Vulnerability, adaptation, and equity in the face of climate change and interacting shocks: the case of smallholder cocoa farmers in the Central Region of Ghana

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Abstract

Climate change is interacting with other shocks to produce new vulnerabilities, reinforce existing hardships and food insecurity, and expose inequities. This thesis examines these dynamics using cocoa- and food crop-producing households in the Central Region of Ghana as an empirical case study. The research employs a mixed methods approach, including fieldwork insights primarily from semi-structured interviews, focus group discussions, and household surveys.

The first thesis paper contributes considerations of climate change to the literature on the cocoa lean season and the food security implications of farming cocoa compared to food crops. It evaluates the roles of cocoa and food crops in households' access to food during the lean season and extreme and variable weather. The findings highlight the critical role of food crops in sustaining households' seasonal food access in the context of climate change. The paper further argues that farmers need more climate adaptation support for their food crops, as government extension services instead prioritise the cocoa cash crop.

The second paper empirically examines how climatic events interacted with COVID-19 restrictions and disrupted cocoa payments over a two-year period. It proposes a novel methodological framework for more systematic assessment of vulnerability to multiple shocks and further examines the roles cocoa and food crops play in households' vulnerability and coping strategies. This paper finds that the interacting shock effects amplified households' income and food shortages, and exceeded households' capacity to cope.

The third paper critically reflects on the equity implications of remote collaborative fieldwork, using a novel application of a social equity framework. Drawing on how this doctoral research was conducted in the context of climate and COVID-19 crises, the paper evaluates nuanced trade-offs for global North researchers, Southern researchers, and Southern participants during such alternative ways of working. It finds that remote ways of working may encourage the redistribution of benefits towards Southern researchers but that contextual inequities between researchers and participants may remain.

This thesis argues that research and policy overlook food crops' essential role in smallholder farmers' incomes and food access in the face of climate change and multiple shocks, as cocoa income cannot consistently sustain households. However, due to cocoa-centred government priorities, farmers do not receive adequate support for their food crop production or adaptation, resulting in difficulties coping and hardships that will worsen as the climate crisis deepens. This research also contends that systematically unpacking the effects of multiple shocks contributes to a deeper understanding of vulnerability, empirically demonstrating this with analysis of climate change and COVID-19. Finally, this work encourages researchers to consider different modes of fieldwork and to actively interrogate the equity implications for the different actors involved.

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List of Abbreviations

COCOBOD	Ghana Cocoa Board
COVID-19	Coronavirus disease 2019
CWD	Cumulative Water Deficit
ECMWF	European Centre for Medium-Range Weather Forecasts
FAO	Food and Agriculture Organization of the United Nations
FORIG	Forestry Research Institute of Ghana
GDP	Gross Domestic Product
IPCC	Intergovernmental Panel on Climate Change
LBC	Licensed Buying Company
MoFA	Ministry of Food and Agriculture
NCRC	Nature Conservation Research Centre
NERC	Natural Environment Research Council
NGO	Non-Governmental Organisation
PFJ	Planting for Food and Jobs
TCDA	Tree Crop Development Authority

CHAPTER 1

Introduction

1.1 Motivation

In recent years, smallholder farmers worldwide have faced two major overlapping crises: climate change and the COVID-19 pandemic. The effects of both have brought great hardship to households, affecting their food security and incomes. This thesis argues that supporting vulnerable smallholders in adapting to these changes requires interrogating and reversing several dominant tendencies. First, the prioritisation by government agricultural and extension services of export-driven cash crops over the production and adaptation of locally consumed and traded food crops. Second, the propensity of research and policy to consider climate change in isolation, overlooking other interacting shocks. This thesis aims to challenge these pervasive notions and give voice to the hardships that smallholders face by shedding light on neglected vulnerabilities and opportunities for adaptation. At the same time, this thesis critically questions how research is conducted in the face of crises and sheds light on unaddressed equity issues and opportunities for change.

Climate change is contributing to weather extremes and climatic variations across the globe, threatening exposed sectors and causing particular harm to agricultural communities (IPCC, 2022). Approximately 3.5 billion people live in

contexts that are highly vulnerable to climate change, including smallholder farmers, who cultivate crops in rain-fed systems with limited resources (IPCC, 2022; Morton, 2020; Wudil et al., 2022). In recent years, research and policy globally have turned their attention to this crisis, aiming to support farmers. However, often the focus has been narrowly targeted on the adaptation of cash crops to climatic changes, to the exclusion of other relevant shocks and the importance of food crops (Afriyie-Kraft et al., 2020; Ahmad and Afzal, 2020; Amfo and Ali, 2020; Khan et al., 2022; Orimogunje et al., 2020; Schroth et al., 2016; Sudiana et al., 2020). This thesis uses cocoa smallholder farmers in the Central Region of Ghana as a case study to explore how the interacting effects of climate change and other shocks shape smallholders' vulnerability and how they are supported to adapt. It adds to the literature by analysing the roles that cocoa and food crops play in these processes. This thesis also addresses how interacting crises shape these types of research and the outcomes for participants and researchers.

An abundance of literature shows the threat of climate change to cocoa production in Ghana (Abdulai et al., 2020; Agbenyo et al., 2022; Anim-Kwapong and Frimpong, 2005; Läderach et al., 2013; Schroth et al., 2016). Conversely, comparatively little attention has been paid to the negative climatic impacts on key food crops (Chemura et al., 2020), which may be defined as staples that are used principally for subsistence and are often sold in markets (Barbier, 1989). Cocoa's major contribution to the national economy and farmers' incomes and status means the cash crop benefits from government, research, and policy attention (Hirons et al., 2018; ISSER, 2018). The Ghana Cocoa Board (COCOBOD)

sets a fixed producer price and supports farmers with extension services, encouraging them to reach national production and export targets (Ashiagbor et al., 2022). Yet, households also cultivate a variety of food crops which are essential for food security and provide some income through local trade, although prices can be low or volatile (Hashmiu et al., 2022b; Hirons et al., 2018). The importance of these crops to households, particularly in the context of a changing climate, has been overlooked as the Ghanaian government focuses on the dominant cocoa crop. Academic literature has compared the contributions of cocoa to food crops for household food security (Ajagun et al., 2021; Anderman et al., 2014; Hashmiu et al., 2022a; Wiggins et al., 2015), but not in the context of climate change. This thesis challenges the dominance of cocoa in policymaking and addresses the gap in the literature by considering the roles of both cocoa and food crops for households' incomes and food access during climatic events.

Climate change has impacts beyond direct crop production, disrupting markets, food prices, and supply chains, with further negative consequences for the incomes and food security of smallholder households (Cohn et al., 2017). Additionally, smallholders are vulnerable to the negative effects of further economic and social shocks which intersect with the impacts of climate change. Studying shocks in isolation can give an incomplete understanding of vulnerability as shocks interact and compound to create novel contexts and effects (O'Brien and Leichenko, 2000; O'Brien et al., 2007, 2009; Eriksen et al., 2011; Roxburgh et al., 2021). Yet, there have been relatively few empirical studies on how households, individuals or communities experience vulnerability to climate change in the context of other shocks and stressors (Antwi-Agyei et al.,

2017; McCubbin et al., 2015; Nyantakyi-Frimpong and Bezner-Kerr, 2015). To date, global- and regional-scale studies of interactions between COVID-19 and climate change have lacked analysis of the effects on individuals or communities (Goswami et al., 2021; Ingutia, 2021; Mishra et al., 2021; Rasul, 2021; Fromm, 2022). Furthermore, at the household level, research on the impacts of COVID-19 on smallholder farmers has not contextualised the pandemic amongst other shocks (Ayanlade et al., 2020; Huss et al., 2021; Moseley and Battersby, 2020; Paganini et al., 2020). Using the COVID-19 pandemic and an intersecting cocoa payment shock as a case study, this thesis argues against considering climate change or other shocks in a silo. It makes an empirical contribution to previous literature by analysing interactions with COVID-19 and late cocoa payments at the household level and presenting a novel methodology for systematically examining multiple shock dynamics.

Together, climate change and COVID-19 co-created new vulnerabilities, re-enforced existing ones, exposed structural inequities and prompted calls for reconsidering approaches to social science (Hulme et al., 2020; Manzanedo and Manning, 2020; Sultana, 2021). Qualitative research ultimately aims to give a voice to others, especially those who are marginalised (Roy and Uekusa, 2020). But *how* we conduct research is perhaps as important as *why*, particularly when working with marginalised or vulnerable groups. The pandemic provided an unprecedented opportunity for qualitative researchers to reflect on their research practices and ways of collaborating (Roy and Uekusa, 2020), and the climate crisis demands that researchers consider the contributions of their practices to carbon emissions, for example through flying for international fieldwork (Baer, 2019;

Whitmarsh et al., 2020). The data collection for this thesis was forced by COVID-19 travel restrictions to change to remote collaborative fieldwork: a model in which I remained in Oxford while my Ghanaian colleagues were in the field. Conducting field research in this way, during intersecting climate and COVID-19 crises, prompted deep reflection on the inequities between the researchers and participants involved. To gain a full understanding of interactions between equity and vulnerability to multiple shocks, I contend that it is vital to consider the research process itself as well as the outcomes for smallholders as participants.

To examine these interconnecting themes and add to debates on cocoa versus food crops, climate change interacting with multiple shocks, and qualitative research practices, this thesis builds an overarching theoretical approach underpinned by vulnerability, adaptation, and equity. The research approach employs mixed methods to examine these issues and draws on the illustrative case study of smallholder cocoa farmers in the Central Region of Ghana. The thesis first assesses the roles of cocoa and food crops in smallholder food security during climate shocks, then introduces interactions with multiple non-climatic shocks to the analysis, and finally examines the research process itself in considering equity and multiple crises.

1.2 Research questions

This thesis aims to understand how smallholders' vulnerability to climatic and other intersecting shocks is shaped by the production and sale of cocoa and food crops. It further seeks to unpack how the climatic and COVID-19 crises present opportunities for reconsidering equity in field research. Using smallholder cocoa farmers in the Central Region of Ghana as a case study, it asks the overarching questions: 'How do the interacting effects of climatic and other shocks shape cocoa smallholder households' vulnerability to food and income shortages, and their adaptation strategies?', and 'How does the way in which research on these shock effects is conducted further impact equity?'

Within this scope of inquiry, this thesis addresses three sub-questions:

1. What roles do cocoa and food crops play in households' food security during the lean season and climatic events, and how is their climate adaptation supported?
2. How did multiple shocks, including COVID-19 and climate change, interact to affect smallholders' vulnerability to food and income shortages?
3. How does conducting fieldwork through remote collaborations shape equity outcomes for Northern researchers, Southern researchers, and participants?

These questions are empirically examined across the three research papers presented in this thesis.

1.3 Thesis structure

This thesis follows the structure and requirements for an article-based thesis. It presents three research papers which form the empirical focus of this work and have been prepared for submission to international, peer-reviewed academic journals. Chapters 2 and 3, which precede the journal articles, provide context for the theoretical approaches that inform the research, and detail the case study and methods that inform data collection and analysis. Additionally, each manuscript is introduced with a short statement outlining linkages to the preceding chapter, the paper's focus, publication stage, and respective author contributions. Although I have taken care not to unnecessarily repeat information, due to the article-based nature of this thesis, certain methodological and case study descriptions and figures are inevitably repeated between the papers and the framing chapters. The following paragraphs lay out the chapters of this thesis.

Chapter 1 has provided the motivation for this thesis and presented the overarching research questions that the three papers address.

Chapter 2 reviews the literature which informs the three research papers, defines the concepts employed, and identifies knowledge gaps which the articles aim to fill. The literature review is divided into two main sections. The first provides the theoretical approaches of this thesis. It addresses the concept of vulnerability, particularly in the context of climate change and multiple shocks, and in relation to smallholders' food security and incomes. It links vulnerability to the concept of adaptation, focusing on coping in response to shocks. Finally, the review turns to the concept of equity and how it relates both to differences in vulnerability

between households and to different outcomes for the actors involved in field research. The second main literature section lays out the substantive context in which this research sits, starting with a review of smallholder vulnerability to climate change in sub-Saharan Africa, and Ghana in particular, and the role of extension services in adaptation. It then outlines the two dominant themes which run through this thesis, namely the intersecting crises of climate change and COVID-19, and tensions between prioritising cash versus food crops.

Chapter 3 presents the case study and methods employed in this research. It gives a brief overview of the case study villages in the Central Region of southern Ghana and justifies the selection of the specific study communities. It explains the phases of fieldwork, including data collected when I was present in the field in-person, and periods of remote collaborative fieldwork while I was based in the UK during COVID-19 travel restrictions. The chapter gives an overview of each of the data collection methods utilised in this thesis and maps how they relate to the relevant research paper(s). Finally, the chapter concludes with statements of positionality, ethics, and precautions taken for safety during COVID-19.

The subsequent three chapters are each an empirical research paper. **Chapter 4** introduces considerations of the effects of climate change to the literature on the food security implications of smallholder farmers producing the cocoa cash crop compared to food crops. It shows that food crops play an essential role in maintaining household food access through direct food production and providing income for purchase, particularly during the cocoa lean season and when cocoa yields fail due to extreme and variable weather. The paper directly

compares the provision and distribution of extension services between two types of crops. From doing so, it argues that support for the climate adaptation of food crops is overlooked by government extension services which prioritise the cocoa cash crop.

Chapter 5 expands the shock exposure focus to consider vulnerability of households to multiple shocks – climatic events, COVID-19 restrictions, and delayed cocoa payments – and how their interactions affect households' food security and income availability. It contributes a household-level multiple shock analysis to two emerging bodies of research: regional- and global-level analyses of COVID-19 and climate shock interactions, and household-level studies of the effects of COVID-19 in isolation. It proposes and implements a novel methodological framework for assessing household vulnerability to multiple shocks and further examines the roles of food crops and cocoa in household adaptation.

Chapter 6 adds to debates on equity in global North/South research by examining the equity implications of conducting fieldwork through remote collaboration for both researchers and participants. Research for this thesis took place within the context of intersecting climate change and COVID-19 crises. The pandemic precipitated a change to remote ways of working, and concerns about the justice of carbon emissions also prompted a reconsideration of international fieldwork travel. With the thesis research as its reflexive case study, this paper uses a social equity framework to assess equity outcomes of remote fieldwork collaborations for Northern and Southern researchers and participants.

Chapter 7 synthesises the novel findings of the three research papers in this thesis and discusses their insights for theory, research practice, and practical implications for policy. Suggestions for future research are made, based on the limitations of this research project and avenues of interest that arose from its findings.

The thesis concludes with a series of appendices which provide more context for the research project, including a COVID-19 impact statement, interview guides, training materials for the field team, and survey questionnaires. Much of the work I have done on equity in field research is advocacy and writing outside of the context of this DPhil. Such activities greatly informed my DPhil research practice and the thinking and scholarship for my third thesis paper. To illustrate this, I present my relevant publications in Appendix C. Finally, I bring the research to life with a selection of photographs from the field in Appendix D.

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CHAPTER 2

Literature Review

This literature review is divided into two main sections. The first addresses the key theoretical concepts that are used in this thesis, and the second presents the main thematic issues that the analyses in this research examine.

Part I: Key theoretical concepts

2.1 Introduction

This thesis uses three main theoretical concepts which connect across the papers, namely, vulnerability, adaptation, and equity. Table 1 illustrates how each paper utilises one or two core theoretical concepts and also links implicitly to other theoretical concepts in the thesis.

Table 1. Core and connecting theoretical concepts used across the thesis papers

	Vulnerability	**Adaptation**	**Equity**
Chapter 4. Cocoa vs. food crops: seasonal food security	Core	Core	Highly relevant
Chapter 5. Vulnerability to multiple shocks	Core	Core	
Chapter 6. Remote collaborative fieldwork	Relevant		Core

Conducting this doctoral research during the COVID-19 pandemic presented new opportunities for research topics and methods but also required a high level of adaptability in my research approach, as explained in Chapter 3, resulting in three linked but unusual papers. Chapter 4 focuses on vulnerability and adaptation to food insecurity during the lean season and climatic events, with

some consideration of inequities. Chapter 5 takes a deep dive into vulnerability to multiple shocks and the ability of households to adapt to and cope with them. Chapter 6 focuses on equity in the fieldwork approaches that emerged due to multiple shocks faced in the research process, and also takes into consideration the different vulnerabilities of the actors involved.

This literature review chapter addresses each of the theoretical concepts that frame my work. For each, I define the concept as I have used it, justify its use in this research, and explain how it is implemented in this thesis. I also outline the theoretical links between the concepts and the ways in which they connect the thesis papers together. I aim to provide the necessary context and overarching theoretical framing of the research project as a whole, rather than an exhaustive background to each concept. With this goal, only a subset of the vast relevant literature is presented, focusing on what then unfolds in the research papers. Further literature reviews on the specifics of how each theoretical concept is used in each research paper are contained in the empirical chapters themselves.

2.2 Vulnerability

2.2.1 Conceptualising vulnerability

Vulnerability has been conceptualised and operationalised in research in a number of different ways, across several fields and disciplines (Adger, 2006; Berry et al., 2006; Birkmann, 2006; Eakin and Luers, 2006; Füssel, 2007; Füssel and Klein, 2006; Giupponi and Biscaro, 2015; McLaughlin and Dietz, 2008; Räsänen et al., 2016; Ribot, 2014; Turner et al., 2003). In general, vulnerability research aims to understand the factors that put people at risk and reduce their ability to respond to threats (Cutter, 2003; Ford et al., 2018). In livelihoods approaches, vulnerability focuses on two aspects: exposure to an external risk, shock, or stress, and the means to cope without sustaining damage or loss (Chambers, 1989). Within the climate change literature, the concept is often used to examine the Impacts of climate change, including climate variability and extreme weather events (O'Brien et al., 2003). This is one of the core theoretical focuses of Chapter 4, the first empirical thesis paper, which examines the roles of cocoa and food crops in vulnerability to extreme and variable weather.

Studies seeking to identify where, how, and why human systems are negatively affected by climatic changes have burgeoned in the last two decades (Ford et al., 2018; McDowell et al., 2016; Räsänen et al., 2016). The field of vulnerability to climate change builds on natural hazards studies in the 1970s and 1980s (Hewitt, 1983; Hewitt and Burton, 1971; Liverman, 2001; Timmermann, 1981), and the subsequent emergence of vulnerability within livelihoods and development discourses (Chambers, 1989, 1994). Vulnerability was incorporated into climate-

related research in the 1990s, where it differed from natural hazards studies due to distinguishing characteristics of anthropogenic climate change, including its long-term, dynamic, global, and uncertain nature (Adger, 1999; Bohle et al., 1994; Downing, 1991). More recently, the Intergovernmental Panel on Climate Change (IPCC) has outlined a broad definition of vulnerability, stating that it is 'the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt' (IPCC, 2022, p5). I adopt this definition going forward in this thesis as the analyses in this research primarily consider how households are negatively affected by climatic events and other shocks and to what extent they are able to cope and adapt.

2.2.2 Approaching vulnerability to climate change

Historically, there have been two main approaches to assessing vulnerability within the climate change literature. The first, based on natural sciences and future climate change model scenarios, focuses on the 'end-point' or 'outcome' of the impacts of climate change and the effectiveness of efforts to respond (Ensor and Berger, 2009; Kelly and Adger, 2000). It considers the linear results of impacts

on a system[1], mitigated by adaptation measures (O'Brien et al., 2007). The second approach foregrounds the 'starting point' or 'context' instead, recognising that vulnerability is not only a product of biophysical influences but is also shaped by the socioeconomic conditions in which climate change occurs (Ericksen, 2008; Turner et al., 2003). This second interpretation of vulnerability focuses on the characteristics that make people and groups susceptible to change and capable of coping and recovering, including the influence of political, institutional, economic, and social structures and inequities (Adger and Kelly, 1999; Bennett et al., 2015; Cardona et al., 2012; O'Brien et al., 2007). A third view of vulnerability, and the one adopted in this thesis, is more integrated. It views vulnerability as a function of interactions between three aspects: exposure, sensitivity, and adaptive capacity (Adger, 2003; Marshall et al., 2010; McCarthy et al., 2001; Tuler et al., 2008; Turner et al., 2003). In this view, the vulnerability of an individual or group depends on both the exogenous change and a given system's social and technical capacity to cope with change at the time (Eakin, 2005; Fellman, 2012; Leichenko and O'Brien, 2008).

[1] In this thesis, the term 'system' is used as a unit of analysis, e.g., a household. While this research considers how relevant connected dimensions shape vulnerability, including access to markets and off-farm income sources, it does not aim to comprehensively analyse the entire agricultural system as per a systems thinking approach (Anandhi and Kannan, 2018).

According to this integrated approach to vulnerability, exposure relates to how a system experiences stress-causing changes, commonly referring to the intensity, frequency or duration of an acute shock or period of stress (Gallopín, 2006; Marshall et al., 2010; O'Brien et al., 2004). In climate change analysis, this can be exposure to aggregated climate variability or specific changes, such as temperature increases or changing patterns of precipitation (Fellman, 2012; Gitz and Meybeck, 2012). Sensitivity refers to the degree to which a system is affected or harmed, and this aspect is influenced by both local social and environmental conditions (Marshall et al., 2010; Tuler et al., 2008; Turner et al., 2003). The impact of a potential stressor is determined by the combination of exposure and sensitivity (Bennett et al., 2015). Lastly, adaptive capacity is the ability of a system to respond in order to reduce damage and even to take advantage of opportunities (Marshall et al., 2010; Parry et al., 2007). It is this capacity to respond to change that determines both the ultimate impact of a stressor and the overall level of vulnerability (Marshall et al., 2010; Parry et al., 2007). Adaptive capacity comprises both behaviour and access to resources and technologies, and is therefore influenced by the role of institutions and governments and can itself be impacted by an external shock (Adger et al., 2007; Gitz and Meybeck, 2012; Williamson et al., 2012). Overall, a system is less vulnerable if it is less exposed, less sensitive, or has more capacity to adapt (Smit et al., 1999; Smit and Wandel, 2006).

The concept of vulnerability can be used in reference to both shocks and stressors (Shackleton et al., 2014). In this thesis, I focus on shocks, which I define as 'unique or semi-periodic perturbations that have immediate and long-term consequences', according to work by O'Brien et al. (2003, p3). Shocks are

differentiated by stressors in temporal terms. The former are characterised by sudden disruption, in contrast to the latter's gradual change or long-lasting pressure (Gitz and Meybeck, 2012; Leichenko et al., 2010; McDowell and Hess, 2012). Some literature, predominantly in the field of economics, distinguishes between idiosyncratic shocks that affect individuals or single households, such as injury or illness, and covariate shocks that affect many at the same time, such as drought (Ansah et al., 2019, 2021). In my analyses in Chapters 4 and 5, I refer only to covariate shocks to which households across the study communities were exposed, such as extreme weather events and the COVID-19 lockdown. Focussing this research on the effects of large-scale shocks that were commonly experienced across households, and how households were able to respond to them, allowed wider conclusions to be drawn than focussing on events that only affected certain individual households.

2.2.3 Links between vulnerability and resilience and equity

Vulnerability and resilience are related concepts that have been considered as two sides of the same coin (Adger and Kelly, 2001). Yet a crucial difference in the temporal framing of the two concepts renders vulnerability most appropriate for the analyses in this thesis. Resilience can be defined as the 'ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner' (IPCC, 2012, p5). It emphasises three critical features: absorptive capacity (coping strategies for moderate impacts), adaptive capacity (incremental adjustments), and

transformative capacity (the ability to create a fundamentally new system) (Béné et al., 2013; Folke, 2006; Folke et al., 2010; Miller et al., 2010; Walker et al., 2004). In doing so, resilience adds a temporal dimension to the concept of vulnerability, putting a greater emphasis on the capacity of systems to recover from shocks, challenge the status quo and transform themselves in the long term (Béné et al., 2014; Folke et al., 2009; Gitz and Meybeck, 2012; O'Brien, 2012).

The analyses presented in the thesis papers focus on households' immediate responses to the effects of shocks, as the study households tended to lack the transformative capacity to recover from shocks or create longer-term change in the face of disturbances. Moreover, our data collection period was too short to adequately address resilience and long-term dynamics. Vulnerability – rather than resilience – is therefore used as a core framing to assess the shocks considered in Chapters 4 and 5.

The vulnerability analyses in this thesis bring important questions of equity to light. Vulnerability is specific to contexts and scales, and dynamically emerges as socio-political and economic processes and structures are negotiated (Antwi-Agyei et al., 2017; Brooks et al., 2005; O'Brien et al., 2003). Even within a given community, differences between the rights and opportunities afforded to households, such as access to resources and government support, shape adaptive capacity in such a way that households may be unequally affected by the same shock (Adger, 2006; Eakin and Luers, 2006; O'Brien et al., 2007; Thomas et al., 2019; Yamin et al., 2005). Moreover, efforts to reduce vulnerability at the community level may not necessarily result in just and equitable outcomes

between households and may even further entrench existing inequalities (Mearns and Norton, 2009; Thomas and Twyman, 2005). Key determinants of vulnerability relate to people's agency and internal assets, including land and income, and external or institutional factors, such as access to education and government support services (Füssel, 2007; Jones et al., 2010). Many studies have examined the differentiated vulnerabilities of Ghanaian households, based on individuals' or household heads' intersecting social identities such as gender, age, and ethnicity (Carr and Thompson, 2014; Lawson et al., 2020; Nyantakyi-Frimpong, 2020; Thompson-Hall et al., 2016; Wood et al., 2021). In Chapter 4, I use survey data to disaggregate households according to such demographic characteristics, for example, investigating differences between households headed by men and women. However, I find that the results of survey analyses were richest when related to households' access to assets and support, rather than household members' social identities. The equity dimensions of my vulnerability analyses in this thesis, therefore, focus on differences between the vulnerability of households, as mediated by aspects such as their land size and access to extension services. I further discuss my approach to equity in Section 2.4 of this literature review.

2.2.4 Use of vulnerability approaches

Analyses of vulnerability can be approached from different disciplines, time horizon focuses, spatial scales, and various methodologies (Fellman, 2012). In this thesis, I focus on short-term vulnerability at the household scale, using mixed

methods (see Chapter 3). In its application, vulnerability can be specified as vulnerability of 'what' to 'what' (Carpenter et al., 2001). The first 'what' refers to the system and particular components that are affected, and the39econdnd is the risks that can occur (Gitz and Meybeck, 2012). In this thesis, I examine the vulnerability of households' finances and food security to the various harmful effects of climatic events and other shocks. Below, I outline the ways in which the concept of vulnerability relates to food security, income, and multiple shocks.

2.2.4.1 Vulnerability and food security

Several studies across different smallholder contexts have examined the vulnerability of households to food insecurity due to climate change, either in isolation (Giannini et al., 2021; Mbuli et al., 2021; Mutengwa et al., 2023; Sietz et al., 2012), or amongst other shocks (Antwi-Agyei et al., 2017; Bacon et al., 2021; Gautam and Andersen, 2017; McCubbin et al., 2015; Segnon et al., 2021; Zavaleta et al., 2018). My first two thesis papers make two main contributions to this literature. First, in Chapter 4, I take a deep dive into temporal aspects to examine how climate change affects households' seasonal food access among Ghanaian cocoa farmers. Second, in Chapter 5, I empirically examine vulnerability to food security due to multiple interacting shocks, including climatic events and the COVID-19 pandemic. Below, I review the relevant theoretical literature on which these empirical contributions are based.

According to a widely-accepted definition proposed at the World Food Summit (1996), food security 'exists when all people, at all times, have physical and

economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. It can be conceptualised in four dimensions, as follows: *availability* of food through production or purchases; *access* to sufficient resources to obtain food; *stability* of food access and availability; and *utilisation* of food for nutritional benefit (FAO, 2006). There is abundant evidence demonstrating how different dimensions of food security are affected by climatic changes such as more frequent and intense extreme climatic events, decreased freshwater resources, drought and flooding, higher temperatures, and the spread of crop diseases (Vermeulen et al., 2012; Sivakumar and Ndiang'Ui, 2007; Tirado et al., 2010; Easterling et al., 2022). For example, a period of low precipitation might reduce crop yield and therefore reduce food availability. This, in turn, might then affect the crop price, causing an economic driver that impacts households' access to food (Ziervogel and Ericksen, 2010).

Much of the literature that explicitly links vulnerability with food security focuses on the dimension of access, as this dimension depends on income, affordability and access to markets (Barrett, 2007; Ziervogel and Ericksen, 2010). Households' ability to access food is affected by external factors and shocks, for example, by crop production failure due to extreme weather events or market food price volatility (FAO, 2008; Leach et al., 1999). Both of these examples may apply in smallholder contexts as households consume what they produce and also sell portions of their yields to purchase additional foodstuffs and ingredients (Burchi & De Muro, 2016). Vulnerability to food security, especially issues of access, is shaped by assets, including land, labour and money, and the trading

options available, and therefore differs between households (Burchi and De Muro, 2016; Kansanga et al., 2022). For example, smallholder households in the same geographical context may be similarly exposed to food insecurity drivers during the lean season but may experience its severity and onset very differently (Kansanga et al., 2022). My assessments of vulnerability to food security in this thesis also focus on food access and relate this to households' assets, access to markets, and government support.

In Chapter 4, I situate food access as part of stability and examine temporal aspects of how households' food security varies according to crop seasons and extreme and variable weather. Food stability concerns the presence of continuous access to food and food supplies and recognises that sudden shocks can contribute to transitory food insecurity (Devereux et al., 2004; Schmidhuber and Tubiello, 2007). The food stability of a household can also vary due to regular seasonal variations in income or food supply, which then are affected by climate variability, price fluctuations, and political and economic shocks. (Ziervogel and Ericksen, 2010). This underwrites the approach taken in Chapter 4, where I consider the effects of extreme and variable weather on households' food stability using a vulnerability framing.

As well as considering the effects of climatic changes on food security, it is important to consider the contextual socioeconomic, political, and institutional factors that act as drivers of vulnerability (Ericksen, 2008). In Chapter 5, I contextualise climate change amongst other shocks, including COVID-19. Several authors have explored the effects of this pandemic on smallholder

households' food security, considering COVID-19 in a silo (Ayanlade et al., 2020; Huss et al., 2021; Moseley and Battersby, 2020; Paganini et al., 2020). For example, Moseley and Battersby (2020) found that COVID-19 affected economic access to food by increasing food prices and reducing incomes, and also reduced physical access as markets were closed. Other researchers have contextualised COVID-19, investigating the twin effects of the pandemic and climate shocks on smallholders' food security, but at a regional or global scale (Goswami et al., 2021; Ingutia, 2021; Mishra et al., 2021; Rasul, 2021; Fromm, 2022). My second thesis paper bridges these groups of research by addressing how COVID-19 and climate change affected smallholders' food security, focusing on analysis at the household level.

2.2.4.2 Vulnerability and incomes

My inclusion of income in the vulnerability analysis in Chapter 4 of this thesis is predominantly in the context of its role in facilitating food access. However, in Chapter 5, I additionally use income as a measure of economic vulnerability to three shocks: climatic events, COVID-19 restrictions, and late cocoa payments.

Among smallholder farmers, climate change has significant effects on both food security and livelihoods (Williams et al., 2018). Incomes play a key role in determining vulnerability in both these areas, mediating households' food access through purchases and shaping their means of living (Ericksen, 2008; Maganga et al., 2021; Orr and Mwale, 2001; Ziervogel and Ericksen, 2010). Various framings of social vulnerability therefore consider household income to be a key

socioeconomic factor determining vulnerability to climate change and other stresses (Blaikie et al., 2014; Cutter, 2013; Füssel, 2007; Ligon and Schechter, 2003; Oluwatayo, 2019). Measurements of household income levels are, therefore, often used to assess the economic factors that contribute to climate change vulnerability (Bedeke, 2023; Dumenu and Takam Tiamgne, 2020). Indeed, many studies across smallholder contexts have shown that higher incomes correlate with reduced household vulnerability to climate change and other shocks, as incomes provide economic security and stability that increase the capacity to withstand and cope with the negative effects of shocks (Bedeke, 2023; Börner et al., 2015; Djoudi et al., 2016; Dumenu and Takam Tiamgne, 2020; Mutabazi et al., 2015; Shackleton and Shackleton, 2004). Chapters 4 and 5 use smallholder farmers' self-reported assessments of household incomes and the effects that shocks had on them.

Climate shocks can affect smallholders' incomes and amplify poverty in a number of ways, for example, driving crop failure and decreasing employment opportunities (Gbetibouo and Ringler, 2009; Munasinghe, 2011; UNDP, 2007). When effects are severe, smallholders have been found to describe states of 'economic hardship' driven by agricultural income losses, affecting both their wellbeing and access to food (Beyeler et al., 2023). Similarly, income losses due to COVID-19 restrictions, whether from mobility restrictions or lockdown regulations, affected smallholders' access to food and economic security (Béné, 2020; Kharel et al., 2023). Chapter 5 unpacks these interacting economic dynamics in the context of multiple shocks.

