UNIVERSITY OF CAMBRIDGE
INSTITUTE FOR SUSTAINABILITY LEADERSHIP

Case Study

Nature-related financial risk: use case

Land degradation, UK farmers and indicative financial risk

NATURE POSITIVE

The University of Cambridge Institute for Sustainability Leadership partners with business and governments to develop leadership and solutions for a sustainable economy. We aim to achieve net zero, protect and restore nature, and build inclusive and resilient societies. For over three decades we have built the leadership capacity and capabilities of individuals and organisations, and created industry-leading collaborations, to catalyse change and accelerate the path to a sustainable economy. Our interdisciplinary research engagement builds the evidence base for practical action.

The Banking Environment Initiative (BEI) is a group of global banks committed to pioneering actionable pathways towards a sustainable economy. The BEI co-produces horizon-scanning applied research, develops leadership tools and convenes academic and industry collaborations. It is a member-led, not-for-profit group, formed in 2010 and convened by CISL alongside our investor and insurer groups. NatWest Group has a leading retail business and is the largest business and commercial bank in the UK. It is the biggest supporter of the business sector banking around 1 in 4 businesses across the UK and Ireland, from start-ups to multi-nationals. They are connected to over 19 million customers across the UK and Ireland. As purpose-led financial institution they have identified three focus areas where they can make a meaningful contribution: climate, enterprise and learning.

Authors

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Preface

Members of the Investment Leaders Group and Banking Environment Initiative are working with the Cambridge Institute for Sustainability Leadership (CISL) and academic partners from the University of Cambridge 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.

The collaboration has so far detailed the financial materiality of biodiversity loss and land degradation and published its cornerstone Handbook for Nature-related Financial Risks in March 2021. 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. The next phase of work involved financial institutions within the project developing use cases that demonstrate how nature-related risks manifest in their portfolios, using this Handbook.

This paper is one of a series of use cases, each assessing a specific type of nature-related financial risk. Financial institutions led the 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 their 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. 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

Nature is in decline. The health of soil, one of nature's keystones and the provider of 95 per cent of our food, is being degraded by agricultural practices that focus on short term crop yields.[1] This land degradation may mean that unmeasured credit risk exists.

Through its membership of the Banking Environment Initiative, NatWest Group has explored the potential financial risks posed by land degradation to arable farming producers in the United Kingdom (UK). This use case forms part of a research collaboration with the University of Cambridge Institute for Sustainability Leadership (CISL).

As the largest lender to the sector, UK Agriculture is of particular importance to NatWest Group.[i] This use case investigated **to what extent a financial risk could exist because of degrading land**. It analysed the impact on UK cereal farmers on degrading land of extreme weather events and fertiliser price hikes, **finding that degrading land poses a material risk to the profitability of those who farm it and, by extension, to those who lend to these farmers**. Specifically, the use case found that:

- For extreme weather events, financial losses for farmers begin once crop yield declines reach and exceed 27 per cent for two consecutive years. Whilst a 27 per cent or greater crop yield decline is very unlikely for those farming healthier, more resilient soils, research indicates it is possible for those on degrading land.

Those farming degrading land are likely to be crop price takers as they are in the minority. As a result, these farmers are also unlikely to be adequately compensated by any crop price increase that follows extreme weather.

The vulnerability of those farming degrading land points to the existence of unmeasured credit risk to banks that requires further investigation.

To carry out this use case, NatWest Group used CISL's Handbook for Nature-Related Financial Risks, data from the Netherlands Environmental Assessment Agency (PBL), the Intergovernmental Panel on Climate Change (IPCC) and further academic sources. Two scenarios were modelled:

Scenario One: Vulnerability of degrading land to extreme weather events

Evidence suggests that degrading land can suffer a negative impact on yield of up to 40 per cent following an extreme weather event, whilst average declines are lower, e.g. 5 per cent.[2] The analysis carried out in this use case concluded that if yields decline by 27 per cent for two consecutive years following an extreme weather event, then a typical UK cereal farmer becomes unprofitable.

