is not given to food system losses arising from food consumption."

The EAT–Lancet Commission on healthy, just and sustainable food systems[316]

The *EAT–Lancet Commission on healthy, just and sustainable food systems* is the most comprehensive and holistic scientific paper ever produced on the food system transformation. Governments need no further evidence for action, and Foodrise urges political leaders to adopt and adapt the Commission's eight solutions and 23 actions (*see Annex V, Figure A4*) as a blueprint for national approaches to food system transformation without delay. In the first instance, political leaders must develop national action plans, based on the Commission's recommendations, to shift national diets towards a regionally and culturally appropriate Planetary Health Diet (PHD).

Image 9: The Planetary Health Diet (PHD) emphasises plant-based foods including fruits, vegetables, seeds and legumes

Source: Shutterstock

These should include changes in tax and subsidy regimes to make PHD-aligned foods more affordable than foods that are not, non-price interventions such as advertising, changes in public procurement policies to drive healthy and sustainable foods in schools and other institutions, and measures to reduce food waste from farm to fork.[317]

These dietary transition measures are also de facto reduction measures for nitrogen surplus and nitrogen fertiliser. Indeed, **with significant volumes of global nitrogen fertiliser production** at the service of intensive animal agriculture, one of the most impactful interventions to reduce nitrogen fertiliser use is to curb the livestock industry's demand for animal feed crops grown using nitrogen fertiliser.

Lower livestock numbers require lower volumes of feed crops and thus less nitrogen fertiliser, and less manure, reducing the overall nitrogen surplus. The 5% annual reduction of red meat production until 2050 envisaged by the EAT–*Lancet* Commission is therefore both a target that supports reduced global meat consumption in line with the PHD and a target to drive the reduction of nitrogen surplus – both in the form of manure and nitrogen fertiliser.[318]

Government leadership on the dietary transition to the PHD and on food waste prevention is therefore also leadership on the nitrogen crisis: the urgency and necessity of the dietary transition cannot be understated.

Ask 2: Listen to farmers, not to agribusiness

As the EAT–*Lancet* Commission states, "addressing the structural imbalances between producers and dominant agricultural corporations is essential" and policy makers ought to "ensure producers have enhanced governance over production inputs".[319, 320] These are necessary, but highly ambitious interventions, given the inherent power dynamic between agribusiness corporations and smaller-scale producers.

As most synthetic nitrogen fertilisers are reliant on fossil fuels and require industrial processes in their manufacture, their widespread use robs farmers of their agency and autonomy. Research by CAFOD has shown that interventions from international institutions such as the World Bank, that purport to support agriculture in the Global South have focused almost exclusively on enabling small-scale farmers to buy hybrid seeds and chemical fertilisers, systematically overlooking the importance of seed systems. This locks farmers into an industrial agricultural model reliant on chemical inputs to activate hybrid seeds, rather than promoting diverse seed systems – particularly local varieties – adapted to their needs and local contexts.[321]

Furthermore, as farmers become increasingly dependent on nitrogen fertilisers, they become vulnerable to price volatilities. The major spikes in fertiliser prices seen in 2021–2022 only mildly impacted commercial crop producers, but severely harmed profitability for smallholders in Sub-Saharan Africa.[322] In Africa, with a situation where the introduction of nitrogen fertilisers has benefited corporations and eroded farmers' agency and national food sovereignty, there has been growing resistance to the techniques of the Green Revolution that are being foisted on the continent by corporations and big American philanthropy (*see Box 11*).

Box 11: Africa's Green Revolution turns sour

Since the early 2000s, the use of synthetic fertilisers in African agriculture has grown, promoted as a key part of the "African Green Revolution".[323] In 2006, the Abuja Declaration led African Union member states to aim for an average fertiliser use of 50 kilograms per hectare.[324] Following this, at least ten African countries began spending large shares of their agricultural budgets on subsidising synthetic fertilisers.[325]

A major force behind the promotion of synthetic fertiliser use in Africa has been the Alliance for a Green Revolution in Africa (AGRA).[326] Founded by the Bill and Melinda Gates Foundation and the Rockefeller Foundation, AGRA continues to work closely with African governments and multinational agricultural corporations, including Norwegian nitrogen fertiliser giant Yara.[327]

Research shows that AGRA's promotion of synthetic fertilisers is failing to produce the anticipated results: in 10 out of 13 AGRA member countries, the number of undernourished people increased by a total of over 30 million, from a total of 100.5 million between 2004–2006 to a total of 131.3 million between 2016–2018.[328]

Box 11: Africa's Green Revolution turns sour (continued)

In 2024, the Alliance for Food Sovereignty in Africa (AFSA) – a coalition of 41 African civil society organizations representing over 200 million stakeholders including smallholder farmers, pastoralists, indigenous peoples, and agroecological entrepreneurs – called for revision of the African Union's proposed 10-year Fertilizer and Soil Health Action Plan 2023–2033. AFSA was critical of the Plan's strong emphasis on the extensive use of mineral fertilisers, hybrid seeds and agrochemicals, which are "a continuation of outdated and potentially harmful practices".[329]

"The proposed 10-year plan exacerbates economic strains by increasing dependency on expensive imported fertilizers, enriching a handful of fertilizer companies while African farmers face soaring costs. This economic imbalance underscores a misplaced priority that benefits industrial agriculture corporations more than it aids the smallholder farmers of Africa."

Alliance for Food Sovereignty in Africa (AFSA)[330]

In late 2025, AFSA issued a damning verdict on the Alliance for a Green Revolution in Africa (AGRA), stating that it had pivoted away from working directly with farmers and is instead focusing its vast resources on influencing agricultural policy – not just nationally, but across the African continent.[331]

"For over 15 years, AGRA has promised a productivity revolution for African farmers through its Green Revolution model: hybrid seeds, chemical fertilisers, and increased private sector involvement. But after billions in funding and years of field-level interventions, hunger remains high, soil fertility is declining, and the promised benefits have failed to materialise."

