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# Climate Capital:
## Financing Adaptation Pathways for Smallholder Farmers

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# About this report

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## Acknowledgments

The authors would like to thank contributions from Jyoti Shankar Nayak (AgFunder) for extensive data collection, analysis and research, Matthew Newman (ISF) for research, Jessica Pothering (ImpactAlpha) for editorial support, and Robin Chauhan (AgFunder) for data management support.

The authors also acknowledge contributions from Katie Lively (AgFunder) on graphic design, Nathalie Gibson and Charlotte James (AgFunder) on social media and marketing.

The authors appreciate the review and guidance from the following experts outside AgFunder and ISF (in alphabetical order): Marcella McClatchey (BMGF), Songbae Lee, Hans Muzoora and Heidi Sumser (USAID), Megan Zsorey, Linnet Leon, Kari Vigerstol (The Nature Conservancy). And collaboration from Daniela Chiriac and Harsha Vishnumolakala (Climate Policy Initiative).

The authors would like to thank all the interviewees who took time to share their insights and experiences (in alphabetical order): Lillian Alexander (Mercy Corps), Malika Anand (Catalyst Fund), Peter Batttisti (Future of Fish), Sara Boettiger, PhD, Junior Costa Ciniro (CGIAR), Urs Dietrich (Landscape Resilience Fund), Oona Eager (Aqua-Spark), Dan Firger (Great Circle Capital Advisors), Tara Guelig and Sanjay Wagle (Lightsmith Group), Fabiola Ikirezi Mutabazi (Rwanda Green Fund), Francisco Jardim (SP Ventures), Christoph Jungfleisch (YAPU), Mark Kahn (Omnivore), Sherief Kesseba (Climate Resilient Africa Fund), Sanjeev Krishnan (S2G), Miguel Lizarazo (CGIAR), Deissy Martínez-Barón (CGIAR), Mike McCrelless (Impact Frontiers), Paul McMahon (SLM Partners), Brian Midler (Aceli), Alberto Millan (former CGIAR), Rebecca Mincy (ARAF), John Mundy (One Acre Fund), Carla Orrego and Trang Tran (Convergence CCFF), David Pierson (Syngenta Ventures), Tim Rann (Mercy Corps), Saritha Peruri and Mitch Rubin (Elemental Excelerator), Kevin Schwartz (Paine Schwartz Partners), Maurice Scheepens and Charissa Bosma (FMO), Kenji Shundo (IFAD ARCAFIM), Lizzie Teague (Root Capital), Luca Torre (Huruma), Chiara Trabacchi (BII), Marthe Tollenaar, (Sail Ventures), Ellie Turner (60DB), German Vegarra (ADAPTA), Daniel Waldron & Christopher Wayne (Acumen), Simon Winter (Syngenta).

Data collaboration: The authors would like to thank Crunchbase for their continued partnership with AgFunder.

## About AgFunder

AgFunder is a world-leading venture capital and intelligence platform for the global food and agriculture industry. AgFunder's team of award-winning journalists and researchers reports on and analyzes the people, companies, and technologies aiming to improve human and planetary health via its news site and research platform. AgFunder is also one of the most active agrifoodtech investors globally, using technology, media and networks to invest in and support transformational founders and technologies.

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## About ISF

ISF Advisors is the leading strategic and financial advisory group committed to mobilizing capital for a more sustainable, equitable, and productive global food system. ISF's combination of research with strategic and financial advisory expertise allows us to analyze problems with a systems lens and structure investment solutions that mobilize different forms of capital.

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# Executive summary

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# Climate change is here, and getting worse.

"We are in an adaptation emergency. We must act like it."

UN Secretary-General António Guterres at COP28

Wherever you are in the world, you no doubt experienced extreme weather events these past 12 months. In fact, nearly half the global population – some 3.6 billion people – is highly vulnerable to climate change impacts[1], from droughts, floods and storms to heat stress and food insecurity[2]. And climate hazards are only expected to worsen.

