Food and Agriculture Organization of the United Nations

UNDP

Agrifood systems in national adaptation plans

An analysis

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By

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Published by the
Food and Agriculture Organization of the United Nations
and
United Nations Development Programme

Required citation:

Crumpler, K., Wybieralska, A., Nelson, S., Hammett, L., Margiotta, G., Haensel, M., Raison, M., Roffredi, L., Angioni, C., Gialletti, A., Galbiati, G., Caputo, I., Alvar-Beltrán, J., Kanamaru, H., Wang, X., Bernoux, M., Kohli, R., Teng, J., & Wolf, J. 2025. *Agrifood systems in national adaptation plans – An analysis*. Rome, FAO & New York, USA, UNDP. https://doi.org/10.4060/cd7579en

ISBN 978-92-5-140281-8 [FAO]

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Foreword

Around 4 billion people live in households that rely on agrifood systems for their lives and livelihoods. These people are on the frontlines of climate change impacts, such as altered weather patterns, extreme events, and temperature fluctuation, all of which reduce crop yields and threaten food security, incomes and livelihoods.

Since 2010, national adaptation plans (NAPs) have been the key mechanism for countries – in particular, Least Developed Countries – to systematically identify ways to reduce their vulnerability to climate impacts and facilitate the integration of climate change adaptation processes across sectors, stakeholder groups, and administrative boundaries.

In close collaboration with the United Nations Framework Convention on Climate Change (UNFCCC) and its Least Developed Countries Expert Group (LEG), FAO, UNDP, and UN system partners have provided support to over 100 countries on their NAPs and other adaptation plans since 2015. Alone, two flagship climate programmes – NAP-Ag and SCALA – have enabled FAO and UNDP to provide agrifood-related NAP technical assistance to dozens of countries in Africa, Asia and the Pacific, and Latin America and the Caribbean, with the financial support of Germany's Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) through the International Climate Initiative (IKI).

This vast experience has given FAO and UNDP unique insights into what challenges and gaps countries face; what opportunities agrifood systems present for boosting climate resilience; and, ultimately, which agrifood adaptation measures could work best, where and why.

This landmark report by FAO and UNDP is based on primary data and an original analysis of the NAPs submitted by 64 developing countries and Least Developed Countries as of June 2025. It highlights that agrifood systems are globally recognized as priority sectors for climate adaptation – both for action that protects and increases the resilience of agrifood systems themselves, and for how agrifood systems contribute to broader resilience across sectors. At the same time, it underscores that adaptation measures are not always tailored to identified risks; that a variety of barriers hinder implementation at scale; and that adaptation finance remains far below identified needs.

The report complements the updated NAP technical guidelines published by the LEG in August 2025. It outlines how future NAPs can enhance the role of agrifood systems and make the case for increased agrifood adaptation finance to bring multiple climate, biodiversity, environment, food security, and social and economic benefits.

FAO and UNDP will continue to support developing countries on the formulation of transformative and investment-ready NAPs. We also commit to helping countries that have already submitted NAPs to leverage the enormous untapped potential of agrifood systems for accelerated implementation that is ambitious, inclusive, and responsive to the needs of all members of society. We hope this report can be a valuable contribution to these ends.

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Acknowledgements

This report was prepared by a multidisciplinary team from the Food and Agriculture Organization of the United Nations (FAO), under the direction of Kaveh Zahedi, Director of the Office of Climate Change, Biodiversity and Environment (OCB), and the United Nations Development Programme (UNDP), under the direction of Cassie Flynn, Global Director of Climate Change. The report was initiated by Julia Wolf, FAO Deputy Climate Change Team Leader, and Rohini Kohli, Senior Technical Advisor on Adaptation Planning, from the UNDP Climate Hub. Overall guidance was provided by the FAO Climate Change Team Lead Martial Bernoux. The report is a result of a collaborative effort between FAO and UNDP, under the lead authorship of Krystal Crumpler, FAO Natural Resources Officer and Climate Policy Lead, and strategic guidance of Sibyl Nelson, FAO Senior Climate Change Specialist, and Julie Teng, UNDP Technical Specialist on Adaptation Planning.

The report is a product of the joint FAO–UNDP flagship programme "Scaling up Climate Ambition on Land Use and Agriculture through Nationally Determined Contributions and National Adaptation Plans" (SCALA), which supports climate action in more than 20 countries across Africa, Asia and Latin America (2020–2028) thanks to the generous support of the German Federal Ministry for the Environment, Climate Action, Nature Conservation, and Nuclear Safety (BMUKN) through the International Climate Initiative (IKI).

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Abbreviations

AFOLU	agriculture, forestry and other land use
BMUKN	German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety
CBA	cost–benefit analysis
CBD	United Nations Convention on Biological Diversity
CCA	climate change adaptation
COP	Conference of the Parties (to the UNFCCC)
CPI	Climate Policy Initiative
CRVA	climate risk and vulnerability assessment
DRR	disaster risk reduction
EbA	ecosystem-based adaptation
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GDP	gross domestic product
GEF	Global Environment Facility
GESI	gender equality and social inclusion
GGA	global goal on adaptation
GHG	greenhouse gas
HICs	high-income countries
IKI	International Climate Initiative
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and the Caribbean
LDCs	least developed countries
LEG	Least Developed Countries Expert Group
LICs	low-income countries

LLDCs	Land Locked Developing Countries
LT-LEDs	long-term low emission development strategies
LUC	land-use change
LULUCF	land use, land-use change, and forestry
MCA	multicriteria analysis
MEL	monitoring, evaluation and learning
M&E	monitoring and evaluation
NAPs	national adaptation plans
NDCs	nationally determined contributions
NENA	Near East and North Africa
NTFP	non-timber forest product
SDGs	Sustainable Development Goals
SIDS	Small Islands Developing States
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WaSH	water, sanitation and hygiene
WMO	World Meteorological Organization

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Executive summary

Climate change impacts are negatively affecting the productivity of crops, livestock, forestry, fisheries and aquaculture, and weather extremes have already exposed millions of people to acute food insecurity globally (IPCC, 2023). The impacts of climate change will continue to ripple through agrifood systems in the form of yield losses, pest and disease outbreaks, and supply chain disruptions, eroding livelihoods and increasing the risk of hunger and entrenching extreme poverty levels (IPCC, 2023). As of 2024, 8 percent of the world's population was already suffering from hunger (FAO, 2025) and, under high emissions scenarios, climate-related impacts could push another 80 million people into hunger by mid-century (IPCC, 2023).

Developing countries that have prepared national adaptation plans (NAPs) overwhelmingly recognize the urgent need to adapt their agrifood systems to climate change. This report presents an analysis of NAPs submitted by 64 developing countries between 2010 and 2025. Nearly all countries[1] – 97 percent – report climate-related impacts[2] on agriculture, livestock, forests, fisheries, aquaculture, their value chains, and cascading impacts on food security. This underscores the scale of risks and impacts these systems face and demonstrates the need to account for agrifood systems in country climate adaptation planning and investments.

The evidence base for adaptation in agrifood systems is incomplete, limiting the ability for risk-informed planning. While almost all countries report climate impacts on agrifood systems, less than half report using climate risk and vulnerability assessments or downscaled climate models tailored to the sector. This gap makes it difficult for governments to align adaptation priorities with the most pressing risks and increasing impacts from losses and damages. Nearly all countries call for strengthening climate services and early warning systems in their NAPs, but without more robust collection and use of climate data, countries risk implementing adaptation measures that do not match the scale of threats from multiple and often compounding climate extreme and slow onset events associated with climate change.

Agrifood systems are priorities for adaptation across all NAPs, but adaptation actions are not always tailored to identified risks. Every developing country with a NAP analysed for this report prioritizes agrifood systems – including the ecosystems and biodiversity, and human and socioeconomic factors that support and depend on agrifood systems. Identified adaptation actions vary by region, and on-farm solutions (climate-tolerant crops, irrigation, and soil conservation) and ecosystem restoration measures are the most common ones. Systems-based approaches – covering post-harvest value chains and the integration of livelihood and social protection programmes for food security and rural poverty eradication – receive comparatively less attention. Only 16 percent of the adaptation actions in agrifood systems included in the

[1] The trends reported in this analysis refer to "percent of *developing* countries with a NAP analysed". Throughout the narrative, the phrase is shortened to "percent of countries" for brevity.

[2] The term "climate impacts" used in this document refers to observed and/or projected climate-related impacts and risks reported in the NAPs.

NAPs are directly linked to a specific climate hazard/event or impact being addressed, and only 14 percent are tailored to a specific socioeconomic vulnerability or vulnerable group, revealing weak alignment between reported risks and impacts and planned measures. This underscores the need for further identification and appraisal of context-based adaptation options for the effective management of climate risks and impacts in agrifood systems.

Mainstreaming agrifood system-related adaptation actions into national and sectoral policies is widespread, but barriers to NAP implementation remain, constraining agrifood adaptation in practice and at scale. Three-quarters of countries outline planned or ongoing efforts to mainstream agrifood adaptation actions into national and/or sectoral policies and plans, and over a third indicate multisectoral NAP coordination mechanisms that include Ministries of Agriculture, Forestry, Fisheries, Food Security and/or Natural Resources. However, nearly half of countries report technical, institutional, or financial challenges to advancing agrifood system priorities. Limited technical expertise, weak interministerial coordination, and scarce financing reduce countries' ability to deliver cross-sectoral agrifood adaptation at scale. There is limited capacity to establish governance frameworks and legislation to implement policies and incentivize financing for climate resilient and adapted agrifood systems.

Finance for agrifood system-related adaptation remains far below needs, and barriers to engaging the private sector persist. Half of the estimated finance among the costed NAPs analysed are related to agrifood systems. Current finance flows reflect a different reality: 20 percent of total adaptation finance goes to agrifood systems, and this represents only about 1 percent of total global climate finance (CLIC, 2025). While most countries identify the private sector as critical in advancing adaptation in the sector, more than three-quarters cite barriers to engagement in their NAPs – including perceived high risks, limited de-risking tools, and governance gaps.

Monitoring, evaluation and learning (MEL) systems are prioritized, yet underdeveloped. Almost all countries recognize the importance of tracking adaptation progress, but only one-third have operational systems in place. Indicators tend to focus on agricultural production and immediate outputs, while far fewer track food supply and distribution, or food security and nutrition outcomes, which are all necessary for measuring progress towards achieving the global goal on adaptation (GGA) target for food and agriculture. Very few include outcome- or impact-level indicators that measure whether adaptation is effectively reducing risks, vulnerabilities and impacts, and building resilience and moving towards transformational systems change.

Stakeholder engagement is widespread, but advancing inclusive and resilient agrifood systems is undercut by a lack of specificity to the vulnerabilities of different groups. Women, Indigenous Peoples, smallholder farmers, youth, and other vulnerable groups, such as migrants and persons with disabilities, face the greatest climate risks and negative impacts. However, only 45 percent of countries identify these vulnerable groups in agrifood systems and only 14 percent of all agrifood adaptation actions included address their specific vulnerabilities and adaptation needs. In NAP updates and implementation, countries can strengthen adaptation actions to be more context-specific, locally led, and reflective of diverse stakeholders – who are not only beneficiaries, but also leading agents of adaptation and systems change.

NAPs emphasize that agrifood systems are already experiencing loss and damage, and that, in some cases, the limits of adaptation in the sector are already being reached. Losses and damages, understood as the adverse effects of climate change beyond adaptation efforts, are more frequently cited in relation to agrifood systems than to any other sector,

featuring in nearly half of all NAPs. These losses and damages associated with extreme weather and slow onset events are overwhelmingly observed rather than just anticipated, compared to those reported in other sectors, demonstrating the urgency of adaptation and risk management planning to avert, minimize and address further losses and damages in agrifood systems.

National adaptation plans are strategic entry points to accelerate climate-resilient agrifood systems. This report demonstrates that by expanding the use of climate science and evidence-based decision-making, strengthening institutional coordination, closing finance gaps, and embedding a core concern with equity, NAPs can help countries safeguard food security, promote rural livelihoods, and contribute to global adaptation goals. Delivering on this potential requires moving from plans to action – aligning measures with evidence, mobilizing resources at scale, and ensuring that adaptation is inclusive, equitable, and transformative.

This analysis provides a foundation for tailoring support to country needs and for informing future delivery, as partners like FAO and UNDP help countries close these gaps and strengthen agrifood adaptation through the NAP process. Leveraging the technical support of the United Nations Framework Convention on Climate Change (UNFCCC) and key financial channels, initiatives such as the FAO–UNDP Scaling up Climate Ambition on Land Use and Agriculture through Nationally Determined Contributions and National Adaptation Plans (SCALA) Programme deliver technical assistance, capacity development, and policy guidance to countries as they drive their NAP processes. The aim is to align adaptation actions with climate science, mainstream agrifood priorities into broader development frameworks, and mobilize finance and private sector engagement at scale. Strengthened support will enable countries to move from planning to implementation, ensuring that NAPs drive agrifood system resilience, safeguard livelihoods, and contribute to achieving global adaptation and sustainable development goals.

KEY MESSAGES

- **Agrifood systems are universal priorities in developing country NAPs,** with all including adaptation priorities or actions in agrifood systems. This is due to their high climate risk profile: 97 percent of developing countries with a NAP report climate-related impacts on crops, livestock, forests, fisheries, aquaculture, their value chains plus food security and nutrition outcomes.

- **Agrifood system adaptation actions are not fully aligned with identified risks.** While 97 percent of developing countries with a NAP cite climate risks and impacts in the sector, only 16 percent of agrifood measures link directly to the specific climate hazards or impacts reported. And only 14 percent of measures are tailored to address socioeconomic vulnerabilities or needs of specific vulnerable groups in agrifood systems. Systems-based approaches to building agrifood system resilience, such as inclusive value chain development, social protection and nutrition remain under-represented.

- **Critical gaps in evidence-based planning may reduce the effectiveness of adaptation.** Only one-third of developing countries cite the use of climate risk and vulnerability assessment to inform adaptation strategies in agrifood systems in their NAPs and less than half are based on robust adaptation options appraisal and prioritization methods.

- **NAP implementation is progressing, but barriers to agrifood adaptation persist.** While there are high levels of mainstreaming of agrifood adaptation into sectoral strategies, nearly half of all developing countries with a NAP cite limited technical expertise, weak coordination, inadequate finance, or challenges to engage the private sector as critical implementation barriers.

- **Finance for agrifood adaptation falls short.** There is a mismatch between the 54 percent of adaptation finance needed for agrifood systems estimated in developing country NAPs and the 20 percent of current adaptation finance flows reaching the sector. This represents only 1 percent of total climate finance.

- **Monitoring, evaluation and learning (MEL) systems are underdeveloped.** Only one-third of developing countries with a NAP report operational MEL frameworks and just under half identify indicators for tracking progress on adaptation in agrifood systems – an initial indication of the readiness for reporting on collective progress towards the global goal on adaptation (GGA) targets.

- **Vulnerable groups in agrifood systems are not adequately recognized.** Less than half of developing countries with a NAP identify the unique vulnerability of populations reliant on climate-sensitive agrifood systems for their food security and livelihoods, including smallholders, pastoralists, fishers, forest-dependent communities, women, Indigenous Peoples, youth, migrants, the poor, people with disabilities, food workers, or other marginalized groups in agrifood systems, despite their central role as leading actors for building resilience.

- **Agrifood systems are already experiencing loss and damage.** Losses and damages in agrifood systems, due to extreme weather and slow onset events, are referenced in nearly half of developing countries with a NAP – with more references than in any other sector. These losses, including income and livelihood losses, damaged productive infrastructure, degraded ecosystems and loss of human life are also reported as observed more frequently than those in other sectors, suggesting that the limits to adaptation are already being met.

- **NAPs are strategic opportunities and enablers of action.** They provide an essential framework to scale adaptation in agrifood systems, but stronger evidence, governance, finance, and equity are needed to deliver and accelerate climate-resilient and inclusive agrifood system transformation.

1. Introduction

1.1. BACKGROUND

Climate change threatens the productivity of agrifood systems and their capacity to meet the needs of the people that depend upon them for their livelihoods, income, food security and well-being. Nearly half the world's population lives in households linked to agrifood systems (Davis *et al.*, 2023) and climate change has already exposed millions of people to acute and severe food insecurity worldwide, with vulnerable groups, including women, small-scale agricultural and low-income households, hit the hardest (FAO, 2024; IPCC, 2023). The impacts of climate change will continue to ravage agrifood systems in the form of reduced crop yields, higher incidence of pests and diseases, livestock mortality, biodiversity loss, land degradation, and market and supply chain disruptions, among others (IPCC, 2023). As the planet continues to warm, climate risks to agrifood systems are projected to escalate: estimates show that under a high emissions scenario global yields are expected to fall significantly for most staple crops by 2050 (Hultgren *et al.*, 2025). Ten percent of current areas for agriculture will become climatically unsuitable by mid-century, reaching up to 30 percent by 2100 (IPCC, 2023), while climate change-driven biodiversity loss and land degradation pose serious threats to agricultural productivity, nutrition and food security (HLPE, 2025). Climate change impacts can further interact with and compound other drivers of risk, such as the direct links already established between weather extremes and severe food insecurity spikes in fragile and conflict affected settings (FSIN and GNAFC, 2025).

Adaptation in agrifood systems is necessary for achieving a world free of hunger and achieving food security (Sustainable Develop Goal 2), yet current adaptation efforts are insufficient to keep pace with rising climate risks (IPCC, 2023). Climate-resilient agrifood systems are essential for safeguarding food security and nutrition, as they provide the sustenance necessary to feed a growing global population. They also sustain rural livelihoods by employing billions of people in farming, processing, and distribution, which in turn contributes significantly to national economies (Davis *et al.*, 2023). To prevent climate risks from derailing progress to date on sustainable development and food security, it is crucial to strengthen the resilience and adaptive capacity of agrifood systems.

The national adaptation plan (NAP) process provides a strategic framework for countries to identify, prioritize, and address their adaptation needs across sectors and systems, including for agrifood systems. The call for country NAPs was established under the United Nations Framework Convention on Climate Change (UNFCCC) through the Cancun Adaptation Framework in 2010, with the goal of reducing vulnerability to climate change and integrating adaptation into national and sectoral development planning processes. Guided by decision 5 of the UNFCCC Conference of the Parties (COP) 17 in 2011 and supported by the Least Developed Countries Expert Group (LEG), the NAP process was established with an emphasis on country-driven, iterative, and participatory action (UNFCCC, 2011a). As defined by the UNFCCC, the two objectives of national adaptation planning are:

1. to reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience, and
2. to facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate (LDC Expert Group, 2012a).

The NAP process has gained momentum with the global goal on adaptation (GGA) as well as the NAP 3.0 initiative launched by the UNFCCC Secretariat in 2024. The 2025 updated LEG NAP Technical Guidelines (LDC Expect Group, 2025) provide refined guidance and lessons learned for all phases of the NAP process. Increasingly, countries are aligning their NAPs with nationally determined contributions (NDCs), long-term low emission development strategies (LT-LEDs), national development strategies – including agricultural and other sectoral planning and development policies – and the Sustainable Development Goals (SDGs) under the 2030 Agenda.

Recent analyses by the LEG indicate that countries are making steady progress in formulating, updating, and advancing NAPs, with many recognizing the importance of integrating agrifood systems into national adaptation priorities (LDC Expert Group, 2023). Overall, 172 countries – 87 percent of the total – have a national adaptation planning instrument as of 2024 (UNEP, 2025). However, the depth and specificity of sectoral integration in the NAPs, particularly in agriculture, forestry, fisheries and aquaculture, varies across countries.

This report presents an analysis conducted to better understand how agrifood systems are included in the NAPs of developing countries – and where gaps and opportunities for strengthening this integration remain. This sectoral analysis complements the LEG progress reports, seeking to understand the depth and breadth of consideration of agrifood systems in the NAPs that have been submitted to date, as well as the readiness for NAP implementation going forward. It also presents recommendations on how countries may strengthen adaptation in agrifood systems within the NAP planning cycle in the future, including alignment with the GGA targets under the UAE Framework for Global Climate Resilience (UNFCCC, 2023a).

The analysis and report were prepared by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Development Programme (UNDP) as part of their joint flagship programme “Scaling up Climate Ambition on Land Use and Agriculture through Nationally Determined Contributions and National Adaptation Plans” – SCALA – (2020–2028). SCALA – which is funded by Germany's Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) through the International Climate Initiative (IKI) – works directly with over 20 countries and supports global research and knowledge sharing based on its experience working to strengthen policy, build capacity, advance private sector engagement, and bolster data and information systems to mobilize climate action for resilient agriculture and land use.

FAO plays a key role in supporting countries to integrate agrifood systems into the NAP process and has developed supplementary guidelines on *Addressing agriculture, forestry and fisheries in National Adaptation Plans* (Brugere and Young, 2020; Karttunen *et al.*, 2017; Meybeck *et al.*, 2020). In line with its global mandate to eradicate hunger and promote sustainable agriculture,

FAO provides institutional and technical support to developing countries on the integration of agrifood system climate solutions into policies, legislation, plans and budgets at the national, sectoral and local level through the *FAO Strategy on Climate Change 2022–2031* and accompanying Action Plan. This assistance enables countries to strengthen their adaptation planning and implementation processes for building the climate resilience of agrifood systems in line with the GGA of the Paris Agreement and 2030 Agenda for Sustainable Development. FAO's support focuses on generating sector-specific risk and vulnerability data, enhancing institutional capacities and mechanisms for inclusive and evidence-based adaptation planning, strengthening technical capacities and systems for monitoring, evaluation and learning (MEL) and facilitating access to climate finance.

UNDP also plays a leading role in supporting countries to advance their NAP processes. UNDP provides policy and institutional assistance to integrate climate change adaptation into policy, planning and investments, across the local, regional, national and global levels, and links NAPs to broader development goals and NDCs through the Climate Promise. Working with over 140 countries and territories and directly benefiting 37 million people, the Climate Promise is UNDP's framework for supporting developing countries to achieve their NDC priorities and deliver the goals of the Paris Agreement. It enables the design and implementation of bold climate action that builds resilience, reduces greenhouse gas emissions, and advances sustainable development priorities. This work leverages UNDP's expertise in gender equality, energy, nature, poverty, health, finance and climate security, among others.

1.2. PURPOSE

As the NAP process gains global momentum, this joint FAO–UNDP analysis looks across all NAPs from developing countries – 64 in total as of 15 June 2025 – to take stock of adaptation priorities and needs in agrifood systems. The analysis serves as a reference for guiding adaptation implementation and investments, highlighting adaptation planning progress and gaps and providing actionable insights on how to strengthen the integration of agrifood systems into NAPs going forward in a way that is grounded in evidence-based, forward-looking, and inclusive approaches. It recognizes that agrifood systems are highly sensitive and exposed to climate change, and their effective integration into NAPs is an important step towards advancing resilience, food security, and sustainable development.

The report is primarily intended to serve two distinct, yet interconnected, audiences:

- **National government stakeholders:** This includes policymakers and technical teams within national ministries of agriculture, forestry, fisheries, environment, finance, planning and social development, other relevant departments, councils and agencies responsible for agrifood system and food security issues, and subnational government planners, who are directly engaged in the formulation and implementation of NAPs.
- **Adaptation practitioners and development partners:** This encompasses technical agencies, international organizations, private sector entities, financial institutions and civil society organizations that provide essential support, expertise, and capacity development for adaptation planning.

This report is organized in three main chapters:

1. **Introduction** – which provides the context, purpose and methodology;
2. **Findings** – which presents the research results and key takeaways of the analysis, organized into sections centered around climate risks and impacts; priority systems and adaptation actions; implementation readiness, barriers and finance; tracking adaptation; gender equality and social inclusion; and loss and damage in agrifood systems; and
3. **Conclusions and the way forward** – which summarizes key takeaways and offers cross-cutting recommendations in line with the LEG NAP Technical Guidelines.

1.3. METHODOLOGY

This report uses a rigorous analytical approach to assess the integration of agrifood systems into NAPs. A conceptual framework was adopted that accounts for the interconnectedness of agrifood systems, ecosystems and biodiversity, and human and socioeconomic systems within the context of climate change impacts and responses:

- **Agrifood systems** encompass the entire value chain, from production (crops, livestock, forestry, and fisheries and aquaculture) and post-harvest activities to storage, distribution and consumption, including the actors involved at every stage of the value chain.
- The **ecosystems and biodiversity** that support these systems are also considered, as they provide essential ecosystem services like pollination and water regulation.
- **Human and socioeconomic systems** include elements like livelihoods, health, energy, and infrastructure that are critical to the functioning of agrifood systems.

This conceptual framework underpinned the systematization of the analysis and identification of trends across a heterogenous set of NAP documents and national agrifood contexts. The analysis was guided by a set of research questions that examine the climate-related hazards, vulnerabilities, impacts and risks reported in agrifood systems, the adaptation priorities and strategies set forth, and the extent to which they are grounded in climate science, inclusive and based on an evidence-based approaches. The analysis also evaluates elements of NAP implementation readiness, including institutional arrangements, stakeholder engagement, finance needs, barriers to action and the metrics and systems in place to track adaptation progress. Refer to the FAO protocol for data extraction and analysis of agrifood systems in NAPs and NDCs – see Information note 1 (Methodology) on the publication page (https://openknowledge.fao.org/handle/20.500.14283/cd7579en) for a description of the full methodology developed, which is based on extensive literature review, including the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (IPCC, 2023) and FAO research and expertise.

To conduct the analysis, a research team screened 62 NAPs and 19 sectoral NAPs submitted by developing countries[3] to the UNFCCC NAP Registry as of June 15, 2025. These represent 64 developing countries (42 percent of all developing countries); 23 least developed

[3] Defined as non-Annex I Parties to the UNFCCC.

countries (LDCs) – 53 percent of total LDCs; and 13 Small Island Developing States (SIDS) – 33 percent of total SIDS (Table 1). A total of five NAP documents were excluded from this analysis based on the document inclusion/exclusion criteria defined in the methodology (e.g. documents titled “communication plan”, “executive summary”). In addition, it should be noted that 11 NAPs submitted by developed countries that were available at the time of this analysis were excluded given the scope.

TABLE 1. Number of developing countries with NAP(s) submitted to the UNFCCC and reviewed in this analysis

FAO Region and UN Special Country Group	Number of developing countries with a NAP submitted and included in this analysis	Total number of developing countries	Share (%) of total developing countries with a NAP submitted and included in this analysis
Global	64	151	42%
Africa	21	47	45%
Europe and Central Asia	7	17	41%
Latin America and the Caribbean	16	33	48%
Asia and the Pacific	15	37	41%
Near East and North Africa	5	17	29%
LDCs	23	43	53%
SIDS	13	39	33%

Source: Authors’ own elaboration, based on analysis of national adaptation plans submitted to UNFCCC as of 15 June 2025. Refer to Appendix 1 for a full list of countries with NAP(s) submissions included in this analysis, along with the inclusion/exclusion criteria.

