



TRANSFORMATION  
THROUGH INNOVATION  
FOR NATURE-POSITIVE  
PRODUCTION

Fifteen Pager

*United Nations Food Systems  
Summit Action Track 3: Boosting  
Nature Positive Production*



## 1. Objective of this Solution Cluster

This solution cluster aims to unleash the potential of nature-positive innovation – i.e. innovation that spurs agricultural productivity growth while contributing to positive environmental and socioeconomic outcomes. The cluster seeks to build a bridge between the *What* (policies, institutions, technologies, used methods and tools, funding and other investments) and the *Why* (economic, social, and environmental outcomes), by tackling the *How* – and showing the central role of innovation in supporting effective and equitable adaptation and mitigation, sustainable productivity growth, as well as improved resilience for primary producers. The cluster stands as essential to boosting nature-positive production at scale – i.e. the overarching objective of Action Track 3 – but also in achieving the goals of other clusters, with innovation being a significant enabling factor to bring sustainable agricultural, fishing and livestock practices to scale.

Innovation has been a major engine for agricultural transformation in the last century. It has enabled an increase in productivity to feed a growing population, led to biotic and abiotic stress tolerant crops and livestock varieties, increased water efficiency, allowed a better understanding of soil nutrient conditions, increased access to weather advisory services, improved harvest and cold chain efficiencies to minimise waste, improved product shelf lives, and at times reduced the negative ecosystem impacts of farming and fishing methods, while also enabling the development of new markets and finance opportunities.

Despite this success, there are also challenges with the way innovation has been designed and deployed. For instance, the leading theory in agricultural innovation – Rogers' *Diffusion of Innovations* theory – was based on the assumption that innovation relied on a particular technology, which inevitably contributed to positive outcomes. Yet, it is becoming increasingly recognised that agriculture and fisheries have contributed to significant negative externalities. Innovation must now focus on addressing these externalities – including water and soil pollution, declining genetic diversity, biodiversity loss, low nutrient density in foods, overfishing, habitat degradation, malnutrition, greenhouse gas emissions, growing gaps in access to food, and overall inequalities, among others. The cluster will thus shed light on solutions and innovations that promote a regenerative and sustainable use of natural resources, respecting planetary boundaries.

Going beyond, and to transform current food systems to meet justice, equity and sustainability challenges, this cluster will ensure greater emphasis is placed on the social dimension and the fundamental role of local knowledge and adaptation (HLPE 2018; 2019; Smits, 2002; Joly, 2018; van der Veen, 2010; Faure et al. 2018). In delivering for people, nature and climate, this cluster recognises that local circumstances will vary and thus calls for tailored approaches that address context-specific priorities.

Innovations should also be viewed in an interdisciplinary way, involving multiple stakeholders, integrating different forms of knowledge and fostering transitions within local communities, including among marginalised groups (HLPE 2018; Kilelu et al., 2013; Elzen et al. 2017). Co-designing and scaling nature-positive innovation that builds resilience for agriculture, people and natural ecosystems will in turn help drive socioeconomic growth, ensure food and nutrition security, and alleviate poverty.

While the focus of the solution cluster is on primary production<sup>1</sup>, its broader objective is to foster nature-positive innovation to address systemic issues across the entire food system, helping organisations, institutions and communities deliver transformative innovation at scale. By its nature, innovation cuts across all dimensions of the production cycle and contributes to the transformation of entire value chains (from crop, forestry, fishery or livestock production, to the management of inputs and market access), including driving consumption patterns and enabling access to finance.

## 2. What is the problem this solution cluster is trying to address?

Food systems have been one of the major drivers of habitat degradation and climate change. They are responsible for 34% of total GHG emissions (Crippa et al., 2021) – with the largest contribution coming from

---

<sup>1</sup> Primary production is defined by FAO as “those steps in the food chain up to and including, for example, harvesting, slaughter, milking, fishing.” (Codex general principles of food hygiene, 1999)



agriculture and land use/land-use change activities (71%). Food systems are also a principal driver of biodiversity loss through deforestation, overfishing, habitat damage, pollution impacts, the conversion of natural ecosystems to agricultural lands or aquaculture facilities, and excessive and unsustainable use of inputs such as fertilisers, pesticides, water, and energy (Benton et al., 2021). At the same time, primary producers, particularly smallholders, are at the frontline of catastrophic impacts of climate change and nature loss. Often living in areas that lack adequate socioeconomic infrastructure (e.g. roads, electricity, water, communication, as well as educational, health and social amenities), primary producers suffer from deepening poverty levels and a widening inequality gap, bearing disproportionate costs compared to other food systems actors. Meanwhile, food systems are failing to provide healthy diets for 3 billion people and to address the double burden of malnutrition. All these problems have been further exacerbated by the COVID-19 pandemic.

To tackle such pressing global challenges, it is widely recognised that a major transformation of global food systems is urgently needed (Steiner et al., 2020, Pharo et al., 2019, Loboguerrero et al., 2020). However, the scale of the climate and nature crises demands that we approach them with boldness and creativity. This is why unleashing innovative and advanced solutions stands as an essential step to promote biodiversity protection, the resilience of livelihoods, and climate mitigation and adaptation (FAO, 2021).

More precisely, this solution cluster aims to focus on those innovations that directly or indirectly have a positive impact on nature, climate and people. Such approaches will compensate for previously damaging innovations that have resulted in negative ecological impacts over the past century. To avoid such unintended environmental consequences, determining the appropriate and more holistic triple-bottom-line balance of costs and benefits is essential.

Scaling up nature-positive innovation will notably allow to:

**(a) Address food systems externalities while ensuring gender equality and other forms of social inclusion**

Throughout innovation processes, gender equality and social equity must be key considerations to align global food systems with SDG requirements. To do so, the focus must be put on embedding gender equality into existing and emerging policies and on scaling up innovative technologies, which should be made accessible, usable and manageable by women and men equally. Innovation in food systems must also address challenges that are particularly affecting women, who have more difficulties accessing markets, finance, and digital tools, and suffer from an unequal labour burden in food production, particularly in developing countries. Likewise, particular attention should be given to the rights and needs of smallholders and youth. These considerations become especially pertinent in the case of internationally shared public goods, as they seek to serve a very diverse and disparate suite of stakeholders who all ultimately rely on healthy natural ecosystems as the critical foundation of their nutrition and food systems.

