UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

Case Study

Nature-related financial risk: use case

The EU Farm to Fork Strategy and Fertiliser Companies

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Preface

Members of the Banking Environment Initiative and Investment Leaders Group are working with the University of Cambridge Institute for Sustainability Leadership (CISL) and academic partners to determine a common language and framework for financial institutions to identify and assess nature-related financial risks, so that these risks can be measured and managed.

Since forming in 2020, this collaboration has so far detailed the financial materiality of biodiversity loss and land degradation and published its cornerstone Handbook for Nature-related Financial Risks. The Handbook explains how specific sources and types of nature loss, and the response to that loss, result in financial risk, explaining key concepts and providing a method for risk identification and assessment. During the following phase of research, member financial institutions used this Handbook to develop use cases that demonstrate how nature-related risks manifest in their portfolios.

This paper is one of a series of use cases, each assessing a specific type of nature-related financial risk. Financial institutions led their internal risk assessment process and subsequent write-ups in close collaboration with the CISL team, who offered guidance, input and support.

The purpose of these use cases is to enable and galvanise further assessments of nature-related risk across the financial system. Detailing the risk assessment process aims to show ways in which the wider financial industry can make such assessments of its own. All financial firms are vulnerable to nature-related financial risks, and the financial materiality of nature loss evidenced constitutes an urgent call to action.

The more that assessments are undertaken and shared, the easier it will be for others to follow and understand the urgency of managing nature-related risks and taking action to mitigate nature loss. Through the creation of these use cases, financial institutions have started to generate internal engagement regarding nature loss, as well as catalysing new conversations with clients and investee companies. Through these conversations, collaborative strategies can emerge to mitigate nature loss and support a transition to a nature-positive economy.

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Executive Summary

Without the ecosystem services provided by nature, from pollination to freshwater, crop yields would collapse. Over the past century, new farming methods and technologies have boosted yields, but at an increasingly unsustainable cost to the natural world:

- Nitrogen-based fertilisers are alone responsible for 2.4 per cent of global emissions – more than all commercial aviation.[1]
- Over three decades, insect populations in Germany have declined by 75 per cent, threatening crop pollination.[2] The main driver is intensive agriculture.[3]

As a result, a paradigm shift in agriculture is needed to reach net zero and nature-positive targets to prevent catastrophic climate change and nature loss. In addition to undermining the biological health of soil, polluting water systems and causing climate change, fertilisers are a source of market risk due to volatile hydrocarbon markets because gas is a feedstock for fertiliser.

The EU Farm to Fork Strategy (F2F) is a policy proposal that aims to create a sustainable and resilient food system in Europe by 2030, acting to reduce nutrient loss by 50 per cent and, in turn, reduce fertiliser use by at least 20 per cent. It sits alongside legislation seeking to reduce greenhouse gas emissions from fertilisers, including the proposed Carbon Border Adjustment Mechanism and EU plans to reduce Russian gas dependency by two thirds by the end of 2022.[4]

Such policies pose nature-related transition risks to financiers as the funders of fertiliser companies. This use case quantified the transition risk, estimating that **polices reducing fertiliser usage could lead to valuation declines of between 12 and 46 per cent for two major fertiliser producers**. If **extrapolated to listed fertilisers globally, equity value across the sector could decline by USD 25–67 billion.**

Table 1: Fertiliser equity value at risk from policies to reduce fertiliser usage

Change in discounted cash flow valuation	**Scenario 1: EU-27 Only**	**Scenario 2: EU-27 and imported food**	**Scenario 3: Globally**
Company A *(% change in DCF valuation vs. base case)*	-12%	-19%	-30%
Company B *(% change in DCF valuation vs. base case)*	-16%	-28%	-46%
Financial loss on total listed fertilisers globally (USD billion)	**-25**	**-42**	**-67**

Source: UBP, Deutsche Bank AG. Data as of February 10, 2022.