# Agriculture and food production is at risk. Smallholder farmers in emerging markets are most vulnerable.

Developing nations are disproportionately affected by climate change; a Stanford University study found that economic inequality between developed and developing nations has increased by 25% since 1960 due to climate change[3].

These developing economies are heavily dependent on agriculture and are home to the majority of the world's 500 million smallholder farmers, as well as fishers, herders, and forest-dependent communities - whose livelihoods are derived from renewable natural resources[4]. These populations with the highest dependency on agriculture and the lowest adaptive capacity, particularly in developing economies, will continue to be the most severely impacted by the effects of climate change.

Agriculture must adapt to increasingly inhospitable growing conditions; as early as 2030, corn and wheat yields could drop by as much as 24% and 17% respectively as a result of climate change[5]. In Sub-Saharan Africa, land providing 70% of crop value will be prone to extreme heat stress by 2050[6] . Some $15 billion of annual adaptation investment in agriculture is needed on the continent, according to the Global Center on Adaptation[7].

Given that smallholder farmers (SHFs) produce one-third of the world's food, their ability to adapt to climate change impacts us all.

**Despite this, adaptation remains largely underfunded.**

Adaptation finance remains a fraction of what's needed – some $212 billion a year by 2030 in developing countries alone[8].

Adaptation initiatives globally have been sidelined by the focus on climate change mitigation – the measurable reduction of greenhouse gas emissions – and the race to "net zero."

Mitigation efforts currently receive 90% of global public and private climate financing, and while adaptation financing reached an all-time high of $63 billion in 2021/2022, mitigation finance grew at a faster rate[9].

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# Agrifood adaptation investment is complicated, yet possible.

Both mitigation and adaptation financing is necessary to help smallholder farmers adapt to climate change. However there are many challenges associated with investing in adaptation in particular, including:

- **Lack of definition.** There is no one-size-fits-all definition of adaptation - definitions range from very broad to very specific. For the purpose of this report, we define climate adaptation as "measures taken to minimize the adverse impacts of actual or expected future climate change or to exploit beneficial opportunities." (see further details in **section two**)
- **Context specificity.** Adaptation is very context-specific; what's needed in a drought-prone region is very different than a flood-prone region
- **Data limitations.** It is hard if not impossible to track certain funding flows to climate adaptation, including agrifood corporations and banks
- **Diverse funding needs.** A range of investor types are needed to scale agrifood adaptation initiatives at different financing stages

Focusing on the world's smallholder farmers - including farmers, fishers and herders - this report is a first look at private sector actors investing in adaptation. Included in this report:

- High-level view of the varied types of capital needed for tech and non-tech adaptation initiatives for SHFs
- Deep dive into where investment has been flowing for climate adaptation agrifood technology startups relevant for SHFs.
- Detailed taxonomy to categorize investments
- Six key agrifood adaptation investment opportunities for a range of private sector actors, plus callouts on where public funding sources can play a catalytic role.

Overall, our analysis demonstrates that investing in climate adaptation for agriculture in low and medium-income countries can be tough, but is very much possible and necessary to uphold our food systems in the face of climate change.

**Above**
Stock image

**Left**
Josephine Kimonyi, farmer, at her home in Makueni County, Kenya on November 13, 2022.

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# Key findings:

