

# Info Note

## Transformative end-to-end innovation (E2EI) in a new era for food and climate

*Insights and key actions supporting institutional change*

*Jana Koerner and Akshay Duda*

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### Key messages

- We need to invest in transforming our innovation eco-systems to achieve the Paris and SDG goals.
- End-to-end innovation (E2EI) can help us to accelerate the design and delivery of game-changing innovations.
- We can catalyze innovations by making commitments and institutional changes: in our processes, incentives, financing, metrics, policies, and perhaps most critically, in our culture.
- This evidence study aims to help organizations and institutions to deliver transformative innovation at scale.

A major transformation of food systems is needed to achieve global food and nutrition security in a changing climate. To catalyze a step change in agricultural innovation, the UK - as part of its COP26 Presidency - has launched the 'Transforming Agricultural Innovation for People, Nature and Climate' campaign, co-chaired by the UK Foreign, Commonwealth & Development Office (FCDO) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

The campaign aims to build international support for increased investments in agricultural research for development (AR4D) linked to the climate and biodiversity crisis, through consensus on evidence-based approaches and inclusive dialogues among key institutions.

### Defining end-to-end innovation (E2EI)

This evidence study on transformative end-to-end innovation (E2EI) forms part of a series looking into the Why, What and How of investing in the transformation of agricultural innovation systems.

In order to meet our ambitious Paris and SDG commitments, we must commit to investing in developing and sustaining end-to-end innovation approaches. We define E2EI as approaches that work across the innovation system for agriculture, where research efforts are targeted towards end user needs, underpinned by robust partnerships with private, public, and civil society actors to ensure adoption and societal outcomes at scale.

### The eight key characteristics of E2EI approaches

- E2EI follows an **open innovation model**, incorporating both external and internal learning, and sharing core insights with the broadest audience.
- E2EI integrates across the **innovation pipeline**, linking activities from foundational science to delivery within a single institutional framework.
- E2EI is conducted with line of sight from research investments through to development impacts based on a clear **theory of change**.
- E2EI puts **end-users at the center** of the research and development process and provides feedback between end-users and the generators of new technology.
- E2EI focuses on **rapid testing** and **attritional management**.
- E2EI uses **metrics of success** and **institutional incentives** linked to downstream deployment at scale, not to the generation of knowledge.
- E2EI fosters **institutional capacity** and capability focused on delivery, having the right people and partnerships.

- E2EI is able to integrate into **national innovation systems** and operates with organizations linked to end or next users.

## The agricultural innovation system

The agricultural innovation ecosystem is complex and deeply interconnected across geographies and domains – to successfully catalyze end-to-end innovation, we must commit to collective action that reforms how we conceptualize, finance, operationalize, and scale innovation.

We here conceptualize the agricultural innovation system as a non-linear interplay of eight steps broken into three stages, that brings together key elements of an innovation value chain. Thus, the innovation system is described as a (interconnected) cycle that describes the evolution of a new idea, concept, product, or service (Figure 1).

### Institutional barriers for E2EI

While there are several barriers spanning public and private institutions that contribute to slowing down innovation, addressing a handful of persistent and cross-cutting issues is paramount:

- **Current funding and institutional mechanisms** that do not encourage or support trial and error at early stages, thereby reducing the rates of idea generation and innovation at the outset.

- **Research organizations** that do not have a culture of impact, with difficulties to prioritize the direct needs of end-users over individual incentives in the research community.
- **Boundary organizations that enable free-flowing exchange of information** across different links in an innovation ecosystem that are underfunded and underutilized.
- **Monitoring and evaluation plans** that are not appropriately set up to measure end-stage impact.
- **Deprioritized operational planning and resourcing** limits the organizational ability for change and change management in complex ecosystems.

## Key actions towards E2EI

While there are significant contextual flavors to how each of these institutions can adapt to successfully prioritize end-to-end innovation, evidence points to a focused set of high-impact best practices that have the potential to transform the status quo:

### 1. Proactively create room for innovation

Evidence suggests that any innovation process requires a cultural and structural environment where creativity is proactively encouraged. These best practices can apply across relevant institutions:

- **Cultures of innovation**, with social and emotional success- and failure management;