Alliance for Food Sovereignty in Africa (AFSA)[332]

Globally, the most famous movement of resistance is perhaps La Via Campesina – founded in 1992, it is an international alliance bringing together millions of agricultural workers to advocate for agroecology and the promotion of food sovereignty.[333] La Via Campesina has long opposed the growth and use of chemical fertilisers.[334]

"We oppose chemical fertilisers and educate against GMOs that cause health problems whose side effects manifest [...] We prefer natural farming, and encourage the use of natural fertilisers like manure and grass."[335]

Cosma Bulu, a women leader of Mtandao wa Vikundi vya Wakulima (MVIWATA), a Via Campesina member group from Tanzania

The Nyéléni process – named for legendary Malian peasant woman symbolizing food self-sufficiency – is a global movement-led initiative to advance food sovereignty and climate justice.[336] It fundamentally rejects the use of chemical fertilisers as part of its broader stance against industrial and corporate-controlled food systems.

While the corporate lobbyists have had the ears of policy makers, agricultural workers and civil society organisations around the world have been striving for decades to counter the power of agribusiness and resist the introduction of nitrogen fertilisers.

It is striking that the 3rd Nyéléni Global Forum met just weeks ahead of the launch of the EAT–*Lancet*'s Commission report. The work of these movements should be understood as complementary to the Commission's scientific endeavours: they are advancing the tried-and-tested solutions on the ground that can deliver justice in the food system.

The EAT–*Lancet* Commission calls for "transparency in lobbying": but transparency alone will not suffice.[337] As governments take action to enable the shift to the Planetary Health Diet and reduce the nitrogen surplus, it is imperative that they listen to farmers and not to corporate lobbyists.

Ask 3: Redouble international cooperation for nitrogen reduction

As we have seen, the nitrogen crisis is a crisis of the food system, and Foodrise therefore calls on political leaders to lead on the transition to the Planetary Health Diet – both to improve people's health, but also to reduce the nitrogen surplus. Action to reduce the nitrogen surplus is therefore 'nested' within national food system action (*see Ask 1*). But given the global consequences of the nitrogen surplus, which extend far beyond national borders, effective mechanisms for international cooperation to achieve nitrogen reduction must also be developed. The disruption to the nitrogen cycle is a global problem on a par with issues such as climate change or ozone depletion but, so far, global cooperation to tackle nitrogen has not been commensurate with the scale of the challenge. Foodrise calls on political leaders to develop the mechanisms for concerted, cooperative global action on nitrogen.

International policy makers have much to build on: the Colombo Declaration, the Kunming–Montreal Global Biodiversity Framework, the United Nations Environment Assembly resolution 5/2 (*see Part 2, Tactic 1*). But these global initiatives must be a starting point only, as while ambitious aims were set – including the target of reducing pollution from excess nutrients, including nitrogen, by at least 50% by 2030 under the Convention for Biological Diversity[338] – these agreements have all been flawed. They are voluntary, have significant data limitations and do not have the funding that they need. What is more, they focus on improving management, rather than reducing production volumes, and little has been done to implement them.

National efforts to rein in nitrogen emissions have been a mixed bag. Sri Lanka's poorly planned intervention to reduce nitrogen use was a failed experiment but one that holds valuable lessons for designing and implementing successful nitrogen reduction policies (*see Box 12*). Other countries have had more success.

Box 12: Sri Lanka's drastic nitrogen fertiliser experiment

In Sri Lanka, following through on a 2019 election campaign promise to transition the country's farmers to organic agriculture over a ten-year period, President Rajapaksa placed an immediate nationwide ban on fertiliser and pesticide imports on 27 April 2021, and ordered the country's two million farmers to go organic.[339] It was a drastic transition that proved disastrous, and the government revoked the fertiliser ban just seven months later on 24 November.[340]

President Rajapaksa's reasoning for the ban was three-fold: saving on foreign currency reserves ($400 million a year spent on synthetic fertiliser), reduced agrochemical use to counter adverse health and environmental impacts and, thirdly, a strategic decision to shift food production away from industrialised farming practices towards traditional approaches using organic inputs.[341] Tea production, which is Sri Lanka's biggest cash crop for export, fell by 18% and rice production dropped by 20% in the six months after the ban was implemented (causing the country to spend $450 million in rice imports where they had once been self-sufficient).[342]

The 2021 events in Sri Lanka highlight the crucial need for strategic planning when undertaking radical agricultural shifts. This includes ensuring the agricultural sector's preparedness, having data for planning and making alternative fertilisers readily available with long-term supply established.

After the ban, the Sri Lankan Department of Agriculture made recommendations on how to effectively manage a shift away from agrochemicals, stressing the need to adopt an integrated approach, including a mixture of chemical and organic fertiliser at the beginning with a phase down of chemical fertilisers.[343]

Despite weaknesses in the existing international initiatives to tackle nitrogen emissions, governments should develop nitrogen National Action Plans (NAPs), as per the United Nations Environment Assembly (UNEA)'s resolution 5/2 on Sustainable Nitrogen Management. But they should also commit to implementing them. These NAPs must deliver the necessary global nitrogen surplus reduction as per the EAT–*Lancet* report, in a way that is just and reflects the fact that countries have not all equally benefited from the use of nitrogen fertilisers, and that the consequences of the nitrogen surplus are also unequally felt.

And with the nitrogen crisis strikingly similar in its gravity and injustice to ozone depletion or climate change, governments should seek to replicate successes in international cooperation in those areas. Some of the critical success factors in The Montreal Protocol and The Paris Agreement (see *Box 13*) that could usefully be replicated to tackle the nitrogen surplus include the principle of 'common but differentiated responsibilities'; the setting of country-specific binding, time bound and measurable commitments similar to Nationally Determined Contributions under the UNFCCC; and the setting aside of funds for technology transfer, and loss and damage.