Each NAP was systematically screened against the FAO data extraction and analysis protocol for agrifood systems in NAPs and NDCs. The data was extracted and coded manually in an Excel database and quality reviewed by at least three technical experts. R programming was used for statistical analysis and data visualization to produce the findings presented in this report. The findings presented in the document refer to the proportion (%) of developing countries (n = 64) with a NAP(s), as some countries have more than one NAP submission. However, for brevity and readability, the document uses the phrasing "percent of countries with a NAP" when referring to the sample of NAPs that were analysed.

Limitations

This analysis is detailed but has limits to its scope. The NAPs analysed were submitted between 2010 and 2025, which illustrate a high degree of heterogeneity. These documents vary significantly in length, data availability, and alignment with evolving UNFCCC decisions and priorities. This heterogeneity limits the direct comparability of documents over time.

In addition, this analysis provides a static look at NAPs from a review of the planning documents themselves. It does not explore how implementation is unfolding, or how goals and priorities have evolved since countries developed their NAP documents. The analysis predominately looks at the proportion of NAPs, or countries, that include adaptation actions – rather than the reach and effectiveness of each action. As such, it is not feasible to draw conclusions on the impact that these actions might have on transforming agrifood systems beyond commenting on the kinds and characteristics of the adaptation actions developed. Likewise, this analysis does not include an impact assessment of these adaptation actions, or a survey of which actions are under implementation or completed.

Future research exploring the extent to which NAPs are being implemented and how adaptation in agrifood systems is unfolding – what is working well and why – would be helpful to guide future NAP strengthening and development.

It is also critical to recognize that these systems – agrifood systems, ecosystems and biodiversity, as well as human and socioeconomic systems – are all mutually reinforcing parts of a broader development context. As such, many of the adaptation actions that are identified for one area may be overlapping or mutually reinforcing with adaptation actions and goals in one or both other areas and should be considered to ensure they avoid inadvertent maladaptation.

Finally, future research based on this report is needed to further interpret the findings and explore key issues that are beyond the scope of this paper, including just transition, socioeconomic impacts of adaptation, and limits to adaptation.

2. Findings

2.1. CLIMATE RISKS AND IMPACTS

Effective adaptation planning requires an understanding of how climate hazards, vulnerability and exposure interact to generate climate risks and impacts in natural and human systems, including in agrifood systems. Indeed, adaptation efforts are most effective when informed by robust climate risk data and analysis (Pörtner *et al.*, 2022).

This section considers the climate-related risks and impacts on agrifood systems reported in the NAPs, as well as how countries utilize climate data and risk and vulnerability assessments to provide the evidence base for understanding impacts, prioritizing interventions, and targeting resources where they are needed most.

Agrifood systems, ecosystems and human systems

Research Finding #1. 97 percent of developing countries with a NAP report climate-related impacts on agrifood systems and their cascading consequences on food security and nutrition.

Agrifood systems are particularly vulnerable to climate change, and climate change is one of the biggest threats to food security worldwide (UNFCCC, 2021). Climate change impacts are particularly pronounced in developing countries largely dependent on rainfed and smallholder subsistence agriculture with limited capacity to adapt to climate change. As they describe their climate risk context in their NAPs, countries consistently note climate-related risks and associated impacts on agrifood systems; impacts on the supporting ecosystems and biodiversity that provide essential services for food and agriculture; and on the human and socioeconomic systems that underpin and sustain the lives and livelihoods of those dependent on agrifood systems. The findings presented here detail the observed and/or projected climate-related impacts and risks[4] reported across these three subsystems or categories.

In the past three decades, disaster events have caused over USD 3.8 trillion in lost agricultural output, a figure equivalent to approximately 5 percent of global annual agricultural gross domestic product (GDP), and extreme temperatures, droughts, floods, landslides and storms were the leading hazards driving those losses across the world (FAO, 2023a). This figure is reflected in the fact that 95 percent of countries[5] report climate-related impacts on agrifood production systems and value chains in their NAPs. This rises to 97 percent when impacts on food security and nutrition are considered. Out of all agrifood subsectors, governments consistently report impacts on crops (94 percent of countries), but over half of all countries also

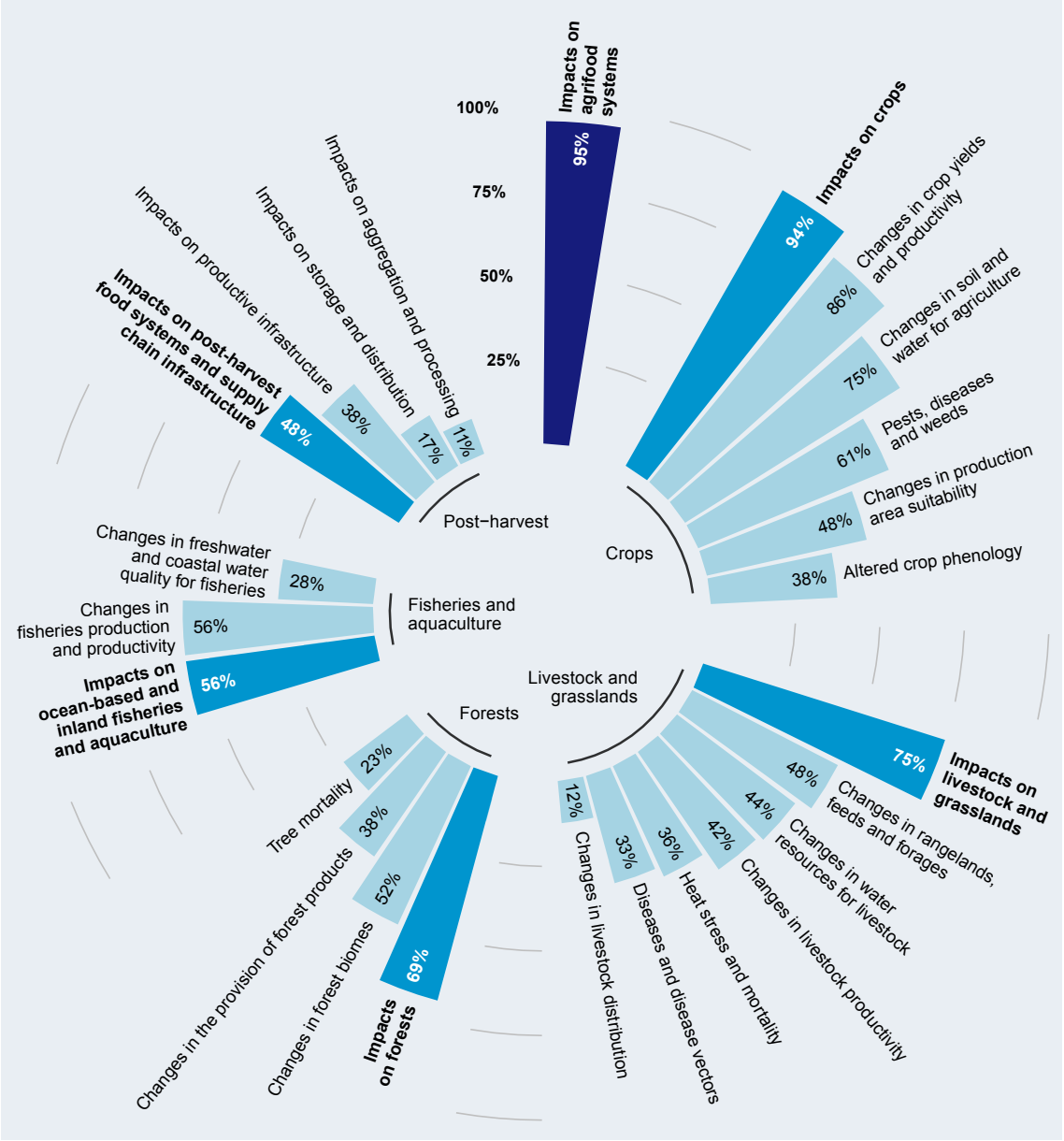
[4] From here forward, the reference to climate-related "impacts" and "risks" is used interchangeably, regardless of how they were reported in NAPs.

[5] The trends reported in this analysis refer to "percent of developing countries with a NAP analysed". Throughout the narrative, the phrase is shortened to "percent of countries" for brevity.

report impacts in each of the other agricultural subsectors, including livestock and grasslands (75 percent), forests (69 percent), and ocean-based and inland fisheries and aquaculture (56 percent) – see Figure 1. Countries most frequently report climate-related declining crop yields and productivity, degradation of soil and water resources, higher incidence and frequency of crop pests, diseases and weeds, changes in fisheries production and primary productivity, diminished rangeland, forage and feed quality and quantity, and reduced water resources for livestock. Around one-third of countries also cite the downstream impacts of climate change on agrifood value chains and infrastructure, mainly on productive infrastructure and assets, while few report impacts on post-harvest processes or on food storage and distribution infrastructure. The IPCC warns that food supply chains will be hit by food safety concerns, especially with an increase in warmer and more humid conditions (IPCC, 2023).

Regional variations show how climate impacts on agrifood systems manifest differently across the globe. Countries in Latin America and the Caribbean and sub-Saharan Africa most frequently report impacts on livestock and grasslands, while countries in Asia and the Pacific and in Europe and Central Asia most often report impacts on crops. Countries in the Near East and North Africa highlight impacts on forests, while SIDS stress threats to fisheries, aquaculture and post-harvest infrastructure and supply chains.

FIGURE 1. **Percentage of developing countries with a NAP that report observed and/or projected climate-related impacts and risks on agrifood systems, by subsector and impact type**



Note: 95 percent of developing countries with a NAP report climate-related impacts on agrifood production systems and value chains. This rises to 97 percent when impacts on food security and nutrition are also included.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Climate-related impacts on agrifood systems lie at the centre of country adaptation agendas because these systems underpin food security, livelihoods, assets, and economic development. By recognizing agrifood systems as highly exposed and vulnerable, countries create a clear rationale for directing adaptation finance, policy reforms, and capacity-building

efforts to reducing systemic risks and safeguarding food security. However, while impacts on agrifood systems are evidenced in the NAPs, the variation of climate-related impacts and risks across regions, countries, communities, and agroecological systems demonstrate the need for tailored adaptation measures and approaches.

Research Finding #2. 95 percent of developing countries with a NAP report climate-related impacts on ecosystems, which provide critical services to food and agriculture.

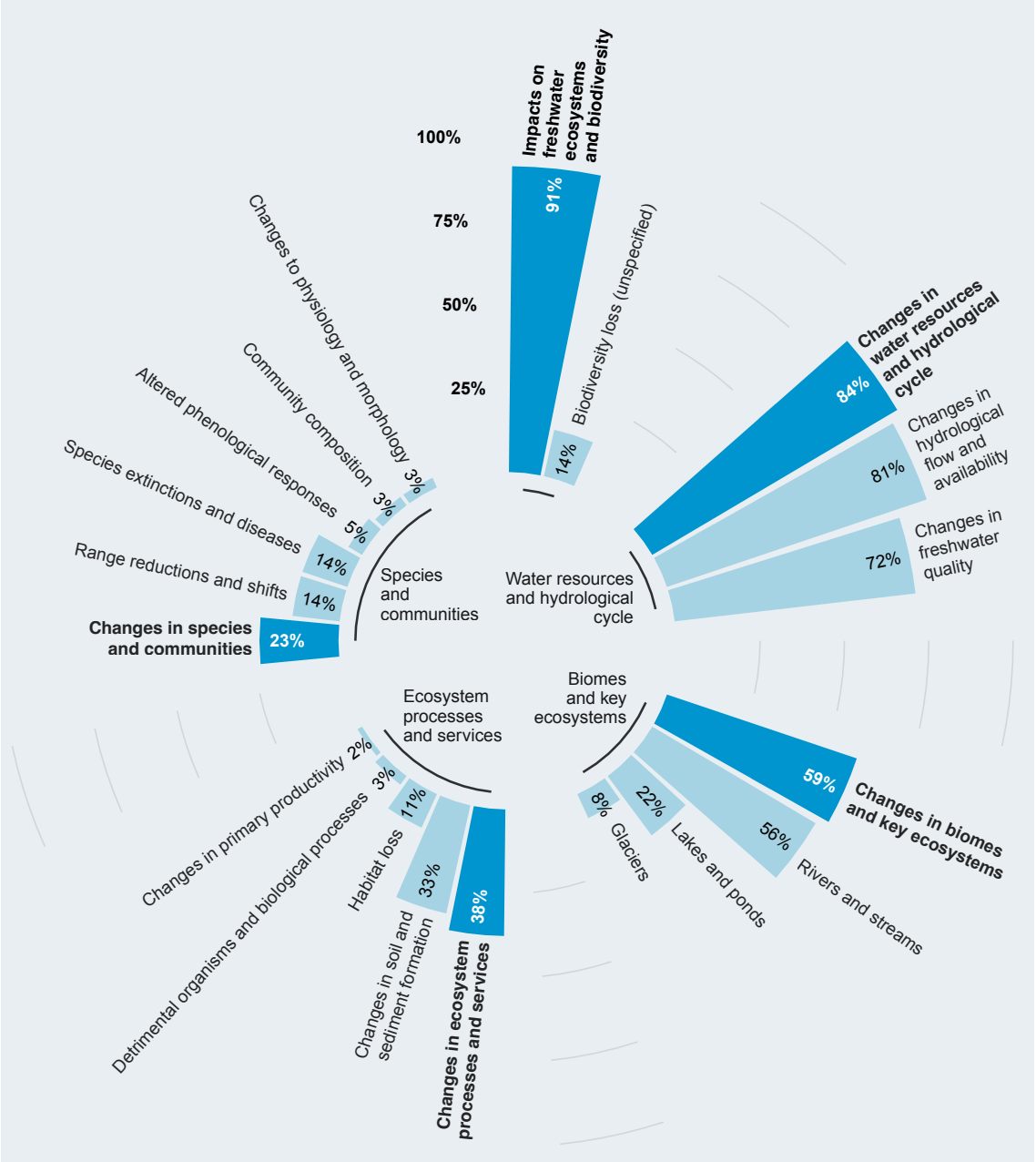
Associated pressures from climate change on ecosystems and biodiversity[6] – including terrestrial, ocean and coastal, and freshwater systems and their services – are increasingly affecting agrifood systems from yield declines to a rise in pests and diseases, increasing the number of people at risk of hunger (IPCC, 2023). Ninety-five percent of countries report climate-related impacts on ecosystems and their services, which function as the ecological foundation of food and agriculture systems, sustaining and enabling production, resilience, and human well-being. Ecosystems directly provide food, fibre and fuel, as well as the services that sustain production such as pollination, pest control, water filtration, nutrient cycling, and local climate regulation. Ecosystems also provide services that support the resilience and well-being of human populations in the face of climate change, such as protecting communities from erosion, landslides or flooding, stabilizing shorelines and buffering against storm surges or saltwater intrusion.

Almost all countries (over 90 percent) report climate-related impacts on freshwater ecosystems and water resources and over 85 percent on terrestrial ecosystems (Figure 2 and Figure 3). Two-thirds of countries report impacts on ocean and coastal ecosystems (Figure 4) and half (47 percent) also report impacts on wetlands. SIDS and countries in Asia and the Pacific, Latin America and the Caribbean, and Near East and North Africa emphasize impacts on ocean and coastal ecosystems, while countries in Europe and Central Asia, and Latin America and the Caribbean report significant pressure on wetlands.

Governments identify a wide range of climate-related impacts on natural and managed ecosystems in their NAPs, including changes and biodiversity loss at the species and ecosystem levels. Reported changes include altered hydrological flows, declining water quality and availability, shifts in forest distribution and physiology, and increased soil degradation. The decline in ecosystem services poses a large threat to productive agrifood systems: Water stress undermines irrigation and rangelands, while degraded forests weaken nutrient cycling, pollination services and flood regulation. Understanding how climate change is affecting the interactions between biodiversity and the critical services they provide for food and agriculture is an essential part of building overall agrifood system resilience.

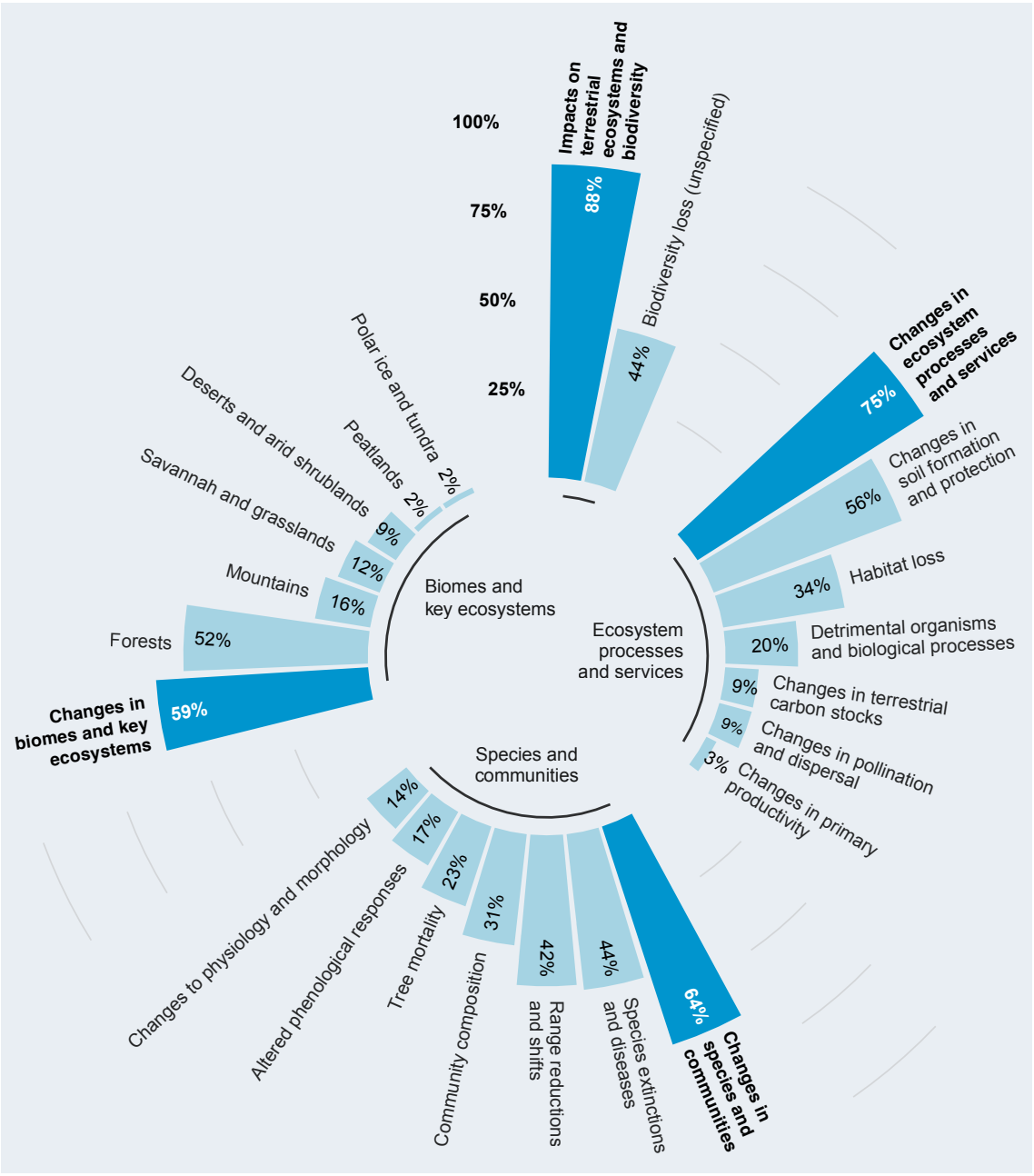
[6] Biodiversity or biological diversity means the variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems (Article 2 of **United Nations.** 1992. *Convention on Biological Diversity*. https://www.cbd.int/convention/articles?a=cbd-02).

FIGURE 2. **Percentage of developing countries with a NAP that report observed and/or projected climate-related impacts and risks on freshwater ecosystems and their services (including water resources), by impact type**



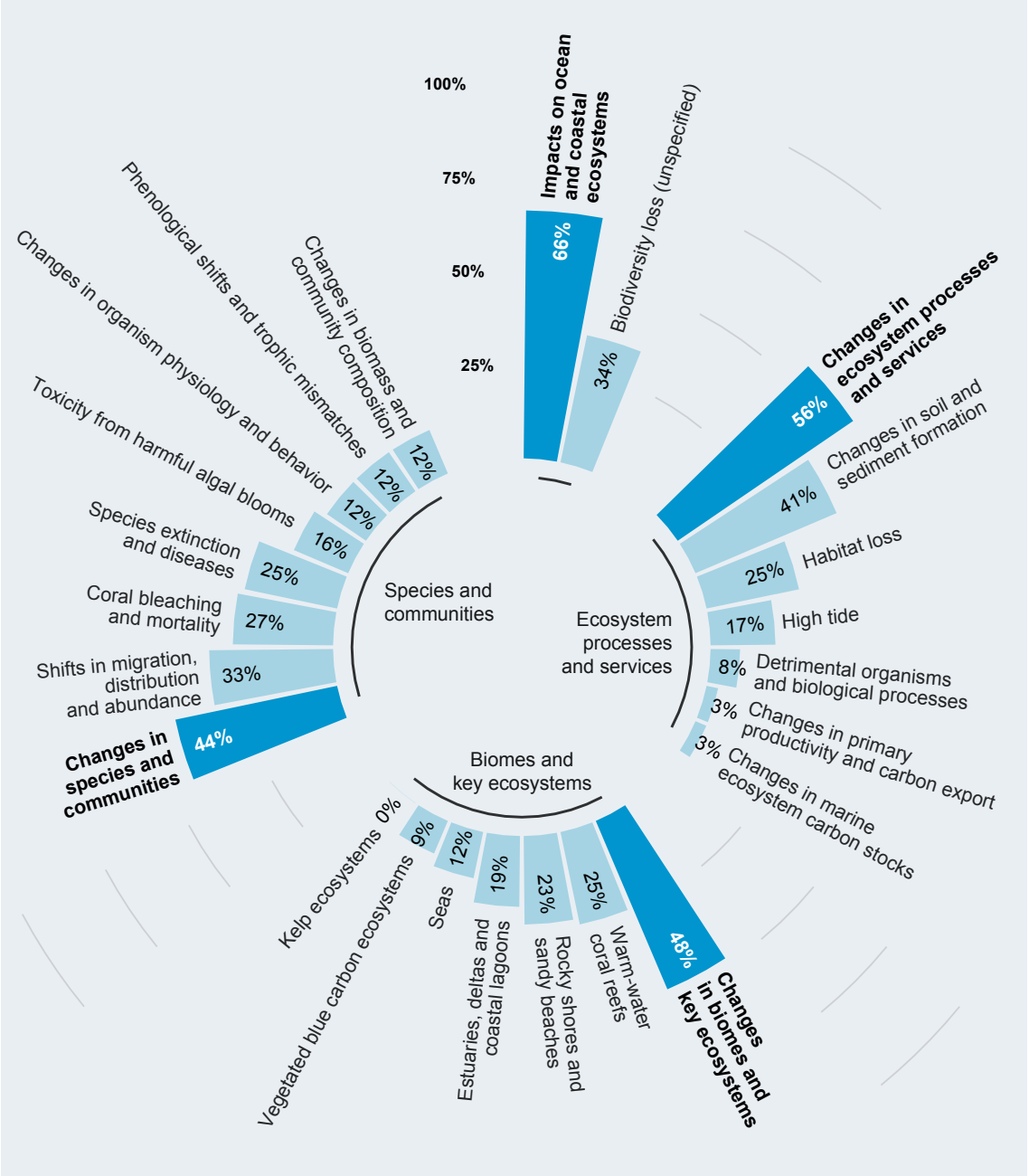
Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

FIGURE 3. **Percentage of developing countries with a NAP that report observed and/or projected climate-related impacts and risks on terrestrial ecosystems and their services, by impact type**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

FIGURE 4. **Percentage of developing countries with a NAP that report observed and/or projected climate-related impacts and risks on ocean and coastal ecosystems and their services, by impact type**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Climate-related impacts on ecosystems and biodiversity are widely recognized in NAPs, illustrating a significant threat to the capacity of agrifood systems to adapt to extreme weather events and climate change. Irreversible losses in terrestrial, freshwater, coastal and open ocean and marine ecosystems that provide essential services to agrifood systems have already occurred in every region, and the biodiversity loss will continue to rise exponentially with every degree of warming (IPCC, 2023). Roughly half of the world's population currently experiences severe water scarcity for at least some part of the year (IPCC, 2023) – the impacts of which are disproportionately absorbed by already vulnerable populations, particularly those dependent on agriculture. Between 1983 and 2009, approximately three-quarters of the global harvested areas experienced yield losses induced by meteorological drought (IPCC, 2023). By recognizing the exposure of critical ecosystems and natural resources to climate-related hazards and interlinkages with productive sectors such as agriculture, governments can use the NAP process to make the case for investing in climate-resilient ecosystems and water security as not only an environmental concern but also an economic one.

Research Finding #3. 98 percent of developing countries with a NAP report climate-related impacts on human or socioeconomic dimensions that are closely tied to agrifood systems, including livelihoods and poverty, health, and human mobility.

Climate-driven stresses and shocks are not only threatening ecosystems and agricultural production, but also driving adverse impacts on human health and well-being, food and nutrition security and the livelihood opportunities of all actors in agrifood systems (Campbell, 2022), particularly in developing countries (IPCC, 2023). Human and socioeconomic dimensions of agrifood systems form the enabling environment for agrifood systems and provide opportunities for beneficiaries of these systems to adapt. Cities, communities and critical infrastructure, networks, and services are also exposed to climate change, and impacts on those systems can be a driver of food insecurity, poverty, human mobility and risks to health and well-being, particularly among vulnerable communities.

Nearly all countries (98 percent) report climate-related impacts on the human and socioeconomic systems that benefit from and support agrifood systems in their NAPs (Figure 5). The most frequently cited impacts relate to health, well-being, and changing structure of communities (94 percent of countries), which include impacts on the incidence of communicable diseases, heat- or cold-related mortality and morbidity, and water, sanitation and hygiene (WaSH) services, as well as human mobility and civil conflict, among others.

Climate-related impacts on food security and nutrition are referenced by 83 percent of countries globally and are particularly pronounced in LDCs and SIDS. Among impacts reported, those on food availability are the most commonly featured, with impacts to food access, utilization, and stability much less frequently reported. However, beyond the direct impacts of climate change on agricultural suitability and yields, impacts on food quality, nutritional content, and food access and stability via supply chain disruptions and food price spikes are also unfolding (FAO, 2023a).

Climate-related impacts on livelihoods, poverty, and inequality are reported by 75 percent of countries, including impacts on incomes and livelihoods (69 percent) and inequality and social exclusion (34 percent). The impacts of climate change on urban systems and critical infrastructure, services and networks are also reported by 62 percent of countries with a NAP.