**(b) Overcome past innovation barriers including low adoption and underinvestment in research**

Although the World Bank estimates that around US\$ 56 billion is spent every year on agricultural research and development (Fuglie et al., 2020), investment in innovation is not expanding at the rate that is needed to address climate change, nature loss, hunger and other development objectives (Laborde et al., 2020). Only 7% of innovation spending in the Global South explicitly targets environmental outcomes. Of this, only around half includes social or human objectives (CoSAI, 2021). Increasing and reorienting investment in innovation that delivers for nature, climate and people are hence critical to improving food system level outcomes and shifting societies onto a sustainable and resilient path, particularly in vulnerable countries (Alston et al., 2014). Investment in innovation, covering both knowledge generation and its transfer to the sector, should be made central within agricultural support policies (OECD, 2021). Taking it a step further, this solution cluster promotes an interactive innovation model, where knowledge is co-created by researchers working closely through partnerships with primary producers and other relevant food system actors, such as governments and the private sector.



There remains a huge opportunity to repurpose the billions of dollars currently supporting harmful production practices towards promoting the responsible use of less damaging methods. Such a transition could help finance the development and application of many innovations on a global scale to reduce emissions, biodiversity loss, habitat damage, pollution, and post-harvest losses that currently occur in food systems. Again, the proactive promotion of inclusive and equitable resource use and trade should be prioritised throughout these innovation processes.

Beyond investment, evidence shows that innovations have a relatively low level of adoption among primary producers. To close this adoption gap, several steps are critical:

- **Policies:** long-term, coherent policy signals are needed to attract the necessary investments to build nature-positive innovation along the food value chain. Food markets at all levels – local, regional and international – also need to develop and maintain policy and operating structures that ensure benefits will accrue among stakeholders that convert to less damaging and more inclusive production practices. Innovative policy adjustments are also needed to ensure the equitable and inclusive engagement of smallholders.
- **Financing:** primary producers are faced with multiple barriers – including high interest rates, lack of access to finance (particularly for the unbanked smallholders), and high operations and maintenance costs for some innovations. Strong and consistent long-term financing mechanisms are needed to address such barriers and support primary producers in co-developing, testing, deploying and adopting nature-positive innovation at scale. Financial schemes must duly consider specificities of the farming and fishing sectors and proactively apply specific risk mitigation measures, while making sure that financial support is accessible and affordable for primary producers.
- **Integration and coordination:** fragmentation among institutions must be addressed through evidence-based dialogue, and continuous exchange of information across stakeholders in the innovation system (incl. by investing in knowledge sharing support tools or technology). Going beyond, horizontal and vertical coordination among different extension services and wings both in the public and private sector is needed to test, adopt and scale innovative methods and technologies. In parallel, the focus must be put on moving away from short-term, project-driven decisions, to understanding concrete benefits to primary producers and framing decisions on the longer-term.
- **Monitoring and Evaluation:** tracking progress and drawing lessons learned from projects, activities, and programmes will help to showcase the central role of innovation systems in supporting effective and equitable adaptation and mitigation, sustainable productivity growth, as well as improved resilience for primary producers.
- **Holistic, end-to-end vision:** producers' needs must be put at the core of the research and innovation process. In order to ensure long-term adaptation, primary producers should be involved not only as end-users or implementers, but also as co-designers, owners and decision-makers.

### 3. What are the components of the Solution Cluster? How do they work alone and together?

As defined by the *Oslo Manual*, innovation is “a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)”. Beyond research and development, innovation thus encompasses both creation and adoption at end-user level. While often referred to as technology, innovation is a much broader concept, which also includes knowledge sharing, governance and organisational changes, and new processes that, when applied to food production, contribute to improving primary producer livelihoods. Promoting what is working and disseminating it through extension and application is indeed essential to close gaps and make innovations accessible to primary producers of all kinds – particularly smallholders. Within this process, innovative policies can also create enabling conditions allowing production practices to become more resilient to a changing climate, to address food and nutritional insecurity gaps and, more broadly, to align with the 2030 agenda.



This solution cluster promotes investment, deployment and scaling of innovation for nature-positive production and supports the use of innovation in the following areas: (i) Technology and practices; (ii) Knowledge systems (incl. scientific & local); (iii) Policy and governance; and (iv) Data and digital. While the below sections provide an overview of each area, the full list of game-changing solutions that form part of this cluster can be accessed separately (through the *UN Food Systems Summit Compendium*).

### 1) Technology and practices

This solution aims at investing, deploying and scaling up innovation in technology and practices by co-designing contextually relevant solutions with producers, businesses and consumers, policy actors, donors as well as other relevant stakeholders. Out of these actors, particular attention must be paid to primary producers who are critical in reflecting on concrete challenges on the ground. Different starting points and ecosystems must indeed be accounted for, and demonstrate the need to approach solutions at a regional and local level. On this matter, participatory scenario building has already been used successfully to build legitimacy, ownership and trust for policy agendas that tackle bottlenecks, enhance opportunities and stimulate action.

The solution also proposes investing in potentially breakthrough innovations that can shift the dial in the years to come. These technological innovations notably contribute to optimising the use of pesticides and fertilisers (e.g. organic matter production to reduce dependency on chemical fertilisers), to optimising water usage (e.g. hydroponics, advanced water treatment systems), to limiting land conversion and use (e.g. urban farming, vertical farming, reducing deforestation), and to converting waste to inputs for agricultural, livestock, and fishery systems (e.g. local, community-focused and contextualised approaches to circular food systems).

### 2) Knowledge systems

Recognising the central role of scientific and farmer and indigenous knowledge in tackling the challenges of biodiversity loss and climate change while meeting production needs, this solution supports the creation of integrated knowledge and innovation systems that allow decisions to be articulated across multiple levels, while taking into account and adapting to local needs. A more holistic valuing of ecosystems functions and the critical benefits they provide to diverse stakeholders, together with further recognition of the social, economic and environmental impacts resulting from current food system operations, are urgently required to future proof and better align global food systems with the SDG agenda. This can be achieved through formal and informal knowledge transfer systems from researchers to primary producers and vice versa, using appropriate communication tools and implementing or modernising extension services.

