March | 2023

Pesticides: A Growing Problem

Why investors must engage with the pesticides industry

ShareAction»

About ShareAction

ShareAction is a non-profit working to build a global investment sector which is responsible for its impacts on people and planet. We mobilise investors to take action to improve labour standards, tackle the climate crisis, and address pressing global health issues, such as childhood obesity. Over the last 15 years, ShareAction has used its powerful toolkit of research, corporate campaigns, policy advocacy and public mobilisation to drive responsibility into the heart of mainstream investment. We want a future where all finance powers social progress.

Visit shareaction.org or follow us @ShareAction to find out more.

Acknowledgements

ShareAction would like to extend appreciation to our funders for their support of this work. We would also like to thank the reviewers of this briefing for their valuable insights. They include: Aidan Shilson-Thomas, Lydia Marsden, Niall Considine, Simon Rawson, and Pesticide Action Network UK.

Author

Eve Gleeson
Research Manager – Biodiversity
eve.gleeson@shareaction.org

Contact

Eve Gleeson
Research Manager – Biodiversity
eve.gleeson@shareaction.org

Dr Katie Leach
Head of Biodiversity
Katie.leach@shareaction.org

Disclaimer

Fairshare Educational Foundation (t/a ShareAction) is a company limited by guarantee registered in England and Wales number 05013662 (registered address 63/66 Hatton Garden, Fifth Floor, Suite 23, London UK, EC1N 8LE) and a registered charity number 1117244, VAT registration number GB 211 1469 53.

Contents

Executive summary

Executive summary

Biodiversity is declining faster than at any point in history. It is estimated that over **25 per cent** of species are now threatened with extinction while **75 per cen**t of land surface and **66 per cent** of ocean area have been significantly altered by human activity[i].

Pesticides are a significant contributor to the biodiversity crisis[ii]. Used in industrial agriculture, pesticides, which include insecticides, herbicides, fungicides and other pest-specific chemicals, contribute greatly to land-use change and pollution. These are two direct drivers of biodiversity loss, according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[iii]. The excessive and inappropriate[1] use of pesticides severely damages terrestrial and aquatic life and compromises ecosystem services like pollination, water purification and soil fertility.

To effectively halt and reverse the loss of biodiversity, the use of pesticides and their devastating impacts on biodiversity must be drastically reduced. The pesticides industry, and its investors, must support this transition and the wider movement toward a more sustainable food system.

Pesticide use is built into our industrialised food system. It relies heavily on chemical inputs to produce food for a growing population – an estimated 99 per cent of global agricultural land uses pesticides to produce food[iv]. The world's largest pesticide-producing companies (who also own patents on two-thirds of the world's major commercial seeds used by farmers) dominate this system[v], promoting destructive food production practices and hindering efforts from scientists and policymakers to bring about change[vi]. However, despite the narrative of pesticide advocates, a just and sustainable food system can thrive without their excessive and inappropriate use[vii].

There is an extremely limited role for synthetic pesticides in a future where biodiversity loss is halted and reversed. The pesticides industry must urgently transform if they are to exist in the future. Methods of food production that prevent the need for pesticides, such as agroecology, must be scaled up, while pesticide companies can offer sustainable alternatives to synthetic pesticides where pests cannot be prevented. Alongside this important innovation, the pesticides industry must phase out the production of harmful synthetic pesticides and adopt robust strategies for radically reducing their impacts on biodiversity.

Policymakers are waking up to the need to build a more sustainable food system and address the impacts of pesticides on environmental and human health. The Convention on Biological Diversity's Kunming-Montreal Global Biodiversity Framework, which has set global goals for halting and reversing biodiversity loss by 2030, includes a target on pesticides. Target 7 calls for reducing the overall risk from pesticides by half by 2030[viii]. While an essential

1 In disproportionately high volumes, and in places or circumstances that are unnecessary or highly damaging.

component in meeting the global goals, this falls short of the original aim to "reduce pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and human health, including by reducing nutrients lost to the environment by at least half, and pesticides by at least two thirds"[ix].

However, Parties to the Convention have already started to act on pesticide-related biodiversity loss, and this action will progress as they translate the Framework's targets into policy solutions. The European Union's Farm to Fork Strategy, for example, calls for a drastic reduction in pesticide use and risks generated by pesticides, while Thailand has taken action to halt the use of some of the most hazardous pesticides. These regulations already severely restrict the activities of pesticide companies and this scrutiny will only increase. Regulation specifically targeting financial institutions and corporations, like the EU's Prior Informed Consent (PIC) Regulation and Colombia's Green Taxonomy, are also beginning to hold companies and financial institutions accountable for their involvement in the use and impact of pesticides. While many regulators want to curb the industry's impact on biodiversity and human health, pesticide companies continue to lobby policymakers in multiple jurisdictions against these developments.

Over 70 per cent of the pesticides market is controlled by just six companies. As the leading producers of pesticides, these companies use their leverage to uphold a global addiction to input-intensive agriculture, and interfere with government and scientific efforts to reverse this trend. Despite their enormous contribution to biodiversity loss, these companies continue with business as usual while failing to reduce or even comprehensively assess their impacts on biodiversity.

Many of the world's largest financial institutions are investors in pesticide companies. Over 2,000 investors hold shares in at least one of the five largest public pesticide companies, and dozens of large banks regularly provide and facilitate debt financing to these companies. In this briefing, we present recommendations on how investors can push for urgent changes in the pesticides industry:

- Investors should develop or expand their assessment practices to understand how their investments in the pesticides industry impact biodiversity and develop a strategy to address these impacts.
- Investors should engage with policymakers, either individually or through collaborative engagements, to encourage regulation of the pesticides industry as part of a wider strategy to drive forward biodiversity-related regulation.
- Investors should develop or expand existing biodiversity strategies and stewardship policies to include robust engagement with pesticide companies in their portfolio. They should build escalation policies into these strategies and disclose all engagement outcomes. This should be accompanied by bold stewardship practices across the food and agriculture sector to help drive systemic change.

Introduction

Introduction

Pesticides are a major contributor to global biodiversity loss through their central role in food production, which has the most significant impact on biodiversity of all industries according to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[x]. While pesticides threaten biodiversity and human health in other applications, including fish farming and when used in urban/suburban environments, pesticide use in agriculture has contributed to the sharp decline in biodiversity worldwide: over 40 per cent of all insect species are now threatened with extinction[xi], farmland birds in Europe are at historically low numbers[xii], and freshwater ecosystems across the planet are contaminated and suffer from the ongoing impacts of pesticide residues[xiii, xiv, xv].

What are pesticides, why are they used, and what does a low-pesticide future look like?

Pesticides are specially formulated chemicals used to prevent crops from being damaged or destroyed by various pests, which can include weeds, insects, small mammals and diseases from fungi, bacteria or viruses.

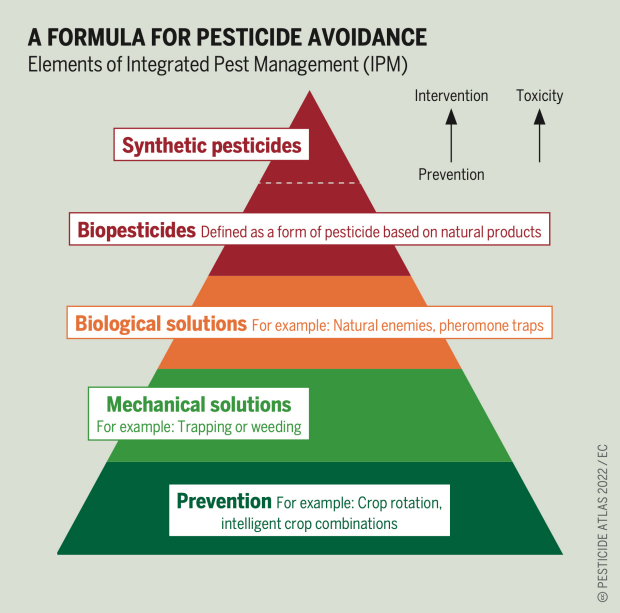
While some pesticides are used by home gardeners and smaller food production operations, the highest volumes are used on industrial farms. Many of these farms, by design, are more vulnerable to pests and often fail to take steps to prevent them[xvi]. For example, farms that produce just one crop variety – known as monocropping, the most common method used to produce commercially grown crops[xvii]– provide a food source for just one pest, allowing the pest population to explode. These monocultures also deplete soil nutrients, which leaves crops vulnerable to soil-borne diseases[xviii]. Deforestation and land clearing practices used to establish farms also eliminate natural predators, exposing farms to worse pest problems[xix]. These conditions create the need for pesticides as biodiversity's innate ability to control pests declines.

Pesticide use has improved global food insecurity, but this has created a dependency on chemicals to produce food, generated immense human and environmental health costs and delayed the uptake of equally effective and low-impact alternatives[xx].

Despite the pesticide industry's narrative that pesticides are essential for maintaining food security, there are much more sustainable solutions that,

if scaled, can effectively feed a growing population, such as using agroecological methods to prevent pests and using innovative technologies to reduce pesticide applications where pests cannot be prevented[xxi]. These methods must be scaled up, as they have much less impact on biodiversity and can even improve biodiversity in the case of agroecology. Pesticide companies must significantly reduce the volume and impact of the pesticides they produce and start replacing synthetic pesticides with more sustainable solutions, such as biopesticides (non-synthetic products derived from natural materials like bacteria or minerals), to align with a sustainable food future (Figure 1).

Figure 1. A Formula for Pesticide Avoidance, from Pesticide Atlas 2022[xxii]



Pesticide companies also insist that pesticides (and genetically modified seeds used in conjunction with pesticides) are necessary for responding to the impacts of climate change, like new pests and worse weather events[xxiii]. However, in the long term, pesticide use can make farms even more vulnerable to these effects by compromising biodiversity and essential ecosystem services, like predation and flood or drought control, that can provide natural resilience to climate change. For example, conventional farms that use pesticides are more likely to experience the acute impacts of drought, like crop losses, than organic farms, as healthy soils have a greater capacity to store groundwater[xxiv].