## 1. Varied private capital sources are investing in SHF adaptation

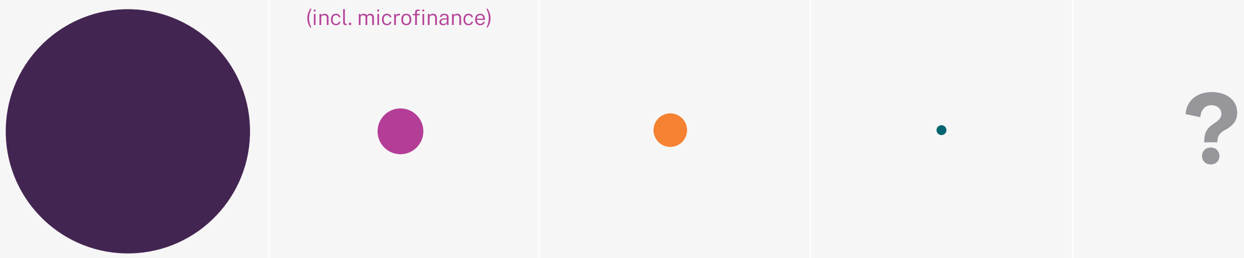
Most financing for small agribusinesses and SHFs comes from commercial banks, followed by non-banking financial institutions and microfinance providers. Financial institutions are an important channel for agriculture adaptation finance, but granular data is not readily available because financial institutions don't classify loans according to adaptation solutions.

Private investors are also investing in climate adaptation, including large multinational corporations, local and international impact funds, farmland funds and even Silicon Valley-based venture firms.

The most robust data findings in this report rely on AgFunder's database of investment deals in agrifood technology startups, from predominantly venture capital investors. Although it is a relatively smaller channel in overall volume, venture capital and other agrifoodtech investments are often a precursor to other forms of financing and therefore a proxy for future trends.

### SHF adaptation funding supply*

A range of actors provide adaptation finance for SHF-relevant products & services, however data is largely under-tracked



| Commercial Banks | Non-banking Financial Institutions (incl. microfinance) | Multilateral Development Banks | VC, PE Impact Funds' | Corporates |
|---|---|---|---|---|
| 87% of FIs expect climate change to pose a material risk to their business | NBFIs provide necessary working capital – generally with smaller ticket sizes - to smallholder farmers and agri-SMEs to help fill the gap of commercial banks | $2.4 bn In annual adaptation funding for low and middle-income economies was committed by MDBs in 2021 | $518m Average annual SHF adaptation agrifoodtech investment targeting SHFs between 2012 and 2023 | 63% of the 79 companies assessed by FAIRR have made regenerative ag commitments, but only 36% of companies with commitments have quantifiable targets |

*Sources: Deloitte and EDF; ISF Agri-SME; FAIRR; ISF & AFN Analysis,
Note: Size of bubbles based on financing flows to SHFs and agri-SMEs according to ISF Agri-SME report and AgFunder analysis

