

Mobilizing climate finance towards agricultural adaptation and nature-based solutions

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Commercial Agriculture for Smallholders and Agribusiness

CASA aims to drive global investment for inclusive climate-resilient agri-food systems that increase smallholder incomes. The programme makes the case for increased agribusiness investment by demonstrating the commercial and development potential of sourcing models involving empowered smallholder producers and by tackling the information and evidence gaps holding back investment.

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Acronyms

CABI	Centre for Agriculture and Bioscience International
CASA	Commercial Agriculture for Smallholders and Agribusiness Programme
CSR	Corporate social responsibility
DFI	Development finance institution
EBA	Enabling Business in Agriculture
FAO	Food and Agriculture Organization
FDI	Foreign direct investment
GAIN	Global Alliance for Improved Nutrition
GCF	Green Climate Fund
GDP	Gross domestic product
GIIN	Global Impact Investing Network
IFC	International Finance Corporation
ISLA	Initiative for Sustainable Landscape Approach
MFI	Microfinance institution
MNC	Multinational company
MSMEs	Micro, small and medium-sized enterprises
NAP	National Action Plan
NbS	Nature-based solutions
NDC	Nationally Determined Contributions
NGO	Non-governmental organization
SMEs	Small and medium-sized enterprises
TI CPI	Transparency International Corruption Perceptions Index
USAID	United States Agency for International Development

Executive summary

The Commercial Agriculture for Smallholders and Agribusiness ([CASA](#)) Programme aims to drive global investment towards inclusive climate-resilient agri-food systems that increase smallholder incomes. CASA's research component has recently identified the challenges faced in mobilizing climate finance in agriculture, and particularly in climate adaptation, as well as the existence of a funding gap for small and medium-sized agriculture enterprises (agri-SMEs) of around \$106 billion (ISF Advisors, 2022).

Of particular concern is the **minimal funding that would be needed to help smallholder farmers adapt to the challenge of climate change and increase their resilience.**

Adaptation for smallholder farmers might include investment in drought-resistant seeds, technologies and practices that enable climate-smart agriculture, investment in improved water management, and investment in improved management of food waste, including facilities for storage of crops.

Smallholder farmers may also benefit from interventions that protect the natural environment on which they depend (e.g. interventions relating to water supplies, soil quality or soil stabilization), or from activities that augment their incomes through payments for the protection of natural capital. Investment in these nature-based solutions (NbS) can potentially contribute to capital flows to smallholder farmers, even though they are often primarily designed to deliver carbon sequestration benefits to companies or investors seeking a 'net zero' position.

This report seeks to answer the following questions, which were explored through interviews with key sectoral stakeholders (principally in Asia):

- What types of investments in agricultural adaptation and NbS are being made by different categories of investors?
- What are the barriers to investment in climate adaptation in agriculture and in NbS?
- What opportunities are emerging for these types of investment?
- What partnerships are required to help drive capital towards these areas of investment?
- What evidence is needed to drive capital towards these areas of investment?

The findings from the first round of interviews with investors, investment support stakeholders, and food and beverage multinationals confirmed that **very limited funding is currently flowing to climate adaptation, compared to mitigation, from commercial investors and multinational companies; and even less is flowing to agricultural adaptation.** The main reasons for this are as follows:

- multinational **food and beverage companies do not often respond to the risks that climate change poses to their supply chains, as they can shift their sourcing across geographies** to cope with climate-related risks
- **it is difficult to identify a short-term business case for investment in climate adaptation** as the results are only seen over a long timeframe
- **commercial investors can avoid risk by not engaging with the agricultural sector or by investing in alternative geographies** where agricultural production might be less affected by climate change
- commercial investors have **limited understanding of what NbS are**, the benefits of investing in them and how to evaluate the impact of those investments
- **there is a limited pipeline of investable opportunities in adaptation and NbS** even for impact investors

The findings from the first round of interviews show that, despite the urgent need for an increased focus on investment in both adaptation for smallholder farmers and protection of nature and biodiversity, activities to date have been very weak and need to be accelerated.

The table below indicates where evidence might help to shift these constraints.

Table 1: Evidence needs by investor type

Food and beverage multinationals	Commercial investors	Impact investors
Evidence that adaptation is about improving the resilience of their supply chain and not just about creating a public good.	A clearer definition of adaptation highlighting that much investment in adaptation is necessary to avoid and minimize loss, rather than to seek returns.	Examples of the catalytic role that patient impact investors can play in regard to enabling farmers to shift to small-scale agroforestry or adopt other adaptation measures with a long timeframe for payback.
A macroeconomic view of how food systems will have to evolve and companies adapt as the effects of climate change increase: this requires a geospatial view, overlaid with an assessment of vulnerability and trade.	Evidence on the impact of climate change on agriculture production and the effect on the broader economy, making the case for banks to get involved in the agriculture sector as a way to protect the rest of their investment portfolio (including government bonds).	Better evidence on where NbS have delivered material change for farmers, where premiums for regenerative farming have delivered income uplift for farmers, and where forestry carbon credits can deliver adaptation co-benefits for vulnerable communities.

The study further explored how these barriers to investment play out in three specific countries affected by climate change, which are covered in the report in the form of case studies. Pakistan was selected as representative of countries with a high climate risk vulnerability and a current government response that is of a low quality. Vietnam and Indonesia were selected as representative of countries with less vulnerability and better readiness plans on the part of the government, which could potentially position them as more investable for capital providers aiming to invest in climate adaptation and NbS.

Table 2: Findings on the enabling environment from the country deep dives

Vulnerability, lack of readiness and poor governance offer low risk/reward levels for investors	<ul style="list-style-type: none"> Vulnerability to climate shocks and stresses is correlated with poor governance in many countries, and the quality of governance further affects a country's level of response or readiness, compounding the risk for investors.
National Action Plans (NAPs) on adaptation do not engage investors	<ul style="list-style-type: none"> A country's NAP on climate adaptation appears to have limited direct influence on investors, unlike NAPs on climate mitigation.
Availability of adaptation finance varies according to the nature of the supply chain	<ul style="list-style-type: none"> Some multinational companies (MNCs) in export-led value chains have implemented adaptation measures for smallholder farmers, partly as a form of corporate social responsibility (CSR), partly to improve the resilience of supply chains, and partly to persuade farmers to continue growing crops. (On the other hand, many MNCs have instead shifted to sourcing from other countries.)

	<ul style="list-style-type: none"> • Where domestic companies have implemented adaptation measures for smallholder farmers, these are often driven by funding from multilateral development banks and development finance institutions (DFIs). • Domestic companies in some sectors (for example, in textiles manufacturing using local cotton) have sought to improve the resilience of their domestic supply chain through supporting smallholder farmers with purchasing drought-resistant seeds and helping them to grow more resilient crops, as there is a logistical and forex benefit in having a local source of supply. • Private finance for adaptation is largely unavailable directly for farms and farmers selling their product to local markets.
<p>Opportunities for adaptation finance vary according to the structure of the financial market</p>	<ul style="list-style-type: none"> • Commercial banks currently play no active role in financing smallholder agriculture, even when mandated to extend agriculture finance. • Domestic commercial banks – providing standard banking services to large local agricultural processing companies with local supply chains in the same country – may be playing an indirect and unwitting role in adaptation through providing corporate loans. • Impact investors are playing an important role in supporting climate-smart agriculture, but commercial investors are not yet engaging on this. • Where microfinance institutions are supported by appropriate regulations (for example, relating to ownership and loan sizes), they are enabling smallholder farmers to access finance that increases their resilience. • Green bonds can potentially play a role in raising finance for adaptation but the overwhelming focus for bond issuers and buyers is on climate mitigation.
<p>The war in Ukraine is exacerbating the adaptation challenges for smallholder farmers</p>	<ul style="list-style-type: none"> • Increased fertilizer prices and reduced availability of fertilizer is making inputs unaffordable for smallholders. • The increase in the cost of imported food supplies (particularly wheat) and reduced availability are creating additional pressures on cash flows of smallholder farmers. • Displaced production (such as increased demand for palm oil as a result of reduced availability of sunflower oil from Russia and Ukraine), and diversion of crops (maize, sugar and vegetable oils) to biofuels as a result of higher fossil fuel prices is beginning to affect land use and is destabilizing existing supply chains for smallholder farmers.

As stated above, the report contains case studies from Pakistan, Vietnam and Indonesia. Interviews with companies domiciled in these countries provided greater context and more insight.

Table 3: Findings by investor type from the country deep dives

Food, beverage and commodity companies	Commercial investors	Impact investors
Some MNCs are investing in making their supply chains more resilient but they often see their supply chains as fungible and are more likely to shift their sourcing to alternative geographies, rather than help existing suppliers to adapt.	Commercial investors see agricultural adaptation and NbS as high-risk areas that are outside their scope and they do not perceive a risk to their own interests. Very limited commercial capital is flowing to smallholder farming for domestic consumption, ignoring the potential wider financial and economic risks associated with the failure of these activities.	Impact investors and investment support stakeholders are playing a catalytic role in both adaptation and NbS and need assurance on the impact they are having.
Domestic companies that are involved in food processing and textiles that are based in countries suffering from climate shocks are more invested in identifying (either alone or in collaboration with other companies in the country) adaptation measures to support their suppliers in-country and to work with them – for example, on climate-resilient crop varieties.	Commercial lenders provide standard banking services, including corporate loans, to large domestic companies, which may be actively supporting the resilience of smallholder farmers in their supply chains. Corporate clients’ support for small farmer adaptation can potentially reduce the credit risk for commercial banks if it leads to more reliable and lower-cost inputs.	Impact investors tend not to focus on the role of large domestic companies in supporting adaptation through increasing the resilience of smallholder farmers but this is an area they should explore more actively.

The main recommendations emerging from this research to incentivize the flow of agricultural investments into climate adaptation are the following:

- **Build a short- to medium-term business case for national or regional commercial investors** to incentivize investment in climate adaptation.
- **National and regional agricultural companies should communicate with the banks** that provide them with corporate loans, **to increase awareness of the benefits of investing in climate adaptation practices and climate-smart agriculture technologies** for reduced credit risk and more resilient profits.
- **Improve the quality of impact measurements by developing better definitions and standard measurement approaches**, which will help better engage with impact investors.
- **Increase the engagement with governments to establish appropriate subsidy schemes and to introduce regulations** for production that support the establishment of adaptation and NbS in key agricultural value chains.

Combining finance with information and evidence generation will be crucial to increase the understanding and engagement of the private sector, leading to internalizing what are generally seen to be public goods.

1. Background

The Commercial Agriculture for Smallholders and Agribusiness ([CASA](#)) Programme aims to drive global investment towards inclusive climate-resilient agri-food systems that increase smallholder incomes. The programme makes the case for increased agribusiness investment by demonstrating the commercial and development potential of sourcing models involving empowered smallholder producers and by tackling the information and evidence gaps holding back investment.

Since the end of 2021, and in alignment with the renewed commitments from governments and investors at COP26, CASA has been exploring the potential role that the programme could play in making the business case for mobilizing climate finance towards agricultural sector adaptation to the effects of climate change and the introduction of nature-based solutions (NbS), as achieving both will be critical components of efforts to promote climate-resilient food systems (CASA Programme, EPIC, Malabo Montpellier Panel, 2021). CASA's cross-programme brief on investing in agriculture in the climate crisis highlighted the programme's nascent work on climate change issues, and identified several areas of action for further enhancing this work in the near future. The focus of the research conducted for this current report was on understanding the current landscape of investment in climate adaptation for agriculture and NbS, as well as identifying key opportunities, challenges and evidence needs, particularly for Asian-focused investors and investment support stakeholders.

Investment in agriculture is perceived by most investors as risky, and particularly so in developing countries. Growing climate change shocks and stresses make agricultural investment even riskier, particularly in the absence of sufficient adaptation and resilience-building measures. As a result, there are currently few commercial investors focusing on agriculture, as highlighted by the CASA report on the state of the small and medium-sized agriculture enterprises (agri-SME) sector (ISF Advisors, 2022), and new investors are unlikely to be motivated to move into climate finance for agricultural adaptation or resilience unless they are subsidized. A recent report by the Climate Policy Initiative notes that climate finance tracked for agriculture, forestry, and land use was only \$20 billion per year in 2017/18, representing 3% of the total tracked global climate finance for the period. Of this, only \$8.1 billion targets small-scale farmers and agri-entrepreneurs, and value chain actors serving them (Chiriack, Naran and Falconer, 2020). The CASA report (ISF Advisors, 2022) notes that the financing gap for agri-SMEs (which often buy from smallholder farmers) is around \$106 billion.

2. Objectives and outline of methodology

2.1 Objectives of the study and research questions

As part of CASA's research and evidence component, the UK Foreign, Commonwealth and Development Office has commissioned this study to analyse the sources of funding for climate adaptation in agriculture and NbS, particularly in Asia. This report focuses on the perspectives of investors. It identifies existing investments in these areas, explores the motivations of existing investors, highlights some of the challenges preventing more investment, and makes some recommendations.

The specific research questions are as follows:

- What types of investments in agricultural adaptation and NbS are being made by different categories of investors?
- What are the barriers to investment in climate adaptation in agriculture and in NbS?
- What opportunities are emerging for these types of investments?
- What partnerships are required to help drive capital towards these types of investments?
- What evidence is needed to drive capital towards these types of investments?

2.2 Limitations of the study

One of the limitations of the study arises from the lack of common definitions for adaptation and resilience. Interviewees provided the following examples:

- investment in crops or inputs that are better suited to the changing climate
- investment in more efficient water use in response to increased scarcity
- investment in initiatives to stabilize the soil or to protect water sources (e.g. through tree planting)
- investment in general initiatives that raise farmers' incomes, giving them more ability to save and therefore more resilience in the face of shocks
- investment in more targeted climate-smart agriculture technologies (e.g. solar-powered irrigation)¹
- insurance and early warning systems to protect people's lives and livelihoods in response to a climate shock (even though they do not reduce the climate shock itself)

This wide range of definitions means that agricultural investors may not see adaptation measures as distinct from general investments to support or improve the supply chain. Interviewees tended to classify these investments as "investments in resilient supply chains". For the interviewees, the term "investment in adaptation" had connotations of falling within the area of responsibility of the public sector, and did not resonate with them.

Distinguishing between investments in supply chain resilience that are made for the purposes of corporate social responsibility (CSR) and those that are made for commercial reasons is challenging. Often, this lack of clarity is the result of investors in agricultural supply chains (commercial, private sector concessional and public sector) trying to avoid being accused of "greenwashing" by rebranding existing activities as climate adaptation.