A food system that uses preventative and alternative methods to manage pests is essential. As we face the dual crises of biodiversity loss and climate change, pesticide companies must acknowledge and act on their linkages to effectively address and respond to both issues.

Pesticides used in the industrialised food system have dire and widespread impacts on biodiversity[xxv]. Of all agriculture-related drivers of biodiversity loss, pesticides have been found to have the most damaging effects on bird populations, including severe impacts on survival[xxvi]. Pesticides have been identified as the second leading driver associated with global insect decline, behind agricultural intensification more generally[xxvii]. They are also strongly associated with commodity-driven deforestation, which leads to the destruction of entire ecosystems[xxviii].

Hilal Elver, former United Nations Special Rapporteur on the Right to Food.

The food system's "reliance on hazardous pesticides is a short-term solution that undermines the rights to adequate food and health for present and future generations."[xxix]

Pesticides, soy and deforestation in South America

Intensive soy production is a clear example of the enabling role of pesticides in the biodiversity crisis. The demand for commodity-grown soy (mostly for livestock feed, biofuels and highly processed food products) has fuelled pesticide-intensive agriculture and deforestation throughout South America[xxx]. This has demolished entire ecosystems and contaminated natural resources that are heavily relied upon by indigenous peoples and local communities[xxxi].

Argentina, Brazil and Paraguay now produce almost 50 per cent of the world's soy[xxxii]. In 2019 alone, the three countries deforested over 600,000 hectares of land – the size of nearly 40 football fields – to establish industrial soy plantations[xxxiii]. This has resulted in the destruction of richly biodiverse forest ecosystems. As of 2019, soy production in South America stretched across 55.1 million hectares – an area nearly the size of the UK[xxxiv].

Almost all soy grown in these countries[2] is genetically modified to be 'glyphosate tolerant' (glyphosate is used in a product line known as 'Roundup Ready' sold by the pesticide producer Bayer AG, alongside RoundUp pesticides)[xxxv,3]. This genetic modification enables repeated applications of glyphosate, an organophosphate pesticide with a wide range of toxic effects on organisms and deemed "probably carcinogenic to humans" by the World Health Organization[xxxvi,xxxvii].

But glyphosate is not the only pesticide enabling soy production and driving biodiversity loss in the region. In 2018, Brazil imported more Highly Hazardous Pesticides (HHPs) than any other country, almost two-thirds of which were used for soy production. Five of the industry's largest companies – Syngenta, Bayer, BASF, Corteva, and FMC Corporation – accounted for most of these sales, which included products with neonicotinoids and other chemicals that have severe impacts on biodiversity[xxxviii]. UPL, another leading pesticide producer, also provides Brazil with high volumes of HHPs such as chlorantraniliprole and mancozeb, which pose significant threats to both human health and the environment[xxxix].

2 95 per cent in Paraguay, 96 per cent in Brazil, and 100 per cent in Argentina.

3 While many industry-funded studies propose that genetically modified soy has reduced environmental impact, these studies have poorly and inaccurately measured risk.

Pesticides negatively impact terrestrial ecosystems in several ways:

- **Pesticides reduce wildlife population sizes.** Targeted pesticides kill pests such as insects to protect the crops they feed on. But, by reducing the size of the local insect population, pesticides also reduce the ecological benefits insects provide, like pollination or soil enrichment. Pesticides also impact non-target species, such as insect pollinators, soil organisms and birds. Pesticides can harm these non-target species in several ways, including by removing food sources and compromising their reproductive ability[xl].
- **Pesticides contaminate soils and negatively impact soil-based organisms.** This compromises the ability for these organisms to provide healthy and fertile soils, such as by breaking down and transporting nutrients within the soil or suppressing diseases. As a result, pesticides leave soil less fertile, less able to store carbon and filter water, and more vulnerable to droughts and floods[xli,xlii].
- **Pesticide use can drive biodiversity loss in surrounding areas where they are not directly applied.** This is because pesticides can contaminate entire animal populations, who can bring pesticides into off-farm ecosystems, and can drift onto neighbouring land during application[xliii]. This can lead to unintended biodiversity loss in areas where pesticides are not directly applied, such as wildlife areas.
- **Pesticides enable intensive farms that drive biodiversity loss through destructive land-use practices.** These farms, which are often monocultures and therefore require more pesticides due to an inherent vulnerability to pests[xliv], drive biodiversity loss in many additional ways, including:
    - clearing land to establish farms, including forests, wetlands and grasslands[xlv]
    - reducing the genetic diversity of crops[xlvi]
    - damaging soil by using destructive cultivation practices[xlvii]
    - draining resources like groundwater that local communities and ecosystems depend on[xlviii].

In addition, pesticides severely damage freshwater and marine ecosystems:

- **Pesticides from agricultural runoff damage freshwater ecosystems like lakes, ponds and rivers[xlix].** In these ecosystems, pesticide residues can accumulate along the food web as larger animals eat smaller organisms that contain pesticide residues[l]. This can reduce the size of a population, alter reproductive capacity and hinder other biological functions essential to survival in freshwater species, such as liver function and normal embryo development[li,lii].
- **Runoff can also contaminate marine and estuary environments.** This contamination can have similar effects on marine species as on freshwater species, especially where the pesticides occur in high concentrations. Pesticide residues in the ocean can also evaporate and spread to other ocean areas over time[liii]. This can lead to pesticides accumulating in marine organisms and has even led to rainwater containing pesticides[liv].

Highly Hazardous Pesticides (HHPs)[4] are especially damaging to biodiversity. HHPs are chemicals that cause disproportionate harm to the environment and human health through high acute or chronic toxicity[lv]. HHPs can cause bioaccumulation through the food chain, whereby pesticides spread throughout species and ecosystems as larger animals prey on smaller, contaminated ones. Many HHPs also persist in water or soil, causing long-term contamination and toxicity to life in these ecosystems. Their toxicity can also severely harm aquatic organisms, bees and other animals that provide essential ecosystem services[lvi]. Because of these properties, the environmental effects of HHPs are often more severe than other pesticides. Pesticide companies must phase out HHPs to protect environmental and human health from the severe dangers of these chemicals.

HHPs have already had stark effects on numerous species and habitats. For example, pesticides in the neonicotinoid class of insecticides have led to notable declines in bird biodiversity[lvii] and drastically reduced bee populations[lviii]. Birds and bees are essential to healthy ecosystems because they kill pests and pollinate plants, so the growing use of neonicotinoids – now the most used pesticides in the world – threaten to create systemic risks to long-term food production[lix]. Other HHPs, such as organophosphates like glyphosate, have been associated with steep declines in soil biodiversity, which compromises soil fertility and productivity[lx].

In the UK alone, bees exposed to neonicotinoids have reduced reproduction by 44 per cent[lxi].

Pesticides like glyphosate compromise soil health by destroying soil microorganisms.[lxii]

4 We determine HHPs according to Pesticide Action Network (PAN) International's list. This list collates all pesticides that have been deemed hazardous by the World Health Organisation, the European Chemicals Agency, the International Agency for Research on Cancer and the US Environmental Protection Agency.