2.2.4.3 Vulnerability to multiple shocks

Within the literature on climate change and human vulnerability, climate change has typically been seen as the main driver of vulnerability and examined in isolation from socioeconomic shocks or stressors (Räsänen et al., 2016; Reid and Vogel, 2006). Some critiques of vulnerability have questioned its ability to capture the full complexities of climate-society dynamics and raised concerns that this approach privileges climatic factors over other social issues (Ford et al., 2018). In response, some authors have emphasised the importance of recognising the role of interacting non-environmental conditions, such as social, economic, political, and institutional processes, in shaping people's vulnerability to climate change (Eakin and Luers, 2006). Others have gone further and argued that climate change is one of several, or many, stresses that cause vulnerability and often find that climate is not the most pressing factor affecting vulnerability (Räsänen et al., 2016).

Different concepts have emerged around vulnerability to climate change in the context of other disturbances, including considering 'multiple stressors' (Adger, 2006; McCubbin et al., 2015; O'Brien et al., 2004; Turner et al., 2003), 'other stressors' (Tschakert, 2007), 'non-climatic factors' (Füssel and Klein, 2006), and 'multiple exposures' (Belliveau et al., 2006; Bennett et al., 2016). Several of these terms build on O'Brien and Leichenko's (2000) seminal paper on 'double exposure', in which they assess the impacts of economic globalisation and global environment change. Since then, the term has been applied more loosely to consider the dual impacts of global environmental change and any other socio-political changes, or to discuss multiple stressors in other ways (Bunce et al., 2010;

Mubaya et al., 2012; Reid and Vogel, 2006). However, despite great theoretical progress, there have been relatively few empirical studies on how households, individuals or communities experience vulnerability to climate change in the context of other shocks and stressors (Antwi-Agyei et al., 2017; McCubbin et al., 2015; Nyantakyi-Frimpong and Bezner-Kerr, 2015). Instead, studies have often focused on regional or global models which fail to capture experiences or heterogeneity within communities or the agency people have in responding to changes (Bennett et al., 2015; Brklacich et al., 2010; Bunce et al., 2010).

In Chapter 5, I build on the double exposure conceptual framework to analyse the impacts of three interacting shocks on smallholder farmers, of which climate change is one. Rather than considering 'multiple stressors', my assessment focuses on what I term 'multiple shocks'. Drawing on O'Brien et al.'s (2003) definition of a 'shock', noted in Section 2.2.2, I define 'multiple shocks' as overlapping or interacting perturbations of a unique and sudden nature that have immediate and long-term consequences. The paper contributes to the literature on multiple shocks/stressors in two main ways. First, I propose a methodological framework, using components from the double exposure conceptual framework, to systematically analyse vulnerability to multiple shocks. Second, I make an empirical contribution by using this methodology to assess vulnerability to extreme and erratic weather events, COVID-19 restrictions, and late cocoa payments at the household level. Following the recommendation of Räsänen et al. (2016), mixed methods are used to triangulate between different data sources and assess the impacts of the disturbances.

Alongside my vulnerability analyses in Chapters 4 and 5, I examine households' adaptation measures and coping strategies, which link to the integrated view of social vulnerability that includes adaptive capacity (Brklacich et al., 2010). I outline these theoretical connections in Section 2.3.3.

2.3 Adaptation

2.3.1 Conceptualising adaptation

Adaptation has been defined as 'the process of adjustment to actual or expected climate and its effects in order to moderate harm or take advantage of beneficial opportunities' and plays a key part in reducing vulnerability and exposure to climate change (IPCC, 2022, p5). Like vulnerability, the concept originated from the natural sciences and has more recently been applied to socioecological systems (Smit and Wandel, 2006, p286).

Several scholarly works have suggested different forms of adaptation, such as planned versus reactive (Adger et al., 2003; Eriksen et al., 2011; Nelson et al., 2022). Planned adaptations tend to result from interventions from public and policy-making agencies in anticipation of disruptions (Nelson et al., 2022). On the other hand, reactive adaptation is a response triggered by ecological, market, or welfare changes and takes place without the direction of public agencies (Nelson et al., 2022). Rural households often rely on reactive adaptation due to their limited access to alternatives and limited control of coping options, although some authors contend that even these strategies require some degree of anticipation (Cooper et al., 2008; Paumgarten et al., 2020). For example, the accumulation of assets which are then sold in response to a shock (Paumgarten et al., 2020). The IPCC also distinguishes between incremental adaptation, in which the essence of a system is maintained, and transformational adaptation, in which fundamental attributes are changed in anticipation of the impacts of

climate change (IPCC, 2022). Again, smallholders may have limited capacity to transform their livelihoods and adopt deep and long-lasting changes.

2.3.2 Adaptation and coping

Timing relative to a stimulus is considered within the adaptation literature to be a key way of classifying forms of adaptation (Dessalegn, 2018; Folke et al., 2002; Smit and Wandel, 2006). Adaptation tends to denote medium- to long-term adjustments and enduring changes, whereas the adoption of short-term measures is referred to as 'coping' (Eriksen et al., 2005; Smit and Pilifosova, 2001; Yohe and Tol, 2002). In smallholder farming contexts, adaptation helps households to not only reduce the negative impacts of shocks on their livelihoods and wellbeing, but also to become better off or benefit from new opportunities related to the changing environment (Eriksen et al., 2011; Osbahr et al., 2008). These could include activities such as changing the timing of crop planting and harvesting and using improved varieties of crops (Aniah et al., 2019; Antwi-Agyei et al., 2014; Antwi-Agyei and Nyantakyi-Frimpong, 2021; Challinor et al., 2014; Deressa et al., 2009; Lawson et al., 2020; Yamba et al., 2019).

On the other hand, household coping strategies are short-term measures to reduce the negative effects of shocks, often over a time frame of less than one year (Cooper et al., 2008; Engle, 2011). They are short-term, location-specific and autonomous activities that often aim to counter immediate negative impacts and restore a previous state (Eriksen and Kelly, 2007; Yohe and Tol, 2002). Coping also differs from adaptation in institutional aspects, as coping strategies take

place within the existing institutional structure of the system under consideration, whereas adaptation strategies may require alteration of institutional structures (Antwi-Agyei et al., 2014; Eriksen et al., 2005). Coping strategies employed by smallholder farmers include, for example, eating less food, changing diets, buying food, reducing spending on agricultural inputs, and earning additional income from off-farm activities (Ahmed et al., 2019; Aniah et al., 2019; Verma and Falendra Kumar Sudan, 2021). However, scholars have raised concerns that increasingly frequent and intense climatic shocks may overburden households' range of coping strategies and push them beyond their capacity to cope (Börner et al., 2015; Coulibaly et al., 2015; Smit and Wandel, 2006).

Despite much literature differentiating between the categories of adapting and coping, there are clear overlaps between the two. Eriksen and Kelly (2007, p505) note that the two processes are 'related' as improving coping mechanisms is an important part of adaptive strategies and Antwi-Agyei and Nyantakyi-Frimpong (2021, p3) consider adaptation to be 'an advanced form of coping'. Some argue that the dichotomy between the two is misrepresented, as, with institutional support, coping strategies can be transformed into adaptive strategies and households may use their coping strategies to adapt (Berkes and Jolly, 2002; Berman et al., 2012; Fabricius et al., 2007). Strengthening households' existing range of coping strategies has, therefore, been framed as a possible way of facilitating early forms of adaptation (Castells-Quintana et al., 2018; Cooper et al., 2008). Furthermore, some authors argue that supporting households' engagement in short-term coping strategies and long-term adaptation is

important for reducing their overall vulnerability (Eriksen and Silva, 2009). In Chapters 4 and 5, I examine households' coping strategies and investigate ways in which institutional support could strengthen households' ability to adopt longer-term adaptation measures.

2.3.3 Links between adaptation and vulnerability and equity

Adaptation is closely linked with the concepts of vulnerability and adaptive capacity, as adaptations can be considered as 'manifestations of adaptive capacity' and 'ways of reducing vulnerability' (Smit and Wandel, 2006, p286). Whereas adaptive capacity represents the potential of a system to change its characteristics or behaviour to cope with existing or anticipated external stress, adaptation is actual action due to the realisation of adaptive capacity (Adger et al., 2004; Brooks, 2003; Fellman, 2012). Adaptation, therefore, fits in with my use of vulnerability in this thesis as it is an action or strategy that reduces vulnerability by mediating the outcomes of a shock. Adaptation research and policy have been dominated by a focus on climate change, but literature on adaptation to multiple stressors has emerged alongside work on vulnerability to multiple stressors. Authors have argued that understanding the interactions between climate change and other social and economic changes over different spatial scales and timeframes is central to designing effective adaptation policies (O'Brien and Leichenko, 2000; Räsänen et al., 2016; Silva et al., 2010; Turner et al., 2003). Some literature is emerging about household-level adaptation to multiple stressors (Freduah et al., 2018; Porcuna-Ferrer et al., 2023). For example,

McDowell and Hess (2012) find that households require flexibility and access to key resources to effectively adapt to exposure to multiple stressors. However, more understanding is needed about context-specific interactions, adaptation processes, and the consequences of responses to intersecting shocks at the household-level (Ensor et al., 2019; Freduah et al., 2018; McDowell and Hess, 2012; Porcuna-Ferrer et al., 2023). Chapter 5 of this thesis contributes to this gap through its empirical analysis of household adaptation and coping in response to three interacting shocks: COVID-19 restrictions, extreme and erratic weather events, and late cocoa payments.

Questions of equity and distribution of access are inevitable when considering adaptation, and it is important to address the underlying vulnerabilities and inequalities that shape households' ability to adapt (Tschakert and Machado, 2012). One critique of vulnerability is the perceived association between the term and portrayals of impacted populations as 'helpless victims' who require the assistance of 'skilled' outsiders, especially in a global South-North research or policy setting (Joakim et al., 2015). My use of adaptation in this thesis counters this potential risk by focusing on households' agency and ability to make changes and decisions. However, the concept of adaptation has been criticised for putting the onus on vulnerable households to adjust, rather than responsibility falling on the social structures that shape vulnerability (Ribot, 2011). It is therefore important to note that, at the local level, the ability to undertake adaptations is reflective not just of internal decision-making, but also of broader influences and conditions, such as access to financial and technological resources, political conditions, infrastructure, and institutional systems such as the availability of

state subsidies (Adger, 1999; Ensor and Berger, 2009; Eriksen et al., 2011; Kelly and Adger, 2000; Nelson et al., 2022; Smit and Pilifosova, 2001; Smit and Wandel, 2006). As such, indicators of adaptive capacity in studies often include households' access to such resources (Eakin and Bojórquez-Tapia, 2008). Ultimately, households' adoption of adaptation and coping strategies depend on multiple factors, including the nature and extent of the shock, household characteristics, and contextual conditions such as access to financial capital, markets, and public services (Cooper et al., 2008; Gautier et al., 2016; Osbahr et al., 2008; Paumgarten et al., 2020; Tran, 2015; Van Aelst and Holvoet, 2016). In Chapter 4, I engage with these issues to examine how agricultural extension and adaptation support differ between households, thereby highlighting inequities in access to important government services. I further discuss how I engage with equity in this thesis in the following section of this literature review.

2.4 Equity

The concept of equity has a long history in the social sciences, with literature across disciplines addressing questions related to people's dignity and rights (Fisher et al., 2019; Leach et al., 2018). A key distinction between equity and equality emerges when looking at these bodies of research (Leach et al., 2018). Although often used as synonyms, the two terms refer to different concepts. Equality refers to 'evenly distributing a given "pie"' whereas equity implies equality in regards to broader ideas of fairness and justice (McDermott et al. 2013). Equity may be interpreted to imply 'more for those who need it', and strive to ensure that everyone has what they need for wellbeing in a given context (Leach et al., 2018, p3). Such an interpretation considers social differences between individuals and groups and considers how to overcome people's respective barriers in order to attain fairer outcomes (Fisher et al., 2019; Guy and McCandless, 2012). Equity may be considered to encompass both material aspects, such as distribution of resources, and normative aspects, such as representing people with respect (Sen, 2009). In this thesis, the concept of equity is used explicitly in a social equity framework in Chapter 6, and issues of equity also emerge in our analyses in the other papers, especially when considering incomes and access to extension services in Chapter 4.

Questions of equity commonly arise in climate vulnerability and adaptation literature, as scholars examine the drivers of vulnerability and peoples' adaptive capacities (Eakin and Luers, 2006; Mearns and Norton, 2009; Thomas et al., 2019; Thomas and Twyman, 2005; Yamin et al., 2005). Equity as pertaining to

vulnerability and adaptation tends to be framed around two dimensions. First, distributive justice, or the fair allocation of goods and services, including the benefits of adaptation support (Araos et al., 2021; Conevska et al., 2019; Paavola and Adger, 2002, 2006; Stults and Woodruff, 2017, 2017). Second, procedural justice, which refers to the inclusion and participation of marginalised individuals or groups in decision-making processes and planning (Araos et al., 2021; Holland, 2017; Paavola and Adger, 2002).

References to equity in Chapter 4 of this thesis focus on distributive justice, particularly differences between households' access to resources, incomes, and coping strategies. Studies on smallholder farmers have consistently found that households with larger assets and more access to resources are often less vulnerable to food insecurity and more capable of coping with shocks (Ansah et al., 2019). Differences in demographic variables, such as individuals' or household heads' age, gender, ethnicity and educational attainment are often linked to people's ability to cope with the negative effects of shocks (Adger and Kelly, 1999; Antwi-Agyei and Nyantakyi-Frimpong, 2021; Carr and Thompson, 2014; Scheraga and Grambsch, 1998; Smit and Pilifosova, 2001; Tschakert and Machado, 2012; Van Aelst and Holvoet, 2016). For example, farmers with access to large lands may have more flexibility to diversify their crops (Scoones, 1998; Smit and Pilifosova, 2001). Within a given community, there may be great differences in how resources are distributed. Moreover, climate adaptation responses that do not adequately incorporate equity considerations deepen existing inequalities (Araos et al., 2021; Williams et al., 2020). So, adaptation support needs to be carefully considered in how it is decided and distributed. In

Chapter 4, I take up these concepts of distributive justice to focus on how household differences in demographic factors and access to resources such as income and land correlate to their levels of food insecurity and equity issues in the distribution of government extension and adaptation support.

In Chapter 6, I turn from equity between households to consider dynamics between the groups of researchers and participants involved in the field research process. In this, I introduce two further dimensions of equity. First, contextual equity, which considers the broad historical, social, political, and economic conditions that shape differences in people's power and abilities to benefit from given processes (Fraser, 2009; Leichenko et al., 2023; McDermott et al., 2013; Thompson-Hall et al., 2016; Pascual et al., 2014). Second, recognitional equity, which refers to respecting actors' rights, values, and interests (Schlosberg, 2007; Sikor et al., 2014; Wells et al., 2021). All four equity dimensions, including distributional and procedural justice, and the trade-offs across them, are considered in turn within a social equity framework which I employ in the paper (McDermott et al., 2013; Pascual et al., 2014).

I incorporate considerations of how disparities in vulnerabilities between groups result in an 'uneven playing field' into the analyses contained in Chapter 6 (Larson and Ribot, 2007; Wells et al., 2021). In this case, vulnerability is framed slightly differently from how I framed it above in considering smallholders' susceptibility to harm from the effects of climate change or multiple shocks. Here, vulnerability is relational and refers to some groups being more or less vulnerable to 'exploitation' (in the broadest sense of the word) within the

particular context of the fieldwork encounter (Baillie Smith and Jenkins, 2017; Eggleton et al., 2017; Von Benzon and Van Blerk, 2017). In Chapter 6, this specific context is remote collaborative fieldwork, in which Ghanaian researchers conducted data collection with smallholders whilst I remained in the UK during COVID-19 travel restrictions. When Northern researchers conduct fieldwork in the global South, Southern participants are often considered to be the most vulnerable group in the research process (Aldridge, 2014). Yet, Northern researchers bring their own concerns to fieldwork and may also be vulnerable in differing ways to participants or hold vulnerable positions within the context of their own research institutions (Ballamingie and Johnson, 2014; Jackman et al., 2022; Kirsch, 1999; Paula, 2020). Through exploring these dynamics and the way in which each group comes to the field research process with their own concerns, vulnerability is linked to equity in the analysis in Chapter 6.

Chapter 6 is also partly framed in the wider context of concerns for climate justice, which relates to the uneven burden of the effects of climate change often falling on communities who have contributed to the problem the least (Pettit, 2004; Schlosberg and Collins, 2014; Sultana, 2022). Recently, this inequity has prompted academics, who often incur a high carbon footprint in their travel for research activities, to consider ways of reducing their flying (Baer, 2018, 2019; Dwyer, 2013; Grant, 2018; Whitmarsh et al., 2020). My personal concerns about this, combined with the push of COVID-19 travel restrictions, prompted an alternative way of conducting field research, the equity implications of which I examine in Chapter 6.

2.5 Summary of theoretical concepts

In this discussion of the literature, I presented the three main theoretical concepts, and their interconnections, that form the foundation for my research papers. Together, vulnerability, adaptation, and equity each shed a different light on the key substantive issues of smallholder farmers' experiences of climate change and interacting shocks and ways of conducting this research. This research in this thesis therefore lies at the junction of the several concepts presented in this literature review. Table 2 summarises how my three research papers draw on different elements of these theoretical concepts to underline my empirical analyses.

Table 2. Use of the key theoretical concepts for analysis in the thesis papers

Chapter	Vulnerability	Adaptation	Equity
Chapter 4. Cocoa vs. food crops: seasonal food security	Household vulnerability to food insecurity	Roles of cocoa and food crops in coping strategies in response to food insecurity	Differences between households' food security and access to extension/ adaptation services
Chapter 5. Vulnerability to multiple shocks	Household vulnerability to food insecurity and income shortages, methodological framework for assessing vulnerability to multiple shocks	Coping strategies in response to multiple shocks	
Chapter 6. Remote collaborative fieldwork	Vulnerabilities of different actors involved, i.e. who is 'vulnerable' in the research processes		Equity outcomes and trade-offs for Northern researchers, Southern researchers, and participants

In the following section, I review the literature related to the main substantive issues that I explore in this thesis. I present the current debates and the ways in which my research papers contribute to them.

Part II: Key thematic issues

Having laid out the theoretical approaches that underpin the analysis in my three empirical chapters, the following reviews the literature related to the substantive themes and empirical problems addressed in this thesis. It aims to contextualise and ground the work as a whole, identify knowledge gaps, and provide an overarching backdrop against which the case study and empirical analyses of individual papers sit.

2.6 Cash and food crops

2.6.1 Defining cash and food crops

A key dimension of this thesis is the examination of the roles and importance of cash compared to food crops to smallholders' food security and incomes. I use Barbier's seminal paper from 1989 to distinguish between the two groups. According to his definition, food crops are staples that are used principally for subsistence and are often sold in markets. The food crops referred to in this research are either consumed in the household and/or sold in local markets. Cash crops, on the other hand, are always sold and may be either a food or a non-food commodity, such as rubber or tea. Studies and policy reports from different contexts globally have focussed on the contributions of cash and food crops to smallholder farmers' incomes, employment opportunities in the rural economy, and risks to sustaining food security (Schneider and Gugerty, 2019; Phororo, 2001; Wiggins et al., 2015; Achterbosch et al., 2014; Nanbol and Namo, 2019). The

research on cash and food crops in this thesis examines these aspects in the context of climate change and other shocks.

Although the terms 'cash crops' and 'export crops' are often used synonymously, cash crops can refer to crops that are traded domestically. In this case, however, the cash crop in question, cocoa, is produced by smallholder farmers in Ghana but then exported. The two groups of crops differ greatly in their marketing systems, governance structures, and climate sensitivities, and the roles they play in households' food security and incomes. Chapters 4 and 5 of this thesis examine aspects of their production and sale, and how these dimensions interact with questions related to smallholders' vulnerability and adaptation.

2.6.2 The production and sale of cocoa and food crops in Ghana

In Ghana, cocoa plays a critical role in both local and national economies, supporting over 800,000 farmers, mostly smallholders, and contributing approximately 3.5% of gross domestic product (GDP) (Asante et al., 2023; OPEC Fund, 2022). Cocoa is the dominant cash crop in the Forest-Savannah Transition Zone of Ghana, with relatively few households in the region producing other cash crops, such as cashews, due to historical climatic suitability (Hashmiu et al., 2022a). Smallholder cocoa farmers in Ghana tend to manage the crop under relatively intensive conditions with limited access to technologies and no irrigation (Läderach et al., 2013). The cocoa trees require continuous labour investments throughout the year, resulting in a minor harvest earlier in the year and then a major harvest later, from approximately September to February

(Glendinning, 1972). The cocoa in Ghana is closely controlled by the Ghana Cocoa Board (COCOBOD), a standalone government body which sets a fixed producer price and supports farmers with extension services, encouraging them to reach national targets for production and export (Ashiagbor et al., 2022). At the local level, smallholder farmers sell bags of cocoa beans to licensed buying companies (LBCs) for a standard fixed producer price, who in turn sell the bags to COCOBOD (Kolavalli and Vigneri, 2017). The beans undergo quality control tests before they are exported. As cocoa is traded on the international market, its price is influenced by global stocks and demand and is subject to international pressures (Kolavalli and Vigneri, 2017).

In contrast to cocoa, the food crops that form a focus of this thesis are used domestically, rather than being exported. Many cocoa-farming households produce food crops such as cassava, maize, plantain, and vegetables, either intercropped with cocoa plants to provide shade to seedlings during the establishment and rehabilitation of cocoa lands, or on separate lands (Duguma et al., 2001; Amfo and Ali, 2020; Osei-Bonsu et al., 1998). Typically, yields from these food crops are consumed in the household and/or sold by the producers at their farmgate, in their village or in nearby markets, often to be transported through a chain of buyers for eventual sale and consumption in urban centres (Victor, 2007). Markets and demand for these food crops are volatile, with studies finding that farmers perceive high risks of low returns from 'lack of a ready market' or sometimes excess local supplies of a given crop, resulting in poor pricing (Asante et al., 2017; Hashmiu et al., 2022b). Food crops in Ghana fall

under the remit of the Ministry of Food and Agriculture (MoFA), but, unlike COCOBOD, the body does not set a fixed price for the sale of food crops.

2.6.3 Agricultural extension services in Ghana

The structure and management of government extension services in Ghana have undergone many modifications over the last several decades (Attipoe et al., 2021). Extension services are now relatively decentralised, with power and decision-making deferred to the district offices with the aim of meeting the needs of farmers, particularly at the local level (Asare-Nuamah et al., 2019; MoFA, 2005; Anang et al., 2020). Government extension services for cocoa and food crops are, on the whole, separate and provided by COCOBOD and MoFA's respective extension divisions. The role of agricultural extension is primarily educational, with agents providing farmers with information, lending institutional support, and otherwise helping meet their farming needs, for example, through the transfer of technologies (Maponya and Mpandeli, 2013; Somanje et al., 2021). The provision of extension supports the principles of inclusiveness and equity through supporting farmers and sustainable development, and MoFA expressly aims to improve food security, target rural development, and tackle environmental challenges through its extension service policies (MoFA, 2022; Fleurbaey et al., 2014). However, studies have found that the provision of extension services as a whole in Ghana is constrained by a number of issues that have resulted in high extension service deficits in most rural communities (Asare-Nuamah et al., 2019). These include a lack of extension officers, poor

coordination, transport limitations, lack of extension materials, inadequate funds, and poor implementation strategies (Sigman, 2015; Asare-Nuamah et al., 2019; Sova et al., 2014; Antwi-Agyei and Stringer, 2021). Indeed, a lack of extension services has been identified by cocoa farmers as the second most significant barrier constraining their agricultural activities (Attipoe et al., 2021).

While some farmers and farmer groups receive extension services from non-governmental organisations, international cocoa companies, and LBCs (Anang et al., 2020; Attipoe et al., 2021), this thesis predominantly focuses on services provided by the COCOBOD and MoFA. This is, firstly, because government services are the predominant form of extension received in the study villages; and secondly, also to allow for more direct comparison of service provision between cocoa and food crops.

2.7 Climate change effects and adaptation

2.7.1 Climate change in Ghana

Climate change is resulting in changes in climate variability and the frequency, intensity, duration, and timing of extreme weather events (IPCC, 2012). Rather than attempt to attribute specific weather patterns or events to anthropogenic climate change, in this thesis, I follow a similar approach to Bryan et al. (2013) who consider climate change to be 'perceived changes in average temperature, average rainfall or rainfall variability of the past 20 years' (p30). Climate change is an urgent threat and further change is inevitable as existing atmospheric concentrations of greenhouse gases have locked in a warmer environment, regardless of future emissions (Di Falco and Veronesi, 2013). Low-latitude countries are most vulnerable, with the IPCC predicting that even relatively low levels of warming of 1-2°C will threaten water availability, food security, and human health in sub-Saharan Africa (IPCC, 2022).

Studies examining climate variability in Ghana have found significant temperature increases and variations in rainfall, with evidence suggesting that the country's climate is becoming drier and more prone to extreme climate events, such as drought and storms, across agroecological zones (Abbam et al., 2018; Asante and Amuakwa-Mensah, 2014; Hirons et al., 2018; Sissoko et al., 2011; Antwi-Agyei and Stringer, 2021). In recent decades, temperatures across Ghana have risen, while rainfall levels have generally reduced, and precipitation patterns have become increasingly erratic (Asante and Amuakwa-Mensah, 2015). Since the 1960s, the mean annual temperature in Ghana has increased by

approximately 1°C, with temperatures rising in all agroecological zones (World Bank, 2021). Over the same period, Ghana's rainfall has also been affected, with an overall reduction in cumulative rainfall of 2.4% per decade and increasingly erratic rainfall patterns (Awuni et al., 2023). Most notable periods of climatic variation in the last few decades in Ghana have included a drought from 1983 to 1984 that caused yearlong bushfires, very hot conditions in 1989, and excessive rainfall in 1991, 1995, 2006, and 2007 (Asante and Amuakwa-Mensah, 2015).

The effects of future climate change in Ghana are also expected to be severe. Based on World Bank (2021) projections, in business-as-usual scenarios where further efforts are not made to reduce greenhouse gas emissions, temperatures across agroecological zones are projected to rise by an average of 1.68°C by 2050 in the wet season and 1.74°C in the dry season. Anomalies of precipitation of -22.2mm to +30.4 mm are also expected by 2050, meaning erratic rainfall with periods of both drought and flooding. Northern parts of Ghana are expected to experience lower rainfall than southern regions.

These climatic changes are having, and will continue to have, significant negative effects for millions of farming households in Ghana (Antwi-Agyei and Stringer, 2021). Furthermore, warmer temperatures as the climate changes lead to high atmospheric water vapour deficits, which increases water stress on plants and tree mortality, even if rainfall does not change (Bauman et al., 2022; Rifai et al., 2019). Agriculture in sub-Saharan Africa is characterised by small-scale rainfed farms with a high reliance on natural resources (Di Falco and Veronesi, 2013) such that production conditions are largely exogenously (or climatically)

determined (Sherlund et al., 2002). In the following sections, I review the literature on the effects of climate change on cocoa, food crops, and food security in Ghana.

2.7.2 Projected climate impacts on cocoa and food crops

Much has been written about the current and predicted impacts of climate change on cocoa production in Ghana. The crop is considered to be climatically sensitive to changes in temperature and precipitation, especially drought conditions, with most potential growing regions predicted to decrease in size (Carr and Lockwood, 2011; Läderach et al., 2013; Schroth et al., 2016; Antwi-Agyei et al., 2012). The maximum number of cumulative dry months in Ghana is predicted to decrease from the current four to three by 2050, whilst the mean annual temperature may increase by 2.1°C, approaching cocoa's heat tolerance limits in some areas (Schroth et al., 2016). More severe and frequent dry spells and changes in rainfall timing are also expected (Schroth et al., 2016; Hirons et al., 2018). Overall, Ghana's cocoa-suitable area will shrink, although regions will not be uniformly affected and there will be landscape-level heterogeneity in impacts due to local biophysical differences such as soil conditions and shade levels (Hirons et al., 2018; Läderach et al., 2013). Cocoa smallholder farmers are already perceiving climatic changes, such as temperatures rises, and many are aware of and concerned about climate change (Bunn et al., 2019; Läderach et al., 2013).

Food crop production in Ghana is also negatively affected by climate impacts, with increasing temperatures, longer dry periods, and unpredictable and

variable rainfall threatening a number of food crops (Chemura et al., 2020; Tetteh et al., 2022). Root crops in Ghana have been shown to be sensitive to the effects of climate variation in the past, for example declining during drought conditions (EPA, 2008). Owusu-Sekyere et al. (2011) found that yields of maize, cassava, plantain and cocoyam in southern Ghana have been declining gradually since 1993 due to climatic changes. Furthermore, Hirons et al. (2018) found that the intensified dry season during the 2015/16 El Niño event adversely affected staple food crop cultivation, including maize, cassava, and vegetables. Overall, the yields of major staples, including maize and cassava, are expected to further decrease by 7–27% by 2050 in parts of sub-Saharan Africa and warming of 4°C risks the production of maize becoming unviable (Schlenker and Lobell, 2010; IPCC, 2014). Different climate scenarios have shown that cassava yields may be halved by 2080 (EPA, 2008).

2.7.3 Impacts of climate change on food security

The impacts of climate change on crop species can include decreased freshwater resources, the spread of pests and diseases, changes to the range and abundance of crop species, and drought and flooding (Vermeulen et al., 2012). In Ghana, these effects significantly affect food production, to the great detriment of the nation's food security and particularly smallholder households who rely on their own food production (Asare-Nuamah and Mandaza, 2021). For example, Hirons et al. (2018) found that Ghanaian households were forced to supplement their food resources with market purchases during a drought which affected the yields

of their staple crops, exacerbating cash shortages and creating difficulties in paying for healthcare and education. Changes in climate have also induced seasonal changes in smallholders' food security, leaving households in some of the most deprived communities in Northern Ghana with gaps in their food availability which last for months (Quaye, 2008).

Food insecurity is not caused only by failures in agricultural production and crop yields but is also strongly influenced by access to food purchases at market, even among farming households (Devereux and Maxwell, 2001; Tyler et al., 2013; Downing, 2002). Climate variability and extreme weather events can affect rural food production, transportation, processing, price volatility, and storage of food at the local level (Codjoe and Owusu, 2011; Wossen and Berger, 2015). Yet, food security studies in Ghana have paid less attention to assessing household food security from an access perspective, focussing instead on the dimension of availability (Asare-Nuamah and Mandaza, 2021). This thesis addresses this gap by examining smallholder households' food access and stability in the context of climate variability and multiple shocks. I note that climate change also affects the composition and nutritional contents of some plants (Soares et al., 2019; Myers et al., 2014), but assessing these impacts on crop species was beyond the scope of this work.

2.7.4 Climate adaptation in Ghana

Smallholder farmers engage in both autonomous and assisted coping strategies and adaptation practices (Thornton and Manasfi, 2010). In Ghana, households'

concerns about the effects of climate change mean some are employing on- and off-farm adaptation strategies and short-term coping practices. These include changing the timing of planting, planting different crop varieties, changing diets in response to price fluctuations and crop yields, selling assets, and diversification of livelihoods, including off-farm income generating activities (Asare-Nuamah and Mandaza, 2021; Antwi-Agyei et al., 2014; Antwi-Agyei and Nyantakyi-Frimpong, 2021). However, smallholders require more external support to adopt beneficial adaptive strategies, as they face major barriers due to underlying poverty, restricted access to markets, and limited credit, information and inputs (Bryan et al., 2013; Antwi-Agyei et al., 2015; Yiran and Stringer, 2017). In one study in Ghana, Aniah et al. (2019) found that farmers' adaptation strategies to climate change are dominated by the application of chemical inputs, which is costly and places a high financial burden on households (Asare-Nuamah and Mandaza, 2021). Due to these barriers and limitations, smallholder farmers in sub-Saharan Africa have been found to have low adaptive capacity to climate change, which increases their vulnerability to its effects (Connolly-Boutin and Smit, 2016; Asare-Nuamah et al., 2019; FAO, 2015).