The term 'nature-based solutions' is not widely used or understood by capital providers. Investors that allocate funds to a more efficient use of water, increased carbon

¹ The recent CASA report on [Private finance investment opportunities in climate-smart agriculture technologies](#) explores this area in more detail.

sequestration or protection of biodiversity in their agricultural activities might be more likely to refer to these as conservation-friendly agriculture or, for some, regenerative agriculture. Investors focus in particular on afforestation projects as part of their strategy for net zero greenhouse gas emissions and do not view these investments through the lens of adaptation or NbS. In the interviews, the term was explained to enable the interviewees to understand the types of activities that were relevant to the research.

Another limitation of the study is that **there is a bias towards organizations and initiatives that are communicated widely, and particularly those that communicate in English.**

2.3 Outline of the methodology

Table 4: Methodology overview

Secondary research	<ul style="list-style-type: none"> Revision of published materials to evaluate the current state of the evidence
Primary research	<ul style="list-style-type: none"> One-hour interviews with nine investors – four food and beverage multinationals and five investment networks – to gather insights on investment in agricultural adaptation and NbS
Identification of focus countries	<ul style="list-style-type: none"> Selection of countries for further assessment of secondary evidence on country-specific investment activities and to undertake primary research with key selected organizations
Primary research	<ul style="list-style-type: none"> One-hour interviews with two companies operating in the focus countries in South Asia and Sub-Saharan Africa
Analysis of the data	<ul style="list-style-type: none"> Curation, analysis and identification of conclusions from the primary research
Conclusions and recommendations	<ul style="list-style-type: none"> Identification of key opportunities, challenges and evidence gaps in regard to mobilizing climate finance for agriculture adaptation and NbS Identification of opportunities for collaboration between CASA and other climate finance mobilization initiatives

2.3.1 Methodology for the initial interviews

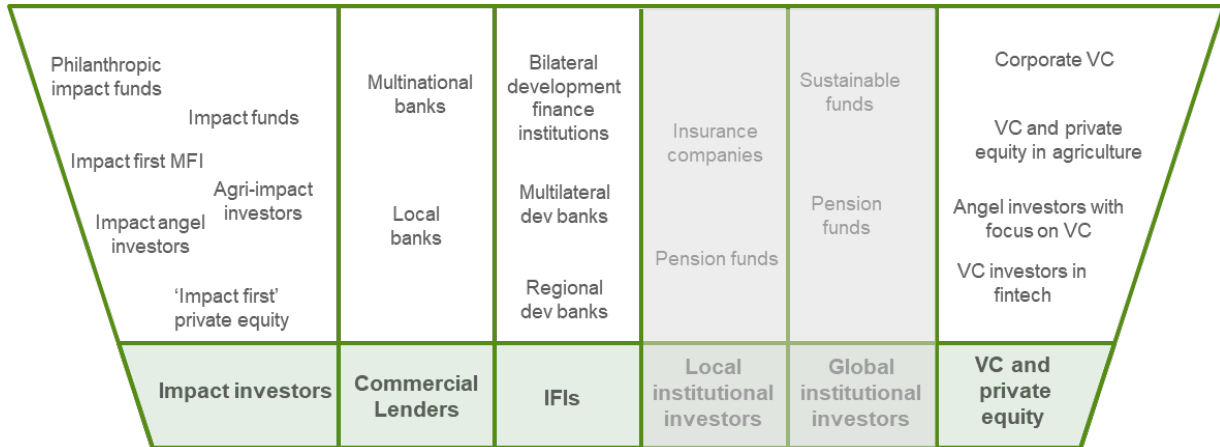
Stakeholder categories

The approach used for the categorization of stakeholders was the same as that used for the previous investor survey in 2019 that was used to frame the original design of the CASA Programme (CASA Programme, 2019). Investors are defined here as individuals or organizations that directly invest their own capital in a person, group, SME or bigger enterprise, with the aim of either directly receiving financial returns or having a positive social or environmental impact. The report categorizes investors in the following way:

- **Impact investors:** Mission-driven commercial funds investing in smallholder farmers and agribusinesses either directly or indirectly.
- **Commercial lenders:** Financial institutions providing loans to smallholder farmers or co-operatives.
- **International finance institutions (IFIs):** Bilateral DFIs like British International Investment and the Dutch Entrepreneurial Development Bank, and foundations or government-backed funds which provide early-stage seed capital or concessionary loans alongside capacity-building support and advice, and which do not seek a commercial return.

- **Venture capital (VC) and private equity:** Venture capital and private equity investors investing in agribusinesses and smallholders, including corporate venture capital.

Figure 1: Typology of investors



For this investor survey an additional important stakeholder category was included: **multinational and domestic food and beverage companies** that source from the agricultural sector. These stakeholders are not investors in the formal sense, but they actively invest from their own balance sheet in their supply chains for adaptation in agriculture and for NbS.

The selection of interviewees for this study was based on the following criteria:

- **Focus on agribusiness and smallholders:** The investors selected were organizations that have been engaging in the agricultural supply chain.
- **Geographical focus:** The study aimed to cover investors with a proportion of their investment portfolio in Asia, as well as some African investors to ensure that the research considered the global context.

This study and survey did not prioritize local institutional investors (e.g. pension funds and insurance companies based in the local market, which are often government-owned) or global institutional investors (e.g. hedge funds and mutual funds based in the developed markets but looking for investable opportunities worldwide). This is because of their currently limited exposure to and limited investor appetite for the agricultural sector in developing countries, as confirmed by several recent reports.²

Investment support stakeholders are defined here as individuals or organizations that offer a support function to direct capital investments by investors with the aim of improving efficiencies and the overall functioning of industries and sectors. The type of support can include the development and promotion of knowledge, the design of policies and regulations, the provision of inputs, support for producer groups, and the development of platforms for increased trade and market access. Investment support stakeholders were selected with similar criteria in mind:

- **Focus on agribusiness and smallholders:** The organizations selected were supporting smallholders in a range of ways, including business incubation, providing climate information, providing support with preparation of business plans, linking with investors, reviewing financial performance, supporting relevant industry associations, enabling market access and providing early-stage capital.

² See e.g. CASA's reports on [Private finance investment opportunities in climate-smart agriculture](#) technologies and [The state of the agri-SME sector - Bridging the finance gap](#)

- **Geographical focus:** The organizations selected have a mixture of global programmes and more geographically focused activities, with Asian activities being of particular interest.

3. Findings from the initial interviews

The initial phase of research on the finance available for investment in adaptation and NbS in agriculture found that there is limited domestic or international finance flowing to these areas. The main reasons for this, as well as the opportunities and evidence needs for increasing investments in adaptation and NbS, are outlined in the tables below.

Table 5: Constraints on investing in adaptation and NbS

Topic	Constraints on increased investment	Investor category relevant for addressing constraints
Risk awareness	Difficulty of quantifying the cost of climate change for, and its impact on, corporate supply chains in the medium to long term.	MNCs, domestic agricultural companies
	Investment in supply chains often comes in response to climate shocks, rather than for preventive adaptation to climate stresses.	MNCs, domestic agricultural companies
	Difficulty of quantifying the cost of climate change for, and its impact on, the livelihoods of smallholder farmers in the medium to long term.	Impact investors, DFIs
	Many investors do not see the systemic risks arising from climate change, the severity of the shocks that are likely, how soon the shocks will intensify, and the lack of investment in adaptation for agriculture.	Commercial and development banks
Risk avoidance and mitigation	International investors and food companies without in-country assets can shift their supply chain to other locations that are less vulnerable to climate change – ‘stranded assets’ are not a constraint, with the exception of some commodities for which the majority of production is concentrated in one or two countries. ³	MNCs, international investors
	Most investors are not directly exposed to the agricultural sector in developing countries.	Local and global pension funds
Business case	Investors may see a medium- to long-term systemic risk arising from a failing agricultural sector but cannot make a business case for investment in the short term.	Commercial banks
	Opportunities are not competitive (return on investment) with other sustainability investments (e.g. renewable energy).	Venture capital, private equity, commercial banks
	Long payback periods for investment in adaptation (e.g. improving water supplies, planting trees for crop diversification, or soil improvement), which requires patient long-term capital in a high-risk environment.	DFIs
	Lack of clarity on good practices and successful investment models in regard to promoting climate adaptation in agriculture, including forms of capital, the extent of concessional finance required at	All investors

³ An example of this would be cocoa sourcing from West Africa.

Topic	Constraints on increased investment	Investor category relevant for addressing constraints
	different stages, and technical assistance requirements.	
Investment pipeline	Limited knowledge of investable opportunities beyond some well-known climate-smart agriculture technologies.	All investors
	Investors see the need for significant staff time and resources to develop investments in NbS, limited opportunities for commensurate upside potential, and risks to returns from structuring, ownership of assets and impact evaluation.	Venture capital and private equity, DFIs
	Investment in regenerative agriculture is currently focused on large-scale opportunities in developed countries with lower transaction costs and lower costs for monitoring, reporting and verification.	Commercial investors
Climate commitments	Commitments to net zero emissions are seen by investors and food companies as all the climate-related activities that are required, while adaptation is less understood and is deprioritized.	MNCs, international investors
	Climate change mitigation is more easily understood and quantified, which makes it the low-hanging fruit for investors and multinationals seeking to address climate change.	MNCs, international investors
Enabling environment	Government subsidies are not currently focused on activities that do not support climate adaptation.	Governments
NbS	NbS are not seen as a likely solution for improving smallholder livelihoods, as they might add only 5–10% income uplift.	Impact investors
	Schemes for the certification of NbS are expensive and difficult, making it difficult for investors to justify the significant resource deployed in implementing such schemes.	All investors
	Forestry carbon credits attract most of the interest, and these do not always have a link to improved smallholder livelihoods.	Commercial investors
	Forest carbon sequestration to enhance financial returns is prioritized over other types of NbS (e.g. water is seen as too political and difficult, and soil carbon has long timescales). ⁴	Commercial investors

⁴ Many scientists argue that permanent soil sequestration is simply not possible.

Table 6: Opportunities for investing in adaptation and NbS

Topic	Opportunities for increased investment	Investor category relevant to the opportunity
Risk awareness	Increased evidence of the impacts on global food security, especially when combined with shortages caused by market shocks (e.g. the war in Ukraine and Covid-19), can be an opportunity to see the interdependencies and vulnerability of the food system without investment in resilience.	MNCs, impact investors
Risk avoidance and mitigation	Limited capacity to shift production or investments to other countries, as this might result in “stranded assets”, which can incentivize investments in climate adaptation in agriculture.	Local investors, national and regional food companies
Business case	Concessionary, patient funding can be deployed to support the shift towards agroforestry and soil improvement (organizations like Aceli Africa are proving its feasibility).	DFIs and impact investors
	Interventions like reducing food waste can help with adaptation (by increasing incomes and enhancing resilience) and can have a rapid payback.	DFIs and impact investors
Investment pipeline	Commercial investment opportunities exist in climate-smart agriculture technologies that can contribute towards increasing climate adaptation and resilience.	Commercial investors
	Impact investment opportunities in activities directly impacting vulnerable smallholder farmers.	Impact investors
Climate commitments	Adaptation can be presented more effectively when its benefits are bundled with those of mitigation ⁵ and immediate business benefits (e.g. reducing post-harvest food waste). ⁶	MNCs, international investors
Enabling environment	Better allocation of subsidies and improved regulation can incentivize improved adaptation and resilience of national food systems, and can even mobilize private sector investment.	Governments
NbS	Opportunities to further develop the ways in which smallholder farmers are paid for NbS and to highlight the combined social and biodiversity benefits.	Impact investors
	Premiums paid for products from regenerative farming practices could be a more likely route to enhanced smallholder incomes than other nature-based cash flows, ⁷ as the premium is on an existing product not a previously un-monetized commodity like carbon, water or biodiversity.	Investment support stakeholders
	Commercial investors will struggle to allocate capital to water and soil NbS in the near term, offering an opportunity to investors who are seeking social or environmental returns.	Impact investors

⁵ See e.g. the work of the [Natural Climate Solutions Alliance](#).

⁶ See [State of Play Review of Climate Assessment Guidance](#).

⁷ However, these types of premiums have remained niche over the last several years and have not seen scaling and take-up at the level required to respond to the growing challenges.

Table 7: Evidence needs for investing in adaptation and NbS

Topic	Opportunities for increased investment	Investor category
Risk awareness	Macroeconomic analysis of how food systems will have to evolve as climate change increases its effects. This could take the form of a geospatial view, overlaid with an assessment of vulnerability and trade.	All investors, MNCs, governments
Risk avoidance and mitigation	Using scenarios to illustrate how investment in agriculture is a way to protect the overarching investment portfolio (including government bonds).	Local banks
	A clearer definition of adaptation, highlighting the loss avoidance and loss minimization role of these investments, rather than seeking returns (losses can be experienced both at the micro and macro levels because of knock-on effects on food supplies, taxation receipts and economic growth).	All investors
Business case	Evidence that adaptation finance is about the resilience of the supply chain and not just about creating a public good.	All investors
	Case studies of the catalytic role that patient capital can play in regard to enabling farmers to shift to agroforestry or to adopt other adaptation measures with a long timeframe for payback.	DFIs and impact investors
Climate commitments	A clearer definition of adaptation (versus climate change mitigation) in order to increase levels of understanding.	All investors
Enabling environment	Evidence of where government subsidies to the agricultural sector are currently deployed to activities that do not support adaptation (e.g. seed and inputs subsidies do not always recognize fundamental changes to weather patterns). ⁸	Governments
	Evidence about the level of support required to incentivize private sector investment in adaptation in the agricultural sector.	Governments
NbS	Evidence of where NbS have delivered material improvements for smallholder farmers.	Impact investors
	Evidence of where premiums for regenerative farming have delivered material improvements for smallholder farmers.	Investment support stakeholders
	Evidence of the types of forestry carbon credits that deliver adaptation co-benefits for vulnerable communities.	All investors
	Evidence of water, soil and other non-carbon projects that have delivered notable social and environmental benefits. ⁹	Impact investors

⁸ The [evaluation of AGRA](#) also identified this as an issue.

⁹ Examples here are the World Resources Institute in Himachal Pradesh (<https://www.wri.org/research/food-systems-risk>) and the Vietnam So'n Tho Commune (<https://casestudies.naturebasedsolutionsinitiative.org>).