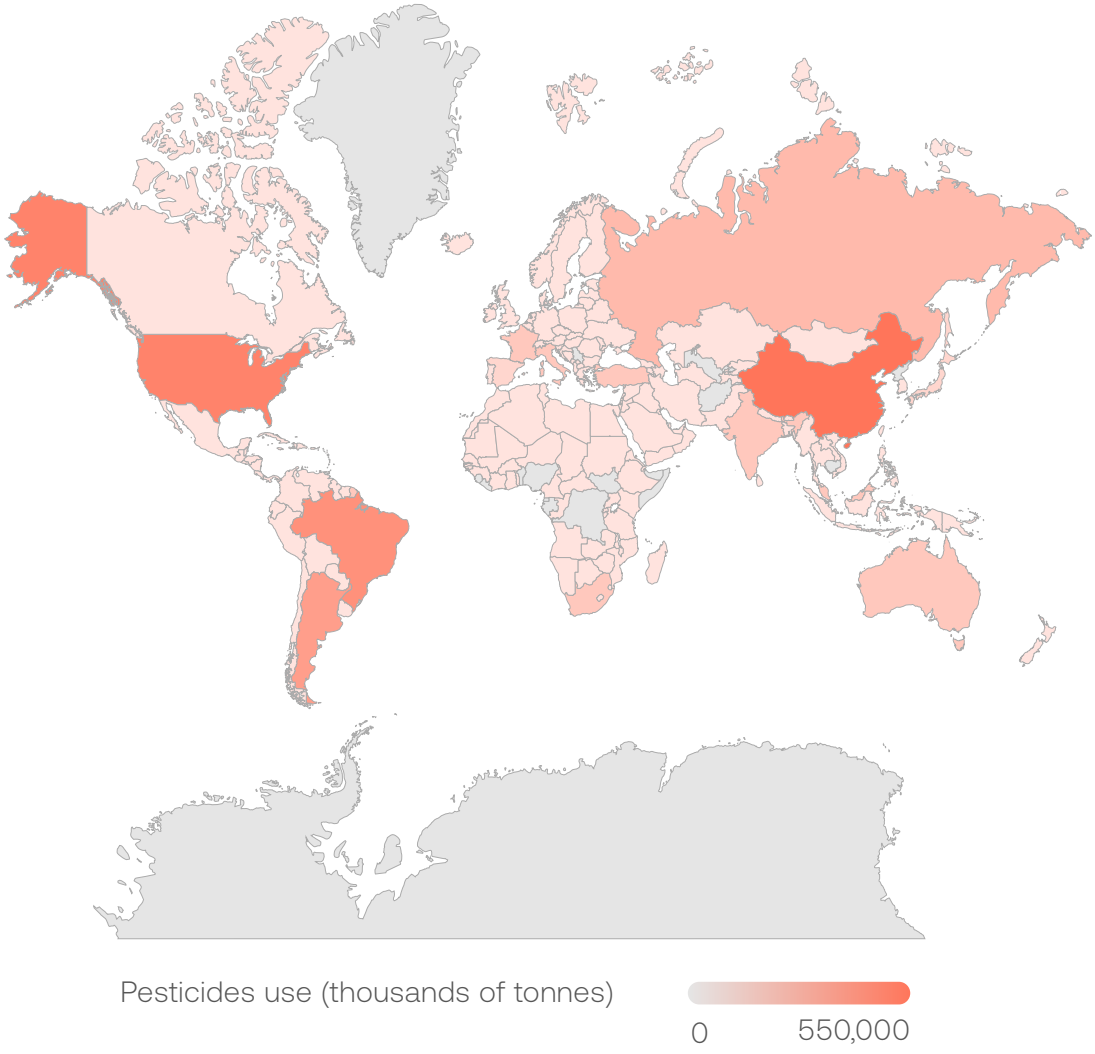
Pesticide use and export by country

Pesticide use and export by country

Pesticides are applied in mass volumes and are used worldwide. Most, if not all, countries use pesticides for food production, although some countries use far more pesticides than others (Figure 2). In 2020, China used over half a million tonnes – the most of any country. The USA, Brazil and Argentina also used high volumes, with other countries trailing far behind. The United States, the second largest user of pesticides behind China, used more pesticides in 2021 than Russia, France, Canada, Australia, India and Italy (all major agricultural producers) combined.

Figure 2. Pesticide use by country in 2020.

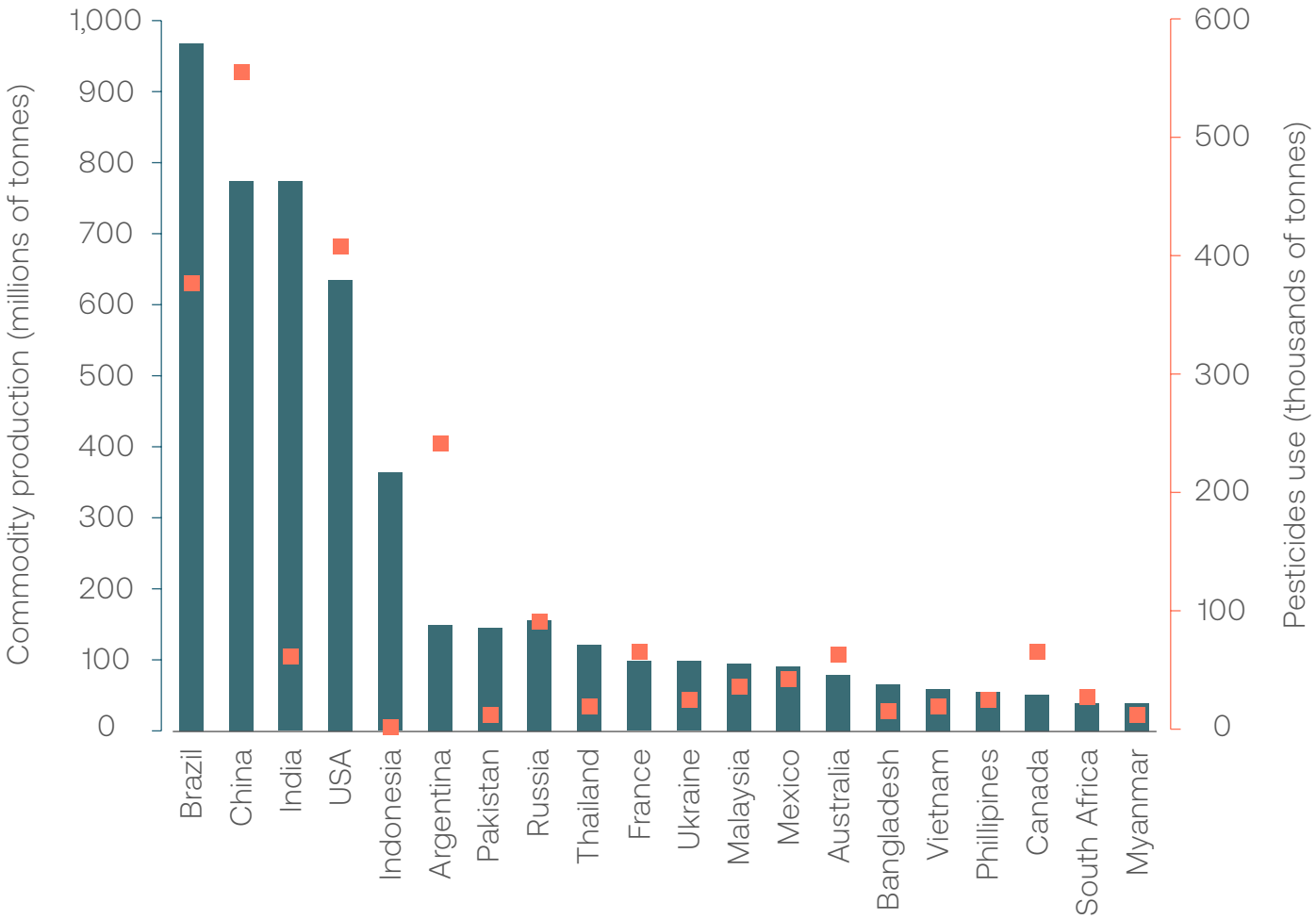
2020 data retrieved from the UN Food and Agriculture Organization (FAO) service FAOSTAT, the most recent year of available data[lxiii]. This data includes the major pesticide groups, including insecticides, herbicides and fungicides, and relevant chemical families. Volume refers to metric tonnes of pesticide active ingredients used in or sold to the agricultural sector.



Countries with high pesticide use are also the leading producers of major commodity crops – basic agricultural products produced in mass quantities, such as soya, wheat and maize (Figure 3). Indeed, many pesticides are created specifically for these crops due to their high production volume and importance in global commodity markets[lxiv]. Countries with both high commodity production and pesticide use indicate agriculture's reliance on chemical inputs to produce the world's leading commodity crops, many of which are low-nutrient foods used for manufacturing highly processed food products, biofuels and livestock feed[lxv].

Figure 3. Top 20 countries by production of key agricultural commodities in 2021 compared to pesticide use.

Commodities measured include soya beans, wheat, maize, sugar cane, rice, cotton, sugar beet, barley and oil palm fruit. These are the most produced crops by volume globally. Data on crop production and pesticide use was retrieved from FAOSTAT[lxvi, lxvii].

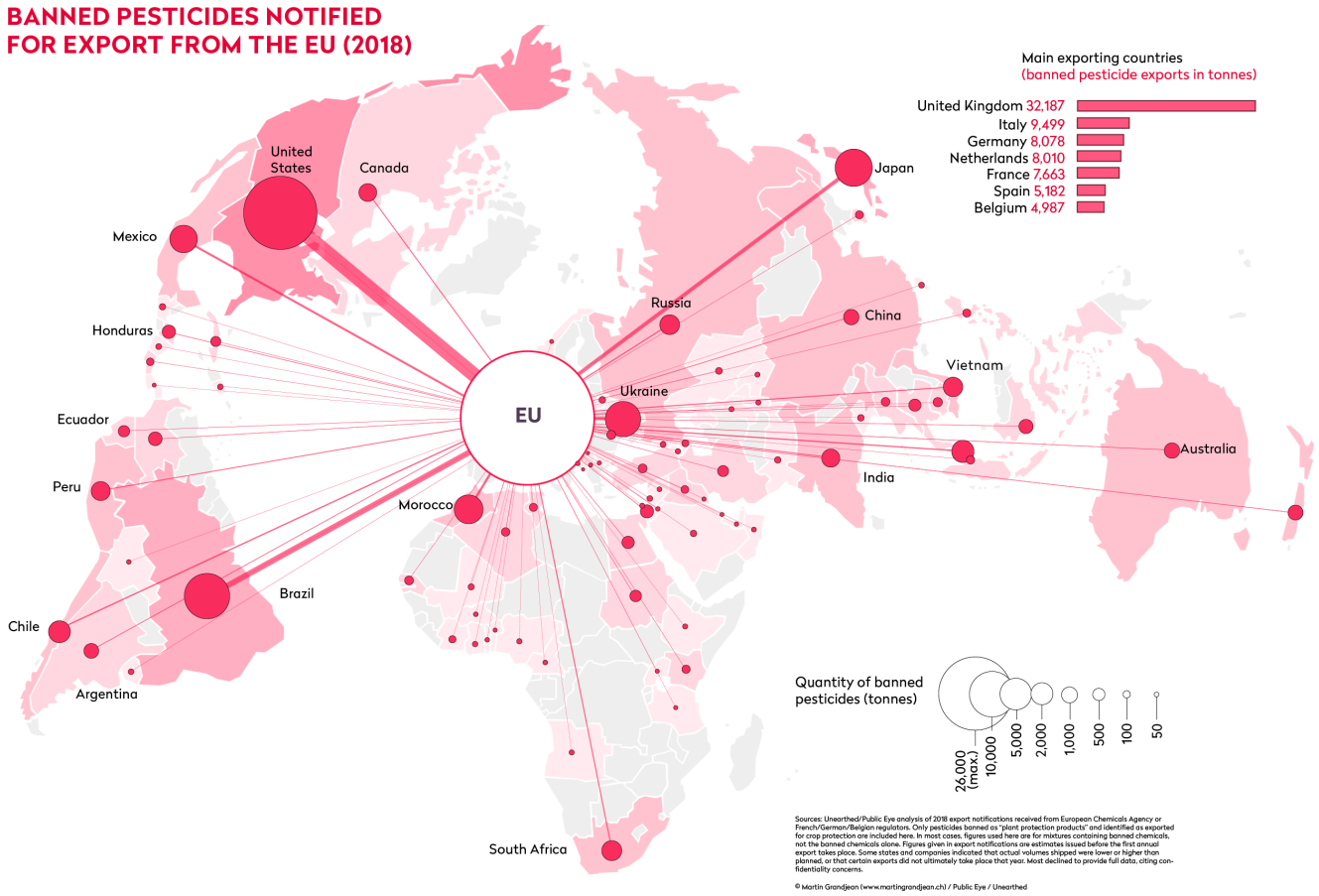


Although some countries use far more pesticides than others, where these pesticides are used within the country matters. Biodiversity loss from pesticide use is site-specific. For example, if pesticides are used within or near areas of biodiversity importance, they are likely to have more severe effects on biodiversity. Without precise location-level data on where pesticides are being used, it is difficult to accurately assess the impact of pesticides on biodiversity within a country or region. Pesticide companies must begin to disclose location-level data for more accurate insight into how and where pesticides are driving biodiversity loss.