# Key findings:

## 2. Adaptation investment is increasing, but not as a portion of all climate finance

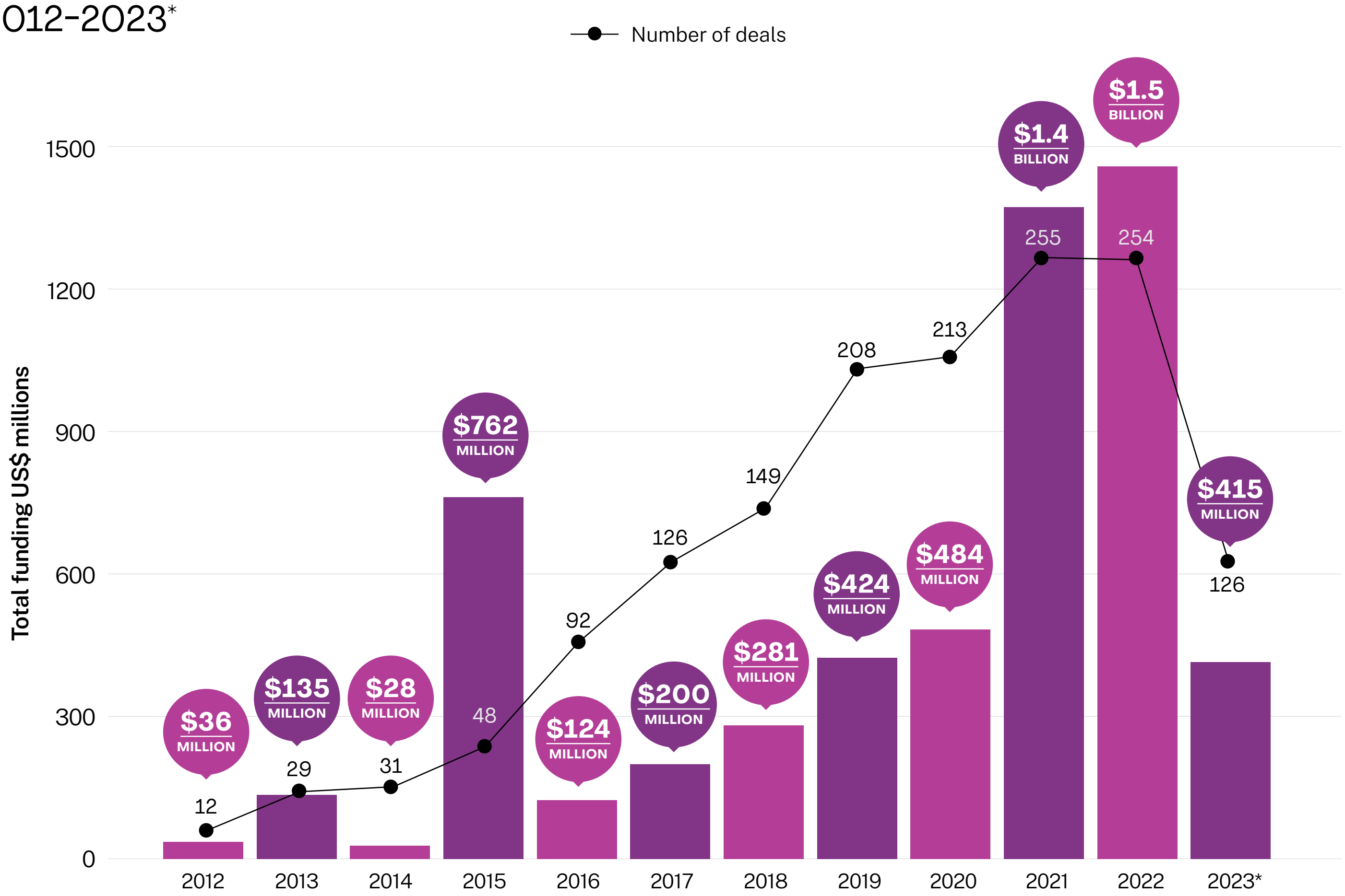
Multilateral development banks are investing at an increasing pace; in 2021, they doubled adaptation investment in food, agricultural and ecological resources to just over $2.4 billion compared to the year before[10].

Tech investors – predominantly venture capital, private equity and impact funds – have put over $5.7 billion of funding to work on adaptation tools and services for SHFs since 2012, increasing year-over-year, except in 2023 when the whole VC market experienced a downturn, according to the analysis showcased in this report based on AgFunder data.

Low-tech adaptation initiatives are also gaining investment, such as local and international efforts to transition farmers to climate-smart and regenerative farming practices, particularly by local and international banks and corporations. Nearly 50 corporates that control a third of the agrifood sector's $9 trillion in revenues mention regenerative agriculture as part of their investment strategies[11].

But funding for climate mitigation is growing at a faster rate than adaptation[12].

### SHF adaptation agrifoodtech funding by year 2012-2023*




 *as reported at October 31, 2023

# Key findings:

## 3. Digital tools are the most popular adaptation investment for venture capital...

Within agrifoodtech, digital agribusiness marketplaces are the most invested category as early-stage investors back the scalable aggregation of SHFs to supply inputs and markets typically unreachable to them, as noted in the graphic below.

