The Triple Gap in Finance for Agrifood Systems

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ABOUT CPI AND CLIC

Climate Policy Initiative (CPI) is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has seven offices around the world in Brazil, India, Indonesia, South Africa, the UK, and the US. The ClimateShot Investor Coalition (CLIC) is a global coalition working to accelerate and scale finance for low-carbon, climate-resilient, and nature-positive agriculture and food systems globally. CPI is the Secretariat of CLIC.

ABOUT FAO

The Food and Agriculture Organization (FAO) is a specialized agency of the United Nations that leads international efforts to defeat hunger. FAO's goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives. FAO seeks to support the 2030 Agenda through the transformation to more efficient, inclusive, resilient, and sustainable agrifood systems for better production, better nutrition, a better environment, and a better life, leaving no one behind. With 195 members – 194 countries and the European Union –, FAO works in over 130 countries worldwide.

DESCRIPTORS

SECTOR

Agrifood Systems, Agriculture, Food Systems, Forestry, Fisheries and Aquaculture, Other Land Use

REGION

Global

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Climate finance, agrifood systems, agriculture, forestry, fisheries, aquaculture, land use, AFOLU

RELATED CPI WORKS

Landscape of Climate Finance for Agrifood Systems
The Climate Finance Gap for Small-Scale Agrifood Systems
Landscape of Climate Finance for Agriculture, Forestry, Other Land Uses, and Fisheries

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EXECUTIVE SUMMARY

Agrifood systems form the cornerstones of economies, societies, and ecosystems across the world, but also generate significant environmental costs. Agrifood systems are currently responsible for a third of the world's greenhouse gas (GHG) emissions—second only to energy systems. They are also the primary source of nitrous oxide and methane emissions, deforestation, biodiversity loss, and freshwater consumption globally. In addition, these systems are both already being impacted and highly vulnerable to the effects of climate change: rising temperatures, floods, storms, droughts, and other extreme weather events that are already, and will continue to, severely reduce agricultural productivity and disrupt supply chains.

Transitioning agrifood systems to low-carbon, climate-resilient, and nature-positive pathways will deliver significant climate co-benefits. Given their intrinsic relationship with the environment, agrifood systems can naturally reduce GHG emissions, sequester carbon, and restore biodiversity and natural habitats. However, to achieve their adaptation and mitigation potential, the scale of climate investment in these systems must drastically increase. Climate finance flowing to agrifood systems amounted to an annual average of USD 28.5 billion, or less than 5% of total global climate finance tracked in 2019/20 (CPI, 2023).

This report takes a systems-based approach to analyzing the investment needs of the agrifood sector. This goes beyond the traditional agriculture, forestry, and other land use (AFOLU) framework to encompass the entire process of agricultural and food production, from farm, to table, to waste. Agrifood systems also include non-food products (e.g., biofuel, fibers, and timber) that support livelihoods, along with the stakeholders, activities, investments, and decisions involved in bringing products to end consumers (FAO, 2023c). This framework better reflects the complex interactions and feedback loops between the sectors involved across agrifood value chains.

The analysis takes an unprecedented, two-pronged approach to estimating investment needs for global agrifood systems. This dual approach blends the expertise of CPI and FAO to comprehensively understand the gaps between the available, estimated, and required funding to transition agrifood systems to low-carbon and climate-resilient pathways. The "top-down" method estimates the level of climate finance required to fund the actions and interventions needed in agrifood systems to keep the average global temperature rise within 1.5°C by 2050. The "bottom-up" method estimates the level of climate finance required by countries to achieve their national climate targets for agrifood systems, as stated in their Nationally Determined Contributions (NDCs) submitted to the UN Framework Convention on Climate Change (UNFCCC).

A comparison between the top-down and bottom-up analyses reveals three gaps in transitioning agrifood systems: in planning, finance, and data. The two approaches estimate investment needs from different perspectives to understand not only the shortfall in climate finance delivered for agrifood systems at a global level, but also the underestimations from governments about their climate funding needs at a national level. The findings of this "triple gap" aim to inform policy and investment decision-makers about the steps required to transition agrifood systems, especially considering the UNFCCC's upcoming submission deadline for the next round of NDCs in 2025.

KEY INSIGHTS

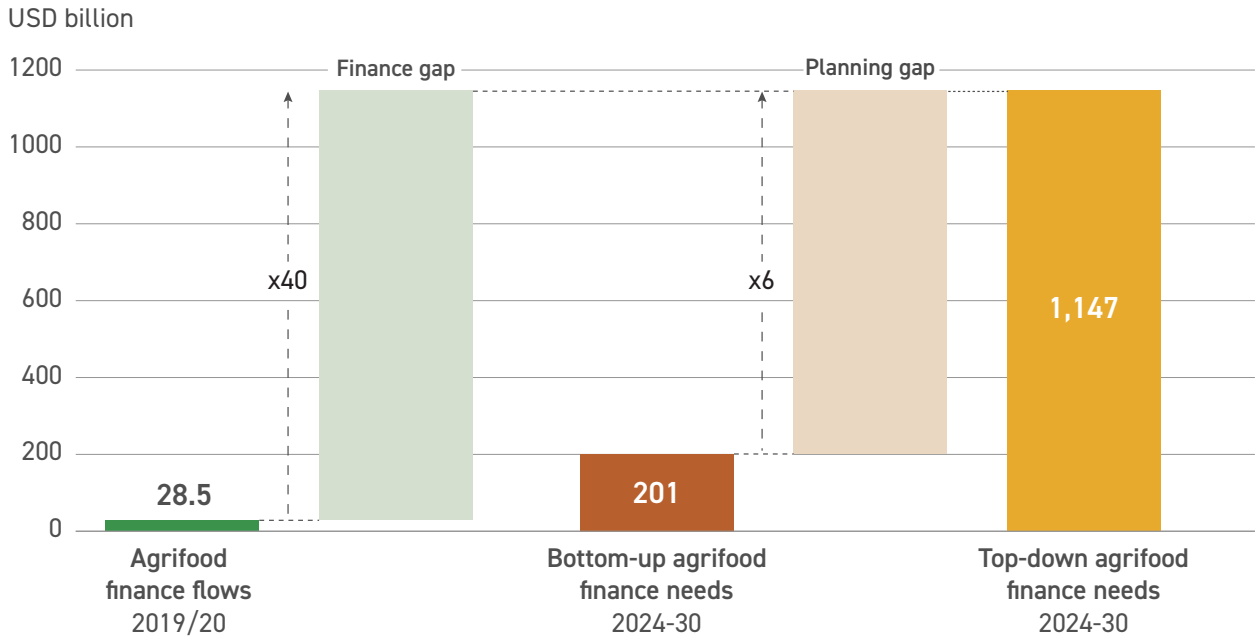
The cost of transitioning global agrifood systems to a 1.5°C-aligned pathway is estimated to run to over a trillion dollars a year. According to the top-down analysis, global agrifood systems require USD 1.1 trillion annually until 2030 to achieve emissions reduction and climate resilience targets under the Paris Agreement. As per the bottom-up analysis, countries with agrifood finance needs require a collective USD 201.5 billion annually until 2030 to achieve the climate pledges stated in their NDCs. These results demonstrate that national governments have to plan for an increase in climate finance commitments for agrifood systems by at least six times, a finding that this report refers to as the "planning gap" (see Figure 1).

Climate finance flows to global agrifood systems must increase by 40 times from current levels to achieve their climate transition. Current climate investments in sustainable agrifood systems are so low—estimated at USD 28.5 billion in 2019/20—that scaling them up to the needs expressed in the bottom-up analysis would be a significant policy win. However, financial flows must reach the level estimated by the top-down analysis to keep global agrifood systems on a 1.5°C pathway. The longer the delay in capital deployment for climate action, the more climate impacts are expected to intensify, and the higher these costs may increase, exacerbating the "finance gap" (see Figure 1).

Current NDCs underestimate the level of investment required to achieve their climate pledges for agrifood systems. Climate finance needs for agrifood systems account for only 15% of total funding needs reported in NDCs, despite the sector contributing a third of global GHG emissions. Furthermore, only 37% of the 167 Parties to the Paris Agreement that have submitted NDCs provide a breakdown of the level of climate finance needed for specific sectors, with the majority defined in developing economies. This report refers to this shortcoming as the "data gap."

Data limitations in both top-down and bottom-up approaches also complicate the results of this report. Both analyses are impeded by significant gaps in the availability and quality of data, making it difficult to accurately assess the disparities in investment needs between the two methods. Compounding these challenges, both approaches rely on different datasets, coverage, and assumptions. This creates inherent imprecisions within the analysis, and makes it harder for estimate the exact level of support the sector needs. This limitation falls under what this report defines as the "data gap".

Figure 1: Climate finance flows (annual average, 2019/20) vs. needs for agrifood systems (top-down and bottom-up estimated annual averages, 2024-30)



TOP-DOWN RESULTS

NEEDS BY SECTOR

- At USD 467.5 billion annually, **policy, national budget support, and capacity building** comprise over 40% of climate finance needs—with policy and financial instruments including agricultural subsidies and economic incentives, requiring the largest share of investment.
- **Crop and livestock systems**, which are the largest users and sources of emissions from agricultural land worldwide, represent almost a third of estimated needs (USD 316.7 billion). Greater financing is required in the fields of emissions reduction, crop diversity, and climate-smart agriculture.
- **Biodiversity, land, and marine ecosystems** supporting agrifood systems require nearly USD 188 billion annually, highlighting the importance of nature-based solutions for land restoration, ecosystem conservation, and biodiversity protection.
- F**orestry sector** flows must increase by 10 times to reach USD 116.8 billion per year, reflecting the catalytic role that forest systems play in both mitigation and adaptation.
- **Food and diets** require USD 52.8 billion annually, prioritizing investments in food loss and waste, alternative proteins and plant-based diets, and local linkages between urban consumers and farmers.
- **Fisheries and aquaculture** represent USD 5.3 billion of annual climate finance needs, with a focus on reallocating nature-negative subsidies and mainstreaming blue finance.

BOTTOM-UP RESULTS

NEEDS BY GEOGRAPHY

- Agrifood finance needs have been predominantly estimated by developing economies, with **sub-Saharan Africa** (35%)**, Europe & Central Asia** (35%), and **Latin America & the Caribbean** (33%) constituting the highest share of climate finance needs as a portion of total costed needs.
- **Sub-Saharan Africa** had the highest number of NDCs with costed needs for agrifood systems (63%), significantly higher than the global average (37%).

NEEDS BY SECTOR

- **Ecosystems and biodiversity** (26%) constitute the highest share of climate finance needs reported, prioritizing nature-based solutions for ecosystem conservation, restoration, and management.
- **Forest systems** and **crop-based systems** each comprise 23% of estimated needs, with a focus on reforestation, agroforestry, and water conservation.
- Pre- and post-production processes along agrifood value chains, including **energy industrial** (8%), **waste** (2%), **and post-harvest** (1%) **processes** comprise a collective 11% of climate finance needs, constituting a major mitigation action gap in current NDCs.
- **Livelihoods, health, and food security** represent a 10% share of climate finance needs reported in agrifood systems, while **livestock and grassland-based systems** constitute 8% of estimated needs.

NEEDS BY CLIMATE OBJECTIVE

- The global distribution between **adaptation and mitigation** finance requirements in agrifood systems is almost equal, highlighting the need for cross-cutting investments that address both objectives simultaneously, alongside dedicated investments against each area.
- However, **mitigation** dominates agrifood finance needs expressed at the sector level, comprising 75% of estimates. This disparity suggests that the true size of adaptation needs may be underestimated due to the challenges in accurately costing adaptation finance.

NEEDS BY SOURCE OF FINANCE

- 65% of climate finance needs for agrifood systems reported in NDCs are conditional, or dependent on **international public and private finance sources.**
- This reliance is especially pronounced in climate-vulnerable regions with limited domestic resources, such as the Middle East & North Africa (74%) and East Asia & the Pacific (73%).

OPPORTUNITIES AND RECOMMENDATIONS

The triple gap of planning, finance, and data must be bridged simultaneously to ensure a successful transition to resilient and low-emission agrifood systems. The following recommendations have been made to address the challenges faced by agrifood systems regarding climate finance, and the corresponding opportunities to bridge these gaps.

