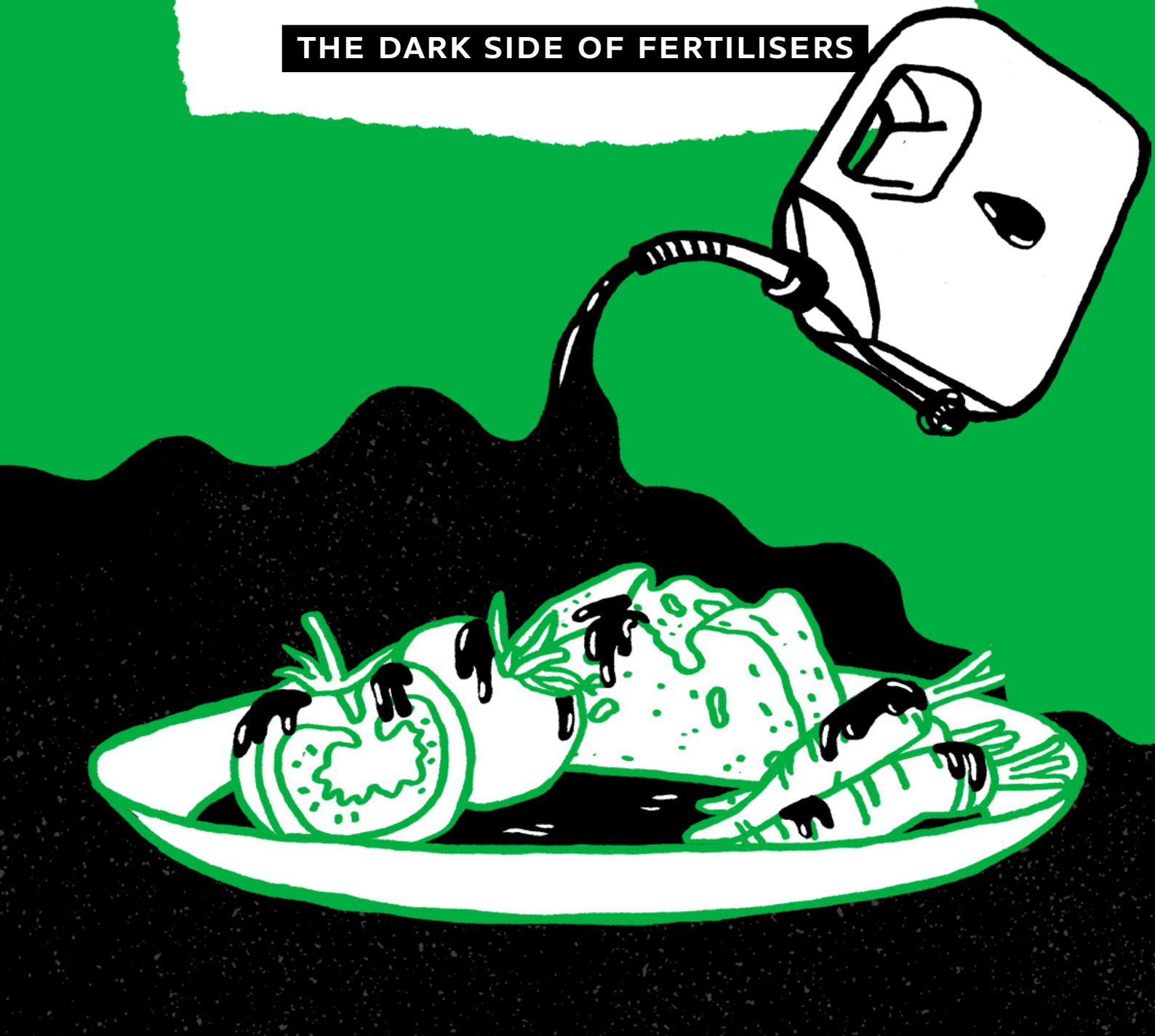
Les Amis de la Terre France

FOSSIL FUELS ON OUR PLATES

THE DARK SIDE OF FERTILISERS



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Introduction

In 2020-2021, the Covid-19 pandemic and restrictions on Chinese exports caused fertiliser prices to skyrocket. In 2022, the Russian invasion of Ukraine pushed prices up further. Last, but not least, the widespread inflation resulting from the war disproportionately increased the profits of fertiliser-producing multinationals, particularly Yara in Europe, as is often the case in times of economic or financial crisis. In the light of these multiple economic, environmental and geopolitical crises, our dependence on synthetic fertiliser to fuel a deadly industrial farming system is becoming less and less viable.

Friends of the Earth France have been combating chemical fertiliser use in France and Europe for years, with the aim of phasing out these products which are damaging to the environment, climate and human health. By chemical or synthetic fertilisers, we refer to all types of fertiliser (which provide mainly nitrogen, phosphorus or potassium) obtained by means of synthesis or processing by the chemical industry.