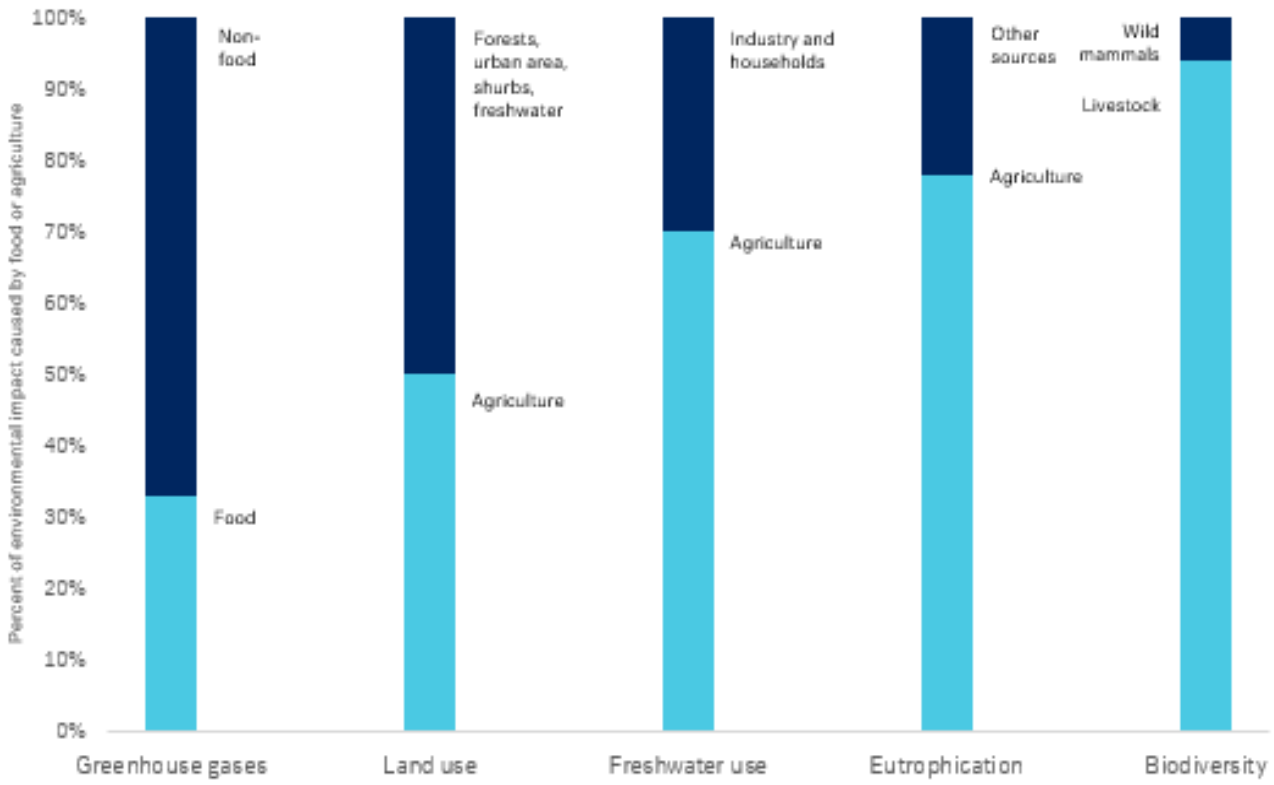
To manage the transition risk, engagement undertaken with fertiliser producers while developing this use case highlighted the need for product diversification and cost base adjustments. Given the materiality of the risk quantified, the wider financial sector needs to start this engagement today, discussing and defining transition plans with portfolio companies in recognition of the urgent need to shift to sustainable business activities in the food value chain.

Introduction

The consequences of intensive agriculture for nature and farmers

The decline of the services nature provides looks set to wipe USD 10 trillion from global GDP by 2050.[5] There are various causes of nature loss, but the footprint of agriculture dwarves that of other sectors, as shown in Figure 1.

Figure 1: Environmental impacts of food and agriculture



Source: Our World in Data, UBP, Deutsche Bank AG. Data as of February 10, 2022

The size of the impact is mirrored by the extent to which agriculture depends on the services provided by nature, which constitutes the double materiality of nature loss on companies. In other words, the agricultural sector is degrading the very services on which it relies.

The current food system can be seen as a result of a "cheaper food paradigm".[6] In order to lower the financial costs of food production, the efficiency of production processes has constantly been raised (eg by using fertilisers, pesticides, energy, land and water) at the expense of environmental damage and biodiversity loss.