The Ghanaian government has implemented various initiatives and programmes to support farmers' adaptation to climate change. However, some researchers consider there to be a disjuncture between national-level and local-level adaptation in Ghana, and criticise national policy-making processes for not adequately involving or representing smallholder farmers' experiences and knowledge (Asare-Nuamah and Mandaza, 2021; Sarpong and Anyidoho, 2012). Government climate change adaptation programmes for cocoa include projects

to improve sustainable resources and land management, for example, the Environmental Sustainability and Policy Cocoa Production Project (Asare-Nuamah and Mandaza, 2021). In light of the uncertainty about the exact effects that climate change will have in the future, Bunn et al. (2019) recommend 'no-regret' practices for adapting cocoa that will have socioeconomic benefits regardless of the climate outcome. These include planting diverse shade trees, food crop diversification, the use of pest- and disease-resistant crop varieties, and enhancing farmers' access to credit. However, there is little adoption of such practices by Ghanaian smallholder farmers due to barriers such as limited access to credit, secure land tenure, labour, education, agricultural inputs, and extension services (Asaaga et al., 2020; Bunn et al., 2019; Thomas and Twyman, 2005).

To support farmers' food crop adaptation, MoFA undertook the West Africa Agricultural Program and the Root and Tuber Improvement and Marketing Program to alleviate the impacts of climate change and improve socioeconomic development (MESTI, 2015). More recently, the flagship Planting for Food and Jobs (PFJ) project aims to increase incomes and food security by improving the agricultural production of crops including maize, rice, cassava, and vegetables, including tomato, onion, and pepper (MoFA, 2018). However, although the programme intends to target resource-poor smallholders, Pauw (2022) found that more educated and wealthier farmers are more likely to participate and benefit. Addressing smallholders' adaptation is not just about 'technological quick-fixes' but must consider social differentiation and equity within the communities and who benefits from adaptation strategies (Hirons et al., 2018).

Targeted measures such as addressing the inconsistent and unequal distribution of subsidised inputs are key (Morel et al., 2019). Furthermore, the PFJ programme's aims to reduce the impacts of climate change have been criticised for poor planning related to climate adaptation strategies and a lack of proactive measures to help farmers improve their climate resilience (Chutab, 2023).

Many studies have demonstrated the critical role of extension services in facilitating smallholder adaptation to the effects of climate change, improving adaptive capacity through the transfer of knowledge and skills, provision of inputs, giving of technical advice, and demonstration of technology and innovations (Asare-Nuamah et al., 2019). As a result, extension services in Ghana have been widely found to improve farmers' awareness of climate change and promote their adoption of soil improvement technologies, improved crop varieties and chemical fertilisers across cocoa and other cash crops, such as pineapples, as well as food crops (Emmanuel et al., 2016; Antwi-Agyei and Stringer, 2021; Asare-Nuamah et al., 2019; Anang et al., 2020). Yet, as described in Section 2.6.3 above, agricultural extension officers face crucial barriers that limit their ability to implement adaptation practices and provide farmers with support (Antwi-Agyei and Stringer, 2021). Furthermore, studies to date have tended to focus on adaptation support from either COCOBOD or MoFA, rather than encompassing or comparing the two, as I do in Chapter 4.

2.7.5 Non-climatic effects on households

While most empirical studies focus on the effects of climate change alone on crop production in Ghana, a few also consider the role of other socio-political and economic factors on households. Nyantakyi-Frimpong and Bezner-Kerr (2015) find that land-grabbing, unfavourable market conditions and lack of access to credit were key socioecological challenges to their farming activities. In Northern Ghana, Antwi-Agyei et al. (2017) identified a range of key non-climatic household stressors, including a lack of money, limited market access, expensive farm inputs, and a lack of storage facilities. Both of these studies, and others based elsewhere in sub-Saharan Africa (Quinn et al., 2011; Batenga et al., 2023), conclude that households perceive certain non-climatic pressures to be more important or acute than the impacts of climatic variability and change. These papers emphasise the need to consider agroecological, socioeconomic, and institutional factors to help households overcome barriers to adaptation and they argue that focusing only on climate change restricts understanding of household vulnerability. Furthermore, in a recent study on smallholder farmers in Senegal, Porcuna-Ferrer et al. (2023) found trade-offs in responses to multiple stressors, as short-term adaptation to one stressor can lower farmers' future adaptive capacity to respond effectively to others. Chapter 5 of this thesis builds on these studies by considering the interacting effects of multiple shocks, rather than pressures or stressors, on smallholder households and how they interact with climate variability.

2.8 Conclusion

This section of the literature review has provided the context for the empirical analyses presented in Chapters 4, 5, and 6. It has presented the dichotomy between cash and food crops in Ghana, explained the context of government extension service provision, and outlined the climate-related challenges faced by smallholder farmers in the study area. This review has also identified where our understanding is limited and established the knowledge gaps that my thesis research addresses.

Together, the two sections of this literature review underscore the theoretical and empirical contributions that this thesis makes. Further literature is included in Chapters 4, 5, and 6 to provide additional framing to chapter-specific content (see summary in Table 3). The next thesis chapter will present the research project's case study and outline the methods used to collect and analysis data.

Table 3. Additional substantive areas addressed in the literature reviewed in the thesis papers

Paper	Literature reviewed
Chapter 4. Cocoa vs. food crops: seasonal food security	- The lean season among smallholder cash crop/cocoa farmers - Periods of food insecurity as a result of climate change - Marketing of and government role in cocoa and food crop production and trade in Ghana - Current debates on the trade-offs between cash and food crop production and effects on smallholder farmers' food security
Chapter 5. Vulnerability to multiple shocks	- Vulnerability studies exploring interactions between COVID-19 and climatic events - The double exposure framework and other ways of considering vulnerability to multiple shocks and stressors - Effects on smallholders of climatic events interacting with other shocks
Chapter 6. Remote collaborative fieldwork	- The rise of online/remote fieldwork methods - Existing discussions of equity in online/remote fieldwork methods - Origins and dimensions of the social equity framework - Current debates on equity issues related to fieldwork and how they relate to dimensions of contextual, distributive, procedural, and recognitional equity

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CHAPTER 3

Research sites, methods, and data

This methods chapter aims to provide contextualising and linking information for the case study sites, overarching research design, and methods and data collection processes used across the papers in this thesis. Further details on methods employed in the analysis for each specific paper are included in the relevant methods sections of Chapters 4, 5, and 6.

3.1 Case study site

3.1.1 Reasons for the selection of the study area

Data collection was conducted in seven forest-fringe communities in the area surrounding Kakum National Park and near the town of Assin Foso, in the cocoa belt of southern Ghana (see Figure 1 and maps in Chapters 4 and 5). This region was selected as the location of this doctoral research for several reasons. Firstly, the landscape is considered a 'hotspot' of forests and cocoa production, as it is dominated by smallholder farmers who primarily cultivate cocoa as their main cash crop (NCRC, 2020). Secondly, farmers also produce a range of food crops, such as maize, cassava, plantain, oil palm, rice, and a variety of vegetables, depending on the households' resource availability and preferences. Typically, a

portion of the food crops is consumed in the home, and a portion is sold at the farm gate, in the farmers' community or at a market. Each study village has access to one or more local marketplaces at which food crops are sold, and foodstuffs and household items can be purchased. Thirdly, the region is appropriate for the analysis of smallholder vulnerability to climate change as, like in large parts of sub-Saharan Africa, the dominant rainfed systems of crop cultivation are highly sensitive to extreme and variable weather (IPCC, 2022; Morton, 2007). For example, the Ghanaian cocoa belt area in which the case study is located is projected to become hotter and more prone to unpredictable rainfall patterns, requiring site-specific climate adaptation strategies for cocoa production (Bunn et al., 2019; Schroth et al., 2016; Läderach et al., 2013). Finally, background knowledge of this research context and connections to researchers based in the Kakum area was facilitated by previous studies conducted by researchers in the Environmental Changes Institute at the University of Oxford as part of the ECOLIMITS project (Hirons et al., 2016, 2018a, 2018b, 2018c).

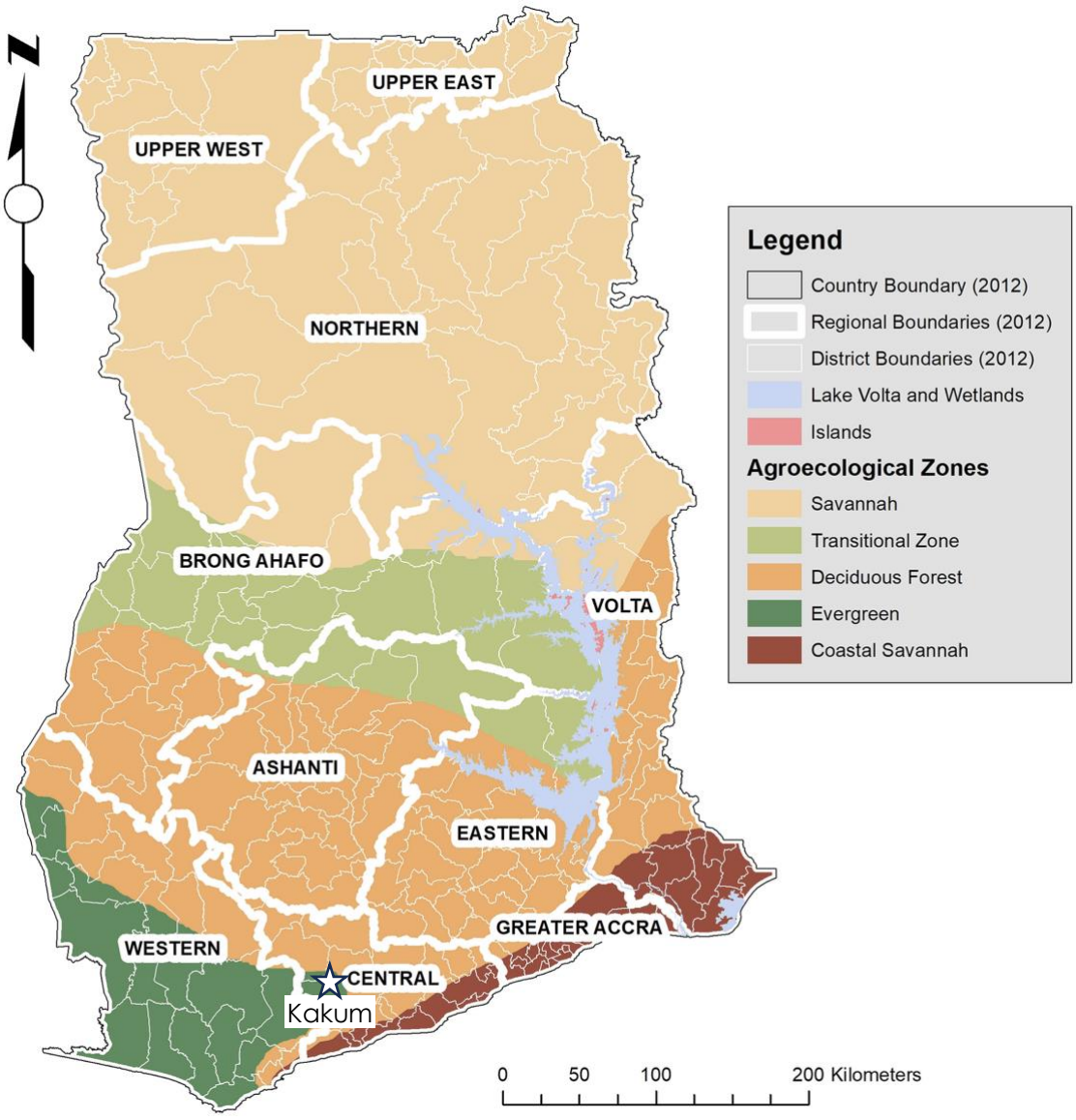


Figure 1. Location of the Kakum field sites (base map from Abbam et al. (2018))

3.1.2 Description of the study site

The Kakum area is dominated by the protected Kakum National Park, a 37,500ha forest which was gazetted in 1992 such that very limited access is permitted for

local farmers (Tscharntke et al., 2011). During my scoping trip, some farmers living next to the forest reported benefits of a stable microclimate and wetter conditions due to its proximity. Annual precipitation in the Kakum area ranges from 1,200 to 1,400mm and temperatures average between 24 and 27°C (Morel et al., 2019).

The communities surrounding the forest have been established for around 50 to 80 years (Hirons et al., 2018c) and are currently made up of households farming cocoa (the primary cash crop), oil palm, staple food crops, and other vegetables on relatively small plots of land (<5ha) (Asaaga et al., 2020). In this thesis, a household is understood as a unit of people who typically 'eat from the same pot' (Codjoe et al., 2016; Puorideme and Christensen, 2020). Farming is characterised by rainfed production with little mechanisation and cocoa yields are low due to limited fertiliser application, low pollination, and dry conditions (Morel et al., 2019). As cocoa is both sensitive to climatic conditions (short-term) and grown over long time periods, there are limited opportunities to implement some agronomic adaptations, such as changing crops or varieties, and clearing forest for new farms is increasingly unfeasible (Friedman et al., 2018; Hirons et al., 2018c). These plots of cocoa land therefore often do not provide sufficient income to farmers (Läderach et al., 2013). It is therefore common for households to have several diverse income sources (on average five), with the dominant ones being cocoa (supplying 45% of income), annual crop farming (supplying 8%), and petty trading (supplying 6%) (Hirons et al., 2018c). Traditionally, food crops are grown whilst cocoa plants are being established to protect the seedlings, however, as land is becoming more scarce and thus less new cocoa is being planted,

permanent food crop fields are increasingly being established (Hirons et al., 2018c). Farmers in this study are characterised as 'smallholders' as they tend to cultivate small pieces of land totalling less than 5 hectares (see Section 4.3.1), have low usage of inputs, and be highly vulnerable to risk, for example, from the effects of climate change (Chamberlin, 2008).

3.1.3 Political economy of cocoa production landscapes

The cocoa sector in Ghana dates back to the late 19th century, during British colonial rule (Leiter and Harding, 2004). Cocoa became the backbone of the national economy, leading to the establishment of institutions and policies in the 20th century that still influence the sector today. Cocoa is the most significant contributor to agricultural GDP and is highly important for foreign exchange generation (ISSER, 2018; Dompreh et al., 2021). Cocoa production and sale in Ghana is overseen by COCOBOD (see Section 2.6.2 for details on COCOBOD and the production of cocoa in Ghana), who determine the fixed producer price that farmers receive for each standard 64kg bag of cocoa beans – 2,070 Ghana cedis for the 2023/2024 cocoa season. However, this producer price is affected by the export price of cocoa, making Ghanaian smallholder farmers vulnerable to global price fluctuations (Kolavalli and Vigneri, 2017). Factors such as international demand, production levels in other cocoa-producing countries, and global economic conditions impact international prices.

The cocoa industry in Ghana is predominantly composed of smallholder farmers, who, according to estimates, produce more than 90% of the country's cocoa

(Wessel and Quist-Wessel, 2015). Cocoa farming is deeply embedded in the cultural heritage of many smallholder communities in Ghana. Farmers take pride in their role as stewards of the land and producers of one of the country's most important crops. Many cocoa-farming families in the study communities have been established in the area for decades, with current farmers relying on traditional knowledge and practices passed down through generations. However, despite the cultural importance of cocoa, producing communities are struggling with trends of rural-urban migration as young people, in particular, are increasingly turning to other livelihoods rather than engaging in cocoa farming (Anyidoho, 2012). This is leaving an ageing population in many smallholder farmer communities. Further challenges are presented by high poverty levels in villages as farmers struggle to earn sufficient income from cocoa yields and additional income sources, such as food crop production and off-farm activities, and lack access to credit or financial services (Boeckx et al., 2020).

Smallholder cocoa farmers in Ghana tend to manage the crop under relatively intensive conditions with limited access to technologies or irrigation (Läderach et al., 2013). The cocoa trees require continuous labour investments throughout the year, peaking during the major harvesting season, from approximately September to February. Cocoa farming on smallholder farms is often a collective effort, with members of the whole family contributing to activities. Some households hire additional paid labourers on a daily basis during certain periods. Communal community-based shared labour arrangements also exist in many cocoa farming villages, such as the practice of 'nnoboa,' in which farmers work together to harvest pods from each other's farms in turn (Aneani et al., 2017).

Many smallholders are also members of cooperatives or farmer groups, which may offer access to credit, technical assistance, shared learning, and support. Smallholder farmers across Ghana also receive education and support through government extension services provided by COCOBOD and MoFA (a detailed explanation of extension services is provided in Section 2.6.3). Non-governmental organisations, international cocoa companies, and LBCs may also offer services in some communities (Anang et al., 2020; Attipoe et al., 2021).

Extended family networks also often provide support in terms of financial assistance, childcare, and social safety nets and are a key foundation of the social structure of cocoa farming communities. Women play a vital role in cocoa farming, often involved in gender-specific tasks such as fermenting and drying cocoa beans. However, women frequently face disparities in land ownership, access to resources, and decision-making power in communities (Friedman et al., 2018). Land governance in Ghana and the region is under a pluralistic legal framework, with both state legislations and local customary laws. However, the latter dominates the tenure regime, especially in rural agricultural areas, such that nearly 80% of all land is owned by traditional authorities under a variety of customary tenure arrangements (Asaaga and Hirons, 2019).

3.1.4 Selection of the study villages

In order to capture variation between communities, I purposely selected villages according to population size and location. In the absence of community-specific demographic data at the time of site selection, this approach captured some

variation in microclimate, land ownership dynamics, and community composition in the region. Researchers from a collaborating organisation, the Nature Conservation Research Centre (NCRC), spatially mapped the villages in the Kakum Hotspot Intervention Area (HIA) and grouped them into three size categories according to approximate population size: 'small', 'medium', and 'large'. No further information on the demographic composition of the communities was available, so I primarily based village selection decisions on size and logistical criteria.

In consultation with NCRC researchers — who live and work in the communities — about vehicle accessibility and levels of research fatigue in each community, I selected one village in each size category in both the Northern and Southern halves of the HIA region and in the Southern half, resulting in six communities in total. An additional 'large' seventh village was added, as I had visited it with NCRC researchers during my initial scoping trip, and had already established some relationships with community leaders and smallholders. Some preference was given to villages previously involved in the ECOLIMITS survey (Hirons et al., 2018b, 2018c) in order to have continuity if I used these data, in addition to my own interviews and focus group discussions. However, I later opted to collect my own survey data to more specifically target my research questions and because it was one of the methods that seemed most feasible to co-ordinate remotely whilst I was in the UK during pandemic restrictions. The research team entered into the selected study communities by initially making contact with community leaders and established NCRC research contacts.

3.2 Methodological approaches

3.2.1 Collecting data in a pandemic: timeline of in-person and remote fieldwork

To better understand the research context and engage farmers and community leaders in setting the research agenda, I conducted an initial scoping visit to the study area in November 2019. Following this, I had planned to conduct my fieldwork over three trips: April-May 2020, October-November 2020, and spring 2021 (see Appendix Figure 1). However, the onset of the COVID-19 pandemic forced me to radically change my research plans. I felt committed to the communities that I had visited and the research gap that I had identified during my scoping trip and that I had outlined in my Transfer of Status (passed in April 2020), entitled 'Food crops and climate resilience in Ghana's smallholder cocoa landscape'. I therefore persisted in trying to find ways to make this field-based research happen, rather than starting again and adopting a new desk-based project.

In the long months of uncertainty and pandemic travel restrictions that ensued, I found, hired, and trained a team of Ghanaian scientists, mostly FORIG (Forestry Research Institute of Ghana) staff. Given that I was in Oxford and they were in Kumasi and Assin Foso, training in qualitative focus group discussion and survey methods took place over many WhatsApp calls and message exchanges. When the team was in the field, we communicated through weekly, or often daily, check-ins and debriefs. Collaborating 'remotely' was an extremely rewarding and challenging experience, which gave rise to a number of ethical

challenges which led me to identify the research gap for my third thesis paper (Chapter 6).

As soon as the lifting of travel restrictions and guidance permitted, I returned to Ghana to conduct in-person, semi-structured interviews in January 2022, and then again in March 2023. The interviews were semi-structured and more flexible than the survey, allowing live decision-making to shape the direction of the discussion. It was, therefore, important that I conducted them myself, but online interviews are not possible in villages with low internet connectivity. Table 4 gives the timeline of my in-person and 'remote' DPhil fieldwork.

Table 4. Timeline of fieldwork activities

Date	**Activity**	**Fieldwork location**
November 2019	Scoping trip	In-person
June 2021	Focus group discussions (14 groups)	Remote
October - November 2021	Pilot survey (30 participants) Survey (270 participants) Survey reflection reports (from 4 researchers)	Remote
January 2022	Interviews: farmers, market sellers, and key informants (52 participants)	In-person
March 2023	Interviews: farmers and key informants (32 participants) Focus group discussions (2 groups)	In-person

3.2.2 Overview of data collection and mixed methods

The three thesis papers draw on a variety of methods (see breakdown by paper in Table 5). The first two thesis research papers employ mixed methods, using both qualitative and quantitative data collection techniques to better understand the research problems (Creswell and Plano Clark, 2018). Mixed methods are compatible with explorative research processes and may bolster the evidence for interpretations as the strength of one method may offset any weaknesses of another (Creswell and Plano Clark, 2018; Glaser and Strauss, 1999). In order to combine different insights about the same phenomena, I used mixed methods to triangulate between different types of data (Creswell, 1999). Triangulation not only validated and corroborated results from different data sources, but deepened and broadened my understanding through comparison of results on the same topic (Creswell, 1999; Olsen, 2004; Creswell and Plano Clark, 2011; Elliott and Timulak, 2005). In the following sections, I outline the main data collection methods used for this research.

My three main methods of data collection in this doctoral research were: 16 focus group discussions, a survey with 270 participants, and 84 semi-structured interviews. Focus groups can play an invaluable role in defining research objectives and gaining background and contextual information on a topic to be explored in-depth later in the research process as they provide insights into collective views of issues (Lloyd-Evans, 2006). Surveys allowed me to gather a wide range of demographic and agricultural information and subjective views from a representative sample of smallholder farmers (Simon, 2006). However, surveys are limited in the extent to which they can explain patterns or explore

attitudes and opinions; I addressed these limitations using semi-structured interviews (Willis, 2006). In the following sections, I outline the timing and approach for each of the three main thesis methods. Photographs of the fieldwork and data collection are presented in Appendix D.

Table 5. Overview of methods employed in each thesis paper

Paper	Data collected and from whom
Chapter 4. Cocoa vs. food crops: seasonal food security	- Semi-structured interviews: smallholders, market sellers, key informants from MoFA, COCOBOD and LBCs - Focus group discussions: smallholders - Survey: smallholders
Chapter 5. Vulnerability to multiple shocks	- Semi-structured interviews: smallholders, market sellers, key informants from MoFA, COCOBOD and LBCs - Focus group discussions: smallholders - Meteorological data - Government announcements and newspaper articles
Chapter 6. Remote collaborative fieldwork	- Semi-structured interviews: smallholders, Ghanaian research colleagues - Focus group discussions: smallholders - Reflexive written reports: Ghanaian research colleagues - My own field notes based on in-person fieldwork and remote phone calls with the field team

3.2.3 Focus group discussions

All three papers draw upon focus group discussions, ranging in size between four and 15 participants. Community leaders helped to select participants

representing different demographic backgrounds across ages, genders, and community positions. The first discussions, conducted while I was 'remote' in the UK in June 2021, helped ground my understanding of the demographic and agricultural make-up of the study villages, the roles food crops play for households, and the key challenges communities face. The field researchers initially conducted a series of pilot focus group discussions in smallholder villages which they were familiar with near Kumasi. These were useful for training the field team and testing the planned questions and discussion prompts.

In the main focus group discussions, groups were gender-disaggregated in order to fully capture women's perspectives, as roles, experiences, and needs may differ between genders and women's voices may be marginalised in public forums (Gurung and Leduc, 2009). The lead researcher moderated the discussion by asking each participant to answer in turn for certain questions and encouraging all participants to have the opportunity speak for the rest of the questions. Participants were asked at the beginning to listen carefully to others and respect all voices. The discussions were held in Twi by one researcher, while another took live notes in English, and were between one and two hours long.

We conducted a further two mixed-gender focus group discussions in March 2023, which I led 'in-person'. These aimed to further explore issues that had been raised in other methods and to understand public attitudes, collective views, and group contradictions (Lloyd-Evans, 2006). In particular, the groups discussed the importance of food crops and attitudes to involvement in research processes for this DPhil and other research projects. These two discussions were conducted

using live English-Twi interpretation between researchers, and were recorded and transcribed. Data from the focus group discussions were thematically coded and the results were compared across groups (Glaser and Strauss, 1999).

3.2.4 Surveys

Chapter 4 employs household-level survey data. In October 2021, the field team piloted the survey with 30 participants. To mitigate research fatigue among participant communities (Jost et al., 2016), we conducted the pilot in two demographically and agriculturally similar non-study villages in the same area. We employed open-ended questions to generate responses that populated multiple-choice options in the final survey, and also gave final survey respondents the option to specify a non-listed 'other' response, which we categorised before analysis.

We then conducted our full survey in November 2021 with 270 smallholder households, 250 of which farmed cocoa. To select participants, we spatially sampled every fifth dwelling on a given village street (Nyantakyi-Frimpong and Bezner-Kerr, 2015) until we reached the designated sample size, which was approximately proportional to the relative study village size. We aimed to interview the household member who identified as being mainly responsible for cultivating food crops; if they were not available, the household head was surveyed. Questions ranged from demographic information, land size and use, benefits of producing cocoa and food crops, market dynamics, food availability, perceptions of COVID-19, and responses to climate shocks. The survey

concluded with open-ended qualitative questions to give participants the opportunity to speak about anything else that they thought was relevant to the survey topics. The survey data were analysed with descriptive statistics using SPSS version 29.0.1.0.

3.2.5 Semi-structured interviews

All three thesis papers draw upon the 84 semi-structured interviews I conducted in-person in January 2022 and March 2023. The interviews for this thesis can be categorised into three broad groups (see Table 6): smallholder farmers, food crop market sellers, and key informants. For each village, I generated a shortlist of prospective smallholder farmer interviewees from those who had participated in the earlier survey. I selected these based on wanting to delve deeper into their survey responses on particular topics, such as attitudes to COVID-19, and to sample across a range of demographic and agricultural markers, including age, gender, land size, and occupation. This approach allowed triangulation and elaboration and also had the advantage of freeing interview time for other questions, as some demographic and agricultural details were already known from the survey. I also included some community leaders and other farmers sampled through snowballing.

Smallholder interviews covered topics related to agricultural production, marketing, off-farm livelihoods, climate adaptation, experiences during COVID-19, and their experiences of participating in the research project. At the end of each interview, farmers were invited to share feedback and ask any questions of

their own. Interviews with smallholder farmers lasted from approximately 20 minutes to one hour and 15 minutes, depending on the flow of the conversation. I also conducted a series of semi-structured interviews with food crop sellers in two major local markets, to better understand food crop trade dynamics, negotiations with farmer producers, and the impacts of COVID-19. These were relatively short, lasting from ten to 30 minutes, as they took place whilst the participants continued to conduct their sales, and interviewees were chosen to be spatially distributed around the markets and represent the range of food crops on sale. Finally, I conducted a number of key informant interviews (Kumar, 1989) across three groups: government agricultural ministries, LBCs and the DPhil research team. These lasted between 30 minutes and one hour and provided factual information and insights into institutional plans and decision-making. MoFA, COCOBOD and LBC interviewees were mostly district-level staff, as they had more knowledge of localised dynamics and interacted more with farmers in the study region compared to their national-level counterparts. Furthermore, decisions over government extension services in Ghana are largely made by district offices (Asare-Nuamah et al., 2019; MoFA, 2005).

Smallholder interviews were conducted outside people's homes or in public village spaces. Interviews with food crop sellers were held at their market stalls, government staff in their Assin Foso offices or on Zoom, and LBC staff at their Assin Foso company depot. All interviews, except a small number conducted in English (see Table 6), were carried out using live English-Twi interpretation between one researcher and another. All interviews were audio-recorded, with participants' permission and transcribed with the aid of Sonix AI software before

coding using NVIVO version 1.7.1 (Miles and Huberman, 1994). Due to budget constraints, the live-interpretation English was transcribed and quoted rather than participants' original responses in Twi being later translated from the audio recordings.

Table 6. Breakdown of the thesis interviews. Note: some participants were interviewed twice, in 2022 and 2023.

Type of interview		**Number of interviews**	**Remarks**
Focus group discussions (smallholder farmers)	Abaase village Aboabo village Asorefie village Bankyease village Dosii village Homaho village Kwameamoabin village	2 per village (one male and one female group)	These 14 discussions were conducted 'remotely', while I was in the UK
	Homaho village Kwameamoabin village	1 per village (mixed-gender)	
Smallholder farmers	Abaase village	8 (one interviewed twice)	
	Aboabo village	8	
	Asorefie village	7 (one interviewed twice)	
	Bankyease village	10 (one interviewed twice)	Two conducted in English
	Dosii village	9	
	Homaho village	9 (two interviewed twice)	
	Kwameamoabin village	5 (one interviewed twice)	
Market sellers	Nyankumasi market	9	
	Ando market	6	
Key informants	MoFA	4 district office (one interviewed twice) 1 national office	All conducted in English. National office interview via Zoom audio
	COCOBOD	2 district office	All conducted in English
	LBCs	3	Conducted in Assin Foso depots; one in English
	Research team	3 (one interviewed twice)	One conducted in English
Total		**84 interviews + 16 focus group discussions**	

3.2.6 Additional paper-specific methods

Chapters 5 and 6 also employ further data collected from additional methods, specific to each paper's analysis. In Chapter 5, I contextualised participants' reports of shock events with meteorological data on temperature, precipitation, and cumulative water deficit (Malhi et al., 2009), and government announcements and newspaper articles. In Chapter 6, I draw upon my own field notes and memos, and my field team members' reflexive written reports. Further details of these specific methods are provided in these chapters.

3.2.7 Iterative development of mixed methods

Data collection and analysis through this DPhil was iterative (Miles and Huberman, 1994; Patton, 2002; Srivastava and Hopwood, 2009). This is partly out of necessity, as I had to dynamically adapt my research plans to the outbreak of COVID-19. The pandemic rapidly and radically shifted the challenges smallholders were facing, so I continued to develop my research questions as the pandemic unfolded and I collected data. Moreover, COVID-19 created long gaps between data collection activities, due to the time taken to hire and train field research teams, and the long wait for international travel restrictions to lift. During these gaps, I had the opportunity to analyse my existing data and reorientate my research questions before designing the next phase of data collection (Morgan and Nica, 2020; Bryant and Charmaz, 2007).

The pandemic introduced a novel, unprecedented, and therefore un-researched shock into the lives and livelihoods of the smallholder farming communities in

my study area, and became a focal theme of this doctoral research project. Lacking literature upon which to base foundational knowledge for my study of the impacts of the pandemic, I took a flexible and open-minded approach to examining the phenomenon and generating research directions (Stebbins, 2001). As Stebbins described, 'the art of exploratory research is evident in the ideas that emerge from data' (2001, p8). My approach also aimed to address the interests, concerns and priorities of the smallholder farmers, rather than my *a priori* research interests (LaRocco et al., 2019; Berg, 2004; Robson, 2002). I attempted to understand smallholders' concerns from the start of the project, asking broad questions about smallholders' priorities and the challenges they faced during my initial scoping and agenda-setting trip in 2019. I continued after the onset of the pandemic through early focus group discussions, open-ended survey questions, and later semi-structured interviews.

3.3 Statements on positionality and ethics

3.3.1 Positionality

I have wrestled a lot in my doctorate with questions of power dynamics, extraction, and the ethics and responsibility of academic knowledge production, particularly in the context of being a scholar from the global North conducting research in the South (Giwa, 2015; Scheyvens, 2014; McFarlane, 2006; Jazeel and McFarlane, 2007, 2010; Biswas, 2023; England, 1994; Katz, 1994; Nagar, 2002; Hammett et al., 2022; LaRocco et al., 2019; Nhemachena et al., 2016; Smith, 1999). This is reflected both in my research approach, the choice to write an unusual third empirical chapter on fieldwork equity, and the wider work on fieldwork ethics and advocating for institutional change that I undertook alongside my DPhil (see Appendix C).

I aimed in my research to acknowledge the power dynamics that shaped how knowledge was generated and to continually reflect on both my and my team's positionality (Charmaz, 2006, 2017). My positionality encompasses both my role as a Northern researcher, with experience in the natural and social sciences, and also my intersecting identities of being a highly-educated woman of mixed ethnicity raised in a British education system. My background has shaped not just my particular understanding of the world, but how I interpret data, and what I consider to be just and equitable. As a privileged outsider, I aimed through my data collection and interpretation to give voice to participants' concerns, both to 'allow for ethical anxieties to be addressed' and address my research questions (LaRocco et al., 2019). My field research team, mostly composed of scientists from

the Forestry Research Institute of Ghana (FORIG) were also educated, city-dwelling 'outsiders', bringing their own preconceptions to interactions in the smallholder farming communities (Mandiyanike, 2009; Oriola and Haggerty, 2012; Sultana, 2007). Our entrance into the communities and introduction to interviewees were often made through community leaders or smallholder farmers who had previously interacted with researchers from NCRC. The standing of these individuals in the community will also have shaped how the research team was perceived by smallholders and perhaps, too, some responses they gave.