By connecting the extent of degrading arable land with the risk to profitability and the rising probability of extreme weather events, a picture emerges where additional unmeasured credit risk exists due to land

[i] Total Sector Exposure as a percentage of Total NatWest Group = 1.3% as of Dec 2020 (NatWest Group Climate-related disclosures report, pg. 41). Agriculture has been identified as exposed to heightened climate-related risk impacts. Total sector exposure comprises loans (gross loans gross loans and advances to customers and banks accounted at amortised cost and fair value through other comprehensive income) and related off balance sheet exposures.

degradation. This unmeasured credit risk could be significant as at least nine per cent of arable farmers in Western Europe are farming degrading land.[3]

Scenario Two: Vulnerability of degrading land to fertiliser price spikes

Per ton of crop, those farming degrading soil use more fertiliser than their peers to help make up for lost productivity. This makes them more exposed to price increases than their peers. Therefore, there is a follow-on risk to profitability for those farming degrading land should crop price adjustments caused by fertiliser prices not fully cover their proportionally higher fertiliser cost base (versus those working non-degraded land).

In 2021 fertiliser prices in the UK have spiked by over 100 per cent year-on-year.[4] Initial analysis showed that whilst this has impacted farmer profitability, an average cereal farmer on degrading land is not materially worse off than a peer on healthy soils, bearing £5,670 of additional cost (this equates to nine per cent of an average cereal farmer's estimated 2020 gross profit).

Next Steps

The additional risk posed by land degradation – through crop yield declines – highlights a need to gather more information about environmental sources of risk and integrate them into financial planning and decision-making.

Customers that utilise the Global Farm Metric (GFM) and share the output with NatWest Group will contribute critical information to help improve the bank's understanding of customer needs and its own exposure to unsustainably managed and degrading land. Such efforts to map impact and dependence on nature – across farmers, policymakers, financial institutions and businesses along the supply chain – are critical first steps toward the management of nature-related financial risks, such as land degradation. NatWest Group piloted the GFM in 2021 and are expanding its use in 2022.

This research into the implications of land degradation on credit risk is part of an ongoing effort within NatWest Group to guide decision-making processes that have a greater understanding of nature-related financial risks and to protect and restore nature. The analysis process has unearthed risks that require further exploration. The intention of this exploration is to enable financial institutions to go further in supporting businesses become more resilient as they operate in a future threatened by nature loss and its drivers, such as climate change and overexploitation of natural resources.

Troublingly, the estimated nine per cent of arable land that is degrading does not factor in the impact of climate change. **This means the actual extent of degrading land could be far greater, underscoring the need for action. Banks can support such action, mobilising finance towards positive impact activities, and mitigating their exposure to nature-related financial risks**.

Background

Future changes in land condition are projected to be widespread, as a result of both continued changes in land use, such as conversion of natural land into cropland, and of land management practices in croplands, grazing lands and forests. The consequences are a loss of net primary production over large areas, a decline in soil organic carbon, and a loss of biodiversity.[5]

– PBL Netherlands Environmental Assessment Agency

Land degradation, defined by PBL as a decline in the condition of land, which results in a lower productive capacity, has been estimated to cost USD 6.3tn globally each year.[6] 'Land management practices in croplands', referenced above by PBL, are those of relevance to this use case, causing a decline in soil health and its productive capacity for arable farmers.

Protecting the land from degradation is critical because:

- Demand for food is forecast to increase by more than 50 per cent between 2010 and 2050.[7]

  An increase in degraded land is by definition a decrease in productive land. If costly interventions are required to maintain land productivity or new land to compensate is scarce, this exacerbates food insecurity.

- Soil is needed as a sink for carbon to help mitigate climate change.

  UK soils store roughly as much carbon as the country emits in 80 years, yet intensive agriculture has seen arable soils lose up to 60 per cent of their carbon.[8] As an organisation striving to halve its financed emissions by 2030 and as a member of the Net Zero Banking Alliance, NatWest Group has a vested interest in promoting the protection and sustainable management of land from a carbon capture perspective.

- Land that is not degraded is more resilient to extreme weather events.