Knowledge systems rely on the successful development and deployment of innovation platforms that connect stakeholders across all food value chains. This is particularly critical when it comes to small- and medium-scale primary producers, who often lack access to buyers and markets. Various platforms have thus emerged to better connect stakeholders (global agriculture stakeholders, local farm projects, small producers and buyers, etc.) and to foster collaboration, co-creation and best practice sharing across different contexts. Knowledge systems must indeed consider how producers are already innovating themselves and experimenting with existing resources, and build from and with this knowledge base.

For example, regional food systems innovation hubs have been created to stimulate knowledge exchange and investment through private partnerships, impact investors, and government collaboration. Increasingly, innovation hubs are aiming to draw existing companies to expand into the Global South, invest in local companies that have the potential to scale, and stimulate innovation tailored to Global South markets. Drawing additional investment into scaling up and innovating is especially impactful to SMEs and start-ups that still represent a large part of food production and employment, particularly in developing countries.

### 3) Policy and governance

Institutional, policy and governance innovations are likely to be even more important than technological innovations in dealing with the heterogeneous and uncertain impacts of climate change. Indeed, most of the



food systems challenges emanate from institutional, policy, governance and other non-technical factors. In fact, innovations in these spheres offer the greatest prospects for impact at scale, speed and lowest costs.

This solution fosters policy and governance innovations (including regional, national and local governance structures that connect decision-makers with end-users) as key drivers of transformational change to food systems on a global scale. Such innovations can trigger investment in nature-positive production, support primary producers in the protection, adoption and provision of ecosystem services, and ensure fairness and equity in access to critical resources, capacity building and technologies, irrespective of gender, age, and ethnicity. To do so, policy and governance innovations should give a prominent role to primary producers in the decision-making process, and promote equal participation from relevant groups to ensure large stakeholder buy-in.

Policy innovations also include efforts to modernise and increase the ability of institutions to respond to the difficulties of primary producers (e.g. creating working groups within institutions but open to all stakeholders, developing innovative strategies and policies, etc.), but also to promote adequate regulatory and legislative environments. More specifically, the capacity of producers to make adjustments will depend on the existence of policies and institutions that can support their access to credit and insurance.

#### **4) Data and digital**

Digital technology has great potential to transform food systems at scale, at a fast pace, and at a very low cost. It can be both a source/instigator of innovation, as well as the carrier/transmitter of innovation at scale and speed. For such technologies to deliver at scale, accessibility and adoption must be facilitated to make sure all primary producers – including smallholders – have the resources and skills to operate these tools and make the best use of the data and information they are provided with.

More specifically, digital technologies are able to facilitate the deployment and scaling of innovation for nature-positive, climate-resilient production through:

- Digital climate advisory services (DCAS), which support primary producers in better managing climate variability and risks and in adopting climate-smart practices.
- Smart and prediction technology (analytics and artificial intelligence), as well as digital platforms that facilitate exchange of data, which allow for greater transparency and predictability of field and fishery output, better reporting and benchmarking, and, ultimately, better management of natural resources.
- Precision agriculture based on GPS guidance, control systems, sensors, etc.
- Low cost digital data systems, which provide data to inform sustainable production management. Such data systems also include financial literacy tools and monitoring mechanisms that provide primary producers with some formalised evidence of revenue, which can be leveraged to gain micro-finance and to engage in other innovative practices.
- Low-cost satellite and AI-enabled monitoring systems, which can alleviate primary producers from high-cost, high workload verification of the changes they employ.
- Advanced Internet of Things (IoT) technologies, data science and smart farming and fishing – making sure accessibility issues related to the cost of data and Internet access are addressed.
- Frontier technologies, which can enhance agricultural growth and rural development, improve food and nutritional security, while ensuring sustainable management of natural resources.
- Bundled solutions, which can address the diverse socioeconomic needs that producers have.
- Block chain technology for traceability along nature-positive chains, which can be effectively harnessed to monitor the value and risk flows for various ecosystem players.
- Digital trading and communication platforms, which promote data flows, trade efficiencies and can allow smallholders to increase their personal agency within food trade structures and systems.

Data and digital innovations can enable traceability and transparency, enhance fairness and equity in both value and risk sharing along the chain, as well as value the ecosystem services that primary producers provide in the context of nature-positive value chains. However, to ensure adoption, digital tools need to be co-created with primary producers to supplement traditional knowledge and indigenous techniques rather than replace them. In



order to ensure impact, these tools need to address concrete issues – including lowering production costs, improving incomes and taking proactive steps to ensure smallholders are not marginalised from important market opportunities. Addressing the digital divide will indeed be key to ensure marginalised regions and groups are equally served, including those with no access to digital tools.

With the promise of digitalisation lies the challenge of building a system that positions producers, from the smallest to the largest, at the centre of the conception and scaling-up of technologies, whilst bridging the gap between development and effective use. Primary producers are economic actors, and when it comes to digital technologies, solution developers should demonstrate a return of investment of time and resources for them.

#### 4. What is needed to make the components impactful at scale, and what is stopping them from scaling right now?

The solution proposes investing in initiatives that have demonstrated the ability to scale inclusive, human-centred, end-to-end solutions working across the innovation landscape for food systems, providing tailored solutions to address local needs, while mobilising relevant partners to ensure societal and biodiversity outcomes at scale. Because innovation is a complex process in which governments and other key stakeholders play different roles, scaling it up means adopting a systemic, integrated approach bringing stakeholders together at different stages of the food system.