4. Implications of the initial findings

The initial findings of this study clearly highlighted the current limited interest among international investors, as well as food and beverage companies, in investing in agriculture climate adaptation and NbS. With the aim of evaluating the applicability of these findings to investors and food companies that operate at a regional and national level only, the research also included a more localized approach. The types of investors within this group were therefore expected to be the following:

- **domestic or regional food and beverage companies** sourcing agricultural products from within a country
- **investors in larger domestic or regional companies** in countries with more sophisticated capital markets (private equity firms, banks, institutional investors in the case of listed companies)
- **DFIs, national development banks** and **impact investors** operating in a country
- **rural or agricultural banks** operating within a country
- **microfinance providers** operating within a country

Figure 2: Target investors for the country deep dives



The initial hypothesis was that these investors, as well as food and beverage companies with a national or regional focus, will have an additional incentive to invest in climate adaptation in their specific countries of operation for a number of possible reasons, including the following:

- **their supply chains are tied to that country and they potentially have stranded assets**, which forces them to provide support to the agricultural operations rather than having the possibility of migrating to alternative geographies and sources of supply, like multinational companies
- they are **looking to promote a positive development impact in that country**
- **their investment portfolio** in a country, including sovereign bonds, **is likely to be adversely affected by the knock-on effects** of a struggling agricultural sector, which would affect the purchasing power across the economy and reduce taxation receipts for the government
- **they see commercial opportunities emerging for ag-tech-enabling climate-smart agriculture**

4.1 Methodology for country selection

4.1.1 Criteria

In order to select countries for the deep dives on climate finance for adaptation in agriculture, the study considered the following criteria:

- **vulnerability** of the country **to climate shocks and stresses**
- **enabling investment environment**, including national policies and investment plans
- **ease of doing business** in agriculture
- **opportunities for scaling up** investments, considering the size of the national markets

Table 8 below offers additional information on the selection criteria, which were divided for the purpose of this study into two distinct types of countries: countries with low levels of vulnerability to climate and potentially with higher capacity to attract investment (Type A); and countries with high levels of vulnerability and lower capacity to attract investment (Type B).

Table 8: Country selection typology

Type A countries	May not be as exposed to climate shocks and stresses as other developing countries , either because of their geography or because of their greater adaptive capacity.
	A high number of multinational and domestic food and agriculture companies source from within the country and want to ensure resilience in their supply chains.
	Capital markets may be more sophisticated than the average developing country market and are better positioned to develop green bonds , sustainability-linked loans, development impact bonds and other more sophisticated financial instruments to drive capital towards adaptation and NbS.
Type B countries	Vulnerable to climate shocks and stresses , affecting agriculture, and do not attract commercial capital. They need adaptation finance the most.
	Limited size of the economy , with limited investment in the country from multinational and domestic food and beverage companies.
	Impact investors can help de-risk non-concessional finance (e.g. from commercial banks).
	High levels of natural capital to attract finance to regenerative agriculture and NbS.

4.1.2 Data sources

The sources of relevant data used for the country selection are described in the table below:

Table 9: Focus country selection criteria and relevant data

Selection criteria	Description
Vulnerability to climate shocks and stresses	Climate shocks (e.g. floods, droughts and storms), as well as climate stresses (e.g. temperature rise, season shifts, changes in rainfall patterns, soil degradation, biodiversity loss, increased pest and disease risks and water stress). Data in the ND Gain Country Index provides a composite vulnerability index showing: a) climate risk based on future climate scenarios; and b) the context (infrastructure, education, policy etc), which, combined, determine vulnerability. The underlying data on the science-based climate risk can be used separately. ¹⁰
Enabling investment environment	The underlying data in the ND Gain Country Index is combined with the Transparency International Corruption Perception Index (TI CPI) for this indicator. Both Type A and Type B countries need to meet a minimum criterion in this area, which requires selected countries to be situated outside of the bottom quartile of either the TI CPI or the Enabling Business in Agriculture (EBA) Index.
Ease of doing business in agriculture	The EBA Country Index ranks countries according to the ease of doing business and investing in agriculture. Countries with a low EBA Index are more challenging to do business in, and in these situations blended finance or other forms of support will be needed.
Scalability potential	This indicator consists of a combination of the absolute size of the agricultural sector in the country and the size of the companies operating in the country. It indicates the potential for an investment or company to scale up in a given country.
Political interest from funders	CASA has collated a list of priority countries in Asia for British, American and Australian donors, which is also considered as a factor in country selection, as they can help de-risk investments.

Countries were selected based on the criteria set out above and afterwards an additional layer of analysis around opportunities for innovation and replication in financial structuring (e.g. green bonds for regenerative agriculture or sustainability-linked loans for large food and agriculture companies) was applied to the analysis.

4.1.3 Combining the data

The process applied to identify Type A and Type B countries for more detailed analysis involved the following steps:

1. the NDI-GAIN index rank, the TI CPI rank and the EBA Index rank were combined into a single ranking
2. any country in the lowest quartile for the TI CPI or the EBA Index was eliminated from the selection due to their lower likelihood of attracting private sector investors

¹⁰ Risk is the exposure to a hazard, while vulnerability is the combination of the exposure and the sensitivity to a hazard. Adaptation mostly addresses the sensitivity to climate hazards to reduce vulnerability, although some aspects (such as physical defences, like sea walls) can also reduce the exposure too. "Extreme adaptation" (otherwise captured as an aspect of loss and damage), such as physically relocating, can also be a means of lowering vulnerability by reducing exposure, but not necessarily reducing sensitivity to other hazards in the new area.

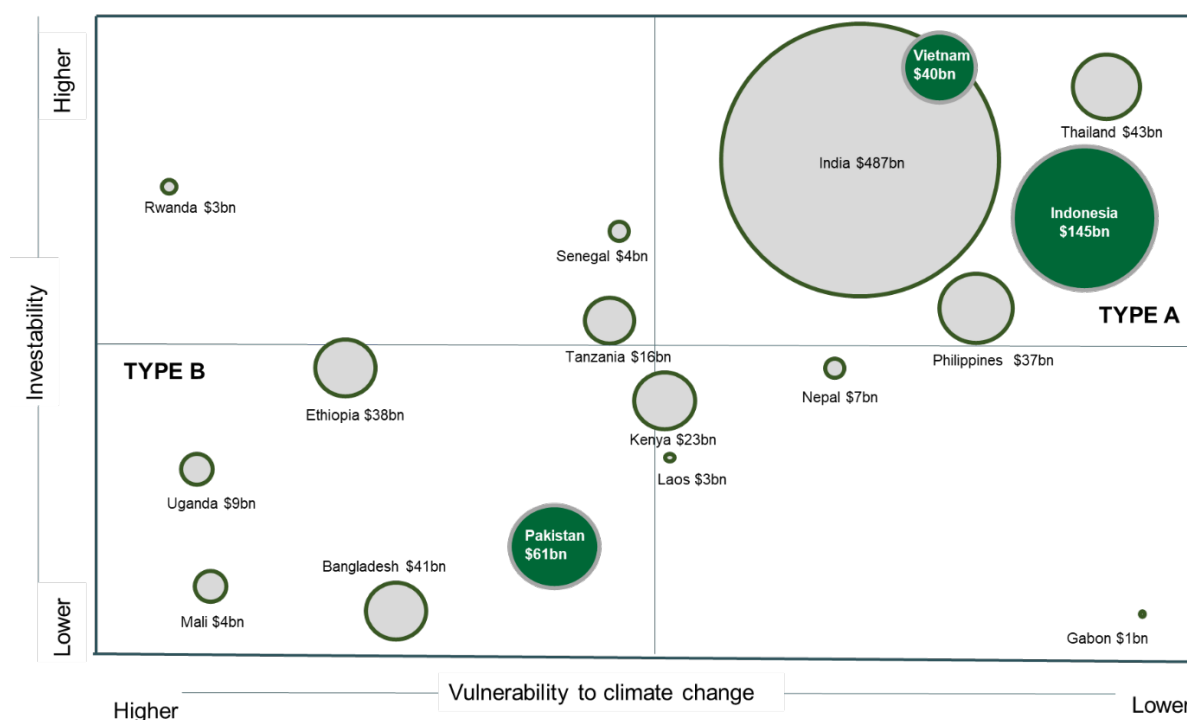
3. any upper middle-income country was eliminated from the selection, as these tend to be of less interest to donors and for poverty reduction goals
4. countries with an agricultural sector of less than \$10 billion were not eligible for selection, given that the size of the agricultural sector influences investor interest; in practice, this only eliminated one country (Uganda) from the country selection for Type B, and no countries for Type A
5. donor interest in specific countries, as identified through CASA discussions with key donors, was considered in the final selection
6. a total of three countries were selected (two Type A countries and one Type B), given the greater capacity of Type A countries to attract agricultural investment

4.2 Selected countries

Using the criteria described above, the countries were ranked by vulnerability and by investability – further details can be found in Annex 1. The position of the countries is illustrated in Figure 3 below. These positions led to the selection of the following three countries for the deep dives:

- **Type A: Vietnam (Annex 3) and Indonesia (Annex 4)**
- **Type B: Pakistan (Annex 2)**

Figure 3: Country selection map¹¹



As can be seen in Figure 3, Pakistan was selected from among the Type B countries, as it has the biggest agricultural sector (\$61 billion) in that category. In regard to the Type A countries, India was considered for the second stage of research but was finally excluded from it due to the wide range of existing policies across its different states, which makes the nature of the enabling environment quite variable across the country. Thailand was also not selected for further analysis, as it is widely considered to be one of the most developed economies in South-East Asia and is increasingly less of a priority for donors. In addition,

¹¹ Key: the size of the circle relates to the size of the agricultural sector (source: World Bank data at <https://data.worldbank.org/indicator/NV.AGR.TOTL.CD>)

another group of countries were not eligible for selection because of their low ranking in the investability scores: most of these in any case had small agricultural sectors of less than \$10 billion (apart from Nigeria, with an agricultural sector of \$104 billion). These countries are not depicted in the figure.

4.3 Analysis of factors within the three countries

The country analysis focused on the following three factors to better assess the financial flows towards agriculture adaptation and NbS in the three focus countries:

- **government policies and commitments** towards supporting adaptation finance and NbS
- **value chains** and the types of crops grown, including the size of firms operating in the sector and whether they serve local or export markets. The research focused primarily on the crops that have the highest contribution to each country's GDP, as these are the most critical to the economy and the size of the sector translates into a higher likelihood of attracting capital
- **the investment landscape** and the structure of the financial system, including the range and quality of the financial institutions that might undertake investments

5. Key country-level findings

The findings from the research and interviews provided insights into the factors that influence the nature and volume of investment in adaptation and NbS in the three case study countries.¹²

5.1 Influencing factors

Of critical importance is understanding the role played by the investment-enabling environment in facilitating or promoting investment in adaptation and NbS. The analysis highlights that commercial investment is only possible in countries where the business and political environment facilitates it.

Table 10: Investment environment for adaptation and NbS

Finding	Description
Vulnerability is correlated with poor governance, compounding the risk for investors	Of the 16 countries that are deemed to be the most vulnerable to climate risks (as measured by the ND-GAIN Vulnerability Index), 12 are in the lowest quartile of the rankings for either the TI CPI or the EBA Index or both. The exceptions (i.e. countries that are vulnerable to climate risk but that are not in the lowest quartile of the TI CPI or EBA Index) are Mali, Uganda, Rwanda and Mauritania.
Climate readiness is correlated with good governance	The climate readiness of countries, as measured by the NDI-GAIN readiness index, is closely correlated with the TI CPI. Countries with high levels of corruption are less likely to be able to adapt to the challenges presented by climate change. ¹³ One country, Somalia, stands out as an exception, performing well on the readiness index (19 th out of the 59 countries analysed) despite having a poor TI CPI ranking.
Ability to do business in agriculture is correlated with good governance	There is a close correlation between the TI CPI and the EBA Index (although the latter does not cover as many countries). Two exceptions are Uganda and Nigeria, both of which rank well on the EBA Index even though their TI CPI rankings are relatively low.
National Action Plans (NAPs) on climate adaptation have limited direct influence on investors	The NAPs of the countries assessed during the research tended to be broad-brush in their references to plans for adaptation and NbS and are not generally seen as a factor influencing investors. Accompanying work highlighting sectors and geographies that are vulnerable to climate change (e.g. the work carried out by the NAP-Agriculture programme in Vietnam) can play an important role in increasing investor awareness.
Government intervention can distort the market and disincentivize private sector investment	The wheat market in Pakistan was highlighted in the research as a prime example of a government policy that is distorting the market such that private investors cannot invest (Raza, 2021).

¹² More information on all of the initiatives mentioned in this summary can be found in the country analyse in Annexes 2, 3 and 4

¹³ In Bangladesh, one of the countries that is most vulnerable to climate change, an estimated 35% of climate project funds are embezzled, according to a recent report by Transparency International Bangladesh and SOAS.

Finding	Description
Tailored interventions by governments to reduce risk for farmers and private sector firms can mobilize capital	Specific practical interventions, such as guarantee schemes, insurance schemes and risk-sharing through blended finance, have been important factors in driving capital to agricultural adaptation.
The types of investment identified support the Type A and B categorization	In Vietnam and Indonesia (Type A countries that rank higher in the country score), the analysis identified several examples of commercial investment in adaptation. In Pakistan (a Type B country with greater vulnerability), investment is predominantly by government and impact investors, although the cotton sector appears to be an outlier.

The analysis also highlighted a number of examples of commercial investors and DFIs already playing a role in promoting investment in adaptation measures, particularly in export-oriented value chains.

Table 11: Commercial investor engagement in value chains

Finding	Examples
Export-oriented value chains involving MNCs implement adaptation measures for smallholders (for CSR and value chain resilience)	<ul style="list-style-type: none"> • Levi Strauss's involvement in the Better Cotton Initiative. Water usage by smallholders in their cotton supply chain in Pakistan was reduced by an average of 32% and profits increased by up to 69% (Ahmad, 2016). • PT Royal Lestari in Indonesia (a joint venture involving Michelin) established a sustainable rubber plantation in co-operation with the Government of Indonesia, the United States Agency for International Development (USAID) and BNP Paribas, among others. This combines the rubber business with forest restoration, ecosystem conservation and community programmes.¹⁴ • Louis Dreyfus Company has joined IDH's Initiative for Sustainable Landscape Approach (ISLA) in the Central Highlands of Vietnam to mitigate risks to future coffee supply, in response to declining production and product quality (Louis Dreyfus Company, 2018).