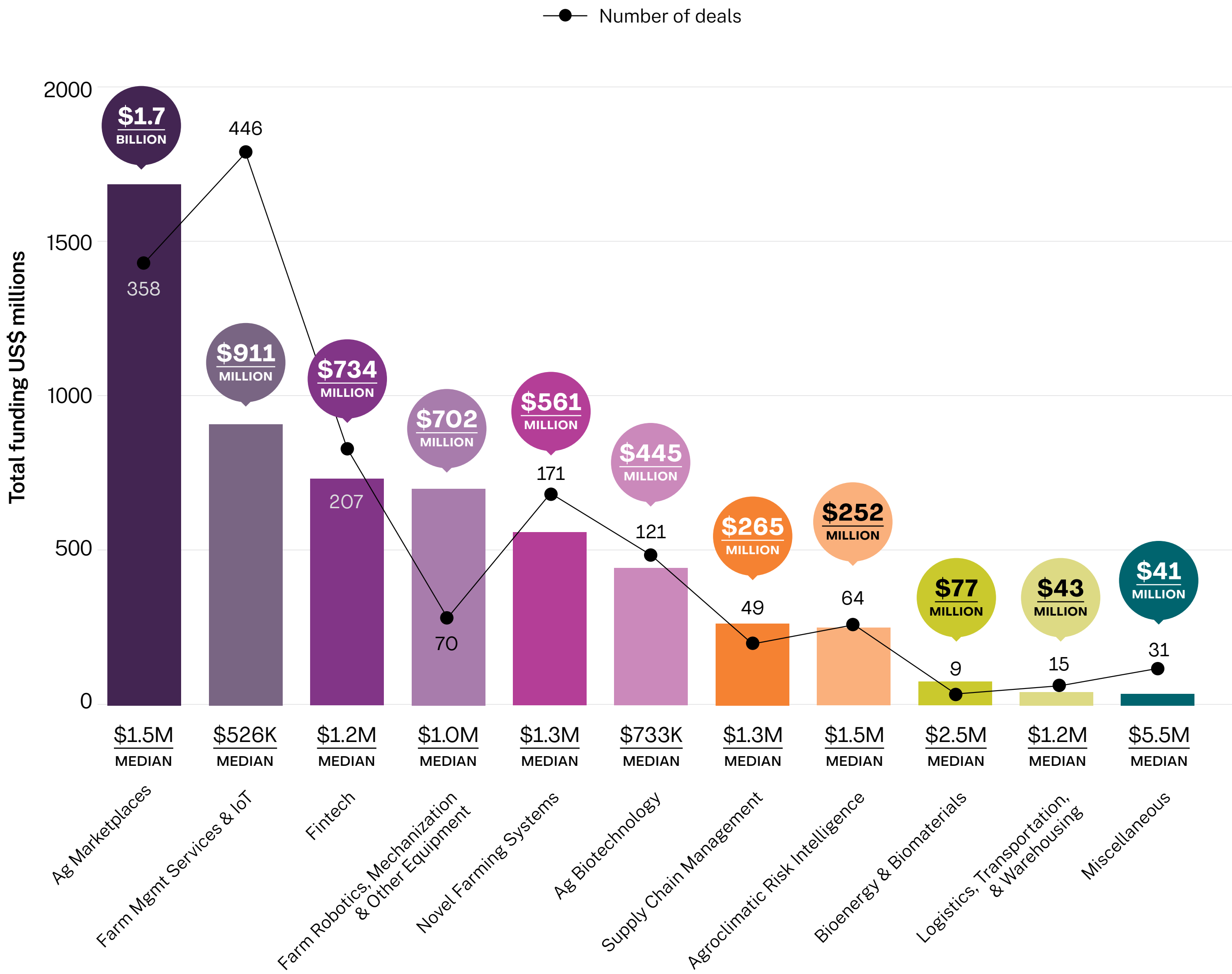
Runner up is farm management services, which enable the adoption of precision agriculture practices and a better understanding of crop yields

Third is fintech tools which also enable SHF financial resilience through access to credit and insurance.

