

Picking locks for potential

Mobilizing private sector innovation for climate action

Leanne Zeppenfeldt, Annebelle Rombach, Philip Thornton, Dhanush Dinesh

Introduction

A food systems transformation means we must do food and agriculture differently—in terms of fundamental approaches and across scales. We will need to close both adaptation and mitigation gaps. Those gaps present us with known unknowns: we know *that* gaps in our pathways and strategies exist but do not know *how* to fill them.

That is where innovation, in its broadest sense, will need to come in. It will require technical ingenuities¹—matched with carefully negotiated institutional shifts and fundamental social transitions in society—to transform food systems and increase their resilience to and impact

on the changing climate.² These innovations require investment—an estimated USD 10.5 billion in additional investment in agriculture research and innovation per year to reduce hunger by 5% and reach emission targets in line with the Paris Agreement by 2030.³ With public investment slowing down in recent decades,⁴ there is a significant gap between public and philanthropic funding and the level of innovation investment that is needed.⁵ In this context, there has been growing interest in mobilizing private sector investment to contribute to this climate innovation agenda.



The private sector's unique position in market reach, innovation capacity, and scaling models could be an important, albeit partial, answer to the innovation gap. It functions as both a vital innovator and a link to many mitigation and adaptation opportunities through its direct connection to farmers and consumers. At the same time, the increasing concentration of large private sector actors in various food system industries⁶ has also been highlighted as complicating the transition to more sustainable pathways. As market power becomes increasingly concentrated, the risk that large corporate actors steer innovation away from fundamental transformation increases.^{7,8} As such, private sector innovation has the potential to both promote and undermine food systems transformation under climate change.

This Discussion Starter provides a starting point for exploring this potential. Based on literature and interviews with experts working on climate and innovation through private sector efforts, it 1) draws a picture of the functioning of private sector R&D pipelines in food and agriculture and how private sector actors are working to align these to climate action, and 2) identifies remaining lock-ins and suggests lockpicks that could help unlock more climate action in private sector innovation pipelines.

We will primarily focus on the innovation efforts of larger agri-food industry actors. This is because, typically, larger companies spend more on research and development (R&D) and innovation, both in absolute and relative terms.⁶ Also, many bold innovations, like those related to

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inputs, livestock, and crop varieties,⁹ require dedicated R&D resources and pipelines.¹⁰ Many "smaller" innovators, like farmers and small-medium enterprises (SMEs), cannot access these due to cashflow limitations or difficulty accessing external investment.¹¹ Hence, while both groups have tremendous innovation potential, especially in producing disruptive alternatives, this Discussion Starter focuses on private sector innovation through dedicated R&D pipelines.

Innovation in food systems

History highlights that food system innovation is usually a long and drawn-out process and that substantial change generally arises from multiple incremental shifts over many years.¹² It is not a simple pursuit—various ethical, political, and practical challenges must be considered. For example, there are ethical and food safety issues, with robust policies, regulations, and social licenses to operate that are difficult to shift. Agriculture and food innovations also face long lead times caused by technical complexities, testing requirements, and a common dependence on yearly harvesting cycles. Additionally, the food sector depends on biological systems that provide critical provisioning and regulating services and vital income and livelihoods for billions of people, both of which are important to consider and protect. Lastly, food systems exhibit a range of path dependencies: lock-ins concerning technological choices, attitudes and culture, infrastructure, institutions and policies, power and politics, and in research and innovation priorities, practices, and narratives.⁸ Moving away from existing path dependencies towards more climate-oriented and socially just food systems can be extremely challenging.

All actors working on innovation in food and agriculture face these challenges. Still, there are differences in how actors operate in relation to innovation—an important distinction being private versus public or philanthropically funded innovation research. Private sector R&D spending, for example, tends to be more focused on specific



crops and products, whereas public and philanthropic agricultural R&D addresses more fundamental research.¹³ In recent years, private sector R&D spending has been nearing, and sometimes exceeding, public food and agriculture-related R&D spending.^{4, 6, 13} That the private sector functions under significantly different incentives and interests than philanthropic and public actors is obvious—the question then is, how can we improve those incentives to align with the climate action we urgently need?