The monetary value of food has increasingly shifted away from those who produce it – the stewards of the land – to those who provide fertiliser, process crops and move and market the processed products. As a

result, farmers' share of the total value generated by agriculture is steadily decreasing, driven by volatile commodity prices, increased fertiliser and pesticide costs and the need to invest in new technologies and buildings.[7]

Policy to restore nature and transition the food system

Policies are emerging to prevent catastrophic climate change and nature loss. The EU F2F is one example, aiming to create a sustainable and resilient food system in which agriculture no longer undermines the services upon which it depends, such as pollination. As such, F2F states there is "an urgent need to reduce dependency on pesticides and antimicrobials, reduce excess fertilisation, increase organic farming, improve animal welfare, and reverse biodiversity loss […] so that the food chain [has a] neutral or positive environmental impact".[8] As a result, the European Commission states in F2F that it will act to reduce nutrient loss by 50 per cent which will require fertiliser use to drop by 20 per cent by 2030.

This is in a context where the greenhouse gas emissions impact from fertilisers will be targeted through a number of different pieces of legislation, including the proposed Carbon Border Adjustment Mechanism (CBAM), and where the EU is planning to phase out dependency on Russian gas by two thirds in 2022.[9]

The COVID-19 pandemic and reliance on Russia for gas, a feedstock for fertilisers, highlight vulnerabilities in the European food system.[10] The food system needs to be redesigned in order to enable the transition to lower natural resource consumption and ensure economic returns, as well as livelihoods, for all actors (farmers, producers, consumers, etc).[11] Otherwise, the system at present will cause increased biodiversity loss while creating more land degradation and negative health impacts due to both under- and over-nutrition.

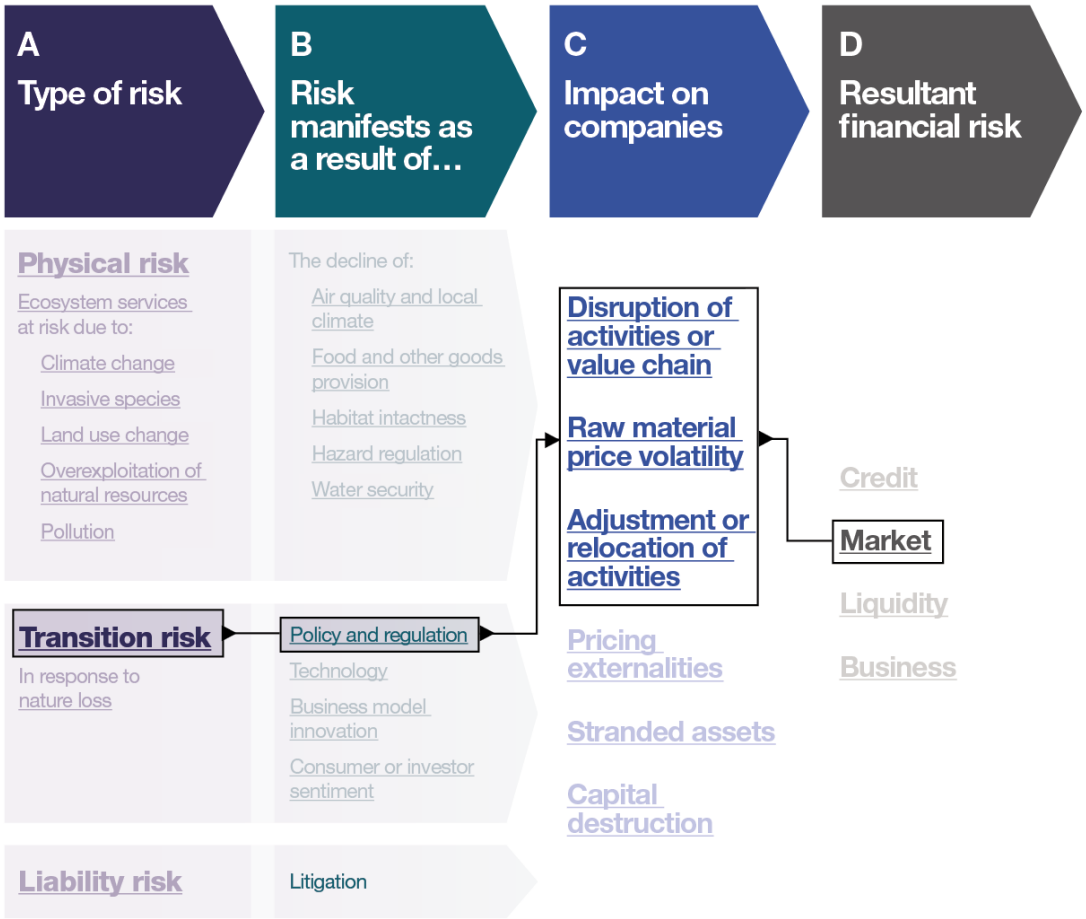
The need to transition to a sustainable food system, and the policies that support it, is a risk to incumbents if they do not acknowledge and integrate such a transition into their business model. Hence, financiers of these companies face a nature-related financial transition risk. This use case assesses and quantifies one aspect of this transition risk: the impact on fertiliser producers of policies that will reduce usage by 20 per cent by 2030.