Box 13: The Montreal Protocol and the Paris Agreement

The Montreal Protocol on Substances that Deplete the Ozone Layer (known as the **Montreal Protocol**) is a multilateral environmental agreement, designed to regulate the production and consumption of nearly 100 human-made chemicals referred to as ozone-depleting substances (ODS). It was adopted in 1987, and is widely considered the world's most successful international environmental treaty.[344]

Under the treaty, all parties have specific responsibilities related to the phase-out of the different groups of ODS, control of ODS trade, annual reporting of data and more; 'developing' and 'developed' countries have common but differentiated responsibilities; all countries have binding, time-targeted, and measurable commitments.[345]

In 1991, a multilateral fund was established to provide financial and technical assistance to 'developing country' parties to the Montreal Protocol.[346]

Recent evidence shows that the ozone hole over Antarctica is beginning to repair itself because of efforts under the Protocol to reduce ozone-depleting substances.[347]

The **Paris Agreement** is a legally binding international treaty on climate change, with the goal "to limit the temperature increase to 1.5°C above pre-industrial levels".[348] It was adopted by 195 parties at the UN Climate Change Conference in 2015.[349] Its implementation is based on a five-year cycle of increasingly ambitious climate action, whereby countries submit national climate action plans, known as nationally determined contributions (NDCs).[350] While countries are currently off track to achieve its goals, tangible progress has been made since the Paris Agreement was signed.[351]

While there are several United Nations and multilateral initiatives that touch on nitrogen pollution, the global community does not yet have the mechanisms – in the form of a legally binding treaty or protocol – that would help galvanise national efforts within a concerted global effort. This must change.

Ask 4: Make the nitrogen fertiliser corporations pay

"A great food transformation is required if the world is to align with the EAT–Lancet's vision by 2050. The focus should move beyond simply maximising profit and volume in agriculture, to achieving food security in ways that prioritise diet quality and advance health, sustainability, and social justice."[352]

The EAT–*Lancet* Commission on Healthy, Sustainable, and Just Food Systems

Reducing nitrogen surplus requires reducing production of nitrogen fertilisers, in the context of an industry structured to grow and to maximise its profits. This will not happen unless political leaders show the necessary leadership to rein in, regulate and shrink the industry.

Beyond recommendations to reduce corporate influence on policy makers, calls for greater transparency and strengthening competition frameworks, the EAT–*Lancet* Commission does not grapple with interventions to reduce the size of the nitrogen fertiliser market and of its constituent corporations.

In the first instance, governments should stop all direct and indirect subsidies to the nitrogen fertiliser industry, including energy subsidies such as the ones for blue and green hydrogen projects; subsidies to its client industries in the animal-industrial complex, such as subsidies to grow animal feed; and subsidies to its customers, through subsidies to farmers for nitrogen fertilisers.

More ambitious interventions to rein in the industry could include production quotas or the application of the polluter pays principle. With regard to the latter, this could take the form of a nitrogen pollution tax, with the tax applicable to the harms linked to fertiliser use, as per national Nitrogen Use Efficiency (*see Part 2, Tactic 2*).

Or, with the industry's harms clearly identifiable and quantifiable (*see Part 1*), it could be a compulsory damage fund, payable by nitrogen corporations to governments as part of their terms of business.

And more ambitious interventions still might include measures such as those proposed by activists, civil society and academics to end fossil fuels, applied to nitrogen fertiliser corporations. These measures include the establishment of a reparations for climate change, to be paid by the fossil fuel corporations most responsible for historic and current emissions – similar reparations could be required from nitrogen fertiliser corporations as compensation for the dysregulation of the nitrogen cycle.[353] Or indeed removing the profit motive from oil and gas production through nationalisation of oil and gas corporations – these proposals could equally apply to nitrogen fertiliser corporations to rein in and significantly shrink nitrogen production in the public interest.[354]

Implementing interventions to significantly reduce nitrogen fertiliser production would require overcoming significant barriers. This is the challenge before political leaders, and **Foodrise urges governments to use the full suite of policy and regulatory interventions to tackle the nitrogen fertiliser corporations head on**.

Conclusion: Fixing the nitrogen crisis requires de-corporatising the nitrogen cycle

In this report, Foodrise has shown how the growth in nitrogen fertiliser production, and the substantial corporate profits from this, have come at the expense of the integrity of critical planetary systems. **The nitrogen fertiliser corporations have knowingly produced such vast amounts of surplus nitrogen as to transgress planetary boundaries, putting humanity beyond its safe operating space**.

The nitrogen fertiliser industry has done this while seeking to distract from its environmental and health impacts and peddling myths. Far from feeding the world, the nitrogen fertilisers industry feeds the industrialised food system. The nitrogen crisis is a crisis of the food system, to be solved by transformation of the food system.

Food system transformation will require significant political leadership to tackle the greatest barrier to change: the corporate nature of the food system. While the harms of the nitrogen surplus have long been known to scientists and policy makers, it has continued to grow, not shrink. This is in large part because the nitrogen fertiliser corporations have captured public policy to go about their business largely unquestioned and unchallenged, with tacit public support, public subsidies, and a favourable regulatory and policy environment. This needs to stop, and the nitrogen cycle must be de-corporatised, if humanity is to return within its safe operating space, with a life-supporting nitrogen cycle, rather than a destructive nitrogen surplus.