¹⁴ <https://partnershipsforforests.com/partnerships-projects/enhancing-livelihoods-and-supporting-wildlife-conservation-through-sustainable-natural-rubber-production/>

Finding	Examples
Multilateral development bank/DFI funding drives implementation of smallholder adaptation measures by domestic companies	<ul style="list-style-type: none"> The Pakistani sugar cane trade association Bonsucro has supported an initiative with Pakistan sugarcane growers Thal Industries and Almoiz Industries, led by the International Finance Corporation (IFC). The main motivation was to demonstrate higher sustainability standards to overseas buyers, rather than promoting adaptation.¹⁵ The Loc Troi Group is the first agribusiness to apply sustainability standards in Vietnam. In a two-year initiative with IFC, the company has been implementing standards among 3,500 smallholder farmers in its rice supply chain, improving their incomes and in particular reducing their use of water (IFC, 2019).
Private sector adaptation finance is not directly available for products sold to local markets	<ul style="list-style-type: none"> Smallholders and local aggregators often do not have access to finance for adaptation for products sold to local markets or grown for subsistence. In these cases, government sources, impact investors and NGOs play an important role: e.g. the Green Climate Fund (GCF) is funding a programme implemented by the FAO in Pakistan to enhance the climate resilience of farmers (Ahmad, 2016). One region produces more than 90% of the country's agricultural output, including the staple crops of wheat and rice.
Private sector adaptation finance can become available in the form of corporate loans and publicly listed equity finance to large domestic companies that are investing to improve the resilience of their local supply chain	<ul style="list-style-type: none"> Pakistani cotton companies, such as Nishat Mills, which have been forced to import cotton because of the failure of the local crop in earlier years, have started to collaborate to provide improved (drought-resistant) seeds to the smallholder farmers in their supply chain through an initiative called SANIFA. These large corporates have standard banking arrangements with local commercial banks, including receiving bank loans in some cases. Some of them are quoted on the Pakistan Stock Exchange. Indirectly and mostly unwittingly, commercial banks and public investors are therefore helping to fund adaptation. These activities by the cotton companies could be expected to improve their credit risk and enhance their profitability over time.

The structure of the financial sector in each of the case study countries also has a strong influence on the nature and size of investments in agricultural adaptation and NbS.

Table 12: Structure of the financial sector

Finding	Examples
Limited evidence of commercial banks playing a role in directly financing adaptation, even	<ul style="list-style-type: none"> Banks in Pakistan are mandated by the State Bank of Pakistan to earmark a proportion of their total loan portfolio for the agriculture sector, but credit is available to less than 30% of farmers and in most cases it is accessed only by bigger landholders. For example, the Bank of Punjab extends its

¹⁵ <https://bonsucro.com/sustainable-sugarcane-pakistan/>

Finding	Examples
<p>when mandated to invest in agriculture</p>	<p>Kissan Dost Short-Term Running Finance Facility to farmers owning or leasing at least 50 acres of agriculture land (Ahmad, 2016).</p> <ul style="list-style-type: none"> Working under the State Bank of Pakistan, ZTBL Bank offers a number of special loan programmes, including production loans, development loans, agricultural loans, off-farm income-generating loans and cottage industry loans. However, ZTBL previously had a climate change department but this was later wound up as the bank did not see it as a “viable” business. (Ahmad, 2016).
<p>Impact investors play a vital role by investing in climate-smart agriculture but there is still limited commercial investment</p>	<ul style="list-style-type: none"> The sources of finance identified in Pakistan for climate-smart agriculture are all NGOs or impact investors (CIAT and World Bank, 2017): CARE, Oxfam, the Sustainable Agriculture Initiative, the Bill & Melinda Gates Foundation, and the Rockefeller Foundation. The vast majority (89%) of “mainstream commercial finance with impact” in Indonesia is invested in tech solutions, and, within this, only one transaction (\$0.85 million) was in agriculture. However, almost half (48%) of the investments made by impact investors (26 transactions) are in food, agriculture, forestry and land use (Soukhasing, 2020).
<p>Microfinance institutions (MFIs) can play a critical role in adaptation, but the scope depends on the current regulation in each country</p>	<ul style="list-style-type: none"> The regulations around the ownership of MFIs in Vietnam, which requires a political or socio-political organization to be the largest shareholder, prevents private sector investment (Lambert, 2022). There is a large microfinance sector in Indonesia, with over 60,000 MFIs reaching more than 50 million people (Shrader, 2013). Bank Rakyat Indonesia (a government-owned commercial bank) plays a significant role in supporting rural microfinance. In August 2021, a new regulation was issued requiring banks to disburse at least 20% of their loans to either micro, small, and medium-sized enterprises (MSMEs), MSMEs’ supply chains or low-income earners (Rahman, 2021), but only a small proportion of this focuses on agriculture.
<p>Green bonds could play a role in raising finance on capital markets but the market is not yet well-developed, especially for agricultural adaptation and NbS</p>	<ul style="list-style-type: none"> The Global Green Growth Institute in Vietnam has been supporting a green bonds readiness programme¹⁶ but it is likely to be focused primarily on renewable energy. Indonesia’s regulation on green bonds explicitly specifies climate change adaptation as one of the 11 types of eligible projects but there is no private sector corporate green bond explicitly dedicated to climate change adaptation, which may be due to foreign exchange constraints, the small size of issuances, and a lack of advisory services (Center for Climate Change and Multilateral Policy, 2020).

¹⁶ <https://gggi.org/project/vn10-viet-nam-green-bond-readiness-program/>

5.2 Motivations for investor groups

There are different reasons why an investor might want to invest in climate adaptation in agriculture and in NbS. The table below summarizes the main motivations referred to by interviewees and categorizes some of the initiatives encountered during the research by motivation:

Table 13: Motivating factors for investors and examples

Motivation	Type of investor	Example
Protecting value chains	<ul style="list-style-type: none"> MNCs Large domestic companies 	Loc Troi, Louis Dreyfus, PT Royal Lestari Utama, Westmill, ¹⁷ Bonsucro, Levi Strauss, Danone, the Pan Group, Nishat Mills
Supporting smallholders and reducing poverty	<ul style="list-style-type: none"> Impact investors DFIs Governments 	Vietnam So'n Tho commune, ¹⁸ Indus River Basin (GCF/FAO) (GCF, 2019)
Conserving nature and the environment	<ul style="list-style-type: none"> Impact investors Governments 	Peat preservation, North Sumatra (PreventionWeb, 2021), Ten Billion Trees Tsunami (UNEP, 2021)
Protecting against civil unrest arising from lack of food security or from hunger	<ul style="list-style-type: none"> Governments Potentially "universal" investors¹⁹ 	Proposed rice bonds (Askew, 2019)
Scaling up a finance business by providing access to finance for farmers	<ul style="list-style-type: none"> MFIs Banks with MFI activities 	Bank Rakyat Indonesia – ultra-micro ecosystem (Pt Bank Rakyat Indonesia, 2021), Khushhali Bank (Khushhali Microfinance Bank, 2017)

Other potential motivations mentioned during the interviews, for which no examples were found, include those set out in the table below:

Table 14: Additional motivating factors for investors

Motivation	Type of investor
Making an attractive financial return on the investment	<ul style="list-style-type: none"> Commercial bank Private equity investor Institutional investor MFI
Protecting against macroeconomic instability arising from a fall in GDP and/or export earnings	<ul style="list-style-type: none"> Government Potentially "universal investors"

¹⁷ <https://westmill.co.uk/our-stories/working-towards-sustainable-basmati/>

¹⁸ <https://casestudies.naturebasedsolutionsinitiative.org/>

¹⁹ Universal investors (asset owners, such as pension funds, insurance companies and sovereign wealth funds) own such a representative slice of the economy that they cannot diversify away from large system-wide risks, such as environmental degradation and conflict. The stability of their returns therefore depends on ensuring that these risks are properly managed by the companies in which they invest. <https://www.unpri.org/sustainable-development-goals/the-sdgs-are-an-unavoidable-consideration-for-universal-owners/306.article>

5.3 Impact of the war in Ukraine

The war in Ukraine started during the initial stages of this study, and both the interviews and the secondary research have highlighted how the war is exacerbating the challenges faced by smallholder farmers in the three focus countries of the study. It is increasingly known that the main impacts of the war in the agricultural sector are being felt through increased fertilizer prices, increased food prices, displacement of production and increased energy prices. The table below outlines and illustrates the form these impacts are taking and how they are impacting the agriculture investment environment in Indonesia, Pakistan and Vietnam.

Table 15: Impact of the war in Ukraine on agriculture investments in Indonesia, Pakistan and Vietnam

Issue	Examples
Increased fertilizer prices and reduced fertilizer availability	<ul style="list-style-type: none"> • In Vietnam, which has historically sourced around 10% of its fertilizer imports from Russia and Ukraine, fertilizer prices have increased by between 44% and 200% (depending on the specific product) (Ministerie van Landbouw, 2022). With fertilizers accounting for 40% to 60% of the input costs of agricultural production (Ministerie van Landbouw, 2022), the price increase is pushing farmers into a cost crisis. • In Pakistan, the shortage of fertilizers for wheat production is expected to lead to a 40% reduction in grain production in the province of Khyber Pakhtunkhwa, which is already facing food shortages (Buneri, 2022). • Indonesia imports more than 15% of its fertilizer from Russia and Ukraine. The Indonesian Government announced in April 2022 that it would cut back on its subsidized fertilizer programme to shield the state budget from rising commodity prices. It noted that it would prioritize distribution of subsidized fertilizers to producers of priority commodities, including smallholders producing rice, corn, soybeans, shallots, chilies, cocoa and sugarcane (Thomas, 2022). These subsidies might limit the amount of subsidies that the Indonesian Government can dedicate to incentivizing climate adaptation.
Increased costs of, and reduced availability of, imported food supplies	<ul style="list-style-type: none"> • The conflict is impacting wheat imports from Ukraine and Russia. In Pakistan, these accounted for 39% of the total imported wheat in the preceding fiscal year (Kamal, 2022). Indonesia imported 38% of its wheat from Ukraine and Russia in 2019/20, and in 2020 and 2021 Ukraine was the country's single largest source of grain (Abuza, 2022). The increase in the price of these staples will increase the cost of living for all and may make these staples unaffordable for many, and it might also push farmers to seek cost savings at different levels of household and farm finances.
Displacement of production	<ul style="list-style-type: none"> • In Indonesia, demand for palm oil is increasing as a knock-on effect of the war. The majority of sunflower oil (between 70% and 80%) was previously supplied by Ukraine and Russia and prices have increased by 1,000%. The Round Table for Sustainable Palm Oil has reported that this has resulted in increased demand for palm oil. This could

²⁰ <https://ourworldindata.org/ukraine-russia-food>

Issue	Examples
	<p>potentially translate into an opportunity and increased motivation to invest in promoting climate adaptation in this commodity, with the aim of protecting its supply, while some commentators express concern about the possibility of increases in supply coming from unsustainable sources that do not protect the rights of local communities (Rowsell, 2022).</p> <ul style="list-style-type: none"> • Across all three markets, higher energy prices open up the opportunity to use agricultural feedstock (particularly maize, sugar and vegetable oils) as potential sources for biofuel production, as they become competitive with fossil fuel energy sources (FAO, 2022).

The war in Ukraine certainly poses a number of additional challenges to the promotion of finance for agriculture climate adaptation and NbS. Increased input subsidies might help cope with some of the challenges related to increased input costs in agriculture, but in some cases this could mean a diversion of government funds from the promotion of subsidies targeted at climate adaptation in the agricultural sector.

The reduced purchasing power faced by smallholder farmers, due to increased production costs and increased food costs, might be seen as an additional risk factor by many investors who are considering investing in agriculture, which might limit the amount of investment going into the agricultural sector during this crisis. However, the shift of focus towards the production of substitute crops (e.g. oil palm to address shortages of sunflower oil) contributes to strengthening the case for investing in climate adaptation in these value chains, to reduce climate-related risks and to be able to cope with the increasing demand for these crops.

This food crisis also highlights the importance to investing in promoting the resilience, both to market and climate shocks, of global food systems, particularly in those value chains where smallholder farmers play an active role, as they are the most vulnerable to shocks.

6. Conclusions and recommendations

The research has highlighted that agricultural investment in climate adaptation and NbS is currently very limited. At the same time, the majority of investors and food and beverage companies do invest to some degree in implementing mitigation measures that contribute to reducing their carbon footprint in the agricultural sector, or that help them to demonstrate their green credentials. The main recommendations emerging from this research in regard to incentivizing the flow of agricultural investments into climate adaptation are the following:

1. **Commercial investors are not currently engaged in providing finance for agricultural adaptation and NbS** because they see these as high-risk areas that are outside of their scope and they do not perceive a risk to their own interests from lack of adaptation. **Making the short- to medium-term business case for national or regional commercial investors to invest in climate adaptation can start to incentivize investments**, including the analysis of how climate-related disruptions in national food systems can negatively affect their wider portfolio of investments in the country.
2. **Some MNCs are investing in making their supply chains more resilient but they often see their supply chains as fungible** and are more likely to shift their sourcing, rather than helping existing suppliers to adapt. **National and regional agricultural companies have less flexibility in their supply chains and are more motivated to invest in promoting climate adaptation practices and in identifying climate-smart agriculture technologies**, including through cross-industry collaboration. These companies could communicate with the banks that provide them with corporate loans, to increase awareness of the benefits of these interventions in terms of the potential for reduced credit risk and more resilient profits.
3. **Impact investors and investment support stakeholders are beginning to play an important role in both adaptation and NbS** but further engagement by these actors would be strengthened by **improving the quality of impact measurement through developing better definitions and standard measurement approaches**.
4. **Broader engagement by governments is necessary to establish appropriate subsidy schemes and to introduce regulations** for production that support the establishment of adaptation and NbS in key agricultural value chains.
5. **Combining finance with information and evidence generation will be crucial to increase understanding and engagement of the private sector**, leading to internalizing what are generally seen to be public goods.