3.3.2 Ethics statement and COVID-19 precautions

Ethical review and approval were obtained for this research from the University's Central University Research Ethics Committee (reference SOGE 1A021 – 02). Data collection was conducted in accordance with the principles and guidelines for researcher collaboration and community engagement established in Oxford University's Code of Conduct for Ethical Fieldwork (Picot and Grasham, 2022). Additional health and safety precautions were taken per the Ghanaian and UK governments' COVID-19 guidance, including frequent hand washing and the use of face masks by researchers, and social distancing. Participants were also provided with and encouraged to use hand sanitiser and face masks.

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CHAPTER 4

Cocoa vs. food crops: smallholders' seasonal food access and extension support for climate adaptation in the Central Region of Ghana

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Linking statement

The first empirical chapter of the thesis examines smallholders' food stability during the cocoa lean season and in the face of climate shocks, and assesses the relative contributions of cocoa and food crops through food production and purchasing. It addresses the overarching research question: What roles do cocoa and food crops play in households' food access during the lean season and climatic events and how is their climate adaptation supported?

The study focuses on the timing of periods of food shortages and contributes a novel analysis of the roles that cocoa and food crops play during these periods in the context of climate change. It also examines farmers' climate adaptation of cocoa and food crops and challenges the relative prioritisation and distribution

of government extension support between the two groups of crops. The paper presents a qualitative analysis of semi-structured interviews and focus group discussions. In addition, survey data is used to provide an overview of the households studied in this thesis, to quantitatively analyse crop production and sales, and to examine the distribution between households of reported food access and receipt of government extension support.

An earlier version of this paper was submitted to *Climate and Development* in September 2023 and received a 'revise and resubmit' decision just before the submission of this thesis. The version presented in this thesis is an updated manuscript, following feedback during the Confirmation of Status process. I conducted fieldwork with BS, AO, FM, KA, RA, and GH. I performed the qualitative and statistical analysis, and conceptualised and wrote the manuscript with the support of YM and CLM. GH contributed to the paper's ideas and food stability framing. M. Hirons, W. Thompson, M. Penumaka, and J. Monrad provided comments which improved the manuscript.

Abstract

The food security implications of the production of cocoa compared to food crops and the phenomenon of the lean season amongst smallholder farmers have been well-researched. Yet, the literature has yet to consider how climate change affects these dynamics. This study addresses this gap by comparing the contributions of cocoa and food crops to food access during extreme and variable weather. It then compares government extension support for households' climate adaptation of these crops. Our data draw on the case of smallholder cocoa farmers in Ghana's Central Region and comprise a survey of 250 households, 16 focus group discussions, and 82 semi-structured interviews with smallholders, market sellers, and government officials. We find that food crops are essential for households' food access during the cocoa lean season and when cocoa yields are reduced by climate change-related extreme or erratic weather events. However, food crop yields are themselves negatively affected by climate change impacts. Furthermore, many farmers lack climate adaptation strategies or support for food crops as government extension services focus instead on export-driven cocoa. We argue that to promote households' food stability, more smallholder extension support for food crop production and climate adaptation is urgently needed.

Keywords: Food security, climate adaptation, extension, lean season, food crops, cocoa, smallholders

4.1 Introduction

Many smallholder farmers worldwide cultivate both food and cash crops (Rapsomanikis, 2015), often in rainfed systems that are highly sensitive to climate change (Wudil et al., 2022). The food security implications of producing cash crops compared to food crops[2] have been extensively debated and researched (Anderman et al., 2014; Jarzebski et al., 2020; Hashmiu et al., 2022a; Wiggins et al., 2015; Maxwell and Fernando, 1989). Likewise, the phenomenon of the lean season has been well documented (Chambers et al., 1981; Sahn, 1989; Vaitla et al., 2009; Sibhatu and Qaim, 2017; Kansanga et al., 2022). This study adds to this literature by examining how food crops contribute to households' food access during the lean season. Specifically, this paper addresses a gap in the literature related to the effects of climate change on these dynamics. It examines how climate variability shapes food access during the lean season and the extent to which extension services support smallholder farmers to adapt their cocoa to climate change compared to their food crops. Using cocoa smallholder households in the Central Region of Ghana as a case study, in this paper, we pose three questions. First, how do food crops contribute to households' food access during the cocoa lean season? Second, how do cocoa and food crops contribute to households' food access during extreme and variable weather? Third, how do

[2] We define 'food crops' as staples which are used principally for subsistence, but are often also sold in market (Barbier, 1989).

government extension services and climate adaptation support vary between cocoa and food crops and between households?

Food security has been widely conceptualised in four dimensions: availability, access, utilisation and stability (FAO, 2006). In this study, we investigate households' food stability, which concerns the presence of continuous access to food and can vary due to seasonal variations in income or food supply, climate variability, and price fluctuations (Ziervogel and Ericksen, 2010; Schmidhuber and Tubiello, 2007). Figure 2 illustrates the components of food stability that form this research. We conceptualise food stability as composed of food access over time (FAO, 2006; Manikas et al., 2023), and focus in particular on the temporal aspects of the cocoa lean season and the harvest seasons of food crops. In the cocoa belt of Ghana, the majority of farming households engage in cocoa production, which serves as their primary source of income, and also cultivate a range of food crops (Hirons et al., 2018c). These food crops play various roles, including directly providing food for consumption, marketing for cash, and providing favourable shade conditions for growing young cocoa (Osei-Bonsu et al., 1998). Households may access food through direct production or market purchases, which are largely determined by incomes from cocoa and food crop sales. Many farming households in the region also have off-farm income sources, but these are beyond the scope of this study, as it compares the roles of on-farm cocoa and food crops specifically. When considering the temporal aspects of food stability, this research also focuses on smallholders' crops and considers the seasonality of cocoa and food crop harvests. Relevant fluctuations in the prices that farmers receive for the sales of their food crops are considered, which are

influenced by seasons and climate variability (Dzanku et al., 2021; Anderman et al., 2014; Gregory et al., 2005; FAO, 2008; Kotir, 2011). However, we do not examine price variations of purchased foodstuffs that are not subject to these local-level seasonal and climatic dynamics, such as imported canned goods.

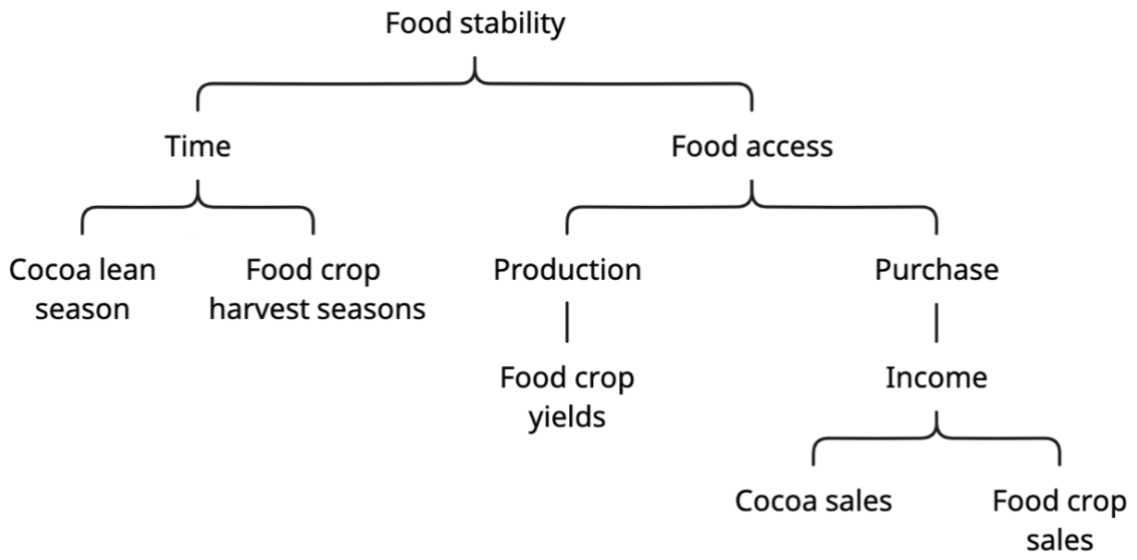


Figure 2. The components of food stability examined in this paper. Source: authors' own.

Many studies have questioned whether households in Ghana earn sufficient money from cocoa to purchase food from markets or if it is necessary to grow food crops to improve self-sufficiency (Anderman et al., 2014; Asubonteng et al., 2018). Studies vary in their conclusions, but some suggest that cultivating more cocoa reduces food access, as cocoa income is insufficient to match market food prices, markets are unreliable, and profits are seasonal (Anderman et al., 2014; Ajagun et al., 2021). Indeed, many households are vulnerable to recurrent seasonal food shortages, or the 'lean season', which occur among cocoa farmers

after the previous season's cocoa harvest has been sold, as farmers are unable to bridge the income gap between harvests (Chambers et al., 1981; Sahn, 1989; Kiewisch, 2015; Dzanku et al., 2021; Hashmiu et al., 2022a). In our study area, the lean season tends to fall between March and July for most households, during which approximately 70% of cocoa farming households report food shortages (Hashmiu et al., 2022a), particularly of high-quality foods, including vegetables (Anderman et al., 2014). This can lead to farmers resorting to buying food on credit, eating lower quality or variety of food, reducing portion sizes or skipping meals (Kiewisch, 2015; Amfo et al., 2021). This study builds on this research on cocoa production and seasonal food shortages by specifically analysing the role of households' food crops for their food access during the cocoa lean season.

This study introduces considerations of the effects of climate change to research on seasonal food shortages and debates on cocoa and food crop production. Smallholder households' seasonal food shortages tend to be intensified or lengthened if yields from cash crops are low or fail (Sahn, 1989; Vaitla et al., 2009; Sibhatu and Qaim, 2017; Alpízar et al., 2020; Kansanga et al., 2022; Brown et al., 2009), which is becoming more likely as the climate changes (Chemura et al., 2020). In Ghana, climate change is predicted to reduce cocoa yields in particular, rendering some areas unsuitable for cocoa production and necessitating adaptation strategies (Läderach et al., 2013; Schroth et al., 2016). Increasing temperatures, longer dry periods, and unpredictable and variable rainfall also threaten a number of food crops in the area, including maize, cassava, plantain, and vegetables (Chemura et al., 2020; Owusu-Sekyere et al., 2011; Schlenker and Lobell, 2010; Hirons et al., 2018a). This study compares the impacts of extreme

and variable weather on households' cocoa and food crop production and the roles the two types of crops play in households' food stability in the context of climate change.

Finally, this study compares the provision of government extension services to support the production and climate adaptation of households' cocoa and food crops. Like many smallholders worldwide, Ghanaian smallholder cocoa farmers have little capital for climate adaptation and are vulnerable to extreme weather events as they rely on rainfed agriculture with small land holdings and basic farming technologies (Morton, 2007; Asante et al., 2017). Climate adaptation strategies adopted by smallholders can include, for example, planting drought-tolerant crop varieties, changing the timing of planting, and the use of indigenous knowledge in farming practices (Antwi-Agyei and Stringer, 2021; John et al., 2013). Studies in Ghana have consistently found that agricultural extension services underpin farmers' ability to adapt their agricultural production to the effects of climate change (Denkyirah et al., 2017; Asare-Nuamah et al., 2019; Antwi-Agyei et al., 2021). Climate adaptation measures provided in communities by extension officers include offering education to improve climate change awareness, providing technical advice, demonstrating innovations, and promoting strategies such as planting shade trees, crop diversification, use of chemical inputs and improved varieties, and soil conservation (Denkyirah et al., 2017; Asare-Nuamah et al., 2019; Antwi-Agyei et al., 2021; Emmanuel et al., 2016; Anang et al., 2020; Antwi-Agyei and Stringer, 2021). Farmers in Ghana receive agricultural extension for their cocoa from the Ghana Cocoa Board (COCOBOD) as well as from licensed cocoa-buying companies (LBCs) (Attipoe et al., 2021). On

the other hand, extension for food crops falls under the broad institution of the Ministry of Food and Agriculture (MoFA), which has historically focused on export crops rather than locally-traded food crops (Wolter, 2009). Both COCOBOD and MoFA deliver agricultural extension through decentralised services administered by district offices, with local extension agents assigned to visit designated geographical areas (Anang et al., 2020). This study investigates and compares the provision of agricultural extension services and examines the distribution of MoFA and COCOBOD extension visits between villages and households. Building on this, the paper then compares farmers' ability to adapt their cocoa and food crop production to the effects of climate change.

While our study focuses on the contributions of cocoa compared to food crops and extension provision in Ghana, its findings are relevant to climate-vulnerable smallholders across a variety of contexts who grow food crops alongside export-driven cash crops, such as coffee, rubber, and tea (Wiggins et al., 2015). Our findings may have relevance for policymakers and practitioners who seek to understand the relative prioritisation of cash and food crops for smallholder seasonal food access, how the climate crisis affects this balance, and how they may support smallholders to adapt.

The rest of this paper is presented as follows. Section 4.2 outlines the case study, methods, and data utilised in this study. Section 4.3 presents our results. In Section 4.4, we discuss our findings, before providing conclusions and implications of our study in Section 4.5.

4.2 Methods

4.2.1 Case study

This study is based on fieldwork conducted in seven forest-fringe villages surrounding Kakum National Park in Assin South District, Central Region, Ghana (Figure 3). The region is a hotspot of cocoa production (NCRC, 2020), where smallholder communities have been farming the crop for around 50 years (Hirons et al., 2018b). Study villages were purposively selected to capture variations in microclimate, community size, and land tenure systems, including land owned by traditional authorities and privately owned land (Hirons et al., 2018c).

The management of the sale of smallholder farmers' cocoa and food crops differs greatly in Ghana. Cocoa export and international sales are controlled by COCOBOD and the Ghanaian government benefits greatly from cocoa exports. Cocoa is the largest contributor to agricultural GDP and is of great strategic importance for foreign exchange generation (ISSER, 2018; Dompreh et al., 2021). Farmers are paid an immediate fixed payment for each standard 64kg bag of cocoa beans – 800 Ghana cedis (approximately 70 USD) for the 2022/2023 cocoa season. Food crops, on the other hand, are traded at local markets close to farmers' villages, rather than exported. Here, prices can be low and are determined through negotiation and in response to relative abundance. Food crop markets are, therefore, uncertain and volatile compared to assured ready cocoa markets (Hashmiu et al., 2022b).

4.2.2 Data collection and analysis

We conducted field visits between June 2021 and March 2023, in which we carried out surveys with 250 cocoa-farming households, 16 focus group discussions, and 82 semi-structured interviews with smallholder farmers, market sellers, and government officials. For the focus group discussions and survey conducted in 2021, COVID-19 travel restrictions necessitated hybrid collaboration, with some research team members collecting field data in-person while others worked remotely. Our data collection and analysis were an iterative process (Miles and Huberman, 1994; Patton, 2002). As we collected and generated preliminary results from data, we determined the additional data required. Following initial focus group discussions and survey data analysis, we conducted further qualitative data collection: in-depth interviews and two further focus groups. Parts of our data collection also followed a mixed methods triangulation design (Creswell, 1999), in which we collected and analysed separate quantitative and qualitative data on the same topics and compared these results during our interpretation. This allowed us to use our qualitative findings to corroborate our quantitative results, provide more depth and nuance, and further explore questions that arose which may not be well-suited for quantitative analysis (Creswell and Plano Clark, 2011). We present our data collection in chronological order below, grouped by method.

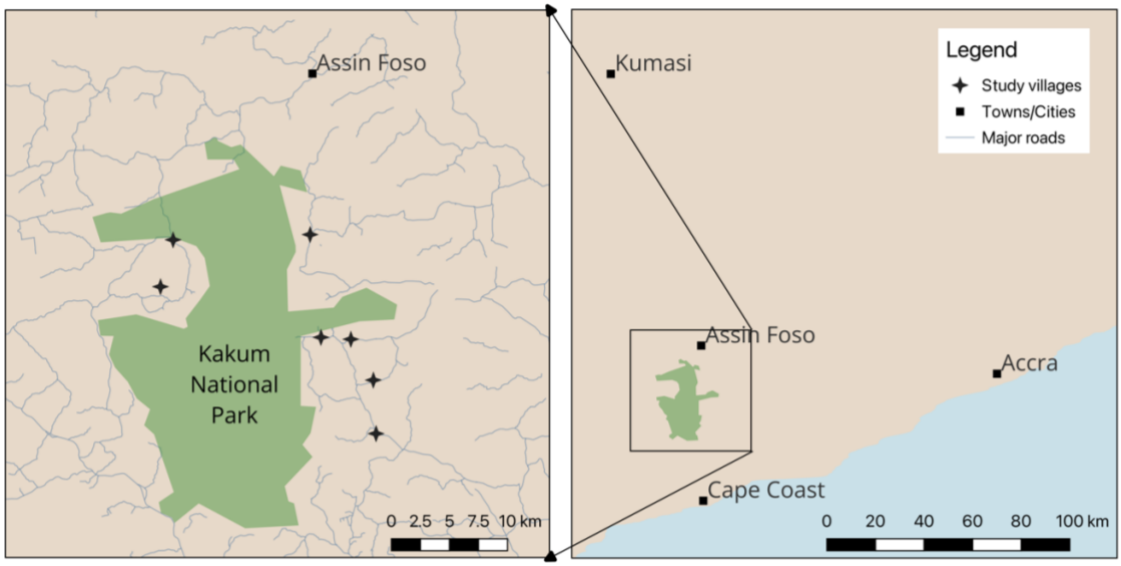


Figure 3. Map showing study villages and nearby towns and major cities (Picot et al., Under review).

4.2.2.1 Focus group discussions

In June 2021, we carried out one male-only and one female-only focus group discussion in each study village, with participants representing different backgrounds, including a range of community leadership positions. Groups discussed village demographics, interactions with local markets and unusual weather patterns. Each group ranked the food crops they cultivated in order of importance and explained the factors that they chose to determine importance. They also listed and ranked the main challenges they experience related to food crops. In March 2023, two further mixed-gender focus group discussions were held in two of the study villages. These focussed on the production and purchasing of food crops, perceived changes in weather patterns, and resultant farming impacts and adaptation measures. Both groups orally mapped out the annual crop harvesting calendar, month by month, for different crops grown in

the area; we then corroborated these timings with published literature. Group sizes varied between four and 15 participants and were held in Twi, the most common local language, and live translated with notes recorded in English. Full details of the focus group discussions are provided in Chapter 3.

4.2.2.2 Surveys

Findings from our focus group discussions informed our survey on 250 cocoa-farming households in November 2021. We used a random spatial sampling approach, walking down village streets and surveying every fifth household until we had the required sample size for that village, which was approximately proportional to the relative village population (Nyantakyi-Frimpong and Bezner-Kerr, 2015). Field researchers also had the discretion to include a small number of key individuals to maintain good relationships in the community; we do not expect that this significantly altered the results. Where possible, we interviewed the household member who primarily cultivates food crops; otherwise, the household head. Of the 273 households we surveyed, 250 (91.6%) grow cocoa, demonstrating the high incidence of cocoa production by smallholders in the area. We specifically analyse only these 250 households in this paper, as we focus on comparing the contributions of cocoa and food crops for cocoa-farming households.

The survey elucidated households' demographic information, land size and use, uses and perceived advantages of cocoa and food crops, market dynamics, and responses to extreme or unusual weather events. Survey questions about the

benefits of food crops focussed on maize, cassava, and plantain, as these had already been identified as most important in the prior focus group discussions. In the year preceding the survey, the region experienced unusually high temperatures, from May to October 2021, and unusually variable rainfall patterns which affected food crops (Picot et al., Under review) and may have influenced food availability. A binary variable was used to record if the household cultivates a given crop, as we did not have the capacity to gather yield data. To capture food stability, we used an indicator that measures the household's own assessment of the number of months in the past year that they were able to provide sufficient quantity and variety of food for themselves, either through production or purchasing (Hirons et al., 2018c; Alpízar et al., 2020; Dzanku et al., 2021). For analyses related to how food security correlated to other variables, we created a binary variable for whether the household self-reported having had sufficient quality and variety of food in the last year (Hirons et al., 2018c). Likert data were also collected to estimate the frequency with which respondents perceived their household had enough to eat, but were of limited analytic utility as a specific time period was not specified and the data were skewed, with 0% of households responding *'Never'* (see Figure 5). Likert scales were also used for indicators giving the frequency of food crop waste and the hire of labourers ('always, often, sometimes, rarely, never') and self-reported effects of unusual weather on crop yields in the last two years ('much lower yields, somewhat lower yields, no effect, somewhat higher yields, much higher yields').

Annual household incomes were self-reported by respondents, although surveyors helped conduct basic calculations, for example, to sum different cash

amounts reported for a given crop across a year. A total annual income variable was created which included reported incomes from cocoa, food crops and off-farm sources for the whole household. Other studies have found that income data from smallholder communities, such as our study area, may be unreliable as households do not keep records and because a given survey respondent may not have known about all household members' activities (Hirons et al., 2018c; Mohammed et al., 2021). To counter errors in recall, Hirons et al. (2018c) grouped households into income quartiles. We found that analyses conducted with the original continuous income variables and categorical income quartile variables produced similar results and therefore present the untreated continuous data in this paper. However, absolute values should be treated with caution and we focus instead on indicative trends. Analyses of total cocoa land size are based on a continuous variable resulting from the sum of the household's land dedicated to cocoa only and their intercropped land; vice versa for food crops.

We analysed the survey data using descriptive statistics in SPSS Version 29.0.1.0. Where more than 20% of expected values are less than 5, results from Fisher-Freeman-Halton Exact Tests are presented instead of Chi-square analyses (Cochran, 1954). Although variables relating to household income and land size were somewhat positively skewed, *t*-tests were still preferred over non-parametric tests due to their recommended power advantage and their robustness to modest deviations from normal distribution assumptions (Posten, 1984; Stonehouse and Forrester, 1998; Rasch and Guiard, 2004). *T*-tests and Chi-square tests were more appropriate than regression analyses as the data examined were predominantly grouped or categorical.

4.2.2.3 Semi-structured interviews

In January 2022, we conducted 52 semi-structured interviews with participants comprising 30 smallholder farmers and 15 food crop sellers at two local markets. We also interviewed seven key informants from district-level agricultural offices, namely from MoFA, COCOBOD and licensed cocoa-buying companies. Additional interview participants were included until we reached theoretical saturation in the responses given (Patton, 2002). Our preliminary smallholder survey analysis informed both the contents of the interviews and our selection of farmer participants, mostly a sub-set of survey participants with a wide demographic range (e.g., age, land size, gender) and varied responses on key issues. We also included some community leaders and others sampled through snowballing. Smallholder interviews included the use, cultivation and sale of food crops (and disruptions thereto), extension receipt, causes of hardship and food shortages and the roles of food crop cultivation and other coping strategies, and climate change effects and adaptation strategies. Food crop seller interviewees were randomly spatially distributed around the markets and sold a range of different food crops. They further elucidated market functioning and trade flows of food crops. Key informant interviews gave information on extension service provision, cocoa market functioning, relative government ministry prioritisation of cocoa and food crops, and government climate adaptation strategy.

We conducted a further 30 semi-structured interviews in March 2023 with 26 smallholders and four officials from the MoFA and COCOBOD Assin Foso district offices. Participants were sampled in the same way as for the previous

interviews, i.e., predominantly survey participants, and included six farmers and one key informant whom we had also interviewed the previous year. This second set of interviews further explored food security and related coping strategies, incomes generated through the year, production and purchase of foodstuffs, investment into cocoa and food crops and climate change impacts on food crops. The key informant interviews focussed on support for farmers on food crops, prioritises for extension and changing weather. Interviews were conducted using live English-Twi interpretation, except for eight key informant interviews and two smallholder interviews which were conducted in English. Conversations were audio-recorded with permission from participants and transcribed using the assistance of Sonix AI. We used standard coding and memoing techniques to analyse the interview data (Miles and Huberman, 1994).

4.3 Results

The results section starts with an overview of the households surveyed. The rest of the results are presented in three main sections which correspond to the paper's three research questions. First, we examine the contributions of food crops to household food access during the cocoa lean season. Second, we compare the contributions of food crops and cocoa to households' food stability in the context of climate change. Third, we analyse the extent to which government extension services vary between households and compare how they support farmers to produce cocoa and food crops, respectively, and adopt climate adaptation strategies.

4.3.1 Overview of study households

Table 7 provides a summary of descriptive statistics for 250 cocoa-farming households in the study region. Households had, on average, farmed cocoa for 17 years, indicating a wealth of experience in cocoa production and marketing. However, nearly a third of household heads had received no formal education, highlighting the need for other forms of education, such as agricultural extension services. The majority of household heads in our cocoa household survey farmed cocoa as their primary occupation, although a small minority focussed on producing food crops instead. Households in the area may split their land into areas used only for cocoa, only for food crops, or intercropping food crops among cocoa trees. Significantly more land is used for cocoa than for any other crop.

Table 7. Summary of cocoa-farming households in the study area

Variable	Mean	Median	Min.	Max.	Std dev.
Age of household head	50.46	50.00	21	89	13.56
% female-headed households	31.0%				
Ethnicity of household head	35.8% Fante; 32.9% Assin; 7.3% Krobo; 6.5% Northern; 5.3% Asante				
Education of household head	46.4% Junior High School; 30.2% no formal education; 13.7% Primary School; 8.5% Senior High School				
Primary occupation of household head	86.3% cocoa farming; 5.6% food crop farming; 2.8% artisan; 2.4% petty trading				
Time household head has lived in village (years)	29.61	30.00	1	63	14.99
Age of person responsible for food crops	47.80	47.00	21	87	13.20
% female household member grows food crops	40.3%				
Household size (number of adults)	3.10	3.00	1	14	1.78
Household size (number of children)	3.30	3.00	0	18	2.71
Household cocoa production experience (years)	17.07	15.00	1	70	12.45
Annual income from cocoa (GH₵)	3335.8	2000.0	0	30000	4201.9
Annual income from food crops (GH₵)	784.6	50.0	0	11000	1521.0
Total annual income, including off-farm sources (GH₵)	4753.8	3000.0	20	50000	5899.7
Farm size total (ha)	3.77	3.24	0.40	17.81	2.70
Land used for cocoa only (ha)	2.01	1.62	0.00	12.14	2.13
Intercropped land (ha)	1.01	0.81	0.00	10.93	1.28
Land used for food crops only (ha)	0.46	0.00	0.00	6.07	0.76

4.3.2 Contributions of food crops to food access during the lean season

4.3.2.1 Accessing food through cocoa and food crops

Farming households may access food through growing crops or purchasing foodstuffs with income generated through cocoa, food crops or off-farm livelihoods. Interviewees and focus group participants described purchasing food from markets to supplement their own production, make up for losses, and provide foodstuffs that they do not themselves cultivate. These include meat and fish, spices, beans, rice, palm oil, maize dough, yams, and other vegetables not grown by the household.

Cocoa contributes to food access by providing seasonal income, with the major harvesting period in the study area typically falling between October and February. Cocoa is seen by farmers as the most profitable crop, with smallholders reporting mean cocoa incomes of approximately four times the amount generated from all other food crops over the course of a year (Table 7).

> *"The income from cocoa is very important compared to food crops... The money from food crops helps us in our day-to-day activities, but cocoa gives you money to buy new clothes for your children and things like that. With cocoa money, you can even save some for the future." [female farmer, in her 70s]*

According to one district official, however, MoFA's estimates of relative food crop income are much higher as their data indicate that farmers in the area actually make more money from food crops than cocoa [key informant, MoFA

district office]. Farmers in our study generally had better recall of the income from bags of cocoa than food crops, as prices for the former are fixed, whereas prices for the latter vary and sales are spread through the year.

We found that most cocoa-farming smallholder households in the study region cultivate a variety of food crops. Unlike cocoa, food crops are flexible in that they can be consumed or sold (Figure 4), depending on household needs and market factors. Farmers require food production as *"you can't eat cocoa"* [48-year-old male farmer] and our interviews found that even COCOBOD officials advise farmers to use a small portion of land for subsistence crops. Our survey showed that 43.6% of households grow food crops for household consumption only, 2.2% cultivate for the sole purpose of selling and 54.2% grow food crops to both consume and sell them. In interviews, some households described only selling what was left over after their own consumption or when harvests were about to go bad. Households surveyed ranked the profitability of food crops in the following order (from highest to lowest): cassava, plantain, maize, tomatoes, pepper, oil palm, okra, cocoyam, and garden eggs (aubergines).

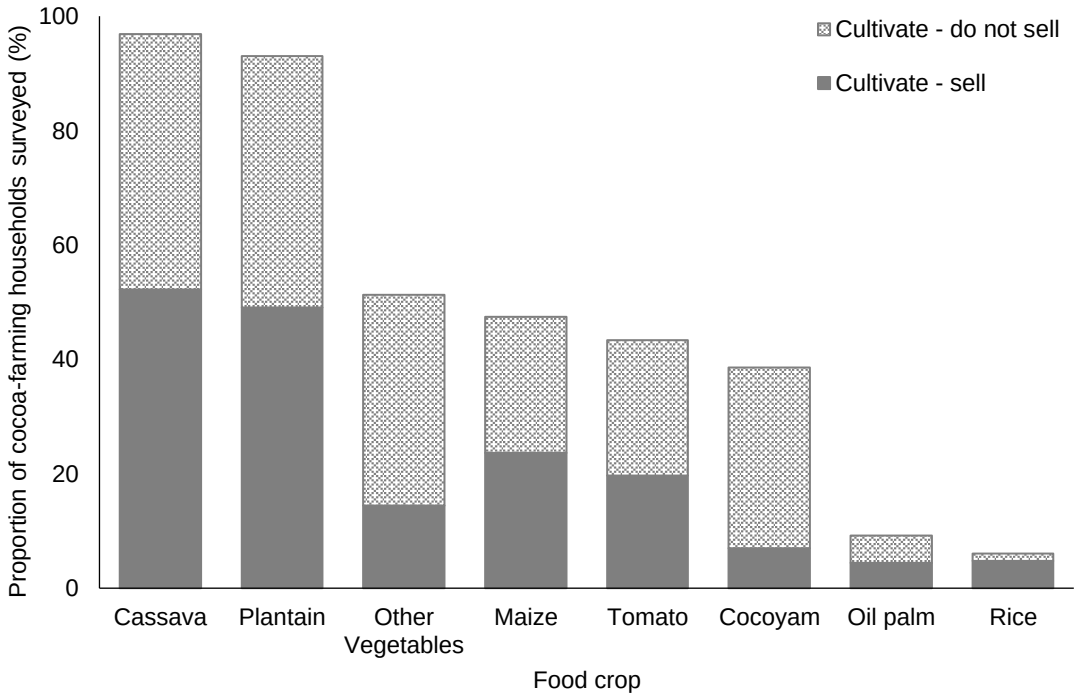


Figure 4. The proportion of cocoa farming households surveyed that cultivate and sell different food crops. Total bar height represents the total proportion of households that grow the crop. Other vegetables include pepper, garden egg (aubergine), okra, and other crops.

4.3.2.2 Seasonal food access

Seasonal food shortages in the study region are common. Only 61.6% of surveyed households reported *"always"* having enough food to eat (see Figure 5) and 16.8% of households had insufficient food quantity or variety in the last year, lasting an average of 4.0 months (*SD* = 2.64).

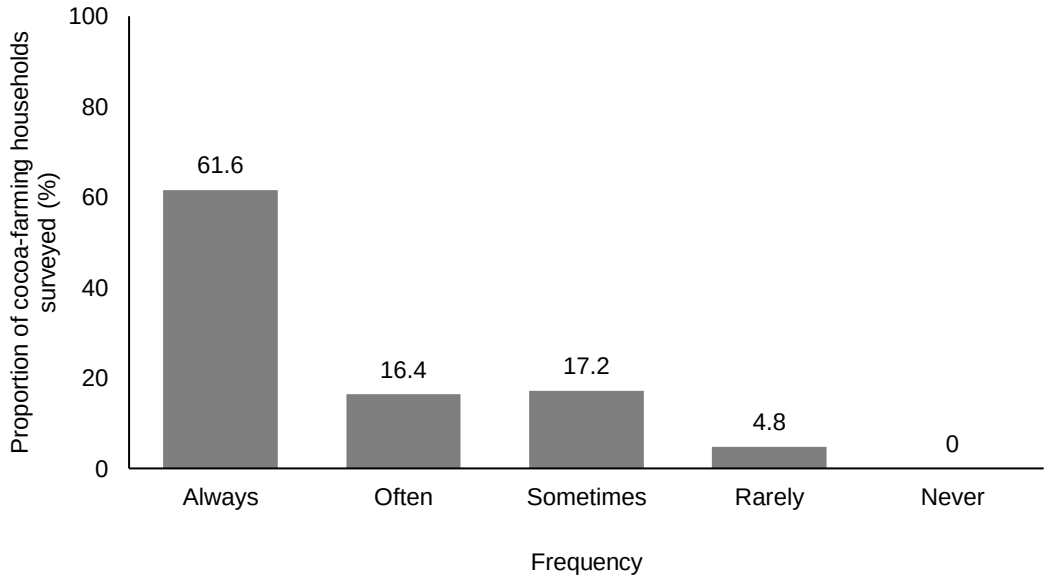


Figure 5. The frequency at which cocoa farming households report having sufficient food, shown by proportion of households surveyed.