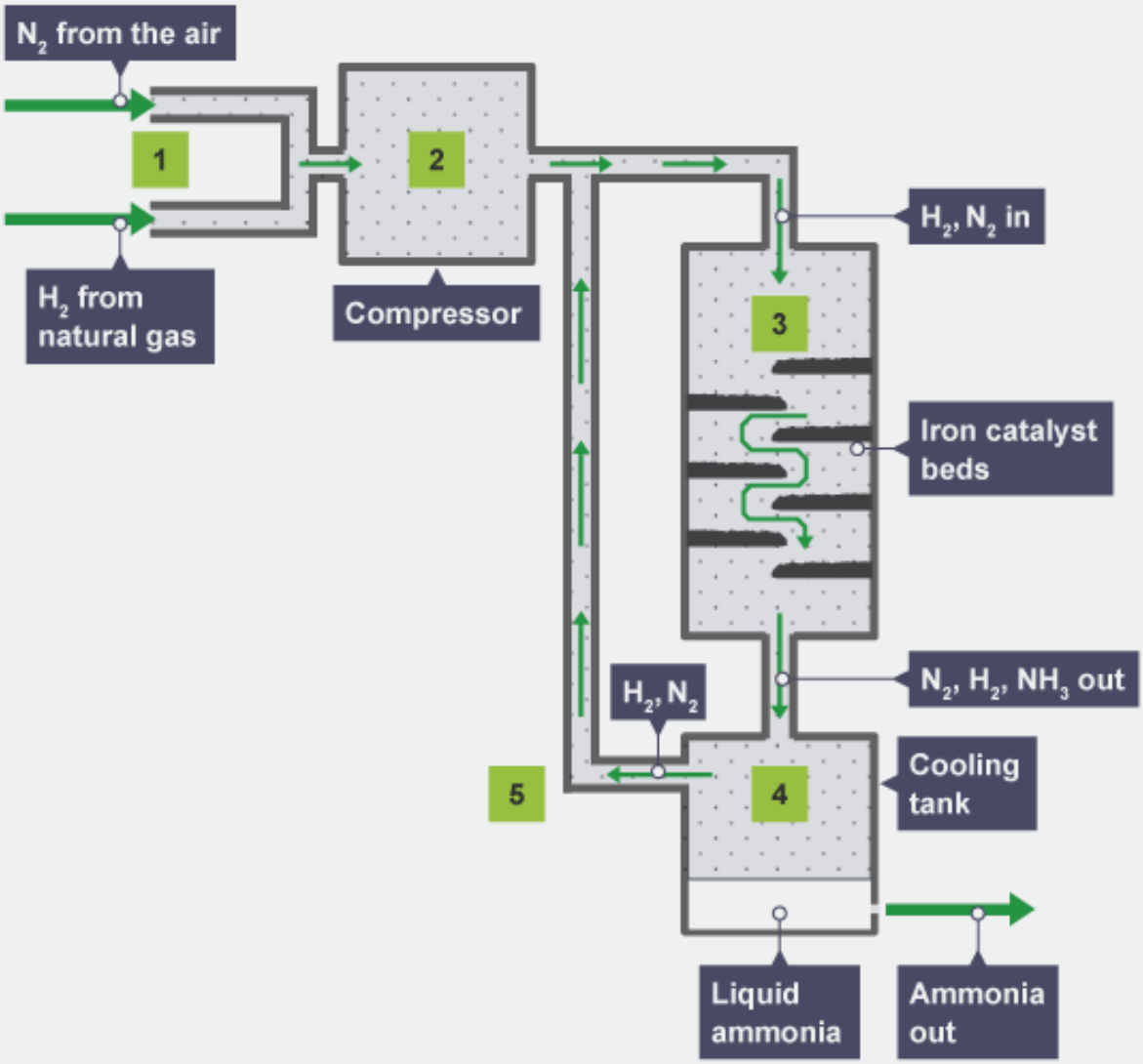
At Foodrise, we envisage a food system with fewer animals being farmed, less nitrogen fertiliser required for animal feed and a reduced need for gas extraction for fertiliser manufacture. With the Planetary Health Diet, less land is required for agriculture and more is freed up for nature.

Tackling the nitrogen fertiliser crisis opens up the possibility of a post-corporate food system to be replaced by one rooted in food sovereignty, equity and the restoration of nature.

Annexes

Annex 1

Figure A1: The Haber–Bosch process



The main stages in the Haber process

In the Haber process:

1. nitrogen (extracted from the air) and hydrogen (obtained from natural gas are pumped through pipes
2. the pressure of the mixture of gases is increased to 200 atmospheres
3. the pressurised gases are heated to 450°C and passed through a tank containing an iron catalyst
4. the reaction mixture is cooled so that ammonia liquefies and can be removed
5. unreacted nitrogen and hydrogen are recycled

Source: BBC, The Haber process – Making ammonia [355]

Annex II

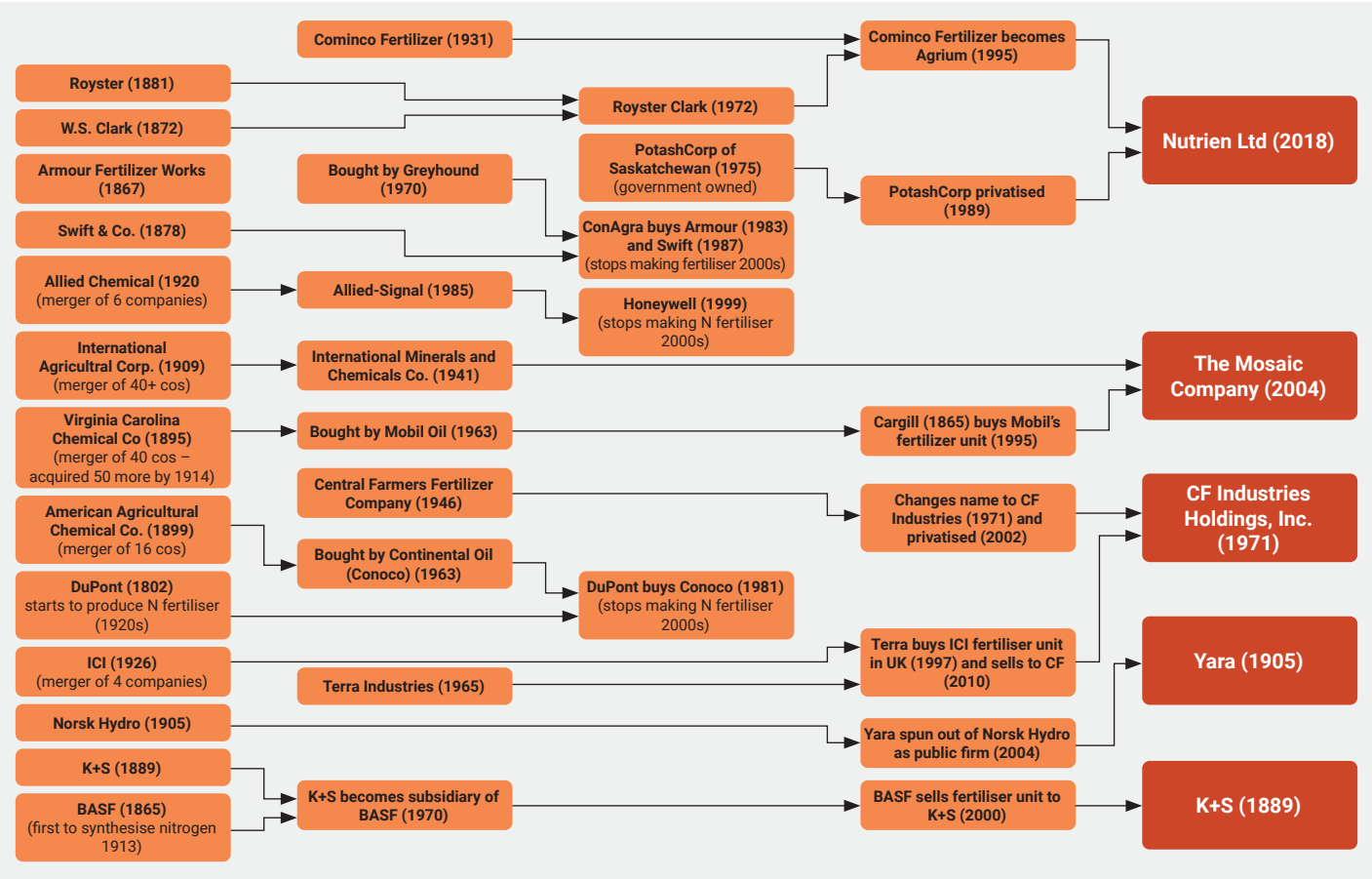
The table below lists the most common fertilisers, their nutrient content and the technical abbreviation most often used.[356]