Four key inputs are needed to make this solution impactful at scale:

- **Increase long-term investment in R&D, innovation, technology and knowledge sharing**, while securing basic socio-economic infrastructure and services. While in some instances this requires the development of new technologies and practices, in others it requires adjustments to how natural resources and other public goods are valued, managed and equitably shared among diverse stakeholders. This can at times drive a “back to the future” outcome where more traditional methods are promoted and scaled upon recognition that they have increased productivity but still impose lesser impacts upon ecosystems than their current industrialised counterparts. Fostering investment also means for food system stakeholders to take existing technologies and practices to scale and to deploy them in such a manner as to realise multiple objectives. To do so will require that such innovations are designed to include the realities and perspectives of primary producers, who actively invest in innovations. Potential ideas include principles and metrics on agricultural and fisheries management innovation – serving as a reference but open to context-specific adjustments – as well as knowledge and data sharing platforms for resource mapping, progress monitoring, training, best practice sharing and collaboration/co-creation. In addition, increased investments in innovation entities, such as accelerators, incubators, funds and start-ups focusing on food systems, will further progress the impact of nature-positive innovation. As well as looking at successful examples, focusing on practices that haven’t proven to work can shed light on present bottlenecks and how to solve them.
- **Realign innovation systems to address climate change, protect nature and improve livelihoods**. National and international institutions responsible for innovation need to become fit for purpose to achieve multiple outcomes. This solution will focus on realigning institutions to address fragmentation and streamlining efforts for greater impact, while putting primary producers at the centre – ensuring that the valuation model fits the producer. This will involve changing incentive structures, management and governance for researchers and the public sector in the space, while ensuring innovation systems focus on impact and societal outcomes (climate, biodiversity and nature, resilience, livelihoods, inclusivity), and promoting greater uptake of research results by food systems stakeholders. Innovations in this space should include actively promoting and enabling production practices that minimise their negative impacts upon broader ecosystems – which includes shifting from the expansion of agriculture and livestock under large industrial actors towards high carbon and/or biodiversity rich ecosystems. Current efforts are disproportionately focused on technical aspects, so realignment should also focus on delivery, addressing issues faced by primary producers.
- **Identify and replicate best practices taking innovation to scale**. These best practices connect capital providers, researchers, and primary producers to co-create and provide a research-for-development “ecosystem for innovation” or “innovation value chain”, capable of catalysing food systems transformation. Other ways to bring innovation to scale include harnessing the power of digital technologies, re-engineering



policies, and investing in backbone socio-economic infrastructure. Primary producers are innovators by nature and they are already implementing a number of solutions to cope with climate change and other challenges affecting their daily businesses. It is key to identify producer-driven solutions which are ready to be scaled up if provided with the right investments and enabling policies, and to complement these with new innovative practices.

- **Identify and prioritise evidence-based approaches that address the critical needs of primary producers** (including the new generation) **through inclusive dialogue**. This will help provide the right support systems for primary producers, as well as ensure gender and social inclusion is addressed explicitly as part of this transformation. Using innovation to re-balance power relations within value chains is essential to ensure that there is fairness, equity and transparency in the distribution of risk, to address producer welfare issues emanating from value chain-based impoverishment, and to ultimately empower primary producers to scale up their existing production and contribute to the local economy.

5. Who are the key types of stakeholders that need to work together to make the components work?

Multi-stakeholder initiatives – bringing together business, governments, international organisations, primary producers and innovators – are essential to finding innovative joint solutions to global challenges and to bringing nature-positive innovation to scale. They allow the creation of platforms for partners to come together in a pre-competitive space and deliver results at the sector- and field-level.

Beyond the global level, regional stakeholder ecosystems for innovation are also needed to ensure innovations are both locally relevant and context-specific, and meet the concrete needs of primary producers. There is also a need for primary producers and governments to have more and increasingly productive dialogues to inform agricultural and fisheries management on local and international scales.

Within such multi-stakeholder ecosystems, primary producers should be centre stage when developing innovations as well as measuring the impact thereof, with a view to address their most pressing needs and challenges, but also to understand wider impacts among rural communities. At the same time, as part of a full value chain approach, consumers must be taken into account, as they will be the ones who ultimately drive demand for nature-positive production practices.

In addition to multi-stakeholder collaboration, more focused partnerships are also essential to delivering on the ground. This is notably the case for partnerships between:

- Private sector actors, governments and development banks, to foster systemic approaches leveraging funding and expertise, and produce blended finance streams;
- Private sector actors and research and development organisations, to inform private sector investment;
- Producer organisations and private sector actors to test, deploy, and replicate models that work;
- Different private sector actors (incl. competitors), to unlock the investment that is needed to deploy and bring innovation to scale – thus addressing issues in a pre-competitive space;
- Food system actors and consumers to engage them in finding and scaling solutions.

**Table: Examples of existing initiatives**

Initiative	Scope	Description
Agriculture Innovation Mission for Climate (AIM4C)	Global, National	AIM4C aims to increase public spending on agricultural R&D and innovation within the next five years to mitigate and adapt to climate change, while conserving nature and biodiversity. It will also coordinate prioritisation of spending, particularly through enhanced links among basic research programmes, applied innovation and R&D for development actors, and national agricultural research extension services.
Meetings of Agricultural Chief Scientists	Global	MACS-G20 gathers ministries or governmental bodies responsible for agricultural research in the respective G20 states as well as leading research institutions to address agriculture and nutrition questions which are too great