FIGURE 5. **Percentage of developing countries with a NAP that report observed and/or projected climate-related impacts on human and socioeconomic systems, by system dimension and impact type**

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

By documenting these risks, countries make clear that climate impacts on agrifood systems extend far beyond production losses. As climate-related impacts on primary production combine with downstream food supply chain disruptions, they cause economic and non-economic losses and interact with other non-climatic factors driving poverty, hunger and conflict, hindering prospects for achieving the SDGs. Food insecurity erodes nutrition and public health, while impacts on livelihoods deepen poverty and inequality levels and can catalyse conflict and migration and displacement (FAO and UNU-EHS, 2025). These impacts strike hardest in regions

with high climate exposure and limited adaptive capacity (IPCC, 2023). Recognizing these impacts in the NAP process is an opportunity for governments to design adaptation strategies that combine technical on-farm measures in agriculture with social protection, nutrition-sensitive programming, and inclusive livelihood development for the most vulnerable populations.

Climate science basis

Research Finding #4. The most significant climate hazards reported in submitted NAPs – drought and floods – reflect those most impactful to agrifood systems, underscoring the exposure of the sector to climate risks.

In their NAPs, countries consistently highlight changes in rainfall (100 percent of countries) and temperature trends (98 percent), drought (84 percent), and flooding (84 percent) as the most significant climate-related hazards they face. This corresponds with the hazards that, according to scientific evidence, are among the most threatening to agrifood systems (FAO, 2023a). For example, between 2007 and 2022, 65 percent of the total economic losses reported caused by drought occurred in the agriculture sector, devastating crop and livestock production (FAO, 2023a).

Beyond these core climate-related hazards, other extreme weather and slow onset events have significant and expanding impact on agrifood systems and are reported in the NAPs. In the decade from 2008 to 2018, storms and tropical cyclones – reported as a major hazard in the NAPs of 72 percent of countries worldwide and 93 percent of countries in Asia and the Pacific – were responsible for over USD 19 billion in agricultural losses, particularly impacting regions like the Caribbean (FAO, 2023a). Sea-level rise and salinization increasingly affect coastal and deltaic regions, contaminating freshwater aquifers and agricultural lands and reducing crop yields (Bezner Kerr *et al.*, 2022). Sea-level rise was reported as a major climate hazard by 64 percent of countries, including in 80 percent of countries in Asia and the Pacific, 81 percent in Latin America and the Caribbean, and 100 percent in SIDS. Refer to Figure 8 for the major climate-related hazards and events reported in the NAPs.

Research Finding #5. While the NAPs often reference climate data, key elements of evidence-based strategies in agrifood systems – including use of downscaled climate models and climate risk and vulnerability assessment – are often missing.

Across countries, the models and sources of information used to assess climate risks to agrifood systems vary. For most countries, across sectors, these models reflect analysis not only of historical observations, but also future projections of how climate hazards are expected to increase in both severity and frequency as the climate changes.

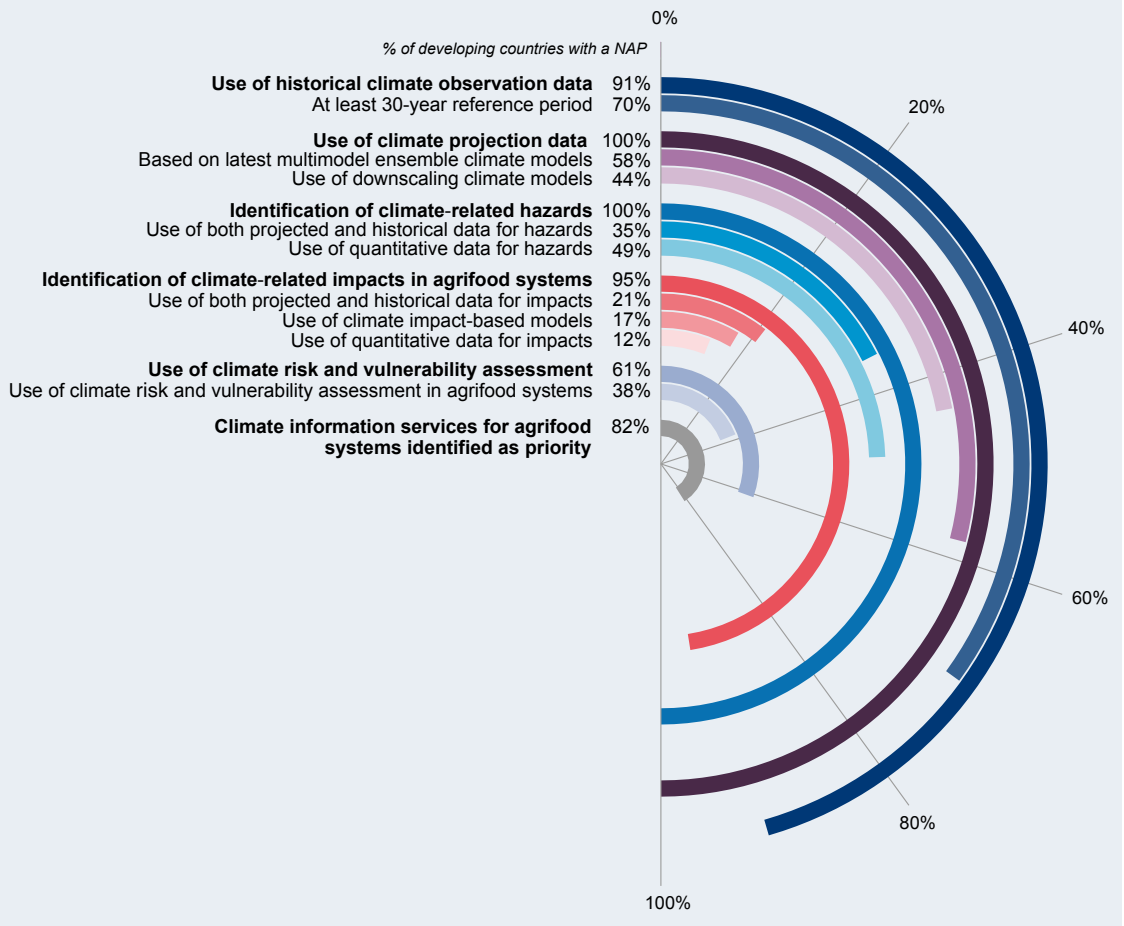
Despite the widespread use of climate observations and projections in NAPs, a significant gap persists in the application of evidence-based tools to understand climate risks to agrifood systems (Figure 6). Around 70 percent of countries are using at least 30 years of historical climate data and all countries report using climate projections in their NAPs. However, only slightly more than half of countries (58 percent) report using the best available[7] climate projection data and less

[7] Use of "best available" or "latest" climate multimodel projection data refers to the use of Coupled Model Intercomparison Project (CMIP) 5 or 6 in NAPs submitted in or after 2021.

than that (44 percent) use regionally downscaled climate models for higher resolution data. Many of these observations remain qualitative or literature-based rather than stemming from quantitative datasets. While nearly all countries identify climate impacts in agrifood systems and food security (97 percent – see Research Finding #1), less than one-fifth of countries cited refer to both historical and projected impacts, and only 17 percent of countries reference the use of climate impact-based models for agrifood systems.

Over 60 percent of countries note the use of climate risk and vulnerability assessments (CRVAs), yet the specific application of these for understanding risks and vulnerabilities in agrifood systems remains low, with approximately one-third (38 percent) of countries globally reporting CRVA use for this critical sector. CRVA is a necessary first step for guiding evidence-based adaptation option identification in agrifood systems (see Research Finding #7).

FIGURE 6. **Percentage of developing countries with a NAP that reference the use of climate science to inform adaptation planning, including in agrifood systems, by climate data category**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

These findings demonstrate that while governments acknowledge the importance of building NAPs on climate science, there are still likely gaps in the underlying technical and institutional capacities and availability of data required for designing evidence-based, climate-risk informed adaptation strategies in agrifood systems. As of 2019, the World Meteorological Organization (WMO) reported that, globally, the use of science-based climate services for adaptation action in the agriculture and food security sector remains one of the weakest areas in the climate services value chain (WMO, 2019). This analysis further emphasizes that an enhanced climate science basis for designing appropriate climate adaptation actions is needed. Without systemic CRVAs, climate impact modeling, and adaptation appraisals (see Research Finding #7), governments risk implementing measures that do not match the scale or specificity of the threats they face.

Evidence-based planning strengthens decision-making and governance, enables countries to target investments, and ensures forward-looking adaptation strategies address the most urgent risks to agrifood systems. Encouragingly, many countries are prioritizing improvements to climate information services that can help expand available quantitative data for risk and impact understanding. Over 80 percent of countries highlight the importance of strengthening climate information services in their NAPs, including early warning systems (EWS) tailored to agrifood systems (Figure 6). Such investments in data, forecasting, and information delivery can help bridge the gap between high-level climate projections and actionable guidance for farmers, local governments, and private sector actors. Expanding the use of advanced modeling, CRVAs, and adaptation option appraisal tools will be critical to building robust, evidence-based adaptation strategies for agrifood systems that can withstand a changing climate.

KEY TAKEAWAYS

- **Climate impacts on agrifood systems are experienced worldwide.** Almost all developing countries with a NAP (97 percent) report climate-related impacts on agrifood systems and food security and nutrition. The crops subsector is the most frequently cited, but all other agricultural subsectors, including livestock and grasslands, forests, fisheries and aquaculture, and post-harvest infrastructure and food supply chains are also highly affected.
- **Impacts on agrifood systems are inextricably connected with those on surrounding ecosystems and human and socioeconomic systems.** Ninety-five percent of developing countries with a NAP report climate-related impacts on the ecosystems and biodiversity that sustain agrifood systems, while 98 percent cite impacts on human and socioeconomic systems – including food security, livelihoods, human mobility and health and well-being. This reflects the interconnected nature of agrifood systems, ecosystems and socioeconomic systems.
- **Evidence gaps limit effective risk-informed adaptation planning for agrifood system resilience.** While all developing countries with a NAP report using climate projections, only 58 percent use the best available multimodel data and less than half (44 percent) use regionally downscaled climate models. Only 38 percent of countries

applied climate risk and vulnerability assessments in the context of agrifood systems and 17 percent utilized impact-based models for agrifood systems, leaving potentially large gaps in understanding risks across agricultural sectors, communities and households. Utilizing the best available climate data, including deeper understanding of the interactions between climate hazards, exposure and vulnerability, can help countries frame risks to agrifood systems.

- **Strengthening data and climate services is a priority.** Over 80 percent of countries with a NAP call for enhanced climate information services for agrifood systems, including early warning systems. Expanding CRVAs, impact modeling, and climate information services for agriculture and food security will help governments better manage climate risks by protecting livelihoods and assets and targeting investments accordingly. Diverse forms of knowledge including indigenous knowledge and local knowledge are recognized as key to understanding climate risks and informing adaptation options (IPCC, 2022).

2.2. PRIORITY SYSTEMS AND ADAPTATION ACTIONS

Prioritization and options appraisal are essential steps in the NAP process, enabling countries to identify which risks are most urgent and which adaptation actions are most feasible and aligned with development objectives (LDC Expert Group, 2012b, 2025). For agrifood systems, prioritization ensures that: a) agrifood systems are addressed in adaptation planning; and b) adaptation actions account for and address the most pressing vulnerabilities of and risks to the agriculture sectors.

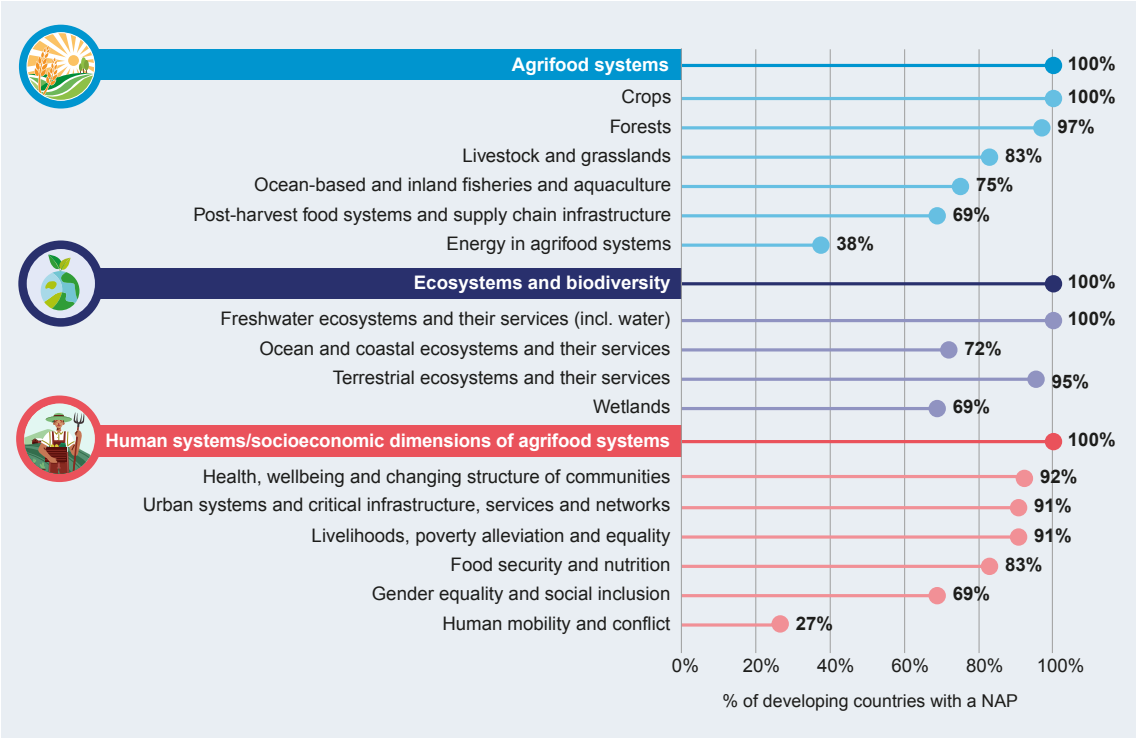
This section details how agrifood systems are prioritized for adaptation in country NAPs, and how countries have included adaptation actions that address agrifood system risks.

Agrifood systems, ecosystems and human systems

Research Finding #6. 100 percent of developing countries with a NAP prioritize adaptation in agrifood systems, as well as the surrounding ecosystems that provide essential services and biodiversity for food and agriculture.

NAPs analysed universally prioritize agrifood systems, ecosystems and biodiversity, and the human and socioeconomic dimensions underpinning agrifood systems, recognizing their critical role in climate adaptation. The following subsections detail the priority areas identified for adaptation in agrifood systems (Figure 7), as well as the types of adaptation actions that countries are proposing in their NAPs.

FIGURE 7. **Percentage of developing countries with a NAP that identify priority areas for adaptation in agrifood systems, by system and subsector**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Agrifood systems

All major agrifood system subsectors – including crops, livestock, forestry, fisheries and aquaculture, and the post-harvest side of food systems and value chains – are integrated into most countries' adaptation priorities, with crops prioritized by all countries. On the other hand, the adaptation benefits of energy efficiency gains along agrifood value chains and more resilient clean energy infrastructure and supply in rural households and communities are not often acknowledged in NAPs.

This subsection presents the typology of adaptation actions identified in the NAPs for building climate-resilient agrifood systems (Table 2). Across all agrifood system subsectors, the most frequently promoted adaptation actions among countries in the NAPs include: (i) climate-tolerant crops and varieties, (ii) afforestation, reforestation and forest and landscape restoration, (iii) irrigation and drainage, (iv) on-farm soil and water moisture conservation, and (v) water harvesting.

TABLE 2. **Percentage of developing countries with a NAP that include adaptation actions related to agrifood systems, by subsector and action typology**

Adaptation Actions in the NAPs: Agrifood systems			
Subsector	**Most frequently reported adaptation action typologies**	**Least reported adaptation action typologies**	**Regional highlights**
Crop **Adaptation actions in 100% of countries**	• Adoption of climate tolerant crops and varieties (84%) • Irrigation and drainage systems (80% of countries & highest number of overall actions) • Sustainable/Climate-resilient agriculture* (77%) • On-farm soil nutrient and water conservation (73%) • Water harvesting (69%) • Mixed systems, including agroforestry (53%)	• Pest and disease management (45%) • Crop calendar optimization & rotation (31%) • Improved rice management (16%) • Reduced crop residue burning & fire management (9%) • Frost and hail protection (8%)	**High priority in all regions** • Climate-tolerant crops especially a focus in LDCs (87%), Asia and Pacific (93%), and NENA • Mixed systems especially a focus in LDCs (74%) • Improved rice management prevalent in Asia and Pacific, SSA • Frost and hail protection prevalent in NENA, Europe and Central Asia
Forests **94% of countries**	• Afforestation, reforestation & forest and landscape restoration (84%) • Sustainable forest management (59%) • Agroforestry (53%) • Reducing deforestation and forest degradation (45%) • Adapted forest species and genetic diversification (45%)	• Wildfire prevention & management (38%) • Forest conservation (38%) • Pest and disease management (33%) • Non-timber forest products (25%) • Urban and peri-urban forestry (19%)	**High priority (> 80%) in all regions except SIDS** • Afforestation & reforestation in 100% of NENA NAPs, 86% of Europe and Central Asia • Non-timber forest products priority in NENA, Asia and Pacific • Sustainable forest management prevalent in SSA, LAC, and >60% of LDCs. • Agroforestry widely emphasized in LDCs (74%) • Wildfire prevention and management more common in Europe and Central Asia
Livestock & grasslands **83% of countries**	• Grazing & grassland management and restoration (47%) • Animal feed and nutrition (44%) • Animal health & welfare (41%) • Adapted animal breeds & species diversification (38%)	• Sustainable/climate-resilient livestock & grasslands* (16%) • Manure management & bioeconomy (14%) • Mixed systems, including agrosilvipastoralism (12%) • Water infrastructure for livestock (12%)	**High priority (> 80%) in all regions, except Europe and Central Asia** • Grazing & grassland management especially prevalent in SSA (67%), LDCs (65%) • Animal feed and nutrition high priority in NENA (80%) • Higher rate of agrosilvipastoralism in LLDCs (35%)

* Mention of general “sustainable” or “climate-resilient” practice.

Adaptation Actions in the NAPs: Agrifood systems			
Subsector	**Most frequently reported adaptation action typologies**	**Least reported adaptation action typologies**	**Regional highlights**
Ocean-based and inland fisheries & aquaculture **70% of countries**	• Adaptive capture fishing practices and technologies (38%) • Aquaculture species selection and selective breeding (36%) • Sustainable fisheries practices (33%) • Aquaculture farm site selection & infrastructure (33%)	• Aquaculture water management (14%) • Improved water management to sustain fishery services (8%) • Aquaculture feed management (8%) • Safety at sea (0%)	**High priority in Asia and the Pacific and NENA** • Adaptive capture fishing practices & tech priority in NENA (60%) and LAC (50%) • Aquaculture species selection and selective breeding in Asia and Pacific (67%)
Post-harvest food system & supply chain infrastructure **69% of countries**	• Value addition and markets (50%) • Improved post-harvest practices (47%) • Productive infrastructure and equipment (31%)	• Food loss and waste reduction (8%) • Agricultural waste management (5%) • Agricultural wastewater management (2%)	**High priority in SSA and NENA** • Value addition and markets particularly prevalent in SSA (76%) and LDCs (74%) • Improved post harvest particularly prevalent in Asia and Pacific (73%) • Low inclusion in Europe and Central Asia (29%)
Energy in agrifood systems **38% of countries**	• On farm and post-harvest improved energy efficiency and supply (22%)	• Improved energy efficiency and supply in rural households and communities (12%) • Bioenergy generation (12%) • Use of bioenergy byproducts as organic fertilizer (0%)	**High priority in NENA (80%)**

Note: In this table, figures represent the proportion of developing countries with a NAP reporting adaptation actions within each agrifood subsector. NENA = Near East and North Africa; LAC = Latin America and the Caribbean; SSA = sub-Saharan Africa.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

There is a notably lower focus on improved livestock management practices or integrated approaches, such as agrosilvipastoralism. Systems-based approaches that look at reducing food losses along agrifood value chains, climate-resilient food storage to buffer against supply shocks, and reuse of agricultural waste as organic inputs or energy are also less prevalent than adapting crop varieties or irrigation. There is also variation of adaptation priorities across regions, which is often linked to predominant regional production systems, such as irrigated rice production in Asia or pastoral systems in Africa.

Adaptation in agrifood systems can be enabled or hindered by underlying conditions. The IPCC identified three categories of enabling conditions for adaptation and risk management, including governance, knowledge and capacity and finance (New *et al.*, 2022). Of all agrifood system-related adaptation actions analysed, over 55 percent can be considered governance-

based instruments, such as regulations or policies, and over 47 percent are knowledge- and capacity-based actions, such as trainings or research. Less than 7 percent of all agrifood system actions are related finance-based instruments, though 70 percent of countries prioritized finance-based instruments in their NAPs as necessary for adaptation in agrifood systems. Economic incentives and market-based instruments only represent around 3 percent of agrifood adaptation actions. Highlighting key areas of need, 81 percent of countries include actions that prioritize research and development for agrifood systems adaptation, and 82 percent of countries promote actions that strengthen climate information services, including early warning systems, for agrifood systems.

Ecosystems and biodiversity

The inclusion of ecosystems and biodiversity as priority areas for adaptation across all NAPs analysed reflects the important role these ecosystems play in providing key services that buffer economic sectors and communities against climate extremes and maintain and build their system resilience in the face of climate change. Of the ecosystems considered, nearly all countries tend to prioritize freshwater ecosystems and water resources, with ocean and coastal ecosystems, terrestrial ecosystems, and wetlands featuring in adaptation priorities of around three-fourths of countries.

This subsection presents the typology of adaptation actions identified in the NAPs targeting ecosystems and biodiversity, which provide critical adaptation services to agrifood systems (Table 3). Across all ecosystems, the most frequently promoted adaptation actions include: (i) water management in agriculture, forestry and fisheries; (ii) restoration, management and/or conservation of terrestrial ecosystems and their services; (iii) sustainable water management; (iv) conservation and/or management of ocean and costal ecosystems and their services; and (v) WaSH-related adaptation in agrifood systems and rural areas.

TABLE 3. **Percentage of developing countries with a NAP that include adaptation actions related to ecosystems and biodiversity included in NAPs, by ecosystem and action typology**

Adaptation Actions in the NAPs: Ecosystems & biodiversity			
Ecosystem	**Most frequently reported adaptation action typologies**	**Least reported adaptation action typologies**	**Regional highlights**
Freshwater ecosystems and their services (including water resources) **Adaptation actions in 100% of countries**	• Water management in agriculture, forestry, fisheries, and aquaculture (91%) • Sustainable water management (53%) • WaSH-related adaptation in agrifood systems and rural areas (50%) • Wastewater treatment and reuse of non-conventional sources in agrifood systems (42%) • Flood risk reduction (42%)	• Riparian habitat restoration (28%) • Adaptation of the cultural water uses of Indigenous Peoples (2%)	**High priority in all regions** • Water management in agriculture sectors a focus in all regions (over 85%), LDCs (91%) and SIDS (85%), except Europe and Central Asia • Sustainable water management especially priorities in Asia and Pacific (60%), LAC (69%), NENA (80%) • Wastewater treatment and reuse prevalent in NENA (60%) • Adaptation of the cultural water uses of Indigenous Peoples included only by LLDCs
Terrestrial ecosystems and their services **95% of countries**	• Restoration (86%)	• Management (81%) • Conservation (69%)	**High priority in all regions**
Ocean & coastal ecosystems and their services **70% of countries**	• Conservation (56%) • Management (52%)	• Restoration (41%)	**High priority in Asia and Pacific, LAC, NENA, and SIDS**
Wetlands **69% of countries**	• Management (41%) • Conservation (38%)	• Restoration (33%)	**High priority in LAC and NENA**

Note: In this table, figures represent the proportion of developing countries with a NAP reporting adaptation actions within each ecosystem. NENA = Near East and North Africa; LAC = Latin America and the Caribbean; SSA = sub-Saharan Africa.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

It is notable that for ecosystems and biodiversity, most adaptation actions are focused on management and conservation rather than restoration, except in terrestrial ecosystems where afforestation, reforestation and landscape restoration is predominant. This may be due to the challenges associated with restoring a landscape or ecosystem to a prior state versus managing and conserving existing resources.

Of all actions listed that address ecosystems and biodiversity, overwhelmingly they fall into addressing enabling conditions for adaptation via governance-based instruments (57 percent of actions) and knowledge- and capacity-building actions (44 percent of actions), over finance-based instruments. Over 50 percent of ecosystem-based actions fall under climate and

disaster risk planning and institutional capacity development. And, while the total number of actions was small, over 70 percent of countries prioritized finance-based instrument actions in their NAPs for ecosystem-related adaptations such as payments for ecosystem services. Regulatory approaches – key tools to implementing land and resource management and conservation – were also prioritized by 97 percent of countries.

Human and socioeconomic systems

In addition to ecosystems and biodiversity, the human and socioeconomic dimensions of agrifood systems are also a top priority for adaptation in all countries with a NAP. NAPs recognize the importance of food security and nutrition (prioritized in 83 percent of countries), as well as livelihoods, poverty alleviation and equality in agrifood systems (91 percent). Gender equality and social inclusion is also highlighted as a priority by two-thirds of countries with a NAP (66 percent). This is crucial, as vulnerabilities to climate change are strongly influenced by wealth, gender and age; for example, female-headed households lose significantly more of their incomes than male-headed households when extreme weather events occur (FAO, 2024).

This subsection presents the typology of adaptation actions identified in the NAPs aimed at addressing the human and socioeconomic dimensions of agrifood systems, as critical determinants of vulnerability and adaptive capacity (Table 4). Overall, the most frequently promoted adaptation options in that category include: (i) gender equality and social inclusion-based approaches; (ii) improved cultivars for food security; (iii) agricultural insurance; (iv) multisectoral approaches for food security, and (v) WaSH-related adaptation in agrifood systems and rural areas.