Table A1: Details of main fertilisers

Fertiliser	Abbreviation	Nutrient content
Ammonium Nitrate	AN	33.5% Nitrogen
Calcium Ammonium Nitrate	CAN	27% Nitrogen
Ammonium Nitro Sulphate	ANS	26 % Nitrogen, 14 % Sulphur
Calcium Nitrate	CN	15.5 % Nitrogen
Ammonium Sulphate	AS	21 % Nitrogen, 24 % Sulphur
Monoammonium Phosphates	MAP	11 % Nitrogen, 52 % Phosphorus
Diammonium Phosphates	DAP	18 % Nitrogen, 46 % Phosphorus
Urea	Urea	46 % Nitrogen
Urea Ammonium Nitrate (liquid)	UAN	30 % Nitrogen
NPK 15-15-15	NPK	15 % Nitrogen, 15 % Phosphorus, 15 % Potassium
Triple Super Phosphate	TSP	48 % Phosphorus
Muriate of Potash	MOP	60 % Potassium

Annex III

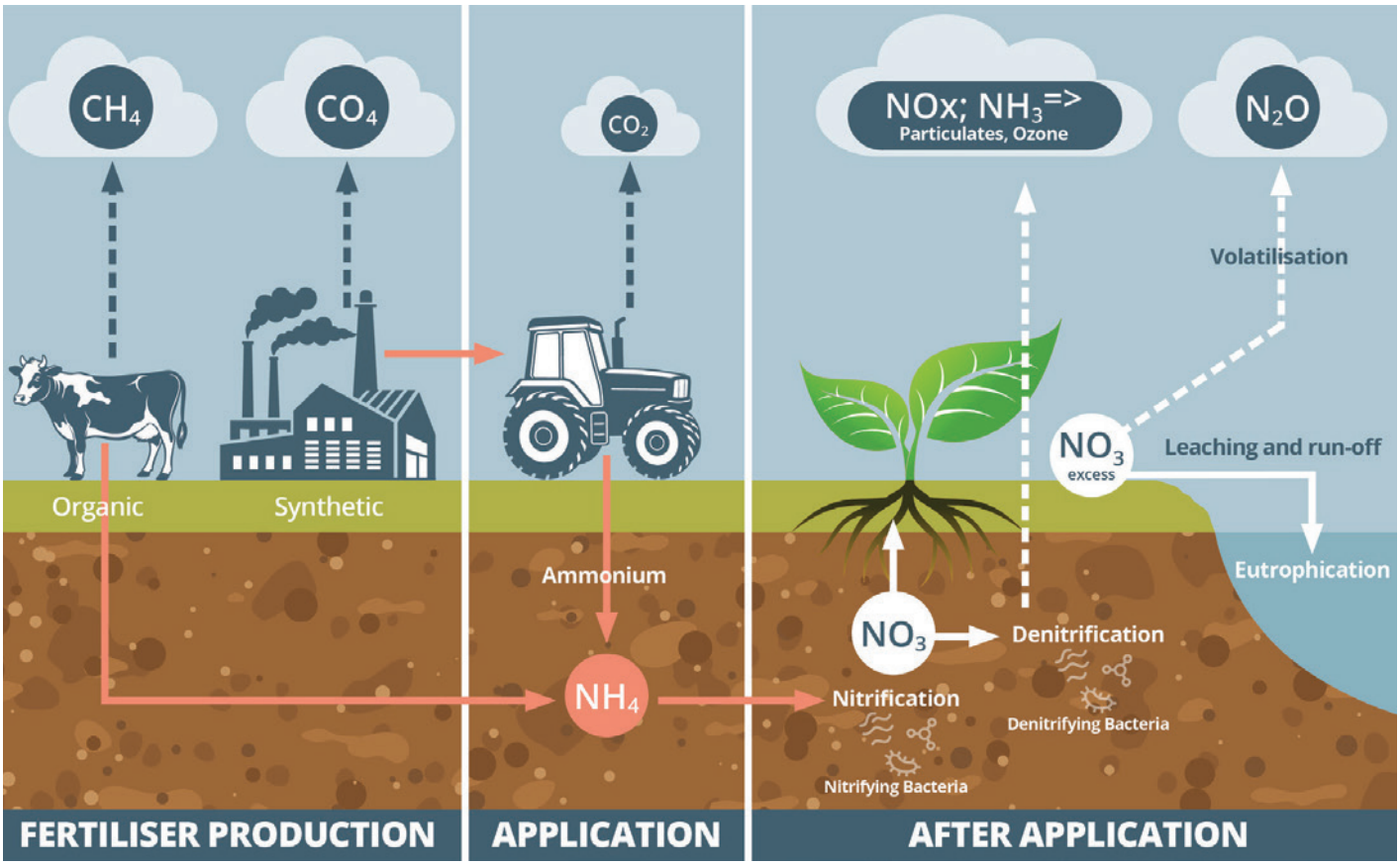
Figure A2: Overview of key mergers and acquisitions in the global fertiliser market