  For example, in England and wales, four million hectares are at risk of soil compaction, a state of degraded land that increases the risk of flooding.[9]

Throuhgout this paper, land degradation and the decline of soil health are occasionally used interchangeably as soil that is degraded has lower biological health, i.e. it is degraded land. Both result in an increased vulnerability to extreme weather events, which refer to extreme variabilities in weather in terms of timing, frequency, intensity and length e.g. temperature, wind, precipitation.[10]

Research Question and Scenario Overview

The decision to assess the impact of land degradation on financial institutions is rooted in a concern that nature is precipitously declining. NatWest Group's business, including its customers and the society it operates in, is part of the natural world and it is essential that the natural capital depended upon for survival is managed in a sustainable way. If financial institutions can evidence the risks posed by land degradation to their business, customers, shareholders and beyond, they can advocate for sustainable action.

Given the above, there is a need to investigate **to what extent land degradation poses credit risk (in finance portfolios)**

Two scenarios were used to understand the potential risk exposure of how:

1) Crops on degrading soil are more likely to be lost during extreme weather.
2) Fertiliser price spikes and how these could have a disproportionate impact on producers on degrading land that tend to rely more on fertiliser.

Notes on method

The analysis undertaken focused on arable farmers. Due to the uniqueness of each customer's situation with respect to farm size and level of diversification, each requiring their own specific lending assessment, it was deemed most appropriate to utilise open-source information on the profit margins of English cereal farmers. This helped determine profitability tipping points. This means no specific NatWest loan book or customer data has been used in this analysis, this helped determine profitability tipping points for an average UK farm.

Findings of this paper are also based on the assumptions that farm revenues are undiversified, and farmers do not take mitigating actions to lessen the impact of operating on degrading land, e.g. sow cover crop.

Scenario One – Vulnerability of degrading land to extreme weather

Focus

To what extent can the financial risks of extreme weather events be assessed to determine the effect on producers faming degrading land?

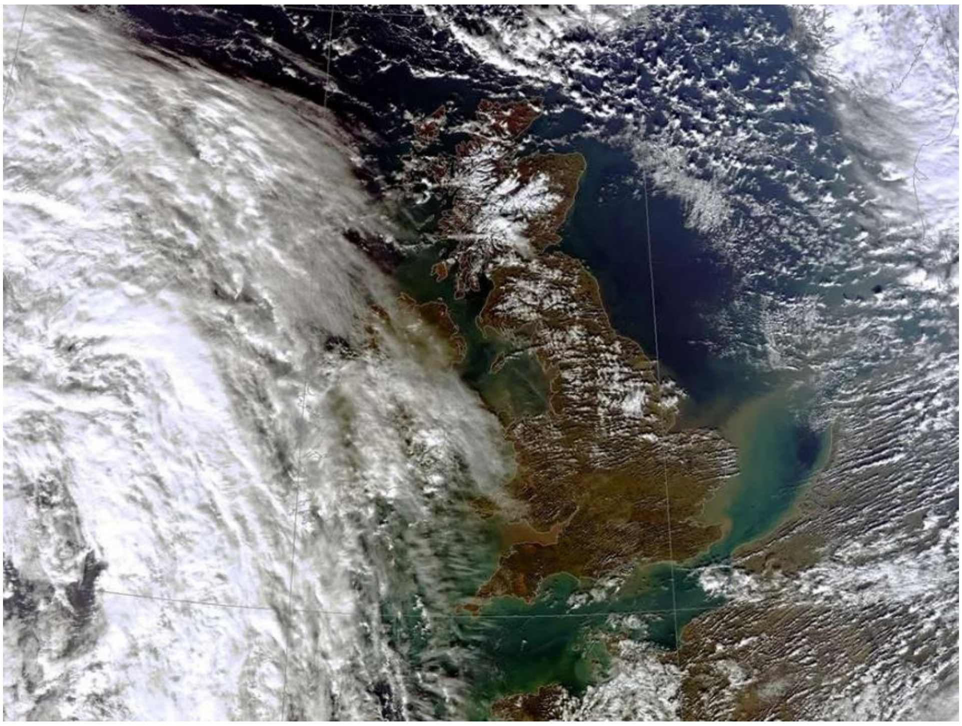
- **Location**: UK
- **Sector**: Arable[ii]
- **Scenario**: Cereal producers on degrading land lose 21, 50 or 90 per cent of yields during an extreme weather event

