




Re-WIRE

Agricultural Resilience:
From cost to investment opportunity

Executive summary

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in collaboration with:

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SYSTEMIQ

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As physical climate and nature impacts on agriculture worsen, standard corporate responses to risk management will face limits. Agri-food companies, farmers and governments are already paying for physical climate and nature impacts on agricultural supply chains. In 2021 and 2022, droughts across Brazil, Argentina and Paraguay cut soy production by over 18 million tonnes, a 9-10% decrease from a region that supplies over half the world's crop, while a heat dome over Western Canada, the world's largest rapeseed producer, cut its rapeseed production by 35%. In shocks like these, most companies respond by accepting higher raw material costs, diversifying sourcing regions, substituting raw materials, reformulating products, or passing costs on to consumers to preserve or expand margins. These are rational responses, but they do not build the resilience of farmland and landscapes to withstand shocks over the long term. Diversification and substitution work while risks are independent and modest, yet available evidence suggests these conditions will not last. The four major oilseed crops, soy, palm, rapeseed and sunflower, supply virtually all the world's edible oil, oilseed-based animal feed and oilseed-based biofuels. Production of three of these four crops is geographically concentrated, and the likelihood of simultaneous shocks is increasing. Simultaneous droughts in the US, Argentina and Brazil, which together produce around 80% of global soy, become 11-16 times more likely under long-term climate trends, and 4-15% more severe. A flood or drought in any one of the US, Brazil or Argentina raises world soybean prices by 1.8 to 5.9%, because buyers shift to the unaffected producers. When all three are hit in the same year, prices rise by 9.5 to 33.2%, Chinese soybean imports fall by around a fifth, and the additional cost to Chinese consumers of soybeans and meat reaches up to 174 billion yuan.

Investments in agricultural resilience could reduce yield losses, but are a fraction of what's needed. Such investments span in-season practice-level adaptations like precision nutrient management, medium-term farm investments such as no-till, and longer-term landscape interventions like watershed restoration (Exhibit 9). Unlike diversification and substitution, these interventions act to reduce crop exposure and vulnerability to climate and nature shocks. Whilst their benefits are expressed today in terms of increased yields, GHG mitigation or nature benefits, there is strong consensus amongst experts and practitioners on their potential to avoid yield losses under climate change and nature loss. Economy-wide returns on adaptation investment in agriculture run at around 27%, but accrue to farmers, governments and whole economies rather than to the companies and lenders with a stake in resilient supply chains. Whilst many leading companies today invest in these measures under a rationale of building supply security, quantifying the return on investment remains a challenge, and investment has not scaled beyond a small group of sustainability leaders. The result is a system that misallocates capital on a large scale: private finance has the capacity to provide around USD 630 billion annually to global food systems, yet only around USD 19 billion is directed toward financing climate mitigation and adaptation. This compares with an estimated combined public-private need of USD 1.1 trillion per year.

Structural barriers and evidence gaps mean risks and returns in agriculture are systematically underestimated. Incentives to quantify the financial impact of physical climate and nature risks to agricultural supply are weak or non-existent. This has not to date been required by regulation, and low insurance penetration in agriculture has meant weak incentives for the (re)insurance sector to build out comprehensive models. Where agrifood companies, banks, insurers or investors seek to quantify the risks, three evidence gaps contribute to their underestimation. Incomplete hazard coverage, limited crop vulnerability data and an absence of financial metrics mean that decision-makers in companies do not see a problem large or near-term enough to act on. Companies relying on standard sectoral crop yield models do not see material yield losses for oilseed crops until the 2050s, far beyond their standard five-to-ten-year planning horizons. As a result, programmes that build agricultural resilience are treated as discretionary sustainability costs rather than as investments that reduce recurring, foreseeable losses under a rapidly changing climate.

Photo by Kawê Rodrigues on Unsplash

To correct their risk baseline and develop a return-on-investment case, agri-food companies, governments and investors need to use probabilistic risk-to-resilience modelling. Catastrophe risk modelling, a widely-used approach in the (re)insurance industry, can quantify the full range of possible losses, including events with no historical precedent, and generate financial metrics for a business case for resilience investment. The Annual Average Loss (what supply disruption costs in an average year) and Probable Maximum Loss (what it costs in a bad year at a defined probability) are established metrics in (re)insurance, risk capital markets and the built environment. They allow investors to assess the return on resilience spending against the losses it avoids. A recent study published by the European Investment Bank and the European Commission applied this approach to European agriculture, and demonstrated that adverse weather already causes an estimated EUR 28 billion in annual average losses to EU crops and livestock. The findings have sharpened how European policymakers, regulators and insurers understand the scale of the exposure they carry. Resilience interventions reduce crop vulnerability. Catastrophe risk models can quantify losses before and after resilience investments, isolating the avoided losses. Comparing the losses avoided against the cost of the intervention therefore gives a return on investment (Exhibit 6).

Better evidence alone is not enough: new investment models are needed to make resilience pay. The returns on agricultural resilience are hard for any single investor to capture. A company that co-funds producers across a sourcing region to adopt conservation tillage or improved irrigation lowers drought vulnerability for every buyer sourcing from that region. Lenders cannot price the benefit either, for different reasons. The benefit appears at landscape level, credit is repriced annually, and unfamiliar practices are underwritten as an added risk rather than a mitigant. Without mechanisms that return part of the benefit to whoever funds it, better evidence could push companies and investors out of at-risk producing regions faster, rather than incentivise investment to build their resilience.

Three gaps must therefore be closed together. The first is evidence, meaning crop vulnerability thresholds, the effect of nature risks on yields, and data on how far interventions avoid losses. The second is return capture, the financing structures, offtake design and public instruments that return part of the benefit to whoever funds it. The third is capability, the skills and worked examples to build a credible ROI case. No single actor can close all three gaps. Because the underlying risk modelling should be a public good, progress depends on private, public and philanthropic partners working together from the outset.

The next Re-WIRE paper applies this approach to the Brazil-China soy corridor. Due January 2027, it will produce a first partial estimate of avoidable losses and return on investment, and a first view of who is best placed to invest and how returns can be captured and shared.

USD 630bn

Estimated annual private finance capacity for the global food system (2023)

USD 19bn

Private sector climate finance flowing to agrifood systems annually (2021/22): roughly 20% of combined private and public flows

USD 1.1tn

Annual climate finance needed for agrifood systems by 2030, roughly 12 times current levels (private and public combined)