The countries and companies that supply these pesticides often do not feel the location-level impacts of pesticides. The leading pesticide exporters, such as Europe, the United States and China, are located far from highly biodiverse countries, such as Brazil and Argentina, that use large volumes of pesticides and may experience severe site-specific impacts. European countries regularly export pesticides that are banned for use within the EU, including high volumes of HHPs, to these and dozens of other countries[lxviii]. In 2018 alone, EU countries exported 81,000 tonnes of HHPs to countries outside Europe, nearly the same volume of pesticides that France used that year (Figure 4)[lxix].

Figure 4. Banned pesticides notified for export from the EU (2018).

Unearthed/Public Eye analysis of 2018 export notifications received from the European Chemicals Agency or French/German/Belgian regulators. Only pesticides banned as "plant protection products" and identified as exported for crop protection are included here. In most cases, figures used here are for mixtures containing banned chemicals, not the banned chemicals alone. Figures given in export notifications are estimated issues before the first annual export takes place. Some states and companies indicated that actual volumes shipped were lower or higher than planned, or that certain exports did not ultimately take place that year. Most declined to provide full data, citing confidentiality concerns.



Regulation of pesticide companies and their investors

Regulation of pesticide companies and their investors

As policymakers become more aware of the damage to biodiversity and human health caused by pesticides, they are developing regulations and policies to hold stakeholders to account. This changing policy landscape has already started to restrict pesticide production and use, such as the EU's strict authorisation processes and bans on certain pesticides. Financial regulation is also growing, which will hold investors and companies accountable for their role in pesticide-related biodiversity loss. Non-compliance with these policies will create risks, such as fines or reputational damage, for both companies and their investors.

The Kunming-Montreal Global Biodiversity Framework is one such effort from global policymakers to tackle pesticide-related biodiversity loss and shape national policies. The Framework's Target 7 calls for "reducing the overall risk from pesticides and highly hazardous chemicals by at least half". While vague in its current form, it is hoped that implementation of this target through National Biodiversity Strategies and Action Plans (NBSAPs) will be more explicit about what reducing risk by half means. The Framework also emphasises that all actors, including businesses and financial institutions, must play a role in achieving these goals. Countries that enact these goals will likely hold the business and finance community accountable for their role in pesticide production. Target 15 of the Framework (which will also be embedded in national policies) calls on the business and finance community to assess and disclose impacts and dependencies on biodiversity, including those that result from pesticide production and use[lxx].

In addition to global policy, many jurisdictions are developing their own strategies and frameworks to address pesticide use. This includes the EU biodiversity strategy for 2030[lxxi] and the UK Environment Act[lxxii], which provide the foundations for addressing pesticide use as a key driver of biodiversity loss. Europe's Farm to Fork Strategy, which draws on the EU's biodiversity strategy for 2030 and is a core component of Europe's Green Deal, calls for a 50 per cent reduction in the use and risk of pesticides and the use of HHPs by 2030, an increase in biological pesticides and a ban on the use of pesticides in sensitive areas, like in parks and gardens and near ecologically important areas.

Regulation that will impact companies and financial institutions is also growing. Numerous jurisdictions are developing strong pesticide-related regulations that will increase scrutiny of companies in this industry, such as restricting which pesticides can be sold and used (Table 1). Many are also developing financial regulations that require financial institutions to assess and disclose their investment impacts on biodiversity; in many cases, this could be linked to pesticide use and/or the key drivers of biodiversity loss associated with pesticide use, especially pollution (Table 2).

Table 1. A non-exhaustive list of existing regulation relevant to pesticide companies[5].

Jurisdiction	Legislation	Status	Description
EU	Directive on Sustainable Use of Pesticides (SUDP)[lxxiii]	Established	Calls on member states to reduce pesticide use and minimise the risks they pose to human and environmental health, which may force companies to phase out or reduce the production of some products
EU	EU Prior Informed Consent (PIC) Regulation[lxxiv]	Established	Companies must annually notify the European Commission when exporting certain hazardous chemicals that are banned or restricted in the EU, including pesticides
EU	Regulation (EC) No 1107/2009[lxxv]	Established	Subjects pesticide companies to extensive authorisation processes for active ingredients within pesticide products
France	Decision no. 2019-823 QPC[lxxvi]	Established	Prohibits companies within France from producing, storing and transporting active ingredients, such as those in pesticides, that have not been approved for use within the European Union
Thailand	Ban on the use of select pesticides by the National Hazardous Substances Committee[lxxvii]	Established	Reduces market access for pesticide companies by prohibiting the use of select pesticides, including HHPs glyphosate, paraquat and chlorpyrifos, and the import of foodstuffs grown with these pesticides

Table 2. A non-exhaustive list of established and emerging financial regulation relevant to pesticides.

Jurisdiction	Legislation	Status	Details
EU	EU Green Taxonomy[lxxviii]	Established	Defines economic activities considered sustainable. While it does not explicitly mention pesticides, the Taxonomy highlights that chemical pollution is contrary to sustainable economic activity
EU	Sustainable Finance Disclosure Regulation (SFDR)[lxxix]	Established	Financial institutions must report their share of investments in chemical-producing companies, including pesticide companies
South Africa	Green Finance Taxonomy[lxxx]	Established	Taxonomy-aligned investment must minimise excessive use of pesticides and associated pesticide pollution
Colombia	Taxonomía Verde de Colombia (Colombian Green Taxonomy)[lxxxi]	Established	The Taxonomy identifies natural resource pollution from pesticides as contrary to sustainable economic activity
UK	Sustainability Disclosure Requirements (SDR)[lxxxii]	Emerging	Will establish expectations for financial actors to disclose their environmental impacts and dependencies. While it does not explicitly mention pesticides, it includes objectives relating to natural resource pollution

5 Since UK seceded from the EU, the UK has complied with most pre-Brexit EU pesticide policy. The Retained EU Law Bill, currently in progress, will determine which European pesticide regulation will be retained in UK policy. Some new regulation has already been introduced that reverses EU standards. For example, the UK government has repeatedly authorised the temporary use of neonicotinoids – a pesticide class banned in the EU in 2018 for its detrimental effects on bees – to support the beet sugar industry, against expert advice. While the EU is developing new ambitious and progressive pesticide regulations, the UK will no longer be subject to this regulation.

There is more regulation on pesticides in Europe than in other regions of the world. Europe has numerous regulations that apply to pesticides, including legislation that governs which pesticides can be used, what information companies must report and how financial institutions will be held to account for their investments in the industry. The disparity between Europe and other regions is growing as the EU develops ambitious pesticide reduction goals, such as the Farm to Fork Strategy's target of reducing pesticide use, and risks created by pesticides, by half by 2030.

Europe still falls short by allowing the export of pesticides which are banned for use in the region. The European Commission recently faltered on an earlier commitment to restrict these exports[lxxxiii], although France stepped up to introduce regulation that halts the export of these products. This has reduced export volumes from France dramatically, but the country continues to export some banned pesticides, exposing pesticide companies and their investors to financial risk from non-compliance[lxxxiv]. Multiple groups have been working to delay or water down ambitious EU regulation due to threats to the pesticide industry and fears from constituent countries and interest groups about food security and farmer job security[lxxxv].

The lobbying of pesticide companies is a strong factor in delays in European regulation and weak regulation elsewhere. Seeking to dilute and limit industry regulation on pesticides, these companies hinder policy development through several mechanisms, including making individual donations to policymakers, threatening legal action against policymakers, funding biased economic and environmental impact studies, and holding positions in government[lxxxvi,lxxxvii]. Many leading pesticide companies are members of CropLife International, a lobbying group that influences policy internationally, regionally and nationally[lxxxviii]. In 2021, the group's members spent over EUR€12 million on lobbying activities in Europe, targeting policies related to agriculture, sustainability, biodiversity, chemicals and sustainable investment[lxxxix]. The group has immense political influence in other jurisdictions, including in countries with large agriculture sectors like South Africa[xc], Brazil[xci] and the United States[xcii], where it continues to block regulation that could reduce the severe impacts of pesticide use on biodiversity and human health.