The Challenge	The Opportunity
The Planning Gap	▪ Further integrating agrifood and climate in the development narrative would help create a more holistic picture of investment need, facilitating the deployment of capital. ▪ Aligning domestic ambitions with global investment needs estimates can build clarity on the need to ensure collective climate action for agrifood systems. ▪ Existing international organizations and initiatives, such as the NDC and FAST partnerships, should actively engage in financing the agrifood systems climate transition to support national governments. ▪ Outlining priorities for public investment in and through the NDCs can create a conducive climate for private investment. ▪ Increasing domestic finance targets within NDCs would demonstrate a commitment to climate goals and build private and international investor confidence.
The Finance Gap	▪ Policymakers and regulators must design sector-specific investment plans that integrate both public and private financing to help signpost investment opportunities to agrifood systems. Country platforms could support and help implement the planning and execution of this key step. ▪ Integrating a climate lens into existing financial flows could redirect climate- and nature-negative investments towards the transition, without requiring new sources of investment. ▪ Pricing climate adaptation and mitigation into agrifood investments could ensure that financial flows are directed toward low-emission, climate-resilient activities. ▪ Establishing a working group of key organizations engaged in agrifood investment would facilitate greater coordination and alignment on finance roadmaps for the sector.
The Data Gap	▪ Collecting more comprehensive and consistent finance data is required to fully leverage NDCs as sources of information to guide Paris-aligned investments. ▪ Aligning both top-down and bottom-up approaches to develop rigorous, transparent, and standardized methods to cost climate finance needs will help develop the knowledge base for investments. ▪ Adopting a clear definition and consensus on the scope of agrifood systems can facilitate improved data collection and analysis. ▪ Developing regional- or country-specific models is critical to identifying where the largest finance gaps exist.

CONTENTS

1. INTRODUCTION

WHY ANALYZE CLIMATE FINANCE FOR AGRIFOOD SYSTEMS?

Agrifood systems are the cornerstones of economies, societies, and ecosystems across the world—however, they also generate significant costs. Agrifood systems are the world's biggest employer, providing livelihoods to over a billion people (Davis et al, 2023). In low- and middle-income countries (LMICs), they account for over two-thirds of all jobs and nearly a third of total GDP, compared to a world average of 4% (World Bank, 2022b, 2024). However, they also generate USD 10 trillion each year in hidden social, economic, and environmental costs (FAO, 2023), which are disproportionately generated by high-income countries and borne by low-income ones. As several of these impacts are not factored into market prices or economic incentives, they are not accounted for in traditional cost-benefit analyses. This can have distortive effects on estimating the true costs of current agrifood systems, and which actors bear responsibility as a result. Additionally, LMICs and small island developing states (SIDS) are more exposed to agrifood risks due to a myriad of reasons including geography, location, colonial legacies, histories of monocropping and extractive economies, and others.

Agricultural ecosystems can be both a contributor and casualty of climate change, as well as a solution to building climate resilience. Agrifood systems are currently responsible for a third of the world's GHG emissions—second only to energy systems—and the primary source of nitrous oxide and methane emissions, deforestation, biodiversity loss, and freshwater consumption globally (FAOSTAT, 2024). They are also highly vulnerable to the effects of climate change—rising temperatures, floods, storms, droughts, and other extreme weather events can severely reduce agricultural productivity and disturb supply chains. Since the 1980s, the impacts of climate change have reduced agricultural productivity by 1-5% per decade (Steiner et al., 2020). At the same time, given their intrinsic relationship with the environment, agrifood systems have the inherent potential to deliver co-benefits for climate mitigation and adaptation. Upstream activities can provide 20-30% of the GHG mitigation needed for a 1.5°C or 2°C pathway, particularly through avoided deforestation and improved agricultural practices (IPCC, 2022). Agroforestry has the potential to increase food security for over a billion people by increasing nitrogen available to crops, enhancing soil carbon storage, and halving erosion rates (FAO, 2023).

Adopting a systems-based approach to agrifood systems, rather than the traditional Agriculture, Forestry, and Other Land Use (AFOLU) framing, better reflects the complex interactions of the sectors involved across the value chain. The vulnerability of the food supply chain to external stressors has been exposed by the climate crisis, COVID-19 pandemic, price inflation, geopolitical tensions, and other ensuing shocks. As a result, addressing socioeconomic and environmental underperformance in agrifood systems—particularly food security, affordability, and access—can no longer only be addressed from the lens of production. Recognizing this, nearly 160 countries endorsed the Emirates Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action, which calls for the systematic integration of agrifood systems into national climate pledges and related public policies.

WHAT IS THE CURRENT STATE OF CLIMATE FINANCE FOR AGRIFOOD SYSTEMS?

Climate finance to agrifood systems is deeply insufficient to achieve a transition toward a low-carbon, climate-resilient pathway. Initial analysis by the ClimateShot Investor Coalition (CLIC), of which Climate Policy Initiative (CPI) is the Secretariat, found that climate finance flowing to agrifood systems amounted to an annual average of USD 28.5 billion, or less than 5% of the global total tracked in 2019/20. Along with volume, public and private capital need to be pragmatically allocated toward climate mitigation and adaptation, instead of funding actions that compound these challenges. For instance, the distortionary effects of agricultural subsidies on the environment have been a longstanding public policy issue – subsidies to high-carbon crops and livestock are estimated to be responsible for 14% of global deforestation (World Bank, 2023).

To mobilize climate action for agrifood systems, greater efforts are needed to understand the size and nature of the investment gap. Quantifying the gap between current finance flows and needs allows for a more transparent view of progress toward a low-carbon, climate-resilient pathway. A more precise and detailed picture of finance needs can help both measure progress and coax key stakeholders to direct more capital to critical and underserved areas. Establishing a baseline for financial needs to track action against the efforts required to mitigate and adapt to climate change is particularly necessary ahead of 2025, when the parties to the Paris Agreement will submit their revised Nationally Determined Contributions (NDCs) to the UNFCCC. Moreover, refining investment needs with improved data quality and granularity can help equip capital owners and policymakers active in the agrifood space with the tools and data required to allocate finance productively.

This report is the first step in a research cycle to inform global decision-makers of the current opportunities to scale climate finance flows to agrifood systems. The next step will be an update to the Landscape of Climate Finance for Agrifood Systems (CPI, 2023), which will analyze public and private finance flows to the sector over 2021/22. Slated for early 2025, this follow-up report will compare investment needs with the most recent available figures. This will be succeeded by a financial roadmap identifying types and sources of capital, as well as levels of financing for potential technologies and solutions to address the climate finance gap in agrifood systems. The roadmap will be a sectoral application of a broader methodology that CPI will publish for consultation in a whitepaper by the end of 2024.

2. SCOPE AND METHODOLOGY

2.1 SCOPE

This report takes a systems-based approach to the agrifood sector, which goes beyond the traditional AFOLU framework. This better reflects the complex interactions and feedback loops between the sectors involved in the agrifood value chain and considers their costs and benefits to humans. Agrifood systems also include non-food products that support livelihoods, along with the actors, activities, investments, and decisions involved in bringing products to end consumers (FAO, 2023c). As a result, this concept of agrifood systems encompasses the entire process of agricultural and food production, from farm, to table, to waste.

The definition of agrifood systems used in this report builds on the approach taken in the Landscape of Climate Finance for Agrifood Systems (CPI, 2023) and the State of Food and Agriculture (FAO, 2023c). It adopts the scope developed by FAO, IFAD, UNICEF, WFP, and WHO, which expands the definition of agrifood systems (Crumpler et al., 2024) to include:

- Both agricultural and food systems, i.e., both food and non-food agricultural products with significant overlaps;
- All food products derived from farms, forests, fisheries, and other sources intended for human consumption;
- The entire range of actors across the value chain and their interconnected activities, from the production, to distribution, to disposal of food products, including those of non-agricultural origin;
- The diverse economic, societal, and natural environments in which agrifood systems operate, from the institutions and stakeholders that govern the sector to the ecosystems and biodiversity that support production.

To support this systemic framing, the analysis in this report is based on an improved taxonomy (see Annex I), resulting from a joint effort between CPI and FAO to align their classifications of sectors, activities, and solutions relevant to agrifood systems.

2.2 ANALYTICAL APPROACH

This report takes an unprecedented, two-pronged approach to estimating investment needs for global agrifood systems. This dual approach blends the expertise of CPI and FAO to better understand the gaps between available, estimated, and required funding to transition agrifood systems to low-carbon and climate-resilient pathways. The two methods adopted in this approach are:

- **A "top-down" approach** (discussed in Section 3), which estimates the amount of climate finance required to fund the actions and interventions needed in agrifood systems to keep the average global temperature rise within 1.5°C by 2050. These needs are typically derived using predictive models for different sectors, solutions, and activities. The climate-compatible scenarios

analyzed are developed by different institutions and can differ widely in their data, assumptions, models, and scopes.

- **A "bottom-up" approach** (discussed in Section 4), which estimates the amount of climate finance required by countries to reach their national climate targets for agrifood systems, as stated in their NDCs submitted to the UNFCCC. These needs include both the investment required to be raised domestically (unconditional needs) and the financial support required from international public and private sources (conditional needs).

The two approaches estimate climate finance needs from different perspectives to convey a comprehensive picture of the total funding needs for agrifood systems. Table 1 outlines the points of convergence and divergence between the top-down and bottom-up needs estimates.

Table 1: Comparison between the top-down and bottom-up approaches

Approach	Top-Down	Bottom-Up
Scenarios analyzed	The scenarios analyzed outline the climate finance required to fund the actions and interventions needed in agrifood systems to limit the average global temperature rise within 1.5°C by 2050.	The NDCs analyzed outline the climate finance required by countries to reach their national climate targets for agrifood systems.
Climate objectives	Typically, the scenarios analyzed do not explicitly highlight whether finance needs correspond to mitigation, adaptation, or cross-cutting measures.	While the level of granularity varies across countries, NDCs typically distinguish between finance required for mitigation, adaptation, and cross-cutting measures.
Sectoral scope	Top-down needs estimates are usually provided at the level of sector, solution, or both. As this categorization differs across scenarios, our analysis matches the sectors and solutions in these scenarios with an agrifood system taxonomy to standardize and compare the data.	While the level of granularity varies across countries, NDCs typically include estimated needs by sector. In several cases, data is also available at the solutions or project level.
Geographical scope	The scenarios analyzed are framed at a global level and do not provide a breakdown of finance required at a country level.	Estimated needs are more prevalent in non-Annex I[1] countries' NDCs. As a result, bottom-up data mainly focuses on developing economies and is available at the country level. Our analysis extrapolates the data to create a global estimate, allowing a comparison between the two approaches.
Sources of finance	The scenarios analyzed do not provide any information on the types of investors or financial instruments that could fund the projected scenarios.	Typically, countries specify whether finance will need to be raised domestically or internationally.

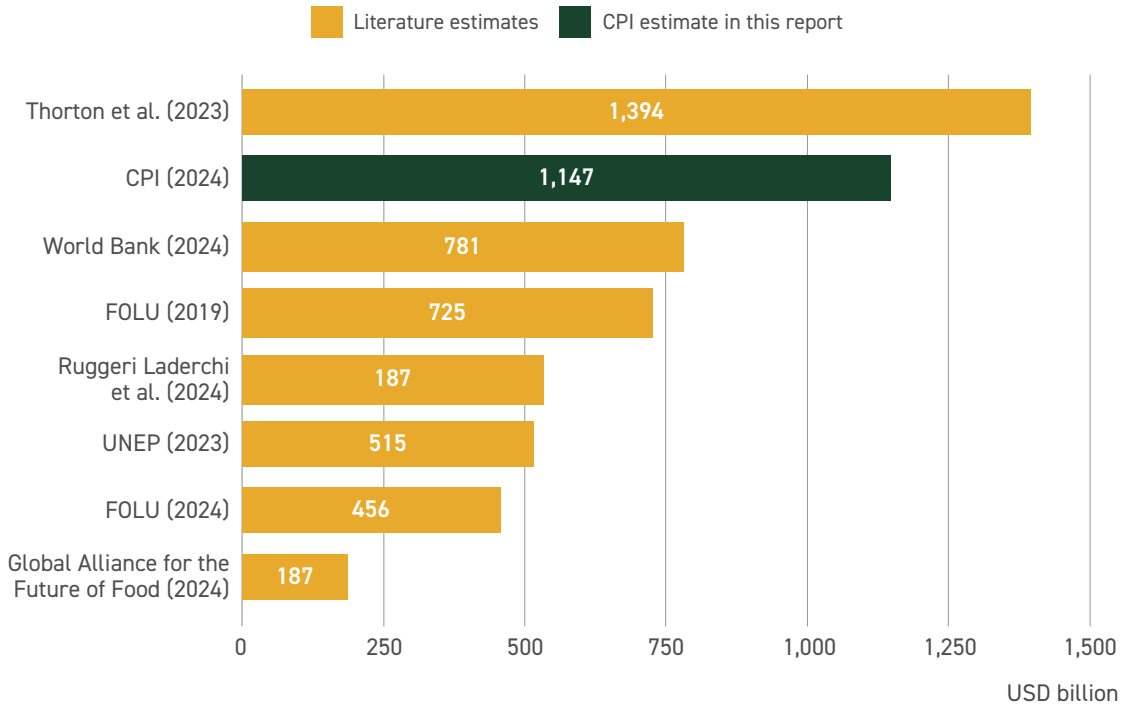
1 "Non-Annex I" countries are mostly developing economies. Certain groups of developing economies are recognized by the UNFCCC as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others, such as countries that rely heavily on income from fossil fuel production and commerce, are more vulnerable to the potential economic impacts of climate change response measures (UNFCCC, nd).