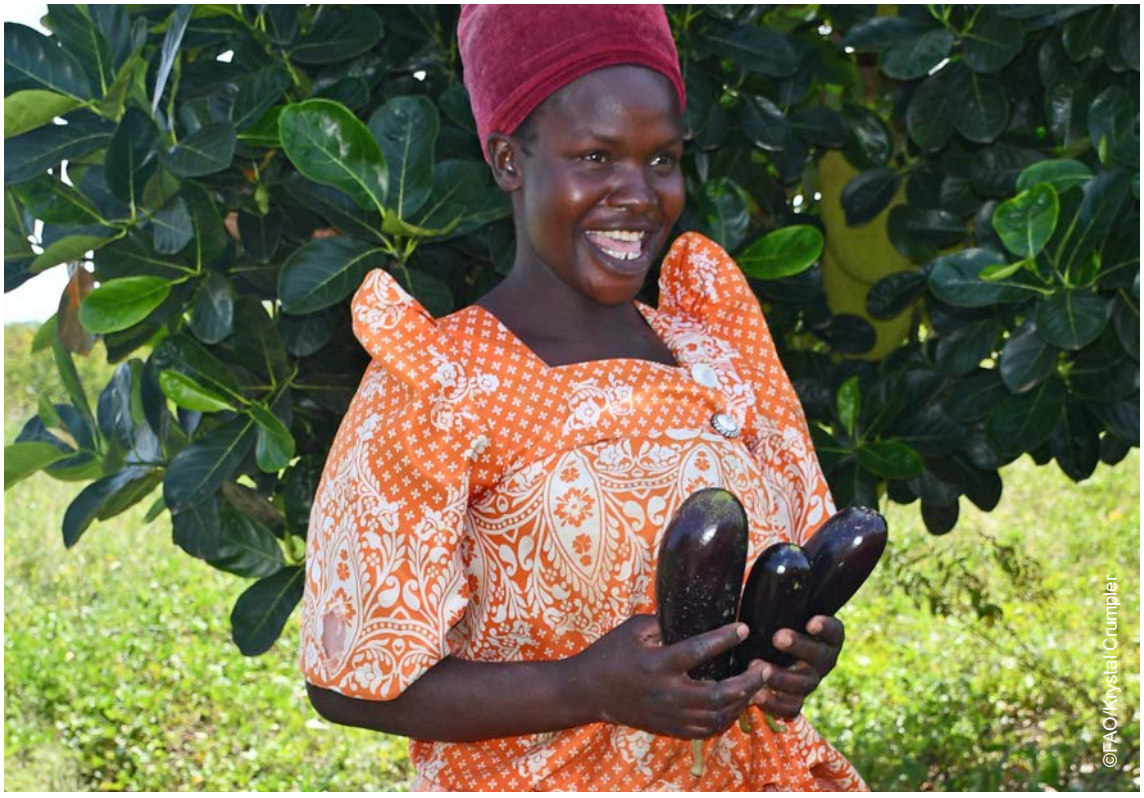


TABLE 4. **Percentage of developing countries with a NAP that include adaptation actions related to the human and socioeconomic dimensions of agrifood systems, by system dimension and action typology**

Adaptation Actions in the NAPs: Human and Socioeconomic Dimensions of Agrifood Systems			
Dimension	**Most frequently reported adaptation action typologies**	**Least reported adaptation action typologies**	**Regional highlights**
Livelihoods, poverty alleviation and equality in agrifood systems and rural areas **Adaptation actions in 91% of countries**	• Gender equality and social inclusion (66%) • Agricultural insurance (53%) • Community-based adaptation (34%) • Finance, savings, and credit (31%)	• Social networks and member organizations (25%) • On- and off-farm livelihood diversification (23%) • Subsidies (16%) • Payment for ecosystem services (16%) • Land and water tenure (12%) • Social protection (9%)	**High priority in all regions** • Gender equality and social inclusion highest priority in SSA (67%), Asia and Pacific (80%), LAC (75%) and LDCs (74%) • Land, forest and water tenure double the global average in SSA (24%) • Agricultural insurance inclusion higher than 50% in all regions, except NENA (20%) • Payment for ecosystem services highest in Asia and Pacific (33%) • Community-based adaptation (60%) and social networks (47%) highest in Asia and Pacific • On- and off-farm livelihood diversification highest in LDCs (39%)
Food security and nutrition **78% of countries**	• Improved cultivars (58%) • Multisectoral approaches for food security and nutrition (50%)	• Urban and peri-urban agriculture (22%) • Changing dietary patterns (16%)	**High priority globally and especially in Asia and Pacific, LAC, and NENA** • Multisectoral approaches (80%) and urban and peri-urban agriculture (80%) particularly prevalent in NENA • Improved cultivars particularly common in Asia and Pacific (73%)
Critical urban-rural infrastructure, services and networks for agrifood systems and nature-based solutions in cities **73% of countries**	• Green, blue, and green-grey infrastructure in cities and peri-urban areas (45%) • Land-use planning (42%) • Climate-proofed physical infrastructure for agrifood systems (39%)	• Urban and peri-urban agriculture (22%) • Nature based solutions to protect urban shorelines (14%)	**High priority in Asia and Pacific, LAC, NENA** • Urban and peri-urban agriculture highest in NENA
Health, well-being and changing structure of communities in agrifood systems and rural areas **67% of countries**	• WaSH-related adaptation (50%) • Health strategies, policies, and interventions (38%)	• Safe and resilient communities (16%) • Reducing conflict risks (16%) • Human mobility and adaptive migration (12%)	**High priority in Asia and Pacific, LAC, NENA** • Adaptive migration, reducing conflict risks, and safe and resilient communities not present in NENA • Safe and resilient communities most prevalent in SSA and LAC • WaSH related adaptation most prevalent in Asia and Pacific (73%)

Note: In this table, figures represent the proportion of developing countries with a NAP reporting adaptation actions within each human/socioeconomic dimension of agrifood systems. NENA = Near East and North Africa; LAC = Latin America and the Caribbean; SSA = sub-Saharan Africa.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

NAPs do exhibit some significant gaps in addressing the socioeconomic vulnerabilities and risks linked to climate change, with few countries addressing human mobility (12 percent) or civil conflict (16 percent) as adaptation priorities in agrifood systems, despite the reference to human mobility and civil conflict as climate-related social tipping points by half and one-third of all countries, respectively. This is a significant gap, as climate change – and its impacts on agrifood systems – can exacerbate existing political and social tensions, including increased conflict due to competition for natural resources or internal displacement and migration in search of off-farm livelihood opportunities (FAO and UNU-EHS, 2025; IPCC, 2023). Further, inclusive livelihood diversification programmes and social protection tailored to vulnerable populations in agrifood systems – for instance, smallholders, women and Indigenous Peoples – are rarely included in NAPs. This is despite the evidence that climate change will threaten agricultural livelihoods as adaptation options are increasingly constrained and the increasing recognition in both IPCC reports and UNFCCC decisions of the vital role of social protection in supporting inclusive climate adaptation to address the adverse effects of climate change on poverty and livelihoods (Bhalla *et al.*, 2024; IPCC, 2023; USP 2030, 2024).

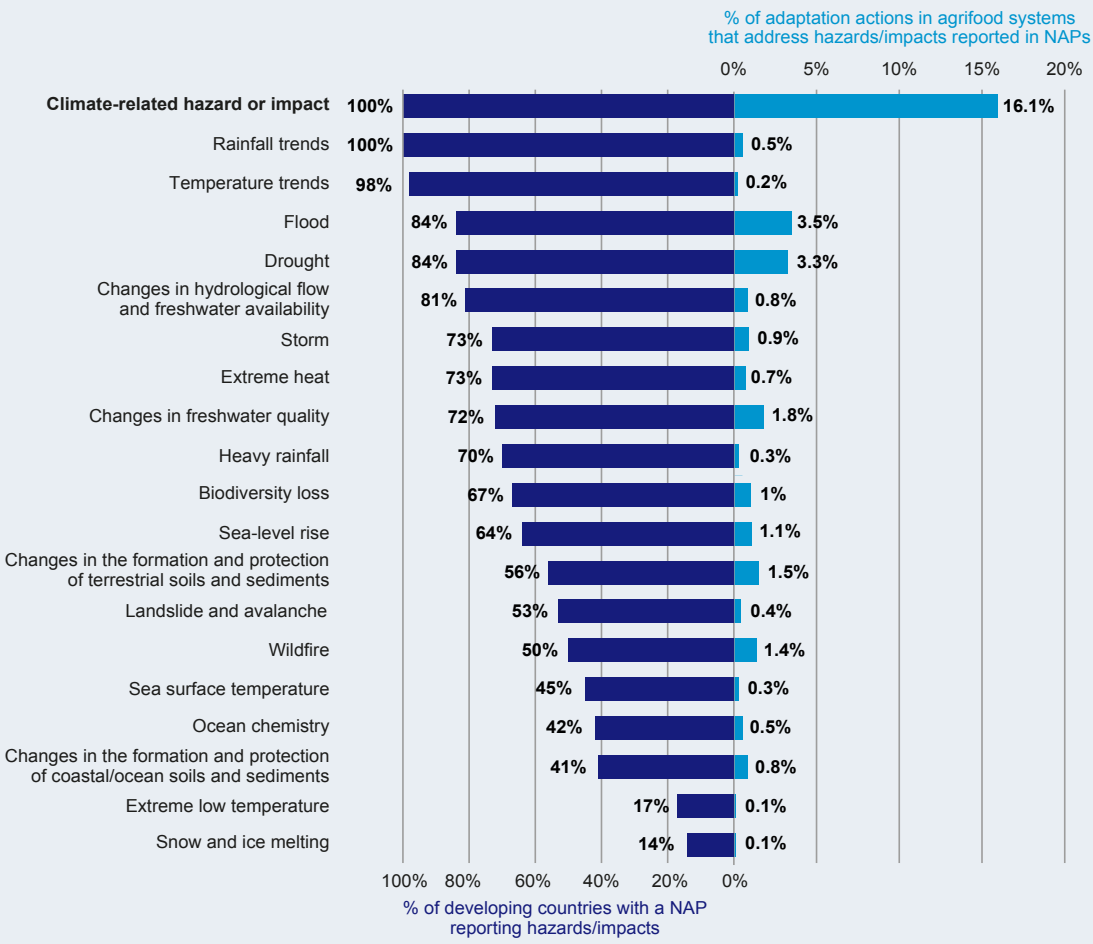
Of all actions listed that address the human and socioeconomic dimensions of agrifood systems, overwhelmingly they fall into addressing enabling conditions for adaptation via governance-based instruments (50 percent of actions), such as climate and disaster risk planning and institutional capacity building, as well as knowledge- and capacity-building actions (42 percent of actions), predominantly research and development and information programmes and trainings (e.g. agricultural extension). And, while the total number of actions was small, over 70 percent of countries prioritized finance and market-based instruments in their NAPs to enable adaptation in agrifood systems, including access to credit, financial services and fiscal incentives.

Evidence-based approaches

Research Finding #7. Adaptation actions in agrifood systems do not match the degree of reported climate hazards, and adaptation options appraisals are not often used to inform context-specific action.

There is a significant mismatch between major climate-related hazards and impacts countries report and the adaptation actions they plan in their NAPs, highlighting what the analysis shows is a critical gap in evidence-based planning for agrifood systems (Figure 8 and Figure 9). While nearly all countries report on climate hazards and their impacts on agrifood systems, only 16 percent of adaptation actions in agrifood systems are directly linked to a specific observed and/or projected climate hazard or impact being addressed (Figure 8). Similarly, only 14 percent of adaptation actions in agrifood systems are targeted to address the vulnerabilities, needs and capacities of specific agrifood system actors and vulnerable groups, including women, youth and Indigenous Peoples (see Research Finding #21).

FIGURE 8. **Percentage of developing countries with a NAP that include adaptation actions in agrifood systems explicitly addressing observed and/or projected climate-related hazards or impacts reported, by hazard/impact type**



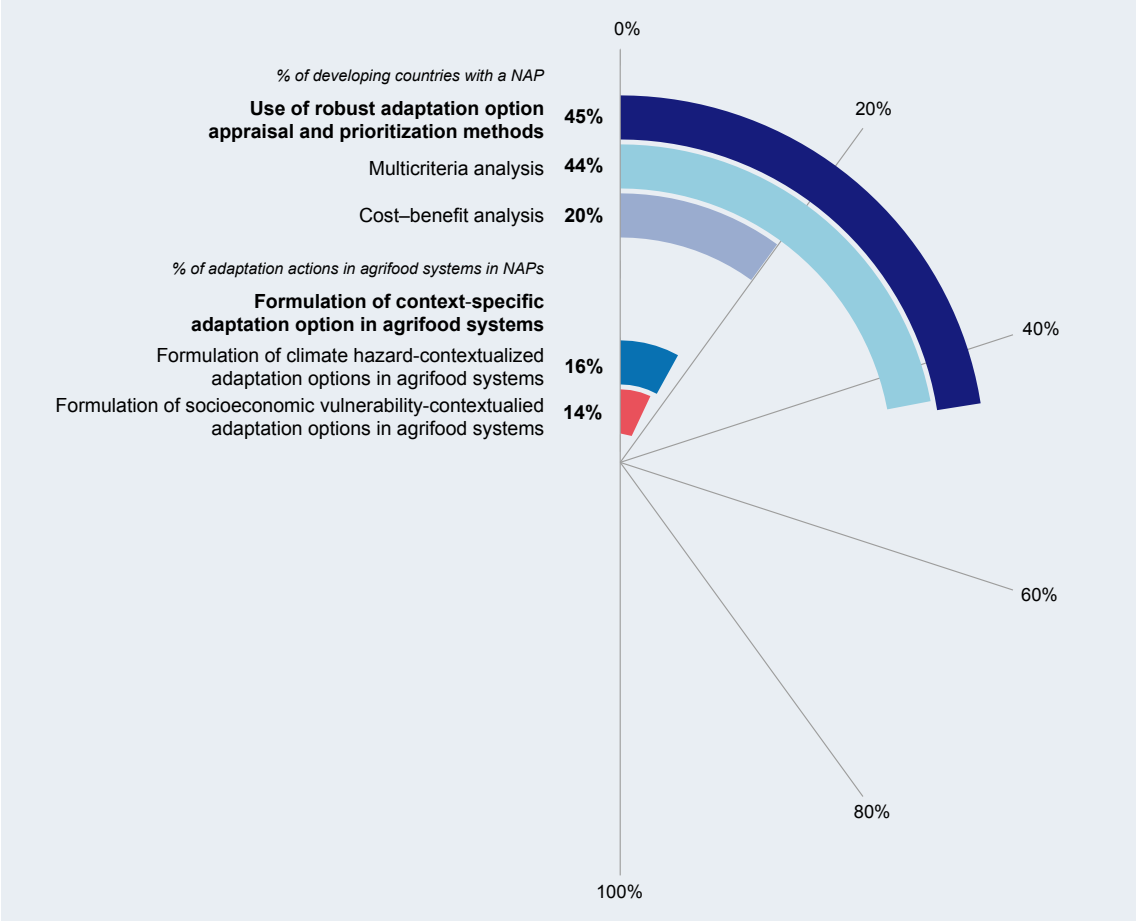
Note: This figure presents data on two axes: (i) % of developing countries that report climate-related hazards or impacts in their NAPs; and (ii) the % of adaptation actions in agrifood systems that explicitly address those climate-related hazards or impacts reported in the NAPs. In the figure, the term climate-related hazards includes extreme weather events and slow onset events.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

These discrepancies might indicate a lack of robust climate risk and vulnerability assessment (see Research Finding #5). And this disconnect could stem from a lack of robust[8] adaptation option identification and appraisal (Figure 9): less than half of all countries (45 percent) report use of processes like multicriteria analysis (MCA) – 44 percent – or cost–benefit analysis (CBA) – 20 percent – to prioritize their adaptation options.

[8] Use of multicriteria and/or cost–benefit analysis.

FIGURE 9. **Percentage of developing countries with a NAP that reference the use of evidence-based tools and approaches to inform adaptation planning, including in agrifood systems, by tool/approach category**



Note: This figure presents variables grouped into two categories: (i) the first three variables correspond to the % of developing countries with a NAP that reference the use of robust adaptation option appraisal and prioritization methods; and (ii) the subsequent two variables correspond to the % of adaptation actions in agrifood systems included in the NAP that are context-specific.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Context-based appraisal is essential because climate adaptation is highly location-specific and complex. Unlike mitigation, which can use a standardized metric like greenhouse gas emissions, adaptation measures are tailored to local risks and needs. According to reports from the UNFCCC, using tools like CBA and MCA allows for the consideration of both quantitative and qualitative factors, such as economic benefits, social equity, and environmental impacts (UNFCCC, 2011b). Without robust appraisal, governments risk implementing measures that do not match the scale or specificity of the threats they face.

The limited use of appraisal tools can lead to misallocated resources and potential maladaptation, where an adaptation measure inadvertently increases vulnerability. By systematically evaluating options against a range of criteria, countries can ensure that their investments are not only effective but also socially and economically sound.

This evidence-based approach strengthens decision-making, attracts more targeted investment, and ultimately ensures that adaptation strategies address the most urgent risks to agrifood systems. By closing this gap, countries can move from general planning to implementing actions that are demonstrably robust and impactful.

KEY TAKEAWAYS

- **Agrifood systems are global priorities for adaptation.** All developing countries with a NAP highlight agrifood systems as central to their adaptation vision and strategy. Countries emphasize the importance of adaptation in the crop subsector, and most also prioritize adaptation in livestock and grasslands, forests, and fisheries and aquaculture subsectors, including the post-harvest side of food systems and value chains. Energy efficiency and climate-resilient energy supply and infrastructure improvements in agrifood systems and rural areas receive less attention.
- **On-farm or production actions are prevalent.** Adaptation measures in agrifood sectors among developing countries focus heavily on practices including climate-tolerant crops, irrigation and drainage, and soil and water conservation, while systemic approaches that build resilience across agricultural value chains are less represented. Having a more holistic and systems-based approach to adaptation action in the sector can improve resilience outcomes.
- **Limited use of evidence-based planning and lack of alignment of options with impacts may compromise the effectiveness of adaptation.** Less than half of developing countries with a NAP use robust adaptation options appraisal and prioritization methods, such as CBA and MCA, and only 16 percent of agrifood-related adaptation actions directly respond to specific climate hazards and impacts reported. Even fewer – 14 percent of agrifood-related adaptation actions – explicitly address the differential socioeconomic vulnerabilities and needs of vulnerable agrifood populations. Investing in options appraisal can help prioritize actions based on their potential effectiveness, equity, and economic viability. Likewise, integrating social protection, inclusive livelihoods programmes and aligning adaptation with disaster and climate risk and impact management to address multiple risks, such as human mobility and conflict in rural areas into NAPs could improve uptake and sustained impact.
- **The majority of planned adaptation actions are centred on governance-based instruments (e.g. policies, regulations) and knowledge and capacity building (e.g. training, R&D).** Economic incentives and market-based instruments, while crucial, are mentioned in a very small proportion of actions. Payment for ecosystem services, subsidized agricultural insurance, fiscal incentives and other inclusive rural financial services represent some of the enabling conditions promoted for the uptake of climate adaptive practices and technologies in agrifood systems. While the role of governance and other enabling conditions is recognized in the NAPs, building national capacities to implement legislation and other enabling instruments remains crucial.

2.3. IMPLEMENTATION READINESS, BARRIERS AND FINANCE NEEDS

A critical component of successful adaptation is a country's readiness to implement its NAP. Readiness goes beyond having a plan on paper – it requires the institutional, legal, financial, and social foundations that enable action, in other words, an appropriate enabling environment. Building on the key elements of implementation readiness highlighted in the original NAP guidelines, the LEG now provides guidance on a fifth phase of the NAP process through Module E on "building readiness and accessing funding and other support for the whole process" (LDC Expert Group, 2012b, 2025). Building readiness ensures that planned actions in sectors including agrifood systems can move from strategy to practice, allowing investments to deliver lasting resilience on the ground.

This section considers how countries' NAPs demonstrate readiness for NAP implementation specifically as it relates to adaptation in agrifood systems, outlining institutional arrangements, stakeholder engagement, and where countries listed barriers and finance needs.

Barriers to implementation

Research Finding #8. In their NAPs, developing countries report facing a variety of technical, institutional, and financial barriers specific to implementing adaptation for agrifood systems.

Despite progress in planning, 47 percent of countries report implementation barriers specific to agrifood systems in their NAPs. These barriers include:

- **Technical barriers:** 52 percent of countries report technical barriers specific to agrifood-system adaptation, such as challenges accessing the technical skills and expertise needed to design and implement complex adaptation projects. Countries cited a scarcity of skilled professionals and analytical tools in fields like climate modeling, sustainable agriculture, climate-resilient farming methods and water management, as well as gaps in information needed to fine-tune adaptation actions to specific crops and growing areas. Lack of data storage capacity, specific technologies and improved infrastructure for livestock production were noted as additional technical barriers to the rollout of efficient and effective adaptation solutions.
- **Institutional barriers:** 48 percent of countries report institutional barriers specific to agrifood-system adaptation, such as those involving a lack of coordination among government ministries, including agriculture, environment, and finance, leading to fragmented efforts and inefficient resource use. Countries cited examples including the need for alignment between policies and plans across government sectors, weak governance or regulatory structures, instability in institutional arrangements, and capacity gaps among NAP coordinating entities.
- **Financial barriers:** 26 percent of countries report barriers related to funding agrifood-system adaptation. Barriers cited include not only the lack of available funds for adaptation, but also an insufficient awareness about the potential sources of funding and how to access them, weak public finance management, and a de-prioritization of agriculture, natural resources management, and land management in national budget appropriations. In addition, while adaptation finance remains scarce, the private sector is often hesitant to invest in agricultural adaptation due to perceived high risks and low returns (New *et al.*, 2022).

While many countries have made progress in adaptation planning, nearly half still face significant barriers that constrain implementation of agrifood system priorities in their NAPs. Technical gaps, institutional fragmentation, and limited financial resources together create a persistent mismatch between adaptation ambition and on-the-ground action. Addressing these barriers will be critical to closing the implementation gap and ensuring that planned measures translate into climate-resilient agrifood systems.

Institutional readiness and coordination

Institutional readiness and coordination mechanisms are central to determining how NAPs move from strategy to implementation. The LEG advises that institutional arrangements and regulatory frameworks can be strengthened through three key areas of action: create/update formal mandates and legislation for adaptation as appropriate; strengthen coordination mechanisms between ministries; and integrate climate change adaptation in sectoral planning (LDC Expert Group, 2012b). For agrifood systems – given their close ties with environment, water, finance, social development and trade – institutional readiness and coordination mechanisms help ensure that adaptation is not fragmented or under-resourced, but aligned with national development, agriculture, poverty and food security goals.

Research Finding #9. Though not often the leading NAP coordination entity, Ministries of Agriculture play a key role in NAP implementation.

Ministries of Agriculture are leaders in implementing adaptation in agrifood systems, but they are seldom appointed as the primary bodies for NAP coordination. Only seven countries included in this analysis have officially designated their Ministry of Agriculture as the lead agency for NAP coordination, while 24 countries (41 percent) have established multisectoral coordination mechanisms that include the Ministry of Agriculture. This reflects a recognition of the sector's importance, even if agricultural ministries are not often in a leadership position. Their inclusion in coordination mechanisms, through well-designed legal and institutional frameworks, can be a key part of ensuring that the unique needs and vulnerabilities of agrifood systems are integrated into national adaptation priorities and NAP implementation processes.

In many countries, NAP coordination is led by executive offices or Ministries of Environment, or Ministry of Planning and Development reflecting respective institutional mandates for national climate policy and budgetary processes and resource mobilization. This dynamic of non-leading but still-involved agricultural ministries presents both opportunities and challenges. On the one hand, it facilitates multisectoral approaches that prevent climate action from being siloed within a single sector. On the other hand, institutional barriers can arise if agriculture ministries lack the authority, resources, or technical capacity to effectively advocate for sectoral priorities. Strengthening the role of agriculture ministries within coordination mechanisms – by ensuring clear mandates, allocating adequate resources, and enhancing their technical and policy capacity – is a step towards better enabling NAPs to address agrifood system vulnerabilities. This aligns with the UNFCCC guidance provided on NAPs, which stresses inclusive and participatory coordination as a foundation for effective NAP implementation (LDC Expert Group, 2012b, 2025).

Research Finding #10. 75 percent of developing countries with a NAP outline mainstreaming agrifood adaptation actions into national and/or sectoral policies and plans as a priority.

Three-quarters of countries outline planned or ongoing efforts to mainstream agrifood system adaptation actions into national and/or sectoral policies and plans. This trend reflects growing recognition of the central role agrifood systems play in achieving food security, sustaining rural livelihoods, and meeting development goals. Adaptation measures are more effective when integrated into broader development policy frameworks and inclusive of inputs from multiple agencies and sectors, rather than treated as isolated projects (New *et al.*, 2022). Mainstreaming ensures that agrifood system adaptation actions are not treated as stand-alone interventions but are instead embedded into broader policy processes such as agricultural investment plans, food security strategies, social protection systems, and sustainable natural resource management frameworks. This integration helps align adaptation with existing institutions and financial mechanisms and create an enabling environment in which governments, farmers, local communities, and private sector actors can work towards common adaptation goals. This can reduce fragmentation of effort and make it more likely that measures will be sustained and scaled.

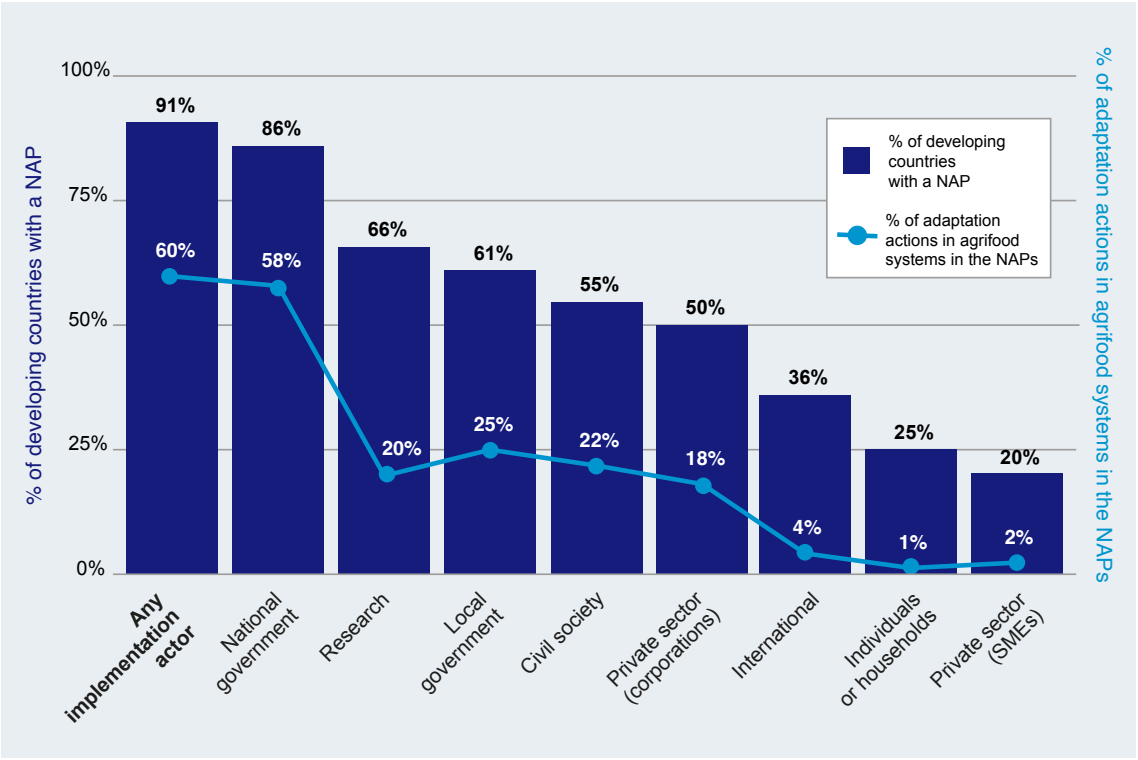
Mainstreaming agrifood adaptation also enhances coherence across global and national climate and development agendas. Around two-thirds of countries identify links between their NAPs and nationally determined contributions (NDCs), underscoring the importance of aligning long-term adaptation planning with country climate commitments under the Paris Agreement (LDC Expert Group, 2023). Strengthening alignment between NAPs and NDCs has been shown to reduce operational burdens on governments while increasing coordination, efficiency, political support, and the case for investment (UNDP, 2025a). Similarly, embedding adaptation into agriculture and rural development policies supports progress toward the Sustainable Development Goals (SDGs), particularly SDG 2 on zero hunger and SDG 13 on climate action. The links between NAPs and SDGs are recognized by over half of all countries. However, acknowledgement of the synergies between adaptation and the goals of the Convention on Biological Diversity (CBD) remains limited in the NAPs (27 percent of countries), despite the mutually reinforcing relationship between the conservation, restoration and sustainable use of biodiversity and the capacity of ecosystems and communities to withstand climate impacts.