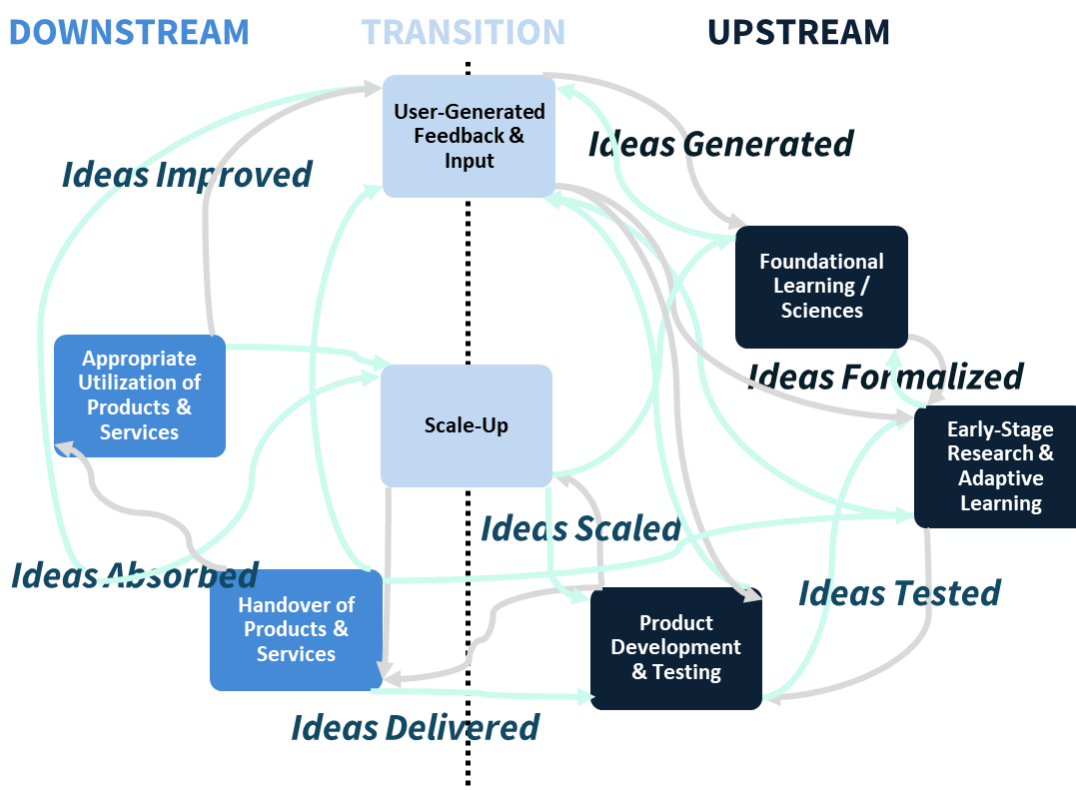


Figure 1. Simplified View of Innovation System (adapted from Hansen and Birkinshaw 2007; Rothwell 1992 by Akshay Duda)

- **Physical and temporal spaces** for open communication and collaboration;
- **A clear picture of market needs and gaps**, through generating, synthesizing, and sharing data; and
- **Innovative IP management practices** centered on creative licensing that fosters innovation in the private sector while maintaining global access.

## 2. Craft channels for continuous exchange of ideas & broadened perspectives

Evidence suggests that innovation is most effectively catalyzed through the rapid and continuous exchange of information across diverse (and often competing) actors. Best practices to foster fidelity and volume of ideas shared:

- **Cross-functional teams** where possible to encourage diversity of thought and employee growth;
- **Knowledge sharing support tools or technology** developed within and across organizations; e.g. data mining or crowdsourcing of information;
- **Networking between individuals** across different domains in the value chain, with emphasis on the role of intermediaries or boundary organizations;
- **Innovation at the user level** enabled by mechanisms that maximize the input of local context into any innovation ecosystem; and
- **Policies facilitating the transmission of ideas and knowledge** across borders and domains.

## 3. Develop organizational ability to test, learn, and iterate

The ability to test and iterate quickly has been broadly recognized as a critical lever to accelerating innovation across the private and public sector. To bring about a culture shift in how agriculture innovation systems currently operate, these following steps can help:

- **Innovation strategies** that proactively seek to generate new ideas and processes on a focused set of problems;
- **Rapid iteration, failing, and learning** during the early stages of idea generation and testing, with financial and organizational incentives; and
- **Early stage-gating** focused on frequent check-ins, adaptive benchmarks, and flexible course correction, rather than rigid, rule-based decision processes.