Type of risk and how it manifests

Unhealthy soils are less resilient and extreme weather events in particular can lead to crop quality or volume being impacted, reducing income. Prolonged wet seasons can result in soluble nutrients needed for plant growth being leached in run-off e.g. nitrogen, potassium and soluble phosphate (see Figure 1 for aerial image of soil run-off). As well as erosion and removal of the soil leading to unstable riverbanks, changes to the soil pH may result in increased acidity and subsequently poor plant growth. Equally, prolonged dry seasons can dry out the soil, causing the organisms in the soil to die, whilst a lack of water will drive poorer crop yields.

[ii] In June 2020 the Utilised Agricultural Area (UAA) was 17.3 million hectares, covering 71% of the total UK land area. UAA is made up of arable and horticultural crops, uncropped arable land, common rough grazing, temporary and permanent grassland and land used for outdoor pigs. It does not include woodland and other non-agricultural land. Cereal crops accounted for 50% of the croppable area. Wheat and barley were the predominant cereal crops, both at 1.4 million hectares. P.18, Agriculture in the United Kingdom 2020, DEFRA, Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004670/AUK-2020-22jul21.pdf (accessed 05/10/21)

Figure 1: UK floods flush out silt plumes into the sea (credit: Dundee Satellite Receiving Station)



In contrast, healthy soils are better able to withstand extreme weather events and to recover afterwards:[11]

- Healthy soils that have been cover cropped are better at retaining water during a drought.[12]
- Soils with low levels of organic matter are more vulnerable to erosion or decline during extreme weather.[13]
- The yields from land managed in a way that promotes soil health, such as no-till practices and cover cropping, are more stable during extreme weather events than land that has been tilled.[iii]

Nine per cent of arable land in Western and Central Europe is degrading (has a declining productivity trend).[14] This number is 'climate-corrected', meaning it excludes the impact of climate change on the health of soils. Therefore, the extent of degradation is likely greater. However, by removing the impact of climate change and showcasing how land management techniques degrade soils this climate-corrected figure provides a representation of what is in the control of farmers to mitigate (by employing techniques like cover cropping and no-till methods). **Banks can support positive land management action, thereby mobilising finance towards impactful activities, and mitigating their exposure to nature-related financial risks.**

[iii] Amin Nouri,, Daniel C. Yoder, Mohammad Raji2, Safak Ceylan, Sindhu Jagadamma, Jaehoon Lee, Forbes R. Walker, Xinhua Yin, Judith Fitzpatrick, Brady Trexler, Prakash Arelli & Arnold M. Saxton, Conservation agriculture increases the soil resilience and cotton yield stability in climate extremes of the southeast US, p.1. Retrieved from: https://www.nature.com/articles/s43247-021-00223-6.pdf (accessed 01/10/21)

Degrading land is a physical source of risk to ecosystem services, caused by land use change and overexploitation, as shown in column 'A – Type of risk' of the CISL nature-related financial risks framework, shown in the below Figure 2.

Figure 2: CISL Framework for identifying Nature-related Financial Risks – soil health risk highlighted

The risks posed by land degradation manifests as an increased vulnerability to hazards, such as extreme weather, and a decline in food provision (as shown by column 'B – Risk manifests as a result of' in the above Figure 2):

- In 2010, soil degradation in England and Wales was estimated to cost £1.2 billion a year.[15] In 2019, the UK supplied 55 per cent of the food the country consumed. [16] This local consumption, combined with the fact that cereals are the second largest food export group with a value of £2.4 bn, highlights the importance of the sector to the UK economy.

Key data and assumptions

The below data and assumptions were used to inform and run scenario analysis of how an extreme weather event impacts farmer profitability.