Stakeholder engagement in NAP implementation

Research Finding #11. Over 90 percent of developing countries with a NAP acknowledge the role of different actors in implementing adaptation in agrifood systems.

Stakeholder engagement is a cornerstone of effective NAP implementation, especially in agrifood systems where adaptation depends on the actions of diverse actors across scales. A majority of countries (91 percent) identify the role of different actors in implementing adaptation in agrifood systems in their NAPs, recognizing that adaptation requires a whole-of-society approach (Figure 10).

FIGURE 10. **Percentage of developing countries with a NAP that reference the role of specific actors in implementing adaptation in agrifood systems, by actor type**



Note: This figure presents data on two axes: (i) % of developing countries with a NAP that include actions detailing the role of specific actors in implementing adaptation in agrifood systems; and (ii) the % of adaptation actions in agrifood systems included in the NAPs with the role of specific actors in implementation identified.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Because the framing of adaptation differs depending on the perspective and experience of those involved, broad, inclusive participation helps implementation be equitable, context-specific, and responsive to local needs (LDC Expert Group, 2012b). And, as agrifood systems are highly localized yet interconnected with national development priorities, meaningful stakeholder involvement helps translate national strategies into practices that build resilience in communities, supply chains, and markets. Without such engagement, adaptation risks being top-down, poorly aligned with local realities, and less effective in strengthening food system resilience. While national governments are most frequently identified in NAPs as key players, countries also outline roles for local governments, civil society organizations, research institutions, the private sector, and international entities.

While over 90 percent of countries identify the role of actors in implementing agrifood adaptation (Figure 10), there is room for more clearly identifying roles and responsibilities for implementation at the individual action level and engaging a broader set of actors in the process. For example, the analysis shows a relatively lower rate of identification of individuals, households, and small and medium-sized enterprises (SMEs) as responsible actors for implementation (approximately 2 percent of agrifood adaptation actions each).

This is counter to evidence that effective adaptation is locally driven and context-specific (IPCC, 2019). Local governments and civil society, for instance, have a deep understanding of local vulnerabilities and can help tailor solutions to community needs, yet only one-quarter of agrifood adaptation actions include them as implementing actors. And individuals, households, and SMEs are not only beneficiaries of adaptation, they are also agents of change. Empowering smallholder farmers, producers of much of the world's food, and other vulnerable or marginalized groups including women, youth and Indigenous Peoples to adopt new, adaptive practices is central to building resilient agrifood systems (FAO, 2021). By involving local actors in whole-of-society planning and implementation process, adaptation strategies become more effective, equitable, and sustainable.

Adaptation finance needs, flows and gaps

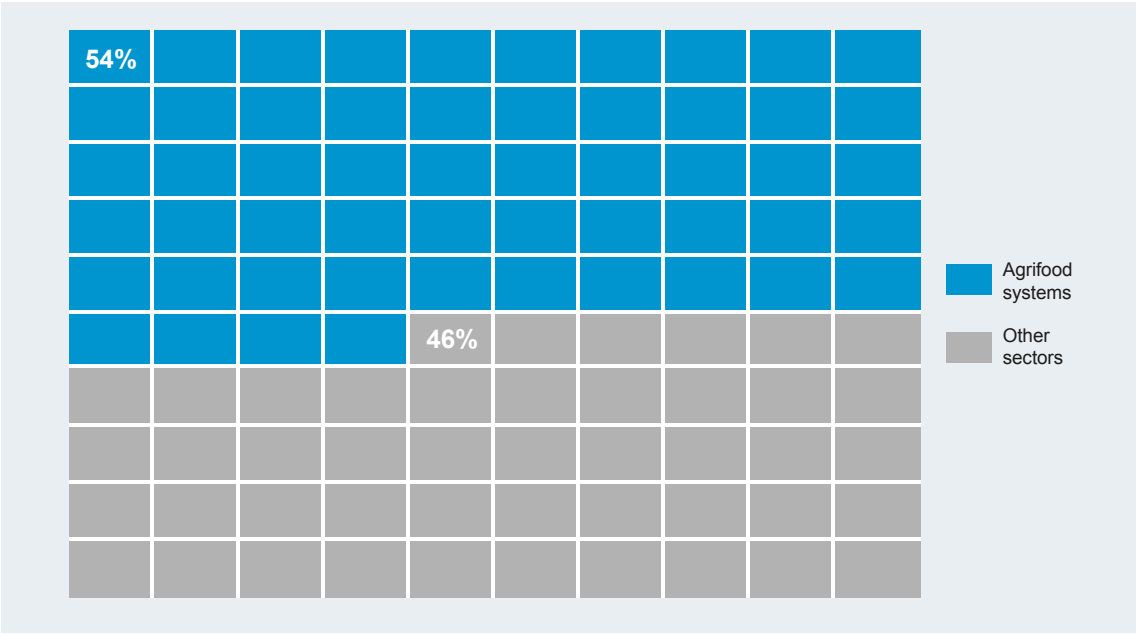
While all countries prioritized agrifood systems for adaptation in their NAPs, investment in adaptation remains a hurdle. According to the Climate Policy Institute (CLIC, 2025), agrifood systems receive only about 7.2 percent of total global climate finance, and adaptation finance holds a significantly smaller share. This falls short of the need for the sector to adapt and meet country climate and food security goals. On-farm activities and adaptation efforts are significantly under-funded as compared to energy projects or those with mitigation co-benefits (CLIC, 2025).

This analysis looks at reported adaptation finance needs for agrifood systems and how they compare to current flows. The analysis does not examine adaptation financial support provided for the NAP formulation process, such as through bilateral and multilateral channels, including the Green Climate Fund (GCF) and Global Environment Facility (GEF).

Research Finding #12. Agrifood systems account for over 50 percent of total adaptation finance needs reported in developing country NAPs.

Across NAPs analysed, 58 percent of developing countries report costed information on adaptation finance needs for agrifood systems. The level of reporting varies by region, with Europe and Central Asia having the highest rate of reporting (71 percent of countries), and Asia and the Pacific the lowest (53 percent), and LDCs report their needs at a higher rate (65 percent) than the global average. Over half of countries in all regions, notably, report their agrifood adaptation finance needs. Where estimates are provided, agrifood systems account for more than half (54 percent) of total adaptation finance needs in developing countries (Figure 11), underscoring the sector's centrality to resilience, food security, and national development objectives. These finding are consistent with other recent estimates in the literature (UNEP, 2024). At the regional level, the share of agrifood system finance needs ranges from 40 percent of total adaptation costs of developing countries in Asia and the Pacific to 79 percent in Latin America and the Caribbean.

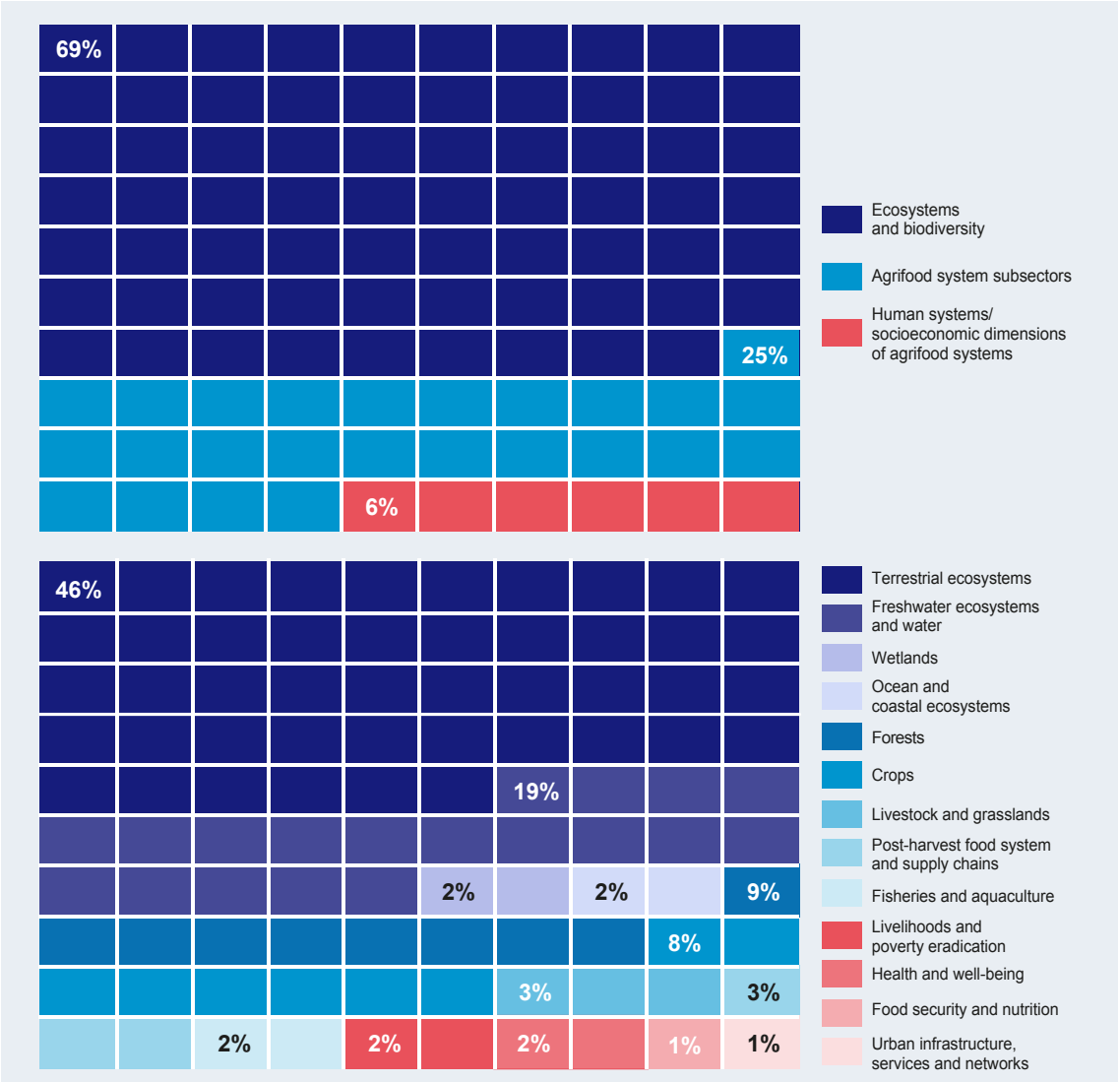
FIGURE 11. **Percentage of total adaptation finance needs for agrifood systems in developing countries estimated in NAPs**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

The majority of finance needs reported for agrifood systems (Figure 12) are associated with ecosystems and biodiversity (69 percent of total agrifood finance needs) in nearly all regions, reflecting the reliance of agrifood systems on healthy natural systems, followed by agricultural production and value chains (25 percent) and the human and socioeconomic dimensions of agrifood systems (6 percent). When costed at the subsector level, the majority account for adaptation in terrestrial ecosystems (46 percent of total agrifood finance needs), followed by freshwater ecosystems and water resources (19 percent), forests (9 percent), and crops (8 percent). On the other hand, fisheries and aquaculture (2 percent), ocean and coastal ecosystems (1 percent), livestock (3 percent), post-harvest (3 percent), energy in agrifood system (<1 percent) and the human and socioeconomic systems dimensions of agrifood systems, including poverty alleviation, food security and livelihoods (6 percent) all represent very small shares of the total adaptation finance needs costed for agrifood systems in developing country NAPs.

FIGURE 12. **Distribution of total adaptation finance needs for agrifood systems in developing countries estimated in NAPs, by system and subsector**



Note: Values are rounded to the nearest whole number. Energy in agrifood systems is not displayed in the figure, as it represents less than 0.5% of the total.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

However, this cost distribution does not entirely align with the adaptation priorities set out in many NAPs. For instance, freshwater resources and livestock systems are more frequently prioritized in planning, and food security is often central – but in costed estimates these sectors and priority areas receive relatively smaller shares of importance than forests and terrestrial ecosystems. This discrepancy may reflect the fact that some adaptation priorities are financed through non-adaptation or sectoral budgets outside the NAP cost envelopes. It may also indicate methodological variation in costing or limited capacity to capture full sectoral costs. Research by CPI and FAO indicates that NDCs underestimate the level of investment required to achieve their climate pledges for agrifood systems (CPI and FAO, 2024). For NAPs,

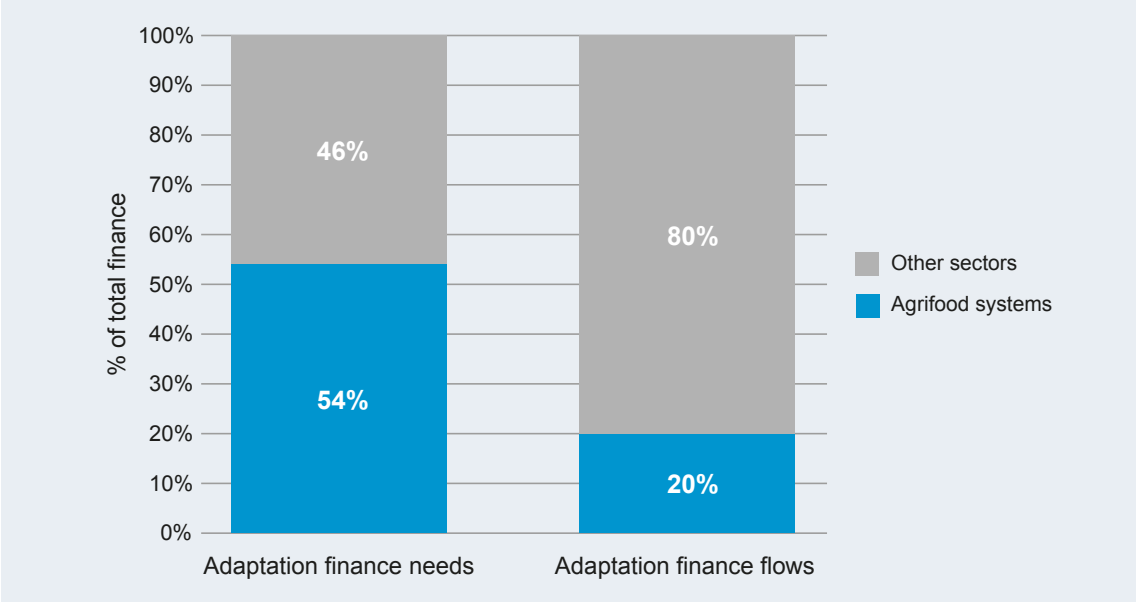
strengthening the alignment between priority setting and financial estimates, and improving consistency across countries, is essential as they evolve and advance in implementation.

Research Finding #13. While agrifood systems constitute over half of adaptation finance needs in developing countries estimated in the NAPs, only 20 percent of global adaptation finance actually flows towards the sector – which is equivalent to 1 percent of total climate finance.

Current climate finance flows are strikingly insufficient to match the scale of investment needed for adaptation in agrifood systems. Estimates suggest that the likely range for adaptation costs and financing needs is between USD 215 billion/year and USD 387 billion/year for developing countries this decade, and the agriculture, water and infrastructure sectors hold the highest share of that (UNEP, 2024).

On average, agrifood systems account for 54 percent of total adaptation finance needs in developing countries, based on estimates in the NAPs reviewed in this analysis. Comparatively, in 2021/22, agrifood adaptation finance reached approximately USD 13 billion, representing only 20.3 percent of global adaptation finance and 1.1 percent of total climate finance flows (CLIC, 2025). There is therefore a striking mismatch between adaptation finance needs and flows in the sector (Figure 13). Without a quick course correct and redirection of global finance flows towards adaptation in agrifood systems, the magnitude of costs associated with future loss and damage will significantly outweigh the current costs of adaptation in the sector.

FIGURE 13. Percentage of total adaptation finance needs for agrifood systems in developing countries estimated in NAPs versus total adaptation finance flows towards agrifood systems tracked in 2021/2022, compared to other sectors



Note: Absolute values are different.

Source: Author elaboration based on (i) FAO analysis of adaptation finance needs expressed in developing country NAPs submitted as of 15 June 2025 and (ii) adaptation finance flows tracked in 2021/2022 (**CLIC.** 2025. *Landscape of Climate Finance for Agrifood Systems 2025*).

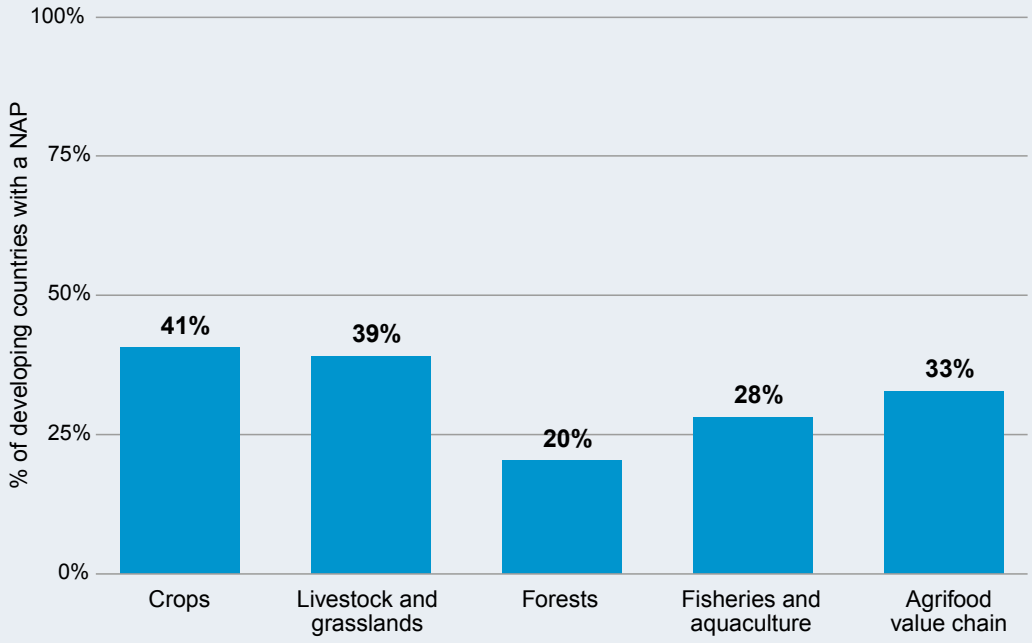
Private sector engagement in agrifood systems

Research Finding #14. The role of the private sector is identified by 78 percent of developing countries as critical for unlocking NAP implementation in agrifood systems – but all of them report barriers to private sector engagement.

Most countries with NAPs recognize the critical role of the private sector in implementing climate adaptation for agrifood systems, but significant barriers hinder effective engagement. The private sector is identified as a priority actor for the implementation of adaptation in agrifood systems by 78 percent of countries. Out of those countries, the majority see the private sector as a beneficiary (46 percent of countries) or holding a cross-cutting (36 percent) role, with fewer countries referencing private sector actors as having a partner (14 percent) or investor role (3 percent). Around half of countries (59 percent) identify concrete entry points for the private sector to invest in agrifood systems for adaptation (Figure 14) – particularly within crop and livestock production and climate-resilient agrifood value chain development more broadly.

Involving the private sector – particularly SMEs, but also corporations – is important. SMEs make up a large share of the local agrifood system (FAO and UNDP, 2025). Together with the broader private sector, they are drivers of innovation, while larger private entities can often mobilize investment in technologies and practices that public funding alone cannot support. However, the recognition of the role of agrifood SMEs in the NAPs is comparatively lower to that of corporations that of corporations in their adaptation actions (see Figure 10).

FIGURE 14. Percentage of developing countries with a NAP that identify concrete opportunities for private sector investment in adaptation solutions in agrifood systems, by subsector



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

While the private sector features as a priority actor in many country NAPs, 78 percent of countries report significant barriers to engaging the sector in agrifood systems adaptation. This high rate of identified barriers highlights a major gap between national ambition and the practical realities of implementation. Addressing these barriers is crucial for mobilizing the private capital and innovation needed to scale up climate adaptation efforts across the entire food value chain. Overall, 80 percent of countries report the need for a private sector finance mobilization strategy to facilitate NAP implementation.

The primary barriers to private sector engagement in agrifood systems adaptation identified by countries in their NAPs fall into three main categories:

1. Knowledge and capacity (63 percent of countries): A lack of awareness, technical expertise, and understanding of climate risks to agrifood systems among private sector actors limits their ability to engage in adaptation action.
2. Finance and market (58 percent of countries): Perceived high risks and low returns on investment in climate-resilient agriculture can make traditional financing difficult to secure.
3. Policy and governance (41 percent of countries): Inadequate legal and policy frameworks, and weak institutional support can deter private sector investment.

Overall, 78 percent of countries note the need for de-risking instruments to unlock private sector investments in agrifood systems, while only 11 percent of countries note that adequate de-risking instruments already exist. These instruments, including financial insurance and guarantees, market incentives, improved understanding of climate risks, and policy and governance enabling conditions, can help reduce investment risk for the private sector.

Financial instruments

Research Finding #15. 94 percent of developing countries with a NAP recognize that grants are critical for enabling adaptation and particularly relevant for smallholder-based investments in agrifood systems.

Research suggests that a more strategic mix of instruments is needed to align climate finance with the diversity of risk and return profiles in agrifood systems. In 2021/22, debt instruments accounted for 62 percent of agrifood climate finance globally (CLIC, 2025). While debt-based instruments are instrumental for scaling proven solutions, other types of instruments, including grants, concessional debt and equity-based tools are enabling early-stage, high-impact investments with initially low returns, such as adaptation in smallholder agricultural settings, rural infrastructure investments and climate information services.

Ensuring that this financing truly benefits developing countries requires greater attention to concessionality. Determining an appropriate level of concessionality is essential to meet the needs of vulnerable countries without exacerbating existing debt burdens in countries. For many, particularly those already facing fiscal constraints or high levels of indebtedness, purely market-based finance is neither viable nor sustainable to deliver the scale of investment required for climate action.

Equity-based instruments are also effective risk-sharing tools for small agribusinesses exploring adaptive innovations. Country NAPs underline the importance of grant-based instruments for unlocking adaptation investments, constituting the single most frequently reported financial tool promoted by 94 percent of countries.

KEY TAKEAWAYS

- **Implementation barriers to adaptation in agrifood sectors remain widespread.** Nearly half of developing countries with NAPs (47 percent) report significant technical, institutional, and financial barriers to implementing agrifood system adaptation. Challenges include a shortage of skilled professionals, weak interministerial coordination, and insufficient financing – particularly from the private sector due to perceived risks.
- **Integration of adaptation in agrifood systems into national development and sectoral plans and budgets is a priority.** Three-quarters of countries outline planned or ongoing efforts to mainstream agrifood system adaptation actions into national and/or sectoral policies and plans, yet only 41 percent have established multisectoral coordination mechanisms that include the Ministry of Agriculture. Investing in the data systems and technical expertise of agricultural ministries and related institutions, clarifying mandates and allocating resources can improve coordination and avoid fragmented efforts.
- **Adaptation in agrifood systems requires a whole-of-society approach.** While over 90 percent of developing countries with a NAP recognize the importance of engaging diverse stakeholders, entry points for households, SMEs, and local actors are often not clearly identified. Recognizing these groups as key implementers, rather than just beneficiaries, will ensure that adaptation actions are context-specific, effective, and sustainable.
- **There is a striking mismatch between the scale of adaptation finance needs for agrifood systems and actual flows.** While agrifood systems account for 54 percent of total adaptation finance needs for developing countries estimated in the NAPs, only 20 percent of current global adaptation finance is directed towards the sector (CLIC, 2025). That amounts to merely 1.1 percent of total climate finance flows in 2021/2022 (CLIC, 2025). Without additional investment in adaptation, the cost of loss and damage will increase exponentially as the limits to adaptation are met across impacted ecosystems, production systems and rural communities. This entails a quick course correction of the trillions of US dollars currently being directed annually into unsustainable agrifood system projects (CLIC, 2025) towards investments in climate-resilient solutions. Sustained access to international climate finance – e.g. via the Green Climate Fund (GCF) or Global Environment Facility (GEF) – will be essential to translate NAPs into concrete actions that enhance the resilience of agrifood systems.
- **Agrifood systems present an area of opportunity for private sector investment, but barriers to engagement persist.** Although 69 percent of developing countries with a NAP highlight the importance of the private sector in implementing agrifood adaptation priorities, more than three-quarters also report barriers to concrete engagement. These include lack of knowledge and capacity, limited access to finance and insurance, misaligned governance frameworks and the need for de-risking instruments, including tools like guarantees and insurance to unlock private

finance for smallholders and high-risk contexts. More NAPs recognize the role of corporations over MSMEs, though MSMEs are cornerstone of agrifood systems in many countries.

- **Grant-based instruments are critical for enabling investments in adaptation, especially in smallholder agrifood settings.** In 2021/22, debt instruments accounted for 62 percent of agrifood climate finance globally (CLIC, 2025). However, a more strategic use of grant, equity and concessional based financing is needed to complement debt. In smallholder and high-risk agrifood profile settings, grants enable upfront, high-impact adaptation investments with initial low returns.

2.4. TRACKING ADAPTATION

A central element of advancing adaptation is the ability to track progress on implementation. Monitoring, evaluation and learning[9] (MEL) goes beyond documenting activities – it provides the evidence base to assess whether adaptation measures are effective, equitable, and aligned with national priorities. The LEG emphasizes that NAPs should include robust MEL systems, which enable countries to measure progress, identify gaps, and adjust strategies over time (LDC Expert Group, 2012b). These systems are also essential for linking NAPs to other national and global frameworks, including the GGA, and for reporting under the UNFCCC as part of the NAP process, including through adaptation communications and transparency mechanisms (Montpetit *et al.*, 2025).