of G20 States (MACS-G20)		to be solved with only national efforts, to better coordinate agricultural research systems and to seek and apply common solutions strategies.
Forest, Agriculture and Commodity Trade (FACT) Dialogue Research & Innovation Working Group	Global	The FACT Dialogue Research & Innovation Working Group brings countries together for collective action and collaboration to strengthen and enhance research, development, and innovation efforts to sustainably increase agricultural productivity, improve livelihoods, conserve nature and biodiversity, and adapt and build resilience to climate change within forests and agricultural commodity systems.
100 Million Farmers Multi-Stakeholder Platform	Global, Regional, National	The 100 Million Farmers platform drives aligned ambition on a set of objectives, priorities, and tools, and facilitates collective action to transition towards net-zero, nature-positive food systems by 2030 at the regional and local levels through multi-stakeholder partnerships.
One CGIAR	Global	One CGIAR unites organisations in a global research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.
Global Research Alliance on Agricultural Greenhouse Gases (GRA)	Global	GRA brings countries together to deepen and broaden mitigation research efforts in the agricultural sector. More specifically, it provides a framework for voluntary action to increase cooperation and investment in research activities to help reduce the emissions intensity of agricultural production systems.
Global Alliance for Climate Smart Agriculture (GACSA)	Global	GACSA facilitates dialogue, knowledge exchange and partnerships through an open, diverse and inclusive multi-stakeholder platform, catalysing actions to enhance agriculture, forestry, livestock and fisheries practices and systems that increase productivity in a sustainable way, improve resilience and adaptation and reduce/sequester emissions.
UNDP Farmers Support System Toolkit and Scorecard	Global	The UNDP Farmers Support System Toolkit and Scorecard facilitates common diagnosis and investigation and supports collective vision, strategies and implementation plans for national and sub-national farmer support systems.
AgriCord Building Resilience toolkit	Global	AgriCord’s Building Resilience toolkit helps primary producers identify climate vulnerabilities and design adaptive action based on their priorities.
WFP Innovation Accelerator	Global	The WFP Innovation Accelerator sources, supports, and scales high-impact innovations to disrupt hunger, and leverages new business models to better serve vulnerable communities across the world.
Global Network of Lighthouse Farms	Global	The Global Network of Lighthouse Farms brings together exemplary farms and foodscapes from around the world that have found radical solutions to address sustainability challenges.
Climate-Smart Villages	Global	Climate-Smart Villages foster dialogue between community representatives and researchers to identify appropriate climate-smart options at local level.
The Climakers	Global	Born under the “Farmers’ driven climate change agenda”, the Climakers was conceived by primary producers as a multi-stakeholder alliance proposing solutions to climate change that are producer-driven, science-based and results-oriented.
Local Technical Agroclimatic Committees (LTACs)	Regional (Latin America)	LTACs foster dialogue between a diversity of local actors – including researchers, representatives of the public and private sector and primary producers – who seek to understand climate variability at local level and to mitigate associated risks.
Viet Nam Partnership for Sustainable	National	The Viet Nam Partnership for Sustainable Agriculture (PSAV) convenes various stakeholders to increase productivity for smallholders, while



Agriculture (PSAV)		improving climate resilience, international integration, and the sustainable development of Viet Nam’s agricultural sector.
Klimrek	National	Klimrek mobilises climate consultants to provide ongoing support to primary producers and help them transition to more sustainable practices.

6. Why is the cluster/its components actionable? Which named stakeholders (i.e., member states, agencies, donors, businesses, civil society groups) are enthusiastic about it?

This cluster is actionable as it recognises that nature-positive innovation must deliver at scale, and thus needs to be made accessible to all primary producers – irrespective of their size and region. Innovative and less damaging production methods have already proven their triple-bottom-line benefits in both developing and developed world contexts. An example includes the ‘Village Farmers Initiative’ (VFI) in Nigeria, which aims to bridge the gap in the agricultural landscape by blending local innovations and indigenous knowledge with integrated development strategies. This initiative helps boost the adoption and implementation of innovation and research packages, particularly among women and youth smallholders in socially and economically disadvantaged communities. Other initiatives include the Tropical Forest Alliance, which supports collective action and inclusive dialogue with primary producers to promote deforestation-free supply chains across various regions, including Latin America, Southeast Asia, and West and Central Africa. In Asia, other initiatives, such as the Community Seed Banks (CSBs), aim to protect biodiversity whilst keeping farming profitable by developing adapted crop varieties and sharing them with local farmers.

Building on this unprecedented potential, a variety of stakeholders have joined efforts globally to promote the use of innovation to boost nature-positive production. Since September 2020, around 30 Member States have expressed their willingness to support a global campaign on ‘*Transforming Agricultural Innovation for People, Nature and Climate*’. Launched by the Rt Hon Lord Goldsmith, UK Minister for Pacific and the Environment at the UK Foreign, Commonwealth & Development Office at the 2021 Climate Adaptation Summit, this campaign benefits from strong support under the UK’s COP26 Presidency.

Recognising that a significant increase in investment in innovation for nature-positive production will be a critical factor for meeting the SDGs and Paris Climate Agreement, a wide range of stakeholders have also launched initiatives to support better research and innovation. The Agriculture Innovation Mission for Climate (AIM for Climate), spearheaded by the United Arab Emirates, United States, Australia, Brazil, Denmark, Israel, Singapore, the UK’s COP Presidency and Uruguay, thus aims at increasing public spending on agricultural research and innovation in the next five years. Other initiatives such as the Accelerator for Agriculture and Agroindustry Development and Innovation Plus (3ADI+), spearheaded by the UNIDO and FAO, aim to develop inclusive and sustainable value chains by ensuring that investments in agricultural industrialisation protect natural ecosystems and secure the rights of local communities, especially the most vulnerable.

In addition to increased investment, the Commission on Sustainable Agriculture Intensification (CoSAI) also established a voluntary *Taskforce on Principles and Metrics* to develop and agree on a set of principles and metrics to guide and track innovation for sustainable agriculture.

7. How does the cluster contribute to all 5 Action Track Goals?

While the focus of the solution cluster is on production, its broader objective is to foster nature-positive innovation to address systemic issues across the entire food system – including hunger, healthy and sustainable diets, livelihoods, and resilience.

Links with other Action Tracks are summarised below:

- **Action Track 1 (Ensure access to safe and nutritious food for all):** the cluster, by promoting innovative solutions tackling the impacts of climate change and nature loss on productivity, helps address hunger and increases the availability of safe and nutritious food.



- **Action Track 2 (Shift to sustainable consumption patterns):** the cluster, by encouraging and facilitating the adoption of nature-positive innovations by primary producers, increases the affordability and accessibility of sustainable products for consumers and facilitates a transition in diets towards more sustainable and nutritious foods that don't incur excessive damage to ecosystems in their production or harvest.
- **Action Track 4 (Advance equitable livelihoods):** the cluster, by unlocking new employment opportunities, bridging the rural divide and empowering youth and women to access information, technology and markets, contributes to alleviating poverty and advancing equitable livelihoods. By promoting further recognition of smallholders, this cluster also helps ensure that these critical stakeholders are not further marginalised.
- **Action Track 5 (Build resilience to vulnerabilities, shocks and stress):** the cluster, through a wide range of digital solutions fostering better management of climate risks, ensures primary producers are empowered to prepare for, withstand, and recover from climate variability and shocks. By promoting more sustainable production methods, this cluster also minimises the broader ecosystem impacts incurred through food production, therefore increasing the resilience of natural food production systems and the livelihoods that critically rely upon them.