2.3 METHODOLOGY

The top-down approach aggregates and summarizes climate finance needs estimated by a selection of third-party publications. Through a comprehensive literature review of 46 sources, CPI selected seven to produce the estimates presented in this report. These seven sources were chosen as they included quantitative estimations of finance needs for the agrifood systems with a significant level of granularity, comprehensiveness, proprietary data, and recency (see Annex II). Overall figures were collected, standardized, and aggregated by sector, solution, activity, and sub-activity using an improved taxonomy developed by CPI and FAO (see Annex I), and by year between 2024 and 2030. Data was collected at the most granular level to ensure the widest coverage possible of solutions. Maximum, minimum, and average values were calculated to provide ranges of needs estimates for different solutions and to reflect the variability of estimates across studies.

Figure 2 compares the annual average agrifood finance needs from CPI's aggregated estimates with the seven sources used in this top-down methodology. The heterogeneity of estimates should be kept in mind while reading the analysis, with the lowest estimates (FOLU, 2024) being seven times lower than the highest (Thornton et al., 2023). This range is in part due to the difference in methodologies employed by the original sources and the models used. A full description of the method used in this report can be found in Annex II.

Figure 2: Top-down climate finance needs estimates for agrifood systems by source (annual averages, 2024-30)



The bottom-up approach collected climate finance needs estimates for agrifood systems from 167 NDCs submitted to the UNFCCC as of 1 January 2024. Based on the 62 NDCs providing costed finance needs for agrifood systems, FAO collected, standardized, and aggregated the finance needs by sector, source of finance, climate objective, and geography. Annual and cumulative average needs were calculated for the 2021 to 2030 period. To enable comparison with the top-down analysis, data was extrapolated to build a global bottom-up needs figure.

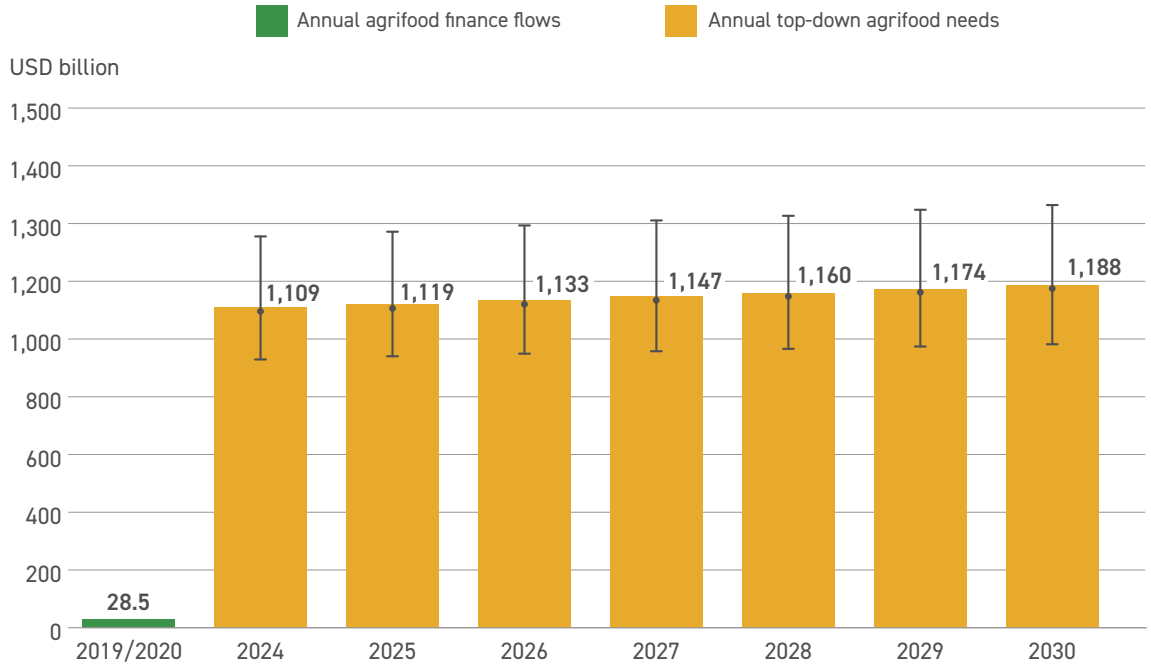
A full methodology of both approaches can be found in Annex II and III.

3. TOP-DOWN RESULTS

The top-down approach reveals that, in an average scenario, global agrifood systems require USD 1.1 trillion annually from 2024-30 to align with a 1.5°C pathway. Climate finance toward agrifood systems was tracked at an annual average of USD 28.5 billion in 2019/20 (CPI, 2023). Consequently, climate finance flows toward the agrifood sector must increase at least 40 times from current levels (Figure 3). The longer the delay in capital deployment for climate action, the more climate impacts are expected to intensify, and the higher these costs may increase, exacerbating the "finance gap."

The overall finance landscape for agrifood systems suggests that significant liquidity exists to transform the sector. Agricultural public subsidies reached a historical high of USD 851 billion per year from 2020-22 (Elwin et al., 2023; OECD, 2023). However, less than 1% of the finance provided to the agricultural sector is conditional on environmental criteria (Damania et al., 2023; Global Alliance for the Future of Food, 2022). This status quo promotes an intensification of production that is misaligned with a climate-positive pathway.

Figure 3: Annual finance flows (2019/20) and top-down climate finance needs estimates for agrifood systems (annual averages, 2024-30)



3.1 NEEDS BY SECTOR

3.1.1 POLICY, NATIONAL BUDGET SUPPORT, AND CAPACITY BUILDING

The majority of the USD 1.1 trillion climate investment is needed in Policy, National Budget Support, and Capacity Building, which represent 41% of annual agrifood needs (USD 467.5 billion). While strong governance and institutional frameworks are critical to enable the transition to a 1.5°C

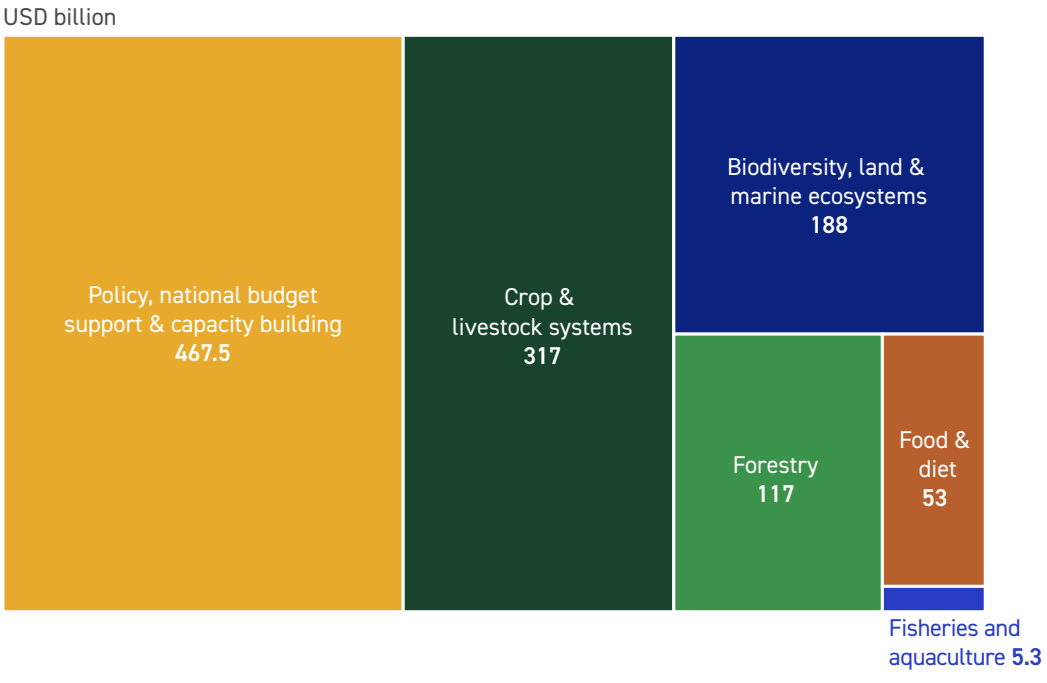
scenario, it is important to note that these needs are overarching and feed into each of the outlined sub-sectors within agrifood systems. Furthermore, CPI's current estimates include domestic finance and subsidy-based flows to a limited extent, suggesting that the investment gap may be due to limitations in available data, a persistent challenge in estimating climate finance needs for agrifood systems.

The greatest finance needed within this category is for policy instruments (USD 439.6 billion). This amount is further broken down into the needs associated with economic incentives and market-based instruments (USD 211.1 billion); capacity building efforts to realign agricultural subsidies and eliminate administrative barriers (USD 205.3 billion) (see Box 1); and investments in sustainable finance (USD 23.2 billion) to enable an influx of private investment and business opportunities. For example, more initiatives like the Green Climate Fund's (GCF) Transforming Financial Systems for Climate are necessary to upscale the commercial viability of climate projects.

Early investments and cross-sector collaboration are required to advance agriculture and climate research and development (R&D) (USD 25.1 billion). This includes activities such as connecting farmers and agribusinesses to information and communications technology (ICT) enabled advisory services and ensuring public sector support to provide end-to-end solutions to agribusinesses (Thornton et al., 2023). Early investments in R&D and sustainable agrifood technology deployment would allow these innovations to be refined, scaled, and made more cost-effective over time.

Extension services require USD 2.8 billion to empower farmers against changing climatic conditions and reduce future adaptation costs (Tilman et al., 2011). This includes support to implement novel and complex farming techniques, such as precision agriculture and climate-smart agriculture (CSA) practices, as well as to navigate new regulations such as the EU Deforestation Regulation (EUDR). This category exemplifies the importance of considering needs from the perspective of farmers and communities most affected by pressures on agrifood systems. Although not explicitly a part of climate finance needs, a significant amount of transition finance for livelihoods and poverty alleviation is required to move toward a low-carbon and climate-resilient pathway (see Box 2).