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Annex 1 – Country rankings

Figure 4: Ranking countries by vulnerability to climate risk (not accounting for readiness measures)

Name	Vulnerability rank	ND-GAIN readiness rank	TI CPI Rank	EBA ranking	Overall average ranking	Size of ag sector (ag, forestry and fishing value added US\$m)	Ag sector size rank	Donor focus	Comment
Niger	59	19	30	35	39	5,275	26		Excluded (lowest quartile on TI CPI and / or EBA)
Somalia	58	15	59	n/a	55	n/a	59		Excluded (lowest quartile on TI CPI and / or EBA)
Guinea-Bissau	57	47	52	n/a	54	442	49		Excluded (lowest quartile on TI CPI and / or EBA)
Chad	56	58	53	n/a	56	5,018	27		Excluded (lowest quartile on TI CPI and / or EBA)
Sudan	55	45	54	36	48	4,342	28		Excluded (lowest quartile on TI CPI and / or EBA)
Mali	54	35	35	29	38	6,320	22	L	Relatively small ag sector and low donor focus
Congo, the Democratic Repub	53	52	56	34	48	10,173	16		Excluded (lowest quartile on TI CPI and / or EBA)
Eritrea	52	57	50	n/a	54	262	55		Excluded (lowest quartile on TI CPI and / or EBA)
Uganda	51	37	40	9	32	8,997	17	L	Relatively small ag sector and low donor focus
Afghanistan	50	51	58	32	47	5,395	25		Excluded (lowest quartile on TI CPI and / or EBA)
Benin	49	21	12	31	27	4,243	29		Relatively small ag sector and low donor focus
Rwanda	48	8	5	23	15	2,713	37		Relatively small ag sector and low donor focus
Sierra Leone	47	26	24	37	33	2,417	38		Excluded (lowest quartile on TI CPI and / or EBA)
Central African Republic	46	59	46	n/a	52	765	46		Excluded (lowest quartile on TI CPI and / or EBA)
Burundi	45	46	55	27	43	809	45		Excluded (lowest quartile on TI CPI and / or EBA)
Mauritania	44	14	37	n/a	31	1,598	39		Small ag sector and low donor focus
Ethiopia	43	28	16	18	23	38,162	8	L	Short-listed
Malawi	42	40	23	22	29	2,760	36		Relatively small ag sector and low donor focus
Madagascar	41	48	44	25	38	3,280	34		Small ag sector and low donor focus
Burkina Faso	40	36	11	28	26	3,299	33		Relatively small ag sector and low donor focus
Bangladesh	39	43	43	20	36	41,730	6	H	Short-listed
Myanmar	38	44	39	33	38	17,551	12	M	Excluded (lowest quartile on TI CPI and / or EBA)
Gambia	37	29	19	n/a	25	384	50		Relatively small ag sector and low donor focus
Guinea	36	27	45	30	34	3,711	31		Excluded (lowest quartile on TI CPI and / or EBA)
Bhutan	35	3	2	n/a	5	445	48		Small ag sector and not a donor focus
Senegal	34	18	10	21	17	4,196	30		Relatively small ag sector and low donor focus
Cambodia	33	38	49	26	36	5,776	23	H	Excluded (lowest quartile on TI CPI and / or EBA)
Tanzania, United Republic of	32	33	15	8	18	16,686	13		Focus on Asia for Type A countries
Pakistan	31	39	38	16	29	60,744	4	H	Selected
Zimbabwe	30	56	48	17	38	1,373	41		Excluded (lowest quartile on TI CPI and / or EBA)
Kenya	29	34	32	3	22	23,281	11		Focus on Asia for Type A countries
Zambia	28	23	26	4	18	539	47		Relatively small ag sector and low donor focus
Lao People's Democratic Repu	27	25	33	24	26	3,101	35	M	Relatively small ag sector
Mozambique	26	42	42	11	29	3,586	32		Relatively small ag sector and low donor focus
Congo	25	55	51	n/a	49	973	43		Excluded (lowest quartile on TI CPI and / or EBA)
Swaziland	24	31	28	n/a	27	333	52		Relatively small ag sector and low donor focus
Nepal	23	17	27	15	20	7,784	19	M	Relatively small ag sector and not as investible
Cote d'Ivoire	22	32	21	19	22	13,120	15		Focus on Asia for Type A countries
Angola	21	50	36	38	38	5,541	24		Excluded (lowest quartile on TI CPI and / or EBA)
Togo	20	24	34	39	31	1,422	40		Excluded (lowest quartile on TI CPI and / or EBA)
India	19	13	13	5	11	487,238	1	H	Short-listed
Nigeria	18	54	47	14	34	104,370	3		Excluded (lowest quartile on TI CPI and / or EBA)
Viet Nam	17	7	14	6	9	40,276	7	H	Short-listed
Djibouti	16	22	31	n/a	24	44	57		Relatively small ag sector and low donor focus
Cameroon	15	49	41	40	37	7,093	20		Excluded (lowest quartile on TI CPI and / or EBA)
Namibia	14	11	6	n/a	9	972	44		Small ag sector; UMIC; not a donor focus
Sri Lanka	13	9	20	13	14	6,745	21		Relatively small ag sector and low donor focus
Philippines	12	20	25	2	13	36,817	9	H	Short-listed
Lesotho	11	30	18	n/a	18	117	56		Relatively small ag sector and low donor focus
Ghana	10	16	9	12	11	13,196	14		Focus on Asia for Type A countries
Botswana	9	6	3	n/a	4	318	53		Upper middle income country; not a donor focus
Indonesia	8	10	17	n/a	13	145,046	2	H	Short-listed
Equatorial Guinea	7	53	57	n/a	42	300	54		Excluded (lowest quartile on TI CPI and / or EBA)
Seychelles	6	5	1	n/a	3	20	58		Upper middle income country; not a donor focus
Mauritius	5	1	4	n/a	3	372	51		Upper middle income country; not a donor focus
Thailand	4	4	22	7	11	43,298	5	H	Upper middle income country; not a donor focus
Gabon	3	41	29	n/a	22	1,020	42		Relatively small ag sector; UMIC; low donor focus
South Africa	2	12	8	1	5	8,479	18		Upper middle income country; not a donor focus
Malaysia	1	2	7	10	6	27,616	10		Upper middle income country; not a donor focus

The selection of a shortlist of Type A countries was straightforward, being based on the size of the agricultural sector and donor priorities, and excluding upper middle-income countries. The shortlisted countries are highlighted in yellow in Figure 5 below. Vietnam and Indonesia were selected from final shortlist of four. India was excluded because of the wide variations in policy and practice across the country, which would make it difficult to draw conclusions. The Philippines was the smallest of the four markets and so was not selected on that basis.

Figure 5: Shortlisting of Type A countries (ordered by the overall average ranking – top down)

Name	ND-GAIN index rank	TI CPI Rank	EBA ranking	Overall average ranking	Size of ag sector (ag, forestry and fishing value added US\$m)	Ag sector size rank	Donor focus	Comment
Seychelles	4	1	n/a	3	20	58		Upper middle income country; not a donor focus
Mauritius	2	4	n/a	3	372	51		Upper middle income country; not a donor focus
Botswana	5	3	n/a	4	318	53		Upper middle income country; not a donor focus
Bhutan	7	2	n/a	5	445	48		Small ag sector and not a donor focus
South Africa	6	8	1	5	8,479	18		Upper middle income country; not a donor focus
Malaysia	1	7	10	6	27,616	10		Upper middle income country; not a donor focus
Namibia	11	6	n/a	9	972	44		Small ag sector; UMIC; not a donor focus
Viet Nam	8	14	6	9	40,276	7	H	Short-listed
Thailand	3	22	7	11	43,298	5	H	Upper middle income country
India	15	13	5	11	487,238	1	H	Short-listed
Ghana	12	9	12	11	13,196	14		Focus on Asia for Type A countries
Indonesia	9	17	n/a	13	145,046	2	H	Short-listed
Philippines	13	25	2	13	36,817	9	H	Short-listed
Sri Lanka	10	20	13	14	6,745	21		Relatively small ag sector and low donor focus
Rwanda	18	5	23	15	2,713	37		Relatively small ag sector and low donor focus
Senegal	20	10	21	17	4,196	30		Relatively small ag sector and low donor focus
Lesotho	17	18	n/a	18	117	56		Relatively small ag sector and low donor focus
Zambia	23	26	4	18	539	47		Relatively small ag sector and low donor focus
Tanzania, United Republic of	32	15	8	18	16,686	13		Focus on Asia for Type A countries
Nepal	19	27	15	20	7,784	19	M	Relatively small ag sector and not as investible
Gabon	14	29	n/a	22	1,020	42		Relatively small ag sector; UMIC; low donor focus
Kenya	31	32	3	22	23,281	11		Focus on Asia for Type A countries
Cote d'Ivoire	26	21	19	22	13,120	15		Focus on Asia for Type A countries

The selection of Type B countries involved the exclusion of several countries that fell into the lowest quartile of the TI CPI and the EBA Index and of countries with a relatively small agricultural sector. Figure 6 shows the countries that remained that looked most promising for research, based on the size of the agricultural sector and the degree of donor focus. These were shortlisted, with Pakistan being selected for the analysis. Ethiopia was excluded because of the complexities created by the current conflict, while the choice of preferring Pakistan over Bangladesh was mainly linked to CABI's strong network in Pakistan, which will enable follow-up research.

Figure 6: Shortlisting of Type B countries (ordered by overall average ranking – bottom up)

Name	ND-GAIN index rank	TI CPI Rank	EBA ranking	Overall average ranking	Size of ag sector (ag, forestry and fishing value added US\$m)	Ag sector size rank	Donor focus	Comment
Chad	59	53	n/a	56	5,018	27		Excluded (lowest quartile on TI CPI and / or EBA)
Somalia	51	59	n/a	55	n/a	59		Excluded (lowest quartile on TI CPI and / or EBA)
Guinea-Bissau	56	52	n/a	54	442	49		Excluded (lowest quartile on TI CPI and / or EBA)
Eritrea	57	50	n/a	54	262	55		Excluded (lowest quartile on TI CPI and / or EBA)
Central African Republic	58	46	n/a	52	765	46		Excluded (lowest quartile on TI CPI and / or EBA)
Congo	47	51	n/a	49	973	43		Excluded (lowest quartile on TI CPI and / or EBA)
Congo, the Democratic Repub	55	56	34	48	10,173	16		Excluded (lowest quartile on TI CPI and / or EBA)
Sudan	54	54	36	48	4,342	28		Excluded (lowest quartile on TI CPI and / or EBA)
Afghanistan	52	58	32	47	5,395	25		Excluded (lowest quartile on TI CPI and / or EBA)
Burundi	48	55	27	43	809	45		Excluded (lowest quartile on TI CPI and / or EBA)
Equatorial Guinea	27	57	n/a	42	300	54		Excluded (lowest quartile on TI CPI and / or EBA)
Niger	53	30	35	39	5,275	26		Excluded (lowest quartile on TI CPI and / or EBA)
Myanmar	43	39	33	38	17,551	12	M	Excluded (lowest quartile on TI CPI and / or EBA)
Zimbabwe	50	48	17	38	1,373	41		Excluded (lowest quartile on TI CPI and / or EBA)
Madagascar	45	44	25	38	3,280	34		Small ag sector and low donor focus
Angola	40	36	38	38	5,541	24		Excluded (lowest quartile on TI CPI and / or EBA)
Mali	49	35	29	38	6,320	22	L	Relatively small ag sector and low donor focus
Cameroon	29	41	40	37	7,093	20		Excluded (lowest quartile on TI CPI and / or EBA)
Cambodia	33	49	26	36	5,776	23	H	Excluded (lowest quartile on TI CPI and / or EBA)
Bangladesh	44	43	20	36	41,730	6	H	Short-listed
Guinea	28	45	30	34	3,711	31		Excluded (lowest quartile on TI CPI and / or EBA)
Nigeria	41	47	14	34	104,370	3		Excluded (lowest quartile on TI CPI and / or EBA)
Sierra Leone	37	24	37	33	2,417	38		Excluded (lowest quartile on TI CPI and / or EBA)
Uganda	46	40	9	32	8,997	17	L	Relatively small ag sector and low donor focus
Togo	21	34	39	31	1,422	40		Excluded (lowest quartile on TI CPI and / or EBA)
Mauritania	24	37	n/a	31	1,598	39		Small ag sector and low donor focus
Pakistan	34	38	16	29	60,744	4	H	Short-listed
Mozambique	35	42	11	29	3,586	32		Relatively small ag sector and low donor focus
Malawi	42	23	22	29	2,760	36		Relatively small ag sector and low donor focus
Benin	39	12	31	27	4,243	29		Relatively small ag sector and low donor focus
Swaziland	25	28	n/a	27	333	52		Relatively small ag sector and low donor focus
Lao People's Democratic Repu	22	33	24	26	3,101	35	M	Relatively small ag sector
Burkina Faso	38	11	28	26	3,299	33		Relatively small ag sector and low donor focus
Gambia	30	19	n/a	25	384	50		Relatively small ag sector and low donor focus
Djibouti	16	31	n/a	24	44	57		Relatively small ag sector and low donor focus
Ethiopia	36	16	18	23	38,162	8	L	Short-listed

Annex 2 – Country background – Pakistan²¹

(a) Context

Pakistan is among those countries that are most vulnerable to climate change, facing a multitude of climate hazards, ranging from extreme heat, dust storms, and acute water shortages to glacial lake outburst floods and erratic rainfall patterns, which have most recently resulted in devastating floods.²² Pakistan is ranked as the 152nd country in the Global Adaptation Index, with a high vulnerability to climate change impacts and a low level of “readiness” to cope with the expected impacts.²³

The massive floods in Pakistan that took place in August 2022 underlined this vulnerability. Over a third of the country found itself under water, affecting 33 million people (15% of the population).²⁴ Over 3.6 million hectares of crops were destroyed and over 800,000 livestock died. The International Rescue Committee estimates that Pakistan will suffer an economic loss of \$12.5 billion from the floods.²⁵

Agriculture contributes 19.5% of Pakistan’s GDP, employs 42% of the labour force, constitutes 65% of export earnings, and provides livelihoods to 62% of the population.²⁶

Out of the total area of 79.6 million hectares, 22.1 million hectares are cultivated. The rest of the country is made up of land that is not currently cultivated, densely populated forests and rangelands. The country has the world’s largest contiguous irrigation system, with almost 80% of the cultivated area irrigated.²⁷ The average farm size in Pakistan – 5.2 acres as at 2020 – is less than half of what it was in 1972, when it was 13.06 acres (Aazim, 2018).

Pakistan is among the world’s top 10 producers of wheat, cotton, sugarcane, mango, dates and kinnow oranges, and is ranked 10th in rice production. Major crops (wheat, rice, cotton and sugar cane) contribute around 4.9% to the country’s total GDP, while minor crops contribute 2.1%.²⁸ The livestock sector contributes 11% to the country’s GDP and employs approximately 35 million people. The fisheries and forestry sectors each contribute an estimated 0.4% to GDP.²⁹

The country faces high levels of food insecurity.³⁰ According to a global report published jointly by FAO, WFP, UNICEF, WHO and IFAD in 2019, 20.3% of Pakistan’s population (40 million people) is undernourished/food insecure.³¹ The recent floods exacerbate that problem in a significant way.

The irony of the flooding is that Pakistan’s agricultural sector in Pakistan often suffers from a lack of sufficient water, with the large amounts of agricultural production and the continuously increasing population placing high demands on Pakistan’s water resources. At present, the annual per capita availability of water in Pakistan is estimated at about 1,100 cubic meters; below 1,000 cubic metres, countries begin experiencing chronic water stress. 90% of the country’s water resources are used for agriculture, while the remaining share is split equally between industry and domestic use.³²

²¹ See also the climate-smart agriculture profiles for Pakistan, Pakistan (Punjab) and Pakistan (Sindh) (CIAT and World Bank, 2017; CIAT and FAO, 2018; Wilderspin *et al.*, 2019).