1) **Production decline (loss of yield) across degrading land following extreme weather events is estimated at 21 per cent.**[iv] This data point was derived from a range of research:
   - Previous intense droughts or extreme precipitation have reduced agricultural production by 30-40 per cent in parts of Europe.[17]
   - In areas where soil erosion was greatest during the Dust Bowl, suggestive of the areas of lowest soil health, the decline in crop productivity was as high as 39 per cent. Where soil erosion was the lowest, suggestive of better soil health, the decline was 12 per cent.[18]
   - Extended drought events in the US Midwest had a negative impact on crop yields of 2-22 per cent.[19] The top end of this range is indicative of where soil health is lowest.[20]
   - Analysis of historic crop yields in the Netherlands found that extreme weather, in this case high temperature events, can reduce average yields by 5 per cent.[21] As this is the reduction of average yields, it supports a view that those on degrading land have higher yield losses.

2) **Soil is so severely biologically degraded or eroded that it cannot be farmed for two years following the extreme weather event, which is deemed a worst case situation.** Depending on which season the crop is lost the farmer might:
   - Resow the same crop
   - Resow a different crop or a spring variant of the original
   - Fallow the land / sow cover crop
   - If a partial loss, cut back on inputs, e.g. fertiliser sprays
   - Allow livestock to graze some damaged crops
   - Remediate the land in severe situations, e.g when damaged by flood waters or had material deposited by flood waters

     There are still variable costs (seeds, fertilisers) and sunk fixed costs (labour, fuel) for the year the extreme weather event occurs and for the purposes of this scenario it has been assumed variable costs decline in line with yield.[v]

Scenario analysis was run for those on degrading land losing 21, 50 and 90 per cent of crop revenues for two years:

- A 21 per cent yield decline was modelled as this was a simple average of above data points about the indicative yield declines of degrading land
- 50 and 90 per cent yield declines were modelled to provide an indication of losses if production areas, as a whole, have very heavy concentrations of severely degraded land. This is based on the concept that within the yield decline figures cited – as they can span a wide geographic area – there will some areas of land where the crop yield declines may be concentrated.

[iv] This is a simple average of sources cited analysing the extent to which crop yields of degrading land decline following extreme weather.
[v] Variable cost spend would stop as soon as the crop is lost and producers will store and carry forward the inputs to the next season e.g. fertiliser, sprays (weedkillers, fungicides and insecticides), seed. On a case by case basis it would depend on when extreme weather event hits relative to crops development.

- For simplicity, the price of crops remained fixed. However, their above industry average yield declines also mean those on degrading land are likely to be crop price takers, and so are unlikely to be adequately compensated by any crop price increase that follows extreme weather events.
- Due to the lack of easily available data about the operations and revenue diversification of producers in an agricultural lending book, analysis was run for cereal farms only as the majority of arable farmers in the UK are focussed on cereal farming. Whilst this provides an initial indication of the additional financial risk posed by land degradation, in reality many farms have diversified revenue streams that will insulate them to an extent from crop yield declines.

To assess the potential financial impact on a loan book, data from the Farm Management Handbook 2020/21 about the average English cereal farmer input and output costs was used. Table 1 contains a breakdown of typical cereal farming input and output costs in England.[vi]

Table 1: Financial overview of an average English cereal farmer[22]

Average Cereal Farmer Financial Overview (per annum)	
Output	£ 244,664
Basic Payment Scheme (BPS)	£ 39,500
Diversification surplus	£ 17,300
Fixed costs	£ (133,222)
Variable costs for an average cereal famer	£ (102,500)
Profit / Loss	£ 65,742
	Number of farms in sample: 193 *Average farm size (hectares): 204* *Cereals (hectares): 132*

Impact on companies and the resultant financial risk

Analysis suggest an average UK cereal farmers will become unprofitable when yield decline reaches 27 per cent, as shown in Table 2.

[vi] Utilising statistics on Wales was discounted as the amount of cereals grown in Wales would not have a significant impact on the NatWest Group loan book. Less than 3 per cent of the agricultural area of Wales is used for growing cereals ~48,000 ha. Statistics for English cereal farmers were easier to obtain that those for Northern Ireland or Scotland.