In this report, we shed light on the energy-related and geopolitical dependencies which stem from widespread use of chemical nitrogen fertiliser, as well as the dangerous offensive by agribusiness, supported by the public authorities, to promote the false solution of decarbonisation, which will ultimately only lead to further exploitation of fossil fuels.

The report exposes this irresponsible attitude, but also demonstrates that a different, more environmentally-friendly and fairer world is possible. This requires a complete overhaul of our agricultural model, moving towards one which no longer uses synthetic fertiliser and is resilient to climate and economic events, generates thousands of stable jobs in small-scale farming, and is truly respectful of living systems.

PART I

The high energy and environmental price tag of fertilisers

1 Fertiliser production increases our dependence on fossil fuels

It is well known that chemical fertiliser causes damage and that we must reduce our use of it. **The most widely used fertilisers in France are nitrogen fertilisers**. This type of fertiliser is used more often and in greater quantities than potassium and phosphate fertilisers - 2 million tons (MT) of nitrogen per year in France compared with 0.5 MT of each of the other types. Potassium and phosphate fertilisers also take a heavy environmental and human toll (linked to mining), but the enormous damage caused by nitrogen fertilisers makes the search for alternatives even more urgent in this case. For this reason, this report focuses on the environmental and economic consequences of nitrogen fertilisers.

Almost all industrial nitrogen fertilisers are still currently manufactured from fossil fuels, mainly gas or, in some countries, coal or oil. Although farming has existed for millenia, fossil fuel-based agriculture has only been in existence for around 60 years. **The FAO (Food and Agriculture Organization of the United Nations) estimates that our agrifood system accounts for 30% of worldwide energy consumption.**[1]

Nitrogen fertilisers are derived from ammonia, which itself is made by mixing nitrogen from the air with hydrogen. Globally, hydrogen is manufactured using fossil gas (72%) and coal (26%).[2] The ammonia manufacturing process represents around 5% of worldwide demand for coal and 20% of demand for industrial gas.[3] 80% of this ammoni[4] is then made into ammonium nitrate or urea, which are the world's most widely used nitrogen fertilisers.

Energy consumption in agriculture can be broken down into direct energy (fuel oil, electricity, gas) and indirect energy (that which is used in manufacturing, production and transport of inputs, and for buildings).[5] Currently in Europe, indirect energy represents 52% of total energy consumed in the agricultural sector, 55% of which is linked to nitrogen and therefore to fertilisers.[6] In Europe, manufacture, transport and spreading of synthetic nitrogen fertilisers represents over 5% of total energy consumption. The manufacturing stage of fertiliser requires most energy, representing 91% of the energy consumed along the production chain (manufacture, transport, spreading).[7]

The outlook for 2050 is not much brighter. The International Energy Agency (IEA) forecasts a rise in demand for ammonia by 2050 driven by the fertiliser industry, which will also increase demand for energy. Likewise, in its most optimistic scenario,[8] corresponding to net zero emissions by 2050, the IEA estimates that over half of all fossil gas produced by 2050 will be used for hydrogen production, which is a key product for manufacturing ammonia to be used for nitrogen fertiliser.

In 2014, production of ammonia and fertiliser in France represented 7% of consumption of fossil gas in industry.[9] according to the French Energy Regulatory Commission. Bearing in mind that 44 gigajoules are needed to produce 1 tonne of synthetic nitrogen,[10] and that France consumes more than 2 million tonnes of nitrogen annually in the form of nitrogen fertilisers, 88 million gigajoules are required every year just to produce nitrogen fertiliser.

2 A staggering environmental cost

As well as their cost in terms of energy and their close links with fossil fuels, **synthetic nitrogen fertilisers also have an enormous impact on the climate and biodiversity. Spreading these fertilisers emits nitrous oxide** into the atmosphere, a gas with a heating effect 265 times more potent than CO_2. In France, nitrogen fertiliser, including production and transport, represents almost a quarter of greenhouse gas emissions from the agricultural sector.[11] Between 30% and 43%[12] of greenhouse gas emissions linked to agriculture are nitrous oxide emissions, with two-thirds of greenhouse gas emissions from fertiliser taking place during spreading (nitrous oxide emissions), whilst one-third stems from their manufacture from fossil fuels.

Synthetic fertilisers, often in conjunction with industrial livestock farming, also cause excessive nitrate levels in the water table. This reduces the amount of oxygen present in river waters to the point that sea biodiversity can be affected.[13] This is the phenomenon of eutrophication, better known as the proliferation of green algae.