Figure 4: Top-down climate finance needs estimates for agrifood systems by sector (annual averages, 2024-30)



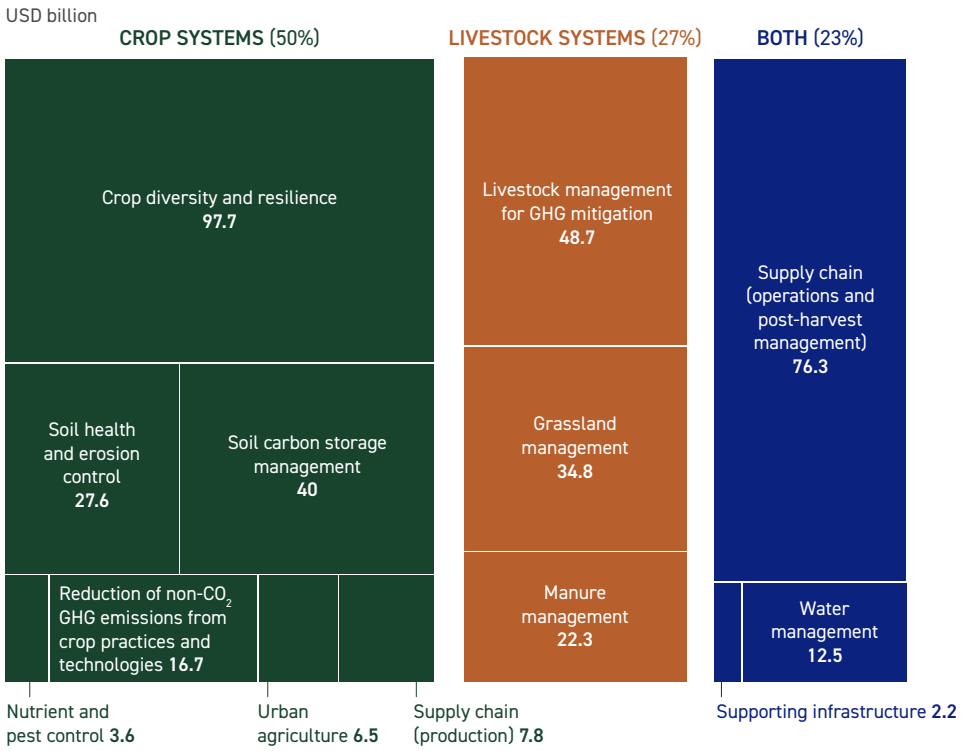
3.1.2 CROP AND LIVESTOCK SYSTEMS

Crop and livestock systems represent almost a third (28%) of annual climate finance needs (USD 316.7 billion). These estimated needs are led by crop diversity and resilience measures (e.g., climate smart agriculture) (USD 97.7 billion) and emissions reduction and resource efficiency within supply chains (USD 76.3 billion). This is followed by livestock management for mitigation (e.g., silvopasture) (USD 48.7 billion), and soil carbon storage management (USD 40 billion), which includes techniques such as agroforestry and the application of biochar. This represents an annual increase in investments by 27 times, based on the USD 11.9 billion in financial flows previously tracked at the project level in 2019/20 (CPI, 2023).

Repurposing finance alone will not be adequate to fill this gap—there is an urgent need for new investments in these systems. While existing finance for these systems has centered on OECD countries, most of the financing requirements are in developing economies. The urgency to invest is underlined by the fact that crop and livestock systems are the largest sources of GHG emissions within global agrifood systems, with livestock as the leading contributor within farm gate emissions (FAO, 2022). Almost half of the world's habitable land is used for agriculture, two-thirds of which is used for grazing and the remaining for croplands (Ritchie & Roser, 2019).

These results suggest the urgent need to adopt mitigation-focused CSA practices at scale. Due to the challenges in costing adaptation accurately, current estimates for crop and livestock systems most likely underestimate their adaptation needs. As the impacts of climate change intensify, responding to emergencies without solid infrastructure and knowledge such as early-warning systems can lead to costly yet avoidable disruptions to crop yields, food security, and many other productive outputs. While timely investments in climate resilience can reduce the vulnerability of agrifood systems to these critical threats, they are widely missing from current estimates.

Figure 5: Top-down climate finance needs estimates for crop and livestock systems by solution (annual averages, 2024-30)



3.1.3 FORESTRY

The forestry sector represents 10% of total climate finance needs, amounting to an annual average of USD 116.8 billion. This amount is split between forest restoration and rehabilitation (USD 79.7 billion), forest conservation (USD 18.5 billion), payments for ecosystem services (e.g., REDD+)[2] (USD 16.2 billion), and sustainable forest management (USD 2.3 billion). This represents an annual increase in investments of 10 times, based on the USD 11.7 billion in financial flows previously tracked at the project level in 2019/20 (CPI, 2023).

The greater need for investment in forest systems reflects the critical role they play in sequestering carbon and conserving biodiversity, as well as generating sustained mitigation benefits (IPCC, 2019). Layered approaches that combine carbon credits with investments in solid asset classes such as timber, are increasingly considered as innovative ways to build robust investment portfolios in the sector (Aquila Capital, 2022). This development also aligns with the growth of voluntary and regulated carbon markets and the subsequent attribution of economic value to ecological restoration. The forestry sector saw an increase in carbon credit issuance by 2.5 times in 2021, mostly focused on avoided emissions from deforestation and land use conversion (World Bank, 2022a).

3.1.4 BIODIVERSITY, LAND, AND MARINE ECOSYSTEMS

Biodiversity, land, and marine ecosystems supporting agrifood systems require USD 188 billion annually, representing 16% of total climate finance needs. This primarily includes investments in rehabilitating degraded land, restoring degraded landscapes, and conserving non-forested land. CPI currently does not quantify flows toward this sector.

These ecosystems play an integral role in maintaining ecological balance and supporting climate resilience, thus providing buffers against climate impacts. Agrifood-adjacent ecosystems such as mangroves, peatland, seagrass, and saltmarshes, provide services essential for food production, such as pollination, pest control, and nutrient cycling (FAO, 2019). The relationship between biodiversity and agrifood systems is systemic – agrifood systems are the primary driver of biodiversity loss due to the intensive use of pesticides, land clearance, and so on (UNEP, 2021).

The effectiveness of investments in the space will depend on integrated approaches that balance the trade-offs between biodiversity conservation and other land use activities (e.g., agriculture). While the increasing maturity of nature-based solutions (NbS) and conservation goals, such as the Global Biodiversity Framework's 30x30 target, are building avenues for such investments, they must be accompanied by a reduction of nature-negative financial flows to be effective (UNEP, 2023).

3.1.5 FOOD AND DIETS

Investments in food and diets need to increase 528-fold per year, representing the second-largest required rise in climate finance flows across agrifood systems. Climate finance for food and diets represents 5% of estimated needs, at an annual average of USD 52.8 billion. These investments are divided into food loss and waste (USD 18.8 billion), low-emissions diets that include diversified sources of protein and plant-based consumption (USD 27.1 billion), and local linkages between

2 Reducing emissions from deforestation and forest degradation in developing countries. The '+' stands for additional forest-related activities that protect the climate, namely sustainable management of forests and the conservation and enhancement of forest carbon stocks. (UNFCCC, n.d.).

urban consumers and farmers (USD 6.8 billion). With only USD 100 million invested annually at the project level in 2019/2020 (CPI, 2023), the sector remains an untapped investment opportunity.

The magnitude of the estimated need reflects a growing consensus that addressing demand-side factors, while improving production practices, is crucial to achieve sustainability goals. Better access to healthier, more diverse, and nutritious diets is a critical lever to reduce agrifood emissions in a way that benefits local populations and delivers co-benefits to human health, such as reduced obesity and cardiovascular disease (Willett et al., 2019; Springmann et al., 2017). The reports reviewed for this analysis are unanimous in the importance of sustainable consumption patterns to transition agrifood systems, with five out of six reporting needs for food and diets.

This estimate is aligned with recent developments witnessed across advocacy and R&D efforts. In 2024, Europe's food and farming lobbies raised the need to reduce animal protein consumption among the key priorities for a more sustainable food system (Niranjan, 2024). The same year, the launch of R&D centers for sustainable and alternative proteins, such as the UK Bezos Centre for Sustainable Protein and the UK Research and Innovation (UKRI) National Alternative Protein Innovation Centre, resulted in an influx of climate finance to the sector (Dunning, 2024; Brogan, 2024). However, some populations across the world remain dependent on agropastoral livelihoods and animal protein from livestock for adequate nutrition. Given these considerations, the role of animal protein in human diets must be carefully considered against local realities and contexts to enable a just transition in agrifood systems (Lancet, 2019).

3.1.6 FISHERIES AND AQUACULTURE

Climate finance needs for fisheries and aquaculture are estimated at USD 5.3 billion annually, yet they received only USD 130 million in climate finance in 2019/20. As such, despite representing a small proportion of total needs (<1%), climate finance to fisheries needs to increase by 41 times annually till 2030. Sustainable fisheries account for the bulk of the required funding (USD 4.8 billion), including expenses such as decommissioning fleets and retraining fishermen to align wild catch with maximum sustainable yields (FOLU, 2019). The remaining USD 500 million has been reported for sustainable aquaculture techniques to mitigate climate change effects on fish stocks (FOLU, 2019).

The minimal allocation of climate finance needs to fisheries and aquaculture might reflect an underestimation of the complex challenges faced by the sector, which exists at the intersection between nature and climate. While fisheries contribute about 0.5% of total GHG emissions, transitioning the sector warrants greater financial resources due to its ecological footprint and vulnerability to climate threats impacting productivity (MacLeod et al., 2019; FAO, 2024a). Furthermore, fishery subsidies were estimated at USD 35.4 billion in 2018, with a majority of USD 22.2 billion believed to be harmful – over four times higher than estimated needs (Damania et al., 2023).

Blue finance, a dedicated term for the intersection of climate and nature finance for fisheries and aquaculture, may also explain this omission. Blue finance is relatively a nascent field as compared to other areas of climate finance (McBain, 2023; Sumaila et al., 2020). For instance, the world's first sovereign blue bond was launched by Seychelles in 2018 and raised USD 15 million to support sustainable marine and fisheries projects (World Bank, 2018). Such innovative financing mechanisms highlight the potential to leverage blue bonds to mobilize investment in sustainable

fisheries and aquaculture. They could create pathways for countries to finance climate adaptation and mitigation effectively for sectors that predominantly depend on nature (World Bank, n.d.).

Blue finance must be integrated into the mainstream framework and discourse on climate and nature finance. Rather than being viewed as a separate field, blue finance should be acknowledged as inherent to agrifood systems and reflected in funding strategies. A promising example of this is the Fisheries Improvement Fund launched by the World Wildlife Fund (WWF) and Finance Earth, which aims to catalyze over USD 100 million by 2030 to enhance the sustainability of global fisheries (WWF, 2023). However, such initiatives are still in their infancy and require support to scale. The integration of blue finance is particularly critical to address the inequities and insecurities faced by small island developing states (SIDS), which are disproportionately affected by climate change and the resultant loss of natural fisheries assets (Heck et al., 2020).

Box 1: The importance of investing in subsidy reforms for a new paradigm in agrifood systems

Early investments in sustainable agricultural practices offer significant long-term benefits. Preventing further land degradation, deforestation, and biodiversity loss not only protects essential ecosystem services such as carbon sequestration and water regulation, but also proves more cost-effective than addressing damage post-occurrence (Lal, 2015).

However, current efforts are still outweighed by financial flows that have direct negative impacts on climate and nature. Between 2016-18, public subsidies for agriculture were estimated at USD 635 billion per year (Damania et al., 2023). From 2020-22, this figure rose to a record high of USD 851 billion (OECD, 2023). More than 60% of these agricultural subsidies were found to be market-distorting and potentially harmful to the environment, posing a threat to the sustainability of the sector while presenting an opportunity to redirect this liquidity (Damania et al., 2023; OECD, 2023). Additionally, UNEP (2023) estimates that financial flows with direct negative impacts on nature amount to nearly USD 7 trillion, with most arising from private finance flows (USD 5 trillion) and the remaining USD 1.7 trillion from public subsidies—primarily for fossil fuels, followed by agriculture, forestry, and fisheries.

Public and private sector decision-makers must repurpose their support in a way that recognizes the interconnectedness of agrifood systems, other economic sectors, and the planetary boundaries on which they depend. Repurposing harmful subsidies within agrifood systems (e.g., subsidies for chemical fertilizers and reduced VAT on animal products) could redirect significant public funds toward climate mitigation and adaptation objectives. This shift could help create an enabling environment for developing nature-based solutions and decoupled payments (Sutton et al., 2024). Beyond agrifood systems, subsidy reforms should encompass other sectors that directly affect ecosystems essential to agrifood, particularly those reliant on fossil fuels (e.g., energy and transport). In 2022, consumer fossil fuel subsidies doubled compared to the previous year (UNEP, 2023).

While efforts to align fiscal and environmental policies exist, they must be implemented and scaled more effectively (UNEP, 2022). Pursuing the development of net-zero, nature-positive pathways at a higher level will be essential to comprehensively address the challenges faced by and caused by agrifood systems (UNEP, n.d.).

Box 2: Enabling a just transition: Transition finance for livelihoods and poverty alleviation

Nearly half of the global population depends on agrifood systems, with over 1.23 billion people employed in the sector as of 2019, including 78% of the world's poor (FAO, 2023b; Damania et al., 2023). Agrifood systems, responsible for more than a third of global GHG emissions, are also among the most vulnerable to climate change impacts. Addressing both climate finance needs and supporting a just transition for affected communities is, therefore, essential.