#### 8. What are key sources of evidence to support the cluster?

The initial theoretical background comes from the 'Action to Transform Food Systems Under Climate Change' report (Steiner et al., 2020), which has seen input from over 100 organisations. This report highlights key challenges pertaining to our food systems, and explores pathways i) to improve productivity to feed a growing population, ii) to create nutritional diets, iii) to ensure equal access to food, and iv) to reduce the negative impacts on the environment.

Taking these theoretical foundations forward, five evidence reviews were commissioned as part of the COP26 campaign on '*Transforming Agricultural Innovation for People, Nature and Climate*'. Serving as further evidence for this cluster, these five studies show that there is clear underinvestment in innovation that works for people, nature and climate, and that better partnerships are needed to address the investment gap and create the right environment to make innovation an enabling factor for food system transformation (Snapp et al., 2021; IFPRI, 2021; De Clerck et al., 2021).

#### 9. How is the cluster aligned with other related initiatives?

Innovation cuts across various strands of the UN Food Systems Summit. While focusing on production, this solution cluster thus closely aligns with other workstreams of the UN Food Systems Summit, including which:

- The Innovation Lever of Change and its four areas of focus (knowledge and technology, societal and institutional, regional and national, data and digital).
- Action Track 2, as the solution does not only rely on incentivising primary producers to adopt nature-positive innovation, but also on empowering consumers to demand and support this type of agricultural production.
- Other solution clusters within Action Track 3:
  - 'Monitoring, stakeholders and evidence; driving restoration impact', through the role data can play in measuring progress and making informed decisions.
  - 'Transformation through agroecology and regenerative agriculture', as innovative approaches need to work alongside regenerative and inclusive practices to enable the transition to nature-positive food production systems.
  - 'Sustainable Livestock', in which key stakeholders from farming, science, government, business, civil society and consumers outline pathways on how technological, social and organisational innovation can be fostered and broadly adopted to optimise resource utilisation of livestock, and ensure food and nutrition security.
- Solution clusters within other Action Tracks, which use innovation as an enabler to tackle issues along the food value chain, including which:



- Solution cluster 1.1.1 (within Action Track 1) ‘Democratising access to future technology, inputs, and finance: empowering smallholders as stewards of healthy and productive soils’, which supports healthy diets and a decrease in hunger by using technology to increase yields, while improving soil health and increasing soil carbon sequestration.
- Solution cluster 1.3.2 ‘Enable food safety innovation and tools’, which uses innovation to ensure food is not only nutritious and affordable, but also safe.
- Solution cluster 7.1.1 ‘Innovation for Alternative Proteins’ (within Action Track 2), which deals with alleviating pressure on the food system by encouraging alternative protein production through innovation, while also ensuring economic development and nutritious food.

Beyond the United Nations Food Systems Summit, this cluster is closely aligned with existing FAO Voluntary Guidelines, as well as with the Sustainable Agriculture strand of COP26, and more particularly the campaign on ‘*Transforming Agricultural Innovation for People, Nature and Climate*’, which calls for a shift in focus for investment in agricultural innovation and the generation of partnerships, synergies and knowledge-sharing to bring innovation to scale.

### 10. How does the cluster involve/take into account women’s empowerment, gender equity, and youth engagement?

This solution aims at ensuring women and men primary producers are provided with the means to co-design, adopt and scale innovative solutions that address their needs. By recognising there are significant gaps between men and women in access to and benefits from innovation, this solution supports policies, investments and practices that aim to address such gaps. Several game changing ideas place particular emphasis on ensuring sustainable economic opportunities for women, youth, and indigenous communities. This is for example the case of urban food system development and urban gardening, which generate income opportunities for women in cities. But this is also the case in more rural areas, where a range of projects are implemented across different countries to empower women smallholder groups with tailored packages of support and to help female-led cooperatives connect with nature-positive production methods and access to the digital economy.

Furthermore, in continents like Africa, where almost 60% of the population is under 25 years of age, innovation that is co-designed and targeting youth, including digital and financial support systems, can be a major lever for food systems transformation. This cluster seeks to include the new generation of women and men primary producers in decision-making and empower them to bring innovative solutions to farming and the rest of the food system. Indeed, making farming more appealing to the new generation of primary producers is essential, as they are often early adopters of technology and are in a key position to advance nature-positive innovation.

### 11. How much will the cluster be financed?

Protecting, managing and restoring nature under a changing climate will require large increases in investment into innovative and scalable solutions, as well as a rethinking of how we design and deliver this investment. Current rates of investment are projected to deliver only 40% of the climate change mitigation needed to reach the ambitions of the Paris Climate Agreement (Wollenberg et al., 2016).

This solution aims to support financing models and instruments which enable system actors to develop, adopt, deploy and scale innovations, which give primary producers access to productive assets (land, capital) and the ability to invest in more sustainable production practices, and which empower youth, women and marginalised groups to significantly contribute to the transition.

As activities and assets that degrade nature are becoming less profitable, and those that protect and add to natural capital are becoming more valuable, a fast-growing market in nature-positive innovative solutions is emerging. The Food and Land Use Coalition estimates that US\$ 300-350 billion of investment capital is required annually up to 2030 for the transition to sustainable food and land use systems, of which US\$ 90-115 billion is needed to deploy solutions that protect, manage and restore nature (FOLU, 2019). Similarly,



CoSAI estimates that US\$ 15 billion are needed in research and development for sustainable agriculture (CoSAI, 2021). This cluster envisages two key components for finance to contribute to innovation for nature-positive production.

### 1) Financing for nature-positive solutions

The design, development and scaling of nature-positive innovation require a substantial increase in the level of investment in agricultural research and innovation. This includes dramatic improvements in the level and quality of national investments, a reorientation of current agricultural subsidies into nature-positive innovation, and the scaling up of public and private investments.