The high-level business case

Regulatory push

Reputational risk

Three reasons to align innovation pipelines to climate action.

Private sector innovation: R&D configurations

Innovation—in terms of new products, markets, and models—is essential to organizational survival for private sector companies. There are various configurations in which the private sector invests in and pursues innovation, including:

- **In-house R&D** covers the research and development activities organized and undertaken by researchers within a company. This capacity is common among larger companies, often including a traditional pipeline model that explores potential innovations and ensures full autonomy and intellectual property (IP) rights.
- **External R&D** and ventures enable large private sector players to externalize innovation by investing in stand-alone start-ups or other ventures, like start-up incubators. This way, companies outsource the risks

and costs associated with failed ventures while building on sources and ideas that originated outside their traditional R&D pipelines and strengths.

- **Collaborative R&D** is an increasingly important strategy to foster innovation. This includes R&D efforts undertaken in partnership with other actors like public research entities and pre-competitive collaboration with other private sector companies.

Aligning private sector R&D to climate

The need to align innovation pipelines with climate action was widely recognized by all interviewees. Aside from ethical motivations, there are three main reasons for incorporating and aligning climate into their innovation approaches and pipelines:

- **The high-level business case:** With the long timelines for food and agriculture R&D, innovations currently in the pipeline will inevitably need to address a changing climate for business survival. To secure production, sales, and profitability, new products will need to support producers and other customers in navigating and adapting to climate change.
- **Regulatory push:** Regulatory frameworks push private sector companies to report and deliver on climate, environment, and nature indicators. This regulatory push is a key factor driving the prioritization of climate in innovation pipelines in order to secure the legal license to operate.
- **Reputational risk:** There is a growing social demand for private sector organizations to be transparent and responsible about their climate impact. This increasingly incentivizes private sector actors to actively address climate change and its effects and incorporate mitigation and adaptation into their innovation pipelines to protect their social license to operate.

Of course, these three motivations are interconnected and could reinforce each other. For example, the economic success of companies also relies on the pull mechanism of consumer preference, both in terms of products and company sustainability reputation. Furthermore, the way climate action is understood is also an important factor. We found that climate action and sustainability were primarily framed in terms of mitigation and sustainable intensification. This may result from mitigation measures being more straightforward to communicate and verify than adaptation indicators,

adaptation being seen as less attractive in terms of profitability, and adaptation being understood as a risk to be addressed to secure existing business markets rather than an essential climate action agenda.

Strategies for R&D alignment to climate

In this context, private sector actors employ different approaches to align their innovation pipelines to climate action. Based on our interviews, we have delineated three categories:

- **Gateway alignment: enhancing metrics and testing for climate-related standards and impacts.**

This approach entails improved testing on climate indicators, such as emission/productivity ratios, life cycle analysis, and regulation compliance. It primarily focuses on innovations developed without a specific climate dimension approaching the innovation pipeline's end. Although this does not necessitate fundamental changes to innovation approaches, it ensures minimum climate benefits and enables the identification of unknown climate benefits. However, when this approach only informs the final stages of the innovation pipeline, it is less likely to change the direction of innovation fundamentally.

- **Pipeline alignment: adjusting the innovation strategy and process throughout the pipeline.** This approach has the potential to be more profound and can take the form of strategic alignment or process alignment. In strategic alignment, the problem that sparks new innovation efforts is directly framed in terms of climate change. In process alignment, the selection process incorporates climate dimensions and criteria throughout the pipeline. It can include testing innovations under different climate change scenarios and ecosystems and the active involvement of climate change/sustainability specialists throughout the selection process.

- **Application alignment: improving climate action in innovation use.** This is less related to new technological innovations and more about exploring innovative ways to bundle and enhance practices and using existing products to increase climate and sustainability benefits. It also includes market development efforts.

These three approaches can be implemented in each of the three R&D configurations—internal, external, and collaborative R&D—discussed earlier.