²² Government of Pakistan, 2012.

²³ ND-GAIN Index.

²⁴ [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(22\)01732-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)01732-9/fulltext)

²⁵ <https://www.rescue.org/press-release/pakistan-floods-will-devastate-economy-likely-leading-widespread-hunger-and-violence>

²⁶ Government of Pakistan, 2018.

²⁷ <https://www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/>

²⁸ <https://www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/>

²⁹ *Ibid.*

³⁰ Population Action International, 1993.

³¹ <https://www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/>

³² <https://www.fao.org/pakistan/our-office/pakistan-at-a-glance/en/>

Farmers in Pakistan retain about 60% of their wheat production for seed and village and household food consumption. For the remainder of the wheat that is marketed, the government is the main buyer, often procuring 25% to 30% of total production, driven by both food security and market intervention objectives. The remaining 15% of the harvest is purchased by the private sector, for use in the milling industry and bakeries. The high volumes of wheat procurement by the government make it more difficult to attract private sector trade and investment in the post-harvest supply chain (Raza, 2021).

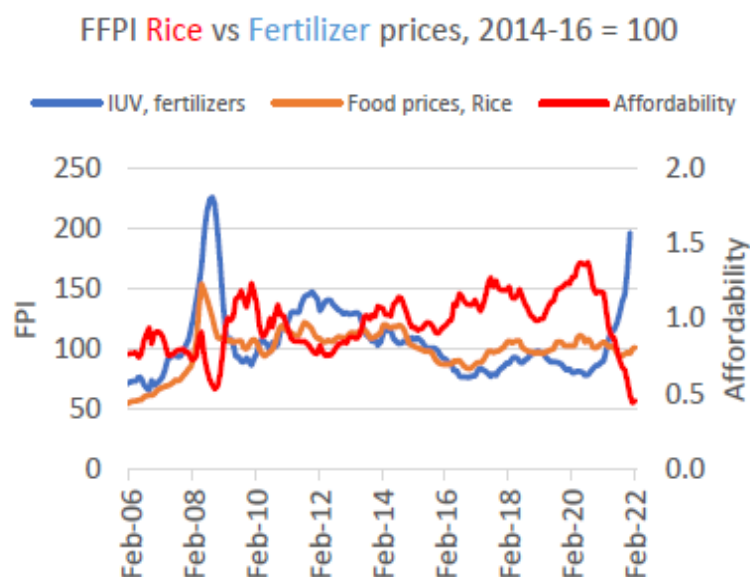
There has been a recent shift away from cotton and towards sugarcane, which requires a lot more water. The water availability can be expected to create long-term problems for farmers, but the current cotton prices have at times been too low and the cost of inputs too high to make commercial sense for them (Aazim, 2018).

Attempts to incentivize farmers to grow more cotton, using improved varieties, were dealt a substantial blow by the floods in 2022, which destroyed almost 80% of the crops in Sindh, where 30% of Pakistan's cotton is grown.³³

Because of the shortage of fertilizer for the wheat crop in Khyber Pakhtunkhwa, farmers are concerned that grain production may decrease by 40% in the province, which is already facing a food shortage (Buneri, 2022). In addition, the flood damage in some areas of the country will prevent or delay the planting of wheat, which is due to happen in October and November.

Moreover, the conflict in Ukraine will directly impact Pakistan's wheat imports from Ukraine, which accounted for 39% of the total imported wheat in the preceding fiscal year (Kamal, 2022). A further 40% of Pakistan's imports are from Russia, which is affected by sanctions. Disruption to these supplies will have a knock-on effect on the demand for wheat and other staples, and will lead to rising prices. In theory this could be of benefit to small farmer producers but in practice they have been unable to maintain production in response to higher prices because of the shortage of fertilizer, and in many cases flood damage, which is creating a vicious cycle.

The price of rice, for example, is significantly lagging the cost of fertilizer inputs, as shown in the graph below (FAO, 2022b).



Source; FAO

³³ <https://www.aljazeera.com/economy/2022/9/7/after-record-floods-now-pakistan-has-to-worry-about-economy>

The various shocks to the agricultural system leave smallholder farmers in an extremely vulnerable position. This is exacerbated by the fact that many are in debt to input providers, and so are effectively indentured labourers and cannot leave the land to find alternative sources of income.³⁴

(b) Policy³⁵

The National Food Security Policy highlights that *“Pakistan needs to build strong resilient agriculture sector to cope with the climate change risks. Climate change projections indicate that there will be greater variability in the weather with more frequent extreme events such as floods and droughts. Much of the impact of these changes will be on the agriculture sector, which needs mechanisms to cope and adapt”* (Government of Pakistan 2018).

Pakistan’s 2021 Nationally Determined Contributions (NDC) paper (UNFCC, n.d.) recognizes the importance of adaptation in agriculture, particularly in relation to the dwindling water supply: “The crop yields over recent years have adversely been affected by changing climate patterns and associated shocks. The already strained water availability is expected to worsen over the coming decades, with water demand projected to rise significantly with rising population and warmer temperatures. Agriculture sector is also the largest consumer of freshwater, accounting for 95% of total withdrawals. The four major crops that account for 80% of this share include high water consumption and low value crops such as rice and sugarcane. It is estimated that the country loses 4% of its GDP to inefficient water use in agriculture. Hence, to ensure long term water and food security of the country, Pakistan needs to significantly boost water efficiency and agriculture productivity.”

The NDC paper also outlines a number of adaptation actions relating to NbS. Moreover, the NDC has as its first Guiding Principle “NbS green livelihood opportunities”. Specific initiatives in this category include an Eco-system Restoration Initiative, a Protected Areas Initiative, a project for Ecosystem-based Adaptation for Integrated Flood Risk management, the Ten Billion Tree Tsunami Programme, and a project to transform the Indus Basin with climate-resilient agriculture and water management. The latter is the only initiative that is explicitly related to agricultural activities, although many of the other schemes will have an impact on rural livelihoods.

(c) Current landscape for investment in agricultural adaptation and NbS

Domestic resources dedicated to climate change have been low by international standards, at only 8% of the development budget (Malik, 2018). In addition, Pakistan has only been able to capture a small share of the available international climate finance, compared with other climate-vulnerable countries.

The UK Foreign, Commonwealth and Development Office, through Action on Climate Today, has been collaborating with the Ministry on establishing a Climate Finance Unit to bring together national and international stakeholders to develop bankable projects for the GCF, Global Environment Facility and Adaptation Fund, and to deliver training to provincial planning and line departments in order to build their knowledge of climate finance.

The Climate Finance Unit has successfully leveraged \$101 million from international funds (including co-financing pledged by provincial governments and departments). There is an active pipeline of projects, including on climate-smart agriculture (Malik, 2018).

Looking at the finance sector more broadly, farmers in Pakistan lack access to agriculture credit, experience weak extension support and receive inadequate research knowledge to counter the threats of climate change. Banks are mandated by the State Bank of Pakistan to earmark a proportion of their total loan portfolio for the agriculture sector, but credit is

³⁴ <https://www.nytimes.com/2022/10/01/world/asia/pakistan-flood-farmers.html>

³⁵ This section draws on <https://cabiagbio.biomedcentral.com/articles/10.1186/s43170-022-00077-8>

available to less than 30% of farmers and in most cases it is accessed only by bigger landholders. The Bank of Punjab, for example, extends its Kissan Dost Short-Term Running Finance Facility to farmers owning or leasing at least 50 acres of agriculture land (Ahmad, 2016). Thus, most smallholder farmers rely on informal credit, often paying very high rates because of a lack of collateral (CIAT and World Bank, 2017).

Working under the State Bank of Pakistan, ZTBL Bank offers a number of special loan programmes, including production loans, development loans, agricultural loans, off-farm - income-generating loans and cottage industry loans. However, ZTBL had a climate change department which was later wound up as the Bank did not see it as “viable” business (Ahmad, 2016).

The small size of farms makes it particularly challenging for banks to reach out to the under-served segments of agricultural borrowers. This results in poor farm care and little investment in farming innovation (Aazim, 2018) or adaptation.

A scoping study was carried out by Oxfam-Novib Pakistan in 2016 to assess the extent to which growers and lower-end market intermediaries were accessing and using financial services. The survey involved interviews with these growers and intermediaries, as well as with various representatives of public sector financial institutions, private banks, insurance companies and MFIs. Only 17% of the total respondent group reported having sought financial assistance in the form of a loan, while the majority (83%) said that they had never approached any financial institutions for a loan. Out of those that had reported the use of institutional borrowing, one-third (33%) had borrowed through ZTBL and 25% through the National Bank of Pakistan (Ahmad, 2016).

Except for Khushhali Bank, which prioritizes opening up bank branches in areas that are prone to natural hazards, none of the commercial banks interviewed had in place criteria for outreach to disaster-affected areas. None of the banks interviewed reported that they included climate as a risk factor. All risks were reported to rest with the borrower or insurer.

The scoping study concluded that the greatest level of awareness of climate change impacts was found among the growers. Higher up the value chain, the impact of climate change was not felt, apart from in the form of temporary disruptions to supply chains following a disaster. The only exception to this was in the large national private companies and multinational companies interviewed, such as Engro, Nestlé and Unilever. The study found that risk management strategies were minimal: growers did not access insurance products because of lack of awareness and/or because of cost and the companies higher up the value chain did not perceive a risk. Although now quite old (dating from 2016), the study provides an interesting reference point.

It is notable from a report on climate-smart agriculture in Pakistan (CIAT and World Bank, 2017) that the sources of finance identified for climate-smart agriculture in Pakistan do not include any commercial providers. The private sector sources cited are all NGOs or impact investors: CARE, Oxfam, the Sustainable Agriculture Initiative, the Bill & Melinda Gates Foundation and the Rockefeller Foundation.

(a) Examples of initiatives

1) GCF and FAO – enhancing the resilience of farmers in the Indus River Basin (GCF, 2019)

GCF has signed a \$35 million agreement with FAO to implement a project to enhance the climate resilience of farmers in Pakistan’s Indus Basin. Climate effects in the Indus River Basin, such as extended droughts and floods, threaten to jeopardize Pakistan’s food security as the region produces more than 90% of the country’s agriculture.

The project will establish cutting-edge information systems to carry out the accurate measurement, monitoring and modelling of hydrological processes in the Indus Basin. This

will integrate climate resilience considerations into agriculture and water planning and policies.

2) Levi Strauss – Better Cotton Initiative (Ahmad, 2016)

In Pakistan, local farmers using Better Cotton farming methods reduced pesticide and water use by an average of 32%, and saw increases in their net profits by up to 69%. The majority of the farmers involved with the initiative held less than two hectares of land.

3) Nestlé – water stewardship

Nestlé Pakistan has signed a memorandum of understanding with WWF-Pakistan for sustainable water use and water stewardship. As part of its commitment to the sustainable use of water, Nestlé Pakistan, in collaboration with WWF-Pakistan, has launched projects to improve the water usage within Nestlé's operations and supply chain, and to implement Alliance of Water Stewardship standards. Through creating awareness of responsible water use in the agriculture sector among farmers, Nestlé aims to reduce the water footprint across its value chains and to make them more resilient.

4) Initiative of IFC with Bonsucro sugarcane growers, Thal Industries and Almoiz Industries³⁶

IFC has been working with local businesses to implement sustainable standards for sugarcane production. The pilots have indicated that businesses see the business case primarily in terms of access to markets and not in terms of adaptation.

5) Sustainable rice production – Westmill – less water, lower greenhouse gas emissions³⁷

Westmill sources basmati rice from Pakistan, where there has been increasing scarcity of water over the past 20 years as a result of farming methods and climate change. Westmill has therefore signed up to the Sustainable Rice Platform. Its partner, Galaxy, provides training to farmers, covering the use of water-saving technologies including land laser levelling and alternate wetting and drying. The training also covers pesticide management, health and safety, and agribusiness techniques.

The initiative has so far led to a 25% reduction in water use and a 38% increase in net incomes. The original 600 farmers involved in the initiative have now been expanded to 1,200.

6) Government initiatives – loan insurance scheme, refinance scheme for revival of SMEs in flood-affected areas, and public–private partnership for innovative financial products focused on weather index insurance (IFAD and Pakistan Poverty Alleviation Fund)

7) Ten Billion Trees Tsunami (UNEP, 2021) – an NbS

The Ten Billion Tree Tsunami programme aims to help restore ailing ecosystems and improve natural capital, as well as supporting livelihoods. The project is expected to create income for almost 85,000 people. In addition, Pakistan's protected areas initiative will create almost 7,000 long-term jobs.

8) Khushhali Bank – training farmers on climate adaptation (Khushhali Microfinance Bank, 2017)

Khushhali Bank has paid for the Pakistan Agricultural Research Council to provide technical training to “enable the farmers to reap the benefits of bank's credit, thus improving the living standard of millions of farmers and ultimately the national economy”. The Bank describes the initiative as being part of its CSR activities.

³⁶ <https://bonsucro.com/sustainable-sugarcane-pakistan/>

³⁷ <https://westmill.co.uk/our-stories/working-towards-sustainable-basmati/>

Table 16: Pakistan country summary

Crop	Importance	Climate impacts on crops	MNCs	Large local firms	Financial initiatives
Total ag	19.5% of GDP. 42% of labour force.	Total agricultural production in Pakistan will decline by around 8%–10% by 2040. ³⁸			
Wheat	1.6% of GDP. Majority grown by smallholder farmers. 72% of calorific intake among Pakistanis (Donley, 2022). Pakistan is now a net importer.	A decrease of 14.7% in yield has already been observed. One study has predicted a further 6% decrease in wheat yield by 2040 and 27% by 2080 (Syed <i>et al.</i> , 2022).		1,000 domestic millers, including Volka Food International (milling plant to stabilize supply of flour for its products) (Donley, 2022).	Volka Food commercial investment. But intervention by Pakistan government in wheat market affects private investor appetite. Studies indicate that improved fertilizer use can improve yields by 29% (Shahbaz, Haq and Boz, 2021) but prices are high.
Rice	1.4% of GDP. 2 nd most exported product. Main livelihood for 730,000 farmers in Punjab.	A decrease of 20.5% in yield has already been observed. One study has predicted a further 15-18% decrease in basmati rice by 2040 in all regions of Pakistan except Northern Pakistan (Syed <i>et al.</i> , 2022)	Louis Dreyfus (in bulk from local traders).		Indus Basin. Westmill sustainable rice production.
Cotton	0.8% of GDP (Rana, Ejaz and Shikoh, 2020). 55% of forex. 81% smallholder farmers (Wei <i>et al.</i> , 2020).	Temperatures and changes in the rainy season affect cotton yield and quality.	Levi Strauss, Louis Dreyfus.	1,000 ginning factories in the country, such as Nishat Mills.	MNC members of Better Cotton Initiative invest in initiatives to reduce water use.
Sugar cane	0.7% of GDP. 64% grown by smallholder farmers	Requires large quantities of water, which is becoming scarcer.		81 sugar mills, including Thal Industries and Almoiz Industries, working with Bonsucro.	Bonsucro initiative.