Scenario Overview

CISL's Handbook for Nature-related Financial Risks was used to estimate the equity value of fertiliser companies at risk based on (1) a reduction in fertiliser usage to protect and restore nature and (2) no mitigating actions being taken by the companies analysed to participate in this needed transition.

To assess this market risk (column D in the CISL framework in Figure 2, below), scenario analysis was performed of how F2F (column B) would impact companies who produce chemical fertilisers by disrupting sales activities (column C).

Figure 2: Framework for identifying nature-related financial risks (CISL, 2021)



The impact on the market valuation of the fertiliser sector was quantified by modelling three scenarios: one where reduction of fertiliser use affects the EU-27 only and the others where the reductions also happen outside the EU-27. This included taking into account how fertiliser reduction policies could be exported, with fertilisers due to fall under the CBAM. These scenarios and the subsequent modelling were based on the published F2F, agrochemical consumption growth expectations, relevant company financial statements, projected market developments and interviews with sector specialists. Again, the modelling did not factor in changes to company strategy in response to the transition risk or other spillover effects.

Scenario Application

The future cash flows of listed global companies who produce chemical fertilisers were modelled under different scenarios to assess the market risk posed by the introduction of F2F.

Step 1: Discounted cash flow (DCF)-indicated values for each company were calculated under a base case scenario, where only historical figures and consensus estimates were used. This base case did not consider any impact on financials due to the implementation of F2F.

Step 2: Three different scenarios were created based on the possible geographic reach of F2F, utilising the analysis of the US Department of Agriculture (USDA).[12] In these scenarios, a fertiliser reduction of at least 20 per cent applies:

1. to the EU-27 only [S1]
2. to the EU-27 and food imported to the EU-27 [S2]
3. Globally [S3]

Step 3: A two-stage DCF model was built for two representative fertiliser companies to calculate the financial impact of F2F implementation on their valuations.[1] Three models were constructed for an explicit period of 2021–30 and a terminal period after 2031. Hence, the model was aligned with the timeline of F2F, which targets the reduction of fertiliser use by at least 20 per cent by 2030.

Step 4: Company valuations indicated under each scenario were compared with the base case valuations.

Step 5: Last, by using data for individual companies and their share in the global fertiliser market, we estimated the expected total financial impact of the reductions in fertiliser use on the overall fertiliser sector.

To understand the situation and explore possible mitigation strategies requiring changes in business models, we also engaged with portfolio companies that may be affected by a reduction in fertiliser demand. This engagement helped crystallise the potential for reducing transition risk.

Scenario detail

Fertiliser consumption

In Scenario 1 [S1], we assume that the 20 per cent reduction in fertiliser use applies in the **EU-27 only**, leading to an estimated 0.63 per cent decline in global fertiliser sales volume versus the base case.[2] The fertiliser sales volume declines by only 0.63 per cent because markets outside the EU-27 continue to do business as usual, with some countries' fertiliser consumption continuing to grow.

[1] Details of DCF modelling can be found in the Appendix.
[2] Our estimate is similar to that of the USDA.

In Scenario 2 [S2], the 20 per cent decline in fertiliser consumption **applies both to the EU-27 and the food imported into the EU-27**. Hence, countries exporting into the EU also reduce fertiliser consumption. As a result, a 7.7 per cent decline in global fertiliser consumption is forecast versus the base case.

In Scenario 3 [S3], the 20 per cent reduction is applied **globally**, leading to 20 per cent lower consumption versus the base case.

Fertiliser prices

For simplicity, consumer price index (CPI) expectations were used in the base case. For Scenarios S1–S3, we assume that the unit prices of fertilisers follow a similar trend to those calculated for global fertiliser prices by the USDA (who indicate that fertiliser prices will increase). We did not conduct regional analyses and apply them to companies' sales footprints.

Scenario transmission into fertiliser company financials

Declining sales will impact company financials to varying degrees, depending on business and operating model. Margins are likely to come under pressure as it may not be easy for companies to reduce production costs proportionally to the sales decline, given fixed overheads. However, capital expenditure (Capex) is likely to be more flexible, with the 'Capex % sales ratio' adjusting more rapidly to any material decline in sales. As a result, margins, Capex, working capital and equity costs vary under the three different scenarios versus the base case according to our assumptions, as shown in Table 2.