Picking the locks for potential

The overall business case for an innovation pipeline sensitive to both the impact on and of climate change is clear: the environmental cost of current food systems amounts to at least USD 7 trillion per year.¹⁴ Despite the existing approaches for aligning private sector innovation pipelines with climate action, several bottlenecks and competing incentives are locking in the potential for further action. These bottlenecks can be organized around **profitability, competition & accountability, and the leverage of the climate agenda**. Here, we explore these bottlenecks and lockpicks that can help leverage the potential of private sector innovation to promote climate action.

Profitability

The bottom line is that investments in R&D by private sector actors need a solid business case. Given the high failure rate of innovations, private sector companies rely on intellectual property rights to recover costs by securing an exclusive license and market for innovations, thus preventing *knowledge spillover*.¹⁵ However, this reduced knowledge transfer can inhibit the speed of further development and scaling of climate innovations.¹⁵ Furthermore, risk aversion, especially in relation to new market segments, is an important bottleneck related to profitability. Not only are food system readjustments inherently risky due to their complex nature, but innovations also often operate in the face of an incomplete understanding of climate risks affecting the decisions and actions of food system actors. In addition,

Gateway alignment: enhancing metrics and testing for climate-related standards and impacts

Pipeline alignment: adjusting the innovation strategy and process throughout the pipeline

Application alignment: improving climate action in innovation use

market demand for new products of innovation may be slow to develop for reasons including limited market accessibility, lack of knowledge and know-how, and limited access to credit, for example. This is especially true for lower-income countries. These considerations can prevent the exploration of fundamental innovations by the private sector as these could threaten profitability and existing markets.

Lockpicks

There are two avenues to increase the profitability of enhanced alignment to climate action. First, there is securing a return on investment. For example, advanced market commitments by governments, multilateral organizations, or philanthropy establish a market for a new product while it is still being developed—securing a private sector business case for products with a strong public benefit. Another potential construction is public or philanthropic funders purchasing intellectual property rights around innovations. This gives private sector actors a return on their R&D investment while enhancing knowledge sharing and availability. Lastly,

market development is an important avenue to securing profitability. Here, there is a substantial opportunity around repurposing subsidies.^{15,16} Many agricultural subsidies are tied to practices that do not support food systems transformation. Repurposing those subsidies to more climate-smart practices and inputs could create a market for climate-aligned innovations and incentivize their development by private actors.

A second set of lockpicks relates to making investing in R&D linked to climate action more attractive. This can be achieved through public and philanthropic funders matching the R&D investments of private actors in particular climate-related innovation projects. Many public R&D efforts are framed around this approach, aiming to crowd in private sector investment.⁵ Here, there is a risk, however, concerning the additionality of public investment. Public actors will likely prioritize the most promising or scalable innovation opportunities to realize the largest “impact return” on their investment. However, these innovations are already most likely to be developed by the private sector regardless. In that sense, matching investments runs the risk of crowding out



private sector investment instead of generating additional funding.¹¹ Financial incentives, like tax reductions depending on the climate-sensitivity of R&D efforts or the sustainability portfolio of investors, are also an approach to incentivize R&D. Policies that link IP rights of non-essential innovations with the open-access sharing of climate and sustainability innovations, or those requiring waiving IP rights for specific regions, could also be an option to enhance knowledge sharing and accessibility.⁵ However, these strongly depend on clear standards on what constitutes climate-related innovation or “green” investment.⁵ Hence, the development of these standards and indicators is essential.

Competition and accountability

Increasing the accountability and ambition of climate action by private sector actors is another approach to incentivize more climate innovation. The increased push for transparency and accountability from both policy and consumers incentivizes private sector actors to invest in innovations that help them (and those in their value chain) reduce their climate impact and adapt to climate change. Through these dynamics, the companies’ sustainability character becomes a more substantial element of their business identity, especially as consumers are increasingly willing to pay a “sustainability premium,” particularly in high-income countries. This, in turn, also creates a competition on sustainability to secure that premium market. On the one hand, this competition is likely to accelerate climate-related innovations. At the same time, this competition also reduces the incentive for collaboration on, for example, industry-wide measurement tools or best practices, as these are increasingly tied to companies’ competitive advantage.