We found that the food crop incomes of surveyed households who reported having insufficient food in the last year were approximately twice as high as those with enough to eat throughout the year (t = -2.41, df = 246, p = .017). This could be because those more vulnerable to food shortages rely more on selling food crops, compared to other income sources. However, due to potential inaccuracies in self-reported income data, it may also be that households with concerns over food access only perceive their food crops as being more important for livelihoods than those who have access to enough food to eat. We also found that those vulnerable to food insecurity may be less established in the community as we found that the heads of households with food shortages had, on average, lived fewer years in the village (26 years compared to 36 years: t = 3.33, df = 233, p = <.001) (see Appendix Table 1). Our analysis also provides some evidence to suggest that having larger cocoa lands is associated with being less likely to

report having inadequate food quantity or variety in the last 12 months (t = 2.20, df = 76, p = .031). However, we used a binary food security variable (see Section 2.2.2) and Dzanku et al.'s (2021) study with more granular analysis found that, beyond a threshold of 41% of total land, dedicating a higher proportion of land to cocoa has negative implications for households' food security. We did not find evidence for household food security varying according to other household characteristics or between villages (see Appendix A).

Our qualitative data provided further evidence of food instability amongst smallholder cocoa farming households in the region and the timing of periods of food shortages. In interviews, smallholders described particularly struggling in the lean season, between cocoa harvests, as seasonal cocoa incomes are not sufficient to meet food needs throughout the whole year:

> *"Cocoa brings in a lot of income, but cocoa marketing season is actually quite short; it's a maximum of three months. Once cocoa has been sold, you're back to starting all over again. So that money actually may not last throughout the whole year as you'll have expenditures within those three months. So what will give you a little income here and there is food crops. We eat most of the food crops, so we are not getting huge income from it." [male smallholder farmer, aged 75]*

> *"Normally some hardships crop up… That's when cocoa is out of season and you've used all your cocoa money. So for about five months you face some hardship, but it's not severe. If you have other food crops such as rice or maize, that will help you keep up the household." [female farmer, aged 32]*

4.3.2.3 Roles of food crops in food access during the lean season

Our qualitative interviews showed that, during the cocoa lean season, the production and sale of food crops are essential for food access, either through direct production or income for purchase. As smallholders described:

> *"You can't rely solely on the cocoa all the time. You have to do something extra. So the okra and the pepper make up for when the cocoa has not been harvested yet and there's no cocoa money around." [female farmer, aged 65]*

> *"Cocoa and food crops are of equal importance to me because I need both of them for income and food crops for survival." [female smallholder farmer, aged 53]*

COCOBOD also acknowledges that farmers must have alternative livelihoods for the lean season:

> *"You can't get cocoa throughout the whole year. So during the lean season when there is no cocoa, farmers depend on food crops to survive. Some plant a little cassava, vegetables…" [key informant, COCOBOD district office]*

Figure 6 shows the seasonality of different crops and represents how the timing of the harvesting seasons of some key crops, specifically maize, tomatoes, pepper, and okra, may help plug gaps caused by the lean season outside of cocoa. In focus group discussions, household accounts reflected this vital role of food crops. Alongside household consumption, market value, and versatility, farmers commonly cited the timing of the harvest as a reason for determining importance. For example, according to focus group discussions, maize tends to be the first

crop ready in the harvest season, in April and May, so it provides food and money to households first. It also has a second major season later in the year, typically in August, and can be stored for several months in between harvests. Barring extreme weather conditions, cassava can also be stored by keeping it in the ground for one to two years and only harvested when needed; it is thus available year-round. Tomatoes, peppers and garden eggs mature quickly and therefore can generate money from sales fast. Unlike cocoa, food crop pricing responds relatively directly to supply, such that farmers reported in interviews and focus group discussions that their profits are higher if they are able to produce them at times when local abundance is relatively low. For some crops, farmers are able to adjust the timing of harvesting and timing of crops to accommodate this. For example, tomatoes, okra and peppers can be grown in marshy areas during the dry season.

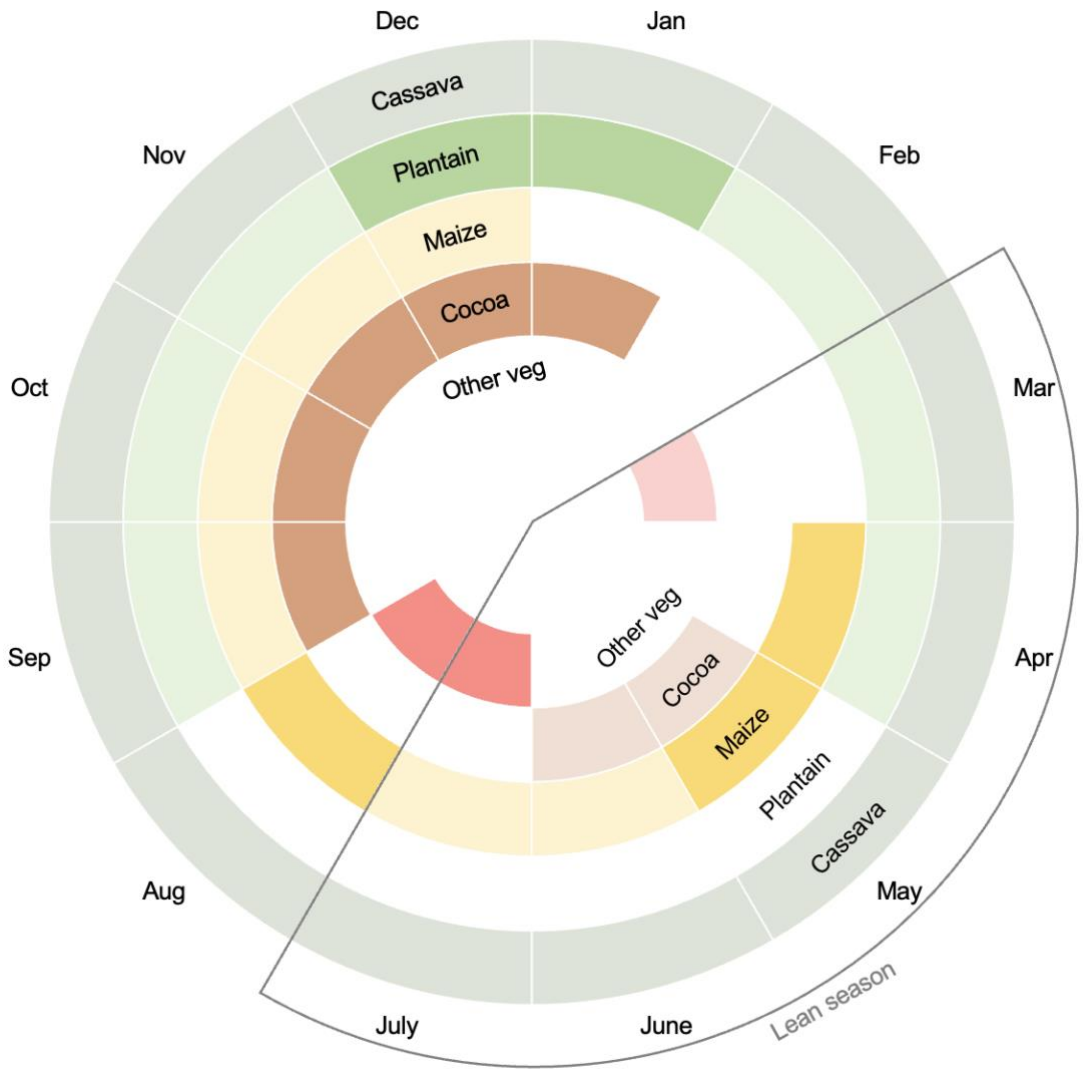


Figure 6. Annual lean season and harvesting seasons for cocoa, cassava, maize, plantain, and other vegetables (tomato, pepper and okra), based on qualitative data. Dark shading denotes major harvesting seasons and light shading denotes minor seasons. Source: authors' own illustration based on field data.

On the other hand, responsive food crop pricing also means that, during times of high abundance, harvests can be hard to sell or fetch low prices that do not cover transportation costs. 15.5% of surveyed households reported having food crop harvests go to waste because of a lack of market demand. We also note that food

production and income from food crops can be insufficient to ensure food access during the lean season, with some households struggling to meet their needs:

> *"No, we can't always eat what we want. There are times there is no money even to buy meat to supplement the food we're eating." [male smallholder farmer, aged 75]*

4.3.3 Contributions of cocoa and food crops during extreme and variable weather

4.3.3.1 Reported climate impacts on cocoa and food crops

The changing climate is having significant effects on the quality and yields of crops. Farmers in the region consistently reported that temperatures, sunshine and rainfall are becoming more *"irregular and unpredictable"* and *"extreme"*, with a common message from farmers being that, now, *"God is the main farmer and will take care of the farm"* [male focus group discussion participant]. Rather than formerly regular patterns of wet and dry seasons, *"seasons are swapping"*, and delays in rainfall extend the lean season, with negative consequences for food access. Poor weather, including heavy and erratic rainfall, high temperatures, and drought, is the most common reason for food crop wastage, with 62.6% of households reporting crops being ruined, resulting in a marked decline in food stability.

> *"When the weather is good and everything is favourable to the crops, we get 1000 to 2000 cedis from our pepper and tomato sales. But when the weather*

is bad, we get 300 to 200 cedis per year. And for cocoa, we normally get 5000 profit after expenses, but when the weather is bad, it's 1000 to 2000." [female farmer, age unknown]

According to our survey, cocoa was highly affected by recent climate change impacts. As of November 2021, 74.4% of cocoa-growing households said they had experienced lower cocoa yields due to unusual weather in the previous two years. This is higher compared to some food crops: 68.9% for cassava, 59.4% for tomato, and 38.7% for plantain for households who grew those crops respectively; but is similar to that of maize, where 75.8% of cultivating households experienced lower yields. These numbers provide some evidence that cocoa may be even more susceptible than other crops to the types of climatic changes occurring in southern Ghana.

In qualitative interviews, farmers described the effects of different extreme and erratic weather patterns on their cocoa. Excess rains caused farmers' fruits to develop black spots, symptomatic of black pod disease which is affected by weather (Lawal and Emaku, 2007), and drop before maturity, whilst high sunshine and lack of rains caused leaf discolouration and also reduced yields. Excess temperature and sun, or rain, therefore both reduced smallholders' incomes from cocoa, as expected from other studies (e.g. Schroth et al. 2016).

However, food crops are also affected by climate change (Chemura et al., 2020). Despite being relatively climate-tolerant compared to other staples (Schlenker and Lobell, 2010), cassava is also sensitive to waterlogging, which causes roots to rot (Ceballos et al., 2011). Farmers described that excess rains *"spoil tubers in the*

ground", meaning they can no longer be stored, or *"destroy"* the crop, resulting in less to sell. Farmers also described high temperatures reducing tuber quality, as well as difficulties in pulling cassava out of dry, hardened soils. Excess heat and drought stunt plantain growth (Ramirez et al., 2011) such that the plantains become *"very small and you can't sell them for high prices"*, whilst strong winds uproot stalks and cause bunches to fall. Maize was also reported to be adversely affected by a range of extreme weathers, particularly flooding and drought, supporting Chemura et al. (2020) who consider it to be especially climate-sensitive among staple food crops. Excess sunshine or drought conditions were described to have particularly negative effects on tomato and pepper cultivation (Abou-Hussein, 2012). Nearly a third (31.3%) of households reported changing their diets by less quantity or variety of food, or switching to different foods from normal in response to weather disruptions in the past two years.

4.3.3.2 Role of food crops during extreme and variable weather

Our findings showed that some food crops may be less negatively affected than cocoa than certain periods of extreme or erratic weather. Together, food crops may therefore fill gaps when cocoa yields are hampered by extreme or variable weather, as well as during the lean season.

Our interviews showed that MoFA district officers in the area advise farmers to use half their land for non-cocoa crops, so that they are still able to have access to food through production, even if their cocoa does not yield well. Many farmers also described how they sell more food crops when they have a low cocoa yield.

In our survey, we found that 66.9% of households sell more cassava and 69.8% sell more plantain to cope when they have less money than usual. We also found that 19.2% sell more maize, 14.5% sell more tomatoes, and 20.9% sell more vegetables, such as garden eggs and cocoyam. Furthermore, farmers adjust the planting of certain crops to compensate for cocoa losses. Tomatoes, pepper and okra may be replanted, as they are less seasonal than cocoa and may grow in other seasons "*as long as you giving them the right requirements that they need*":

> *"We subsidise [low cocoa yields] with the income that we get from tomatoes, pepper and all that. So it means that we would have to do more of the tomatoes and the pepper to support their income from the cocoa." [male smallholder farmer, aged 75]*

Furthermore, a COCOBOD official explained that the annual lifespan of some food crops, such as tomatoes, means they can be planted in response to changing seasons and therefore are more flexible than perennial cocoa. Plantain and cassava are particularly useful when cocoa fails, as plantain production peaks in December to January, coinciding with the cocoa season (see Figure 6), and cassava can be harvested *"as the need arises"*. One farmer also described times when cocoa has been badly affected by the weather but there has been *"little to no effect on the cassava and plantain"*, as, according to a MoFA official, these crops are more *"adaptive"* during dry periods.

Even if they have food crops to help with cocoa failures, households may still endure hardship and a prolonged lean season. Compared to cocoa, incomes from food crops are low and cannot make up fully for what is lost from cocoa.

Furthermore, the ability to supplement low cocoa yields with food crops depends on how the food crops themselves have been affected by the weather. Although some species are more climate tolerant than cocoa, the evidence described above shows how extreme weather still affects them, and farmers are doing little to adapt their food crop production to climatic changes. Therefore, farmers have to buy more food crops to supplement their harvests when yields are reduced by poor weather:

> *"Generally now, the food crops do not do well on the farm, so we buy almost everything… but it's very expensive" [female smallholder farmer, aged 43]*

4.3.4 Extension and climate adaptation support for cocoa versus food crops

4.3.4.1 Provision of extension services for cocoa and food crops

The ability of Ghanaian farmers to adapt their cocoa and food crop production to the impacts of climate change has been found to be partly shaped by access to agricultural extension services (Denkyirah et al., 2017; Asare-Nuamah et al., 2019; Antwi-Agyei et al., 2021). In our study, we found that smallholders' receipt of extension services for cocoa and food crops varies greatly, with more extension provided for cocoa than food crops from different sources (Figure 7). In this paper, we focus on government extension as provided by MoFA and COCOBOD district offices. Overall, 57.6% of surveyed households reported receiving visits from COCOBOD agricultural extension officers, compared to 13.0% for MoFA officers. This is reflective of decision-making at the national level, resulting in

significantly more understaffing of MoFA extension officers, such that MoFA officers must cover twice the number of communities as COCOBOD extension providers, according to a MoFA district official. We found that extension receipt from MoFA differs significantly between villages in our study (Fisher's Exact Test, $p = .003$), whereas extension from COCOBOD did not (Fisher's Exact Test, $p = .074$) (see Appendix Table 2, Appendix Figure 1, and Appendix Figure 2). A senior MoFA district official explained that communities within the municipality are selected for extension visits based on 'hotspots', where there is a high level of agriculture and crop production of key crops is concentrated, particularly oil palm, rice, and vegetables. While the production of oil palm (Fisher's Exact Test, $p < .001$) and rice (Fisher's Exact Test, $p < .001$), along with maize ($\chi^2 = 14.76$, df = 6, $p = .022$), significantly varied between villages, the geographical distribution of their cultivation across villages did not appear to follow the same trend as MoFA extension across villages (Appendix Figure 3). Furthermore, the focus on hotspots does not address the uneven distribution of MoFA extension support for key staple crops, such as plantain and cassava, whose cultivation was not found to significantly vary between villages and which were not described as MoFA priorities. The officer explained that district radio extension service extends to all communities that can access radio and aims to *"close the gap"* for communities *"disadvantaged"* by not receiving extension officer visits. However, only 3.0% of farmers surveyed in our study reported listening to MoFA radio extension, despite 75.1% of households reporting owning a radio.

We found further differences between households that correlated to household farm size and income. For example, MoFA extension significantly favoured

farmers with larger cocoa lands (t = -2.22, df = 22, p = .033). We found evidence that COCOBOD extension, on the other hand, did not vary with farm size but was associated with household wealth, as households with higher total incomes or incomes from food crops or cocoa were significantly more likely to report receiving extension (see Appendix Table 4). These differences provide some examples of the uneven distribution of government extension officer visits and the vulnerable households who may not be benefitting, and future research could explore this further. We did not find any significant differences in receipt of MoFA or COCOBOD extension visits according to how long the household had been established in the village, their cocoa farming experience, or the age or ethnicity of the household head (see Appendix Table 2, Appendix Table 3, and Appendix Table 4). Male-headed households were significantly more likely to receive COCOBOD extension (χ^2 = 8.343, df = 1, p = .004) but MoFA extension did not significantly differ between household heads' genders (χ^2 = 1.817, df = 1, p = .178).

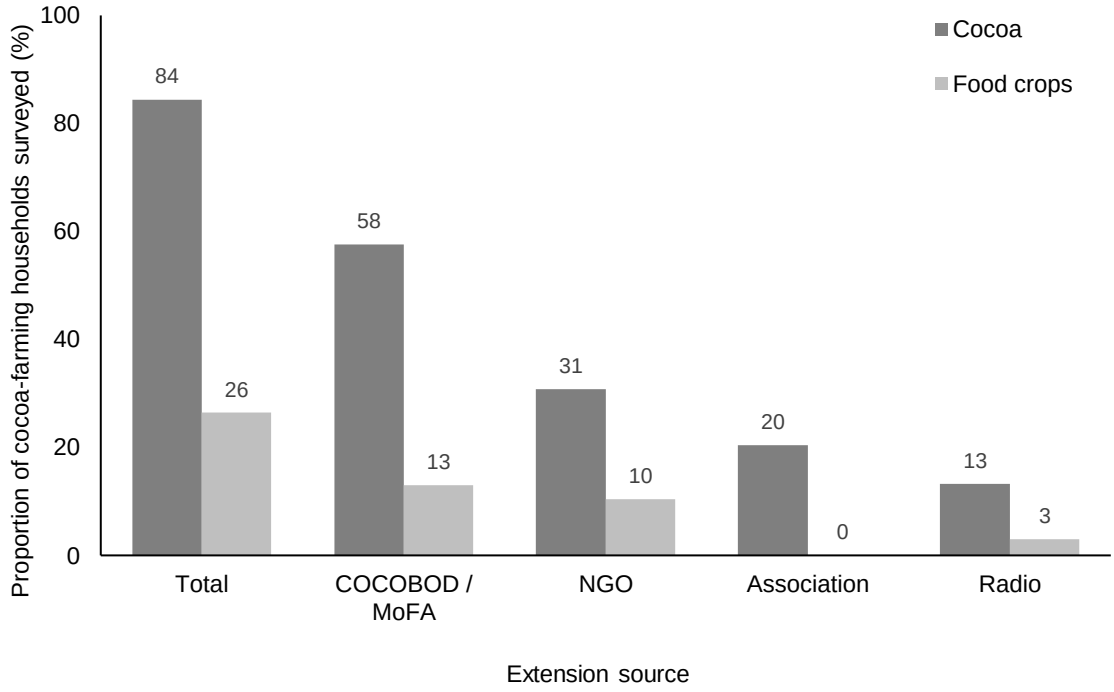


Figure 7. The proportion of cocoa farming households that receive agricultural extension from different sources for their food crops and cocoa. The COCOBOD / MoFA category indicates visits from COCOBOD extension officers on cocoa and from MoFA officers related to food crops.

4.3.4.2 Support for climate adaptation for cocoa versus food crops

As well as differences in extension visits offered by MoFA and COCOBOD, we found differences in the extent to which the two government agencies provide resources to help households cope with the effects of climate change on their crops. Our qualitative data showed that government support for climate adaptation is greater for cocoa than for food crops. COCOBOD district officers explained that the government agency provides free shade tree seedlings and hybrid cocoa seedlings with improved tolerance to poor weather and disease, as well as frequent extension visits with information and inputs. Pilot testing is also

underway to evaluate irrigation mechanisms that will soon be rolled out to more communities. Farmers also described receiving climate-related support from LBCs, with buyers conducting community visits. On the other hand, MoFA officers said that they are doing little, beyond raising awareness, to help farmers improve the climate impacts on their food crops, despite climate change being a priority.

> *"We are not doing so much as far as climate change is concerned. But I can say that we are sensitising the farmers on the effects of climate change on food production, especially the major food crops grown in the municipality, maize, cassava, plantain… Just a matter of sensitisation, just to create the awareness that climate change is catching up with us." [Municipal Director of Agriculture, district MoFA office]*

MoFA advice to farmers includes using organic fertilisers and in-a-row sowing patterns to improve yields, planting forest trees to stabilise the micro-climate, practising mulching to improve soil moisture, and constructing drainage gutters to cope with excess rains. However, unlike for cocoa, farmers are not provided with materials to achieve these recommended measures, so their implementation can only be done by the few households who have sufficient resources. For example, MoFA's advice to farmers to plant maize in upland areas, not low-lying land, depends on households having access to such lands. Furthermore, given MoFA's significant understaffing, relatively few households benefit from such education and extension office visits. It is estimated that the national agricultural extension officer to farmer ratio in Ghana is approximately 1:1300, with Northern

regions particularly understaffed (Anang et al., 2020). In some communities in our Central Region study area, MoFA is giving public demonstrations to teach new systems for planting involving demonstrations of planting in raised pipes, land preparation techniques, and using types of drought-resistant seeds, but as these are only available in some communities that have received extension officer visits, many have yet to access these technologies.

As a result, we found that few households said they are able to adopt climate adaptation measures for food crops:

> *"I'm not able to do anything to protect against the weather, so I'm just praying and hoping for the rains to come in." [male rice farmer, aged 25]*

A small number of households we surveyed described using raised beds or gullies to drain off excess rain, for example, for pepper and tomatoes. Vegetables like these and garden eggs can also be manually irrigated, but only if farmers have the strength and a nearby water source to carry from, or if they can afford to construct a borehole. However, interviewees stated that plantain, maize and cassava require too much water to manually irrigate. One MoFA official noted that farmers are *"not really"* adapting to the climatic changes that are already occurring in the area, and many smallholders reported lacking the capacity to adopt any measures at all:

> *"Even for myself, even water to drink, I struggle with it. So there's no way I can irrigate the farm." [male farmer, aged 62].*

4.4 Discussion

This study introduces considerations of climate change effects and adaptation into debates on the cocoa lean season and the food security implications of the production of cash crops compared to food crops (Anderman et al., 2014; Jarzebski et al., 2020; Hashmiu et al., 2022a; Wiggins et al., 2015; Chambers et al., 1981; Sahn, 1989; Vaitla et al., 2009; Sibhatu and Qaim, 2017; Kansanga et al., 2022). In the following, we present our key findings and discuss them in the context of related literature.

The study finds that food crops play a key role in facilitating households' access to food during the cocoa lean season, through both direct crop production and providing income for the purchase of foodstuffs. In support of other studies that demonstrate cocoa smallholders' vulnerability to food instability (Dzanku et al., 2021; Kiewisch, 2015; Anderman et al., 2014), we find that 16.8% of households reported having insufficient food quantity or variety in the preceding 12 months, lasting for an average of four months. Our qualitative data suggested that, for many households, the cocoa lean season is a period of particular hardship, as the income generated during harvesting season does not last through the year. In this time between cocoa harvests, we found that food crops provide households with staples for meals and essential incomes. Food crops can, therefore, help feed the household through direct consumption and income provision, and many households sell more food crops when they have less money than usual, particularly cassava and plantain. In interviews and focus group discussions, farmers described how the seasonality of different crops is an important factor in

crops' value. However, food crop incomes may be too low and unreliable to ensure food access during the lean season. Our findings on the prevalence of insufficient food access in the cocoa lean season support studies from different regions in Ghana which find similar food shortages between cocoa harvests (Anderman et al., 2014; Kiewisch, 2015; Ajagun et al., 2021; Dzanku et al., 2021). Building on this research, this study contributes a novel research focus by specifically considering the role of food crops in food access during the cocoa lean season.

Next, this study compares the contributions of cocoa and food crops in the context of the climate crisis, an urgent issue for smallholder farmers worldwide that threatens livelihoods and food security (Vermeulen et al., 2012; Cohn et al., 2017). It finds that food crops are again vital in facilitating households' food access when cocoa yields are hampered by the effects of climate change. Cocoa yields were reported to be particularly negatively affected by extreme or variable weather, while our survey found that the yields of cassava, tomato and plantain were less negatively affected by weather over the same period, although the crops are still vulnerable to certain weather conditions. We found that food crops, including plantain, cassava, tomato, pepper and okra, appear to compensate for losses when the main cocoa cash crop is hampered by climate change effects. Crop seasonality was found to be important and farmers may adjust the timing of the planting and harvest of certain crops to plug cocoa income gaps. Our findings concur with studies showing the importance of diversifying crops as a climate adaptation strategy to insure households against the variability of climatic conditions and protect against crop failure (Mohammed et al., 2021;

Amfo and Ali, 2020). Our results also align with research by Antwi-Agyei et al. (2014) and Kansanga et al. (2022) which found that food crops' short time to maturity and flexible planting timing are helpful climate adaptation features amongst smallholder cocoa farmers in Ghana.

Having established the importance of food crops for smallholder cocoa farmers' food access during the cocoa lean season and periods of climatic variability or extreme weather, this study directly compared the provision of extension and adaptation support for cocoa and food crops. Our findings highlight comparative gaps in extension for food crops and farmers' ability to adapt to the effects of climate change. It is well-established that extension services in Ghana increase farmers' adoption of climate adaptation strategies, boost productivity, and raise farm incomes (Denkyirah et al., 2017; Asare-Nuamah et al., 2019; Antwi-Agyei et al., 2021; Emmanuel et al., 2016; Danso-Abbeam et al., 2018; Anang et al., 2020; Yeleliere et al., 2023). Furthermore, a lack of extension has been identified by farmers as a key barrier to crop production and also hinders climate change adaptation support (Antwi-Agyei and Stringer, 2021; Attipoe et al., 2021). Yet, our research finds a disparity in government extension provision between the two types of crops. Despite food crops' importance, we found low rates of extension receipt from MoFA, including radio extension, and great variation in extension officer visits between villages. Moreover, our results indicate that households receive more agricultural extension visits for cocoa than for food crops, reflecting the relatively low ratio of MoFA extension officers to farmers of one officer for approximately 1300 farmers (Anang et al., 2020). Our results suggest lower rates of MoFA radio listenership than found in the Upper West

Region of Ghana (Anaglo et al., 2014) but mirror other studies' findings of MoFA challenges, including staff shortages, lack of adequate transport, poor road networks and limited logistical support (Asare-Nuamah et al., 2019; Anang et al., 2020; Antwi-Agyei and Stringer, 2021; Antwi et al., 2022). We also found evidence of households with larger lands being more likely to access MoFA extension visits, which suggests inequities between households that go beyond MoFA's geographical distribution across communities that could be explored through further research.

While our study provides useful insights into the importance of food crops for seasonal food access and highlights a lack of climate adaptation support, some limitations and avenues for further research should be considered. First, as mentioned in Section 2.2.3, our income data is based on farmers' own reports and could be improved with more accurate sales data. However, food crop incomes would be difficult to measure given the variable nature of local food crop markets and the lack of a fixed producer price. Crop yield data could also be gathered to confirm income accuracy, although this was beyond what was possible for our field research team at the time. Such yield data would also facilitate a deeper analysis of how food crop production relates to household food stability and extension receipt, beyond a binary variable of whether or not a household grows a given crop. Our quantitative analyses also relied on self-reported impacts of climatic events on crop yields, which may be less accurate than crop yield measurements. This study also relies on self-reporting for its quantitative food security measures, which are subjective and risk participants overreporting the severity of the issue (Maxwell et al., 2008). Additional survey indicators

recording during which specific months households had insufficient food would have strengthened the qualitative analysis of the typical timing of household food instability and its relation to the cocoa lean season (Anderman et al., 2014; Bilinsky and Swindale, 2007). Although, our findings are corroborated by other studies which found similar lengths of food insecurity periods (approximately four months per year) amongst cocoa farming households in Ghana (Dzanku et al., 2021). Finally, this study focused on government extension as provided by MoFA and COCOBOD through extension officer visits and radio services. Further research could unpack support from other sources, such as NGOs, farmer associations and LBCs.

4.5 Conclusion

This study reveals the vital but overlooked role that food crops play in Ghanaian smallholder cocoa farming households' food access during the cocoa lean season and in the context of climate change. It argues that, given food crops' importance, extension services and climate adaptation support for them must be improved.

We find that cocoa incomes are often insufficient to facilitate food purchasing throughout the year, such that many farmers struggle with recurring food shortages during the lean season between cocoa harvests. Our results suggest that food crops play an essential role in bolstering food access during these months through income generation and direct food production for consumption. Food crops' flexibility, variety and relative climate tolerance mean they play an essential role, particularly when the cocoa crop fails under extreme or variable weather conditions. However, food crops may themselves be susceptible to the impacts of climate change and farmers lack feasible strategies to adapt their production. Government extension support to smallholders, including for coping with the effects of climate change, remains focussed on export-driven cocoa, to the detriment of food crop cultivation and climate adaptation. Indeed, recent MoFA agricultural initiatives, such as the Planting for Export and Rural Development programme and the creation of the Tree Crop Development Authority (TCDA) continue to focus on cash and export crops, such as cashew, shea and coconut, rather than locally consumed and traded food crops (MoFA, 2018; Government of Ghana, 2020).

As the ratio of extension officers to farmers improves (MoFA, 2022), we suggest that MoFA extension services prioritise supporting smallholders with locally consumed and traded food crops and address gaps in households that may not receive extension visits. In the face of intensifying extreme and variable weather, farmers across Ghana and other smallholder contexts will increasingly need resources, tools, and technologies to adapt their food crops and promote food stability as lean seasons become longer and more severe. We propose that the benefits of food crop production may become increasingly important as climate change impacts worsen, further negatively impacting cash crop incomes and food prices. Support for food crops should therefore be prioritised, given their essential role in food access in the context of climate change and the cocoa lean season.

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Appendices

Appendix A: Food security results

Appendix Table 1. Independent Samples Test: food security and household characteristics

	Sufficient food		Insufficient food				
	M	SD	M	SD	*t*	df	*p*
Total farm size (ha)	3.84	2.75	3.43	2.43	0.91	243	.363
Cocoa land size (ha)	3.15	2.34	2.47	1.67	2.20**	76	.031
Food crop land size (ha)	1.50	1.46	1.29	0.80	1.32	107	.189
Household size	6.40	3.54	6.33	3.79	0.12	245	.906
Household head age (years)	50.18	13.12	51.81	15.63	-0.63	53	.530
Household head lived in village (years)	35.98	16.36	26.61	16.35	3.33***	233	<.001
Household cocoa experience (years)	17.03	11.94	17.26	14.84	-0.11	243	.913
Annual income from cocoa (GH₵)	3482.3	4362.3	2634.9	3282.5	1.19	241	.235
Annual income from food crops (GH₵)	680.6	1447.9	1294.3	1770.7	-2.41**	246	.017
Total annual household income (GH₵)	4746.5	6007.6	4788.7	5426.6	-0.04	239	.967

Asterisks ***, **, * denote parameter is significant at less than 1%, 5% and 10% significance level respectively.