Table 2: Change in key DCF assumption items relative to the base case scenario

Change in assumptions vs base case	S1: EU-27 Only	S2: EU-27 and food imported	S3: Globally
Fertiliser Sales Volume	-0.63%	-7.70%	-20.00%
Fertiliser Unit Price	+0.44%	+2.75%	+7.10%
EBITDA Margin*	-0.73%	-1.21%	-2.14%
Capex % of Sales*	-0.02%	-0.04%	-0.06%
Working Capital % of Sales*	-0.03%	-0.05%	-0.09%
Cost of Equity*	+0.10%	+0.20%	+0.30%

* Average of two companies' data
Source: UBP, Deutsche Bank AG. Data as of February 10, 2022.

Industry-wide impact

After the scenario impact on two representative listed fertiliser company valuations was estimated, the potential impact on the fertiliser sector globally was approximated by extrapolating the impact to the total market capitalisation of the sector.

Findings

Using the above scenarios and inputs, the analysis indicated that:

1. The two representative listed fertiliser companies modelled suffer a valuation decline of between 12 and 46 per cent, as indicated, for the three scenarios. The difference between the two companies is due to different business structures – product offering, existing margins, etc.
2. Taking the company specific results as the basis, the wider listed fertiliser industry is estimated to suffer market capitalisation decreases of between USD 25 billion and USD 67 billion.

Table 3: Change in company DCF valuations relative to the base case scenario

		S1: EU-27 Only	S2: EU-27 and food imported	S3: Globally
Key Inputs	*Fertiliser Sales Volume*	*-0.63%*	*-7.70%*	*-20.00%*
	Fertiliser Unit Price	*+0.44%*	*+2.75%*	*+7.10%*
	*EBITDA Margin **	*-0.73%*	*-1.21%*	*-2.14%*
Key Outputs	**Company specific impact**** ***(% change in DCF valuation vs. base case)***	**-12% / -16%**	**-19% /-28%**	**-30% / -46%**
	Overall Industry impact ***(USD billion)*** ***(Financial loss on total listed fertilisers globally)***	**-25**	**-42**	**-67**

*Average result for company A and B
**Results for company A and B
Source: UBP, Deutsche Bank AG. Data as of February 10, 2022.

The largest driver of valuation impact across the scenarios is declining operating margins due to lower sales than previously expected. In essence, the modelling did not assume that the cost base adjusts to the lower sales environment, as no such adjustment is guaranteed and, if it occurs, it will be unique to the situation of each market participant. The actual financial impact would depend on how far companies' margins can be preserved by strategies such as reducing the unit cost of production.

The sensitivity of company margins to volume reductions is highlighted by S1, with the EBITDA margin declining by 0.73 per cent while fertiliser demand globally falling by 0.63 per cent (see Table 3 above). The margin sensitivity does not have a linear relationship with volume declines, as price rises compensate for these declines in S2 and S3. Hence, whilst global fertiliser consumption goes from declining by 0.63 per cent in S1 to declining by 20 per cent in S3 – a more than 30-fold difference in demand – the overall negative impact on listed fertilisers is USD -25 billion to -67 billion, not even a three-fold decline. This difference highlights how:

1. Thin operating margins drive valuation, creating sensitivity to top line revenues that are the product of fertiliser price and consumption.
2. Price rises can, to an extent, compensate for reductions in consumption.
3. The ability to reduce operating costs is a key determinant of valuation impact.

The variation in financial impact shows the need for constructive engagement with companies that will be potentially impacted by the introduction of F2F, which provides an opportunity to justify assumptions and begin the conversation about how the business and operating models can transition.

Reflections

The double-digit valuation impacts estimated by this use case underscore the financial materiality of nature-related transition risks to combat nature loss and enhance the resilience of the European food system. COVID-19 and recent geopolitical tensions have underscored the need for action, highlighting vulnerabilities in food security and the connection of food prices to gas-derived fertilisers.