## 4. Prepare for scale that can diffuse to the last mile from the get-go

Translating the germ of an idea into an actionable and replicable insight is hard; however, much harder is scaling that insight in a manner that is equitably accessible,

### The main actors for E2EI approaches

While there are numerous actors who play a critical role in each step of the process, we focus on four main sets of institutions:

- **Research and Education:** These include academic centers, public, private, and transnational research organizations, and educational services.
- **Business and Enterprise:** These include actors that manifest the agricultural value chain – agribusiness and private sector, agricultural producers, and national distribution systems.
- **Boundary Institutions:** These include institutions that connect research/education organizations to the business and enterprise – this includes public, non-profit, and private extension services as well as farmer producer organizations and last-mile retailers.
- **Enabling Environment:** Spanning a vast array of institutions that underpin activity across the agricultural innovation system, including actors with direct (policy) influence, informal actors, actors linking to and from adjacent sectors, and external funding and financing sources.

financially viable, and popularly demanded. Perhaps uniquely for our initiative, this involves starting with those that are most difficult to reach and identifying ways to bring them into the fold. Best practices are:

- **Touchpoints to engage end-users** not only during research, but also when identifying scaling approaches;
- **Leveraging the competitive advantage** of the innovation holder either in the development or the scale-up of an idea;
- **Complementing partnerships** in the early research process for developing products and services at scale;
- **Pull-based financing mechanisms** to ensure private actors have skin in the game from an early stage on.
- **Outcome-oriented stage-gate criteria** that evolve from focusing on likelihood of technical success to likelihood of commercial / delivery success with an eye towards the long-term scale of impact; and
- **Pull-based financing mechanisms** to ensure private actors have skin in the game from an early stage on.

## 5. Continuously innovate on process

Not all innovation is the same. While we all hope to catalyze the next disruption or technological revolution, we

must remember to continuously improve on what we do already:

- **Continuously solicit ideas** pertaining to improvement of products, services, and processes from front-line workers and customers;
- **Shorten M&E cycles** to approximate continuous improvement based on feed-back loops;
- **Encourage cross-cutting communities of practices** and knowledge sharing platforms, focused on process innovation, but with a narrowed research mandate; and
- **Establish innovation funding packages** of key resource flows for developing and improving delivery processes and practices.

## 6. Incentivize success based on value-creation for the end-user

The correlation between what most organizations measure as success and actual value creation for the end-user is tenuous, at best. Best practices suggest that we must be innovative when designing metrics of success and identifying funding mechanisms that reinforce these:

- **Reflect individuals' contribution** in wage structures and promotions, e.g. as risk-reward incentive systems;
- **Financial and organizational incentives** for individuals aligned with (short-term) innovation goals; and
- **Tracked and surfaced measures of quality** of innovation processes at ecosystem level that feed into resource allocation decisions.

## 7. Create long-term stability in the enabling environment

Catalyzing innovations is a long-term commitment, which requires investing in the enabling environment:

- **Build innovation ecosystems** around academic institutions capable of supplying strong human capital with the required technical skills; and

- **Policies creating an inclusive and stable long-term innovation environment** of innovation regions, geared towards inclusivity and building up capacities.

## 8. Execute a change process suited to an ecosystem's capacity

Committing to change is only the first step in any process to infuse an ecosystem with change. The hard work comes next. Leaders must commit to and implement a change process that invests more in communicating with its stakeholders, is adaptable to the context in which change is happening, and reinforces the focus on value creation for the end-user as the only outcome of success. This includes:

- **Empowering the right type of (inclusive) leaders**, that embrace change and are willing to take risks;
- **Setting up a dedicated communication plan** that clearly lays out the goals of the change process, and regularly tracks progress against commitments;
- **Getting stakeholder buy-in**, involving all those affected by change in the design process in the inclusive decision-making.

This Info Note is based on the findings of the evidence review 'Exploring End-to-End Approaches to Investing in Agricultural Innovation' by Akshay Duda. The full report will be available as CCAFS Working Paper at [ccaafs.cgiar.org](http://ccaafs.cgiar.org).

On the authors:

**Jana Koerner** ([j.korner@cgiar.org](mailto:j.korner@cgiar.org)) is the Global Innovation Manager of the CCAFS, and member of the CGIAR/GIZ Task Force on Scaling.

**Akshay Duda** ([akshayduda@gmail.com](mailto:akshayduda@gmail.com)) is an independent consultant who previously worked as a Strategy Officer for the Gates Foundation. He holds a Bachelors in Economics and Math from Yale and an MBA from the MIT Sloan School of Management.

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