³⁸ Cradock-Henry *et al.*, 2020.

Annex 3 – Country background – Vietnam³⁹

(a) Context

Vietnam's agricultural sector contributes 18.1% to its GDP and employs approximately 47% of the labour force.⁴⁰

Since the 1990s, several major intensive monoculture systems have emerged across Vietnam, such as the rice monoculture in the Mekong Delta and the intensive production of coffee and pepper in the Central Highlands. Many of the agricultural products in the country (such as rice) initially addressed domestic consumption, while other agricultural products have become major export commodities, such as coffee, pepper, cashew nuts and rubber. In recent years, Vietnam has constantly been the second largest coffee exporter globally, after Brazil. The country also accounts for over 40% of pepper production in the Asia Pacific region.

There are 10 exporting products that yield a turnover of more than \$1 billion per year, including rice, natural rubber, coffee, black pepper, cashew nuts, cassava, vegetables, shrimp, cat-fish, wood, and timber products. Among these, five commodities (fruit, coffee, shrimp, wood, and timber products) have an export value of more than \$3 billion each (Diem and Thuy, 2019).

However, according to the OECD, efforts are needed to improve the sector's competitiveness and environmental sustainability (Agricultural Policy Monitoring and Evaluation 2020, 2020). Only a small proportion (6% in 2016) of the total investment in the economy flows into agriculture, while foreign direct investment (FDI) in this sector accounted for only 1% of the total FDI in Vietnam in 2016.⁴¹ Vietnam's agricultural production is seen as small-scale, inefficient and as having low productivity. For many agricultural activities, these shortcomings will be exacerbated by climate change.

Vietnam has seven different climate regions, with variations in temperature, rainfall patterns, and frequency/intensity of cyclones, floods and droughts. Projections show that climate change poses an increasingly severe threat to Vietnam's agricultural, forestry and fishery sectors across all of these different regions. Rising temperatures are expected to reduce yields in the north by shortening growth cycles. Severe water shortages are also expected to contribute to a fall in annual yields.

Increased salination levels have, at the same time, created an opportunity for farmers to switch from cultivating rice to farming shrimp, which have a higher export value. The government has been providing training for farmers and loans to help farmers make the transition to shrimp farming. By 2025, Vietnam aims to double its current earnings from shrimp exports (Dung, 2018).

In regard to the cashew nut industry, a recent study has indicated that the optimal growing area for cashews could actually increase globally by about 19% by 2050 (Viglione, 2022). Vietnam, in particular, would see its high-suitability land area increase by about one-third in this scenario. The other major growers of cashew would not fare so well – with forecasts indicating a 16% reduction for Côte d'Ivoire, a 29% reduction for India and a 78% reduction for Benin.

The rubber industry is expected to be affected adversely by climate change, which is a crop that can also bring benefits for soil moisture, erosion and soil chemistry. The rubber tree can be a suitable component of agroforestry models that enhance crop diversity and can provide tree cover for carbon sequestration. Carbon sequestration in plants and soils has an

³⁹ See also the climate-smart agriculture country profile for Vietnam:

https://cgspace.cgiar.org/bitstream/handle/10568/96227/CSA_Profile_Vietnam2.2.pdf?sequence=1&isAllowed=y

⁴⁰ <https://www.fao.org/in-action/naps/partner-countries/vietnam/es/>

⁴¹ Data taken from the General Statistics Office of Vietnam.

additional agricultural benefit and bio-sequestration carbon offsets can potentially bring economic benefits to smallholders. There are opportunities for using genetically selected rubber germplasm for climate adaptation and rubber farming in degraded land, to improve farmers' livelihoods (Pinizzotto *et al.*, 2020).

The Russia–Ukraine conflict has seriously affected fertilizer supply and prices in Vietnam, which imports around 2.7–3.5 million tonnes of fertilizers each year.⁴² Fertilizer imports from Russia made up around 320,000 tonnes in 2021, accounting for around 10% of Vietnam's fertilizer imports. These were mainly potash, combined nitrogen, phosphorus and potassium (NPK), and di-ammonium phosphate (DAP). The sanctions on Russian exports and the disruption to Ukraine's production have led to a significant increase in the price of fertilizer products. Price increases for different fertilizer products range from 44% to 181% (Ministerie van Landbouw, 2022).

Fertilizers account for around 40–60% of the input cost of agricultural production so this dramatic increase in the price of fertilizers is pushing farmers into a cost crisis. This was particularly challenging in April and May 2022, when farmers tried to treat their summer–autumn crops.

The Ukraine crisis has also affected the agricultural sector in Vietnam through its impact on exports. Vietnam has historically exported around \$500 million worth of farm produce to Russia each year (the figure was \$550 million in 2021, including \$164 million worth of seafood, \$173 million of coffee and \$60 million of pepper and cashew nuts).

(b) Policy

In 2011 the government released the National Climate Change Strategy (2011–2020), which stressed the importance of a comprehensive response to the impacts of climate change, specifically the threat to food security. In 2018 the government released its National Adaptation Plan (2020–2030), with support from the NAP-Ag Programme. This builds on lessons learned through implementing the National Climate Change Strategy to plan and budget for adaptation interventions into the medium and long term.⁴³

The NAP-Ag Programme helped the government to undertake risk and vulnerability assessments and the mapping of particularly vulnerable areas, like northern Vietnam (which is affected by landslides) and the Mekong Delta (which is affected by sea level rise and salinization).

The Vietnam NDC (UNFCC, n.d.) outlines a number of areas for adaptation in agriculture, including shifting crop production structures, changing land use and developing organic agriculture. Alongside that, the NDC emphasizes the importance of enhancing the resilience and adaptive capacity of communities and ecosystems. It also refers to the role of NbS in regard to minimizing damage associated with climate change in each sector in the future.

In a 2020 report on 'Private Sector Engagement in National Adaptation Plan Development and Implementation in Vietnam', Vietnam's Department of Climate Change, with the support of the NAP Global Network, outlined the potential tasks, programmes and projects in the NAP that might attract private sector investment. These included the development of models for suburban agriculture, agroforestry, and the integration of cultivation and ecotourism.

The report also proposed mechanisms that might be used to attract investment from the private sector for implementation of the National Adaptation Plan:

- highlight the business need for sustainable value chains, adapted to climate change, and the important role that businesses play in sharing climate risks with farmers

⁴² Vietnam's Ministry of Agriculture.

⁴³ <https://www.fao.org/in-action/naps/partner-countries/vietnam/es/>

- use the Business Climate Index developed by UNDP and Vietnam’s Ministry of Planning and Investment (which logs and benchmarks private sector contributions to climate mitigation and adaptation) as a tool to attract private investment
- promote agricultural insurance, with the State Bank providing a guarantee

(c) Current landscape for investment in agricultural adaptation and NbS

In a study on transition finance in Vietnam (Department of Climate Change, 2020), the OECD notes that Vietnam’s financial system is large for a middle-income country but that it remains bank-centric and dominated by state-owned banks, while non-bank financial institutions account for a relatively small proportion of the system.

About 50,000 firms were engaged in the agricultural sector in 2018, with more than 96% of them being small or very small in scale. Firms with less than 10 employees accounted for 57.34%, and firms with 10 to 200 employees accounted for 38.72%⁴⁴ (MPI, 2018). Households are the largest investors in agricultural production, drawing on their own resources rather than accessing finance from banks (Diem and Thuy, 2019).

Total FDI is limited and only around 6% of the total realized FDI goes to agricultural projects.⁴⁵

A report by GIIN in 2018 (GIIN, 2018) found that since 2007 10 private impact investors had invested \$25 million in 27 deals in ICT, energy and financial services. There was no impact investment in the agricultural sector.

There is also a shortage of MFIs in Vietnam. Less than 1% of the population are microfinance clients, and growth in this area is slow (Lambert, 2022). Vietnam aims to expand credit to 70% of the adult population and MFIs have an important role to play in increasing access to credit, but also in regard to professional networks and education. They are often willing to work in rural areas where other providers would find the operating costs too high.

However, regulatory changes are needed. According to current regulation, a political or socio-political organization must be an MFI’s largest shareholder: these organizations may not have the business or financial acumen to drive growth and they have limited financial capacity to inject capital. The current rules also deter foreign investment. Also, loan sizes are capped (at about \$2,200), which means that clients have to go elsewhere as they grow.

The bond markets in Vietnam could provide a route for finance. Recently, Vietnam has been supported by the Global Green Growth Institute to develop a green bonds programme.⁴⁶ This initiative brings together expertise in green finance to enhance institutional capacity and the regulatory framework, and to share practical experience in piloting green bond issuance.

(d) Examples of initiatives

1) Restoring ecosystem services for smallholder farmers – Vietnam’s So’n Tho commune⁴⁷

An ecosystem-based adaptation pilot was conducted in So’n Tho commune, a mountainous area of Vietnam 75% of which is forest and 15% agricultural land. The ecosystem-based adaptation scheme aimed to reduce the risk of climate-related hazards, including droughts, heat waves, whirlwinds and storms, and ensure food security through increased agricultural resilience and forest restoration.

The community has reported that 40 hectares of native forest are now better protected and 12,000 seedlings of native trees have been replanted, likely contributing to restoring biodiversity losses. Community members have also reported the increased provisioning of

⁴⁴ Ministry of Planning and Investment, 2018.

⁴⁵ https://aseanaccess.com/images/pdf/agriculture/Vietnam_AGR update.pdf

⁴⁶ <https://gggi.org/project/vn10-viet-nam-green-bond-readiness-program/>

⁴⁷ <https://casestudies.naturebasedsolutionsinitiative.org/>

food products and firewood, and the regulation of water flows, which has increased underground water storage capacity. These provisioning services contribute to the food, water and energy security of local households, as well as providing additional income-generating opportunities.

2) IFC and Loc Troi Group (IFC, 2019)

A 2020 report on 'Analysing the challenges in implementing Vietnam's Nationally-Determined Contribution (NDC) in the agriculture sector under the current legal, regulatory and policy environment' (Trung *et al.*, 2020) notes that there are some companies that are applying climate-smart agriculture for their production. The report cites the Loc Troi Group as an example. However, the report argues that their activities are driven by the needs of strategic project shareholders, such as the IFC, the World Bank, international investment funds, and export markets, rather than the need to comply with the government's roadmap. The report argues that private companies that try working with the government to obtain support or incentives to implement climate-smart agriculture model have to suffer long bureaucratic procedures.

3) Louis Dreyfus and ISLA

Declining production and product quality due to the impact of climate change on natural resources has driven the Coffee Platform of Louis Dreyfus Company to join IDH's ISLA in the Central Highlands of Vietnam (Thang, 2022). Under ISLA, Louis Dreyfus Company has joined forces with its coffee-producing competitors on the Landscape Steering Committee in Lam Dong province. The initiative aims to mitigate risks regarding future supply and provides a platform to discuss with government about policy changes that would be beneficial for the future of the business (Louis Dreyfus Company, 2018).

According to Duoc Nguyen, Sustainability Manager, Coffee Platform, at Louis Dreyfus Company Vietnam: "Climate change, soil erosion, water scarcity, etc. are big issues where the involvement of governmental and non-governmental organizations is required, as well as all the players of the value chain, i.e. our suppliers, our competitors, and our customers."

Table 17: Vietnam country summary

Crop	Importance	Climate impacts on crops	MNCs	Large local firms	Financial initiatives
Total ag	14.8% of GDP. 38% of labour force.				
Rice	65% production by smallholder farmers on land <0.5ha.	Sea level rise and desalination in Mekong Region affecting viability and yields. Shift to shrimp.		Loc Troi Group.	IFC working with Loc Troi Group on sustainable rice production.
Coffee	3% of GDP (Conway, 2020). Employs 550,000 smallholder farmers (Conway, 2020).	Rising temperatures, longer droughts, more frequent floods, and severe outbreaks of pests and diseases that result in reduced productivity.	Nestlé, Louis Dreyfus.		Investment in water-saving activities, e.g. Alliance for Water Stewardship (Nestlé, 2020). ISLA.
Rubber	3% of GDP (RubberWorld, 2022). More than 50% of rubber plantations are managed by smallholder farmers (RubberWorld, 2022).	A steady rise in temperature and occurrence of extreme weather might compromise natural rubber production and supply chains in the different rubber growing countries (Pinizzotto <i>et al.</i> , 2020). CIRAD is doing more research (CIRAD, 2021).		Lafooco (The Pan Group).	
Cashew nuts	1.3% of GDP. 52% of global production.	Potential <u>improvement</u> in conditions for cashew nuts in Vietnam.		500 large- and medium-scale processing plants, 500 small-scale firms and about 371 export firms (MOVETOASIA, 2021).	The Pan Group has participated in ISLA (The Pan Group, n.d.).

Annex 4 – Country background – Indonesia⁴⁸

(a) Context

The agricultural sector plays a vital role in Indonesia, both in its economy and in regard to food security in the country. About one-third of Indonesia's land area, or 60.2 million hectares, is used for agricultural purposes. Crops are harvested on an area of 44 million hectares (2016). In 2016, the sector contributed roughly 13% to Indonesia's GDP. The agricultural sector employed 28% of the workforce in 2019 (down from 55% in 1992) (Center for Climate Change and Multilateral Policy, 2020).

The most important agricultural products are palm oil, rubber, cocoa, coffee, tea, cassava, rice and tropical spices (<https://www.indonesia-investments.com/culture/economy/general-economic-outline/agriculture/item378>).

The Indonesian palm oil sector contributes 1.5%–2.5% of Indonesia's GDP⁴⁹ and employs more than 3 million people (UNDP, 2019). The sector is dominated by big private enterprises (such as the Wilmar Group and Sinar Mas Group), producing slightly over half of total Indonesian palm oil output. Smallholder farmers account for around 40% of total production and 30% of total national output (Euler *et al.* 2017; Murphy *et al.*, 2021). Evidence suggests that smallholdings can have lower environmental impacts (Lee *et al.* 2014) and higher biodiversity levels than commercial plantations (Razak *et al.*, 2020; Murphy *et al.*, 2021). Most of these smallholder farmers are highly vulnerable to global downswings in palm oil prices as they have no access to bank loans or other sources of capital.