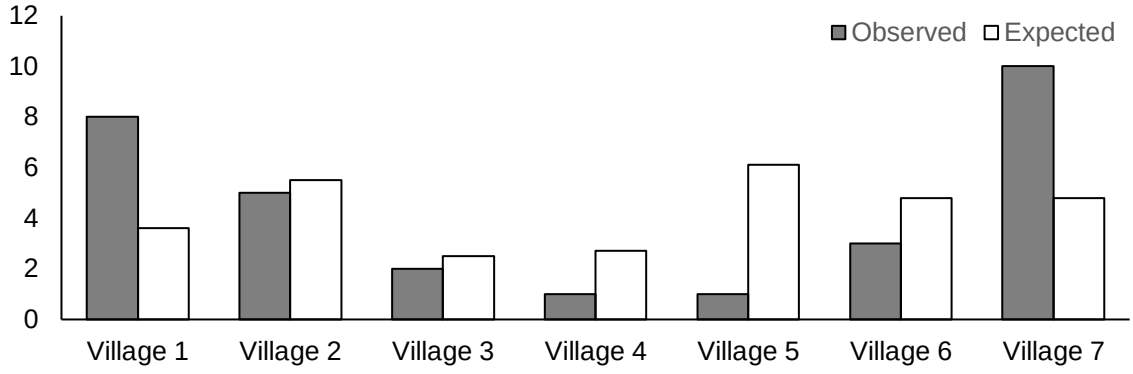
We found no significant difference in reported food security between villages, (χ^2 = 5.768, df = 6, p = .450), male- and female-headed households (χ^2 = 0.514, df = 1, p = .473), or based on the household head's level of education (Fisher's exact test, p = .206) or ethnicity (Fisher's exact test, p = .141).

Appendix B: Extension results

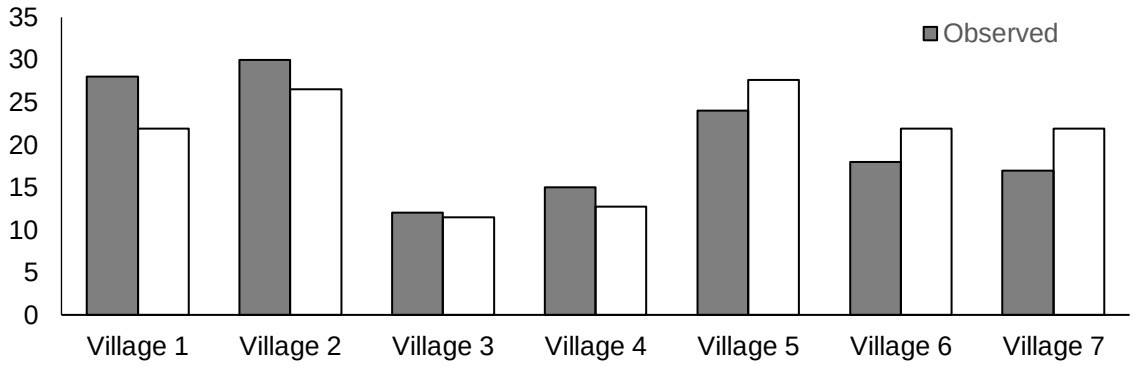
Appendix Table 2. The numbers of households in different villages who receive extension visits from MoFA and COCOBOD. Fisher's Exact Test showed significant differences in MoFA extension receipt between villages (p = .003) but not for COCOBOD at the 5% confidence level (p = .074).

	MoFA			COCOBOD		
	Receive	Do not receive	Total	Receive	Do not receive	Total
Village 1	8(3.6)	20(24.4)	28	28(21.9)	10(16.1)	38
Village 2	5(5.5)	37(36.5)	42	30(26.5)	16(19.5)	46
Village 3	2(2.5)	17(16.5)	19	12(11.5)	8(8.5)	20
Village 4	1(2.7)	20(18.3)	21	15(12.7)	7(9.3)	22
Village 5	1(6.1)	46(40.9)	47	24(27.6)	24(20.4)	48
Village 6	3(4.8)	34(32.2)	37	18(21.9)	20(16.1)	38
Village 7	10(4.8)	27(32.2)	37	17(21.9)	21(16.1)	38
Total	30	201	231	144	106	250

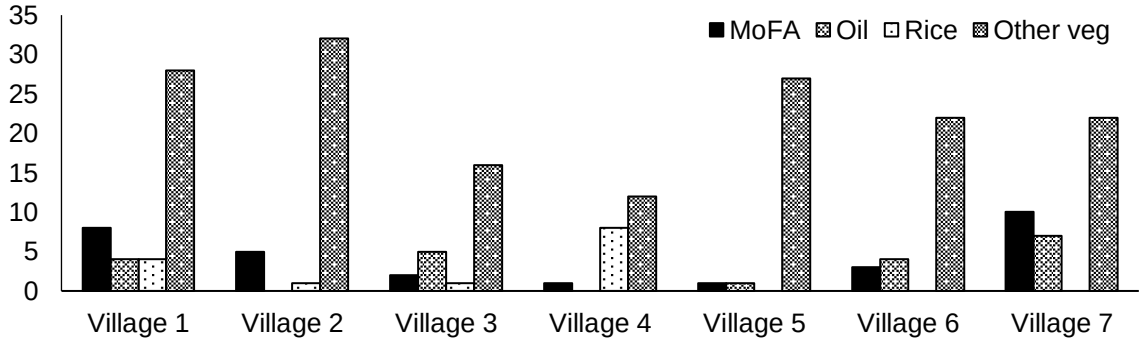
Values given as: observed (expected).



Appendix Figure 1. The number of households in different villages who receive extension visits from MoFA – comparison of observed and expected counts.



Appendix Figure 2. The number of households in different villages who receive extension visits from COCOBOD – comparison of observed and expected counts.



Appendix Figure 3. The number of households in different villages who receive MoFA extension visits and cultivate oil palm, rice, and other vegetables (including tomato, cocoyam, pepper, garden egg, okra, and other vegetable crops).

Appendix Table 3. Summary of *t*-test results comparing the characteristics of households who report receiving extension visits from MoFA with those who do not

	Receive		Do not receive				
	M	SD	M	SD	*t*	df	*p*
Total farm size (ha)	4.98	3.94	3.57	2.48	-1.88*	31	.069
Cocoa land size (ha)	4.21	3.23	2.83	2.07	-2.22**	32	.033
Food crop land size (ha)	1.90	1.43	1.42	1.35	-1.75*	224	.081
Household head age (years)	53.90	11.87	49.78	13.36	-1.59	227	.112
Household head lived in village (years)	38.62	16.20	34.48	16.53	-1.26	215	.209
Household cocoa experience (years)	18.29	13.49	16.29	11.26	-0.85	224	.394
Annual income from cocoa (GH₵)	2583.4	2657.0	3430.9	4349.3	1.04	222	.301
Annual income from food crops (GH₵)	1002.0	1344.7	720.8	1415.7	-1.02	228	.308
Total annual household income (GH₵)	4002.1	3671.5	4810.9	6119.8	0.70	221	.482

Asterisks ***, **, * denote parameter is significant at less than 1%, 5% and 10% significance level respectively.

Appendix Table 4. Summary of *t*-test results comparing the characteristics of households who report receiving extension visits from COCOBOD with those who do not

	Receive		Do not receive				
	M	SD	M	SD	*t*	df	*p*
Total farm size (ha)	4.03	2.78	3.42	2.55	-1.78*	243	.077
Cocoa land size (ha)	3.12	2.18	2.92	2.34	-0.67	237	.505
Food crop land size (ha)	1.56	1.31	1.35	1.44	-1.17	242	.244
Household head age (years)	49.69	12.96	51.50	14.33	1.04	246	.302
Household head lived in village (years)	33.48	15.10	35.47	18.61	0.88	191	.380
Household cocoa experience (years)	17.58	13.20	16.39	11.41	-0.74	243	.461
Annual income from cocoa (GH₵)	3983.3	4439.6	2440.7	3686.2	-2.95***	236	.003
Annual income from food crops (GH₵)	951.0	1693.9	554.1	1213.3	-2.15**	246	.033
Total annual household income (GH₵)	5684.8	6621.1	3418.5	4371.3	-3.20***	238	.002

Asterisks ***, **, * denote parameter is significant at less than 1%, 5% and 10% significance level respectively.

CHAPTER 5

Vulnerability to multiple shocks: unpacking interactions between COVID-19, climate change, and market disruptions among Ghanaian smallholder farmers

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Linking statement

The findings of the previous research paper showed the relative climate sensitivity of cocoa and the food insecurity risks that smallholder households face during the cocoa lean season and climatic shocks. This second thesis paper broadens the context of the first study to encompass household vulnerability to the effects of multiple shocks, rather than just climatic events. The previous chapter also established the key role that food crops played during these periods and highlighted how the adaptation of food crops is overlooked by government extension services in favour of cocoa support. This paper further examines household food security – here, as an outcome of multiple shocks – and also considers impacts on income sources. It also examines the impacts of multiple

shocks on the production and sale of cocoa and food crops and assesses their roles in coping strategies in response to multiple shocks.

The paper addresses the overarching research question: How did multiple shocks, including COVID-19 and climate change, interact to affect smallholders' vulnerability to food and income shortages? Building on the double exposure framework and climate vulnerability literature, this paper proposes a novel methodological framework for disentangling vulnerability to multiple shocks. It then applies this approach to assessing the impacts on smallholder farmers of three shocks that occurred in Ghana in 2020 and 2021: the COVID-19 pandemic restrictions, climatic events, and late cocoa payments. The qualitative analysis in this paper triangulates between semi-structured interviews, focus group discussions and meteorological data, and cross-references these findings with government announcements and newspaper reports. This paper particularly focuses on smallholders' food security and incomes, examining how cocoa and food crops are affected by multiple shocks and their relative roles in farmers' coping strategies.

This paper was submitted to *Ambio* in June 2023. The paper presented in this thesis is a revised version, following peer review feedback, and is ready for resubmission. I conducted fieldwork with BS, alongside further Ghanaian colleagues. TJC collated and analysed the meteorological data and produced Figure 11 with my input. I conceptualised and wrote the manuscript with support from CLM and YM. M. Hirons, W. Thompson, and J. Monrad provided comments which improved the manuscript.

Abstract

Smallholders often face diverse interacting shocks. Between 2020 and 2021, cocoa smallholder households in Ghana's Central region experienced COVID-19 restrictions, extreme climatic events, and disrupted cocoa payments. We present a methodological framework to systematically parse out farmers' vulnerability to these overlapping shocks. We analyse the effect of each shock individually, interacting effects, coping strategies adopted, and outcomes for smallholders' incomes and food security. Our empirical data draw on 52 semi-structured interviews, focus group discussions, meteorological data, and government announcements. We find that multiple shocks compounded effects on farming practices, market engagement, and the yields and sales of cocoa and food crops. Shock interactions exacerbated income and food shortages, necessitating various coping strategies. Some households were pushed into deep hardship, during which food crops played an essential role as a 'backstop' coping strategy. This paper's methodological framework reveals the importance of systematic analysis of multiple shocks for understanding vulnerability and adaptation.

Keywords: Climate change, cocoa, COVID-19, multiple shocks, smallholders, vulnerability

5.1 Introduction

Societies face climatic disruptions in parallel with numerous other challenges. Amidst the worsening climate crisis, communities worldwide are experiencing conflicts, political turmoil, economic shocks, and, recently, a global pandemic (Ansah et al., 2021). The negative impacts of extreme weather events on smallholder farmers are well-established (IPCC, 2022) and evidence is emerging about how COVID-19 affected agricultural livelihoods and food security at the household-level (Agyei-Holmes et al., 2023; Béné, 2020; Paganini et al., 2020). However, studying shocks in isolation can give a false picture of vulnerability as different stressors interact in complex and interdependent ways to shape the context in which other shocks are experienced (O'Brien and Leichenko, 2000; O'Brien et al., 2007, 2009; Eriksen et al., 2011; Roxburgh et al., 2021). In this paper, we investigate the interacting effects of COVID-19 pandemic restrictions, climatic events, and unexpected cocoa payment delays on smallholder cocoa households in Central Region, Ghana.

Recent vulnerability studies have explored the interactions between the effects of COVID-19 and climatic events in a number of ways, for example, examining the impacts of both crises on household health (Wheat et al., 2022), national healthcare systems (Rahman et al., 2021), and international governance across sectors (Khojasteh et al., 2022). Some researchers have investigated the vulnerability of the agricultural sector, and smallholders' food security and livelihoods to the combined effects of the two shocks at a regional or global scale (Goswami et al., 2021; Ingutia, 2021; Mishra et al., 2021; Rasul, 2021; Fromm,

2022). However, there is a lack of research that systematically analyses how multiple shocks interact to shape vulnerability at the household-level. We address this gap by proposing a methodological framework to disentangle the effects of multiple shocks and then use this approach to empirically analyse the vulnerability of Ghanaian smallholder cocoa-farming households. Our paper provides an in-depth examination of the interactions between pandemic, climatic, and economic shock effects on smallholder households, the coping strategies adopted in response, and emerging outcomes. These households are illustrative as, like many of the 475 million smallholder farmers globally (Lowder et al., 2016), they are vulnerable to diverse shocks due to their reliance on rainfed production systems, climate-sensitive crops, and socioeconomic constraints, such as limited access to credit (O'Brien and Leichenko, 2000; Serdeczny et al., 2017).

In our study, as outlined in Chapter 2 (Section 2.2.2), we define shocks as 'unique or semi-periodic perturbations that have immediate and long-term consequences' (O'Brien et al., 2003, p3), distinct from recurring stressors such as the annual 'lean season' farmers undergo before the major cocoa harvest (Kiewisch, 2015). According to this definition, from March 2020 to October 2021, smallholder farmers in the Central Region of Ghana faced three overlapping environmental, social, and economic shocks. First, the global COVID-19 pandemic and related restrictions caused widespread financial hardship and declines in living standards, despite low infection rates in the study district (Adom, 2020; Khoo, 2020; Egger et al., 2021; Agyei-Holmes et al., 2023). Second, market disruptions resulted in farmers across Ghana being paid weeks or months late for their cocoa harvests, their primary annual income source. This was driven

by overall record national cocoa yields as a result of a policy to boost productivity coinciding with COVID-19 ramifications at government level, which restricted Ghana Cocoa Board's (COCOBOD) capacity to purchase the national cocoa harvest. Although yields were high at the national-level, many households in the study region did not benefit from boosted harvests and instead reported low personal cocoa yields at this time, in addition to the late payments (see Section 5.5.2.2). Third, temperatures were unusually high during much of 2021, particularly the minor dry season, and rainfall patterns were erratic, with a delayed major wet season and unusually high rainfall in the minor wet season. These climatic changes negatively affected the production of cocoa, which is particularly sensitive to rainfall distribution and dry season length (Wood and Lass, 2001), and major food crops, such as weather-sensitive maize (Schroth et al., 2016).

The overlapping and intertwining nature of these three events constituted a series of major shocks, with which many smallholders struggled to cope. We use a novel methodological framework to analyse the impacts of each of the three shocks in turn and then unpack how they interacted to affect smallholders' incomes and food sources, and necessitated a variety of coping strategies. Our analysis focuses on households' experiences of economic hardship and food insecurity as a result of multiple shocks and their interactions, as these were the main areas where the three shocks overlapped and interacted. Additional shock effects, such as the impacts of COVID-19 on access to healthcare or travel to visit families, were outside of the scope of this study. We examine the impacts on smallholders' main income sources – cocoa production, food crop production,

and off-farm employment – and on the food security dimensions of access and availability (FAO, 2006), as these were most affected by the shocks. We pose three research questions. First, how could a methodological approach be designed to systematically unpack vulnerability to multiple shocks? Second, how did multiple shocks affect households' incomes and food security? Third, how did households respond to the effects of multiple shocks?

The rest of this paper is structured as follows. Section 5.2 outlines the theoretical framework used to assess vulnerability to multiple shocks. Our research methods are explained in Section 5.3. In Section 5.4, we present a methodological framework for systematically parsing out the complexities of vulnerability to multiple shocks. We then structure our empirical findings of the case of smallholder cocoa households in Ghana according to this framework in Section 5.5. Section 5.6 synthesises these findings, discusses them in the context of existing research, and proposes avenues for further research. Finally, Section 5.7 concludes the paper and suggests ways in which policy may help to improve households' vulnerability to interacting shocks.

5.2 Theoretical framework: household vulnerability to multiple shocks

Vulnerability reflects the degree to which a population is susceptible to and able to cope with harmful events or perturbations (IPCC, 2022). It is commonly characterised by three interrelated dimensions: exposure to shocks and stressors; sensitivity to their effects; and adaptation, or the ability to withstand events and respond to their consequences (O'Brien et al., 2003; Shackleton et al., 2014; Nyantakyi-Frimpong and Bezner-Kerr, 2015; Guido et al., 2020). The concept of vulnerability is often used to highlight the specific contextual factors that affect people's exposure and capacity to respond to potentially harmful events (Leichenko and O'Brien, 2008). In this study, we use vulnerability as a theoretical framework to structure a methodological approach which systematically unpacks the household-level effects of shocks that were common across the region and to investigate households' abilities to successfully adopt coping strategies. Although vulnerability can encompass adaptation to longer-term effects and future threats (Nyantakyi-Frimpong and Bezner-Kerr, 2015; Guido et al., 2020), due to the study data available, we focus on the short-term effects of shocks and the coping strategies adopted in households' immediate responses.

In earlier vulnerability literature, the impacts of individual shocks were commonly assessed in isolation, yet assessing multiple shocks together generates a more complete understanding by revealing their combined effects (Reid and Vogel, 2006; Komarek et al., 2020). Many households experience recurrent, overlapping or permanent crises, so are unable to fully recover from one shock before the next occurs (Béné et al., 2015; O'Brien et al., 2004). Sequential shocks can thereby have

cumulative adverse outcomes, resulting in a continued state of stress that can lead to a downward spiral of household wellbeing and risks descent into poverty traps (Berhanu, 2011; Béné et al., 2016). Furthermore, people may adopt several coping strategies in response to any given shock (Komarek et al., 2020). Systematic consideration of interacting effects (applicable both to short-term shocks and long-term stressors) emerged in vulnerability studies when O'Brien and Leichenko (2000) first used the term 'multiple stressors' to denote the 'double exposure' to globalisation and climate change, establishing how impacts from different processes can combine to affect the same groups. The same authors later proposed three pathways through which two stressors may interact: the combined impact of processes (outcomes), the influence of one process in altering the capacity to respond to another process (context), and the interactions between the outcomes of one crisis and the drivers of another (feedback) (Leichenko and O'Brien, 2008; O'Brien et al., 2009; Leichenko et al., 2010). Building on the concepts outlined in the double exposure framework, we present a novel methodological framework in Section 5.4 which lays out a rigorous way of examining shock interactions in depth, and then use our empirical study to illustrate this approach.

A significant body of research has emerged in the climate change, development, and vulnerability research fields that considers the impact of multiple stressors on households (Reid and Vogel, 2006; Tschakert, 2007; Casale et al., 2010; Shackleton et al., 2014; Martin et al., 2016; Antwi-Agyei et al., 2017; Roxburgh et al., 2021). The impacts of climate events cannot sufficiently be understood if treated in isolation, without contextualising how they occur amidst other shocks, as interactions between shocks of diverse nature can amplify the effects of each

shock alone (Gitz and Meybeck, 2012). For example, climate impacts on crop yields can interact with disruptions to trade or income sources, reducing households' ability to buy that crop, and thus further diminishing their food access (Gitz and Meybeck, 2012). Climatic effects have been found to interact with a variety of stressors, such as agricultural market disruptions, lack of available labour, and high food prices, to affect people's livelihoods in complex and dynamic ways (Reid and Vogel, 2006; Ziervogel et al., 2006; O'Brien et al., 2007, 2009; McDowell and Hess, 2012; McCubbin et al., 2015; Nyantakyi-Frimpong and Bezner-Kerr, 2015). Furthermore, it has been argued that understanding how climate change pressures interact with socioeconomic stressors is essential for successful climate adaptation planning and policy (Hjerpe and Glaas, 2012; Räsänen et al., 2016).

In their 2016 review of studies on climate change, multiple stressors, and vulnerability, Räsänen et al. emphasised the need for further research to empirically analyse the interactions between multiple stressors, including through triangulation using mixed methods. In our study, we used qualitative and quantitative analysis to disentangle the individual effects of different shocks and how they interacted. We also consider the responses that emerged, focusing on households' ability to adopt reactive coping strategies in the face of immediate threats, as our data collection did not permit analysis of longer-term adaptation (Ziervogel et al., 2006). The sudden changes we study – the outbreak of a pandemic, extreme weather events, and payment disruptions – are specific shock events, rather than stressors which include gradual and ongoing phenomena such as trends and policies (Leichenko et al., 2010; McDowell and Hess, 2012).

5.3 Methods

5.3.1 Study area

We conducted our study in seven forest-fringe villages surrounding Kakum National Park in Assin South District, Central Region, Ghana (see Figure 8). These communities mainly consist of smallholders with farms averaging four hectares. They cultivate cocoa as their main commodity crop and rely on the annual income injection it provides during the major harvest season. Farmers receive a fixed producer price – for example, 660 Ghana cedis [approximately 60 USD] in 2020-2021 – for each standard 64kg bag of cocoa beans they sell to local representatives from licensed buying companies (LBCs). COCOBOD then purchases the beans from LBCs, using funds raised on the international market through an annually-sought syndicated loan, and conducts quality control checks before export (Kolavalli et al., 2012).

Most smallholder households in the area also grow various other food crops such as maize, cassava, plantain, and other vegetables. These may be consumed by the household and/or sold, typically in nearby open-air markets where buyers come from nearby communities or further cities. Farmers also travel to these markets via shared taxis to purchase household goods and foodstuffs. In addition to cocoa and food crop cultivation, many households benefit from additional off-farm income sources, such as selling household goods, buying cocoa as an LBC representative, or construction work. Smallholder farmers in our study region mostly access food through the production of food crops and purchasing from local markets. Chapter 3 provides further socioeconomic descriptions of the area.

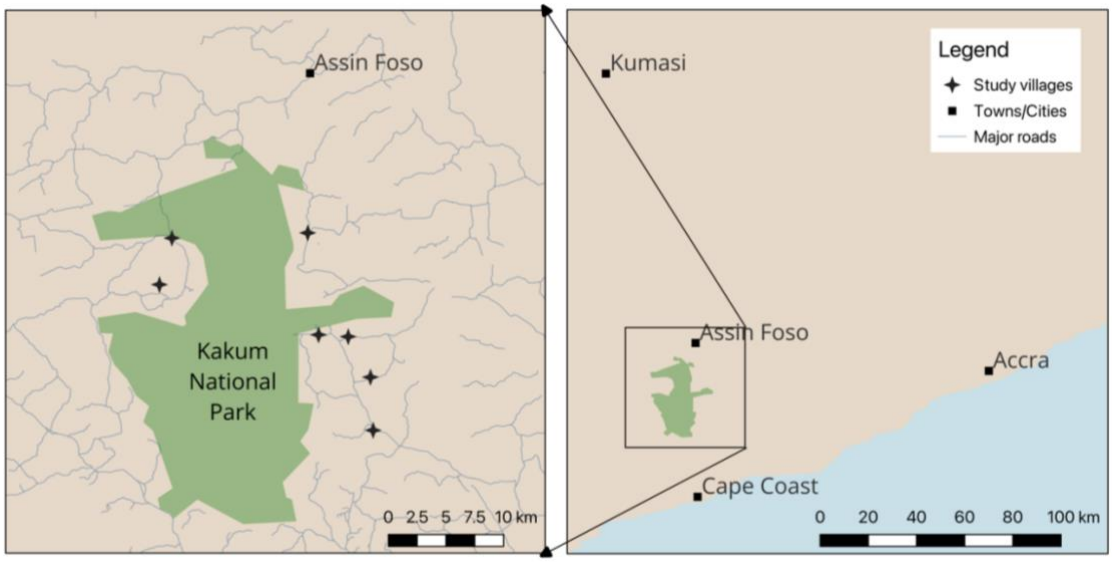


Figure 8. Map showing approximate locations of study villages and relevant towns and cities. (Source: author's own).

5.3.2 Empirical methods

Our mixed-methods study uses data collected in a series of field visits between June 2021 and January 2022. We followed an iterative, empirically-grounded approach, simultaneously collecting data and conducting analysis (Charmaz, 2006; Thornberg and Charmaz, 2014). We first collected data on shock events that farmers experienced in 2020 and 2021, and their impacts. We then validated and triangulated reported events using meteorological data, government announcements, and newspaper articles (Olsen, 2004). In our analysis, we parsed out and chronologically mapped individual shock effects and the effects of their interactions, according to a methodological framework outlined later in Figure 9.

We conducted 14 focus group discussions in June 2021, convening one male- and one female-group in each study village to ensure gendered dynamics did not hinder participants from speaking. We selected participants with different

community leadership positions and smallholder backgrounds. The groups discussed and conducted ranking exercises on market dynamics, the use and importance of food crops, and the key livelihood challenges. Discussions were held in Twi, the most commonly spoken local language, and notes were taken in English. Further details of the discussions are provided in Chapter 3.

In January 2022, we conducted 31 semi-structured interviews with smallholder farmers, stopping once we reached theoretical saturation (Patton, 2002). Results from our previous survey (Picot et al., Under review) helped us to identify patterns to further explore during later interviews, such as the effects on households of climate shocks and COVID-19, and informed our theoretical sampling of smallholder interview participants (Glaser, 1978; Currie, 2009). Interviewees were a sub-set of previous survey participants chosen to represent a range of demographic backgrounds (e.g., age, gender, migrant status) and reported attitudes to COVID-19, as well as community leaders and others recommended by community leaders. We also conducted 15 semi-structured interviews with food crop sellers in two local markets to understand market functioning, trade flows, and the impacts of COVID-19 restrictions. Interviewees were conducted until we reached theoretical saturation and were chosen to be spatially distributed around the markets and sold a variety of food crops. As market selling is a female-dominated role, all market interviewees were female. Finally, we conducted six expert interviews in Assin Foso (in-person) and Accra (via telephone) with staff from LBCs, COCOBOD and the Ministry of Food and Agriculture (MoFA). All interviews, except five conducted in English, were carried out using live English-Twi interpretation between one research and

another; therefore, most quotations included in this paper are translations. We analysed the interview data using standard coding and memoing techniques (Miles and Huberman, 1994).

The focus group discussion and interview participants identified three shocks – restrictions from the COVID-19 pandemic, cocoa payment delays, and unusual weather – as key. We matched the shocks reported to a timeline of known events, cross-referencing to confirm accuracy and triangulating to deepen understanding using historical government announcements and newspaper articles (Olsen, 2004; Räsänen et al., 2016).

To contextualise climatic events reported by interview participants, we acquired data from ECMWF (European Centre for Medium-Range Weather Forecasts) Reanalysis v5 (ERA5) on temperature, precipitation, and evapotranspiration for the relevant period and two prior decades (Hersbach et al., 2020) for the two 30km grid cells of the study area (i.e., 30×60km total area). We computed monthly mean daily temperature, total precipitation, and Cumulative Water Deficit (CWD) (Malhi et al., 2009) for each grid cell and compared the climate patterns for 2020 and 2021 against averages for each month since 2000. The 12-month cycle for the CWD calculation starts at the wettest time of the year (June) and assumes that the soil is saturated then (i.e., CWD is 0) (Malhi et al., 2009). It then cumulatively sums the deficit between monthly water supply (precipitation) and loss (evapotranspiration). CWD is a metric that captures both the intensity and duration of drought, and therefore better captures experienced drought stress than precipitation anomalies alone.

5.4 Methodological framework

In this paper, we propose a methodological framework as a way to structure the assessment of vulnerability to multiple shocks. Based on the components in Leichenko and O'Brien's (2008) double exposure conceptual framework, in Figure 9 we show how multiple shocks necessitate a different analytical approach than considering single shocks in isolation. A conceptual framework encompasses theoretical components and broadly encompasses the underlying thinking and ideas behind a research approach (Kivunja, 2018). Our methodological framework utilises elements from this, but is distinct as it specifically focuses on the methodological approach and points to the order of analyses to assess shocks in two sequential stages (see categories 1 and 2 below). We focus our analyses on the effects of multiple shocks and their interactions, which we disaggregate into two categories:

1. Individual effects: single effects of each shock, seemingly unaffected by other shocks
2. Interacting effects: amplified or emerging effects resulting from interactions or overlaps between two or more shocks.

We suggest that it is important to consider exposure to the aggregation of these effects, and how they dynamically interact with the contextual environment of each household. Our framework represents the range of responses that households may adopt in response to the interacting shock effects, as people's decisions may not necessarily directly relate to specific individual shock effects, but may be in response to some combination of effects. The framework then

represents how the exposure to shocks, and context in which they are experienced, and responses taken by households determine the livelihood outcomes of multiple shocks. Finally, the feedback loops in the framework show how the livelihood outcomes from one shock can alter a household's capacity to cope with another shock (Gitz and Meybeck, 2012), emphasising the multidirectional nature of vulnerability.

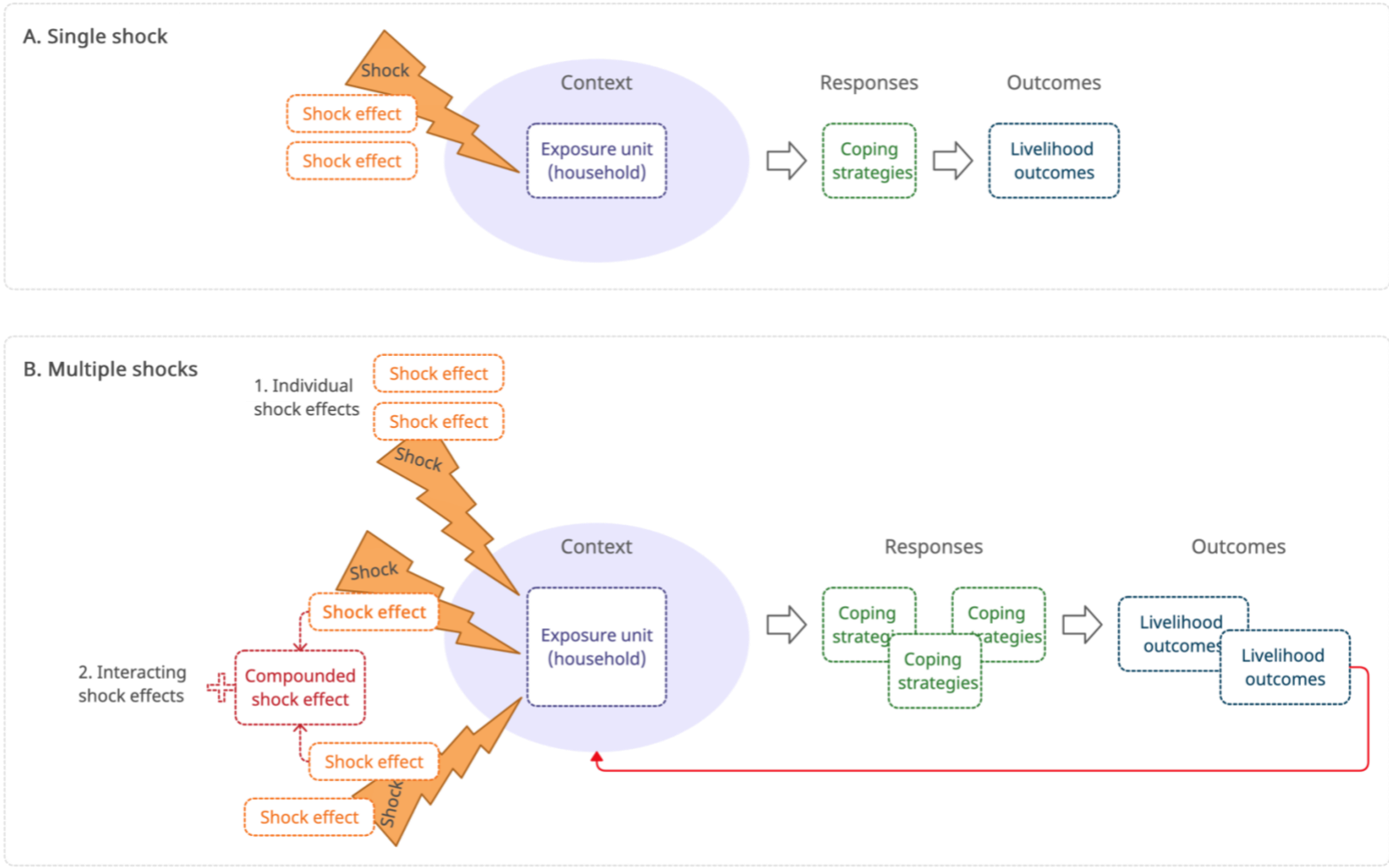


Figure 9. Methodological framework for assessing vulnerability to multiple shocks. Framework A is a vulnerability framework for a single shock. Framework B is a vulnerability framework for multiple shocks, showing our proposed approach of considering individual shock effects followed by the novel dynamics that emerge from interactions between shocks. (Source: author's own, based on components from Leichenko and O'Brien (2008)).

5.5 Results

Following our proposed methodological approach, in the following sections, we systematically unpack households' vulnerability to three interacting shocks. First, we show the overlapping timing of the three shocks in our case study. Second, we analyse the three shocks in turn and their separate effects on smallholder farmers. We then investigate how impacts from different shocks interacted. Next, we present the ways in which the combined multiple shocks necessitated various coping strategies by households. Finally, we examine the financial and food security-related outcomes for households of their vulnerability to multiple shocks.