Last, but not least, the ammonia necessary for manufacture of synthetic fertiliser emits fine particles into the atmosphere which are damaging to human health, and are partially responsible for the upsurge in respiratory and cardiovascular illnesses and cancers. In France, 94% of ammonia emissions can be traced back to the agricultural sector.[14]

PART II

Sharing the losses, privatising the profits

Our agricultural and food system is heavily dependent on fertiliser, and **we pay a high price for this – our capacity to produce food and feed ourselves depends on the ups and downs of the fossil fuel market.**

1 The long shadow of geopolitics

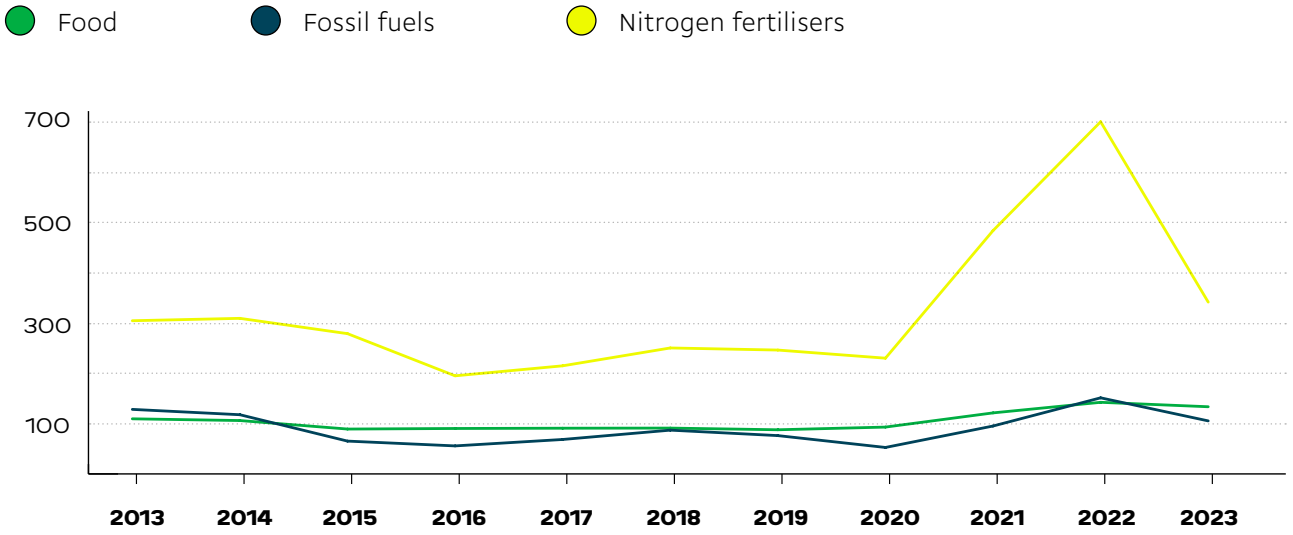
The **price of fertiliser** is indexed to the fluctuating price of gas, and began to rise in September 2020, before the Russian attack on Ukraine. There are a number of factors which explain this increase:

- The export restrictions imposed by China – one of the biggest fertiliser suppliers – after 20 years of exports, in order to ensure its own food security,[15] go some way towards explaining this price increase.
- Due to the full-scale invasion of Ukraine in 2022, the European Union decided to restrict imports of Russian gas. However, Ukraine and Russia are two of the main fertiliser suppliers to the EU,[16] representing 25% of fertiliser supplied to Europe as a whole and 10% to France.
- The oligopolistic nature of fertiliser production in a context of increasing scarcity of fossil fuels allows nine of the largest producers which dominate the market, including Yara and Nutrien, to make billions in profits, even in a context of very high inflation of food prices as seen in 2022-2023.
- The closure of Chinese ports as a consequence of the Covid-19 crisis and general inflation increased gas prices further, leading to a threefold rise in fertiliser prices in just one year.

In 2022, the price of fertiliser was at its highest level since 1997. The FAO reports that the price of urea, the most commonly used fertiliser, has more than tripled since 2021.[17] **The increase in the price of nitrogen fertilisers is therefore one of the key factors behind the inflation of food products:** cereal production capacities (and exportation capacities) are limited by the cost of fertiliser.

Moreover, **large-scale use of synthetic fertiliser is a major factor in European dependence on Russian gas and Chinese exports.** Since the invasion of Ukraine in February 2022, European fertiliser producers have tried to break free of Russia, turning to other countries which produce the raw materials needed such as Algeria, Egypt and Qatar. At the end of 2022, however, fertiliser exports from Russia picked up again. **It is therefore in our interests to phase out chemical fertilisers not only from an economic, environmental and health-related angle, but also for geopolitical reasons, to regain our food sovereignty and our geopolitical and energy independence** in the face of growing authoritarian tendencies in these countries.