About 42% of global rubber production comes from Indonesia (Yoga Prasada and Dhamira, 2021) and it contributes around 0.5% of Indonesia's GDP. More than 80% of Indonesia's rubber production comes from smallholder farmers, with these farmers earning a lower average wage than in other industries. In recent years, smallholder estates have been increasing their production, while the large estates have been replacing their rubber areas with more profitable commodities, especially palm oil (Statista Research Department, 2022).

The cocoa sector contributes around 0.1% of Indonesia's GDP. Around 90% of Indonesia's cocoa output is produced by smallholders who are unable to invest in production capacity, resulting in reducing yields from ageing trees, diseases, floods and other challenges. Many Indonesian farmers have shifted their focus towards palm oil and rubber, so cocoa production may continue to decline (Murphy *et al.*, 2021). While some investment has been made in adaptation by buyers such as Mars, this is focused only on improving the resilience of the cocoa supply chain, rather than trying to enhance the resilience of farmers themselves through diversification or relocation (Amir, 2022).

Indonesia is the third largest producer of rice in the world but its exports are very limited because of the quantity of domestic consumption. Smallholder farmers account for around 90% of Indonesia's rice production, with each farmer holding an average land area of less than 0.8 hectares (Murphy *et al.*, 2021).

Rice producers are among the most exposed to the impacts of climate change: drought, floods, high temperatures and rising sea levels are direct threats to their livelihoods. Farmers in Java typically use an irrigated lowland production system which takes, on average, more than 1,400 litres of water to produce just 1kg of rice.⁵⁰ This reduces the availability of fresh water for human consumption, aquatic ecosystems and other uses, resulting in water conflicts. Furthermore, increased chemical use to maintain crop yields leads to higher production costs and thus farmers cannot generate an adequate income.

⁴⁸ See also the climate-smart agriculture country profile for Indonesia:

<https://cgspace.cgiar.org/handle/10568/114898>

⁴⁹ https://www.aseanaccess.com/images/pdf/agriculture/INDONESIA_AGRI_update.pdf

⁵⁰ <https://preferredbynature.org/projects/empowering-indonesian-rice-farmers-sustainable-practices-better-livelihoods>

In terms of the impact on food security, rice prices are vulnerable to small changes in supply and demand because the international market for trade in rice is very shallow, with only 5% of global rice production being traded on the international market. Sudden changes in trade policies among the three exporting countries can therefore lead to hoarding and speculating by rice-importing countries, driving up prices.

Climate change, manifested in changes in precipitation patterns, sea level rise, increased temperature and increased frequency and intensity of extreme weather events, has affected the production of all crops. Rice yields have decreased by 20% in the last 20 years due to a decrease in rainfall and the availability of water and humidity affecting populations of insects.

Increased precipitation during the wet season and the prolonged dry season is projected to decrease food production in 2050 as compared to the current condition, i.e. rice (-4.6%), maize (-20%), soy (-65.2%), sugar (-17.1%), and palm oil (-21.4%) (Kementerian PPN/Bappenas, 2010). In general, climate change could result in a 9%–25% reduction in farm-level net revenue in Indonesia in the future, affecting the incomes and livelihoods of farmers (ADB, 2015).

Climate change will put those involved in agricultural activities in a more vulnerable condition. This is particularly the case for smallholder farmers, who have small plot sizes, often insecure land rights, a low level of awareness of climate risk and low access to capital. This could be exacerbated by Indonesia's agricultural development: deforestation and irresponsible land-use change could lead to more forest fires and could increase the probability of flood and landslide events (Center for Climate Change and Multilateral Policy, 2020).

The conflict in Ukraine has various implications for the agricultural sector in Indonesia. More than 15% of Indonesia's fertilizer is imported from Russia and Ukraine. On 5 April 2022, the Indonesian Government announced that it would reduce subsidies for fertilizers, in an attempt to protect the public sector budget from rising prices. The government said that the priority would be for subsidies for fertilizers used by the producers of key commodities, such as rice, corn, soy beans, shallots, chilies, cocoa and sugarcane smallholders.

(b) Policy

Indonesia's NDC (2021) states that "The goal of Indonesia's climate change adaptation is to reduce risks, enhance adaptive capacity, strengthen resilience and reduce vulnerability to climate change in all development sectors. This goal will be achieved through inter alia, enhanced climate literacy, local capacity strengthening, improved knowledge management, convergent policy on climate change adaptation and disaster risks reduction, and application of adaptive technology" (UNFCCC, n.d.).

In particular, the NDC (UNFCCC, n.d.) proposes the following actions:

- a) Mainstreaming/integrating adaptation into the agricultural sector through –
 - a) identification, development and implementation of best practices for farmers' economic empowerment
 - b) enhancing the management and provision of ecosystem services in the agricultural sector
 - c) the development of a financing scheme for agriculture
- b) Developing and implementing climate adaptive technologies by
 - i) improving protection from pests and diseases for agricultural crops
 - ii) research and development to produce high-quality (genetically improved) seeds and cultural techniques to increase productivity
 - iii) improved water management systems for increasing resilience to climate change
 - iv) the application of an integrated cropping calendar

(c) Current investment landscape for agricultural adaptation and NbS

A 2020 World Bank report (Agriculture and Food Global Practice, 2020) concluded that there were no supply-side constraints on investment in agriculture (and by implication agricultural adaptation) in Indonesia, stating: “The liquidity in Indonesia’s banking system is sufficient and there already exist extensive physical banking networks within the country. The Indonesian banking networks include a selection of commercial and specialized banks, membership-based groups, and fintech organizations. Also, there exist several large food manufacturers that could potentially aid in the process of financing and the creation of linkages through vertical integration of value chains... Since the supply side of capital is well developed, the focus should be put on the minimization of constraints currently seen on the demand side of the equation. At this juncture, the main recommendation is to aim future interventions at making farmers themselves more attractive to financial institutions, as opposed to making banks more accessible to farmers.”

The challenges that hamper private sector engagement in climate change adaptation are outlined in a report by the Fiscal Policy Agency for Indonesia’s Ministry of Finance (Center for Climate Change and Multilateral Policy, 2020) and include the following:

- a) limited capabilities in agribusiness management
- b) a lack of extension services for farmers as farming units are often remote and fragmented – almost 10 million smallholder households own less than 0.5 ha each, while the availability of agricultural land is further decreasing as a result of converting agricultural land for other purposes
- c) limited awareness of climate change risks, with a tendency of higher awareness among female farmers
- d) issues of land tenure and the marketability of products, making it difficult for farmers to provide collateral to banks when applying for credit
- e) small-scale farmers in particular lack access to finance because financial institutions consider the agricultural sector to have a high-risk profile
- f) insufficient or damaged infrastructure, especially irrigation networks (more than half of the irrigated land works have damaged irrigation systems), clean water and energy
- g) the living wages of agricultural labour are comparatively low
- h) requirements for fertilizer and seeds are barely met
- i) a lack of access to farming equipment and technologies
- j) a lack of know-how in regard to translating international frameworks for climate change adaptation to the local context
- k) weather and climate data, especially related to rainfall, is often incomplete and lacks quality and validity, and there is insufficient access to it

Private sector engagement in adaptation in Indonesia’s agricultural sector primarily consists of CSR schemes (and to a certain extent corporate social venturing), insurance, microfinance and impact investment. MNCs, such as Bayer, DuPont, Cargill and Syngenta (e.g. for fertilizers, pesticides, seed stock, fodder), are engaged in adaptation, as are some Indonesian businesses (e.g. BISI for seeds, CV Karya Hidup Sentosa for tractors/machinery). Providers of digital solutions also play an important role in climate-smart agriculture (e.g. PT Mitra Sejahtera Membangun Bangsa).

Indonesia has a large microfinance sector, with over 60,000 MFIs reaching more than 50 million people (Consultative Group to Assist the Poor). However, many of Indonesia’s 50 million MSMEs do not have adequate access to the bank financing they need to grow their businesses, particularly in rural areas. The Bank of Indonesia previously issued a rule that required banks to have at least 20% of their loan portfolio dedicated to micro loans by 2018. This has opened up new opportunities to grow the microfinance sector (Global Business Guide, 2013).

Indonesia also has the largest impact investing market in South-East Asia. A report by GIIN (GIIN, 2018) found that in 2017 there were 24 private impact investors, which had done 58 deals. Of those deals, 16 (28%) were in agriculture. A report by Angel Investment Network Indonesia in 2020 (Soukhasing, 2020) found that the number had grown to 66 impact investors by that year, although only 34% had made more than one investment, 41% had made one investment and the remaining 25% were still prospecting. The themes with the greatest interest for impact investors were financial inclusion, forestry, clean energy and poverty. The report found that local impact investors had invested 50% of their funds in food and agriculture, while foreign impact investors with local representation had invested 32% in food and agriculture and foreign impact investors without local representation had invested only 18% in food and agriculture. The report identified the following impact investment funds with a particular interest in the agricultural supply chain: Patamar Capital, C4D, Aavishkar, Garden Impact, Lonsdale Capital, Gayo Capital, UOB Venture, Mirova and Jupiter Impact.

Indonesia's regulation on green bonds explicitly specifies climate change adaptation as one of the 11 types of eligible projects but there appears to be no private sector corporate green bond explicitly dedicated to climate change adaptation to date. A report by the Fiscal Policy Agency for the Indonesian Ministry of Finance in 2020 (Center for Climate Change and Multilateral Policy, 2020) suggested that this may be rooted in various challenges, including the following:

- a) foreign investors face currency risks that are often required to be compensated by the issuer, which can be both costly and complicated to arrange, e.g. in the context of foreign exchange hedging tools
- b) issuing bonds makes little economic sense if the bond size is too small, i.e. when costs related to the issuance exceed the costs of a corporate loan
- c) green projects, including climate adaptation projects, are often perceived as not profitable; accordingly, there is a lack of a pipeline of bankable projects that can be financed through bond issuance
- d) Indonesia faces a lack of awareness and knowledge among potential issuers of green bonds; at the same time, there is a lack of affordable service providers that could advise on green bonds

(d) Examples of initiatives

1) Cargill strengthening smallholder farmer resilience

CSR/Creating shared value – Cargill, through their CSR/Creating shared value activity, “Strengthening smallholder farmers’ resilience in poultry sector in Blitar, East Java”, aims to improve the resilience of smallholder chicken farmers in Blitar District. The activity involves designing climate-adaptive chicken sheds following international standards and providing capacity building on proper poultry management for smallholder chicken farmers and the National People’s Farmer Association (Paguyuban Peternak Rakyat Nasional).

Cargill primarily invests time and know-how in the development and testing of climate-adapted chicken sheds, to increase their productivity. Moreover, it also co-develops training modules for farmers on good chicken farming practices, climate change and adaptation action, farm management and entrepreneurship. Cargill is thus investing in adapting its own business to climate change by helping its downstream supply chain, i.e. customers, to climate-proof their businesses. At the same time, it indirectly provides finance to enable poultry farmers in Indonesia to engage in climate adaptation, as they increase their farming businesses’ resilience and contribute to food security in times of changing climate.

2) PT Royal Lestari Utama and sustainable rubber⁵¹

⁵¹ <https://partnershipsforforests.com/partnerships-projects/enhancing-livelihoods-and-supporting-wildlife-conservation-through-sustainable-natural-rubber-production/>

Another prominent example of private sector engagement in sustainable farming in Indonesia is PT Royal Lestari Utama (RLU). The company, a joint venture formed in 2015 between Indonesian Barito Pacific Group and French Michelin, has established a sustainable rubber plantation. It aims to produce natural rubber in a climate-smart, socially inclusive, and wildlife-friendly way, combining its business with forest restoration, ecosystem conservation, and community programmes. The company applies the principle of environmental and social safeguards in its strategic decisions and daily operations. It uses an innovative blended finance scheme for investment, in close co-operation with and with support from the Government of India, USAID, BNP Paribas, and others. Through this initiative, Michelin, the second largest tyre manufacturer, is securing its rubber supply. Although climate change adaptation is not an explicit objective of the project, it is implicit in RLU's business model.

3) NbS in the watershed of Pasuruan – Danone and ICRAF⁵²

Pasuruan is home to Danone's second largest bottled water facility in Indonesia. The flow from the Rejoso natural spring that feeds Pasuruan has fallen by more than 20% since 2007. Experts estimate that failure to conserve water benefits in this watershed will result in zero water discharge in this area by 2040. Danone, the Danone Ecosystem Fund and World Agroforestry (ICRAF) have joined forces with the public authorities to invest in land management to improve water quality and quantity and to generate long-term benefits for people and nature, such as biodiversity preservation. Actions relate to horticulture upstream, complex agroforestry midstream and rice fields (10%) downstream of the 62,773 hectares of the Rejoso watershed.

The scheme is expected to protect the water supply and to result in an increase of up to 40% of farmers' income in horticulture and 15% in agroforestry. In addition, application of the System of Rice Intensification method will reduce methane emissions, uses less water, minimize the cost of production and increase yields by up to 20%. Results-based payments are made to farmers, based on water savings and improved quality of rice through carbon sequestration.

4) Community forestry and peat preservation (PreventionWeb, 2021)

In South Tapanuli, North Sumatra, the local community receives an incentive for restoring forest, including results-based payments and additional income through harvesting sustainable forest products.

⁵² <https://www.foodandlandusecoalition.org/case-studies/solutions/>

Table 18: Indonesia country summary

Crop	Importance	Climate impacts on the crop	MNCs	Large local firms	Financial initiatives
Total ag	13% of GDP. 28% of employment.				
Palm oil	1.5–2.5% of GDP. Employs 3m people. 40% produced by smallholder farmers.	Yields are expected to fall by 20%.	Cargill	Wilmar Group, Sinar Mas	Investment in development of improved seedlings that are disease-resistant and drought-tolerant. ⁵³
Rubber	0.5% of GDP 80%+ of rubber plantations owned by smallholder farmers.	The prolonged rainy and dry seasons in Indonesia have had a very detrimental impact, especially for agriculture, including rubber plantations, where the impact of these seasonal changes has resulted in significant economic losses.	Michelin	PT Royal Lestari Utama	Sustainable bond – blended finance including Government of Indonesia, USAID, BNP Paribas, and others. NbS dimension.
Rice	Staple food 80% produced by smallholder farmers.	Reduced yields, increasing water scarcity reducing income and leading to rural–urban migration.			Sustainable Rice Platform
Cocoa	0.1% of GDP 95% produced by smallholder farmers.	As rainfall patterns shift and temperatures climb, land suitable for cocoa cultivation will fall by 9% by 2050 (Amir, 2022).			

⁵³ Per Wilmar’s submission to CDP.



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