Table 2 - Profit implications of yield declines for UK cereal farmers

Yield decline scenario: 21%			
	Reference	Year 1	Year 2
Income	£ 301,464	£ 250,085	£ 209,495
Expenditure	£ (235,722)	£ (214,197)	£ (197,192)
P/L	**£ 65,742**	**£ 35,888**	**£ 12,303**
Yield decline scenario: 50%			
	Reference	Year 1	Year 2
Income	£ 301,464	£ 179,132	£ 117,966
Expenditure	£ (235,722)	£ (184,472)	£ (158,847)
P/L	**£ 65,742**	**£ (5,340)**	**£ (40,881)**
Yield decline scenario: 90%			
	Reference	Year 1	Year 2
Income	£ 301,464	£ 81,266	£ 59,247
Expenditure	£ (235,722)	£ (143,472)	£ (134,247)
P/L	**£ 65,742**	**£ (62,206)**	**£ (75,000)**
Indicative Profitability Tipping Point **Yield decline = 26.7%**			
	Reference	Year 1	Year 2
Income	£ 301,464	£ 236,183	£ 188,320
Expenditure	£ (235,722)	£ (208,373)	£ (188,321)
P/L	**£ 65,742**	**£ 27,810**	**£ (1)**

The disruption to farming caused by extreme weather may then result in financial loss to the bank if a customer has no choice but to default on a loan because of loss of income. This is reflected by Column 'C – Impact on Companies' and 'D – Resultant financial risk' of CISL's Framework, shown in Figure 3.

Figure 3: CISL Framework for identifying Nature-related Financial Risks

A yield decline of 27 per cent, the calculated Indicative Profitability Tipping Point from Table 2 for a loss-making position, is within the range indicated by reference material about the yield loss of degrading land following extreme weather events.[23] Therefore, farmers on degrading land may pose additional credit risk for financial institutions – this requires further investigation.

Implications

The increased vulnerability to extreme weather demonstrates the need to better understand the connection of the loan book to degrading land. This risk exposure may influence a number of existing considerations during a credit risk assessment of farmers. This process already includes the consideration of granular data about activities, including revenue diversification strategies. As such, **there is a readymade opportunity for the risk to profitability posed by land degradation to become a bigger part of bank engagement with farmers, during which the implementation of risk mitigation strategies that improve soil health, crop resilience and diversify revenue can be discussed.**

However, as extreme weather events become more frequent the urgency to map the credit risk exposure to land degradation is growing:

- A hottest day event is "very likely" to go from being a 1-in-20 year to a 1-in-2 year event by 2100 in "most regions."[vii]
- A maximum daily precipitation event is "likely" to go from occurring 1-in-20 years to a range of between 1-in-5 to 1-in-15 years in "many regions" by 2100.[24]
- Soils were a part of the UK government's response to the Climate Change Risk Assessment for 2020, stating that they "are committed, as part of the 25 Year Environment Plan, to achieving sustainably managed soils by 2030…[in part to] improve soil resilience to the impacts of flood and drought."[25]

Further investigation to map how far land degradation could impact credit risk assessments can include focussing on:

- Who is farming degraded land

  There is currently limited data in the market to have an accurate view of exposure as well as the lack of an agreed standardised framework. This is an industry wide challenge and collaborative groups are seeking solutions to this.

- Crop diversification

  UK farms tend not to practice monoculture farming, instead there will be a variety of crops grown, e.g. wheat (winter & potentially spring) barley (winter & spring), oilseed rape, pulses, sugar beet and potatoes. As such, a farm is unlikely to lose all its production in one year. Furthermore, farms tend to minimise their exposure to extreme weather, such as flooding, by having the most exposed land as grass. In simple terms, crop diversification could help mitigate additional credit risk due to degrading land.

- How soil health is linked to crop quality

  Crop quality can also be impacted by extreme weather events. This first scenario has focussed on the physical loss of a crop but there are potential quality issues that may result in a further reduction to profits.[26] For example, if protein levels in wheat are insufficient, and it must be sold as livestock feed rather than milling wheat, this has an immediate impact on revenue and therefore margins. This could be material.