Price of fossil fuels, nitrogen fertilisers and food



There is a very strong correlation between the price of fossil fuels, the price of fertilisers and food prices. Between 2013 and 2023, the change in these prices follow similar curves. A significant increase in all three can be observed in 2021-2022 after the Russian invasion of Ukraine. Over this period, fertiliser prices shot up 400% compared with reference years. The rise in energy and food prices was limited to 150%, as it is restricted to some extent by pressure from the general public and an absorption of extra costs in industrial firms' profit margins.

Source : *Study: Golden bullet or bad bet? New dependencies on synthetic fertilisers and their impacts on the African continent | INKOTA Webshop.* ***Source data at :*** *bit.ly/3F3bIUs - bit.ly/3Q2i7pa - bit.ly/3ZJRatW*

2 Soaring costs for society

The cost of fertiliser borne by importing countries, and partially by the public authorities via the support measures implemented, has tripled in two years. The governments of the G20 countries saw their fertiliser costs rise 189% in 2021 and 288% in 2022 as compared with 2020.[18] For example, Brazil increased its spending by 3.5 million dollars, and certain developing countries have seen their costs triple, such as Pakistan (+874 million dollars) and Ethiopia (+384 million dollars).[19] In France, the government adopted an Economic and Social Resilience Plan on 16 March 2022 to help companies affected by the crisis, with a one-off envelope of 150 million euros for the agricultural sector.

2 Significant but insufficient public aid

The increase in fertiliser prices contributes to the rising price of grains used to feed livestock, particularly pigs. **80% of fertilisers are used to produce food for livestock,** meaning that the war has hit livestock farmers particularly hard. To cope with this crisis, the French government has allocated specific aid of 400 million euros to livestock farmers.[20] Although this amount represents a considerable amount of the State budget, the continued price increases have meant that it has only served to absorb the excess costs of around 100,000 livestock farmers for around four months, from 15 March to 15 July 2022.[21] These crisis measures are essential in the short term, but they also encourage the continuation of an altogether unsustainable agribusiness model which prolongs our dependence on Russia and autocratic regimes.

As well as rising fertiliser prices, **the world has also witnessed a substantial increase in food prices over the last few months.** In France, most farmers (except pig farmers) are struggling to cope alone with the tripling of input prices. They are unable to increase their prices enough to cover inflation, for fear of no longer being able to sell their produce.[22] 20% of the world's population may no longer be able to feed itself if fertilisers derived from fossil fuels remain at their current price[23] - in September 2022, the Executive Director of the World Food Programme (WFP) declared that the war in Ukraine had driven 70 million people to the brink of famine, mainly due to rising fertiliser prices. WFP experts have warned of a serious risk of a global food shortage in the next few years, particularly in the poorest countries, if fertiliser prices remain at current levels, in view of our current dependence on them.

What is at stake here is the **crucial issue of climate and food justice.** A choice must be made between maintaining our dependence on fertiliser within a production model which leaves food security at the mercy of world events, exposed to the competition of industrial livestock farming and under the control of a handful of multinationals, or developing more moderate, resilient and independent production methods.

3 How fertiliser multinationals profit from the crisis

The world fertiliser market is controlled by an oligopoly composed of a handful of multinationals such as the Norwegian giant Yara, the Canadian company Nutrien and the Austrian company Borealis.[24] Their dominant position allows them to increase the prices of the inputs they sell to farmers to absorb the increase in their production costs, whilst maintaining or even increasing their profit margins. **The biggest fertiliser producers made record profits in 2021 and 2022.** The nine largest fertiliser manufacturers, among others, made around 84 billion dollars in profit in 2021 and 2022 – four times more than in 2020.[25] In 2022, their profits reached 49 billion dollars – a 350% increase compared with average profits (14 billion dollars) before the pandemic.[26]

Nutrien and Yara's profits (in billion GUSD)

	2020	2021	2022
Nutrien	0,46	3,18	7,68
YARA	0,68	0,38	2,78

Figures from the Nutrien and Yara annual reports (consolidated net income corresponding to the group).

The war in Ukraine has enabled the European leader in nitrogen fertiliser, Yara, to spectacularly increase its net income, from 384 million dollars in 2021 to 2.78 billion in 2022. In order to boost its financial power and pander to its shareholders, Yara has prioritised profit above all else. With the price of raw materials skyrocketing, the multinational has closed several of its European ammonia and urea factories, reducing its production by 10% whilst increasing its prices,[27] to the dismay of the farmers who depend on the fertiliser market.

By allowing the chemical fertiliser industry to use public funds for its own ends, states dig deep into financial resources which could have been allocated to the agroecological transition. It is high time for us to hold fertiliser manufacturers to account by refocusing our taxation and budget policy (redirecting national and European subsidies to organic farming and agroecology, increasing taxation on pollution linked to chemical fertiliser) and taxing their profits, in order to fund the agroecological transition in the most vulnerable areas.