Indicated valuation declines were driven by margin sensitivity to reductions in fertiliser consumption. Price increases partly compensate for margin declines, but ultimately different operational and business models are required to ensure that the necessary agricultural transition is a financial opportunity rather than a financial risk. This development requires an evolution of company strategy, supported by financiers. Therefore, disclosure of the risks and opportunities of a transition driven by a policy like F2F are needed, followed by deep engagement by financiers with portfolio companies on mitigation strategies. International standards, clear guidelines and industry-wide awareness are needed to support this engagement process and mobilise capital for strategies that lead to the protection and restoration of nature.

It may be that in the process of transitioning the business, reductions in employee numbers or cost are needed, posing a risk to livelihoods and communities. Companies and governments need to work together to address the social consequences of protecting nature, ensuring that during any transition access to decent work and prosperity is not undermined. If these consequences are not anticipated and solutions not implemented, there is a risk that the political will for transitioning to nature-positive will evaporate.

Private sector investments make up 14 per cent of nature-related financing.[13] Recognising nature-related financial risks and the urgent need to move to a nature-positive economy will enable nature's contribution to the economy to be taken into account, unlocking scaled capital flows for nature-positive economic activity.

Appendix – Methodology Detail

Data sources

This data analysis was done based on data available in December 2021.

Our main data sources are companies' annual reports, Bloomberg, the International Fertilizer Association (IFA) and the Food and Agriculture Organization of the United Nations (FAO).[14, 15] We also drew on our interviews with company representatives and sector analysts for model building and estimates. Finally, we made extensive use of the data in the USDA's analysis since they use a similar scenario structure to ours. The impact of the F2F on production volumes and market prices of different products, including fertilisers, in different regions under each scenario was calculated in the USDA analysis. Since production and sales are highly interlinked, we used the USDA's findings on fertiliser production volume and price change in our estimates.

Focus on fertiliser demand and prices

Building a DCF model and estimating the financials was a complex task for many reasons, such as the detailed structure of the companies and their products, uncertainties about the future economic outlook and complicated relations between income statement and balance sheet under different conditions. However, our aim was not to pinpoint DCF target prices for these fertiliser companies under the new regulation but, rather, to understand the extent to which their target value could change in different scenarios relative to a base case. Hence, we decided to focus mostly on fertiliser demand and price assumptions, since the regulation change would inevitably have the most impact on these two key DCF model assumptions. Thus, we selected 'fertiliser sales volume growth' and 'unit price growth' as the key assumption items. We selected 'operating margin', 'Capex % of sales', 'working capital % of sales' and 'cost of equity' items as the other key assumptions in our DCF models.

Having decided to focus on sales volume and price assumptions in our DCF model, we split companies' fertiliser sales volume in two: i) that impacted and ii) that not impacted by the EU regulation. We then focused on that part of their fertiliser sales volume that would be impacted.

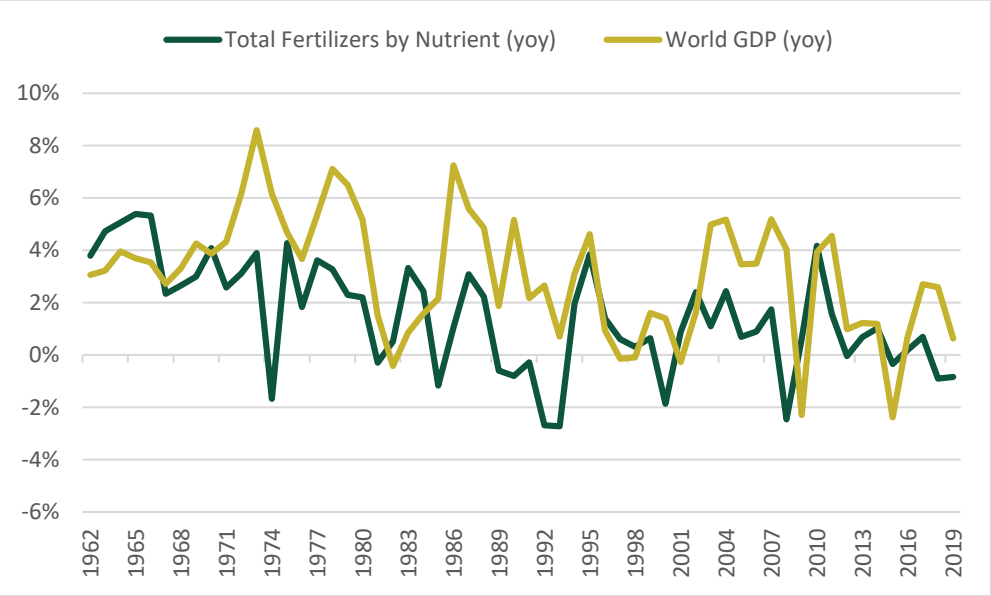
Assumptions about the impact of F2F on fertiliser company product sales