5.5.1 Timing of shocks and their individual effects

Smallholders in the study area experienced several shocks in a 20-month period from 2020 to 2021, starting with COVID-19 restrictions coming into effect in March 2020. Then, from October 2020, farmers were paid late for their cocoa harvests. Third, unusual weather patterns negatively affected crop production from May to October 2021. Farmers had little time to recover from the previous shock before experiencing the next. Figure 10 depicts the relative timings of these shocks and the harvest seasons of cocoa and plantain, maize and cassava (the food crops identified by smallholders as most important due to their roles in income and subsistence). The following sections explain the individual impacts of each shock in turn and then how they interact.

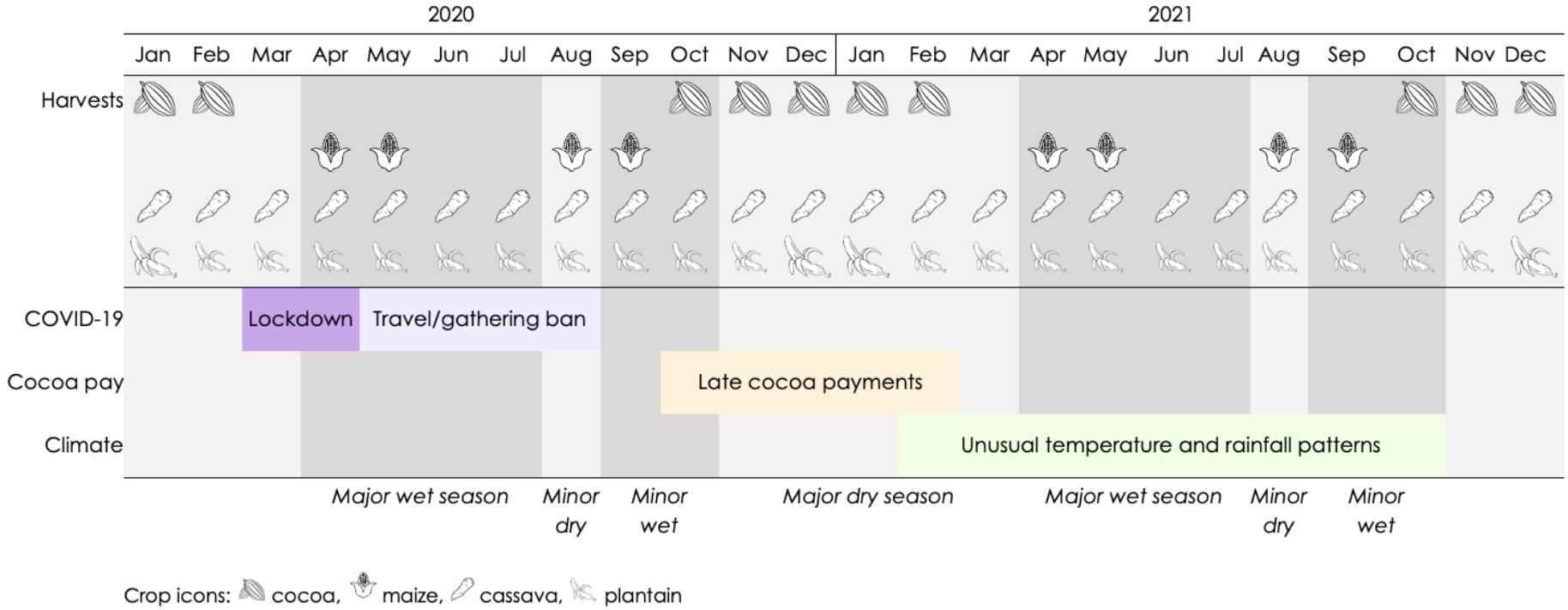


Figure 10. Timeline of consecutive and overlapping shocks in 2020 and 2021. Icons indicate major harvests for seasonal cocoa and maize and perennial harvesting opportunities for cassava. Plantain may be produced year-round, with peak abundance in December and January. (Source: author's own).

5.5.2 Individual shock effects

5.5.2.1 COVID-19

Like many other countries (Bundervoet et al., 2022; Egger et al., 2021), the pandemic brought economic hardship to households across Ghana (Aduhene and Osei-Assibey, 2021). The emergence of the pandemic triggered a series of restrictive measures, starting with a ban on public gatherings and closure of schools and universities from 16 March to 1 August 2020 (Akufo-Addo, 2020a, 2020b). A partial lockdown across Greater Accra and Greater Kumasi also came into effect on 29 March 2020 (Akufo-Addo, 2020c).

As a result of these restrictions, many interviewed farmers reported a decline in their on- and off-farm income sources in the short- and longer-term. Firstly, food crop sales at local markets were reduced as fear of infection in marketplaces or shared taxis en route deterred many from their normal selling activities. Several farmers described ceasing selling for several months, or even a year, because they were "*too scared to go to market*". Further discouragement came from reports of police officers harshly enforcing social distancing measures in marketplaces. For some farmers, being unable to sell resulted in a waste of perishable food crops that could not be stored. For those who did attend markets, sales continued to be poor for several months after the end of lockdown, due to the lack of buyers coming from local villages or further urban centres. Many, such as this smallholder farmer, returned with little or no profit: *"I'd take a pan of cassava to the market but only get a very small amount of money, 80 cedis [approximately 7 USD], from it. And from that, I had to pay for my transportation, tickets to enter the market and a contribution to the market's upkeep. At the end of the day, I had no money left"*. Some

of these effects were longer-term. Even after COVID-19 restrictions were lifted, including at the time of interviewing in January 2022, farmers and market sellers were still reporting low sales due to the lack of *"money in the system"*.

Many interviewees also described the negative effects of the pandemic on their off-farm income sources. External employment, such as men conducting chainsaw operations, ceased for several months because of fear of disease transmission between workers and a reduction in demand for products, such as timber. Several women reported stopping their usual selling of goods, such as lime broom, rubber, fried fish, provisions, or alcohol, for six months due to a lack of buyers travelling from other regions or a reluctance to travel to replenish their stocks. This decline in trading opportunities *"really affected the finances"* of households.

Some households also reported issues with cocoa production as a result of the pandemic, affecting both the 2020-2021 and 2021-2022 harvest seasons. Yields from cocoa for some households were hampered in late 2020 as chemical inputs needed to cultivate the main cash crop were less available to farmers because import shortages raised prices, and farmers were further deterred from travelling to purchase them for fear of infection. People also became reluctant to hire farmhands, who are most commonly employed to work on cocoa, because *"everybody was afraid of contracting [the disease]"* and carried out only the work they could undertake themselves. Continued financial hardship and limited chemical input availability exacerbated the issue, extending effects into the following cocoa season; as one farmer explained about her harvest at the end of 2021,

"Because of Covid, we didn't have enough money in the early stages where the [cocoa] crop needed fertilisers and some chemicals… that's why yields were poor".

Alongside its negative effects on household incomes, COVID-19 had widespread market effects that reduced access to affordable foodstuffs. The announcement of a lockdown was given at 48 hours' notice, triggering mass bulk-buying and spiking prices of food crops, despite food production, distribution and marketing being exempt. Market sellers, rather than the farmers from whom they bought food crops, benefited from the price increases. As a gari (cassava flour) seller recounted, "*People complained, but I, and other sellers, made a lot of money."* Prices remained high as COVID-19 restrictions continued, and fewer traders came to sell foodstuffs brought from elsewhere. Staple ingredients such as fish, meat, oil, tomato paste, beans and onions became expensive and scarce, which *"made eating here quite difficult"* and prompted some households to ration their intake during the lockdown period and afterwards. One household was forced to *"prepare banku [fermented cassava and maize dough] or boil some plantain and [eat] it without any stew or soup".*

5.5.2.2 Late cocoa payments

From October 2020, a few months after the COVID-19 restrictions, smallholders' cocoa payments were late. Although market price volatility has historically been a significant challenge to cocoa farmers, with global dynamics affecting farm-gate prices (Voora et al., 2019), such widespread and lengthy delays in payments were described as unprecedented by smallholders and government officials.

Most farmers interviewed reported waiting weeks or months to be paid in full by LBCs. Some LBCs, in turn, were not fully reimbursed by COCOBOD until February 2021 (Cromwell, 2021). COVID-19 was a co-contributor to the occurrence of this shock. According to a COCOBOD officer and news reports, the pandemic lowered global market prices for cocoa and affected COCOBOD's ability to sell cocoa internationally and secure an adequate syndicated loan facility (Bank of Ghana, 2023; Cromwell, 2021). However, according to the officer, the shock was largely caused by a record national annual yield of 1.046 million tonnes of cocoa resulting from the Productivity Enhancement Programme activities and extension services funded by the new Living Income Differential premium (Boahen Aidoo, 2021). The consequent national productivity boost meant COCOBOD struggled to purchase all the cocoa produced over the harvest season in Ghana, resulting in payment delays at the farmer level. However, we note that, on a household level, some farmers in this study experienced a decline in cocoa yields in the 2020-2021 harvest (see previous section).

The interruptions to expected cocoa payments constituted a significant shock to cocoa-producing households as, according to our focus group discussions, cocoa sales are identified by most households as their main income source. Smallholders therefore struggled when they did not receive their expected bulk cocoa payments on time or in lump sums. Many were paid via credit or in small instalments, which were *"wasted"* before they could pay for major outgoings, such as school fees, loan repayments, remittances to relatives, or farmhand wages. We found that some households were pushed into lending cycles and towards poverty traps that affected their ability to invest in chemical inputs and

labour towards future farm incomes. For example, *"When the money finally came through, I couldn't keep it because I'd borrowed money with the agreement that I'd pay back with my cocoa proceeds"* [smallholder cocoa farmer].

5.5.2.3 Climate change

Following the shocks of COVID-19 restrictions and delayed cocoa payments, farmers faced a climatic shock of unusually high temperatures and erratic rainfalls in 2021. Figure 11 shows that daily mean temperatures from May to October 2021 were higher than the 20-year average and exceeded one standard deviation above the mean, particularly during the minor dry season. Precipitation patterns were also unusually variable in 2021 compared to the 20-year average. Mean monthly rainfall was low in February 2021 and again in April, when it fell one standard deviation below the 20-year mean and extended the major dry season to longer than normal. Rainfall then increased unusually sharply between April and May to start the major wet season. A similar jump in precipitation occurred at the beginning of the minor wet season in September 2021, in which rainfall was much higher than the 20-year mean, before returning to average levels from October. Precipitation patterns resulted in a consistently high (negative) cumulative water deficit from July 2020 to April 2021, as the data suggest that the region experienced somewhat higher-than-average evapotranspiration and thus a sustained soil water deficit.

We focus on the climatic disruptions between May to October 2021, despite parts of 2020 also being somewhat unusually hot and dry, as farmers interviewed

consistently reported adverse weather effects on their crops in 2021, but few reported effects in 2020. This is perhaps due to the different types of unusual weather patterns and their relative timings in the crop growth cycles (Wood and Lass, 2001; Carr and Lockwood, 2011). For example, unusually high temperatures occurred earlier in 2020 (January to June) than in 2021 (May to October), and rainfall was low from July to August 2020, but close to average for these months in 2021 and then unusually high in September.

Consistent with the meteorological data, farmers across the study communities reported experiencing high temperatures, delayed wet season onset, and inconsistent rainfall in 2021 which affected households' crop cultivation. The unpredictability made planning difficult, such that one farmer felt there was *"no way I was going to be able to cultivate whatever I was supposed to cultivate."* Furthermore, when the rains came, there was *"too much for the crops to bear"*, affecting both cocoa and food crop yields. After delayed cocoa payments had disrupted incomes for the 2020-2021 major cocoa season, the erratic weather substantially reduced the yields, and therefore incomes, for the 2021-2022 harvest. *"Cocoa yields were poor because there was too much sun and the temperature was very hot; the rains didn't start on time so that the cocoa couldn't get the rains when they needed it to fruit"* [smallholder cocoa farmer]. As well as quantity, quality also diminished, with one farmer describing the *"black spots"* indicative of black pod disease, for which rainfall is a major determining factor (Deberdt et al., 2008).

The climate shock also negatively affected food crops that are key for subsistence and local sales income. Several farmers reported how *"the rains came and eroded away"*

all their cassava tubers in the soil. Maize and vegetables, such as tomatoes, garden eggs, and peppers, were *"destroyed"* by the high temperatures and then excess rain. One farmer *"lost virtually everything"* from her tomato and pepper crops, forcing her to instead buy at market rates which were high due to scarce regional supplies. Plantains also grew smaller, reducing their marketability and sales.

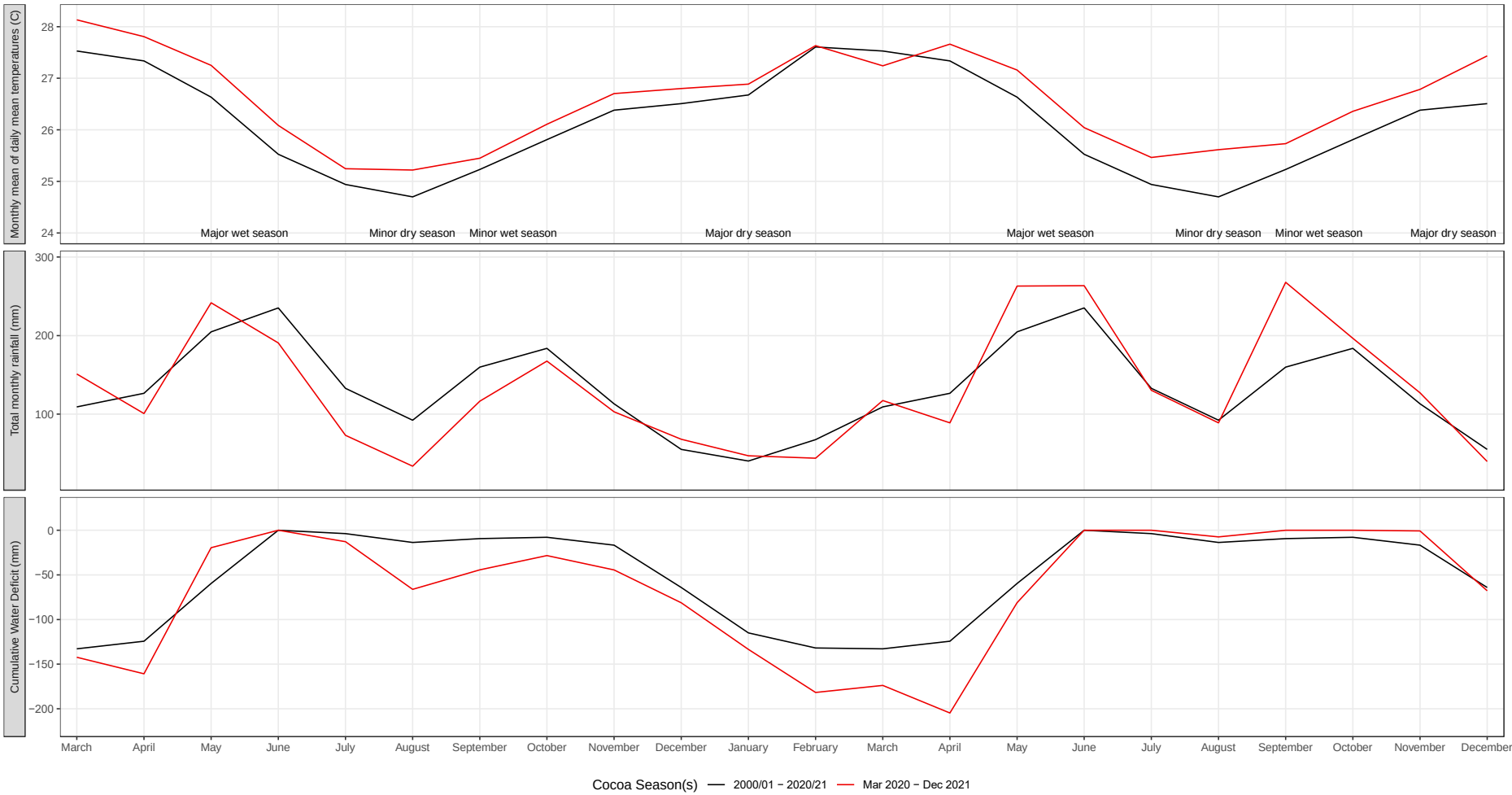


Figure 11. The climate of the study area over the study period from the start of the pandemic in March 2020 compared to a 2000-2020 reference. Lines show monthly mean climate (red = study period; black = 2000-2020) and dark grey shading above and below the lines shows the standard deviation over two decades. (Source: author's own figure and analysis)

5.5.3 Interacting shock effects

Beyond direct individual shock effects, such as lower yields and market disruptions, the three shocks interacted to amplify negative impacts experienced by smallholder farming households over the two-year study period. We illustrate these interactions in Figure 12.

The first interaction resulted from COVID-19 partly contributing to farmers' late cocoa payments for the 2020-2021 harvest. The pandemic also reduced farmers' access to inputs and labour, which affected cocoa production, and combined with the payment delays to reduce income during the major cocoa season. Further economic precarity emerged for smallholder households in 2020 as a result of intersecting individual effects from the COVID-19 restrictions. Interactions can occur between different effects from the same shock. In this case, a combination of lower food crop market sales, elevated market purchase prices, and reduced off-farm incomes all contributed to financial declines and exacerbated households' difficulties in purchasing food. Coinciding with late cocoa payments, the total burden of interacting shock effects led to deep financial hardship and increased food shortages for many households, the worst several farmers could recall ever experiencing. For many months after COVID-19 restrictions came into place, economic hardship affected households' ability to invest in inputs and labour to improve their crop cultivation in 2021 (see red feedback loop in Figure 12).

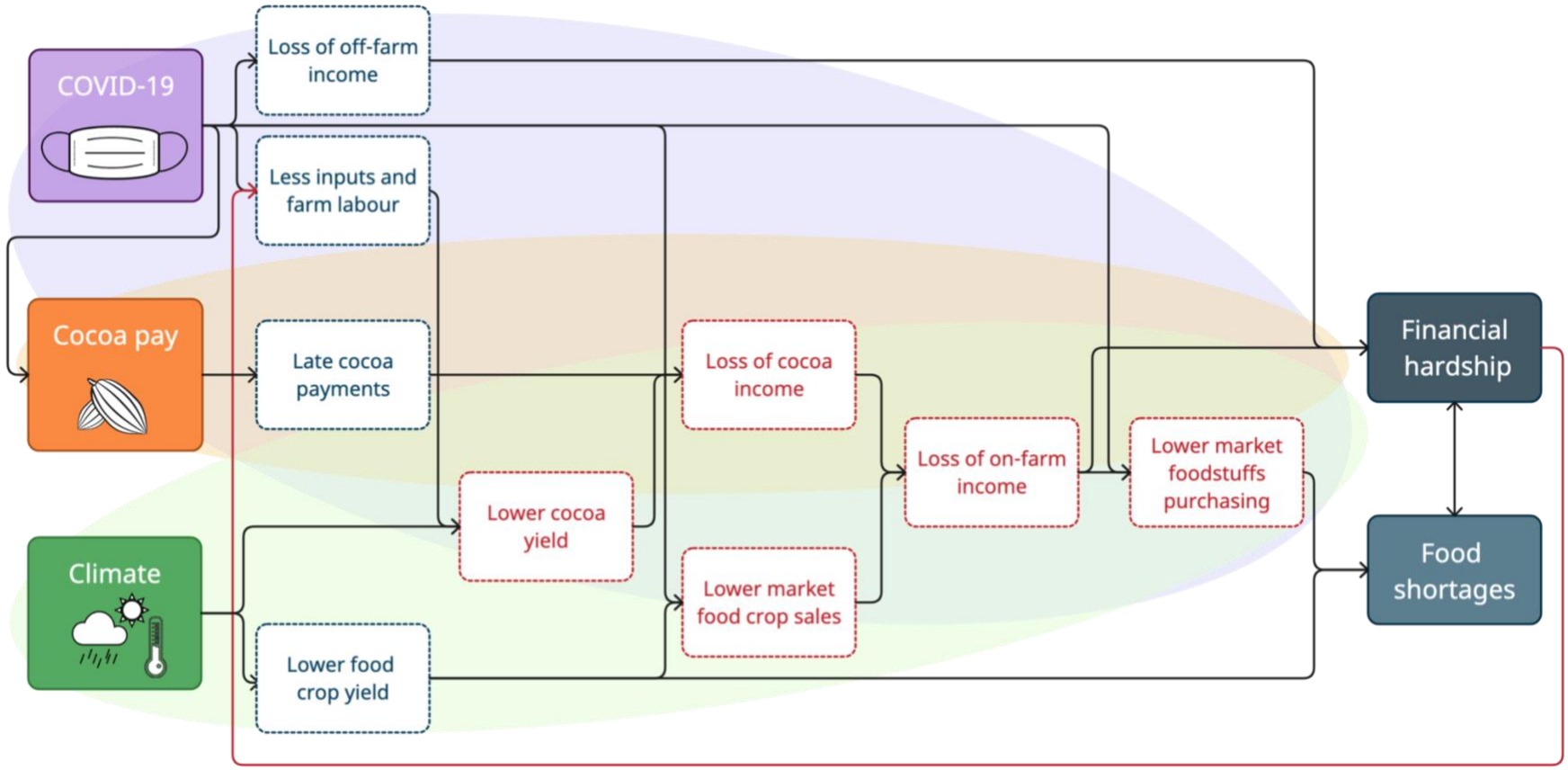


Figure 12. Multiple shocks from March 2020 to the cocoa season at the end of 2021. The illustration shows the individual (blue outline) and interacting (red outline) impacts on smallholder farming households, and outcomes for households' finances and food access and availability (dark blue fill). Black arrows show effects and the red arrow shows a feedback loop. Colour-coded background shading indicates spheres of influence, which trend toward overlapping as shock effects interact and compound. For example, the climate (green) and COVID-19 (purple) shocks both affected cocoa yields. (Source: author's own).

The interactions between shock effects continued in 2021. Weather disruptions affected the yields of different food crops, diminishing food availability and forcing some households to instead purchase these foodstuffs at prices that were elevated during a time of financial scarcity caused by the previous year's shocks. A further interaction between longer-term pandemic effects and the climate shock was felt by farmers who struggled to sell their climatically-reduced food crop yields, as a lack of demand from cash-strapped buyers reduced food crop incomes. Cocoa incomes were also poor for the 2021-2022 harvest season, as the reduction in inputs and farm labour resulting from COVID-19 restrictions compounded with climate events. A smallholder farmer who sells fertilisers said of these interactions, *"It was a joint thing between Covid and the weather. Because of Covid, we couldn't go and sell [fertilisers] and get money. And then there was excessive sunshine at the beginning of the year, so the new cocoa couldn't bear fruits. So the high temperatures also affected our income from selling our cocoa."* These losses meant households had to contend with two consecutive years of major income losses, with little opportunity to recover. The interacting nature of shock was demonstrated by responses such as, *"My cocoa didn't yield much and then I didn't get my money upfront, so it's really made things hard"* [smallholder cocoa farmer].

5.5.4 Coping strategies in response to multiple shocks

Farming households adopted a number of strategies in 2020 and 2021 to cope with the food shortages and decline in household incomes caused by the three interacting shocks. Those identified by focus group discussions included: eating

from farms; rationing food or skipping meals; reducing purchases of foodstuffs; selling more food crops; engaging in off-farm activities; using loan facilities; using savings; reducing spending (e.g., on clothes or school fees); and assistance from family or neighbours. Some of these strategies involved food crops, reflecting their flexibility as producers can choose to eat or sell their yields in response to market and household demands. Cocoa, on the other hand, did not appear to play a role in coping strategies, as the crop cannot be directly consumed and farmers had no option other than to sell their yields when buyers were ready.

We found that many households adopted a variety of coping strategies in response to the impacts of combined shock effects. In some cases, a given coping strategy was found to have been adopted in response to more than one shock effect. For example, farmers reported in interviews that rationing food was necessary when COVID-19 rendered some foodstuffs less available and when late cocoa payments meant households had less money to purchase them. However, interviewees tended to describe actions taken due to a general state of hardship, rather than in response to the COVID-19, late cocoa payments, or the climate shock in particular. It was, therefore, difficult to disentangle which strategies were adopted in response to which specific shock effects.

Furthermore, the overlapping of shock impacts rendered some households' usual coping strategies ineffective. Financial reliance on food crop sales and off-farm income sources is typical during the lean season preceding the annual major cocoa harvest. Yet, in the 2020-2021 cocoa season, these sources became insufficient for many as late cocoa payments extended the lean period.

Furthermore, food crop sales and off-farm income sources were impeded by ongoing COVID-19 financial challenges and the 2021 climate shock. For example, one farmer found her normal strategy of supplementing cocoa income by selling kenkey (fermented maize dough) ineffective during the pandemic. Restrictions overlapped with the maize season, so some people made kenkey from their own harvests, whilst others lacked money for purchases.

When other coping strategies were not possible and households were facing food shortages and financial hardship, eating from farms acted as an essential backstop, providing some food "*no matter what happens*". As one farmer explained, "*Since we had foodstuffs from the farm to eat, we had hope. If we hadn't had food, we would have maybe starved to death. Because we had food, we had hope. We were able to cope with the little food we had. You can just eat, drink some water, and go to sleep.*" Another farmer summarised the importance of food crops in the time of hardship, "*If it hadn't been for food crops helping, we'd probably be dead by now*".

5.5.5 Outcomes of multiple shocks

In a vulnerability framework, outcomes can be considered as resulting from both the exposure to shocks and the coping strategies adopted in response (Leichenko and O'Brien, 2008). In this study, two key outcomes for households were found: food shortages and financial hardship. Food shortages were affected by the direct production of food crops and the ability to purchase foodstuffs at market prices. Financial hardship was driven by effects on incomes (from cocoa sales, food crop sales, and off-farm sources) and expenditure on foodstuffs. We also found

evidence of 'ripple effects' (Béné, 2020) whereby a shock has indirect feedback effects on other interconnected actors or sectors. In our case study, financial outcomes affected households' ability to cope with further shocks. For example, financial hardship from COVID-19 income restrictions reduced some households' ability to invest in farming inputs that would have boosted production and reduced vulnerability to future climate shocks.

Overall, several households described that the economic circumstances posed by COVID-19 and the interacting shocks made life *"very hard"* and worse than in previous periods of financial difficulty. A 75-year farmer provided a longer-term context, *"You face hardships from time to time, but it's been a very long time since we've experienced anything like this, this intense form of hardship and illness, like COVID-19"*. For many, this period of hardship was particularly acute in early 2021, as the effects of the pandemic had accumulated in the previous months and were exacerbated by the late cocoa payments. An example of the *"very intense hardship"* was given by a farmer whose livelihoods includes labouring on others' farms and cultivating his own cocoa and food crops. Gesturing to the holes in his boots, he described how the lack of farmhand work, the late cocoa payments, and the lack of in-season food crops to sell had caused the worst state of poverty his household had experienced for several years.

Figure 13 shows how the shock effects and responses led to food security and financial outcomes for households. It uses our case study to demonstrate the methodological framework (Figure 9). The select elements given are illustrative, rather than a complete analysis of the complexities of the three shocks.

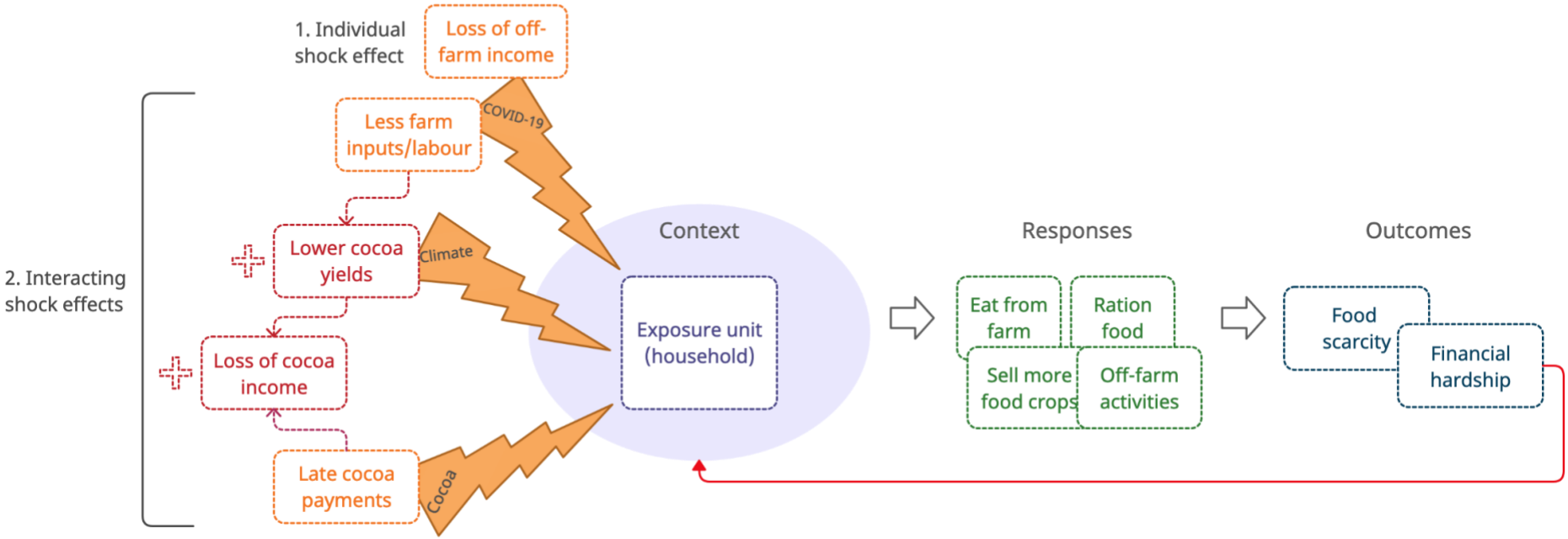


Figure 13. Real-life application of the methodological framework for assessing vulnerability to multiple shocks. The example draws on some shock effects, responses, and outcomes outlined in this case study. (Source: author's own).

5.6 Discussion

Our methodological approach and results add to the literature that evaluates vulnerability in the context of multiple stressors or double exposures (Antwi-Agyei et al., 2017; Leichenko et al., 2010; Leichenko and O'Brien, 2008; McCubbin et al., 2015; McDowell and Hess, 2012; Nyantakyi-Frimpong and Bezner-Kerr, 2015; O'Brien and Leichenko, 2000; Räsänen et al., 2016; Reid and Vogel, 2006; Roxburgh et al., 2021; Shackleton et al., 2014). We make several key contributions in two main areas. First, in proposing a novel methodological framework to systematically examine the individual and interacting effects of multiple shocks and households' vulnerability to them. Second, in following this approach to empirically assess the interacting effects of the COVID-19 pandemic with overlapping climatic and cocoa payment shocks on smallholder farmers in Ghana.

Climatic shocks are known to occur in tandem with other events (Gitz and Meybeck, 2012), and our methodological framework offers a way to rigorously assess this in a flexible way that may be used by researchers and policymakers. Our framework shows how multiple shocks may occur concurrently and/or in quick succession to affect households. One shock may cause multiple individual effects, and different shocks, even if of diverse natures, can interact to amplify impacts. Overlapping shocks should therefore be considered together, rather than in isolation as single constituent shocks. In the methodological framework's application, we focussed specifically on smallholder farming households, but the framework may be widely applied to other sectors, geographies, and scales.

In applying the methodological framework to our case study, we made the following key findings. First, the three shocks had a number of individual effects on smallholder farming households. Fear, travel bans, and marketplace restrictions meant the COVID-19 pandemic reduced smallholders' sale of food crops at local markets, off-farm income sources, such as petty trading and chainsaw operations, and raised market prices of foodstuffs. This is similar to smallholder experiences of the COVID-19 pandemic elsewhere. For example, in Nepal and Bangladesh, declines in employment, incomes, and food security during the early stages of COVID-19 pandemic meant that households' hardship conditions were comparable to what is typical during the lean season, even though the pandemic arrived at harvest time (Kharel et al., 2023).

Second, our results show that the interactions between the shock effects amplified several impacts on smallholders. Disruptions to cocoa incomes were caused by late payments in the 2020-2021 season, which was partly due to COVID-19, and then again for the 2020-2021 harvest, due to the climatic shock and pandemic disruptions to agricultural practices. Further economic precarity came from lower food crop incomes (due to the climatic shock and pandemic market effects), and loss of off-farm incomes during the pandemic. Households' access to food was affected by a combination of reduced incomes to purchase foods, higher prices due to COVID-19 impacts, and climatically-induced lower food crop yields. Even though the burden of disease in the area was reported to be low, the effects of COVID-19 were far-reaching and interacted with other shocks, particularly climatic disruptions, in complex and unforeseen ways. Many studies have found that climatic pressures are not the most important factor affecting vulnerability,

when considered in the context of other stressors (Räsänen et al., 2016). Similarly, in our study, COVID-19 seemed to have the most wide-reaching effects of the three shocks, touching many aspects of households' income and food sources, and amplifying the effects of the 2021 climatic events, months after the lockdown ended.