The current structure of both subsidies and commercial financing indeed tends to favour high input models that have damaging impacts on nature, at the expense of nature-positive practices. To influence policies and action and support primary producers in their transition, several steps are critical:

- A reorientation of subsidies must be undertaken. During this period, particular attention must be paid to transitional funding – which includes investing in the right tools, knowledge, and support – to ensure producers are empowered to make transformative changes and to cover potential losses resulting from the transition of their production systems. For the transition to successfully take place, the very nature of funding cycles needs to be adapted – making sure they cover the full duration of the transition, and involve everyone along the chain.
- Beyond public funding, private sector investment in nature-positive innovation must also be encouraged.

Most importantly, finance for nature-positive solutions must recognise the central role of primary producers and their organisations, which should be part of investment decision-making. For nature-positive innovation to deliver at scale, capital providers need to move away from a ‘development aid’ mind-set to listening to producers, co-building solutions adapted to their needs, and helping them create viable business that can be self-sustaining. Using tailored financing mechanisms, adapted to different sectors, geographies, socio-economic contexts, and population groups, will enable nature-positive solutions to be “income-positive” for producers, allowing even the most marginalised groups (including women, youth and indigenous communities) to benefit from such a transformation.

The past year has seen growing interest for financing for nature-positive solutions, with the COP26 campaign on *Transforming Agricultural Innovation for People, Nature and Climate*, the *FACT Dialogue Research, Development and Innovation Working Group*, and *AIM for Climate*. Working with such initiatives will be key to finance the ambitions of this cluster.

### 2) Innovation in financing instruments

Boosting nature-positive production will require significant additional capital, however this cannot be covered by the current financial market setup that is highly reliant on public finance and dissociates public and private funders. Innovation is required in the design of financial instruments to encourage the transition towards nature-positive production and ongoing use of nature-positive practices. This includes impact investment, blended finance, carbon credits, payments for ecosystem services, green bonds and other mechanisms to de-risk the transition, as well as more outcome-based payments and more partnerships across investors to support small projects going to scale. To ensure innovations can actually scale, boosting financial services that support entire value chains will also be key.

Scaling nature-positive solutions will also require more evidence on their impact. To generate such evidence, better measurement and verification systems are needed – to communicate transparently not only on impact, but also on the level of adoption among producers, as well as on potential trade-offs. Putting in place rigorous and cost-effective monitoring systems, that are low cost, easily accessible and easy to use for all, will facilitate impact assessment for new innovations. This will be crucial for both public and private capital providers, and will enable those initiating the transition to be rewarded for their efforts.



Mobilising finance for nature-positive innovation will ultimately rely on effective evidence and knowledge sharing. Recognising that nature-positive solutions are highly context-specific, evidence is needed to understand the ability to replicate and scale specific innovations. Sharing evidence on what works, where, and for whom, and showing that tangible social and environmental benefits can be achieved will attract additional capital providers – in a context where a growing number of investors are now held accountable for their efforts to deliver on the SDGs (e.g. through the SDG Impact standards framework).

### 12. What kind of impact can be expected over what time frame?

In the near-term, a systematic analysis of current policies and subsidies will allow to identify gaps, opportunities, and trade-offs that may be needed for nature-positive innovation to reach all primary producers. During this process, primary producers should remain centre stage, so that innovations are tailored to their needs and can be easily adopted across different geographies and socio-economic contexts. In parallel, collective evidence and knowledge sharing will enable stakeholders to identify successful business models and partnerships, as well as cost-effective and practical solutions that deploy these innovations on the scale needed to meet climate and nature goals. This collective work is already underway through the COP26 campaign on *Transforming Agricultural Innovation for People, Nature and Climate*, which sheds light on successful innovations and partnerships that can deliver at scale.

In parallel, both public and private actors must increase investment in agricultural research and innovation to develop more climate-resilient, nature-positive technologies and practices. In addition to this, shifting current spending for innovation and rethinking subsidy structures will be key to enable nature-positive solutions to become accessible to all. Public and private capital providers will be assessed against concrete targets – including the objective of having at least a third of agricultural research and innovation investments deliver demand-driven solutions across food systems, to protect nature and limit climate change, as set out in the emerging *Global Action Agenda for Innovation in Agriculture* to be launched at COP26, aligned to the FACT Dialogue Roadmap (2022-26). Initiatives such as AIM for Climate will enable this to happen, by ensuring increasing investment in agricultural innovation and research and development for climate-smart food systems over the next five years.

A continuous impact indicator will be the number of primary producers that are transitioning towards nature-positive production practices. This target is at the core of the 100 Million Farmers multi-stakeholder platform, which aims to empower 100 million farmers to adopt nature-positive practices by 2030 – in line with the SDG goals of zero hunger and attaining food and nutritional security for all by 2030.

In the longer term, innovation must ensure that food systems achieve ‘net zero’ emissions by 2050, reverse biodiversity loss and maintain sustainable healthy food production for all.

**Appendix A**

<b>Member States engaged in the cluster</b>
Australia
Canada
Kenya
Myanmar
Singapore
Thailand
United Arab Emirates
United Kingdom
United States of America

**Appendix B**

<b>Organizations engaged in the cluster</b>
African Union Development Agency - New Partnership for Africa's Development
AgriCord
Alliance of Bioversity International & CIAT
Association of Southeast Asian Nations Climate Resilience Network
European Commission
Finnish Agri-Agency for Food and Forest Development
Food and Agriculture Organisation
Food and Land Use Coalition
High Level Champions UNFCCC COP26
International Centre for Biosaline Agriculture
International Pole & Line Foundation
One Planet Business for Biodiversity
Participatory Ecological Land Use Management
Plant Based Foods Association
Southern African Confederation of Agricultural Unions
Southern African Development Community
Summit Champions Network
UN Economic Commission for Africa
UN Industrial Development Organisation
UNFSS Champions Network
Village Farmers Initiative
World Economic Forum
World Farmers Organisation
World Food Programme
World Resources Institute

**Appendix C – Visualisation Map**

The areas, themes, and topics covered by this solution cluster are closely linked to other solution clusters within Action Track 3, as well as to solution clusters within the other four Action Tracks, and the levers of change. This visualisation [map](#) connects the dots and provides an insight into how all these different ideas come together.