Lockpicks

Strong legislation requiring companies to report on their climate impacts, like those recently passed in the EU, raises the bottom line of ambition and incentivizes innovations targeted at reducing climate impacts. Again, more robust and coherent measurements, reporting, and verification (MRV) are fundamental to their success. In addition to this regulatory push, several interviewees highlighted that pre-competitive collaboration with other companies and civil society actors is the most important for standard and targeting setting, simply because of the lag between (inter)national policy and practice. Strengthening this pre-competitive collaboration is a powerful opportunity to unlock better alignment throughout value chains.

Leveraging the climate agenda

Based on our interviews, climate certainly plays a role in the management and strategic direction of innovation pipelines. At the same time, it was challenging to assess the influence the case for climate action has over the direction of innovation; for example, how innovation managers weigh climate considerations in gateway decisions or the (informal) decision power sustainability experts have in setting the innovation agendas. However, these details determine the ability of these efforts to promote or undermine fundamental food systems transformation under climate change. Other food systems challenges, like food security, nutrition, biodiversity, and livelihoods, also shape that same innovation agenda. Trade-offs between these challenges are likely and important to consider when assessing the potential for climate action.

Lockpicks

The assessment of the leverage that climate considerations exert on innovation decisions within the private sector presents a challenge due to limited available information and a scarcity of established guidelines or best practices. These could be further explored through collaborative efforts to identify ways to strengthen the role of climate change experts and indicators in setting new directions for innovation, which, with long timelines involved, is only more urgent. Furthermore, insights from our interviews underscore a robust commitment at the C-level, extending beyond the support of Chief Sustainability Officers (CSOs) as a crucial driver for improvements in both innovation and climate strategies. Therefore, efforts to strengthen this C-level support can also be an important lockpick to improve alignment to climate action in innovation pipelines.



Conclusion

For all of these listed lockpicks, two essential leverage points are improved measurement and new modalities for collaboration between private and other actors. The complexity of measurement systems and the problems of attribution that arise if the metrics used are too generic were raised in several interviews. Current limitations in verifying typical climate, nature, and environment metrics are also a source of considerable frustration. The absence of reasonably objective verification makes it difficult for companies to strengthen their transparency and trustworthiness and to counter claims of greenwashing. Finding a balance between granularity and practicality is essential and will require creative indicators and measurement tools.

Amplifying collaboration by valuing the strengths and weaknesses of the different actors in the innovation landscape is also essential. Some of the bottlenecks for private sector climate action through innovation are related to the fundamental functioning and incentives of the private sector—no policy can counter those. With legislation and societal push strengthening, however, the private sector increasingly needs more elaborate climate-related research, which is not in their traditional capacity. At the same time, public and academic research often lacks a developed valorization or scaling strategy. Innovation partnerships, including those with philanthropic donors or non-governmental organizations (NGOs), enable a more robust shared research agenda on climate.¹⁷ Developing innovative and creative collaboration formats is essential for making the most of the strengths of innovation actors, including the private sector.



LOCK-INS

LOCKPICKS



Profitability trap	<ul style="list-style-type: none"> • Increase profitability by securing markets or return on investments • Incentivize investments in climate action by financial incentives or investment matching 	
Competition & accountability	<ul style="list-style-type: none"> • Strengthen the policy push through legislation and strong metrics • Convene pre-competitive networks to enhance knowledge sharing and raise ambition 	<ul style="list-style-type: none"> • Develop MRV tools that balance granularity with practical feasibility • Explore creative collaboration configurations to build on the strengths of the diversity of actions
Limited leverage of climate agenda	<ul style="list-style-type: none"> • Build C-level leadership on climate action beyond CSOs • Consolidate best practices to increase climate leverage in innovation pipelines, priorities, and processes 	

As the name suggests, this Discussion Starter invites a conversation about navigating the potential and constraints of private sector innovation for climate action.

Further conversation and contributions are actively invited and can be shared by contacting the lead author.

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