Like most other companies in the world, fertiliser producers have many products under different business segments. Each product has different demand/supply characteristics, and each is expected to be affected by the EU regulation on a different scale, in terms of both demand and price outlook. Companies are also focusing more on value-added businesses and becoming solution providers for their customers, all of which might require a more complex model to estimate their valuation. However, in order not to complicate the process, we treated all chemical fertiliser products as the same in our assumptions as this mirrors the overall philosophy of F2F, which is to reduce fertiliser usage.

Base case assumptions

For our base case scenario, we used FAO and IFA data to calculate the long-term relationship between world GDP growth and fertiliser sales volume growth. Accordingly, fertiliser sales volume posted 1.8 per cent CAGR (cumulative annual growth rate), while world GDP posted 5.5 per cent CAGR during the period 2001–2019 (Graph 1).

Figure 3: Global fertiliser demand growth vs GDP



Source: FAO, Bloomberg L.P., UBP, Deutsche Bank AG. Data as of February 10, 2022.

We then used this relation and the world GDP growth estimates to estimate our fertiliser sales volume growth for the period 2021–2030. We used the Bloomberg consensus world GDP growth estimate for the period 2021–2023 and estimated a pre-COVID growth path of around 3 per cent after 2024, based on long-term fundamental drivers such as population growth, productivity, labour force participation, etc.

Fertiliser volume assumptions

In Scenario 1 [S1], we assume that F2F is implemented only in the EU-27, resulting in a 0.63 per cent decline in companies' fertiliser sales volume relative to their base case assumptions, which is similar to the findings on global fertiliser production volume change in the USDA's first scenario.

For Scenario 2 [S2], we assume that the EU implementation of F2F leads to 20 per cent lower fertiliser use on food imported into the EU-27. The USDA estimates that F2F application in the EU-27 will lead to a 12 per cent decline in EU food production, which will need to be covered by imports. With F2F covering these and given that food has already been imported, we calculate a 7.7 per cent decline in fertiliser use globally.

For Scenario 3 [S3], we assume a global implementation of F2F, leading to a 20 per cent decline in fertiliser consumption, by volume, globally.

Fertiliser price assumptions

Rather than estimating the actual fertiliser prices in the future, it was more important for us to understand the change in our price estimates relative to our base case in each scenario, since our aim was not to pinpoint a target price but, rather, to understand the impact of change on our assumptions. Hence, in order not to complicate the process, we used world CPI expectations for our fertiliser sales price estimate in our base case scenario. We mainly used Bloomberg consensus world inflation estimates and forecasts for the period 2021–2023, while we assumed 2 per cent year-on-year (yoy) CPI after 2024, which is the medium to long term inflation target of major central banks.

When estimating the unit price changes relative to the base case, we mainly used the USDA analysis.[16] USDA used a Computable General Equilibrium model in order to examine the potential market and economy-wide impacts of the F2F strategy. Market prices were calculated for different commodities, including fertilisers, under three different scenarios for different geographic regions (e.g.. EU, EFTA, etc.) and countries (e.g. United States, Turkey, etc). For example, under their EU-only scenario 1, USDA analysis estimated that fertiliser prices declined 0.2 per cent in the EU, but increased 0.3 per cent in the US and 0.5 per cent in China. Since we treat the companies' sales globally, we first calculated the global fertiliser price change by using the regional data in the USDA report and the share of each region in the global fertiliser market, based on FAO data. Thereafter, we calculated the relation between the global fertiliser sales volume change and price change, again using the data from the USDA report. For this analysis, we first estimated that fertiliser production is equal to fertiliser sales volume because USDA has calculated production volumes for different geographic regions (e.g. under EU-only scenario 1, USDA calculated 5.9 per cent and 0.3 per cent decline in fertiliser production in the EU and the US, respectively). Using the FAO fertiliser production data, we calculated the global fertiliser sales volume data in each USDA scenario, which give us a relation between fertiliser sales prices and volumes (e.g. based on EU-only scenario 1 of USDA analysis, we calculated a 0.63 per cent decline in global fertiliser production and 0.44 per cent increase in fertiliser prices). We then used this volume/price relation to calculate the change in fertiliser prices in our three scenarios, taking into account our fertiliser consumption estimates which were different than the USDA analysis.