## References

- ALSTON, J.M., PARDEY, P.G. 2014. Agriculture in the Global Economy. *Journal of Economic Perspectives*, 28 (1): 121-46.
- BENTON, T. G., BIEG, C., HARWATT, H., PUDASAINI, R., & WELLESLEY, L. 2021. Food system impacts on biodiversity loss. Three levers for food system transformation in support of nature. *Chatham House, London*.
- CoSAI. 2020. Emerging results: Investment landscape for transforming agricultural innovation systems for people, nature and climate.
- CoSAI. 2020. Emerging results: The current investment in agricultural innovation in the Global South .
- CRIPPA, M., SOLAZZO, E., GUIZZARDI, D. ET AL., 2021. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, 2, 198–209.
- DECLERCK, F.A., KOZIELL, I., SIDHU, A., WIRTHS, J., BENTON, T., GARIBALDI, L.A., KREMEN, C., MARON, M., RUMBAITIS DEL RIO, C., CLARK, M., & DICKENS, C. 2021. Biodiversity and agriculture: rapid evidence review.
- FAO. 1999. Recommended International Code of Practice General Principles of Food Hygiene.
- FAO. 2021. Innovation at FAO.
- FAO. 2021. The State of Food Security and Nutrition in the World 2020.
- FERDINAND, T., E. ILLICK-FRANK, L. POSTEMA, J. STEPHENSON, ET AL. 2021. A Blueprint for Digital Climate Informed Advisory Services: Building the Resilience of 300 Million Small-Scale Producers by 2030. *Working Paper. Washington, DC: World Resources Institute*.
- FOOD AND LAND USE COALITION. 2019. Growing Better: Ten Critical Transitions to Transform Food and Land Use.
- FUGLIE, K., GAUTAM, M., GOYAL, A. & MALONEY, W. F. 2020. Harvesting Prosperity: Technology and Productivity Growth in Agriculture. *Washington DC, World Bank*.
- HAVEMANN, T., NEGRA, C. & WERNECK, F. 2020. Blended finance for agriculture: exploring the constraints and possibilities of combining financial instruments for sustainable transitions. *Agric Hum Values* 37, 1281–1292.
- HLPE. 2018. Multi-stakeholder partnerships to finance and improve food security and nutrition in the framework of the 2030 Agenda. *A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome*.
- INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE. 2021. Estimating the global investment gap in research and innovation for sustainable agriculture intensification in the Global South. *Colombo, Sri Lanka: Commission on Sustainable Agriculture Intensification*.
- JOLY, P.B. 2018. Innovation and the Problem of Values.
- KILELU, C.W., KLERKX, L., & LEEUWIS, C. 2013. Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme. *Agricultural Systems*, 118: 65-77.



- LABARTHE, P., SUTHERLAND, L.A., ELZEN, B., & ADAMSONE-FISKOVICA, A. 2018. Advisory role in farmers' micro systems of agricultural knowledge and innovation. *13<sup>th</sup> IFSA Symposium*, 1-5.
- LABORDE, D., PARENT, M., & SMALLER, C. 2020. Ending Hunger, Increasing Incomes, and Protecting the Climate: What would it cost donors? Ceres2030. *International Institute for Sustainable Development (IISD) and International Food Policy Research Institute (IFPRI)*.
- LOBOGUERRERO, A. M., THORNTON, P., WADSWORTH, J., CAMPBELL, B. M., HERRERO, M., MASON-D'CROZ, D., DINESH, D., HUYER, S., JARVIS, A., MILLAN, A., WOLLENBERG, E. & ZEBIAK, S. 2020. Perspective article: Actions to reconfigure food systems. *Global Food Security*, 26, 100432.
- LELE, UM. & ROSEGRANT, M. W. 2021. 4 + 6.5 + 4.7 =15.2: Is that all it will take? *Commission on Sustainable Agriculture Intensification*.
- OECD/EUROSTAT. 2018. Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, *OECD Publishing, Paris/Eurostat, Luxembourg*.
- OECD, 2021. *Agricultural Policy Monitoring and Evaluation*.
- PHARO, P., OPPENHEIM, J., LADERCHI, C. R. & BENSON, S. 2019. Growing Better: Ten Critical Transitions to Transform Food and Land Use. *Food and Land Use Coalition*.
- SMITS, R. 2002. Questions from a user's perspective. *Technological forecasting and social change*, 69 (9): 861-883.
- SNAPP, S., KEBEDE, Y., WOLLENBERG, L., DITTMER, K.M., BRICKMAN, S., EGLER, C., & SHELTON, S.W. 2021. Agroecology and climate change rapid evidence review: Performance of agroecological approaches in low-and middle-income countries. *Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*.
- STEINER, A., AGUILAR, G., BOMBA, K., BONILLA, J. P., CAMPBELL, A., ECHEVERRIA, R., GANDHI, R., HEDEGAARD, C., HOLDORF, D., ISHII, N., QUINN, K. M., RUTER, B., SUNGA, I., SUKHDEV, P., VERGHESE, S., VOEGELE, J., WINTERS, P., CAMPBELL, B., DINESH, D., HUYER, S., JARVIS, A., LOBOGUERRERO, A. M., MILLAN, A., THORNTON, P., WOLLENBERG, L. & ZEBIAK, S. 2020. Actions to Transform Food Systems Under Climate Change. *Wageningen, The Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)*.
- TOUZARD, J.M., TEMPLE, L., GOULET, F., CHIFFOLEAU, Y., & FAURE, G. 2018. Innovation and development in agricultural and food systems. *Quae*.
- VAN DER VEEN, M. 2010. Agricultural innovation: invention and adoption or change and adaptation?. *World Archaeology*, 42 (1): 1-12.
- WOLLENBERG ET AL. 2016. Reducing emissions from agriculture to meet the 2C target. *Global Change Biology*, volume 22 (12).