To achieve a just transition, financial resources must go beyond climate mitigation and adaptation efforts to address the socioeconomic risks inherent in transforming agrifood systems. This requires prioritizing support for vulnerable communities, particularly smallholder farmers and women, who are disproportionately affected by climate change and the structural changes needed for sustainability. A just transition ensures that the shift toward sustainable agrifood systems not only reduces emissions but also safeguards livelihoods, promotes fair wages, and addresses inequalities, ultimately fostering a more resilient and inclusive future for all stakeholders (CGIAR Climate Impact Platform, 2024).

CPI's tracked estimates for annual transition finance needs average USD 564.3 billion. These needs encompass multi-sectoral approaches for food security (USD 330 billion), on- and off-farm livelihood diversification (USD 134.6 billion), rural infrastructure development (USD 39.2 billion), social protection systems (USD 32 billion), and social networks and member organizations (USD 23.2 billion)n. Social protection systems include measures such as girls' education and safety nets, while rural infrastructure development covers initiatives like access to clean cooking and connectivity. Women, who disproportionately face the impacts of climate change, stand to benefit greatly from these investments, making gender-responsive finance a vital component of a just transition (FAO, 2024b).

A multi-stakeholder approach to finance is essential to reduce the environmental impact of agrifood systems while protecting the livelihoods that rely on them. Governments and the private sector must prioritize funding not only for critical infrastructure and emissions reduction but also for accessible credit and tailored financial resources that support vulnerable populations. Initiatives such as the Save-the-Mangrove scheme in Kenya exemplify this approach by providing women with small business loans to engage in mangrove conservation and restoration. Through training programs, these women gain the skills needed to protect vital ecosystems while receiving financial support to establish sustainable businesses (Kamadi, 2021).

Multinational corporations (MNCs) will also play a critical role in this transformation by reshaping their supply chains to align with regenerative and climate-smart practices. This shift is especially important considering new regulations such as the EU Deforestation Regulation (EUDR) and Corporate Sustainability Reporting Directive (CSRD), which can increase compliance costs and negatively impact smallholders (Melati & Jintarith, 2024). MNC commitments to fair wages and sustainable agriculture practices are also essential to ensuring the equitable distribution of transition benefits. Large development finance institutions (DFIs) can further support this process through technical assistance, ensuring that knowledge and technology transfers reach those who need them most, fostering a more inclusive and equitable adaptation process. A notable example of a public-private partnership is Keurig D. Pepper's collaboration with Root Capital and USAID to enhance business management skills and access to credit for their coffee suppliers in Indonesia (Root Capital, 2024).

However, these commitments vary significantly across agrifood systems. According to the 2023 Food and Agriculture Benchmark, only 27% of the top 350 agrifood companies are engaged in activities that improve livelihoods, and less than 4% are actively working to bridge the living income gap (World Benchmarking Alliance, 2023). With greater collaborative efforts, agrifood stakeholders can promote economic viability, reduce inequality, and facilitate fair transitions for those most affected by climate change.

4. BOTTOM-UP RESULTS

As per the bottom-up analysis, countries that have estimated their climate finance needs for agrifood systems require a collective USD 30.4 billion annually from 2024-30 to achieve the climate pledges stated in their NDCs. It is important to note that only 62 of the 167 NDCs reviewed (37%) provided climate finance targets specifically for agrifood systems. The lack of estimation of agrifood finance needs in the remaining 105 NDCs highlights a data gap present in this analysis. Therefore, the reported need value is likely a lower bound of the true investment need. Box 3 illustrates the type of data available in NDCs, using Malawi as an example.

Of the 195 parties to the Paris Agreement, 168 have submitted NDCs to the UNFCCC, of which 167 were reviewed for this report.[3] NDCs are self-defined national climate commitments that detail what countries will do to limit the average global temperature increase to 1.5°C from pre-industrial levels, adapt to climate impacts, and ensure sufficient financial flows to support these efforts. NDCs represent short- to medium-term goals and are updated every five years. As of September 2023, NDCs covered 95% of the total global emissions in 2019 (UNFCCC, 2023).

With the next round of NDCs due in 2025, governments have a significant opportunity to raise their ambitions for sustainable agrifood systems. While governments are legally bound to submit and update their NDCs every five years, there is no enforcement mechanism under the Paris Agreement to ensure they comply with their commitments. This creates a lack of accountability and may explain why several nations are hesitant to make more ambitious pledges under the international treaty. Without legal consequences for non-compliance, countries may prefer incremental rather than progressive goals, particularly in the case of agrifood systems, where difficulties in estimating finance needs and impacts complicate governments' abilities to make clear commitments. Pervasive finance, technological, and capacity gaps may also impede more assertive action in developing and vulnerable economies.

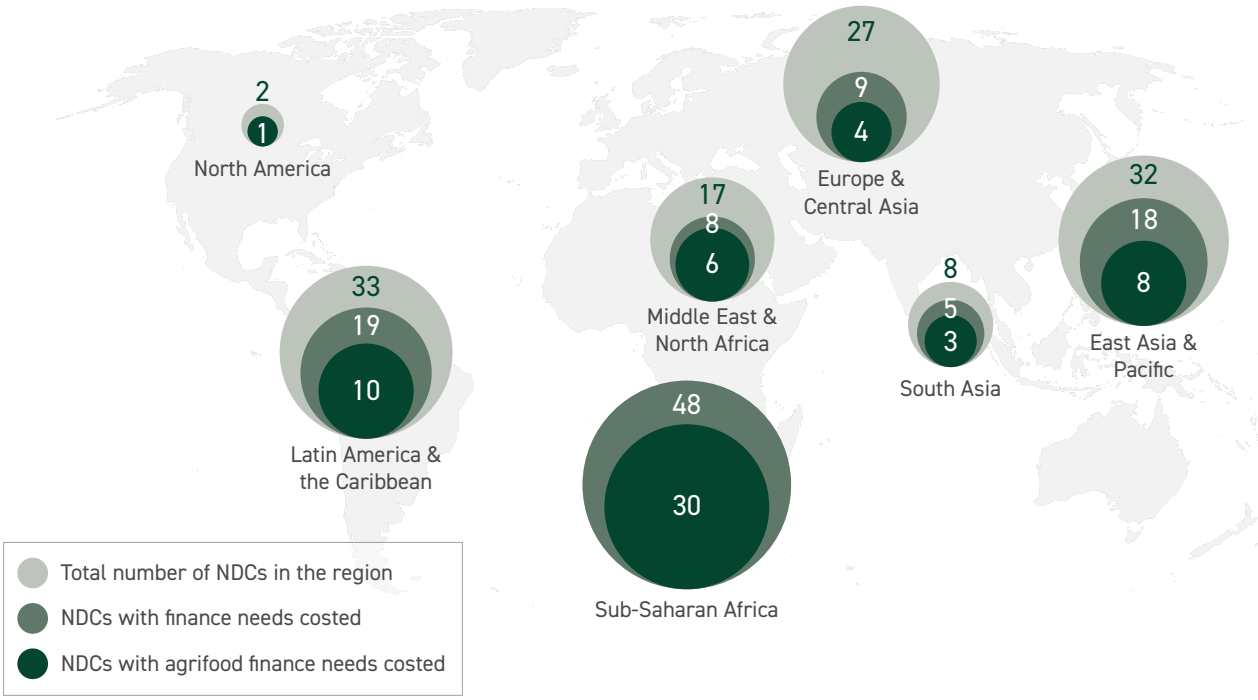
4.1 NEEDS BY GEOGRAPHY

The majority of climate finance needs for agrifood systems are defined in developing countries. Under the Paris Agreement, only non-Annex I countries are encouraged to provide information on their financial needs. As a result, 39% of all non-Annex I parties to the report finance needs for agrifood systems, compared to 19% of Annex I parties.

Sub-Saharan Africa has the highest number of NDCs with estimated needs for agrifood systems (63%), significantly higher than the global average (37%). In all other regions, half or less of NDCs articulate agrifood system climate finance needs (Figure 6).

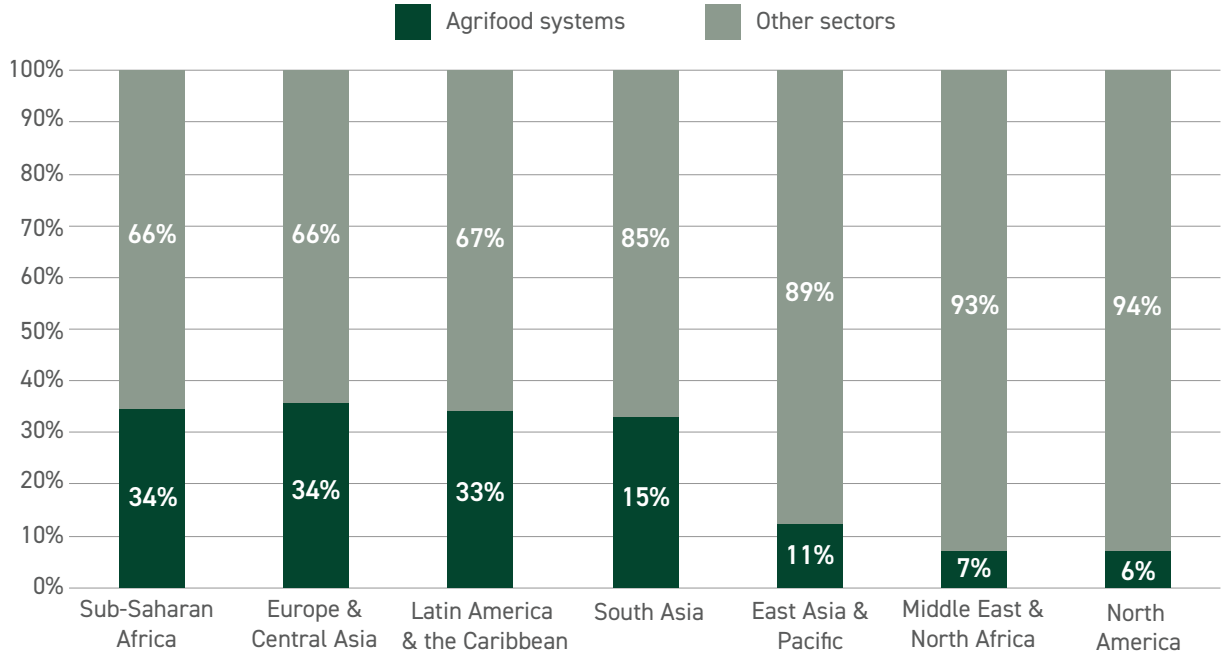
3 The European Union's NDC is used as representative of all EU member states, and the Holy See is excluded from the analysis.

Figure 6: Bottom-up climate finance needs estimates for agrifood systems costed in NDCs by region



Agrifood finance needs as a portion of total needs are highest in sub-Saharan Africa (35%), Europe and Central Asia (35%) and Latin America and the Caribbean (33%) (Figure 7). However, due to the lack of comprehensive data, robust methodologies, and standardized approaches to estimate climate finance needs in NDCs, it is likely that these needs are an underestimation.