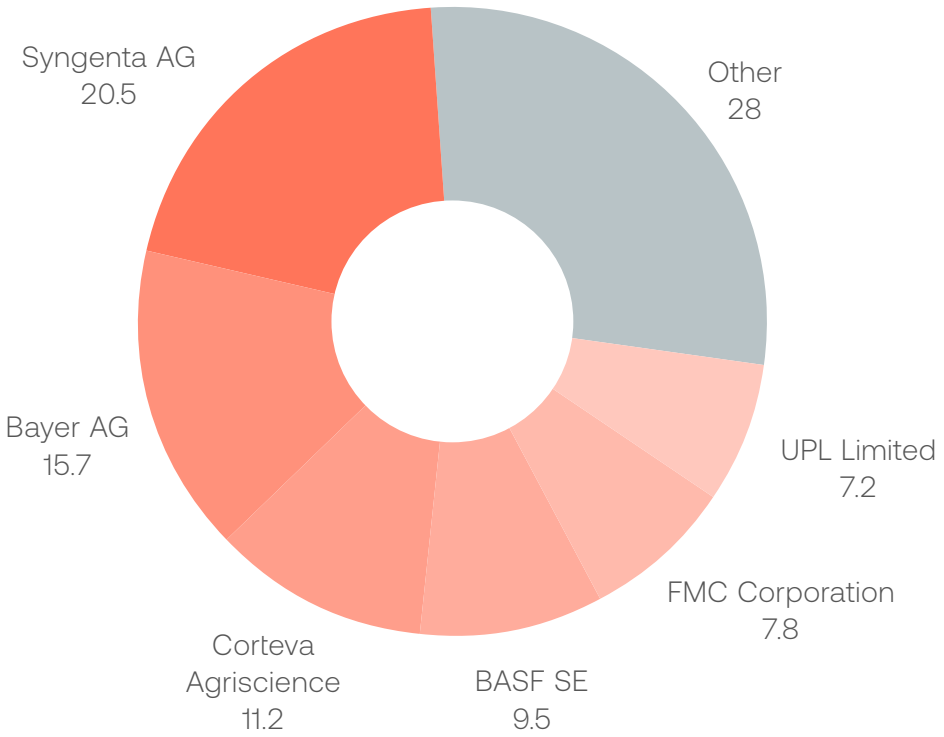
The global pesticides market

The global pesticides market

Six companies dominate 70 per cent of the global pesticide market. With several mergers and acquisitions in the last decade, these six companies now generate around US$47 billion worth of sales in the industry's US$65 billion market (Figure 5)[xciii, 6]. Because of this market concentration, reform within these companies will result in significant progress towards halting and reversing biodiversity loss from pesticide use.

Figure 5. Top six companies in the pesticides industry by percentage of market share.

Pesticide sales data was collected from 2021 company reports and compared to S&P Global's estimated 2021 market valuation of US$65 billion. The "Other" category includes pesticide sales not attributed to the six identified companies.



6 The pesticide sales of the top six pesticide companies were collected through company financial reports, while the market value has been estimated by S&P Global. Both methods have assessed value through pesticide sales, which include herbicides, fungicides, insecticides and other kinds of pesticides.

Performance on biodiversity is poor among these dominant companies. While some companies have broad strategies to address biodiversity loss, these plans do not include robust governance frameworks, identification of risks, opportunities, dependencies and impacts on biodiversity, ambitious target-setting, or thorough reporting practices. Engagement with biodiversity initiatives is also lacking. Only two of the companies are members of the Science-Based Targets Network's Corporate Engagement Program, a crucial initiative for companies to join to establish science-based targets and metrics on biodiversity[xciv].

In addition, all of these companies produce HHPs, including many that have had high-profile environmental and human health impacts. Five of the six companies produce neonicotinoids, which negatively impact numerous species but most notably bees and other pollinators[xcv]. All but one company produce glyphosate, which has been identified as a probable carcinogen by the World Health Organization[xcvi] and highly toxic to aquatic organisms[xcvii]. Producing these highly hazardous substances has already exposed pesticide companies to lawsuits, leading to reputational and financial risk for companies and their investors. For example, the lawsuits against Bayer regarding the company's glyphosate-based products resulted in significant public backlash against the company[xcviii], a decline in product sales and a drop in the company's market capitalisation by 50 per cent since the company acquired Monsanto in 2018[7].

Shareholders can play a key role by influencing the strategies of the dominant pesticide companies. Five of the six dominant companies are publicly listed, meaning they have an extensive base of shareholders who invest in the company's continued operations and growth. Figure 6 shows that 2,140 investors hold shares (of at least US$10K) in at least one of the industry's five largest public companies, with 89 of those investors holding shares in all five. Many of these investors hold well over US$1 billion worth of investments in these companies (Table 3). The industry's largest company, Syngenta, has been privately owned since its acquisition by Chinese state-owned company ChemChina in 2017, yet receives financing from debt investors (Figure 7).

7 Market cap decline based in Eikon financial data in 2018 compared to 2023.

Figure 6. Number of investors with holdings in at least one of the five largest public pesticide companies based on January 2023 shareholder data.

Data on shareholders was retrieved from Eikon. The analysis investigated the shareholders in the five largest publicly traded pesticide companies, including Bayer, BASF, Corteva, FMC Corporation and UPL.

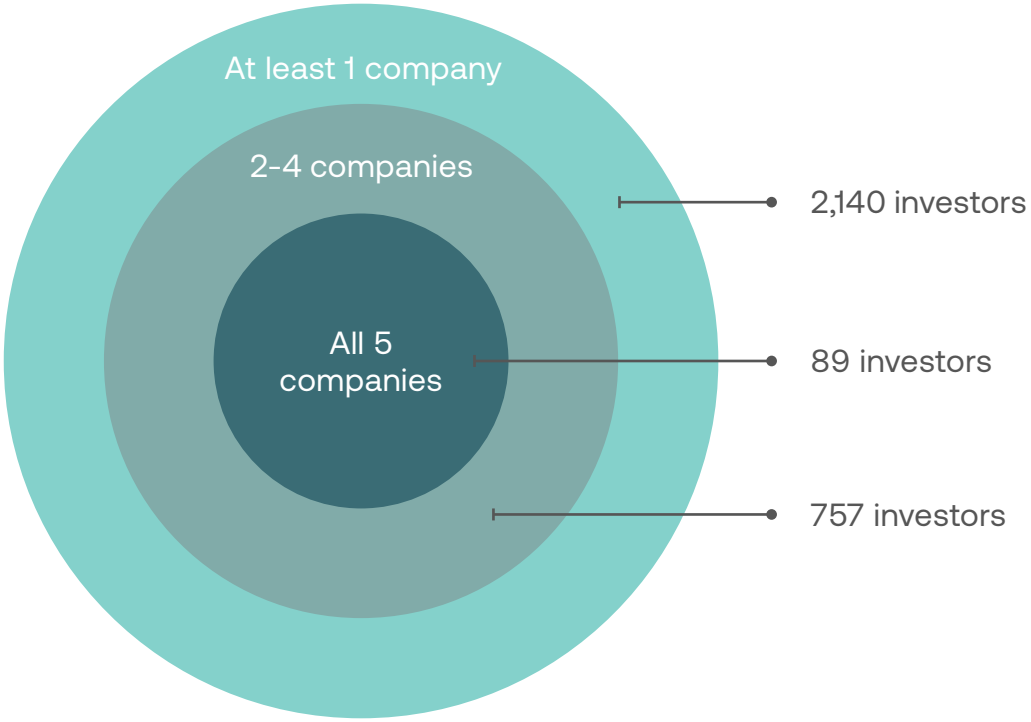


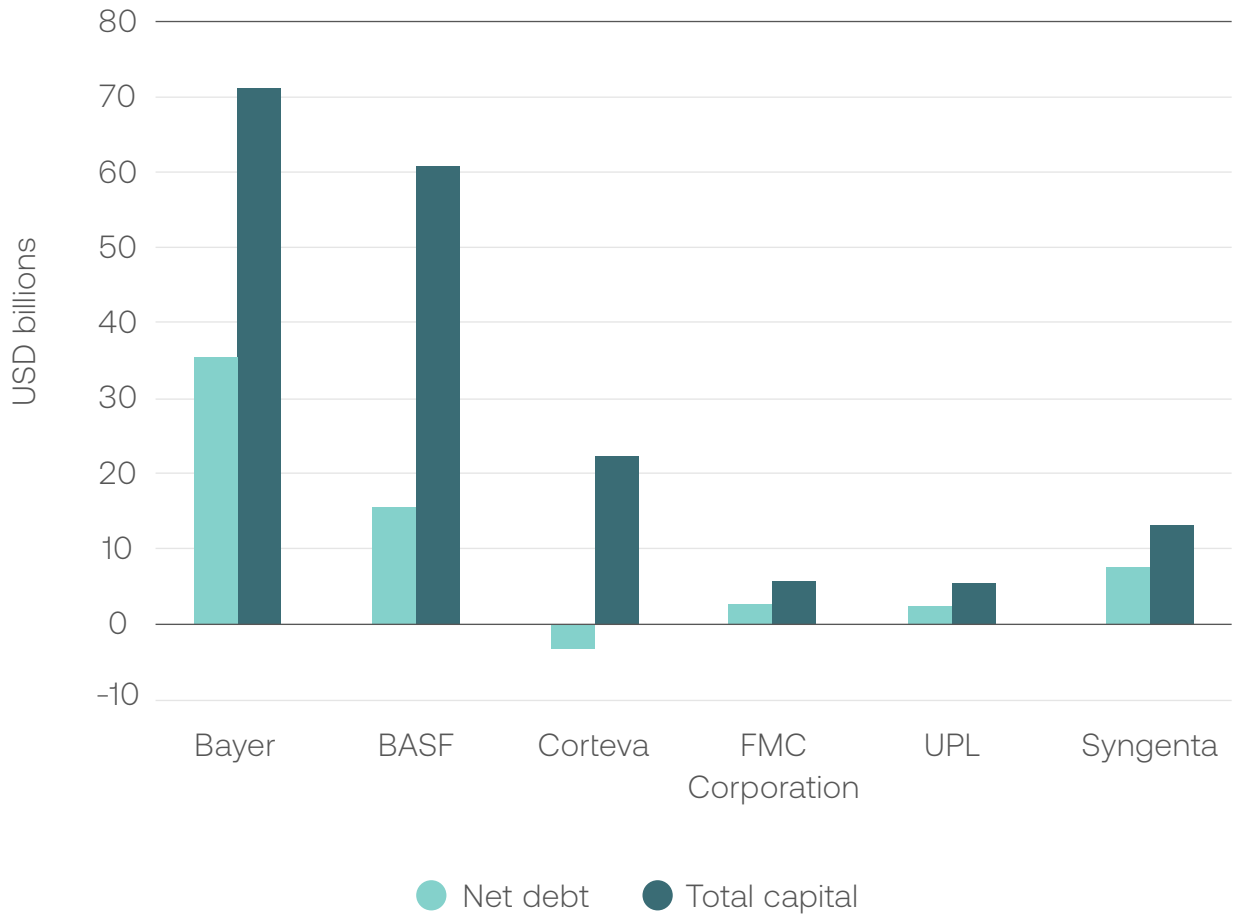
Table 3. Ranking of the top 10 investors who invest in all five companies by share value.