Other key assumptions

We estimate the key assumptions (operating margin, capex % of sales and working capital % of sales) based on our calculation of their relationship with the top line (e.g. how much a company can reduce its capex % of sales ratio during a declining sales environment). For other income statement and balance sheet assumptions, we preferred to use historical averages in our DCF model. Moreover, we tried to broadly align our 2021 and 2022 estimates with the Bloomberg consensus figures and began making our own estimates thereafter, in particular after 2023.

References

[1] GRAIN (2021, Nov 1) *New research shows 50-year binge on chemical fertilisers must end to address the climate crisis*. Retrieved from: https://grain.org/en/article/6761-new-research-shows-50-year-binge-on-chemical-fertilisers-must-end-to-address-the-climate-crisis
[2] McKirdy E (2017, Oct 20) *New study suggests inset populations have declined by 75% over 3 decades*. CNN. Retrieved from: https://edition.cnn.com/2017/10/19/europe/insect-decline-germany/index.html
[3] DW (2019, Oct 30) *Munich Study confirms severe decline in insect populations in Germany*. Retrieved from: https://www.dw.com/en/munich-study-confirms-severe-decline-in-insect-populations-in-germany/a-51052955
[4] Taylor, K (2022, Mar 9) *EU rolls out plan to slash Russian gas imports by two thirds before year end* https://www.euractiv.com/section/energy/news/eu-rolls-out-plan-to-slash-russian-gas-imports-by-two-thirds-before-year-end/
[5] Johnson JA, Baldos U, Liu J, Nootenbaum, C, Polasky S & Roxburgh T (2020). *Modelling the global economic impacts of environmental change to support policy-making*. World Wildlife Fund. Retrieved from: https://www.wwf.org.uk/sites/default/files/2020-02/Global_Futures_Technical_Report.pdf
[6] UNEP (2021, Feb 3) *Our global food system is the primary driver of biodiversity loss*. Retrieved from: https://www.unep.org/news-and-stories/press-release/our-global-food-system-primary-driver-biodiversity-loss
[7] Basic (2021) *Analysis of value creation and hidden costs of synthetic pesticides*. Retrieved from: https://lebasic.com/en/pesticides-a-model-thats-costing-us-dearly/
[8] European Commission (n.d.) *Farm to Fork Strategy: for a fair, healthy and environmentally-friendly food system*. Retrieved from: https://ec.europa.eu/food/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf, p4 and p7
[9] Taylor, K (2022, Mar 9) *EU rolls out plan to slash Russian gas imports by two thirds before year end* https://www.euractiv.com/section/energy/news/eu-rolls-out-plan-to-slash-russian-gas-imports-by-two-thirds-before-year-end/
[10] Duncan J, Rivera-Ferre M, Claeys, P (2020, May 13) *The importance of Food Sovereignty for the Farm to Fork strategy and the New Green Deal. Insights and limits of the SAM and SAPEA reports: Academic Brief*. Retrieved from: https://library.wur.nl/WebQuery/wurpubs/fulltext/524951
[11] European Commission (n.d.) *Farm to Fork Strategy: for a fair, healthy and environmentally-friendly food system*. Retrieved from: https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en
[12] Beckman, Jayson, Maros Ivanic, Jeremy L. Jelliffe, Felix G. Baquedano, and Sara G. Scott. (2020, November). *Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies, EB-30*, U.S. Department of Agriculture, Economic Research Service. Retrieved from: https://www.ers.usda.gov/webdocs/publications/99741/eb-30.pdf?v=1733.5
[13] UNEP, WEF, ELD, Vivid Economics (2021, May 27). *State of Finance for Nature*. Retrieved from: https://www.unep.org/resources/state-finance-nature
[14] IFASTAT (n.d.) *Welcome to IFASTAT*. Retrieved from: https://www.ifastat.org/
[15] FAO (n.d.) *Food and agriculture data*. Retrieved from: https://www.fao.org/faostat/en/#home
[16] Beckman, Jayson, Maros Ivanic, Jeremy L. Jelliffe, Felix G. Baquedano, and Sara G. Scott. (2020, November). *Economic and Food Security Impacts of Agricultural Input Reduction Under the European Union Green Deal's Farm to Fork and Biodiversity Strategies, EB-30*, U.S. Department of Agriculture, Economic Research Service. Retrieved from: https://www.ers.usda.gov/webdocs/publications/99741/eb-30.pdf?v=1733.5