PART III

Decarbonised fertilisers: an illusion created by an industry at a dead end

Faced with criticism of the impact of fertiliser on the climate and its high energy consumption, the industry is attempting to maintain its profits by claiming to have come up with a sustainable solution. This involves replacing the fossil fuels used in fertiliser manufacture with so-called renewable energy, and using carbon capture and storage (CCS) technology or even carbon offsetting mechanisms to limit CO_2 emissions. However, these false solutions (which are the same methods used by the fossil fuel industry to "decarbonise") are incapable of ending the dependence of the fertiliser industry on fossil fuels. **These mechanisms are either in their initial stages of development, ineffective or require large quantities of fossil fuels themselves in order to function.**

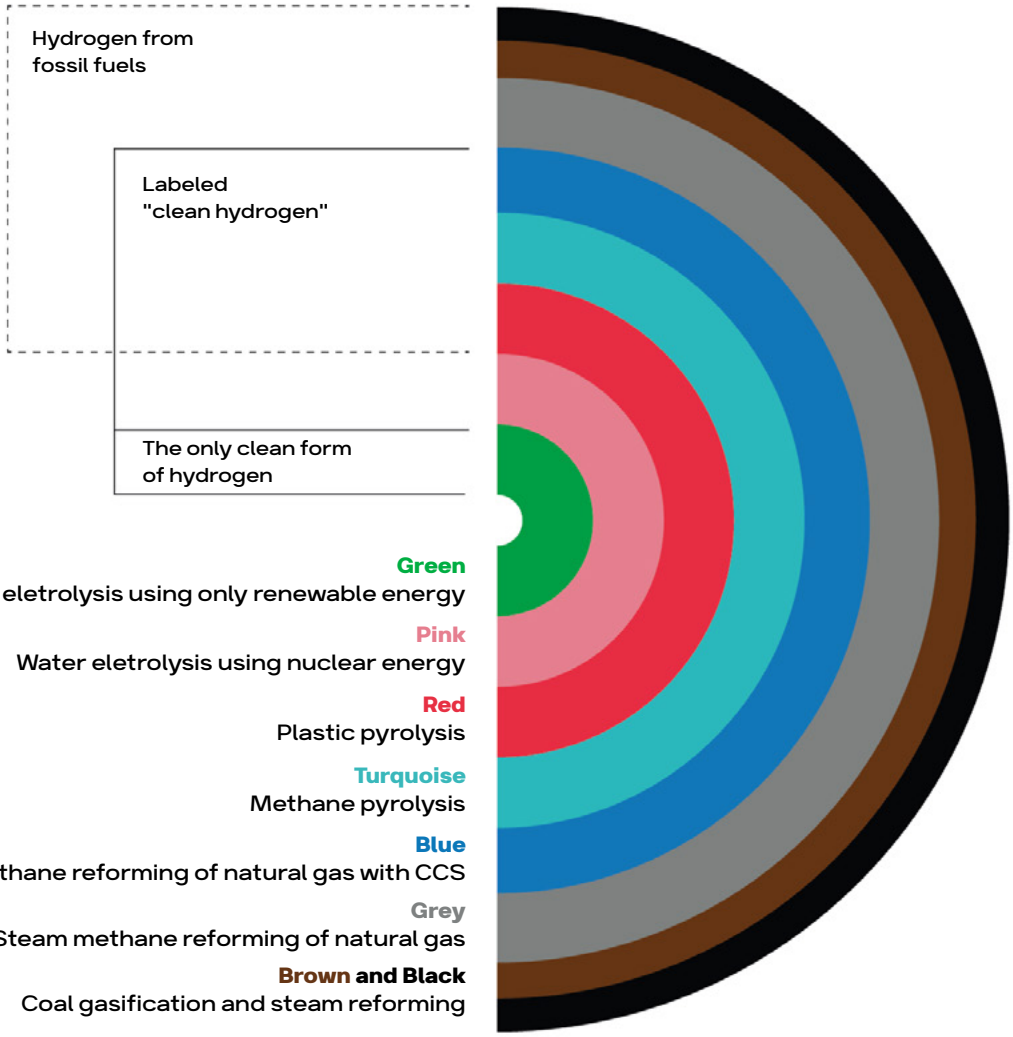
1 50 shades of hydrogen, but the same old scam

Currently, almost all synthetic nitrogen fertiliser is made from fossil fuel (98%). The manufacturing process uses ammonia, which is produced using nitrogen and hydrogen.

In many sectors, including in the fertiliser industry, large industrial groups are tending to use more and more hydrogen, presenting it as the energy of the future, in order to maintain their production levels.