This section examines how countries are establishing MEL frameworks in their NAPs and how agrifood systems are tracked within these frameworks. It considers whether NAPs identify adaptation indicators for agrifood systems, what these indicators entail, and how they connect to assessing collective progress towards the GGA. Understanding these approaches is key to ensuring that adaptation in agrifood systems can be iteratively assessed and strengthened, enabling planned actions to deliver measurable, impactful adaptation results and draw lessons for scaling best practices and improvements for achieving the national development goals.

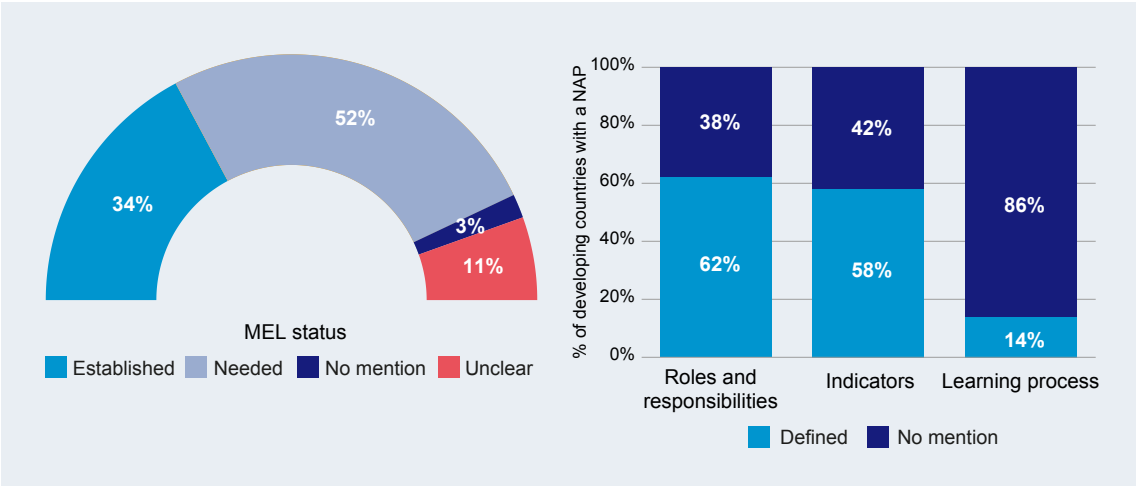
Monitoring, evaluation and learning

Research Finding #16. 97 percent of developing countries with a NAP reference monitoring, evaluation and learning (MEL) systems, but gaps in MEL operationalization are high.

Almost all countries (97 percent) reference MEL in their NAPs; this indicates the importance governments assign to tracking progress and strengthening accountability in implementing adaptation priorities, and shows alignment with Element D of the LEG NAP Technical Guidelines, “monitoring, evaluation and learning and reporting” (LDC Expert Group, 2012b, 2025). However, while the intent to track progress is widespread, the establishment of robust MEL systems for adaptation is limited.

[9] The term “monitoring, evaluation and learning” (MEL) is commonly used (LDC Expect Group, 2025) and is therefore the term used in this report; in cases where a NAP used the term “monitoring & evaluation”, it was counted as MEL.

FIGURE 15. **Percentage of developing countries with a NAP that indicate the status and key elements of monitoring, evaluation and learning (MEL) systems for tracking adaptation, by status**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

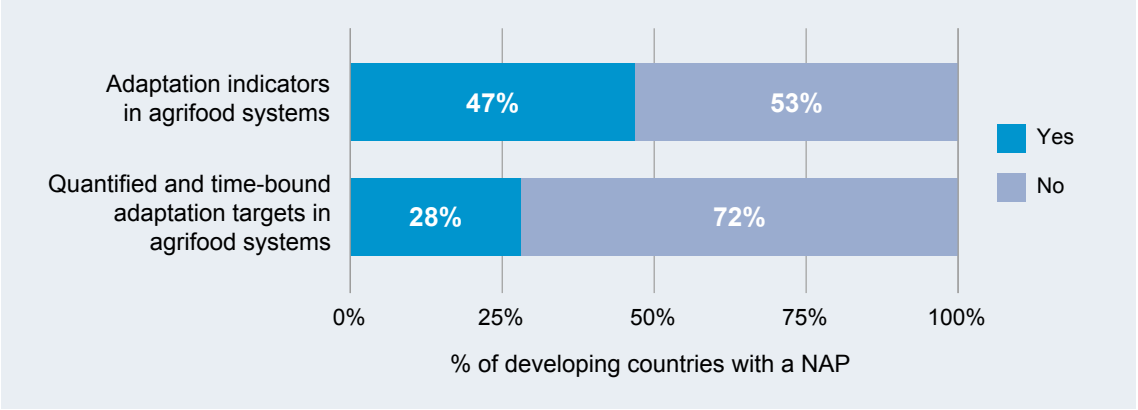
Only about one-third of countries (34 percent) report that MEL systems are currently in place and operational for tracking NAP progress, and 52 percent of countries note that MEL systems are needed, pointing to a significant tracking gap (Figure 15). Encouragingly, more than half of countries (62 percent) report that some institutional arrangements for MEL are already in place, such as roles and responsibilities for data collection. This suggests that while foundations exist, many countries still face challenges in building comprehensive MEL systems.

A particularly weak area is the integration of the "learning" pillar within MEL frameworks. Only 14 percent of countries reference iterative learning in their NAPs, meaning that feedback loops to adapt and refine strategies based on evidence remain largely absent. Without this component, countries risk reducing MEL to a compliance exercise, rather than using it as a tool to improve adaptation effectiveness over time. Strengthening MEL systems that emphasize learning is important to helping agrifood system adaptation remain responsive to evolving climate risks and national development priorities.

Research Finding #17. Approximately half of all developing countries with a NAP identify indicators for tracking adaptation in agrifood systems.

While most countries acknowledge the importance of monitoring and evaluating adaptation in their NAP, only 47 percent identify indicators for tracking adaptation progress in agrifood systems (Figure 16). And, only 28 percent include quantified and time-bound adaptation targets, which are essential for measuring progress against clear benchmarks. This gap reflects a broader challenge in shifting from planning to measurable implementation: without robust indicators and targets, it is difficult to assess whether adaptation efforts are delivering tangible results for agrifood systems and food security.

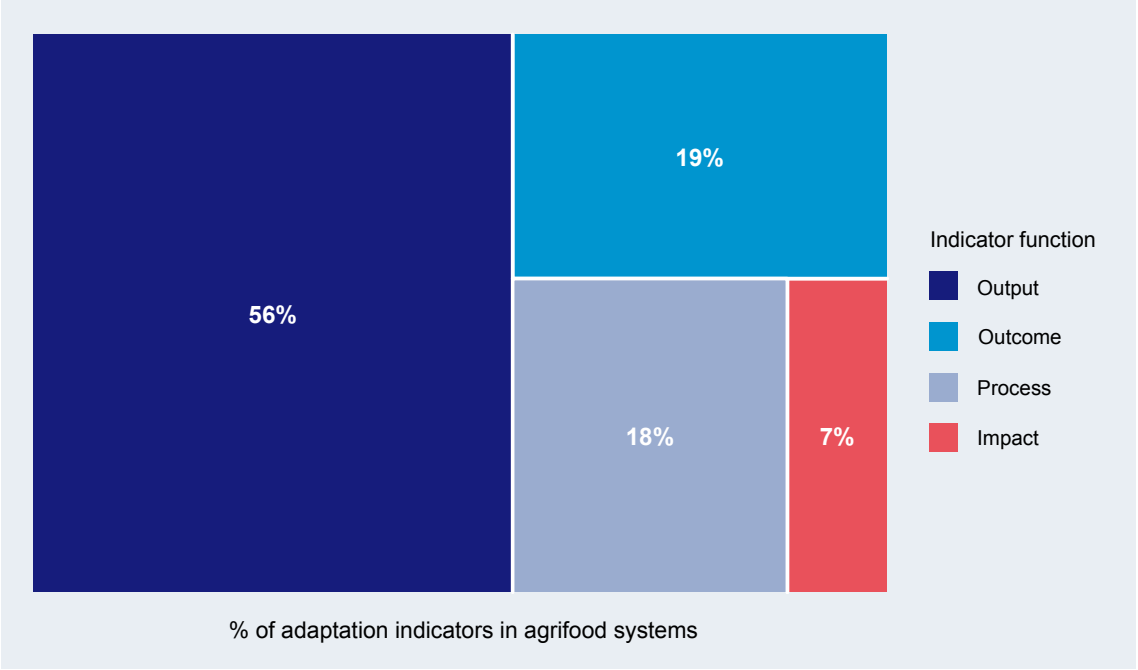
FIGURE 16. **Percentage of developing countries with a NAP that include adaptation indicators and targets for agrifood systems**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

The types of agrifood adaptation indicators included in NAPs also reveal an emphasis on measuring more immediate outputs and processes, rather than the medium- to longer-term outcomes and impacts of adaptation. The analysis (Figure 17) shows that 74 percent of agrifood system indicators track adaptation outputs and processes – for example, the number of seeds disseminated or development of new climate policies – while only 18 percent of indicators track outcomes, including improvements in behavioural and institutional capacities or changes in natural resource use efficiency or quality. Just 7 percent assess impacts, or the longer-term consequences of adaptation on sustainable development and human, economic or environmental well-being in the face of climate change. Yet, outcome- and impact-level indicators are needed to evaluate whether adaptation measures actually reduce poverty and vulnerability, strengthen adaptive capacity and resilience and ensure food security and nutrition over time.

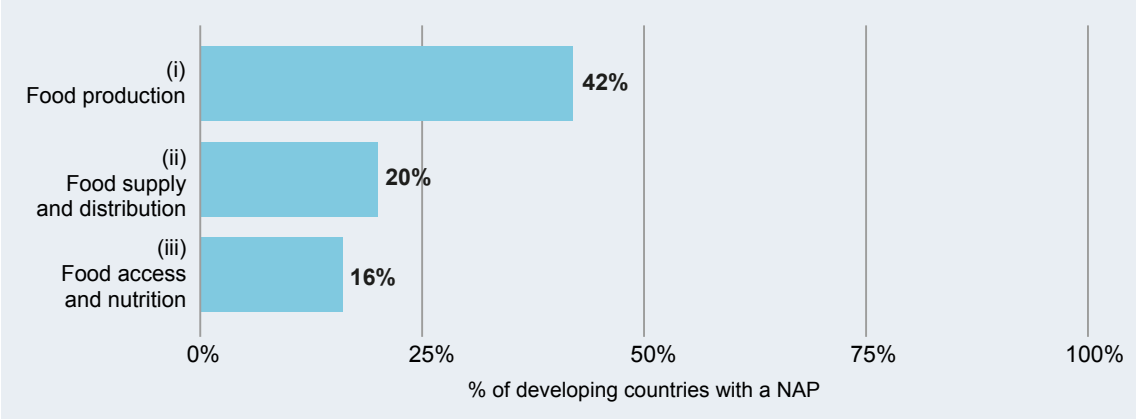
FIGURE 17. **Percentage of adaptation indicators for agrifood systems included in developing country NAPs, by indicator function**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Further, while agrifood systems encompass all of the interconnected activities and actors involved in getting food from field to fork and the outcomes of those actives, the indicators included in the NAPs do not present sufficient coverage of all agrifood system components (Figure 18). Country NAPs demonstrate a primary focus on tracking adaptation results during the production stage of agrifood systems (present in indicators of 42 percent of countries), while far fewer countries track results along food supply and distribution chains (20 percent) and food security and nutrition impacts (16 percent). The imbalance suggests that while governments are prioritizing on-farm agricultural adaptations, less attention is given to tracking how resilience is built downstream through improvements in post-harvest aggregation, storage, transport, and marketing activities, nor the effectiveness of adaptation actions for maintaining or improving food security and nutrition impacts, including access to and affordability of nutritious food – outcomes that are increasingly at risk due to climate change (FAO, 2021). This narrow focus risks overlooking systemic vulnerabilities across agrifood value chains and their consequences on food security and nutrition. Expanding adaptation indicator frameworks to better capture results across all dimensions of agrifood systems would provide a more complete picture of the effectiveness of adaptation plans.

FIGURE 18. **Percentage of developing countries with a NAP that include adaptation indicators for agrifood systems, by agrifood system component covered**



Note: Agrifood system components based on the GGA thematic Target 9b for food and agriculture and subtargets defined in the UAE Framework for Global Climate Resilience (**UNFCCC.** 2023. *Glasgow–Sharm el-Sheikh work programme on the global goal on adaptation referred to in decision 7/CMA.3*. https://unfccc.int/documents/636595).

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

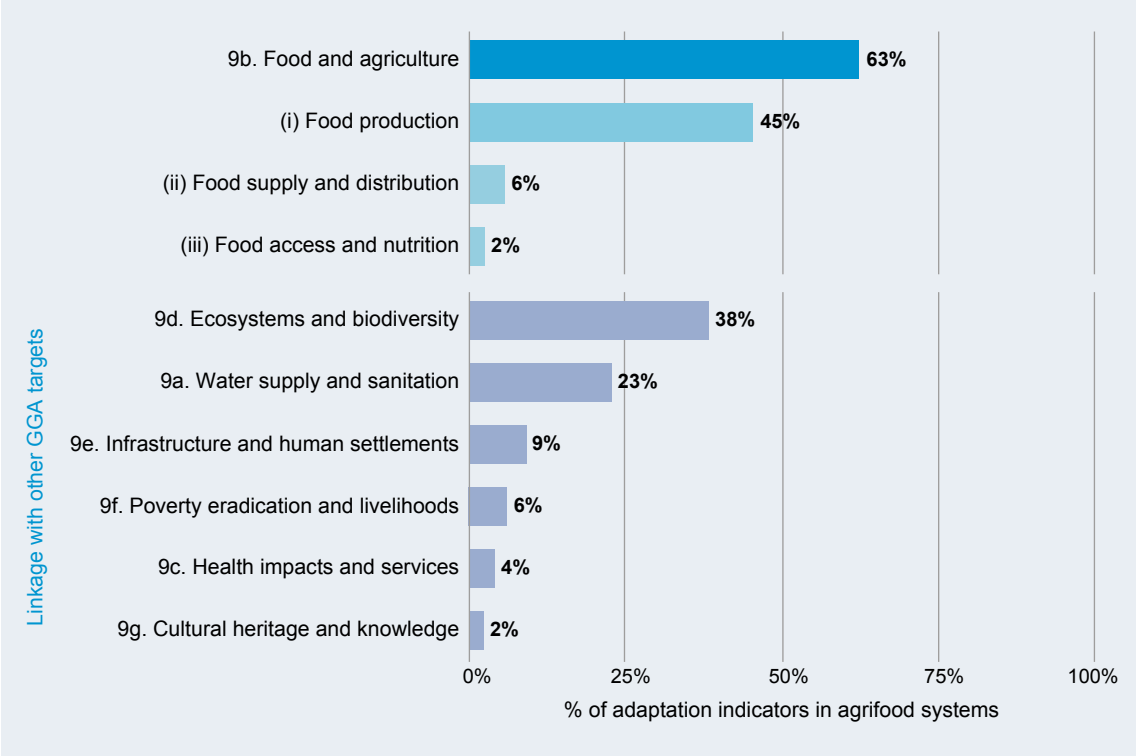
Readiness for reporting towards the global goal on adaptation

The 2023 UAE–Belém Framework for the GGA provides a roadmap for tracking progress, including specific targets that link NAPs with global resilience objectives (UNFCCC, 2023b). In the context of agrifood systems, GGA Target 9b is most aligned, as it focuses on strengthening adaptation across food and agriculture sectors, including food production, supply and distribution, and access and nutrition. Encouragingly, countries are increasingly aligning their efforts with the GGA and demonstrating initial readiness for measuring adaptation results, offering insights into how adaptation metrics for agrifood systems included in the NAPs can contribute towards measuring collective progress towards the GGA under the Paris Agreement.

Research Finding #18. Interlinkages between the indicators developing countries are including in the NAPs with GGA targets on food and agriculture and other thematic targets are strong, but gaps in some metrics remain.

While approximately 80 percent of the NAPs analysed were written prior to the UAE–Belém Framework, there is nevertheless broad cross-cutting alignment of agrifood system indicators in the NAPs with GGA Target 9b, which focuses on climate-resilient food and agriculture. Sixty-three percent of agrifood system-related indicators included in the NAPs directly align with GGA Target 9b, but the distribution across subtargets is uneven (Figure 19). Nearly half (45 percent) of these indicators relate to food production (target 9bi), while far fewer track progress on food supply and distribution (6 percent, target 9bii) or on food access and nutrition (2 percent, target 9biii). This reflects the overall focus of agrifood adaptation indicators toward on-farm production systems, as discussed under Research Finding #16, and indicates that NAPs provide a partial foundation for MEL under the GGA.

FIGURE 19. **Percentage of agrifood-related indicators that developing countries include in the NAPs that are aligned with the global goal on adaptation thematic targets defined in the UAE Framework for Global Climate Resilience**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

The analysis of indicators included in the NAPs and their alignment with the GGA targets also highlights the cross-cutting nature of adaptation in agrifood systems. Many agrifood systems indicators are not only aligned with food and agriculture Target 9b, but also with other GGA thematic targets, reflecting the interdependencies of agrifood systems with ecosystems, water, and livelihoods. For example, 38 percent of agrifood-related indicators in NAPs are linked to Target 9d on Ecosystems and Biodiversity, recognizing the essential role of healthy terrestrial, inland water, and marine and coastal ecosystems in sustaining agrifood systems. Another 23 percent are associated with Target 9a on Water Supply and Sanitation, reflecting the importance of irrigation, watershed management as an ecosystem-based adaptation (EbA) approach, and drought resilience in adaptation for agrifood systems. A smaller share (6 percent), however, align with Target 9f on Livelihoods and Poverty Eradication, revealing a gap in metrics for assessing how agrifood adaptation is fundamentally linked to rural development and poverty reduction. This reinforces the fact that systemic adaptation in agrifood systems often requires integrated action across natural resource management and rural development strategies, bringing together different government ministries and non-state actors to work together to advance agrifood systems resilience (UNDP, 2025b).

Together, these patterns show that while there is strong alignment between NAP agrifood system indicators and GGA targets, opportunities remain to expand indicator frameworks

beyond production. Stronger tracking of supply, distribution, and nutrition outcomes would enable countries not only to measure adaptation progress more comprehensively, but also to better capture the contribution of agrifood systems adaptation to global resilience goals.

KEY TAKEAWAYS

- **The need for MEL in adaptation is widely recognized but underdeveloped.** Nearly all developing countries with a NAP (97 percent) reference monitoring and evaluation as a key step in their overall adaptation process, yet only one-third report having operational systems in place. Investing in functional, cross-sectoral MEL systems is an area of opportunity for future NAP strengthening and priority setting.
- **Learning is a missing component.** Only 14 percent of developing countries with a NAP reference iterative learning within MEL frameworks. Strengthening the "learning" pillar would help governments adjust adaptation strategies over time and avoid treating M&E as a compliance exercise.
- **Indicators for tracking adaptation in agrifood systems remain limited and uneven in scope.** Just under half of developing countries with NAPs (47 percent) include indicators for agrifood systems, and only half of these countries have quantified, time-bound targets for the sector. More countries (42 percent) track agrifood system production, while far fewer track food supply and distribution (20 percent) or food access and nutrition (16 percent). Adaptation metrics are essential for effective planning and incentivizing impact-oriented investments.
- **Indicators are insufficient for assessing adaptation effectiveness.** Developing countries overwhelmingly include indicators that measure short-term outputs and processes over longer-term adaptation outcomes and impacts, which are essential for understanding whether adaptation effectively reduces vulnerability and strengthens resilience in agrifood systems. Governments could broaden their indicator frameworks to capture entire adaptation theories of change and impact pathways in agrifood systems.
- **Alignment with the GGA targets is strong but metrics for measuring food security and rural poverty impacts are lacking.** Sixty-eight percent of agrifood-related indicators included in developing country NAPs align with GGA Target 9b on food and agriculture, but most focus on production (9bi); whereas, for instance, very few indicators track supply and distribution (9bii) or access and nutrition (9biii), leaving systemic gaps in reporting progress on food and agriculture adaptation under the GGA. Many agrifood indicators also demonstrate interlinkages with other GGA thematic targets, mainly ecosystems and biodiversity (9d) and water supply and sanitation (9a), illustrating the cross-cutting nature of adaptation in agrifood systems. However, metrics for tracking poverty eradication and livelihood (9f) impacts from adaptation in agrifood systems remain scarce despite the high prevalence of extreme poverty in rural areas and dependence on climate-sensitive resources for income (Castañeda *et al.*, 2018).

2.5. GENDER EQUALITY AND SOCIAL INCLUSION

Approximately 3.3 billion people worldwide live in contexts that are highly vulnerable to climate change. Increasing extreme events and longer term climatic changes have already affected the productivity of smallholder farmers, fisher people and pastoralists in low- and middle-income countries, exacerbating food insecurity, hunger and poverty levels (IPCC, 2023). Within agrifood systems, the impacts of climate change are disproportionately felt by rural populations living in poverty, especially women, children and older persons (FAO, 2024). Vulnerability is exacerbated by inequity and marginalization linked to gender, ethnicity, low income or combinations of the above; historical and ongoing patterns of inequity such as colonialism also increase vulnerability, especially for many Indigenous Peoples and local communities (IPCC, 2022).

This section reviews how countries report engaging with different groups of stakeholders in the NAP formulation process. It also examines how countries outline and address the adaptation priorities, needs and rights of vulnerable and marginalized populations in agrifood systems throughout the NAP process.

Participatory planning

Research Finding #19. Approximately 70 percent of developing countries formulated their NAPs using participatory, multistakeholder consultation processes.

This broad-based inclusion of a wide variety of stakeholders in NAP processes reflects recognition of the need for a whole-of-society approach to adaptation and efforts to ground adaptation planning in inclusive dialogue. Participatory approaches are central to the NAP process, as outlined in the LEG Technical Guidelines, which emphasize inclusive, iterative, and country-driven planning (LDC Expert Group, 2012b). Because adaptation is highly context-specific, the engagement of a diversity of stakeholders is essential to help governments understand how adaptation can be successful and most effectively meet the needs of vulnerable groups (New *et al.*, 2022). Moreover, a higher degree of public participation in adaptation has been shown to lead to more transformational and ambitious adaptation action (New *et al.*, 2022) with more effective and enduring outcomes (UNEP, 2023).

On the other hand, while countries are largely including participatory processes in their NAP development, there remains limited information on what these processes entail. Further, while drawing on diverse perspectives is a way for countries to ensure that adaptation priorities reflect the local realities, sectoral needs, and knowledge of those most affected by climate change, the multistakeholder processes reported in NAPs do not necessarily translate into NAPs that contain adaptation actions that are designed for specific segments of agrifood and rural populations (see Research Finding #21).

Vulnerable groups

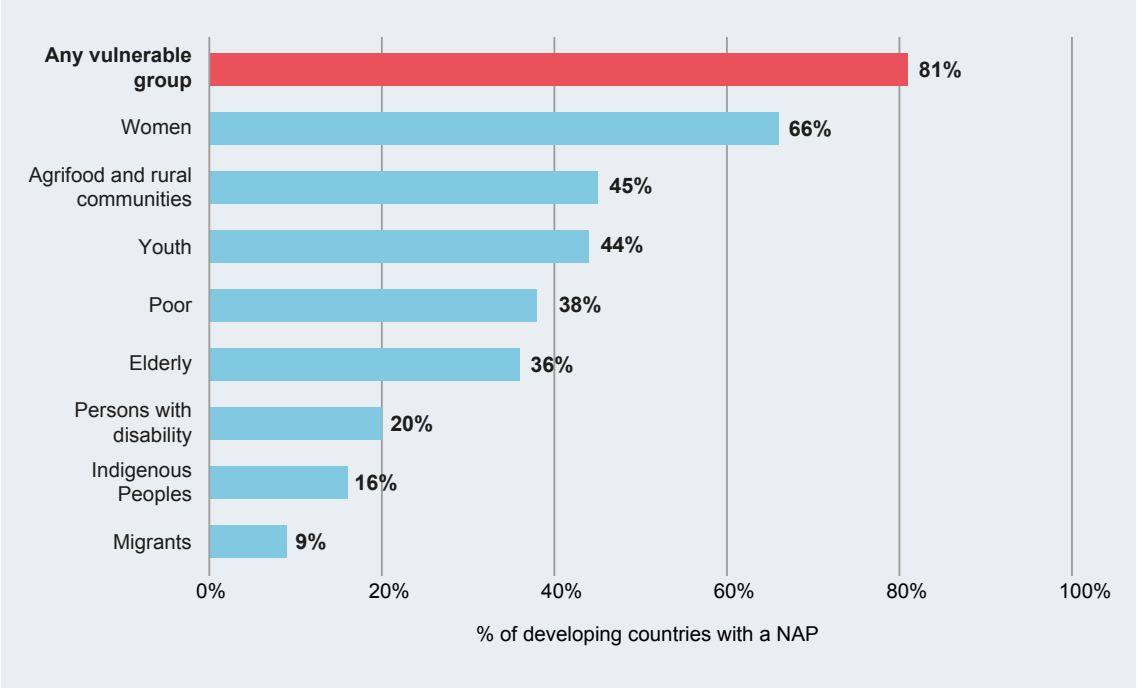
Research Finding #20. Under half of all developing countries with a NAP identify the climate vulnerability of populations that are tied to agrifood systems.

Despite the high number of countries (97 percent) that identify agrifood systems as a climate risk hot spot in their NAPs (see Research Finding #1), only 45 percent identify agrifood and rural communities as vulnerable groups (Figure 20). This level of recognition is low, given that almost 4 billion people are directly dependent upon agrifood systems for

their food needs and livelihoods, mainly in low-income countries (Davis *et al.*, 2023), and rural populations face disproportionately higher levels of climate vulnerability and poverty. Smallholder farmers, pastoralists, fisherfolk, and foresters often rely on climate-sensitive natural resources and face compounding risks that are exacerbated when combined with climate hazards, including insecure land tenure, higher prevalence of poverty and limited access to finance and technology (FAO, 2021). Given that smallholders and other vulnerable groups form the backbone of rural economies in many regions, their limited recognition in risk and vulnerability assessment undermines the effectiveness and equity of NAP planning and, ultimately, implementation.

Beyond agrifood systems, there is a broader recognition of vulnerable groups in the NAPs: 81 percent of countries list populations considered vulnerable to climate change (Figure 20), mainly women and youth, as well as low-income households, the elderly, persons with disabilities, Indigenous Peoples and migrants. Vulnerabilities to climate change are strongly influenced by gender, age, and wealth – in ways that can also affect agrifood systems.