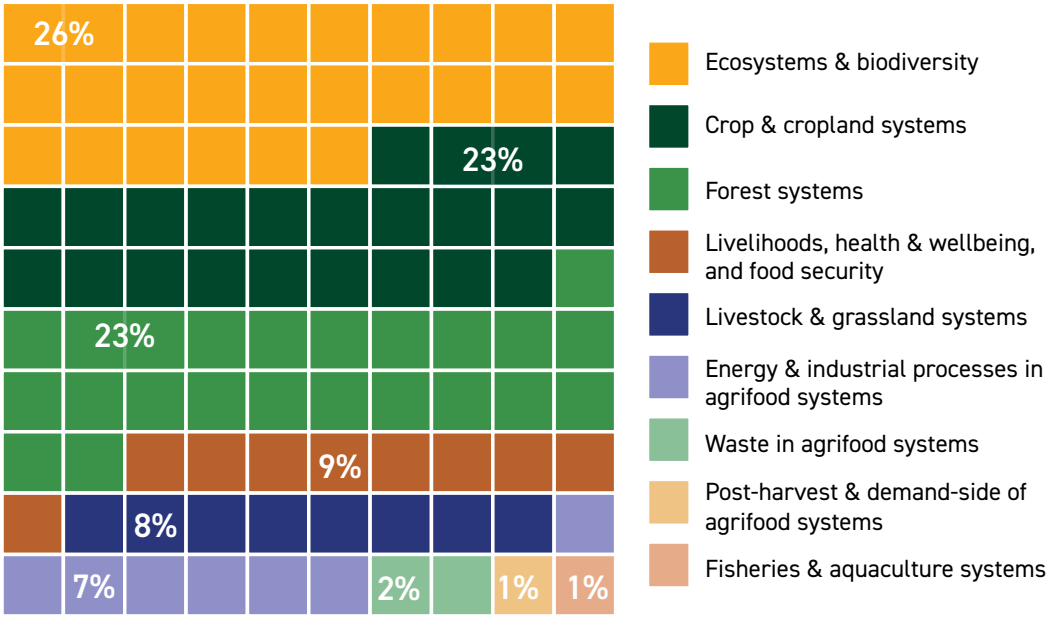
Figure 7: Bottom-up climate finance needs estimates for agrifood systems (as a share of total estimated needs) in NDCs by region



4.2 NEEDS BY SECTOR

Almost three-fourths of climate finance needs for agrifood systems reported in NDCs are dedicated to ecosystems and biodiversity (26%), forest systems (23%), and crop-based systems (23%). Action areas prioritized most frequently for investment include ecosystem and biodiversity conservation, management, and restoration; afforestation, reforestation, and forest ecosystem restoration; sustainable forest management; on-farm soil moisture and water conservation; irrigation and water harvesting; climate-proofing productive infrastructure; shifting to climate tolerant crop varieties and animal breeds; agroforestry; and on- and off-farm livelihood diversification, among others (FAO, 2024).

Figure 8: Bottom-up climate finance needs estimates for agrifood systems in NDCs by sector



Investments to improve the efficiency of pre- and post-production processes along agrifood value chains, including energy and industrial processes (8%) and waste management (3%), constitute a major mitigation action gap in current NDCs. Conversely, agrifood system adaptation portfolios illustrate more comprehensive coverage of adaptation needs both within the farm gate and at the post-harvest stage (FAO, 2024).

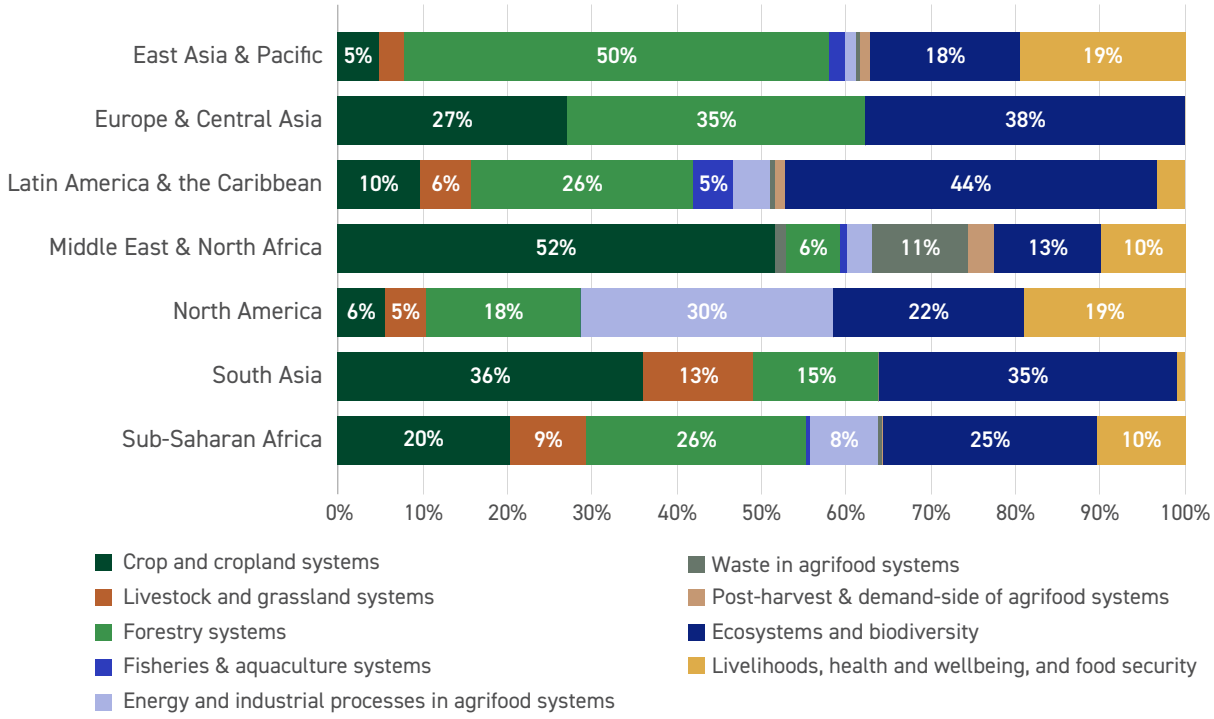
Despite its significant carbon footprint, food waste (3%) has been relatively sidelined in NDC needs reporting. Countries often prioritize sectors like energy, transportation, and industry, which are more explicitly perceived as direct sources of GHG emissions. Food waste—though a significant contributor to methane emissions, for example (Krause et al., 2023)—is often seen as a peripheral issue, overshadowed by larger-scale infrastructural and economic considerations in national climate strategies.

While fisheries and aquaculture constitute a small share of finance needs reported in NDCs (1%), climate change poses an exacerbating risk to the sustainability of the sector. Fisheries and aquaculture are important sources of livelihood and food security in certain regions and socioeconomic settings, particularly small island developing states (SIDS) (IPCC, 2019; Damania et

al., 2023). Strengthening finance for these sectors and solutions is essential to achieving long-term climate goals and ensuring food security in the face of changing climate conditions.

The distribution of climate finance needs for agrifood systems across sectors varies by region (Figure 12). For instance, finance needs in Europe and Central Asia are primarily reported for forest and crop ecosystems; while in North America, finance needs are greatest for energy use and industrial processes. Climate finance estimates explicitly for livelihoods, health and well-being, and food security are relatively low across all regions, stressing the importance of dedicating financial resources to enabling a just transition (see Box 2).

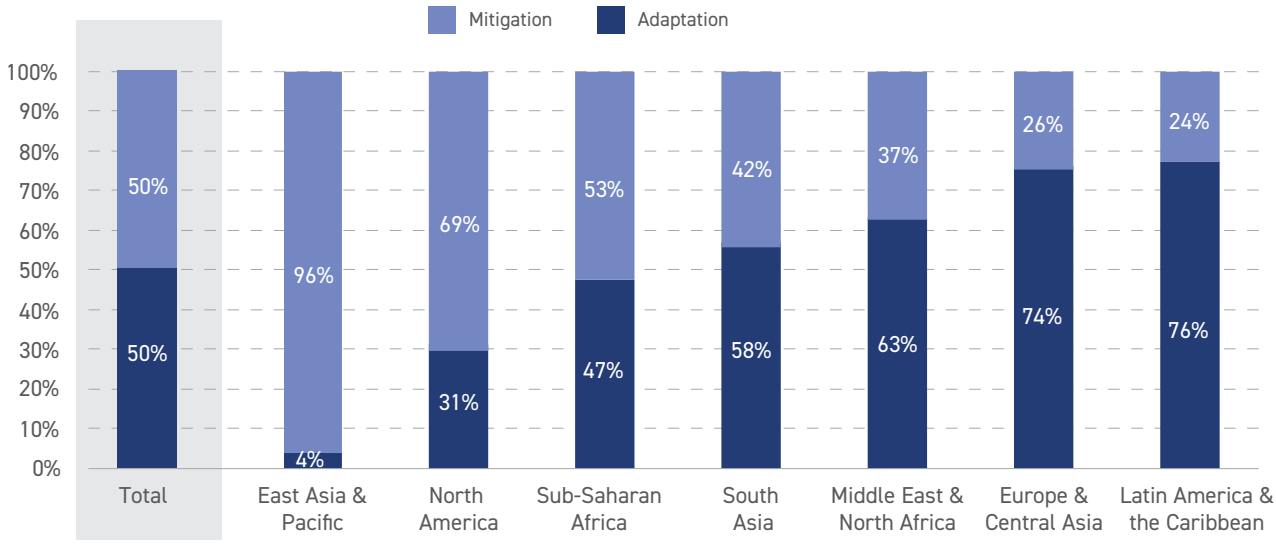
Figure 9: Bottom-up climate finance needs estimates for agrifood systems in NDCs by sector across regions



4.3 NEEDS BY CLIMATE OBJECTIVE

The global distribution between adaptation and mitigation finance needs in agrifood systems is almost equal (Figure 10). Given their intrinsic relationship with the environment, agrifood systems play a critical role in both climate mitigation and adaptation. On the mitigation side, agrifood systems are a significant contributor to GHG emissions, particularly through deforestation, enteric fermentation from livestock, and energy use and waste (FAOSTAT, 2024). On the adaptation side, they are highly vulnerable to shocks, such as droughts, floods, weather volatility, and climate extremes, which have cascading impacts on food security and poverty (FAO, 2023).

Figure 10: Bottom-up climate finance needs estimates for agrifood systems in NDCs by climate objective across regions



Mitigation dominates agrifood systems needs expressed at the level of solutions, comprising 75% of climate finance estimates. Therefore, there is a discrepancy between needs estimates for agrifood systems at the sectoral (Figure 9) and solution levels (Figure 10). This does not necessarily imply that mitigation needs are greater than adaptation needs, but is likely an indication of the limited data, tools, and capacities to cost adaptation for agrifood systems (UNEP, 2023).

Challenges in costing adaptation finance needs for agrifood systems may underestimate the true size of the adaptation gap. Despite its critical role in building climate resilience in sectors like livestock and grassland systems, adaptation is a complex and long-term concept, resulting in a lack of urgency and focus on the area. As adaptation is more nebulous and harder to quantify, it requires significantly more effort to estimate costs. Governments tend to prioritize mitigation action, chasing more straightforward and measurable outcomes. This likely explains, to an extent, why the adaptation finance needs of developing countries are 10-18 times as big as international public finance flows (UNEP, 2023a).

Cross-cutting investments can address both mitigation and adaptation needs simultaneously. Agrifood systems present an opportunity for integrated solutions that can achieve low emissions and climate resilience simultaneously (e.g., agroforestry). Expanding dual-purpose investments would ensure that adaptation receives adequate financial support, while also capturing the benefits of climate mitigation.

4.4 NEEDS BY SOURCES OF FINANCE

65% of climate finance needs for agrifood systems reported in NDCs are conditional, or dependent on international sources (Figure 11a). Among the 62 NDCs that estimate climate finance needs for agrifood systems, only 42% indicate a source of finance (Figure 11b). Developing economies, which constitute the majority of the NDCs with estimated agrifood finance needs, can choose to indicate whether their needs are conditional or unconditional (raised domestically).

The reliance on international finance is especially pronounced in regions with limited domestic resources such as, the Middle East and North Africa (74%), East Asia and the Pacific (73%), and sub-Saharan Africa (63%) and Southeast Asia. Low expectations for domestic investments may also reflect that countries do not prioritize agrifood systems in their national climate strategies or lack the fiscal capacity to do so. These regions also have higher adaptation needs relative to others, further stressing the importance of targeted climate finance from international actors.

The significant presence of unspecified sources of finance (57%) highlights the data limitations policymakers face when working with NDCs (Figure 11b). This could either be due to a lack of detailed policy planning or gaps in available data, which can hinder efforts to effectively mobilize climate finance. As the needs estimates arise from countries with limited domestic resources, these unspecified sources likely indicate international investment. Non-Annex I governments seeking foreign funding must comprehensively estimate their climate finance needs for agrifood systems, to ensure that investors have a clear understanding of the level, type, and distribution of finance needed.