The fertiliser industry uses the terms **"blue hydrogen"** and **"blue ammonia"**, presenting these as a step along the way towards **"green hydrogen"** and **"green ammonia"**. This seemingly innocuous coloured label is in fact nothing more than a marketing product. The only difference is that a **carbon capture and storage (CCS)** procedure is added during hydrogen production. However, CCS is not a reliable solution for reducing greenhouse gas emissions and does nothing to challenge our dependence on fossil fuels – quite the opposite.

Hydrogen rainbow spectrum



Information from H2 Bulletin.

2 CCS, the agribusiness sector's favourite placebo

What is CCS (*carbon capture and storage*) ?

The principle of CCS is to remove carbon dioxide emissions from the atmosphere by capturing them directly where they are generated, then storing them in geological substrates, mines, ocean beds or soils.

It is widely used by multinationals in the fertiliser and fossil fuel industries as it enables them to publish low (or even neutral) CO_2 emissions, whilst maintaining the current model, which is highly profitable.

Ineffective technology

Although CCS technology has been in development for several decades, it has not lived up to its promises. In 2021, a team of researchers studied 263 CCS projects undertaken between 1995 and 2018,[28] and found that most of them had failed, with 78% of the largest projects either being cancelled or postponed. In Australia, Gorgon, the biggest global CCS project with a total cost of 3 billion dollars, also failed, generating results 50% lower than its objectives.[29] Contrary to the expectations of industrial stakeholders, who seek higher returns from such large-scale projects, the largest CCS projects are more likely to be ineffective. **This raises questions about the real economic interest of developing this technology on a large scale,** although it is presented as a solution to be prioritised.

Energy-intensive technology, which leads to further extraction of fossil fuels

Over 80% of the CCS projects developed around the world have been used in order to extract even more oil, without which these projects would not be economically viable.[30] For example, in the United States, increased energy consumption and re-use of carbon to extract oil from wells nearing the end of their life span have meant that CCS has contributed to a net increase in CO_2 emissions.[31] It is therefore just another misleading greenwashing strategy.

The efficiency of CCS has never been proven, and the costs it entails are significant, but it is still being used to justify new investments in fossil fuels. Extraction sites are supposed to be "CCS ready", i.e., equipped with CCS for the future, but this technology remains purely hypothetical and new investments in fossil fuel production are in no way compatible with the goal of reducing greenhouse gas emissions.

In hydrogen production, things are even worse. The equipment required for CCS uses even more energy, which for the sake of convenience is mainly produced using fossil fuels. An American study showed that greenhouse gas emissions from "blue" hydrogen were between 18% and 25% higher than those from "grey" hydrogen (produced without CCS technology).[32] Far from reducing greenhouse gas emissions, the blue hydrogen production process actually begins by increasing them.

Finally, presenting "blue" hydrogen as a solution means that the focus is on reducing greenhouse gas emissions from fertiliser production, whilst emissions from spreading fertiliser (two-thirds of the total) are completely ignored.[33]

"Blue" hydrogen is therefore a dangerous distraction, which may divert attention and public policy from tried-and-tested solutions, and gives the illusion that agribusiness holds the key to the solutions.

3 Is "green" hydrogen really green?

The fertiliser industry claims that it has a "green" alternative at hand, which involves extracting hydrogen via electrolysis, i.e., from water using electricity from renewable sources, rather than using fossil fuels.

"Green" hydrogen is the only type of hydrogen which does not come from fossil fuels, but it remains an exception, and is very costly to produce, in view of the large amounts of energy and water required.[34] Producing hydrogen using electrolysis currently costs two or three times more than the traditional, more polluting methods.[35] Furthermore, a transition to decarbonised production in the synthetic fertiliser industry using water electrolysis would entail significant energy consumption. Storing hydrogen takes a lot of energy, as its density is low, which makes it more difficult to compress or liquify to be transported.

Moreover, sales of "clean" ammonia for the fertiliser industry are forecast to reach just 20 megatonnes per year by 2030,[36] a figure which would fail to cover our current needs - 180 megatonnes of ammonia are currently produced and consumed globally each year, 80% of which is used for fertiliser.[37] In their communication strategies, fertiliser companies vaunt clean ammonia as proof of their climate commitments, but "green" fertiliser based on hydrogen or "green" ammonia only has a very minor contribution to make to the environmental transition. Given its vast water and energy consumption, green hydrogen is expensive and rare, and will remain so over the next few decades. It must be reserved as a priority for sectors which have fewer alternatives, such as the steel industry.

Promoting hydrogen of any "colour", in a context where energy demand is too high to be fully covered by renewables, boils down to more hydrogen production from fossil fuels.

Yara itself admits that its "green fertilisers" are not completely free of fossil fuels,[38] and that significant production of "green fertiliser" is impossible in the short term. The company hopes to be able to deliver 3 megatonnes of "green" ammonia by 2030.