Source: Clapp (2025) Titans of Industrial Agriculture. MIT Press, Cambridge

Annex IV

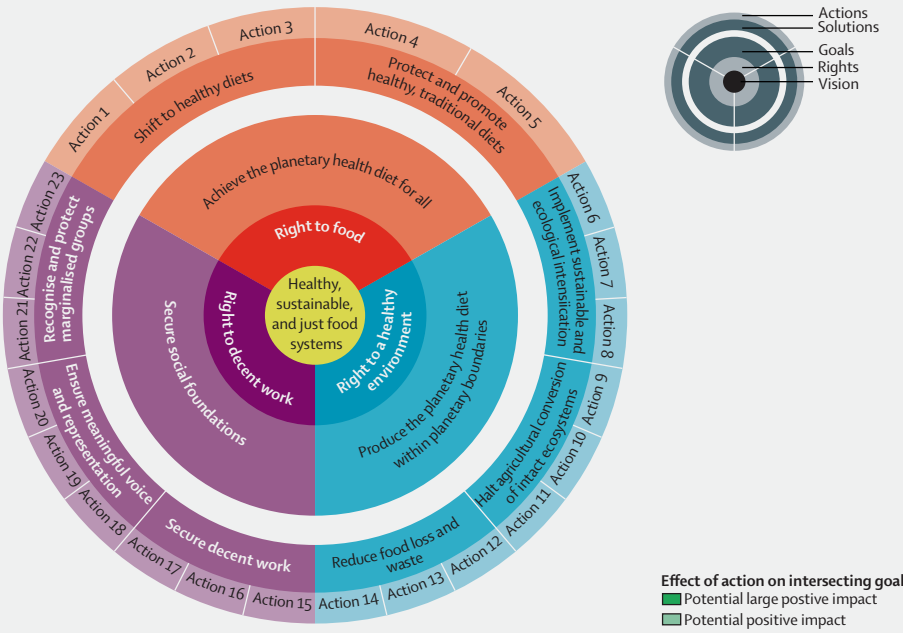
Figure A3: Emissions and pollution from fertiliser production and use[357]



Source: CIEL (2023) Fossils, Fertilisers and False Solutions

Annex V

Figure A4: Solutions and actions proposed by the EAT-Lancet Commission



Effect of action on intersecting goals:
Potential large postive impact
Potential positive impact

Solution	Action		Health	Environment	Justice
1 Shift to healthy diets	1	Use taxes and subsidies to shift affordability of unhealthier foods towards the affordability of healthier foods			
	2	Combine advertisement restrictions with mandatory warning labels on unhealthy foods			
	3	Increase purchasing power for households in the lowest quintile through different social protection measures			
2 Protect and promote healthy, traditional diets	4	Recognise and include traditional healthy foods and diets in food-based dietary guidelines and public procurement programmes (eg, school meal programmes)			
	5	Support local markets, including the development of value chains, to promote consumer demand of underused, healthy, and locally produced crops			
3 Implement sustainable and ecological intensification	6	Ensure producers have access to enhanced governance over land, sea, production inputs, agricultural training and extension, peer-knowledge networks, and markets			
	7	Mitigate power imbalances between producers and corporations by supporting producer coalitions, introducing subsidies for sustainable practices, and regulating corporate control, global trade, and financialisation			
	8	Increase public and private sector investments to cover the transition costs, research, and development processes of sustainable and ecological intensification practices			
4 Halt agricultural conversion of intact ecosystems	9	Combine regulatory measures, such as protection of natural ecosystems, suspension of logging concessions, and implementation of land-use zoning, with coordination mechanisms to reduce land expansion leakage			
	10	Invest in community management of local ecosystems, including Indigenous communities, to promote stewardship of land and water, and balance conservation and use of ecosystems			
	11	Increase multisector commitments to zero-deforestation commitments across supply chains			
5 Reduce food loss and waste		Use fiscal and regulatory policy incentives, as well as circular economy mechanisms and technologies, to:			
	12	Improve storage, logistics, and supply chain data and analytics, especially in low-income settings			
	13	Reduce retail and consumer waste through improved awareness, education, and skills, especially in high-income settings			
	14	Recycle nutrients and energy, prioritising animal feed and on-farm waste recovery			
6 Secure decent work	15	Guarantee payment of updated living wages for all and close the gender pay gap			
	16	Provide training in skills that can enhance redeployment in the context of a food systems transition (especially for youth, women, and the current labour force)			
	17	Improve enforcement of legislation, in society in general and food system workplace specifically, against: • Gender-based violence and sexual harassment • Occupational health conditions • Child labour			
7 Ensure meaningful voice and representation	18	Ensure the existence of enabling mechanisms for collective bargaining by agrifood system workers and farmers			
	19	Develop legal and regulatory frameworks to limit market concentration and ensure transparency in lobbying			
	20	Improve transparency, accountability, representation, and access to information through, supporting civil society, enabling social audits to hold actors accountable, and increasing women's representation in positions of influence			
8 Recognise and protect marginalised groups	21	Implement a range of social protection policies that can provide benefits for those at risk, including mothers, people with low income, older people, and disabled people			
	22	Procure and implement healthy and sustainable meals in schools and other institutions			
	23	Protect basic human rights of people in conflict areas			

***Figure 16*: Goals, solutions, and actions to achieve healthy, sustainable, and just food systems**
Depending on how they are implemented, all actions have the potential to contribute positively to other goals. The suggested strength of positive impact was developed based on dialogue with the Commissioners.