- Alternative income streams and how reliable they are

  The Basic Payment Scheme (BPS) is the largest of the rural grants and payments that provide help to the farming industry. These payments are slowly being withdrawn. By 2024, all farms will have lost at least 50 per cent of their direct payments and some may have lost nearly 70 per cent.[27] Whilst new subsidies designed to encourage sustainable land management may be introduced, the loss of BPS layered on top of financial pressure from crop loss is an additional risk.

[vii] This is the IPCC using an A1B scenario, where there is very rapid economic growth, low population growth and rapid introduction of new and more efficient technology.

Scenario Two – Vulnerability of degrading land to fertiliser price spikes

Focus

To what extent can the financial risks of fertiliser price spikes be assessed to determine the effect on producers faming degrading land?

- Location: UK
- Sector: Arable
- Scenario: For the purposes of the scenario, it is assumed that cereal (wheat) farmer on degrading land requires 27 per cent more nitrogen (N) fertiliser and 60 per cent more phosphorus (P) fertiliser to maintain productivity when compared to non-degraded land and that fertilizer is the limiting yield factor. This is assessed in the context of a fertiliser price spike.

Type of risk and how it manifests

Declining soil health can require higher fertiliser use to replace the nutrients from the soil when crops are harvested – often referred to as the inputs trap. Therefore, farmers on degrading land tend to require more fertiliser to maintain crop yield. Analysis of the hidden costs of land degradation in US maize farming estimated the nitrogen (N) and phosphorus (P) fertiliser needed to replace nutrients lost because of soil degradation, showing how degrading soils need additional nutrients. Although ranges are presented, the study indicates that degrading soils could require up to 27 per cent more N and 60 per cent more P.[28]

Heightened demand for fertiliser could make farmers vulnerable to rising fertiliser costs if attempting to maintain crop yield. In the UK, the four fertilisers required in relatively large amounts for crops to achieve their optimal yield potential are nitrogen, phosphorus, potassium, and sulphur. Most soils in the UK do not contain enough naturally occurring nitrogen. Therefore, supplementary application is required for optimum crop yield. Phosphate and potassium supplements are required to replace the quantities removed in harvested crops. Fertiliser price fluctuation is common and can be driven by the price of other commodities, such as natural gas which is required to produce nitrogen.[29]

As such, the physical source of risk – land degradation – lowers the capacity of the land to provide food unless compensatory fertiliser is purchased (per columns ‘A Type of Risk’ and ‘B Risk manifest as a result of…’ in the CISL framework for nature-related financial risks shown in the below Figure 4).

Figure 4: CISL Framework for identifying Nature-related Financial Risks

Key data and assumptions

The base scenario uses the same data as Scenario 1, with table 3 containing a breakdown of typical cereal farming input and output costs in England.[viii]

[viii] Utilising statistics on Wales was discounted as the amount of cereals grown in Wales would not have a significant impact on the NatWest Group loan book. Less than 3 per cent of the agricultural area of Wales is used for growing cereals ~48,000 ha. Statistics for English cereal farmers were easier to obtain that those for Northern Ireland or Scotland.

Table 3: Financial overview of an average English cereal farmer[30]

Average Cereal Farmer Financial Overview (per annum)	
Output	£ 244,664
Basic Payment Scheme (BPS)	£ 39,500
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Fixed costs	£ (133,222)
Variable costs for an average cereal famer	£ (102,500)
P/L	**£ 65,742**
	Number of farms in sample: 193 *Average farm size (hectares): 204* *Cereals (hectares): 132*

This is based on data for 2020. Over the course of 2021 fertiliser prices have spiked, as shown in the below Table 4. **The question to be considered is how much greater the impact on profits would be for a farmer on degrading land from this fertiliser price spike since they require requiring more N and P fertiliser.**

Table 4: Select fertiliser prices in the UK, 2020-2021[ix, 31]