## ...and India is the leading country for tech investment in adaptation by company HQ location

| | | |
|---|---|---|
| 01 | India | $1.9 b |
| 02 | Israel | $1.4 b |
| 03 | Indonesia | $390 m |
| 04 | South Africa | $385 m |
| 05 | Kenya | $213 m |
| 06 | South Korea | $212 m |
| 07 | Japan | $182 m |
| 08 | United States | $147 m |
| 09 | Uruguay | $124 m |
| 10 | Nigeria | $123 m |

SHF adaptation agrifoodtech funding by category 2012-2023*



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# Key findings:

## 4. Concessional finance and government support are often needed to supplement adaptation funding from private sector actors

To date, climate finance for small-scale agriculture has been sourced 95% from the public sector, including governmental donors, multilateral development finance institutions and bilateral development financial institutions, with grants the predominant financial instrument providing 50% of committed finance, followed by concessional and non-concessional debt[13].

Approximately 14% of the adaptation agrifoodtech companies in our dataset received grants before other private investments.

Many of the successful fund managers we spoke with are tapping public, concessional, or "blended" sources of capital.

Several funds also have grant-funded "technical assistance" facilities that complement their investments by offering pre-or post-investment support to investee companies. And good monitoring and impact management is often supported by grants.

Forward-thinking investors are aligning themselves closely with local government strategies. While private investors can't always wait for governments to catch up – nor should they at the expense of progress – government initiatives can help accelerate private investment in climate adaptation for SHFs. The Government of Rwanda's **Ireme Invest** program is a good example of strategic coordination between public and private sector players to support green business growth. The program is supported by various bilateral and multi-lateral donors and channels investment through the Development Bank of Rwanda and the Rwanda Green Fund.

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While investing in climate adaptation can be difficult, there are ample opportunities for a wide range of private investors. In the report, we have identified six investable opportunities that can help smallholder farmers adapt to climate change:

| Opportunity | | Sample Investments |
|---|---|---|
| **On-Farm and Post-Farm Infrastructure** | Changing temperatures and natural disasters will require innovative on-farm and post-farm solutions for smallholders, including solar irrigation, climate-controlled environments, drying equipment, cold storage solutions, and feasible transportation channels. | SunCulture, ecozen |
| **Enabling Data and Intelligence** | Emerging sets of software providers - including precision agriculture, traceability, monitoring, reporting, and verification, and agroclimatic risk providers - are key to collecting, interpreting, and delivering data and information to players across the value chain, thereby allowing for improved forecasting and risk assessments before, during, and after production. | aquaconnect, Cropin |
| **Adapted Inputs** | Various applications of adapted inputs can assist SHFs in adapting to climate change through adapted crops that offer more stable yields, enhanced pest and disease resistance, improved water efficiency, and improved soil health. Both high-quality inputs and the right distribution channels are instrumental in promoting adaptation. | puna.bio, String |
| **Financial Services** | Climate change will pose additional challenges in the agriculture sector, therefore making working capital even more constrained and necessitating increased and alternative finance sources for SHFs, including the need for increased insurance. | Degas, EQUITY |
| **Climate Adaptive Value Chain Actors** | Many midstream value chain companies (e.g. agro-processors) directly engage with farmers, and can be a channel for encouraging and providing the necessary training/inputs to help them adapt to climate-smart practices. | Tomato Jos, HERSHEY THE HERSHEY COMPANY |
| **Ag Marketplaces** | Innovative marketplace solutions can be instrumental in promoting supply chain connectivity and access to better markets and inputs for SHFs across crop systems, livestock, and aquaculture in the face of climate change. | DeHaat Seeds to Market, AFEX |

Investing in adaptation is not only necessary but urgent. As our analysis shows, adaptation is a readily investable theme where many investors are finding opportunities. It is not easy, and much more investment is required across all the opportunities described above.