Source: EAT–Lancet Commission on healthy, just and sustainable food systems – Figure 16

Methodology

Top three nitrogen fertiliser producers

The rationale for naming CF Industries, Yara International and Nutrien as the top three producers of nitrogen fertiliser is based on the following evidence, taken directly from the fertiliser company websites at the time of writing:

- CF Industries names itself as "the world's largest producer of ammonia", and a "leading global manufacturer or nitrogen products".[358]
- Yara calls itself "the largest industrial nitrogen company in Europe" and "the world's leading ammonia provider".[359]
- Nutrien states that it is "the third-largest nitrogen producer in the world".[360]

Top three companies' nitrogen fertiliser production

We have used the most recent available data (2024) for each of the top three companies to calculate their total manufactured nitrogen fertiliser product in metric tons. In each case, we excluded any data for non-nitrogen-based fertiliser products:

- For CF Industries, we excluded the reported figure for ammonia production because it only reports gross ammonia production, which includes amounts subsequently upgraded into granular urea, UAN and AN. If we had been able to include its net ammonia production (gross ammonia less ammonia used to produce upgraded fertiliser products), the total would likely be higher.
- Yara reports ammonia production and finished fertiliser production separately, so we have only used the data for finished nitrogen fertiliser products.
- Nutrien only reports net sales for its manufactured products, so we have used these figures. It considers "solutions, nitrates and sulphates" as part of its nitrogen fertiliser product line, so we have included these.

Table M1: Nitrogen fertiliser production by the top three companies in 2024

Company	Nitrogen fertiliser product	Manufactured in 2024 (metric tons)
CF Industries[361]	Granular urea	4.404 million
	UAN	6.753 million
	AN	1.392 million
	TOTAL	**12.549 million**
Yara[362]	Urea	4.593 million
	Nitrate	5.941 million
	NPK	6.346 million
	CN	1.694 million
	UAN	0.864 million
	TOTAL	**19.438 million**
Nutrien[363]	Ammonia	2.483 million
	Urea and ESN	3.188 million
	Solutions, nitrates and sulphates	5.023 million
	TOTAL	**10.694 million**

"Over one-third of global fertiliser production"

The most recent available data for global nitrogen fertiliser production is from 2022.[364] Therefore, we have used 2022 data for each of the top three companies to calculate their percentage contribution to total nitrogen fertiliser production. This percentage may differ in more recent years.

We applied the same methodology as above to select the data for each company.

We then divided the total manufactured product for all three companies by the total global nitrogen fertiliser production figure for 2022, and multiplied by 100 to obtain the final percentage (34.6%).

Table M2: Nitrogen fertiliser production by top three companies as a percentage of total nitrogen fertiliser production in 2022

Company	Nitrogen fertiliser product	Manufactured in 2022 (metric tons)
CF Industries[365]	Granular urea	4.561 million
	UAN	6.706 million
	AN	1.517 million
	TOTAL	**12.784 million**
Yara[366]	Urea	3.949 million
	Nitrate	5.625 million
	NPK	6.003 million
	CN	1.749 million
	UAN	0.738 million
	TOTAL	**18.064 million**
Nutrien[367]	Ammonia	2.715 million
	Urea	2.757 million
	Solutions, nitrates and sulphates	4.551 million
	TOTAL	**10.023 million**
TOTAL for CF Industries, Yara and Nutrien (2022)		**40.871 million**
TOTAL Global nitrogen fertiliser production (2022)[368]		**118.080 million**
Top three as a percentage of global production (2022)		**34.6%**

Top three companies' revenue from nitrogen fertiliser production

We used the most recent available data (2024) for each of the top three companies to calculate their revenue from nitrogen fertiliser products. In each case, we used the disaggregated revenue data by product, and excluded any figures from non-nitrogen fertiliser products.

The differences from the above tables are:

- CF Industries reports its revenue from ammonia separately to its other nitrogen fertiliser products, so we were able to include this in the total.
- Yara reports its revenue from ammonia and urea separately from its other nitrogen fertiliser products, so we were able to include these in the total.
- Nutrien includes "Other nitrogen and purchased products" in its nitrogen sales reporting, so we have added this figure.

Table M3: Fertiliser company revenue from nitrogen in 2024

Company	Product	2024 revenue USD
CF Industries[369]	Ammonia	1.736 billion
	Granular urea	1.600 billion
	UAN	1.678 billion
	AN	0.419 billion
	TOTAL	**5.433 billion**
Yara[370]	Ammonia	1.148 billion
	Urea	3.116 billion
	Nitrate	2.323 billion
	NPK	4.431 billion
	CN	0.761 billion
	UAN	0.310 billion
	TOTAL	**12.089 billion**
Nutrien[371]	Ammonia	1.232 billion
	Urea and ESN	1.480 billion
	Solutions, nitrates and sulphates	1.300 billion
	Other nitrogen and purchased products	0.295 billion
	TOTAL	**4.307 billion**

"Nearly $40 billion revenue from nitrogen fertiliser products"

To align with the data on nitrogen fertiliser production, we have also calculated the total revenue for the top three companies using data from 2022. In each case, we used the disaggregated revenue data by product, and excluded any figures from non-nitrogen fertiliser products.

We applied the same methodology as above to select the data for each company.

Table M4: Fertiliser company revenue from nitrogen in 2022

Company	Product	2022 revenue USD
CF Industries[372]	Ammonia	3.090 billion
	Granular urea	2.892 billion
	UAN	3.572 billion
	AN	0.845 billion
	TOTAL	**10.399 billion**
Yara[373]	Ammonia	2.756 billion
	Urea	5.434 billion
	Nitrate	4.200 billion
	NPK	7.010 billion
	CN	1.037 billion
	UAN	0.630 billion
	TOTAL	**21.067 billion**
Nutrien[374]	Ammonia	2.834 billion
	Urea	2.037 billion
	Solutions, nitrates and sulphatesulphates	1.996 billion
	Other nitrogen and purchased products	1.181 billion
	TOTAL	**8.048 billion**
TOTAL		**39.514 billion**

"All three companies plan to increase nitrogen fertiliser production"

Each of the top three companies declared a nitrogen-related production target for 2025 in their 2024 report. We have compared these targets against the relevant production figure for 2024.