FIGURE 20. **Percentage of developing countries with a NAP that identify climate vulnerable groups, by type**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

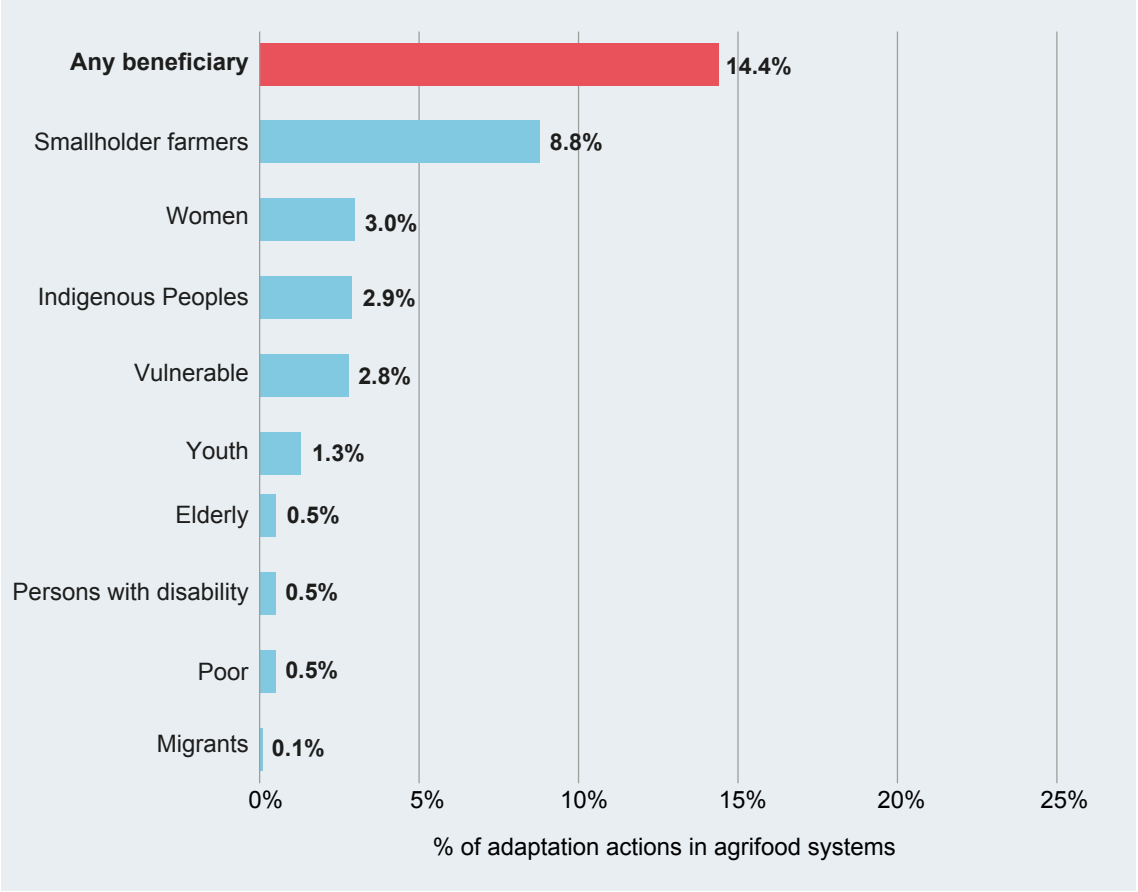
For example, female-headed households and farms lose significantly more of their incomes than male-headed households during extreme weather events, and women take on significantly more work burden after floods, droughts, and other climate events (FAO, 2024). By broadly recognizing the experience of vulnerable groups in over 80 percent of country NAPs, governments provide an important starting point for more inclusive adaptation strategies; the data indicates that more efforts are essential to ensure that specific attention is paid to the needs of groups who are currently under-recognised in NAPs and in climate actions (see Research Finding #21).

Research Finding #21. Less than 15 percent of agrifood adaptation actions included in the NAPs are tailored to address the specific vulnerabilities, capacities, needs and rights of different segments of agrifood and rural populations.

Although 45 percent of countries recognize the vulnerabilities of agrifood and rural communities, relatively few of the adaptation actions included for the sector are specifically designed to address the distinct needs of these groups. The analysis (Figure 21) shows that only 14 percent of agrifood system adaptation actions reference vulnerable populations of any kind, and an even smaller proportion – 9 percent – are explicitly tailored to the vulnerabilities, capacities, and adaptation needs of smallholder farmers, pastoralists, foresters, or fisherfolk. Far fewer actions (less than 3 percent each) target women, Indigenous Peoples, youth, migrants, the elderly, poor and other vulnerable or marginalized segments of populations tied to agrifood systems and rural areas. And less than 10 percent of adaptation actions in

agrifood systems included in the NAPs are designed as local-level adaptation[10] measures (Figure 22), even though climate risks and adaptation needs often manifest most directly at the community and household scale and locally led adaptation actions are proven to be more effective, enduring and less costly (Global Commission on Adaptation, 2021). These gaps suggest that while awareness of vulnerable groups is reflected in planning narratives, it does not consistently translate into concrete, targeted actions that recognize the role of these populations as not only beneficiaries, but also key stakeholders in adaptation action and agents of change.

FIGURE 21. Percentage of agrifood-related adaptation actions included in developing country NAPs targeting specific vulnerable and marginalized groups, by group type

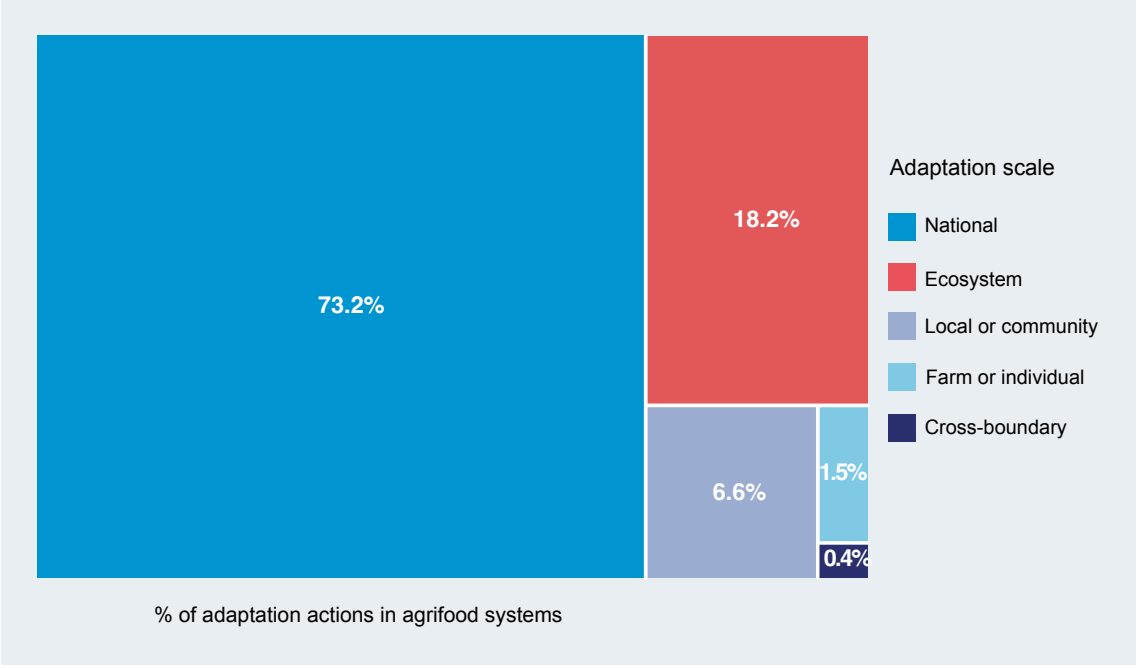


Note: "Smallholder farmers" in figure includes reference to smallholder, smallscale or subsistence farmers, livestock keepers, pastoralists, fisherfolk, aquaculturalists and forest-dependent populations.

Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

[10] Defined as actions at local, community, household or individual level.

FIGURE 22. **Percentage of agrifood-related adaptation actions included in developing country NAPs, by scale of action defined**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

In addition to broad and inclusive stakeholder consultation, vulnerability assessment is a key step to NAP formulation that helps countries understand the context and drivers of differential vulnerability and design effective and inclusive adaptation actions (LDC Expert Group, 2012b). In this area there is room for improvement in the NAP process: Only 37 percent of countries refer to the use of climate risk and vulnerability assessments (CRVA) in agrifood systems in their NAPs (see Research Finding #7).

Strengthening agrifood system resilience requires that adaptation planning moves beyond general strategies toward context-specific measures that address the multiple sources of vulnerability. Targeted, multifaceted approaches that empower smallholders, women, Indigenous Peoples, and other marginalized populations not only address the multidimensionality of climate risk across different populations but can also unlock local knowledge, innovation, and stewardship capacities that are critical for long-term adaptation. Without such tailored measures, NAPs risk perpetuating vulnerabilities rather than reducing them.

Gender equality and social inclusion-based approaches

Research Finding #22. Two-thirds of developing countries with NAPs recognize gender equality and social inclusion in agrifood systems as a principle, but deeper integration is limited.

Two-thirds of all countries include references to at least one adaptation action that is aligned with principles of gender equality and social inclusion (GESI) in agrifood systems (Figure 23). This is especially pronounced in LDCs, where 74 percent reference GESI in the

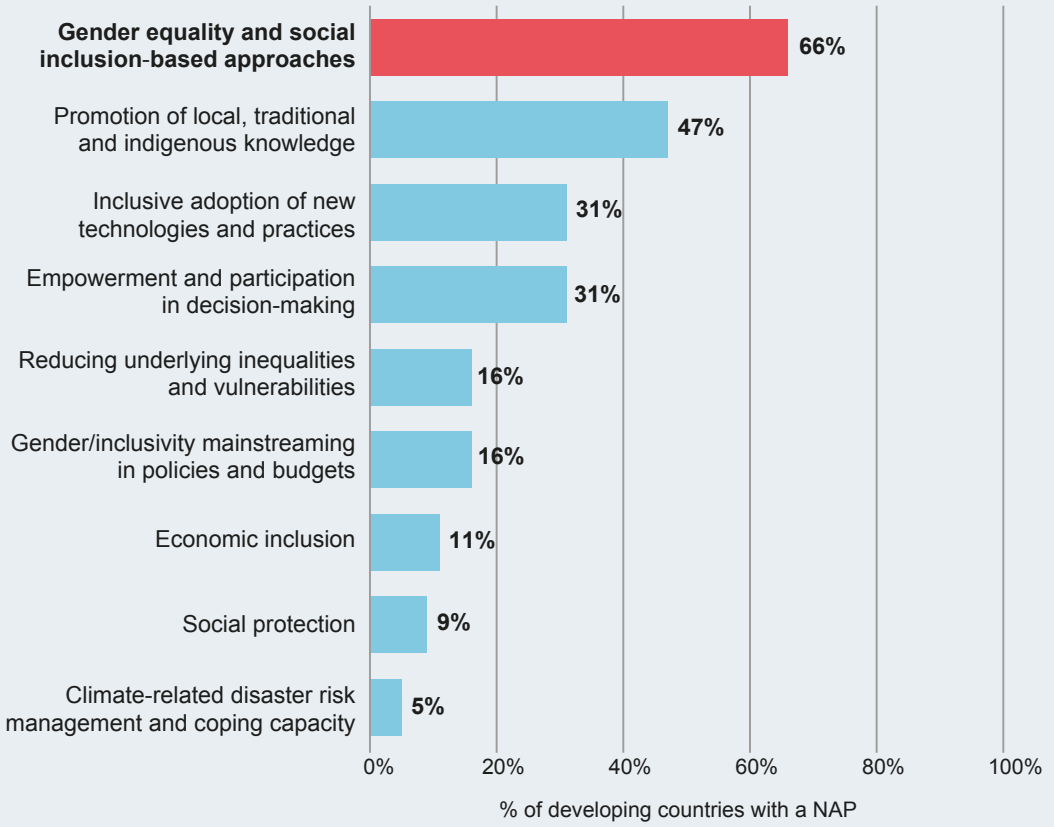
context of agrifood system actions. While, however, 66 percent of countries include at least one GESI-related adaptation action for agrifood systems in their NAPs, these actions represent just 3.8 percent of total agrifood adaptation actions included. This imbalance suggests that, although the majority of NAPs utilize participatory, multistakeholder consultation processes, which are fundamental to mainstreaming GESI principles (see Research Finding #19), the resulting GESI principles are only partially visible in strategies, and are not yet mainstreamed into operational measures that could address structural inequities in agrifood systems.

Evidence of deeper integration of GESI into NAPs is also limited. For example, only 12 percent of countries reference the use of gender analysis in their NAPs, despite widespread acknowledgement that women, youth, Indigenous Peoples and other marginalized groups are disproportionately impacted by climate change, particularly in agrifood systems (FAO, 2024; IPCC, 2022). These groups are not only vulnerable but are essential stakeholders in successful adaptation action and agrifood system transitions more broadly.

Encouragingly, nearly half (47 percent) of countries include adaptation actions that build on local, traditional, and indigenous knowledge. Such knowledge is important to ensure adaptation is context-specific and culturally grounded: Resilience outcomes are stronger when indigenous and local knowledge is combined with scientific information (IPCC, 2022). These approaches reinforce the agency of communities often left out of decision-making processes.

Around one-third of countries also promote the inclusive adoption of adaptive practices and technologies (31 percent) and empowerment of women and marginalized groups in adaptation decision making processes in agrifood systems (31 percent). Empowering women farmers, youth, Indigenous Peoples, and other marginalized groups enhances not only equity, but also productivity and resilience in food systems (FAO, 2021).

FIGURE 23. **Percentage of developing countries with a NAP that include gender equality and social inclusion-based adaptation actions in agrifood systems, by action typology**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Far fewer NAPs, however, address the underlying socioeconomic and cultural drivers of vulnerability and promote economic inclusion, such as inclusive livelihood diversification and improved access of vulnerable groups to credit and financial services for adaptation. Despite the crucial role of social protection programmes in building resilience in relation to climate shocks and in strengthening longer-term adaptive capacities and climate-resilient livelihoods among rural populations (Bhalla *et al.*, 2024), less than 10 percent of countries include social protection measures in the context of agrifood systems in their NAPs. Further, few countries (16 percent) integrate measures, such as laws, to explicitly address structural inequalities and rights, including the right to food or land, forest and water tenure regimes in agricultural and rural communities, which act as key determinants of adaptive capacity. This suggests that NAPs are not addressing the non-climatic drivers of vulnerability that underpin and constrain the capacity of vulnerable groups in agrifood systems to cope with, adapt to and recover from climate shocks and stresses.

Embedding principles of gender equality and social inclusion in the NAP process along with equitable adaptation impact pathways throughout the design, implementation, and monitoring of the NAP process is essential for effective adaptation and a just agrifood system transition.

KEY TAKEAWAYS

- **Recognition of the vulnerability of agrifood stakeholders is limited, despite almost universal acknowledgement of agrifood systems as areas of climate risk.** Only 45 percent of developing countries with NAPs identify populations dependent on agrifood systems, including farmers, pastoralists, fisherfolk, forest-dependent communities, value chain actors and rural communities as vulnerable groups. Greater recognition of their specific vulnerabilities will strengthen equitable and effective adaptation in the sector.
- **Few adaptation actions are tailored to specific vulnerable populations.** Less than 15 percent of agrifood adaptation actions included in developing country NAPs address the distinct vulnerabilities, adaptive capacities and needs of smallholder farmers, pastoralists, land managers, foresters, fisherfolk or other vulnerable and marginalized groups. Far fewer actions (less than 3 percent each) target women, Indigenous Peoples, youth, migrants, the elderly, poor and other vulnerable or marginalized segments of populations. Less than 10 percent are designed to be implemented at the local level. These figures indicate that vulnerable people in agrifood populations are not being adequately targeted and supported to adapt. Countries can strengthen their NAPs by formulating more context-specific adaptation actions that reflect the needs and capacities of diverse stakeholders – who are not only beneficiaries, but also key agents of adaptation and systems change.
- **Gender equality and social inclusion principles are visible but have limited integration in agrifood system adaptation.** While two-thirds of developing countries with a NAP reference GESI in their adaptation actions, they represent only 3.8 percent of total agrifood adaptation actions included. Improving uptake of gender analyses and CRVA could help to improve the understanding of the multidimensional vulnerabilities that groups dependent on agrifood systems face to inform the design of more targeted, inclusive adaptation actions, avoiding the risk of inadvertent reinforcement of inequity and power imbalances. Strengthening the role of social protection and economic inclusion programmes in NAPs would enhance the inclusivity and effectiveness of adaptation actions in agrifood systems. This would help to reinforce coherence across climate and social development objectives in agrifood systems and to ground them in equitable and human rights-based approaches.

2.6. LOSS AND DAMAGE

Loss and damage (L&D) refers to the negative climate impacts that occur despite mitigation and adaptation efforts and is caused by both slow onset and extreme weather events. With increasing global warming and limits to adaptation, losses and damages associated with climate change will become more and more difficult to avoid, particularly for the most vulnerable people (UNFCCC, 2021). Agrifood systems face substantial disaster-related losses, averaging 23 percent of total disaster impacts between 2007 and 2022, and over 65 percent of those losses were caused by droughts experienced in the agriculture sector (FAO, 2023b). These profound losses threaten not only food security but also the lives and livelihoods of the billions of people reliant on agrifood systems (Davis *et al.*, 2023).

This section examines how climate-related losses and damages, driven by slow onset and extreme weather events, are included in country NAPs. It looks into the types of economic and non-economic losses and damages reported generally and, more specifically, in agrifood systems.

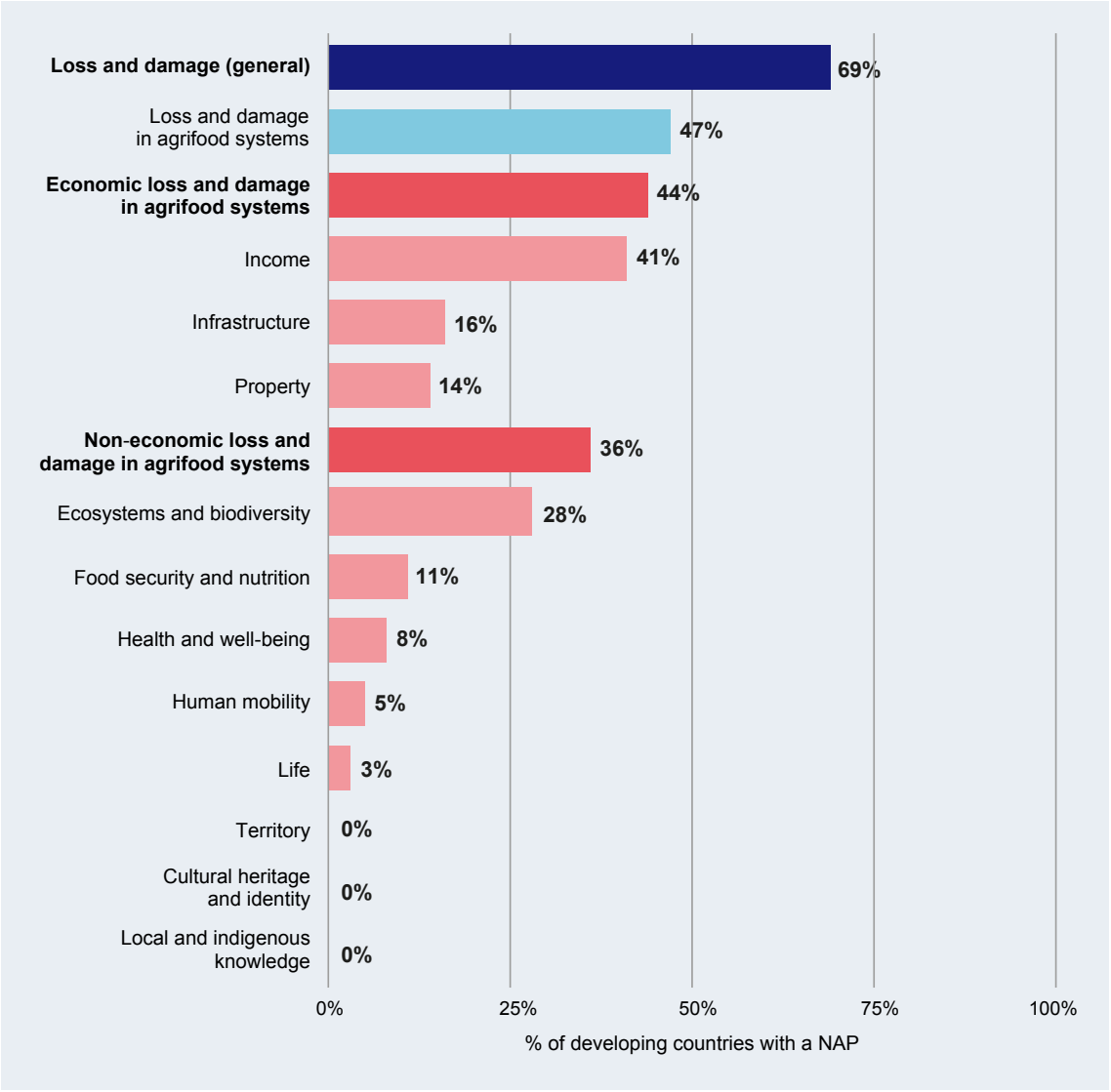
Research Finding #23. 47 percent of developing countries with a NAP refer to losses and damages in agrifood systems.

Loss and damage in the agriculture sector associated with climate change reflect the hard limits of adaptation. Approximately 70 percent of countries report climate-related loss(es) and/or damage(s), while around a half (47 percent) explicitly refer to loss(es) and/or damage(s)[11] in agrifood systems (Figure 24).This significant focus on agrifood systems reflects their heightened vulnerability, where climate shocks and stresses translate directly into reduced yields, degraded soils, diminished water resources, damaged market infrastructure and supply chains, and cascading impacts on food security and livelihoods. The prominence of agrifood systems in national recognition of losses and damages in the NAPs also underscores their economic weight: Disasters in the past three decades have caused over USD 3.8 trillion in lost agricultural production, equivalent to around 5 percent of annual global agricultural GDP (FAO, 2023b).

Countries considered both economic (44 percent of countries) and non-economic losses and damages (36 percent) in agrifood systems in their NAPs. Of the economic losses considered, agricultural income and livelihood losses were mentioned by 41 percent of countries, while agricultural infrastructure and property losses were less frequently reported. Of the non-economic losses considered, loss of biodiversity for food and agriculture (28 percent of countries) was most prominent, while other types of non-economic losses, such as human mobility impacts (5 percent) and loss of life (3 percent) received less consideration in the sector; and cultural heritage and identity, and local and indigenous knowledge none at all.

[11] Hereafter referred to as “losses and damages” for ease of reference.

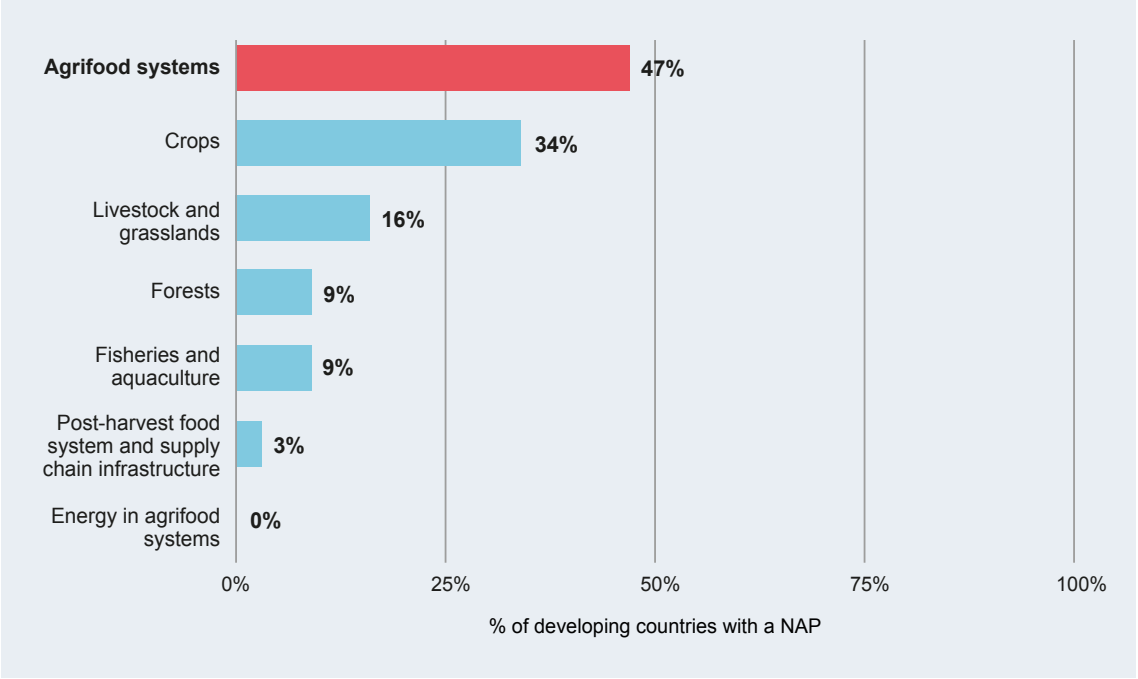
FIGURE 24. **Percentage of developing countries with a NAP that reference climate-related losses and/or damages in general and in agrifood systems, by economic and non-economic loss and damage category**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

The losses and damages being reported in NAPs are concentrated in the crop and livestock subsectors (Figure 25), while far fewer address losses and damages experienced in forests, fisheries and aquaculture subsectors and along the post-harvest aggregation, processing, storage, and distribution stages of agrifood value chains. This reflects heightened attention to upstream production, despite downstream vulnerabilities (e.g. food storage losses, damaged market infrastructure, etc.) being critical for agrifood system-related livelihoods and food security.

FIGURE 25. **Percentage of developing countries with a NAP that reference climate-related losses and/or damages reported in agrifood systems, by subsector**



Source: Authors' own elaboration, based on analysis of national adaptation plans submitted as of 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Overall, the inclusion of agrifood systems-related loss and damage in NAPs is significant, as it demonstrates countries' efforts to position the sector within the broader global agenda on comprehensive risk management for resilience-building (UNFCCC, 2025). Loss and damage is not included in the recommended considerations in the LEG NAP Technical Guidelines from 2012, but the updated version in 2025 includes recommendations to consider loss and damage as part of climate risk and vulnerability assessments and in design of adaptation actions (LDC Expert Group, 2012b, 2025). However, most countries still lack methodological approaches and necessary data for estimating agrifood system-related loss and damage and there are few agreed-upon frameworks for measurement with climate attribution, making it difficult to capture the full extent of climate-related losses and damages in agrifood systems (FAO, 2023b).