Figure 11a: Bottom-up climate finance needs estimates for agrifood systems in NDCs by source across regions

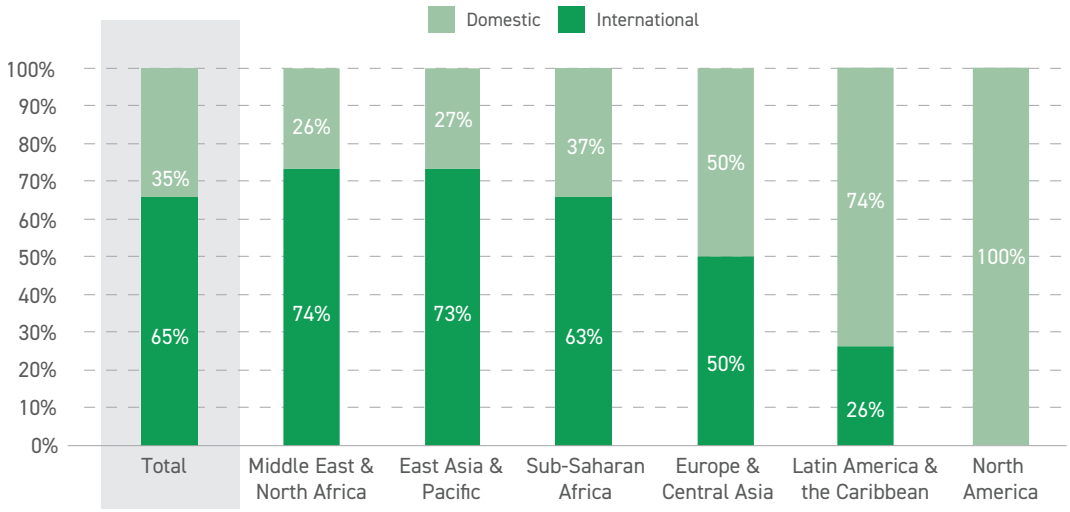
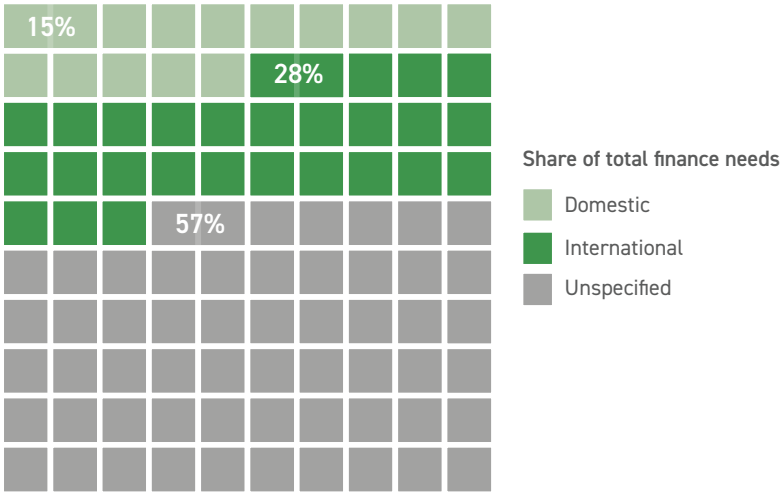


Figure 11b: Sources of climate finance for agrifood systems reported in NDCs.



Box 3: Agrifood systems needs in Malawi's NDCs: Ensuring food security and adaptation to climate change in a country dependent on rain-fed agriculture

Malawi is a landlocked country in sub-Saharan Africa, sharing borders with Tanzania, Zambia, and Mozambique. It is highly dependent on small-scale and rain-fed agriculture for its economic development and national food security while being increasingly exposed to the effects of climate change (USAID, 2023). Agriculture is a critical sector that represents about 30% of Malawi's GDP and 80% of export earnings (CCARDESA, 2024), and the vast majority of the 21 million Malawians are smallholder farmers living in rural areas, whose livelihoods depend on land use (FAO, 2018). Climate hazards such as increased flooding, droughts, and inconsistent rainfall risk expanding land desertification, reducing food production, and ultimately threatening the livelihoods of Malawians and local biodiversity.

To ensure a low-carbon and climate-resilient development pathway, particularly in its critical agrifood systems, Malawi's 2021 NDC estimates a cumulative climate finance need of USD 46.3 billion by 2040 (FAO, 2021). To meet their target of a 51% reduction in emissions, 62% of the climate finance is expected to come from international sources, and 90% of the funding is aimed at climate mitigation.

Malawi's climate finance need for agrifood systems amounts to almost USD 400 million each year up to 2040, equivalent to a fifth of the country's total climate finance needs. Half of agrifood systems' climate finance needs are allocated to crop and livestock systems (USD 206 million), of which three-quarters are directed toward mitigation. The remaining climate finance is aimed toward forestry (mitigation-focused), and biodiversity, land, and marine ecosystems (adaptation-focused).

While Malawi provides a detailed breakdown of climate finance needs for agriculture, forestry, and ecosystems, other sectors such as fisheries and aquaculture see limited information reported in the NDC. This provides an opportunity in the next round of NDC to enhance their climate ambitions by incorporating additional agrifood sectors.

5. THE TRIPLE GAP

A comparison between the top-down and bottom-up analyses reveals three gaps in transitioning agrifood systems: namely, gaps in planning, finance, and data. The two approaches estimate investment needs from different perspectives to understand not only the shortfall in climate finance delivered for agrifood systems at a global level, but also the underestimations from governments about their climate funding needs at a national level. The elements of this "triple gap" have been detailed below:

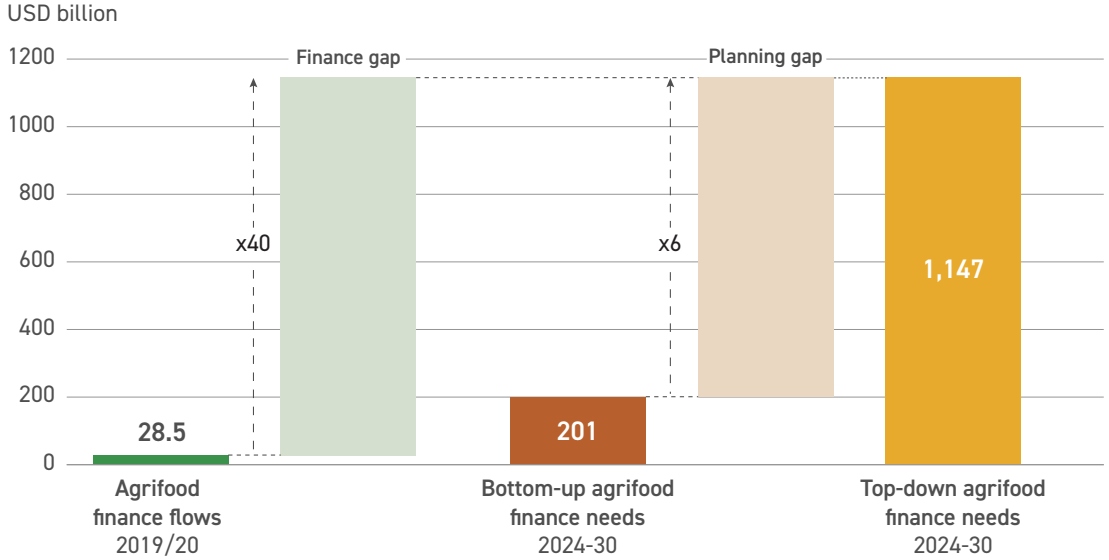
- The discrepancy between global needs estimates and national climate targets for agrifood finance implies there is an **planning gap** in current NDCs.
- The scale of investment needed for agrifood systems globally, which dwarfs current financial flows, signals the existence of a **finance gap** in transitioning the sector.
- The dearth of accurate and granular information on climate finance estimates for agrifood systems highlights a **data gap** in current NDCs.

5.1 THE PLANNING GAP

Bottom-up climate finance needs estimates for agrifood systems amount to USD 201.5 billion annually till 2030—about a sixth of the USD 1.1 trillion top-down estimate (Figure 12). To compare the top-down and bottom-up estimates, we extrapolate the bottom-up results to a global level. The method used is described in Annex III. The results reveal a significant estimation gap, which this report refers to as the "planning gap".

NDCs currently underestimate the volume of climate finance needed to align agrifood systems with low-carbon and climate-resilient pathways. The bottom-up estimate represents the level of investment that UNFCCC parties outline in their NDCs to achieve their climate mitigation and adaptation objectives for agrifood systems.

Figure 12: Climate finance flows (annual average, 2019/20) vs. needs for agrifood systems (top-down and bottom-up estimated annual averages, 2024-30)



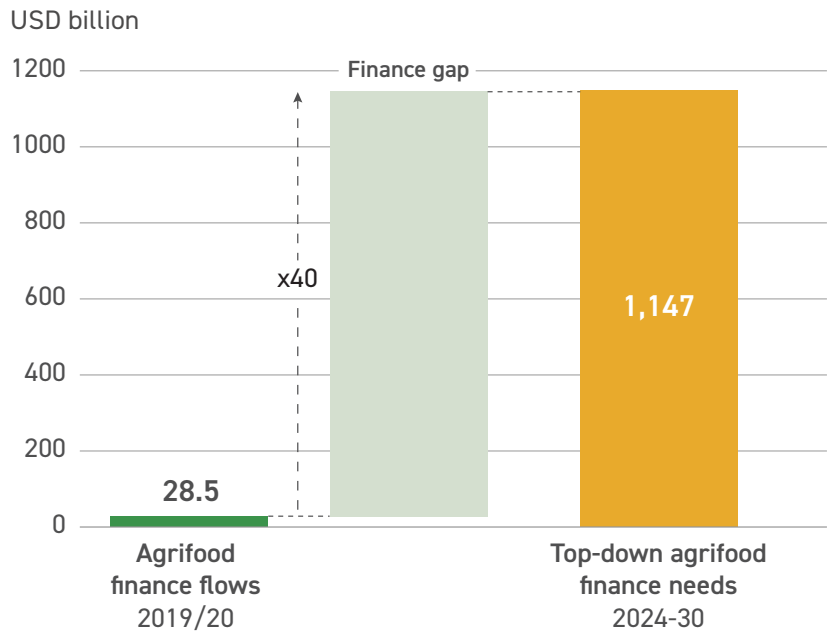
The planning gap refers to not only the paucity of funding for agrifood systems, but also missed opportunities to address specific needs. Raising ambitions is not only about increasing the volume of climate finance, but also improving the quality and direction of funding. For example, current climate finance needs estimates prioritize mitigation over adaptation measures. Investments in adaptation for agrifood systems tend to receive less funding because they are perceived as less commercially attractive investments. This is further compounded by difficulties in costing adaptation needs and measuring their impacts. Making capital more affordable, through tools like concessional finance, can address this balance by lowering entry barriers and directing funding to critical and underserved areas effectively (CPI, 2024b).

With the next round of NDCs due in 2025, governments have a significant opportunity to raise their ambitions for sustainable agrifood systems. The discrepancy between the top-down and bottom-up estimates suggests that NDCs currently do not provide a reliable indication of the actual absolute value of finance needed for agrifood systems. However, our analysis also points to a large information and capacity gap that must be filled to ensure that NDCs deliver as robust policy documents capable of signaling the direction of future investments.

5.2 THE FINANCE GAP

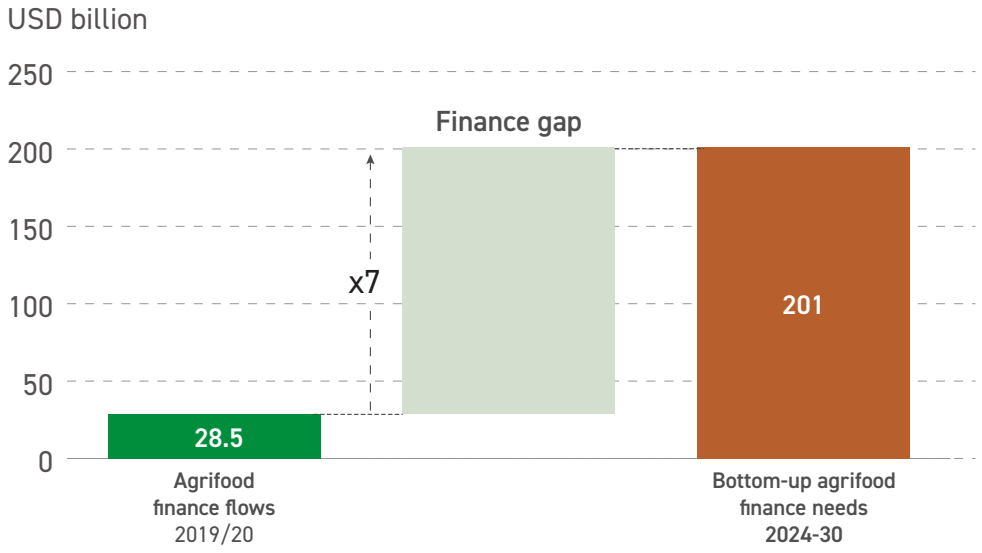
Climate finance flows to global agrifood systems must increase 40 times annually to align with low-emissions and climate-resilient development pathways (Figure 12). The top-down analysis reveals that climate finance for global agrifood systems must increase from USD 28.5 billion to USD 1.1 trillion annually till 2030. However, both current needs and flows estimates involve specific agrifood practices and do not comprehensively represent the full scope of agrifood systems. As such, caution must be taken while interpreting these results (see Annex I for the agrifood systems taxonomy used in this report).