> **Green hydrogen cannot be considered a miracle solution to guarantee our food security, no matter how much is touted as such by manufacturers. It is simply an option which may be useful for very limited and strictly necessary purposes, but these two criteria do not apply to our current consumption of fertiliser.**

4 Grossly underestimated environmental and social costs

In many countries, particularly in the Global South, **the renewable energy plants needed to produce green hydrogen are built on agricultural land, destroying jobs in small-scale farming and threatening the survival of biodiversity in these areas.** In Namibia, South Africa and Maghreb, large renewable energy projects producing "green" hydrogen have been accused of 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.[39] In Norway, the Supreme Court ruled against the development of wind farms for "green" hydrogen which were posing a threat to the Sami indigenous community's way of life and biodiversity in the area.[40] The large amounts of water required for hydrogen production using electrolysis also pose a problem – the development of large "green" hydrogen projects may cause conflict between domestic/agricultural use and these energy-related uses, which mainly benefit agribusiness companies.[41] **Like all resources, renewable energy must be used wisely, with due consideration of its social and environmental impacts.**

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4 Carbon offsetting for fertiliser transportation

Fertiliser manufacturers make much of their commitment to "offsetting" emissions from fertiliser transportation, particularly via reforestation schemes. However, **carbon offsetting is unreliable, ineffective and generally only serves to legitimise the greenwashing narrative pushed by manufacturers,** whilst contributing to the phenomenon of land grabbing[42] (the trees planted to offset emissions often take up agricultural land, without the consent of local small farmers or indigenous communities), a phenomenon which Friends of the Earth France also tackle.[43] Furthermore, **it is particularly ineffective from an environmental point of view to try to offset the emissions stemming from transportation in the fertiliser industry**, as this phase of the production process generates the smallest amount of pollution. Worldwide transport of fertiliser only represented 29.8 megatonnes of CO_2 in 2018, i.e., 2.6% of total emissions linked to fertiliser[44]. On the other hand, production and spreading of fertiliser represented 818.4 megatonnes of CO_2 emissions, i.e., 72.5%. Carbon offsetting of fertiliser transportation is therefore simply a greenwashing operation for Yara and other agribusiness giants – the benefit of it for the climate is minimal. First and foremost, we must reduce the production and use of synthetic fertiliser, and prioritise truly sustainable alternatives to chemical fertilisers.

All of this means that, whether decarbonised or not, the fertiliser on which our agriculture depends is not sustainable in the long term. The manufacturing process based on hydrogen, whether "blue" or "green", will only worsen the climate crisis and North-South inequalities. By promoting these unviable solutions, the fertiliser industry is acting like a ticking time bomb. As well as increasing our dependence on fossil fuels, industrial agriculture encourages monocropping with the pesticide use that this entails, pollutes air and water, and also leads to monopolisation of agricultural land by financial stakeholders interested in short-term profit, at the expense of small-scale farmers and agroecology. In other words, **decarbonised fertilisers are an attempt to lock us into a model which is on its last legs.**

PART IV

Towards agroecology: the ways out of industrial agriculture

According to Michael Fakri, UN special rapporteur on the right to food, *"the underlying problem is not that farmers' access to chemical fertilisers has been jeopardised by the war in Ukraine - the problem is that so many farmers have become dependent on chemical fertiliser. In the short term, it is important to ensure that farmers who depend on this fertiliser have access to it, but the end goal must be to free ourselves of this dependency as soon as possible."*

For this reason, Friends of the Earth France call for a drastic reduction in production and use of these fertilisers in order to achieve real sustainability.

A number of scenarios[45] show that **it is possible to drastically reduce our consumption of synthetic fertiliser, whilst ensuring the food security of the world's population.** To be effective, the transition to an agroecological model must be systemic and multifactorial, reviewing the priorities of the agricultural sector and redirecting public funds towards practices which are sustainable from an environmental, economic and health-related point of view. Our agricultural model must be almost completely free of chemical fertiliser if it is to be resilient.

Ten years ago, the FAO was already raising the alarm about the dangers of allowing food production to depend on energy prices.[46] We can only overcome this dependence by decoupling the price of food production from that of exploiting fossil fuels. **This radical change in the agrifood model must begin immediately** – it cannot be considered only as a mid-term objective.

1 Moving away from intensive agriculture and livestock farming to restore the natural nitrogen cycle

The agricultural world is currently experiencing an economic and environmental crisis, exacerbated by the Covid-19 pandemic and the war in Ukraine. To address this, **it is essential to end financial backing for intensive agriculture,** especially since this is not necessarily the most profitable type of farming: in the UK, 2023 yields of the main crops were up by 2.4% compared with the average for the period, even though use of synthetic fertiliser decreased 27% owing to the increase in prices linked to the war in Ukraine.[47]

All farmers must be provided with support to face the crisis, but more public aid should be allocated to best practices, particularly to organic farming and mixed farming, which depend less on fertiliser than large monocrops and intensive livestock farming based on cereal consumption. The number of heads of livestock must be significantly reduced, and industrial livestock farming methods must be phased out, in favour of best practices. In small-scale mixed farms, for example, animal manure is used to fertilise crops. This restores the natural nitrogen cycle, whilst protecting grassland, which in turn protects biodiversity and acts as a carbon

sink.[48] **Consumption must adapt to this reduced animal production** – which is also necessary to fight climate change and beneficial for the health of consumers.