Rank	Investor	Rank	Investor
1.	BlackRock (US$12 billion)	6.	Fidelity International (US$1.3 billion)
2.	State Street Global Advisors (US$3.1 billion)	7.	Amundi (US$1.2 billion)
3.	Norges Bank Investment Management (US$3 billion)	8.	Wellington Management International (US$1.1 billion)
4.	DWS International (US$1.8 billion)	9.	Dimensional Fund Advisors (US$1 billion)
5.	Geode Capital Management (US$1.6 billion)	10.	Northern Trust (US$970 million)

All companies in the industry are financed through debt, with net debt totalling US$63.5 billion between the six companies. Some companies, such as Syngenta and Bayer, have a significant portion of their total capital composed of debt – 58 per cent and 50 per cent respectively (Figure 7). Because of this, debt investors, including banks and asset managers, play a key role in providing capital for these companies and can help transform their business operations. By setting ambitious lending policies and requirements for debt financing activities, including facilitating bond issuances and providing loans, debt investors can create significant incentives for companies to change.

Figure 7. Debt financing of the largest pesticide companies compared to total capital.

Financial data was retrieved from 2021 company financial reports. Net financial debt is compared with the company's total capital, which includes net financial debt and the book value of equity. Corteva's debt is negative as the company has minimal debt and its liquid assets exceed this debt.



What can investors do?

What can investors do?

To push for improved biodiversity performance by pesticide companies, investors must understand how pesticide use leads to biodiversity loss and which companies dominate the market. They also need to understand the evolving policy landscape that will hold companies and financial institutions responsible for their involvement. Understanding this context will help financial institutions assess their contributions to biodiversity loss, develop appropriate stewardship strategies and policies, and engage proactively with companies in the industry.

As owners and financers of companies in the pesticides industry, the financial sector's role in driving change cannot be underestimated. Financial institutions should act now to adopt policies and practices to address biodiversity loss due to pesticides, drive the transformation of pesticide companies and contribute to the development of a more sustainable food system.

Recommendations for investors

1 **In line with Target 15 of the Global Biodiversity Framework, investors should develop or expand current assessment practices to understand how their investments in the pesticides industry impact biodiversity and develop a strategy to address these impacts.** This should include assessing and disclosing location-specific impacts, dependencies, risks and opportunities on biodiversity from investments in the pesticides industry. These assessments should use science-based impact assessment approaches in line with the Taskforce on Nature-related Financial Disclosures (TNFD) or a similar framework, be conducted at the fund and company level, and consider reputational and regulatory risks. Identified impacts, dependencies, risks and opportunities should be addressed through industry-specific investment and stewardship policies, company engagement and capital allocation choices.

2 **Investors should engage proactively with policymakers, either individually or through collaborative engagements, to advocate for improved regulation of pesticide companies as part of a wider strategy to drive the development of biodiversity-related regulation.**

3 **Investors should develop or expand existing biodiversity strategies and stewardship policies to include robust engagement with pesticide companies in their portfolio.** Investors should build escalation policies into these strategies and disclose all engagement outcomes, including voting, in their annual sustainability reports. This should complement wider stewardship practices across the food and agriculture sector to drive systemic change, ultimately enabling the pesticides industry to transition faster.

Investors can use the following questions to start engaging meaningfully with pesticide companies. They can also measure company performance and the success of their engagements based on the company's progress against the outcomes provided:

Biodiversity assessment and reporting

1 **In line with Target 15 of the Global Biodiversity Framework, does the pesticide company conduct assessments of their biodiversity risks, opportunities, impacts and dependencies, and have these assessments been disclosed?**

Tracking outcome: Using science-based biodiversity measurement approaches, the company conducts location-specific assessments to analyse biodiversity risks, opportunities, impacts and dependencies of its pesticide products based on data collected on the areas affected by their use, including both on and off-farm environments within their value chains. The company publicly discloses these assessments. Ideally, the company uses the TNFD or a similar framework to guide this process.

2 **Does the company collect and disclose precise location-level data on where its products are used?**

Tracking outcome: The company collects and publicly discloses location-level data on where their pesticide products are used throughout its value chain, such as the location of farms. The company actively engages with retailers and distributors of their pesticide products and requests location-level data disclosures on where their pesticide products are sold and used. Pesticide companies should also disclose location-level data for each country, including where all pesticide products are exported to. As the impacts of pesticides on biodiversity are site-specific, this data is essential for accurately assessing their impact.

3 **Does the company plan to align their biodiversity strategy, including target-setting and measurement approaches, with emerging industry standards on biodiversity metrics and targets, including guidance from the Science-Based Targets Network (SBTN)?**

Tracking outcome: The company is actively engaged in SBTN, including piloting existing recommendations and frameworks. The company is also involved in other biodiversity-related working groups and collaborative initiatives on measurement, such as the Align project, and integrates relevant recommendations from these initiatives.

4 **Does the company have a credible plan to integrate biodiversity concerns into strategies to address climate change and broader transition plans?**

Tracking outcome: The company has a credible plan to integrate biodiversity in climate strategies and broader transition frameworks to achieve net zero. This plan includes fully integrating biodiversity into all climate strategies beyond offsetting, including biodiversity-related target-setting, action plans, impact assessment practices, and policy and governance frameworks. The company also integrates climate considerations into biodiversity strategies.

Pesticide production, sales and lobbying practices

5 **In line with Target 7 of the Global Biodiversity Framework and the EU's Farm to Fork Strategy to reduce risks generated by pesticide use, does the company have a credible plan to reduce the risk of pesticides on biodiversity by half by 2030?**

Tracking outcome: The company has a credible plan to measure the risks pesticides pose to biodiversity and to reduce this risk by half by 2030. The EU Farm to Fork Strategy targets indicate that reducing pesticide use is essential for lowering this risk: companies must adopt this principle when aligning with the Global Biodiversity Framework's Target 7. The company should have a credible plan to measure risk using science-based metrics and to reduce this risk by decreasing pesticide production and offering low-impact sustainable solutions, where the threat to biodiversity is also measured for these solutions. The company does not propose solutions for reducing risk that include equally harmful biological pesticides or other alternatives, such as new synthetic pesticides.

6 **Does the company have a credible plan to completely phase out the production and sales of Highly Hazardous Pesticides (HHPs) by 2030 as identified by the World Health Organisation, European Chemicals Agency, the International Agency for Research on Cancer and the US Environmental Protection Agency?**

Tracking outcome: The company has a credible plan to phase out the production and sales of HHPs and the products they appear in, which does not include the production of new pesticides that are equally as harmful. For companies based in the EU, this includes phasing out production and export of all pesticides banned for use in Europe.

7 **Does the company have a credible plan to cease pesticide sales to farms near areas of biodiversity importance and to ensure the company's retailers and distributors stop selling pesticides to farms near these areas, including World Heritage sites, Ramsar sites, Key Biodiversity Areas and nationally designated protected areas?**

Tracking outcome: The company has a credible plan to phase out pesticide sales to farms near areas of biodiversity importance, and to ensure that retailers and distributors also phase out sales of the company's products to farms nears these areas. The company assesses and publicly discloses data on pesticide sales to farms near these areas. This is essential for protecting areas that are particularly vulnerable to the impacts of biodiversity loss.

8 **Will the company commit to disclosing all political donations and activities in all jurisdictions, including financial or other support to policymakers, policy-specific lobbying, and position holding in government, including the company's rationale for these activities?**

Tracking outcome: The company discloses all political lobbying activities, including those conducted as an independent company and as a member of industry organisations like CropLife International. The company discloses its motive behind these activities. The company's lobbying activities align with other goals and targets of reducing pesticide production and impacts on biodiversity.

Potential target companies

ShareAction has compiled a list of potential target companies based on their annual pesticide sales compared to other companies in the industry (Table 4). The annual pesticide sales of these companies far exceed that of other industry players and comprise 70 per cent of the total market (see Figure 5). With the exception of UPL, all these companies are also members of CropLife International, a powerful lobbying group that negatively influences policy in numerous jurisdictions. The history of these companies highlights the mergers and acquisitions that have led to a highly concentrated industry. Due to this concentration, the transformation of these six companies will drastically reduce the overall impact of the pesticide industry on biodiversity.

Table 4. Potential target companies.

Company	Country	History
BASF SE	Germany	In 2016, **BASF** acquired some agricultural assets from **Bayer** (for Bayer's acquisition of Monsanto to receive regulatory approval).
Bayer AG	Germany	In 2016, **Bayer** acquired Monsanto, a pesticides and seed company, and the Monsanto brand was dissolved.
Corteva Agriscience	USA	In 2019, the agricultural unit of then-merged chemical companies Dow and DuPont (known as DowDuPont) was spun off to create **Corteva**.
FMC Corporation	USA	In 2017, **FMC** acquired part of DuPont's crop protection business.
Syngenta AG	Switzerland	In 2017, **Syngenta** was acquired by ChemChina, a Chinese state-owned chemicals business which merged with Sinochem in 2021. ChemChina also acquired Israeli pesticides company Adama in 2016, which now operates as a subsidiary of **Syngenta**.
UPL Limited	India	In 2019, **UPL** acquired American crop protection company Arysta, which now operates as a subsidiary of UPL.