Figure 13: The finance gap: Climate finance flows vs. needs for agrifood systems estimated with the top-down approach (annual averages, 2024-30, USD billion)



When compared to financial needs expressed in NDCs, current climate finance flows for agrifood systems are still nearly seven times too small (Figure 14). Current climate investments in sustainable agrifood systems are so low—estimated at USD 28.5 billion in 2019/20—that scaling them up to the needs expressed in the bottom-up analysis would be a significant policy win. However, financial flows must reach the level estimated by the top-down analysis to keep global agrifood systems on a 1.5°C pathway, which this report refers to as the "finance gap". The longer the delay in capital deployment for climate action in agrifood systems, the more climate impacts are expected to intensify, and the higher these costs are projected to increase.

Figure 14: The finance gap: Climate finance flows vs. needs for agrifood systems estimated by bottom-up approach (annual averages, 2024-30, USD billion)



The USD 1.1 trillion gap in agrifood systems investment arises from a complex interplay of structural, financial, and governmental barriers. Agrifood systems, especially in emerging markets, face significant risks that deter capital flows from both public and private sources. Traditional financial models often fail to accommodate the long-term horizons and small-scale investments needed to transition agrifood systems, particularly in rural or underserved regions. A misalignment between short-term profit motives and long-term sustainability goals further impedes capital flows, preventing a fair allocation of resources to the sector.

The finance gap underscores the urgent need for actors across all sectors, levels, and geographies to rapidly scale efforts to exponentially increase climate finance for agrifood systems. The top-down approach draws upon a thorough review and aggregation of 1.5°C-aligned needs estimates based on global predictive scenarios. These economy-wide models emphasize the need for coordinated action across the board to achieve an effective transition for the sector. To jumpstart the mobilization of finance, national governments should take the lead by updating their NDCs in 2025, given that they have the clearest understanding of local needs.

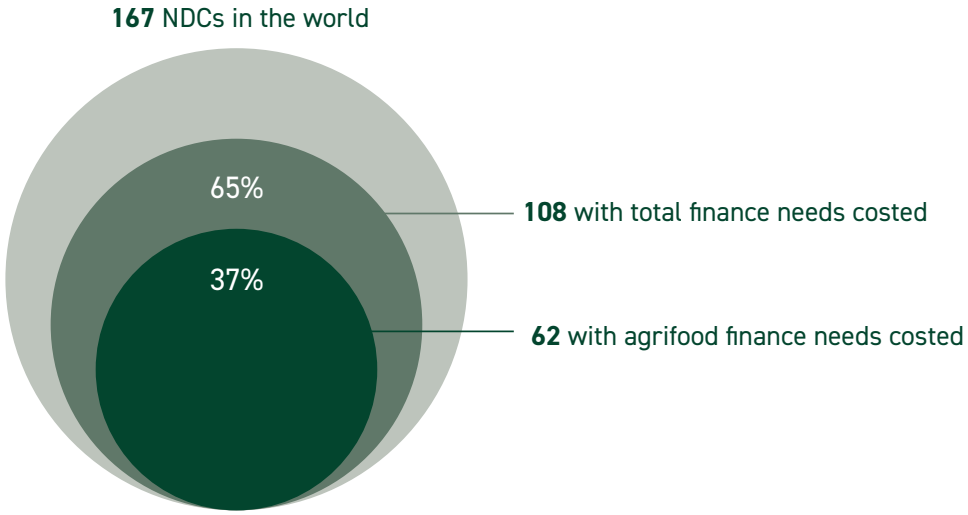
5.3 THE DATA GAP

Data limitations for both top-down and bottom-up approaches complicate the estimation of the planning and finance gaps. Both approaches suffer from significant gaps in the availability and quality of data, making it difficult to accurately assess investment needs disparities between the two methods. Compounding these challenges, both approaches rely on different datasets, coverage, and assumptions. Therefore, both the planning and finance gaps can to an extent be attributed to an underlying data gap. For example, NDCs often do not report private finance needs and may underestimate costs due to incomplete local data, such as unreported adaptation costs in rural agrifood systems.

The top-down approach consolidates investment estimates from multiple reports that range in granularity and scope. Differences in scope lead to the exclusion of estimates that fall outside the agrifood taxonomy defined in Annex I. Variations in granularity result in uneven data coverage across solutions, depending on the focus of each report. By averaging these estimates, we reduce the variability between reports (see methodology in Annex II). However, this process dilutes the unique priorities of each analysis' transition strategy, such as the UNEP's emphasis on nature-based solutions. Therefore, these results should not be read as a point estimate, but rather an indication of the magnitude of climate investment required for agrifood systems.

The bottom-up analysis relies on data from limited sources due to inconsistencies in NDC reporting (Figure 15). Only 62 of 167 parties to the Paris Agreement (37%) articulate the level of climate finance needed for agrifood systems in their NDCs. Each NDC that estimates these needs expresses total and distributed amounts at different levels of detail. This significant data gap prevents more accurate estimations of the financial flows needed to be mobilized across geographies, sub-sectors, and climate objectives for agrifood systems.

Figure 15: The Data Gap: Climate finance needs for agrifood systems estimated in current NDCs



The proportion of NDCs specifying climate finance needs for agrifood systems decreases as country income levels rise. Countries are not mandated to include information on climate finance needs; however, non-Annex I countries are encouraged to include information on finance, capacity building, and technology support needed, and developed economy parties ("Annex I") are urged to include information on support provided. As a result, 39% of all non-Annex I parties to the report finance needs for agrifood systems, compared to 19% of Annex I parties.

The lack of private finance needs estimated in NDCs likely also explains the gap between the two approaches. This omission stems from the public sector's limited engagement with private investors while formulating NDCs, and uncertainty on how to mobilize private capital for climate-specific initiatives. As a result, the distribution of private investment across value chains remains poorly mapped, complicating efforts to estimate the total quantum of private climate finance needed for agrifood systems. Private investors also have little incentive to label or report their investments as climate finance, implying that private spending may occur without being recognized as such. Furthermore, finance policymakers do not enforce robust reporting requirements for private investments, minimizing regulatory and legal obligations for transparency in climate-related finance. As a result, NDCs likely underrepresent the total investment needed for climate action from private sources, limiting the overall scale of financial commitments necessary to achieve low-emissions and climate resilience targets.

6. RECOMMENDATIONS

This report underscores the complex challenges in transitioning agrifood systems: outlining the triple gap of planning, finance, and data. As these challenges likely interact, meeting the climate investment needs for agrifood systems effectively requires all three gaps to be addressed simultaneously. For example, the planning gap is partly influenced by the lack of comparable quality data for agrifood systems, both in countries' NDCs and related literature. Achieving a simultaneous response requires a multifaceted, multi-stakeholder approach that coordinates action between public and private actors.

6.1 THE PLANNING GAP

Aligning domestic ambitions with global investment needs estimates can ensure collective climate action for agrifood systems. While bottom-up NDCs primarily reflect national priorities, they should also contextualize investment needs at the top-down global level to remain aligned with long-term climate targets. While this exercise may be challenging for countries with limited capacities, increased support from development institutions and private advisory groups can provide technical expertise, data infrastructure, and capacity building programs essential for accurate projections.

International organizations and existing partnerships should actively engage in financing transitions to support national governments. Initiatives like the NDC partnership or the Food and Agriculture for Sustainable Transformation (FAST) partnerships can support governments to create the enabling environment necessary to derisk investments and attract finance towards climate solutions outlined in NDCs. This would involve collaborating with governments to redesign subsidy structures, align tax and tariff policies with sustainability goals, and identify innovative financial mechanisms that can mobilize private capital, such as investable bundles that attract blended finance.

Outlining priorities for public investment in and through the NDCs can create a conducive climate for private investment. Governments can provide policy coherence on their estimated expenditures on public goods, such as information systems and infrastructure, which could encourage the private sector to align more precisely with the NDCs. Meaningful engagement with the private sector in the design and revision of NDCs and National Adaptation Plans (NAPs) is critically important to inform public policy and investment priorities.

Increasing domestic finance targets within NDCs would further strengthen and demonstrate countries' commitment to climate goals, and also build private and international investor confidence. Designing investment plans for agrifood systems with the goal of attracting private and international investment will be key to identifying more efficient solutions to address the planning gap. Scaling domestic commitments would indicate that countries are creating an enabling environment for climate action and seeking to crowd in investment.

6.2 THE FINANCE GAP

Policymakers and regulators must design sector-specific investment plans that integrate both public and private financing to help increase financial flows to agrifood systems. By aligning investment strategies with both national priorities and private sector interests, governments can create a clear pathway to direct funds to climate-resilient agrifood projects. This approach incentivizes private actors to participate in the transition, ensuring a larger, diversified, and more sustainable funding pool. For example, Rwanda's Strategic Plan for Agriculture Transformation (PSTA4) includes sub-sector specificities and climate-smart agriculture (CSA) practices to align with national goals (IFPRI, 2022).

Integrating a climate lens into existing financial flows could start transforming agrifood systems at scale. Investments in agrifood systems are often made without climate or nature considerations: between 2020-22, a global total of USD 851 billion was directed to agricultural subsidies annually, approximately 60% of which were expected to have negative climate and nature outcomes (OECD, 2023). Repurposing even a portion of these funds toward climate objectives could accelerate the transition, without requiring new sources of investment.

Pricing in climate adaptation and mitigation activities into agrifood investments can ensure that financial flows are directed to low-emission, climate-resilient agrifood systems. Given their intrinsic relationship with the environment, agrifood systems have inherent potential to deliver co-benefits for climate mitigation and adaptation. For instance, agroforestry has the potential to increase food security for over a billion people by increasing soil nitrogen available to crops, enhancing soil carbon storage, and halving soil erosion rates (FAO, 2023). These cross-cutting benefits should be reflected in investments to maximize their impact.

Establishing a working group of key organizations engaged in agrifood investment would facilitate greater coordination and alignment on finance roadmaps for the sector. This would include stakeholders across national governments, development finance institutions, and the private sector that are engaged in developing investment plans, tracking finance flows, and modeling funding needs for agrifood systems. With COP30 in Belem on the horizon for 2025, host country Brazil could consider taking the lead on such an initiative, especially considering the prominence of the agrifood sector in the country.

6.3 THE DATA GAP

Collecting more comprehensive and consistent finance data is required to fully leverage NDCs as sources of information to guide Paris-aligned investments. Greater efforts are needed from the UNFCCC and other international institutions to equip governments with the tools, knowledge, and capacities to submit updated NDCs, with an indication of the estimated cost of implementation by sector, action or solution area, and funding source. This would help signal a strong commitment to direct and facilitate climate investment in the sector. Coupling this with more ambitious efforts to mobilize domestic and international financing, including from public and private sources, can strengthen the enabling environment for climate action.

Aligning both top-down and bottom-up approaches to develop rigorous, transparent, and standardized methods to cost climate finance needs will help develop the knowledge base for investments. Current top-down estimates of agrifood climate finance needs are inconsistent due

to varying assumptions, models, and scenarios used by different sources. Transparent estimation processes that minimize discrepancies and enable comparisons between the two approaches are critical to direct finance toward priority sectors and regions. International institutions providing estimates should make their data and assumptions open access to enhance comparability, especially in regions with limited domestic capacities.

Adopting a clear definition and consensus on the scope of agrifood systems can facilitate improved data collection and analysis. Currently, terms such as agrifood systems, AFOLU, and agriculture and food systems, are often used interchangeably or with different meanings across literature. International institutions estimating agrifood needs must increase collaboration on their use of terms, scopes, and taxonomies to create clarity among users of agrifood research data. This joint report could be a first step in aligning taxonomies across the board.

Developing regional- or country-specific models is critical to identifying where the largest finance gaps exist. Current estimates are largely global and offer less precision than regional projections, which enable more informed decision-making and investment prioritization. Regional data can ensure that financial resources are directed to underserved and underfunded countries. For example, the Africa NDC Hub's Climate Finance Tracking Model utilizes country- and sector-specific assessments to guide African countries to implement their NDCs.

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