2 Reforming the Common Agricultural Policy (CAP)

The Common Agricultural Policy represents the biggest budget outlay for the European Union. It represents one-third of the EU's budget and 47% of the public budget allocated by France to the agricultural sector. Created in 1962 to make Europe self-sufficient in terms of food production after the Second World War, its initial purpose was to support cereal and milk production. But in 1992 it was reformed, as its relatively interventionist way of functioning was accused of distorting prices on the world market via its attempts to make European agriculture more competitive. The guaranteed prices were therefore lowered, and the way aid was allocated was changed to be based on the number of hectares of each farm, rather than the type of production. This reform automatically penalised types of production which use less land, such as market gardening and beekeeping, and encouraged expansion of farms, which tends to contribute to an agricultural model which damages the climate and biodiversity.[49]

Alongside the Collectif Nourrir, we have put forward a number of proposals for a Common Agricultural Policy which would provide decent income for farmers and bring about a real agroecological transition.[50] Aid for the first few hectares must be increased, to provide better support for small farms and by extension, agroecological practices. The environmental conditionality criteria must be made stricter, to ensure that the various types of EU funding only cover good agronomic practices (particularly organic farming and legume cultivation, which provide alternatives to synthetic fertiliser use) with scientifically proven environmental benefits. Investment aid and support for implementation of agroenvironmental and climate measures must be significantly increased and extended to all types of production, to encourage all farmers to adopt agroecological practices. Finally, funds for training must encourage changes of practice, particularly to help small farmers diversify their activity and enable catering professionals to provide more organic and plant-based foods, in order to guarantee a market for nitrogen fertiliser-free agriculture.

These different tools are fundamental to significantly reduce the use of nitrogen fertiliser in all types of agricultural production, and to make agriculture more local, more resilient, and better for both human and soil health.

3 Reducing our dependence on all types of chemical fertiliser

The problem of nitrogen fertiliser must not eclipse that of mineral fertiliser based on phosphorus or potassium. Extraction and production of fertiliser from minerals uses large amounts of energy, and generates a lot of pollution. Spreading phosphate fertilisers causes an excessive concentration of phosphorus in soils and water, and contributes to the phenomenon of eutrophication and the proliferation of green algae in water, which uses up oxygen in water and leads to biodiversity loss. The deposits of these minerals are concentrated in the same geographical areas - 70% of the world's phosphate reserves are located in Morocco and the Western Sahara, whilst 75% of global potash production comes from China, Canada, Russia and Belarus.[51] This phosphate and potassium fertiliser therefore increases our dependence on countries which are very far removed from the democratic values of the EU and the rule of law.

4 Replacing synthetic nitrogen fertiliser with legumes

Cultivation of legumes is essential to protect the climate, biodiversity and our health. Unlike synthetic nitrogen fertilisers, **using legumes in crop rotations provides a direct source of nitrogen for plants, significantly reducing the dependence of our agricultural model on fossil fuels** and thereby reducing nitrous oxide emissions. According to OECD calculations, intensive production of legumes

in Finland would enable a 60% reduction in the use of nitrogen fertilisers and fossil fuels.[52] In France, the CIRAD agricultural research organisation has demonstrated that replacing nitrogen fertilisers with legumes in large-scale arable crop systems reduces nitrous oxide emissions.[53] Moreover, introducing legumes into the cropping system greatly improves yield for cereal crops (20% on average, and more in the absence of nitrogen fertilisers).[54]

Cultivating legumes using an agroecological model also helps sequester carbon in soils. Legumes require little water, and they help improve water quality, unlike nitrogen fertilisers which cause nitrate pollution in water and contribute to eutrophication. Legumes are also beneficial for biodiversity, as they contribute to crop diversification and attract pollinators. What is more, food diversification via legume consumption significantly contributes to a healthy diet, with less meat and more local production. This boosts our food resilience when faced with climate, economic and geopolitical events. Legumes therefore have an essential role to play in the short and long term in order to replace synthetic fertiliser as part of the agroecological transition.[55] Public authorities must therefore provide major support for their development and encourage the transition towards a more plant-based diet.

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FOSSILS FUELS ON OUR PLATES

THE DARK SIDE OF FERTILISERS

DECEMBER 2023

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