Despite this growth much more investment is required across all the opportunities described above. Private investment will in some cases need to be paired with public investment and government action to enable relevant technologies and solutions to reach smallholder farmers.

This study represents a first step towards more transparency around private investment flows in climate adaptation for smallholder farmer agriculture systems. However several data and knowledge barriers remain, particularly regarding investment among commercial banks, non-banking financial institutions, and corporate supply chains. We hope this report is a useful tool for investors and serves as a launching pad for additional research in climate adaptation investment for the benefit of smallholder farmers.

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**Urgency of Investment**
Sub-Saharan Africa Deep Dive

| | |
|---|---|
| **$15b** | **$201b** |
| **Cost of action** (annual)* | **Cost of inaction** (annual)* |

When it comes to investing in climate adaptation in agriculture and food systems in Sub-Saharan Africa, the cost of action is less than a tenth of the cost of inaction[14], so the economic case is clear.

* Source https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_Adaptation-Finance-Flows-in-Africa.pdf?_gl=1*1shvmx5*_ga*MTEyMDM5MjIwNC4xNzA3NzU5ODcy*_up*MQ.

1 Thangata et al, "Understanding the Paris Agreement's "Global Goal on Adaptation"", 2024: https://www.wri.org/insights/global-goal-on-adaptation-explained

2 IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, https://www.ipcc.ch/report/ar6/syr/

3 Noah S. Diffenbaugh and Marshall Burke, Global warming has increased global economic inequality, Stanford University, 2019: https://doi.org/10.1073/pnas.1816020116

4 Sarah K. Lowder a, Marco V. Sánchez b, Raffaele Bertini, Which farms feed the world and has farmland become more concentrated? 2021: https://doi.org/10.1016/j.worlddev.2021.105455

5 Jägermeyr, J., Müller, C., Ruane, A.C. et al. Climate impacts on global agriculture emerge earlier in new generation of climate and crop models. Nat Food 2, 873–885 (2021). https://doi.org/10.1038/s43016-021-00400-y
https://climate.nasa.gov/news/3124/global-climate-change-impact-on-crops-expected-within-10-years-nasa-study-finds/

6 Bill and Melinda Gates Foundation calculation, https://docs.gatesfoundation.org/documents/bill_and_melinda_gates_foundation_investing_in_climate_change_adaptation_and_agricultural_innovation_is_essential_for_our_future.pdf

7 Adaptation Finance Flows in Africa, Global Center for Adaptation, 2022: https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_Adaptation-Finance-Flows-in-Africa.pdf?

8 Barbara Buchner et al, Global Landscape of Climate Finance 2023, Climate Policy Initiative: https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2023/

9 Barbara Buchner et al, Global Landscape of Climate Finance 2023, Climate Policy Initiative: https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2023/

10 European Investment Bank et al, (Italics)Joint Report on Multilateral Development Banks' 2022 Climate Finance: https://www.eib.org/en/publications/20230128-2022-joint-report-on-multilateral-development-banks-climate-finance

11 Max Boucher, Sajeev Mohankumar PhD, María Montosa, The Four Labors of Regenerative Agriculture, 2023, The FAIRR Initiative, https://www.fairr.org/resources/reports/regenerative-agriculture-four-labours

12 Daniela Chiriac, Baysa Naran and Angela Falconer, Examining the Climate Finance Gap for Small-Scale Agriculture, 2020: https://www.climatepolicyinitiative.org/publication/climate-finance-small-scale-agriculture/

13 States and Trends in Adaptation Report 2021, Global Center for Adaptation, https://gca.org/wp-content/uploads/2022/08/GCA_STA_2021_Complete_website.pdf?

14 States and Trends in Adaptation Report 2021, Global Center for Adaptation, https://gca.org/wp-content/uploads/2022/08/GCA_STA_2021_Complete_website.pdf?