References

i IPBES (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. Available at: https://doi.org/10.5281/zenodo.3831673

ii Oosthoek, S. (2013). "Pesticides spark broad biodiversity loss," Nature. Available at: https://www.nature.com/articles/nature.2013.13214

iii IPBES (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

iv Willer, H. and Lernoud, J. (2017). The World of Organic Agriculture. IFOAM – Organics International (TIPI) and Research Institute of Organic Agriculture FiBL. Available at: https://orgprints.org/id/eprint/34568/7/willer-lernoud-2017-02-12-v1-4.pdf

v Howard, Phillip H. (2018). "Global Seed Industry Changes Since 2013." Available at: https://philhoward.net/2018/12/31/global-seed-industry-changes-since-2013/

vi De Lorenzo, D. and Sherrington, R. (2021). "Mapped: The Network of Powerful Agribusiness Groups Lobbying to Water Down the EU's Sustainable Farming Targets," DeSmog. Available at: https://www.desmog.com/2021/12/09/network-agribusiness-chemicals-pesticides-lobbying-eu-sustainable-climate-farming/

vii Muller et al. (2017). "Strategies for feeding the world more sustainably with organic agriculture," Nature Communications. Available at: https://www.nature.com/articles/s41467-017-01410-w

viii Convention on Biological Diversity (2022). First draft of the post-2020 Global Biodiversity Framework. Available at: https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf

ix Convention on Biological Diversity (2022). First draft of the post-2020 Global Biodiversity Framework. Available at: https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf

x IPBES (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

xi Sanchez-Bayo, F. and Wyckhuys, K. (2019). "Worldwide decline of the entomofauna: A review of its drivers," Biological Conservation. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0006320718313636?via%3Dihub

xii OECD Stat Farm Birds Index. Organisation for Economic Cooperation and Development. Available at: https://stats.oecd.org/Index.aspx?QueryId=77269&lang=en

xiii Malaj, E. et al. (2014). "Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale," Biological Sciences. Available at: https://www.pnas.org/doi/10.1073/pnas.1321082111

xiv Sarker, S. et al. (2021). "Level of pesticides contamination in the major river systems: A review on South Asian countries perspective," Heliyon. Available at: https://www.sciencedirect.com/science/article/pii/S2405844021013736

xv Albuquerque, A.F. et al. (2016). "Pesticides in Brazilian freshwaters: a critical review," Environmental Science: Processes and Impacts. Available at: https://pubs.rsc.org/en/content/articlelanding/2016/em/c6em00268d

xvi Ekroth, A. et al. (2019). "Diversity and disease: evidence for the monoculture effect beyond agricultural systems," bioRxiv. Available at: https://www.biorxiv.org/content/10.1101/668228v1.full

xvii Adam R. Martin, Marc W. Cadotte, Marney E. Isaac, Rubén Milla, Denis Vile, Cyrille Violle. "Regional and global shifts in crop diversity through the Anthropocene," PLOS ONE, 2019; 14 (2): e0209788 DOI: 10.1371/journal.pone.0209788

xviii Wetzel, W. et al. (2016). "Variability in plant nutrients reduces insect herbivore performance," Nature. Available at: https://www.nature.com/articles/nature20140

xix Gurr, G. et al. (2003). "Multi-function agricultural biodiversity: pest management and other benefits," Basic and Applied Ecology. Available at: https://www.sciencedirect.com/science/article/abs/pii/S1439179104701061

xx Hu, Z. (2020). "What Socio-Economic and Political Factors Lead to Global Pesticide Dependence? A Critical Review from a Social Science Perspective," International Journal of Environmental Research and Public Health. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7663108/

xxi Poux, Z. and Aubert, P.M. (2018). An agroecological Europe in 2050: multifunctional agriculture for healthy eating. Institut du développement durable et des relations internationales, Science-Po. Available at: https://www.soilassociation.org/media/18074/iddri-study-tyfa.pdf

xxii Pesticide Action Network, Bund, Friends of the Earth Europe, Heinrich-Böll-Stiftung (2022). Pesticide Atlas 2022. Available at: https://www.pan-europe.info/sites/pan-europe.info/files/public/resources/reports/PesticideAtlas2022_Web_20221010.pdf

xxiii Kelly, S. and Rankin, F. (2020). Investigation: How Pesticide Companies Are Marketing Themselves as a Solution to Climate Change. DeSmog. Available at: https://www.desmog.com/2020/11/18/pesticides-industry-climate-change-marketing-pr/

xxiv Kundel, D. (2020). "Effects of simulated drought on biological soil quality, microbial diversity and yields under long-term conventional and organic agriculture," Microbiology Ecology. Available at: https://academic.oup.com/femsec/article/96/12/fiaa205/5917976?login=false

xxv Hu, Z. (2020). "What Socio-Economic and Political Factors Lead to Global Pesticide Dependence? A Critical Review from a Social Science Perspective," International Journal of Environmental Research and Public Health. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7663108/

xxvi Stanton, R.L. (2017). "Analysis of trends and agricultural drivers of farmland bird declines in North America: A review," Agriculture, Ecosystems & Environment. Available at: https://www.sciencedirect.com/science/article/pii/S016788091730525X#fig0020

xxvii Sánchez-Bayo, F. and Wyckhuys, K.A.G. (2019). Worldwide decline of the entomofauna: A review of its drivers. Biological Conservation. Available at: https://insect-respect.org/fileadmin/images/insect-respect.org/Rueckgang_der_Insekten/2019_Sanchez-Bayo_Wyckhuys_Worldwide_decline_of_the_entomofauna_A_review_of_its_drivers.pdf

xxviii Dowler, C. (2021). "Soya, corn and cotton make Brazil world leader for hazardous pesticides," Unearthed. Available at: https://unearthed.greenpeace.org/2020/02/20/brazil-pesticides-soya-corn-cotton-hazardous-croplife/

xxix UN Human Rights Council Special Rapporteur on the Right to Food (2017). Report of the Special Rapporteur on the Right to Food: note / by the Secretariat. United Nations. Available at: https://digitallibrary.un.org/record/861172?ln=en

xxx Fraanje, W. & Garnett, T. (2020). Soy: food, feed, and land use change. (Foodsource: Building Blocks). Food Climate Research Network, University of Oxford. Available at: https://www.leap.ox.ac.uk/article/soy-food-feed-and-land-use-change

xxxi Gabay, A. (2021). "Poisoned by pesticides: Health crisis deepens in Brazil's Indigenous communities," Mongabay. Available at: https://news.mongabay.com/2023/01/poisoned-by-pesticides-health-crisis-deepens-in-brazils-indigenous-communities/

xxxii FAO, 2022. FAOSTAT Crop and Livestock Products Dataset https://www.fao.org/faostat/en/#data/QCL

xxxiii Global Canopy and Stockholm Environment Institute (2022). Trase.earth. Available at: https://www.trase.earth/

xxxiv Song, X.P. (2021). "Massive soybean expansion in South America since 2000 and implications for conservation," Nature Sustainability. Available at: https://www.nature.com/articles/s41893-021-00729-z

xxxv Bohn, T. (2013). "Compositional differences in soybeans on the market: Glyphosate accumulates in Roundup Ready GM soybeans," Food Chemistry. Available at: https://www.sciencedirect.com/science/article/pii/S0308814613019201

xxxvi Lima, I.B. et al. (2021). "Glyphosate in Brazil: use, aquatic contamination, environmental effects, and health hazards," Caderno de Geografia. Available at: https://www.researchgate.net/publication/349256096_Glyphosate_in_Brazil_use_aquatic_contamination_environmental_effects_and_health_hazards

xxxvii WHO International Agency for Research on Cancer. (2015). IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. World Health Organisation. Available at: https://www.iarc.who.int/wp-content/uploads/2018/07/MonographVolume112-1.pdf

xxxviii Dowler, C. (2021). "Soya, corn and cotton make Brazil world leader for hazardous pesticides," Unearthed. Available at: https://unearthed.greenpeace.org/2020/02/20/brazil-pesticides-soya-corn-cotton-hazardous-croplife/

xxxix UPL Limited (2022). Annual Report 2021-2022. Available at: https://www.upl-ltd.com/financial_result_and_report_pdfs/NAwdXEhMoM3DQSi2TYtDLNlPa3lxuHB7nb1V7HHm/UPL-AR-FY22.pdf

xl Mohaupt, V. et al. (2020). Pesticides in European rivers, lakes and groundwaters – Data assessment. European Environment Agency. Available at: https://www.eionet.europa.eu/etcs/etc-icm/products/etc-icm-reports/etc-icm-report-1-2020-pesticides-in-european-rivers-lakes-and-groundwaters-data-assessment

xli Gunstone, T. et al. (2021). "Pesticides and Soil Invertebrates: A Hazard Assessment," Frontiers in Environmental Science. Available at: https://www.frontiersin.org/articles/10.3389/fenvs.2021.643847/full

xlii UN Food and Agriculture Organisation. (2015). Soils store and filter water. Available at: https://www.fao.org/3/i4890e/i4890e.pdf

xliii Jong, F. et al. (2006). "Estimated nationwide effects of pesticide spray drift on terrestrial habitats in the Netherlands," Journal of Environmental Management. Available at: https://www.sciencedirect.com/science/article/pii/S030147970600404X

xliv Ekroth, A. et al. (2019). Diversity and disease: evidence for the monoculture effect beyond agricultural systems.

xlv IPBES. (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Version 1).

xlvi FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp. Available at: http://www.fao.org/3/CA3129EN/CA3129EN.pdf

xlvii Tsiafouli, Maria A., et al. "Intensive Agriculture Reduces Soil Biodiversity Across Europe," Global Change Biology. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.12752

xlviii Konikow, L. and Kendy, E. (2005). "Groundwater depletion: A global problem," Hydrogeology Journal. Available at: https://link.springer.com/article/10.1007/s10040-004-0411-8

xlix Albuquerque, A.F. et al. (2016). Pesticides in Brazilian freshwaters: a critical review.