Research Finding #24. Agrifood systems are the single most frequently cited sector among loss and damage mentions in developing country NAPs – the impacts of which are more often already being observed compared to other sectors.

Of all mentions of loss and damage in NAPs, 41 percent are specific to agrifood systems. This is high compared to mentions of loss and damage in other sectors[12] (22 percent) and highlights the vulnerability (dependent on stable and predictable climate and weather) of agrifood systems.

[12] The majority of losses and damages mentions in the NAPs (45 percent) are general and not tied to a specific sector (unspecified).

TABLE 5. **Percentage of loss and damage mentions in agrifood systems and other sectors included in developing country NAPs, by projected versus observed incidence, slow onset versus extreme-weather event and economic versus non-economic loss and damage**

Sector	Projected (% of losses and damages mentions)	Observed (% of losses and damages mentions)
Agrifood systems	13.3	81.7
Other and unspecified sectors	37.5	62.0
Sector	**Slow onset events** (% of losses and damages mentions)	**Extreme events** (% of losses and damages mentions)
Agrifood systems	8.3	64.2
Other and unspecified sectors	19.0	74.0
Sector	**Economic** (% of losses and damages mentions)	**Non-economic** (% of losses and damages mentions)
Agrifood systems	95.0	77.0
Other and unspecified sectors	38.3	31.5

Note: Percentage of mentions do not add up to 100 percent per row because mentions may be associated with more than one category.

Source: Authors' own elaboration, based on analysis of national adaptation plans 15 June 2025. Refer to Information note 2 on the publication page for supplementary tables for regional, LDC and SIDS data.

Losses and damages in agrifood systems are not only anticipated but, more often than in other sectors, already being observed in some areas and contexts, according to the information presented in NAPs. Over 81 percent of mentions of losses and damages in agrifood systems note they are already observed, while the respective figure is 60 percent for other and unspecified sectors (Table 5). This may demonstrate that, in line with the findings of the IPCC Sixth Assessment Report, both soft and hard limits to adaptation are already being met in the sector in some areas and contexts, particularly by small-scale farmers and households in low-lying and highly exposed areas (IPCC, 2023).

As in other sectors, reported losses and damages in agrifood systems are more often linked to extreme weather events (64 percent of loss and damage mentions), mainly floods, droughts and storms, than to slow onset events (8 percent), such as sea-level rise and desertification. Methodological and data challenges contribute to this imbalance: extreme events are more visible, immediate, and better recorded via methods such as through the reporting system of the Sendai Framework for Disaster Risk Reduction and Post-Disaster Needs Assessments as compared to slow onset events that unfold gradually (FAO, 2023b).

In agrifood systems, there is a prevalence of reported economic losses and damages (in 95 percent of loss and damage mentions) over non-economic losses and damages (in 38 percent of mentions). This is consistent with the trends for other sectors, and is likely

due to methodological challenges in identifying non-economic dimensions such as cultural heritage or loss of traditional knowledge, and food security, which are less easily quantified (FAO, 2023b). The most frequently reported economic losses and damages in agrifood systems include loss of income, property, and infrastructure. Non-economic losses and damages most reported include ecosystems and biodiversity and food security and nutrition.

Unlike in other sectors, losses and damages in agrifood systems are rarely estimated in monetary terms. While 83 percent of mentions of losses and damages across NAPs are linked to monetized losses (expressed in USD or as a share of GDP), only 29 percent of losses and damages references in agrifood systems are associated with a quantified monetary value. This lack of valuation highlights capacity and technical challenges in assessing the full scale of climate-related losses and damages to agrifood systems. Strengthening methodologies and capacity to measure both economic and non-economic losses and damages linked to extreme and slow onset events affecting agrifood systems would enable governments and other actors to better develop risk-informed interventions and investments, and access resources under international climate finance mechanisms.

KEY TAKEAWAYS

- **Loss and damage is reported more often in agrifood systems than in any other sector.** Nearly half of all developing countries with a NAP (47 percent) reference loss and damage in agrifood systems, and the majority of loss and damage mentions across NAPs are tied to agrifood systems – more than in any other sector.
- **The impacts of loss and damage in agrifood systems are already being observed and – in some contexts – this may be due to the limits to adaptation already being met.** Over 81 percent of mentions of losses and damages in agrifood systems among developing country NAPs note they are already observed, while the respective figure is 60 percent for other and unspecified sectors. This suggests that the limits to adaptation are already being met in some areas and contexts, and – as global warming scenarios increase – the options to adapt that may be available and effective today will be less so tomorrow.
- **Non-economic losses remain under-represented in loss and damage mentions.** Most mentions of losses and damages in agrifood systems among developing country NAPs describe income, property and infrastructure economic losses and damages, while fewer highlight non-economic losses including biodiversity and food security. There is room for innovation in tools and methods for measuring both economic and non-economic losses across agrifood systems and this is an urgent priority to drive climate risk sensitive decision-making, planning and investments.

- **Focus remains on food production, not the full agrifood system.** Loss and damage reporting in agrifood systems in the NAPs centres on crop and livestock production, with comparatively less attention to losses and damages as they occur along the entire agrifood value chain, from production to consumption. Expanding the coverage of economic and non-economic estimates along the value chains and for all actors involved would provide a fuller picture of loss and damage and its implications for food security.
- **Agrifood loss and damage is not easily monetized.** Only 29 percent of agrifood loss and damage mentions in the NAPs include monetary estimates, compared to 83 percent across other sectors. Enhancing analyses, methodologies and capacities to quantify both economic and non-economic losses from extreme and slow onset events is essential to risk-informed planning and investments and for accessing finance mechanisms for building more adapted and resilient agrifood systems.

3. Conclusions and the way forward

Agrifood systems play a vital role in national economies and food security, especially in low-income countries (Shiferaw and Apfalter, 2022). Agriculture and related sectors are also an important part of how countries are advancing their climate and sustainable development goals worldwide. This analysis reinforces that agrifood systems are globally recognized as priority sectors for climate adaptation – both for action that protects and increases the resilience of agrifood systems themselves, and for how agrifood systems contribute to broader resilience across sectors. However, the analysis also shows that evidence gaps, limited use of climate risk data and adaptation options analysis, underdeveloped monitoring and evaluation frameworks, and weak integration of diverse stakeholder perspectives in adaptation planning for agrifood systems persist. The prominence of loss and damage in agrifood systems demonstrates that adaptation limits are already being reached in many contexts and reinforces the need for urgent adaptation action that takes a systems approach to advancing agriculture and food security resilience.

In August 2025, the LEG updated the NAP Technical Guidelines that guide the process to formulate and implement national adaptation plans (LDC Expert Group, 2025). The guidelines highlight experiences of the LDCs in formulating and implementing NAPs, including lessons learned and good practices.

This analysis on agrifood systems in the NAPs provides additional evidence and insights to accompany the updated NAP Technical Guidelines and support countries as they develop, implement, monitor, evaluate, learn from, and update their NAPs. Given the prevalence of agrifood systems as a priority sector for adaptation, this report – and the detailed dataset that it highlights – afford a more specific sectoral look at how NAPs can continue to integrate agrifood adaptation priorities and, in turn, strengthen national agrifood systems, and benefit countries' overall adaptive capacity and resilience.

The updated NAP Technical Guidelines – and constituent modules A through E for NAP development and implementation – provide a framework for organizing the conclusions of this analysis. By taking these insights into account in future NAP iterations, countries can take steps towards strengthening and integrating agrifood systems' resilience in the long-term.

Impact, vulnerability and risk assessment (Module A)

Climate risks to agrifood systems are universal but unevenly assessed. Nearly all developing countries with NAPs (97 percent) report climate impacts on agrifood systems and food security, but less than half apply climate risk and vulnerability assessments specifically for agrifood systems. Only 58 percent of countries use best available multimodel climate projections, and 44 percent use downscaled models, leaving evidence gaps.

The NAP Technical Guidelines recommend developing plausible climate change and socioeconomic scenarios for the medium and long term that can guide understanding of risks and impacts. In addition, applying best available science and framing of risk, vulnerability, and resilience – based on the IPCC Sixth Assessment Report (AR6) – can help countries include not only consideration of crop losses, for example, but also systems-wide risks and vulnerabilities to broader value chains and market systems. Scaling up use of CRVAs, AR6-aligned frameworks and projections, and impact modeling can help capture risks more broadly, and strengthening stakeholder participation in the risk and vulnerability identification process and the integration of socioeconomic and gender-differentiated vulnerability assessments can guide targeted actions (LDC Expert Group, 2025).

Losses and damages in agrifood systems are already being felt, but readiness and capacity to assess loss and damage in the sector is limited. Forty-seven percent of developing countries with a NAP report losses and damages in agrifood systems, and 41 percent of all loss and damage mentions in the NAPs are tied to agrifood systems, outweighing any other sector. However, as in other sectors, agrifood-related loss and damage references focus on economic losses and damages, which are more easily observed and reported on than non-economic losses. Similarly, mentions are most prevalent in relation to crop and livestock production, which is where the majority of losses from drought-related events have been absorbed historically. However, other losses downstream in agrifood value chains and in other vulnerable sectors, such as fisheries and aquaculture, may be under-represented. Technical and institutional capacity for assessing and quantifying loss and damage – both non-economic and economic – could be strengthened to help countries understand where limits to adaptation are being reached already in the sector, and how adaptation actions should be prioritized.

NAP development (Module B)

Agrifood systems are prioritized but actions remain narrow and attention to the needs of vulnerable and marginalized groups is minimal. As countries define their NAPs, a key part of this process is prioritizing sectors of focus and adaptation actions. All developing country NAPs identify agrifood systems as priority sectors, but adaptation actions focus heavily on on-farm measures such as climate-tolerant crops and irrigation. A small fraction (16 percent) of adaptation actions are directly linked to specific climate hazards, and less than 15 percent are tailored to the needs of smallholders, pastoralists, fisherfolk, or women. GESI-related actions make up just 3.8 percent of agrifood adaptation measures.

Broadening NAP actions beyond production to cover storage, processing, markets, and nutrition-sensitive measures would help countries incorporate a whole-of-society, systems approach to agrifood adaptation. This can be accomplished during both the identification and appraisal of options, via expanding stakeholder engagement in this process and having consistent use of options analysis with clear criteria that are defined around climate risks and the country's vision for a resilient future. These steps can help align adaptation actions with identified risks and ensure they are effective, equitable, and economically viable – and aligned with the country's path. As adaptation is interlinked with development, there is no single pathway to achieve resilience and stakeholder participation is key in defining success criteria (LDC Expert Group, 2025). Without targeted attention to the needs of different groups plus deliberate strategies that address the unequal distribution of climate impacts and systemic inequalities within agrifood systems, there is

a risk that current climate actions may generate maladaptive or inequitable outcomes, widening inequalities and entrenching rural poverty (FAO, 2025).

Costs estimated for adaptation in agrifood systems could be expanded. Over half of developing countries with a NAP (58 percent) estimate their finance needs for implementing their adaptation priorities in agrifood systems. However, since not all developing countries had submitted a NAP by the time of this analysis (less than half), the costs of adaptation currently estimated are representative of only one-fourth of all developing countries. Additionally, recent FAO and CPI research (CPI and FAO, 2024) illustrates that climate finance needs estimates in NDCs strikingly underestimate the likely costs for implementation by nearly 12 times. To gain a better understanding of the magnitude of adaptation costs in the sector, countries should be supported to estimate their adaptation needs in the NAPs, including the development of standardized methodologies as a basis for finance mobilization and project pipeline.

Financing and implementation (Module C)

Barriers to implementing agrifood system adaptation remain pervasive. Nearly half (47 percent) of developing countries with NAPs report technical, institutional, and financial barriers to implementation. As countries transition from NAP planning to implementation, there are numerous opportunities to overcome technical and institutional barriers. Countries can create appropriate legal and institutional frameworks, strengthen capacity within government and partner organizations, increase interministerial coordination to avoid fragmentation, and empower agricultural ministries with clear mandates in the implementation process. As lessons learned from NAP processes show, countries that have involved multiple government stakeholders in NAP processes have more ownership of the NAP across government entities (LDC Expert Group, 2025). Additionally, countries can empower local governments, SMEs, and producer groups as identified implementers of agrifood system adaptation actions, rather than just beneficiaries. To increase private sector engagement, countries can expand blended finance and risk-transfer tools (e.g. insurance, guarantees, public–private partnerships) to crowd in private investment.

One way countries can address financing needs is by integrating NAP priorities into country programmes and targeting relevant funding/financing windows (LDC Expert Group, 2025). In addition, the private sector has the potential to be a stronger partner in implementation; although 78 percent of countries recognize its importance for unlocking implementation, all of them report challenges to engaging the private sector for agrifood systems resilience. Reported barriers include lack of capacity, limited access to de-risking instruments, and misaligned governance structures.

Monitoring, evaluation, learning and reporting (Module D)

Recognition of MEL in NAPs is high, but operationalization is weak, often missing learning components, and indicators are limited for agrifood systems. Nearly all developing countries (97 percent) reference MEL in their NAPs, but only one-third (34 percent) have systems to track adaptation in place. Just 14 percent reference iterative learning, limiting adaptation of strategies over time. Agrifood system indicators are output-focused, rather than encompassing measurement of impact.

Moving forward, countries can focus efforts on building functional MEL systems that emphasize learning and iteration, not only compliance. While only a fraction of NAPs include learning considerations, the updated NAP Technical Guidelines emphasize that capturing lessons learned from addressing adaptation and completing iterative and periodic learning and evaluation processes are key to informing subsequent actions (LDC Expert Group, 2025). In addition, metrics for measuring adaptation results in agrifood systems can be expanded to more effectively match all elements of GGA Targets, including Target 9b – covering consideration of food supply and distribution chains, food security and nutrition outcomes, and livelihood and poverty impacts.

Alignment with the GGA target for food and agriculture is strong but imbalanced. Sixty-three percent of agrifood indicators included in the NAPs align with GGA Target 9b on food and agriculture, but most focus on production (9bi). While many agrifood indicators also align with other GGA targets on water and ecosystems and biodiversity, very few indicators track supply and distribution (9bii) or access and nutrition (9biii), leaving systemic gaps in reporting progress toward the global goal on adaptation for agricultural resilience.

The NAP guidelines emphasize the need to frame adaptation at the national level in the context of the GGA thematic targets at the very outset of the NAP process (LDC Expert Group, 2025). Beginning to unpack the GGA thematic targets into NAP components and systems early in the NAP process can help match intended adaptation actions directly to GGA reporting targets and accelerate coordinated reporting on adaptation progress. And, countries can benefit from taking a nexus approach, recognizing that there are multiple entry points for agrifood systems in the GGA as it is a cross-cutting sector with strong linkages to energy, water, EbA and poverty related targets.

Building readiness and accessing funding and support for the process (Module E)

There is opportunity for strengthened and integrated policy, legal and institutional frameworks that include all the mandated institutions of the agrifood sector as key players in adaptation. While a third (37 percent) of developing countries have explicitly referenced a NAP coordination mechanism that includes the Ministry of Agriculture, the other two-thirds of countries are missing a key opportunity to strengthen coordination on one of the most integrated and prioritized sectors for adaptation. Strong institutional arrangements and regulatory frameworks that include agriculture, poverty and food security as key players in adaptation planning can help strengthen national outcomes and link national adaptation planning with local and subnational agricultural governance and extension entities, building local ownership and a whole-of-society approach to adaptation.

Access to international climate finance is a critical enabler of NAP formulation and implementation, particularly for sectors such as agriculture and food systems that are highly vulnerable to climate change. Dedicated support from multilateral and bilateral mechanisms helps countries strengthen institutional and technical capacities to plan and implement adaptation measures in agrifood systems. For instance, the GCF Readiness and Preparatory Support Programme provides an example of how countries can access resources to enhance institutional readiness, generate evidence on climate risks to agrifood systems, and design

pipelines of adaptation actions aligned with national priorities. Similarly, the GEF provides support for climate adaptation primarily through the Least Developed Countries Fund for the most vulnerable nations, and the Special Climate Change Fund for other developing countries, including SIDS. This support includes financing for projects that build resilience in areas like agriculture, water, and food security, alongside efforts to integrate adaptation into broader policies, engage the private sector, and foster innovation.

Gender equality and social inclusion (Cross-cutting)

NAPs are a key yet underutilized tool to bolster equitable development pathways, including in the agriculture and food sectors. As this analysis shows, NAPs are including whole-of-society planning approaches and recognizing gender equality and social inclusion principles in agrifood systems, but further integration is limited. Less than 15 percent of agrifood adaptation actions included in developing country NAPs address the distinct vulnerabilities of smallholder farmers, pastoralists, fishers, women, Indigenous Peoples or other marginalized groups, and less than 10 percent are designed to be implemented at the local level despite the widespread consensus that locally led adaptation is more effective, equitable and enduring.

Countries can strengthen actions to be more context-specific and reflect diverse stakeholders, who are not only beneficiaries but also key agents of adaptation and systems change in agriculture and food sectors. NAP adaptation actions can likewise include social protection for agrifood system actors along with measures to promote decent work, financial inclusion, and to advance education, upskilling and reskilling. A stronger focus on scaling up these approaches would substantially enhance efforts to build more holistic, equitable and lasting resilience and adaptive capacity (LDC Expert Group, 2025).

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Appendices

Appendix 1: List of NAP documents submitted to UNFCCC by developing countries reviewed.

Two further information notes are available as stand-alone documents and can be accessed separately on the report's publication page (https://openknowledge.fao.org/handle/20.500.14283/cd7579en).

Information note 1 (Methodology): *Protocol for NDC and NAP agrifood system data extraction and analysis*.

Information note 2 (Data tables): *Results of analysis of agrifood systems in NAPs at regional level and for LDCs, LLDCs and SIDS*.

APPENDIX 1. List of NAP documents by developing countries reviewed in this analysis

Country name	Document type	Year submitted	FAO regional office	Least Developed Countries (LDCs)	Landlocked Developing Countries (LLDCs)	Small Island Developing States (SIDS)
Cameroon	NAP	2015	Africa			
Brazil	NAP	2017	Latin America and the Caribbean			
Brazil	Sectoral NAP or Other Output	2017	Latin America and the Caribbean			
Sudan	NAP	2017	Near East and North Africa	Yes		
Sri Lanka	NAP	2017	Asia and the Pacific			
Palestine	NAP	2017	Near East and North Africa			
Kenya	NAP	2017	Africa			
Chile	NAP	2017	Latin America and the Caribbean			
Chile	Sectoral NAP or Other Output	2017	Latin America and the Caribbean			
Chile	Sectoral NAP or Other Output	2017	Latin America and the Caribbean			
Chile	Sectoral NAP or Other Output	2017	Latin America and the Caribbean			
Togo	NAP	2018	Africa	Yes		
Colombia	NAP	2018	Latin America and the Caribbean			
Saint Lucia	NAP	2018	Latin America and the Caribbean			Yes
Saint Lucia	Sectoral NAP or Other Output	2018	Latin America and the Caribbean			Yes
Saint Lucia	Sectoral NAP or Other Output	2018	Latin America and the Caribbean			Yes
Saint Lucia	Sectoral NAP or Other Output	2018	Latin America and the Caribbean			Yes
Saint Lucia	Sectoral NAP or Other Output	2018	Latin America and the Caribbean			Yes

Country name	Document type	Year submitted	FAO regional office	Least Developed Countries (LDCs)	Landlocked Developing Countries (LLDCs)	Small Island Developing States (SIDS)
Fiji	NAP	2018	Asia and the Pacific			Yes
Ethiopia	NAP	2019	Africa	Yes	Yes	
Guatemala	NAP	2019	Latin America and the Caribbean			
Grenada	NAP	2019	Latin America and the Caribbean			Yes
Saint Vincent and the Grenadines	NAP	2019	Latin America and the Caribbean			Yes
Kiribati	NAP	2020	Asia and the Pacific	Yes		Yes
Suriname	NAP	2020	Latin America and the Caribbean			Yes
Nepal	Sectoral NAP or Other Output	2020	Asia and the Pacific	Yes	Yes	
Kuwait	NAP	2021	Near East and North Africa			
Timor-Leste	NAP	2021	Asia and the Pacific	Yes		Yes
Cambodia	NAP	2021	Asia and the Pacific	Yes		
Cambodia	Sectoral NAP or Other Output	2021	Asia and the Pacific	Yes		
Cambodia	Sectoral NAP or Other Output	2021	Asia and the Pacific	Yes		
Peru	NAP	2021	Latin America and the Caribbean			
Armenia	NAP	2021	Europe and Central Asia		Yes	
South Africa	NAP	2021	Africa			
Albania	NAP	2021	Europe and Central Asia			
Tonga	NAP	2021	Asia and the Pacific			Yes
Nepal	NAP	2021	Asia and the Pacific	Yes	Yes	
South Sudan	NAP	2021	Africa	Yes	Yes	

Country name	Document type	Year submitted	FAO regional office	Least Developed Countries (LDCs)	Landlocked Developing Countries (LLDCs)	Small Island Developing States (SIDS)
Uruguay	Sectoral NAP or Other Output	2021	Latin America and the Caribbean			
Uruguay	Sectoral NAP or Other Output	2021	Latin America and the Caribbean			
Uruguay	Sectoral NAP or Other Output	2021	Latin America and the Caribbean			
Liberia	NAP	2021	Africa	Yes		
Sierra Leone	NAP	2022	Africa	Yes		
Chad	NAP	2022	Africa	Yes	Yes	
Central African Republic	NAP	2022	Africa	Yes	Yes	
Costa Rica	NAP	2022	Latin America and the Caribbean			
Madagascar	NAP	2022	Africa	Yes		
Democratic Republic of the Congo	NAP	2022	Africa	Yes		
Benin	NAP	2022	Africa	Yes		
Paraguay	NAP	2022	Latin America and the Caribbean		Yes	
Cabo Verde	NAP	2022	Africa			Yes
Niger	NAP	2022	Africa	Yes	Yes	
Bosnia and Herzegovina	NAP	2022	Europe and Central Asia			
Haiti	NAP	2023	Latin America and the Caribbean	Yes		Yes
Ecuador	NAP	2023	Latin America and the Caribbean			
Bangladesh	NAP	2023	Asia and the Pacific	Yes		
Papua New Guinea	NAP	2023	Asia and the Pacific			Yes
Mozambique	NAP	2023	Africa	Yes		
Pakistan	NAP	2023	Asia and the Pacific			

Country name	Document type	Year submitted	FAO regional office	Least Developed Countries (LDCs)	Landlocked Developing Countries (LLDCs)	Small Island Developing States (SIDS)
Bhutan	NAP	2023	Asia and the Pacific		Yes	
Zambia	NAP	2023	Africa	Yes	Yes	
Argentina	NAP	2023	Latin America and the Caribbean			
Burundi	NAP	2023	Africa	Yes	Yes	
Marshall Islands	NAP	2023	Asia and the Pacific			Yes
Morocco	NAP	2024	Near East and North Africa			
Thailand	NAP	2024	Asia and the Pacific			
Trinidad and Tobago	NAP	2024	Latin America and the Caribbean			Yes
Philippines	NAP	2024	Asia and the Pacific			
Republic of Moldova	NAP	2024	Europe and Central Asia		Yes	
Republic of Moldova	Sectoral NAP or Other Output	2024	Europe and Central Asia		Yes	
Serbia	NAP	2024	Europe and Central Asia			
Uruguay	Sectoral NAP or Other Output	2024	Latin America and the Caribbean			
Zimbabwe	NAP	2024	Africa		Yes	
Azerbaijan	NAP	2024	Europe and Central Asia		Yes	
Uganda	Sectoral NAP or Other Output	2025	Africa	Yes	Yes	
Uganda	Sectoral NAP or Other Output	2025	Africa	Yes	Yes	
Jordan	NAP	2025	Near East and North Africa			
Israel	NAP	2025	Europe and Central Asia			
Burkina Faso	Sectoral NAP or Other Output	2025	Africa	Yes	Yes	

Country name	Document type	Year submitted	FAO regional office	Least Developed Countries (LDCs)	Landlocked Developing Countries (LLDCs)	Small Island Developing States (SIDS)
Burkina Faso	NAP	2025	Africa	Yes	Yes	
Mongolia	NAP	2025	Asia and the Pacific		Yes	

Note: The terminology used for document types reflects the terminology applied on NAP Central. In this report, the authors assigned Palestine to the FAO Regional Office for Near East and North Africa for the purposes of regional analysis.

Source: National adaptation plans submitted as of 15 June 2025 (**NAP Central.** 2025. Submitted NAPs from developing country Parties. https://napcentral.org/submitted-NAPs [Accessed: 15 June 2025] and **NAP Central.** 2025. Sectoral NAPs and Other Outputs (developing country Parties. https://napcentral.org/sectoral-naps [Accessed: 15 June 2025]). The classification of country names, Least Developed Countries (LDC), Land Locked Developing Countries (LLDC), and Small Island Developing States (SIDS) is obtained from **UNSD.** 2025 (https://unstats.un.org/unsd/methodology/m49/overview/ [Accessed: 26 June 2025]). The FAO regional offices classification is downloaded from **FAO.** 2025 (https://www.fao.org/about/who-we-are/worldwide-offices/en [Accessed: 27 June 2025]).

National adaptation plans (NAPs) are key mechanisms through which countries – in particular, least developed countries – seek to reduce vulnerability to the impacts of climate change and facilitate the integration of climate change adaptation processes across sectors, stakeholder groups and administrative boundaries.

This report, based on primary data extraction and an original analysis by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Development Programme (UNDP), looks at how agrifood systems are considered in all NAPs submitted by developing and least developed countries to the United Nations Framework Convention on Climate Change as of June 2025.

The report finds that agrifood systems are universal priority areas for adaptation actions in submitted NAPs and that nearly all countries highlight climate-related impacts on agricultural sectors. However, identified risks and proposed adaptation actions are not always aligned in the NAPs; evidence gaps and technical, policy and financial barriers remain; adaptation finance flows reaching agrifood systems are a fraction of identified needs; monitoring, evaluation and learning systems are underdeveloped; and the specific needs of vulnerable groups are not adequately recognized.

With updated NAP technical guidelines published in August 2025, the report also presents a path for how future NAPs can leverage the vast untapped opportunities of agrifood systems to boost climate resilience, food security and livelihoods, and attract much needed finance to scale up transformative agrifood adaptation solutions.

Food and Agriculture Organization of the United Nations
www.fao.org/in-action/scala/en

United Nations Development Programme
www.adaptation-undp.org/scala

International Climate Initiative (IKI)
www.international-climate-initiative.com

German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN)
www.bundesumweltministerium.de/en/

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IKI INTERNATIONAL CLIMATE INITIATIVE

based on a decision of
the German Bundestag

ISBN 978-92-5-140281-8

9 789251 402818

CD7579EN/1/11.25