GB Fertiliser costs	Oct-21 (£/tonne)	Sept-21 (£/tonne)	Change from previous month (%)	Oct-20 (£/tonne)	Change from previous year (%)
Ammonium Nitrate – UK produced (34.5% N)	N/a	N/a	N/a	N/a	N/a
Ammonium Nitrate – Imported * (34.5% N)	587	395	49%	207	183%
Diammonium Phosphate (DAP)	655	579	13%	324	102%
Triple Super Phosphate (TSP)	521	498	5%	245	113%

[ix] The British (GB) fertiliser price series provided by Agriculture and Horticulture Development Board aims to increase transparency in the market. The prices cover the most commonly used products: Ammonium nitrate (UK produced and imported), liquid nitrogen (UAN), granular urea, potash and phosphates. They are an average of spot prices produced a month in arrears.

Based on current fertiliser usage for an average UK farm, the estimated cost increase for N and P between October 2020 and October 2021 is £20,791 for and £26,461 for a farmer on degrading land. The £5,670 difference between these two figures – the additional cost that would be borne by the farmer on degrading land – equates to only nine per cent of an average farmer's estimated gross profit (per Table 3). This indicates that the fertiliser cost difference faced by those on healthy versus degrading soils are unlikely to be financially material on their own, as fertiliser is a minority percentage of total costs. However, they may contribute to already existing headwinds create exposure to geopolitical events through gas prices, which are a feedstock for fertiliser.

Implications

Whilst less material than Scenario One, the additional vulnerability to fertiliser price spikes is further evidence of the need for risk management processes to include a more robust assessment of soil health in the arable sector. This will support discussions with bank customers operating in the agriculture sector, complementing the existing NatWest Group strategy to support farms who have a sustainable and diversified product line.

Reflections

Agriculture is a capital-intensive sector operating with volatile commodity prices and agricultural policy. The profitability of those farming degrading land is more susceptible to shocks, such as those explored in this paper's scenarios: extreme weather events or fertiliser price spikes. These could pose additional credit risk to lenders and other financial stakeholders, requiring further investigation into the individual situation of farmers, e.g. strategies and revenue diversification to mitigate such economic shocks.

The sensitivity of producers on degrading land to extreme weather and fertiliser price spikes has underscored the need to continue engaging with clients on sustainability, particularly on health of soil. By engaging with the client base on the issue of land degradation during the risk assessment process, mitigation strategies can be noted or supported, including:

- Mitigating losses by claiming support payments in the event of damage due to extreme weather. A form of income protection insurance may soon be available in the UK, similar to crop insurance taken out by US farmers.[32]
- Regenerative agriculture techniques that can improve soil health. These include farming systems that do not till the land, growing cash crops like wheat or barley with a companion crop like clover and changes in grazing management. Taking such action on soil health also presents opportunities. For example, soil carbon capture can translate into high quality carbon credits, generating additional revenue to farmers.

In addition to engagement with farming companies to better understand potential additional credit risk, another next step could include analysis of how the two risk scenarios shown in the use case impact those up- and downstream of producers. For example, if crop buyers have long-term offtake agreements from farmers that suffer the greatest yield declines following extreme weather then could margins be compromised by the need to purchase from spot markets? These buyers are also clients of NatWest Group and other banks.

The UK Government's 25 Year Environment Plan states that England's soils need to be managed sustainably by 2030, and steps must be taken towards restoring the UK's soils.[33] This reflects a growing understanding that businesses must take account of not just their impact but also their dependence on nature. If they do not, nature, such as the biological health of soils, will continue to decline, increasing financial risks to banks and the economy and society as a whole. The fact that nine percent of arable land in Western Europe is degrading before climate change is factored in underscores the need for action by farmers and, by extension, how finance and policymakers can support action that reduces land degradation as a source of nature-related risk.

This investigation into the credit risk implications of land degradation is part of an ongoing effort and body of evidence that will help develop understanding and management of nature-related financial risks. It will inform decision-making within NatWest Group and contribute to protecting and restoring nature. The process of producing this analysis has unearthed risks that require further exploration. Through this research, the intent is to enable financial institutions to go further in supporting more resilient businesses operating in a future threatened by nature loss and its drivers, such as climate change and the overexploitation of natural resources.

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