l Schäfter, R.B. et al. (2011). Impacts of Pesticides on Freshwater Ecosystems. Ecological Impacts of Toxic Chemicals (Chapter 6). Available at: https://library.wur.nl/WebQuery/wurpubs/fulltext/192583

li Sulekha, B.T. and Mercy, T.V. (2022). "Impact of organophosphate pesticides on the liver of Etroplus macalatus, a freshwater fish of Kerala, India," Uttar Pradesh Journal of Zoology. Available at: https://mbimph.com/index.php/UPJOZ/article/view/2904

lii Zebral, Y. et al. (2017). "Effects of a glyphosate-based herbicide in pejerrey Odontesthes humensis embryonic development," Chemosphere. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0045653517311207

liii Stemmler, I. and Lammel, G. (2009). Cycling of DDT in the global environment 1950-2002: World ocean returns the pollutant. Geophysical Research Letters. Available at: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2009GL041340

liv Costa Moreira, J. et al. (2012). Groundwater and rainwater contamination by pesticides in an agricultural region of Mato Grosso state in central Brazil. Ciencia & Saude Coletiva. Available at: https://pubmed.ncbi.nlm.nih.gov/22699646/

lv UN Environment Programme. Highly Hazardous Pesticides (HHPs). Available at: https://www.unep.org/explore-topics/chemicals-waste/what-we-do/emerging-issues/highly-hazardous-pesticides-hhps

lvi Pesticide Action Network International. (2021) PAN International List of Highly Hazardous Pesticides. Available at: https://www.pan-uk.org/site/wp-content/uploads/PAN-HHP-List-2021.pdf

lvii Li, Y. et al. (2020). "Neonicotinoids and decline in bird biodiversity in the United States," Nature Sustainability. Available at: https://www.nature.com/articles/s41893-020-0582-x

lviii Rundolf, M. et al. (2015). "Seed coating with a neonicotinoid insecticide negatively affects wild bees," Nature. Available at: https://www.nature.com/articles/nature14420

lix Hladik, M. (2018). "Environmental Risks and Challenges Associated with Neonicotinoid Insecticides," Environmental Science and Technology. Available at: https://pubs.acs.org/doi/10.1021/acs.est.7b06388

lx Gunstone, T. et al. (2021). "Pesticides and Soil Invertebrates: A Hazard Assessment," Frontiers in Environmental Science. Available at: https://www.frontiersin.org/articles/10.3389/fenvs.2021.643847/full

lxi Stuligross, C. and Williams, N. (2021). "Past insecticide exposure reduces bee reproduction and population growth rate," Ecology. Available at: https://www.pnas.org/doi/10.1073/pnas.2109909118

lxii Gunstone, T. et al. (2021). "Pesticides and Soil Invertebrates: A Hazard Assessment," Frontiers in Environmental Science. Available at: https://www.frontiersin.org/articles/10.3389/fenvs.2021.643847/full

lxiii FAO, 2022. FAOSTAT Pesticides Use Dataset http://www.fao.org/faostat/en/#data/RP

lxiv Maggi, F. et al. (2019). PEST-CHEMGRIDS, global gridded maps of the top 20 crop-specific pesticide application rates from 2015 to 2025. Scientific Data. Figure 2. Available at: https://www.nature.com/articles/s41597-019-0169-4/figures/2

lxv Soil Association (2021). Ultra-Processed Planet. Available at: https://www.soilassociation.org/media/23032/ultra-processed-planet-final.pdf

lxvi FAO, 2022. FAOSTAT Pesticides Use Dataset http://www.fao.org/faostat/en/#data/RP

lxvii FAO, 2022. FAOSTAT Crop and Livestock Products Dataset https://www.fao.org/faostat/en/#data/QCL

lxviii Pesticide Action Network International (2022). PAN International Consolidated List of Banned Pesticides. Available at: https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

lxix Dowler, C. (2020). "Thousands of tonnes of banned pesticides shipped to poorer countries from British and European factories," Unearthed. Available at: https://unearthed.greenpeace.org/2020/09/10/banned-pesticides-eu-export-poor-countries/

lxx Convention on Biological Diversity (2022). Kunming-Montreal Global biodiversity framework.

lxxi European Commission. Biodiversity Strategy for 2030. Available at: https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en

lxxii Environment Act, 2021. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

lxxiii European Parliament, Council of the European Union (2019). Consolidated text: Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0128-20190726

lxxiv European Parliament, Council of the European Union (2014). Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of hazardous chemicals (recast) Text with EEA relevance. Official Journal of the European Union. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32012R0649

lxxv European Parliament, Council of the European Union (2022). Consolidated text: Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009R1107-20221121

lxxvi République Francaise (2020). Décision n° 2019-823 QPC du 31 janvier 2020. Available at: https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000041514043

lxxvii B.Tribune. (2020) "Ban on hazardous farm chemicals finalised but caution remains," Bangkok Tribune. Available at: https://bkktribune.com/ban-on-hazardous-farm-chemicals-finalised-but-caution-remains/

lxxviii European Parliament, Council of the European Union (June 2020). Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance). Official Journal of the European Union 198 p. 13-43. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852.

lxxix European Parliament, Council of the European Union (November 2019). Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (Text with EEA relevance). Official Journal of the European Union. Available at: https://www.esma.europa.eu/sites/default/files/library/jc_2021_03_joint_esas_final_report_on_rts_under_sfdr.pdf

lxxx Republic of South Africa National Treasury and International Finance Corporation (2022). South African Green Finance Taxonomy 1st Edition. Available at: https://www.treasury.gov.za/comm_media/press/2022/SA%20Green%20Finance%20Taxonomy%20-%201st%20Edition.pdf

lxxxi Government of Colombia (2022). Taxonomía Verde de Colombia. Available at: https://www.taxonomiaverde.gov.co/webcenter/ShowProperty?nodeId=/ConexionContent/WCC_CLUSTER-191401

lxxxii HM Treasury (October 2021). "Chancellor sets new standards for environmental reporting to weed out greenwashing and support transition to a greener financial system". Available at: https://www.gov.uk/government/ news/chancellor-sets-new-standards-for-environmental-reporting-to-weed-out-greenwashing-and-support- transition-to-a-greener-financial-system.

lxxxiii Corporate Europe Observatory (2022). "European Commission backtracks on promise to stop massive export of banned pesticides". Available at: https://corporateeurope.org/en/2022/10/european-commission-backtracks-promise-stop-massive-export-banned-pesticides

lxxxiv Dowler, C. (2022). "France still exporting prohibited pesticides, despite landmark ban," Unearthed. Available at: https://unearthed.greenpeace.org/2022/11/30/france-still-exporting-prohibited-pesticides-despite-landmark-ban/

lxxxv Bounds, A. (2022) EU delays cut in pesticide use over food output fears. Financial Times. Available at: https://www.ft.com/content/380db86a-e435-41a0-bd9e-abbb4bd878f8

lxxxvi De Lorenzo, D. and Sherrington, R. (2021). Mapped: The Network of Powerful Agribusiness Groups Lobbying to Water Down the EU's Sustainable Farming Targets.

lxxxvii Carrington, D. (2013). "Insecticide firms in secret bid to stop ban that could save bees," The Guardian. Available at: https://www.theguardian.com/environment/2013/apr/28/europe-insecticides-ban-save-bees

lxxxviii CropLife International (2023). Available at: https://croplife.org/

lxxxix European Union Transparency Register. Available at: https://ec.europa.eu/transparencyregister/public/homePage.do?redir=false&locale=en

xc Dowler, C. (2020). "Pesticides lobbyists touted deal to 'embed' staff in office of South African pesticides regulator," Unearthed. Available at: https://unearthed.greenpeace.org/2020/12/11/pesticides-lobbyists-embedded-staff-south-african-regulator-croplife-corteva/

xci Mies Bombardi, L. and Changoe, A. (2022). Toxic Trading: The EU pesticide lobby's offensive in Brazil. Friends of the Earth Europe. Available at: https://friendsoftheearth.eu/wp-content/uploads/2022/04/Toxic-Trading-EN.pdf

xcii Ivory, D. and Faturechi, R. (2017). An Open Door for Pesticide Lobbyist at the U.S.D.A.

xciii S&P Global Commodity Insights. Pesticides Market Analysis. S&P Global Inc. Available at: https://www.spglobal.com/commodityinsights/en/ci/products/crop-science-pesticides.html

xciv Science-Based Targets Network (2022). What is the Corporate Engagement Program? Available at: https://sciencebasedtargetsnetwork.org/take-action-now/take-action-as-a-company/join-the-sbtn-corporate-engagement-program/.

xcv Rundlöf, M. et al. (2015). "Seed coating with a neonicotinoid insecticide negatively affects wild bees," Nature. Available at: https://www.nature.com/articles/nature14420

xcvi WHO International Agency for Research on Cancer. (2015). IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides. World Health Organisation. Available at: https://www.iarc.who.int/wp-content/uploads/2018/07/MonographVolume112-1.pdf

xcvii Hebért, M.P. et al. (2021). "Widespread agrochemicals differentially affect zooplankton biomass and community structure," Ecological Applications. Available at: https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.2423

xcviii Reuters (2021)."Investors sue Bayer over stock's slump in wake of roundup litigation". Available at: https://www.reuters.com/article/us-bayer-litigation-idUSKBN29R1IO

Disclaimer

About ShareAction

ShareAction is a NGO working globally to define the highest standards for responsible investment and drive change until these standards are adopted worldwide. We mobilise investors to take action to improve labour standards, tackle climate change and address pressing global health issues. Over 15 years, ShareAction has used its powerful toolkit of research, corporate campaigns, policy advocacy and public mobilisation to drive responsibility into the heart of mainstream investment. Our vision is a world where the financial system serves our planet and its people.

Visit shareaction.org or follow us @ShareAction to find out more.

Author

Eve Gleeson

ShareAction»

shareaction.org
info@shareaction.org
+44 (0)20 7403 7800

Runway East,
2 Whitechapel Road,
London, E1 1EW, UK

Registered Charity Number: 1117244

EU Transparency Register number: 75791956264-20