In the case of CF Industries and Yara, the production target stated was for ammonia, and for Nutrien the target stated was for manufactured sales volume of nitrogen.

In all three cases, the 2025 (and 2026, where stated) target figure is greater than the 2024 actual figure, so we have concluded that all three companies intended to increase production of nitrogen fertilisers.

Tables M5–M6: Fertiliser company production targets

Company	2024 ammonia production (Mt)	2025 ammonia production target (Mt)
CF Industries[375]	9.8	**10**
Yara[376]	8.1	**8.6**

Company	2024 nitrogen manufactured sales volume (Mt)	2025 nitrogen manufactured sales volume (Mt)	2026 nitrogen manufactured sales volume (Mt)
Nutrien*	10.7	10.7–11.2	11.5–12.0

"Over $10 million spent on lobbying by global agribusiness"

We sourced the lobbying costs for fertiliser companies from OpenSecrets[377] (pertaining to the US) and Lobbyfacts.eu[378] (pertaining to the EU). For consistency, we have used 2023 data for all companies – this year was selected as it had the most available data across all the major nitrogen fertiliser companies profiled in our report.

We converted the total EU lobbying costs to USD (using Wise's currency converter) and added this to the total US lobbying figure to obtain a total figure for the amount spent by major nitrogen fertiliser companies on lobbying in 2023.[379]

Table M7: Nitrogen fertiliser company lobbying costs (2023)

Company	US Lobbying	EU Lobbying
Acron Group	No data	No data
CF Industries	$770,000	No data (no longer registered as of May 2022)
EuroChem	No data	No data for 2023
Fertiglobe	No data	No data
Grupa Azoty	No data	€300,000
Koch Fertilizer	No data	No data
Nutrien	$2,280,000	No data
OCI Global	$480,000	No data (no longer registered as of May 2022)
OSTCHEM	No data	No data
PhosAgro	No data	No data (no longer registered as of May 2022)
Pupuk Indonesia	No data	No data
SABIC	$310,000	No data for 2023
Uralchem	No data	No data
Yara International	$240,000	€2,750,000
Total (2023)	**$4,080,000**	**€3,050,000**
Total in USD (2023)	**$4,080,000**	**$3,529,460**
TOTAL USD (2023)	**$7,609,460**	

We also sourced the lobbying costs for the fertiliser industry groups, Fertilizers Europe and The Fertilizer Institute, from Lobbyfacts.eu and OpenSecrets respectively.

Once again, we converted the EU lobbying figure to USD (using Wise's currency converter) and added this to the US lobbying figure to obtain a total figure for the amount spent by these fertiliser industry groups on lobbying in 2023.

Table M8: Fertiliser industry group lobbying costs (2023)

Industry Group	US Lobbying (2023)	EU Lobbying (2023)
Fertilizers Europe		€700,000
The Fertilizer Institute	$1,740,439	
Total in USD (2023)	**$1,740,439**	**$810,250**
TOTAL USD (2023)	**$2,550,689**	

Finally, we combined the totals (in USD) for the fertiliser companies and the fertiliser industry groups, to obtain a final total of **$10,160,149.**

Table M9: Combined lobbying costs for fertiliser companies and industry groups (2023)

Combined Groups	US Lobbying (2023)	EU Lobbying (2023)
Fertiliser companies	$4,080,000	$3,529,460
Fertiliser industry groups	$1,740,439	$810,250
Total in USD (2023)	**$5,820,439**	**$4,339,710**
TOTAL USD (2023)	**$10,160,149**	

The OpenSecrets database states that the total spent by agribusiness on lobbying in 2023 was equal to $180,497,652.[380] Dividing our calculated total by this amount gives us a percentage of **5.6%** – leading us to conclude that fertiliser lobbying made up over 5% of all agribusiness lobbying in the US in 2023.

"More than triple the number of nitrogen fertiliser lobbyists at COP30, compared with COP26"

Table M10: Nitrogen fertiliser industry attendance COP26-COP30

COP	Total nitrogen fertiliser company representatives	Companies represented	Badge split	Percentage of country delegation badges
COP26 (UK)	5	EuroChem (2) Yara (3)	Country delegation (2) NGO (3)	40%
COP27 (Egypt)	6	EuroChem (1) Nutrien (2) Yara (3)	Country delegation (1) NGO (5)	17%
COP28 (Dubai)	48	EuroChem (6) Fertiglobe (4) Nutrien (6) OCI (1) PhosAgro (5) Pupuk Indonesia (19) Uralchem (1) Yara (6)	Country delegation (41) NGOs (6) Special agencies (1)	85%
COP29 (Azerbaijan)	30	EuroChem (3) PhosAgro (10) Pupuk Indonesia (15) Uralchem (1) Yara (1)	Country delegation (29) NGO (1)	97%
COP30 (Brazil)	17	Pupuk Indonesia (11) Uralchem (1) Yara (5)	Country delegation (17)	100%

To conduct this data analysis, we considered the major nitrogen fertiliser producers as: Acron Group, CF Industries, EuroChem, Fertiglobe, Grupa Azoty, Koch Fertilizer, Nutrien, OCI Global, OSTCHEM, PhosAgro, Pupuk Indonesia, SABIC, Uralchem, and Yara International. These are some of the largest nitrogen fertiliser producers operating globally but is not an exhaustive list.

The data is taken directly from the UNFCCC's published lists of participants for each COP.[381] In the case of COP30, this was a provisional list.

To draw our conclusions, we assumed that:

- Anyone present at COP is attempting in some way to influence the policy debate around climate change.
- Delegate's self-declared affiliations are accurate.
- Members of delegations will represent delegation interests.

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3 See Methodology, Table M4.

4 See Methodology, Tables M7-M9.

5 See Methodology, Table M10.

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