We found that the interacting shock effects necessitated a variety of coping strategies from households. This is to be expected, as existing literature shows that on- and off-farm livelihood diversification strategies can help reduce vulnerability to climate change (Gitz and Meybeck, 2012; Mohammed et al., 2021), and economic studies show how land and labour diversification help to withstand other shocks that are experienced across households (Ansah et al., 2021; Nguyen et al., 2022). Several coping strategies focused on the flexible use of food crops for sale or consumption, emphasising their importance to households, particularly as a last-resort to ensure food availability.

However, we found that we could not determine which coping strategies were adopted in response to which shock effects. Matching of this kind is difficult because people adapt to a broad combination of changes, so it is hard to untangle the specific shock effect to which people are responding (Béné et al., 2014). However, future research on multiple shocks might be able to investigate this further, with in-depth qualitative research to target motivations for the adoption of different coping strategies.

We found that key negative outcomes were felt for households in terms of finances and food security as a result of interacting shock effects and limited coping strategies. The three overlapping shocks pushed vulnerable households

into deep hardship, as multiple income and food sources are affected over the same period by different processes. Smallholder farmers have been found to lack the adaptive and transformative capacity to fully recover from COVID-19 impacts in other agricultural settings (Paganini et al., 2020; Fromm, 2022), and our study goes further by also considering complex interactions with climatic and cocoa payment shocks. In such times of hardship, we find that smallholder households rely on food crops to survive, which reflects literature that highlights the high reliance of cocoa-farmers on self-produced staple foods (Hashmiu et al., 2022). However, the coping strategies that we found were all short-term coping strategies, including reducing meals and engaging in off-farm income generation when crop yields and sales were negatively affected, rather than adaptation strategies such as alternative cultivation methods or marketing approaches. Further research over a longer time period, for example, through longitudinal data collection, could have explored households' ability to adopt longer-term adaptation strategies to multiple shocks and the effects of COVID-19.

Future research could also build on our work by examining in detail household differences in vulnerability to multiple shocks. A given shock can have differentiated impacts in the same community (Béné et al., 2014), as vulnerabilities emerge at the intersections of identities, such as gender (Thompson-Hall et al., 2016), and circumstances such as land availability and injury. The intersections of COVID-19 with other shocks highlighted these differences between households, for example, certain off-farm income sources were particularly badly affected by the pandemic. These could be further unpacked in additional studies.

Our findings have implications for action in two main areas. First, our methodological framework and empirical results show how interacting shocks can have unexpected and complex outcomes. Concurrent and overlapping shocks should there be considered in research and policy together, rather than in individual silos. For researchers, this means mapping out networks of connected aspects, such as climatic and non-climatic factors, or farm-based and market-based effects, when conducting analyses. For policymakers, appropriate preparations should go beyond mitigating the individual effects of future crises, such as climatic events, pandemics, and international market disruptions, to strategic exercises projecting how compounding shocks might cause unexpected across unrelated sectors.

Second, the states of deep hardship that emerged as a result of interacting shocks demonstrate the smallholder farmers' need for backstop coping strategies, including access to credit and savings options. Policymakers should consider the provision of such financial services to be integral to agricultural support. Protective mechanisms or legislations could also be put into place by COCOBOD to ensure that LBCs pay farmers in a timely manner for their cocoa. Our findings show that food crops are essential for smallholder farmers, particularly when cocoa fails due to environmental or economic shocks, or a combination thereof. The government must therefore better support the production and climate adaptation of food crops through extension services. Measures to protect the sale of food crops could include help for farmers transporting harvested crops from their farms to local markets.

5.7 Conclusion

This study presents a novel methodological framework for assessing vulnerability to multiple shocks. We propose first identifying the impacts of each shock in turn, and then how they interact to form deeper and emerging effects. We demonstrate this approach through the empirical analysis of three shocks that affected Ghanaian smallholder farmers in 2020 and 2021: COVID-19 pandemic restrictions, delayed cocoa payments, and climatic events.

The COVID-19 pandemic was unprecedented in many ways, but its concurrence with other events may be taken as a warning of future shocks that will occur in tandem, especially as the climate crisis worsens. Holistic approaches to vulnerability that address how the impacts of the climate crisis interact with other shocks should be adopted by policymakers. This could involve, for example, taking an approach that borrows from our methodological framework to analyse individual aspects of shocks and how they interact with each other. The interactions of shocks in our case study demonstrated that, in the agricultural context, economically valuable crops, like cocoa, may fail under a combination of multiple shocks. Government efforts to improve smallholders' climate vulnerability must therefore be carried out alongside other initiatives to support a range of livelihoods and reduce susceptibility to other social, political, and economic shocks. The flexibility of food crops for sale and consumption must not be overlooked for its advantages for households' finances and food access when faced with multiple shocks. Ministries for agriculture and forestry could work together to tackle the impacts of multiple shocks on food crops and cocoa

together, and to protect smallholders' on- and off-farm incomes, market engagement, and food access. In an interview, a senior MoFA officer said that the COVID-19 pandemic had been a *"blessing in disguise"*, in that it highlighted that smallholder vulnerability must be improved to prevent negative impacts from future shocks. The effects of the shocks outlined in this paper wrought great hardship; we hope that a multiple shocks approach in policy can help mitigate this in the future, providing tools to help people weather different shocks in Ghana and more widely.

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CHAPTER 6

Remote collaborative fieldwork in the global South: equity implications for researchers and participants

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Linking statement

The previous chapters established the importance of considering the context of multiple shocks, including COVID-19 pandemic restrictions and climate change, and the equity issues that arise from the uneven distribution of food security and government extension support in smallholder communities. This third empirical chapter addresses the impact of the intersecting COVID-19 and climate crises on the research process itself and the equity issues that arose as a result. The context of the intersections between these crises was the backdrop for this thesis research and instigated a change in data collection to remote collaborative fieldwork. This study examines the equity issues that are brought to light through this different way of working. It addresses the overarching research question: How does

conducting fieldwork through remote collaborations shape equity outcomes for Northern researchers, Southern researchers, and participants?

This paper is framed around a novel application of a social equity framework to considerations of global North-South fieldwork collaborations. Conducting climate-related research raises questions of the ethics of the carbon footprint created through flying for fieldwork. Overlapping with this, restrictions imposed due to the COVID-19 pandemic precipitated a shift to remote research approaches involving less travel between the UK and Ghana. This reflexive study uses field notes, recordings of discussions between researchers, and semi-structured interviews with smallholder participants to critically examine the equity outcomes of this alternative model of field data collection. The relative advantages and disadvantages of remote collaboration are critically examined for three groups involved in the thesis fieldwork: Northern researchers, Southern researchers, and Southern participants.

This paper has been prepared for submission to *Qualitative Research*. I devised the methodological approach and conducted data collection with BS, AO, FM, KA, and RA. I analysed the data, and conceptualised and wrote the manuscript with the support of my supervisors.

Abstract

The international research community is paying increasing attention to inequities related to academic fieldwork in the global South. Globalisation, technological advancements, travel carbon footprint concerns, and COVID-19 ramifications have made online fieldwork more viable. This has led to the rise of 'remote collaborative fieldwork', where Northern researchers participate online whilst Southern researchers are physically in the field. The equity implications of this model are yet to be explored. We employ a conceptual framework to assess equity dynamics associated with remote collaborative fieldwork in social sciences for Northern researchers, Southern researchers, and Southern participants. We use qualitative fieldwork with Ghanaian smallholder farmers as a case study, analysing reflexive field notes and semi-structured interviews. We find that remote fieldwork does not change fundamental inequities between researchers and participants, such as extractive power dynamics, and involves various trade-offs, but may encourage the redistribution of research experience, budget allocation, and decision-making towards Southern researchers.

Keywords: fieldwork, equity, collaboration, remote, global South

6.1 Introduction

"We are now in a global world, things can be done here as if you were here yourself" - Ghanaian field scientist colleague, 2020

Remote work is becoming increasingly feasible with technological advancements, improved global internet access, and work patterns shifting following the coronavirus pandemic (Braesemann et al., 2022). Along with this increased feasibility, challenges posed by the pandemic and climate change have also made remote work increasingly compelling, even indispensable. In response to COVID-19 restrictions, many qualitative social scientists had to rapidly switch to online methods as an alternative to field-based data collection. Furthermore, the climate crisis is pushing academic institutions, organisers, and individuals to consider reducing travel for fieldwork (Fox et al., 2009; Grant, 2018; Whitmarsh et al., 2020). Online research presents challenges, such as slower relationship-building, lack of immersion in a place, and loss of spontaneous and face-to-face interactions with participants (Howlett, 2021; Hynes, 2023; Johnson et al., 2021; Singh et al., 2021). However, many researchers have argued for the benefits of online fieldwork methods such as video interviews (Archibald et al., 2019; Cabalquinto and Ahlin, 2023), participatory video production (Marzi, 2023), phone surveys (Etang and Himelein, 2020), and photo diaries (Svašek, 2023), and have questioned the necessity of being physically present in the field for certain types of research (Eggeling, 2023; Howlett, 2021).

For researchers studying areas with limited internet connectivity or without ready access to digitally connected devices, virtual research methods are not possible, and alternative ways of conducting face-to-face research were needed during COVID-19. In some cases, research teams shifted from working together in-person to collaborating online, with some colleagues in the field while others participated from their homes or research institutions. We refer to this as 'remote collaborative fieldwork', in which online communication facilitates some research partners participating in fieldwork remotely while other research partners[3] are physically present in the field (Burrell, 2016). There are precedents in qualitative research for collaborations taking place online, for example, when conflicts have affected travel plans (Mead and Métraux, 2000; Moss and Hajj, 2020), and COVID-19 has put remote collaboration on the table as a first-line way of working (Nguyen et al., 2022). Furthermore, it is common in some natural science disciplines, such as long-term ecological monitoring (Şekercioğlu, 2012), for Northern researchers to only visit field sites on short trips, with much of the data collected by Southern field-based colleagues through remote collaborations. This paper assesses the equity implications of these types of field research models, especially the degree to which remote collaborations require or facilitate

[3] The term 'research assistant' is commonly used to refer to field team members from the study country. In our project, we preferred to use the term 'researcher', to disrupt team hierarchies and in recognition that Southern colleagues are integral to research and do not 'assist' but conduct research as active researchers (Caretta, 2015; Msila, 2022).

a transfer of power and benefits in the process of conducting research. While we recognise that the content of research projects can have profound impacts on equity, this study focuses specifically on *how* we conduct fieldwork, rather than *what* the fieldwork is on.

A long-standing body of literature related to global North-South[4] fieldwork collaborations has focused on the dynamics of researchers working in the field together, and their interactions with participants (Ahmed et al., 2023; Binka, 2005; Gaillard, 1994; Hammett et al., 2022; Katz, 1994; Landau, 2012; Sibai et al., 2019; Yorke et al., 2023). Recent discussions of equity have included the virtual fieldwork methods necessitated by COVID-19, addressing aspects such as knowledge exchange and power relations (Konken and Howlett, 2023; MacLean et al., 2021; Marzi, 2023). Nguyen et al. (2022) have written from their experience of conducting remote collaborative fieldwork in upland Vietnam during COVID-19, focusing on the relationship between remote researchers and 'research assistants' in the field. Their paper considers the different ways in which remote fieldwork can contribute to overcoming power hierarchies between Northern and Southern team research members, help Southern researchers improve their

[4] The use of the commonly-employed but much-criticised terms 'global South' and 'global North' in this paper aims to acknowledge the historical and current power asymmetries, relations of domination, and economic structures that continue to divide the world (Sud and Sánchez-Ancochea, 2022).

research skills and confidence, and strengthen knowledge production. However, the positive and negative equity implications of conducting remote collaborative fieldwork, across the different actors involved, remain underexplored. In this paper, we analyse the equity implications of remote collaborative fieldwork for three key groups: Northern researchers, Southern researchers, and Southern participants. We use an equity framework that considers contextual, distributive, procedural, and recognitional dimensions (Pascual et al., 2014), to facilitate the systematic analysis of different aspects of equity and how they apply to those involved in remote collaborative fieldwork. Using our field research as a case study, we aim to address the following questions. First, how does conducting fieldwork through remote collaborations contribute to shaping equity outcomes for Northern researchers, Southern researchers, and participants? Second, how can equity be strengthened within remote collaborative fieldwork?

The rest of this paper is structured as follows. We explain the social equity framework in Section 6.2 and then review the relevant literature on equity issues in fieldwork in Section 6.3, structuring it according to the four framework dimensions. In Section 6.4, we describe the case study of our recent fieldwork in Ghana and the actors involved. This section also explains the research methods and data used for this analysis. We present the results of our analysis on the equity implications of remote collaborative fieldwork in Section 6.5, drawing on our case study and discussing it in the context of other relevant cases from the recent literature. Finally, Section 6.6 summarises our findings and discusses the role that remote collaborative practices can play in improving fieldwork equity.

6.2 The equity framework

Social equity is concerned with fairness and justice in people's treatment in society and their rights (Guy and McCandless, 2012). Unlike equality, which implies equal shares of a given 'pie', equity is a more flexible and comparative measure that considers relative circumstances and the social differences between individuals and groups (Grasso, 2007; Guy and McCandless, 2012; Leach et al., 2018). In other words, a 'fair share… is not necessarily an equal share' (McDermott et al., 2013, p418). Interpretations of fairness and what is equitable vary according to different situations and cultures (Fisher, 1989). In this paper, we take the view that equity means that treating people differently to overcome their respective barriers can lead to fairer outcomes (Fisher et al., 2019; Guy and McCandless, 2012). Definitions of social equity vary from a narrow focus on the distribution of outcomes to broader, more procedural, and contextual conceptions of justice (Fisher et al., 2019). We adopt the multiple-dimensional social equity framework initially proposed by McDermott et al. (2013) and redrawn by Pascual et al. (2014). The framework consists of four widely accepted social dimensions: contextual, distributive, procedural, and recognitional equity (Figure 14).

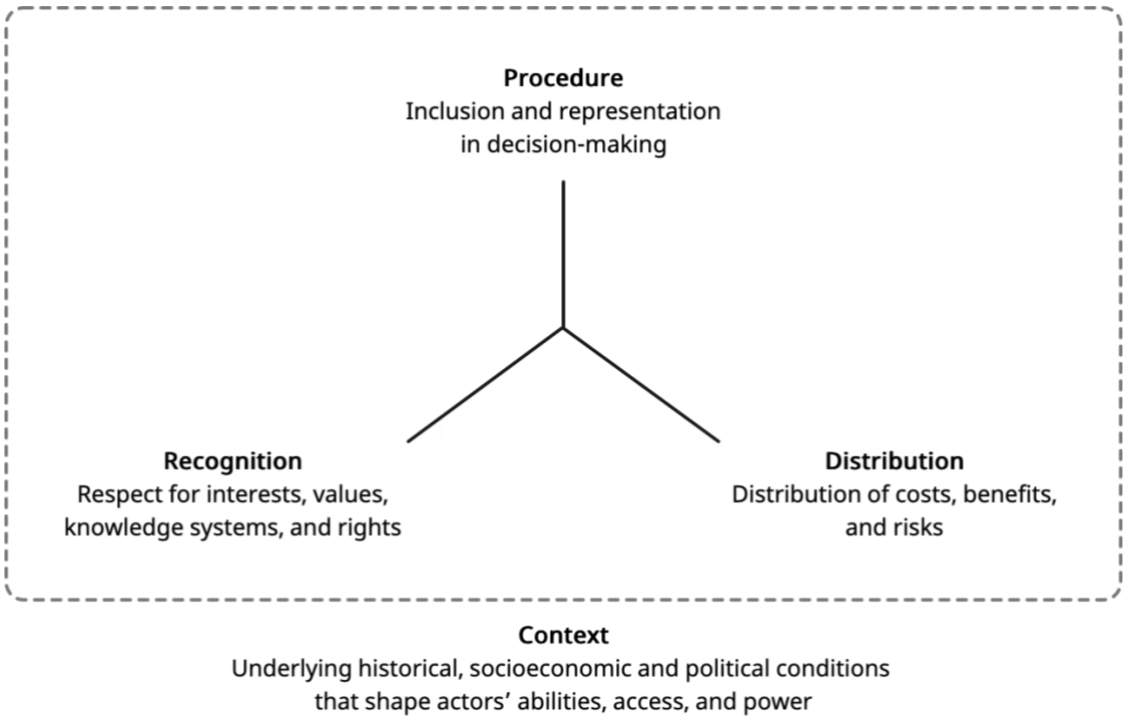


Figure 14. Framework for assessing social equity of fieldwork (adapted from Pascual et al. (2014): the original layout of the framework is maintained while the four dimensions are slightly redefined to fit our research context, according to the following text).

Contextual equity considers the broad political, social, cultural, and economic conditions that shape people's abilities to gain recognition and benefits or participate in decision-making (McDermott et al., 2013; Pascual et al., 2014). It acknowledges that historical and colonial processes shape differences in capabilities, access, and power (Fraser, 2009; Leichenko et al., 2023). Distributive equity focuses on the allocation of costs, benefits, and risks among stakeholders, often with particular attention to economic resources (McDermott et al., 2013). Procedural equity focuses on actors' involvement in making decisions and the processes that govern the allocation of resources and benefits (Schlosberg, 2007; Fraser, 2009). The dimension emphasises factors such as recognition, inclusion,

and representation in decision-making. Finally, recognitional equity refers to respect for different actors' interests, values, rights, social norms, and knowledge systems (Schlosberg, 2007; Sikor et al., 2014; Wells et al., 2021).

In connecting these four dimensions, the equity framework allows consideration of how a given process can improve equity outcomes in some aspects but not others. For example, promoting procedural equity through fairer decision-making processes may not necessarily result in a more equitable distribution of benefits (McDermott et al., 2013). Furthermore, equity outcomes may differ greatly across groups of people, depending on their relative vulnerabilities. We use the framework to assess social equity dimensions and tensions related to our remote collaborative fieldwork, considering implications for Northern researchers, Southern researchers, and participants.

Two key limitations were overcome in adopting the social equity framework. First, changing the context from the original conservation and land management setting to fieldwork required careful defining of the four dimensions of equity. In particular, recognitional equity was reframed to centre on values and interests, rather rights to land or other resources as per Pascual et al. (2014). Second, while the framework facilitates consideration of outcomes for different stakeholders the scope of relevant actors had to be deliberately bounded. Our study was limited to our data collection with Northern and Southern researchers, and Southern participants. Considerations of equity implications for wider members of the study communities, for example, were beyond the scope of this research.

6.3 Fieldwork equity issues and the equity framework dimensions

Multi-dimensional social equity frameworks have been widely applied to a variety of contexts, including to studies of environmental justice (Schlosberg, 2004, 2007), energy justice (Sovacool et al., 2017), and gender equity (Wong, 2016). While myriad equity concerns are under lively debate in discussions of international fieldwork, this paper is the first to apply a multi-dimensional social equity framework to considerations of the processes and outcomes of fieldwork. In this section, we review the literature on equity issues in fieldwork and match the current relevant debates to the four dimensions of the equity framework. By sorting the different concerns related to in-person fieldwork into the framework, we create a map of fieldwork equity issues in the equity framework. In Section 6.5, we then follow this same thematic mapping and use our case study to examine how these equity issues are affected by conducting fieldwork through remote collaborations.

Applying an equity framework allows comprehensive assessment of social equity issues across the different groups involved in fieldwork and facilitates 'affirmative efforts to represent and amplify marginalised voices' (McDermott et al., 2013, p425). As a comparative tool, the equity framework lends itself to considering the effects of a given change or intervention (McDermott et al., 2013), which in this case is Northern researchers conducting collaborative fieldwork remotely, rather than in-person. By systematically analysing the social equity implications of remote collaborative fieldwork, we contribute to current thinking about ways to enhance equity in fieldwork, going beyond the 'do no harm'

mandates often seen in fieldwork guidelines to evaluate to what extent remote ways of working might contribute to more socially equitable fieldwork (Hammett et al., 2022; Picot and Grasham, 2022). Below, we review the relevant literature related to inequities in international collaborative field research conducted in the global South and outline how they relate to the four dimensions of the social equity framework.

6.3.1 Contextual equity in fieldwork

The social equity framework considers how the root causes of disparities and vulnerabilities result in an 'uneven playing field' between stakeholder groups, taking into account both the past and present (Larson and Ribot, 2007; Wells et al., 2021). In field research, the politics of the broader social, economic, and institutional context are played out at a micro-scale (Richmond et al., 2015). Contextual inequities may be particularly pronounced in global North-South research collaborations. Due to pre-existing uneven resource and funding access afforded to researchers based in Northern institutions, deep power asymmetries are common, with Northern partners controlling projects (Weir et al., 2019; Flint et al., 2022). This dynamic is frequently entrenched by Northern epistemologies which prioritise Northern theories and educational backgrounds, placing knowledgeable Southern researchers in roles related to data collection, rather than analysis or writing (Nyamnjoh, 2004). In daily fieldwork, there may also remain an inescapable power dynamic of Northern researchers being the Southern researchers' employer and source of income (Molony and Hammett,

2007; LaRocco et al., 2019). Many scholars have also highlighted the importance of paying attention to context when considering researcher-participant interactions, in order to avoid exploitation and perpetuating controlling power dynamics (England, 1994; Katz, 1994; Nagar, 2002; Weiss, 2013). Inequities may be particularly evident when Northern researchers conduct fieldwork in the global South; yet, class and educational privileges can also situate a Southern researcher as an outsider in how they are perceived by participants, even when conducting research in their home country (Anwar and Viqar, 2017; Biswas, 2023; Lal, 1996; Mandiyanike, 2009; Mullings, 1999; Nagar, 2002; Oriola and Haggerty, 2012).

6.3.2 Distributive equity in fieldwork

Distributive equity tends to refer to economic costs and benefits (McDermott et al., 2013). For Northern researchers in qualitative disciplines, fieldwork is often a prerequisite for academic progression or the award of degrees such as doctorates (Ballamingie and Johnson, 2014). Gaining experience which then leads to career advancement is, therefore, a driving motivation and key benefit of field research, alongside other motivations of research impact (Chacko, 2004). For Southern research team members, fieldwork also provides opportunities to gain experience, skills, and confidence which can aid career progression, as well as immediate income and employment (LaRocco et al., 2019). However, in North-South field research partnerships, there is often a disparity in benefits between research partners, as Northern partners are more likely to benefit from first-

author publications and academic positions as a result of the shared fieldwork experience (LaRocco et al., 2019; Boshoff, 2009).

Studies have also identified a 'benefit gap' that often exists between researchers and participants, as researchers gain information but can offer little in terms of concrete benefits for participants' time, expertise, and shared experiences (Hemming, 2009; Mitchell, 2013). Across field-related disciplines, such as health, feminist geography, and development research, there is an ongoing debate about the ethics of compensating participants through cash payments or other 'tokens of appreciation' such as food, transport costs, or other forms of 'giving back' (Huisman, 2008; Head, 2009; Hammett and Sporton, 2012; Molyneux et al., 2012; Surmiak, 2020; Gupta and Kelly, 2014). There are extremely important equity implications regarding the dynamic of participants contributing to researchers' career advancement without also receiving economic benefits (Langellier, 1994; Huisman, 2008; Fisher, 2011; Gupta, 2014). However, we do not address these issues in Section 6.2 as our approach to compensating participants remained the same whether our research was a remote or in-person collaboration. Instead, we examine the allocation of financial resources, risks, and career benefits that accrue to Northern and Southern researchers through remote work.

6.3.3 Procedural equity in fieldwork

A common model of research across disciplines such as health, development, conservation, and geography is for scientists from institutions based in the global North to travel to regions in the global South to conduct research in the field

alongside Southern partners. However, such North-South field research collaborations can engender a number of procedural equity issues and have long been criticised for the structural inequalities and power imbalances that can exist between the partners (Crawford, 2003; Landau, 2012; Voller et al., 2022). There is a wealth of literature critiquing the dominance of research projects in which Northern scientists make decisions that determine the research objectives, data collection process, and how data is used, mirroring historical patterns of inequity and exploitation (Binka, 2005; Nhemachena et al., 2016). Between North-South research partners, it is typical for directives issued by Northern partners to be enacted by Southern field researchers, with Northern representatives visiting to lead projects and 'build capacity' or 'offer technical expertise' (Eichbaum et al., 2021; Khan et al., 2021; Naidu, 2021). This power dynamic is described by Mawere and van Stam (2019, p169) as 'foreign researchers waltz in and impose what they want Africans to do' and is a key form of procedural inequity in field research. Recent efforts to conduct more equitable research across fieldwork disciplines have suggested steps such as co-establishing the research agenda, joint decision-making, and careful consideration of data ownership (Grieve and Mitchell, 2020; Asare et al., 2022; Ramírez-Castañeda et al., 2022; Voller et al., 2022).

Participants have sometimes been characterised as vulnerable and lacking agency in research decision-making processes. However, there is a strong counter-narrative asserting that participants can exert their power and agency in refusing to participate in research or choosing how to respond to interview questions, going against models of top-down hierarchies (Blakeslee et al., 1996;

Thapar-Björkert and Henry, 2004; Sultana, 2007; Ali, 2015). Calls for more equity in research highlight the importance of dynamic decision-making and co-designing research, for example, through participatory processes (Hammett et al., 2022; Picot and Grasham, 2022). However, as McDermott et al. (2013) state, procedural justice cannot be achieved if those involved have vastly different capabilities to participate, as is often the case between researchers and participants.

6.3.4 Recognitional equity in fieldwork

The potential for participants to be exploited during field research, for example, through their interests being inadequately represented, their knowledge systems not being respected, or their rights to gain from involvement in research being overlooked, has led to a long and rich literature about extractive relationships between researchers and participants (Jones et al., 1997; Smith, 1999; Chilisa, 2012; LaRocco et al., 2019). In global North-South research collaborations, dynamics of 'parachute' research can also occur. Here, scientists from higher-income countries travel to conduct fieldwork in lower-income countries, before returning to their home country to complete the research with little or no engagement with, or recognition of, local researchers or communities or their interests and values (Stefanoudis et al., 2021; Asase et al., 2022). Furthermore, research can lead to participants expecting certain outcomes, such as help gaining influence with governmental bodies, that researchers do not recognise or are unable to provide (Gallaher, 2009). To address imbalances in international field

research contexts, researchers are encouraged to pay attention to positionality and power relations in the production of knowledge (Sultana, 2007) and not to overpromise on the beneficial outcomes of research (LaRocco et al., 2019). Researchers themselves can also be vulnerable to manipulation or exploitation during research processes, jeopardising their interests in rigorous research outcomes. For example, if participants exaggerate information or respond in ways intended to subvert the research process, giving answers that further a particular perspective for political or other reasons (Kirsch, 1999; Ballamingie and Johnson, 2014).

6.4 Methods

6.4.1 Case study fieldwork and actors

This paper draws on the case study of a doctoral research project undertaken at the University of Oxford. The project aimed to understand the vulnerability of smallholder cocoa farmers and their ability to adapt to climate change and other interacting shocks in Central Region, Ghana. The research team was composed of a UK-based lead author [henceforth referred to as LP] and Ghana-based scientists [BS, AO, FM, KA, and RA]. Fieldwork took place in seven rural farming villages with limited or no internet access or mobile phone signal.

Following a scoping visit in 2019, LP had initially planned a series of in-person field visits to conduct interviews and focus group discussions herself, with the aid of an English-Twi interpreter. However, the global outbreak of COVID-19 forced her to find ways of collecting data while remaining in the UK, as international travel between the UK and Ghana was banned for 18 months. Through a series of connections, LP was put in touch with Ghanaian scientists from the Forestry Research Institute of Ghana (FORIG). Over the following two years, the project pivoted to remote collaborative fieldwork in which LP collaborated online and BS, AO, FM, KA, and RA collectively conducted focus group discussions and surveys through a series of in-person field visits.

Based in the UK, LP prepared research materials and led training sessions which were held with the team via WhatsApp calls. The research team had frequent check-ins, involving daily or weekly updates via WhatsApp messages, calls, and voice messages. We shared the collected survey data online using Kobo Toolbox

software and sent written focus group discussion notes via WhatsApp. Researchers and participants took additional health and safety precautions, including social distancing, use of face masks, and careful hand-cleaning, per Ghanaian and UK government guidance, and the study area maintained a low COVID-19 case count. Once travel restrictions had lifted, LP returned to Ghana to conduct semi-structured interviews in the field herself, accompanied by BS, the lead Ghanaian remote field researcher. LP was keen to spend time in the field to gain further contextual understanding and flexibly explore themes that had arisen in the survey and focus groups through in-depth interviews. Table 8 outlines the combination of remote and in-person collaborative fieldwork conducted for the project. The comparison of the research team's experiences of these approaches and the equity issues that arose from this case study.

Table 8. Remote and in-person fieldwork timeline and team members

Date	**Data collection with smallholders**	**LP's location**	**Ghanaian research team**
November 2019	Scoping visit	In-person	1 interpreter
June 2021	Focus group discussions: 14 groups	Remote	2 FORIG researchers
October - November 2021	Pilot survey: 30 participants Survey: 270 participants	Remote	4 FORIG researchers
January 2022	Interviews: 30 participants	In-person	1 FORIG researcher
March 2023	Interviews: 26 participants Focus group discussions: 2 groups	In-person	1 FORIG researcher

It is important to note the positionality of the actors involved in fieldwork, as characteristics such as gender, class, and educational level affect power dynamics in research (LaRocco et al., 2019; Sultana, 2007). LP is a British female doctoral researcher of mixed ethnicity, who travelled to Ghana for the first time to conduct a project scoping visit in 2019. BS, AO, FM, KA, and RA are Ghanaian researchers from the Forestry Research Institute of Ghana (FORIG) who are educated to Bachelor's- or Master's-level and speak both English and Twi fluently. BS is female and the other four scientists are male. At the time of this study, they were ordinarily based in Kumasi, but, when permitted according to COVID-19 restrictions, travelled to stay in Assin Foso, a town near the study villages, to conduct daily research visits. Most of the participants in the field research were smallholder farmers, with an approximately equal proportion of male and female interviewees and focus group discussants. Educational levels among adults in the area are low and only 54% of household heads are reported to be literate (Hirons et al., 2018).

6.4.2 Methods and data for equity analysis

For the analysis presented in this paper, several forms of data are employed (see Table 9). First, we use fieldwork diaries and notes which were recorded by LP throughout the research process, a practice that can serve as a critical tool to aid reflexive and ethical research (Thompson, 2014; Maharaj, 2016; Burgess, 1982). These written notes included accounts of her and her colleagues' in-person daily fieldwork activities, and remote telephone conversations and training sessions

with the field team (LaRocco et al., 2019). Notes written by the Ghanaian researchers reflecting in-field experiences and perspectives were captured with daily or weekly reflexive writing exercises in Google Forms. These were responses to specific prompts such as challenges faced, lessons learnt, things enjoyed, and how teamwork was (Meyer and Willis, 2019). Like Nguyen et al. (2022), in gathering feedback from Southern team members, LP was conscious of responses potentially being shaped by the power dynamics of the employer-employee relationship. BS, AO, FM, KA, and RA were therefore encouraged to be honest and frank in their responses and LP reiterated that even negative responses would not affect the employment relationship. LP also conducted an in-person semi-structured interview with BS, the Ghanaian team leader, at the culmination of all the data collection in 2023. This allowed us both to discuss our relative experiences of working together remotely and in-person at different stages of the research project and the benefits and disadvantages of the two approaches. Finally, we draw on questions posed to approximately 50 smallholder participants during in-person semi-structured interviews and focus group discussions. These related to the experience of participating in the research and expectations of outcomes.

Once they were all collected, these data were analysed in the following steps. First, the reflexive accounts and fieldwork notes written by researchers were coded, allowing for key themes to emerge (Chambers, 2020; Pascucci, 2017; Thompson, 2014). Second, interviews, which had been audio-recorded with permission from participants, were fully transcribed using the assistance of Sonix AI software and then coded using NVivo software (Miles and Huberman, 1994).

Third, the coded data were collated and the findings were triangulated across the different sources, according to each theme. We focused our analysis on equity issues that emerged due to our remote way of working, rather than a comprehensive analysis of all fieldwork concerns that researchers and participants identified. We then grouped these results into the four dimensions of the social equity framework. We present these findings from our case study in Section 6.5 and discuss them in the context of other literature on equity and remote fieldwork.

Table 9. Summary of data used for equity analysis

Date	**Exercise**	**Author/Respondent**	**LP's location**
April 2021	Reflexive writing exercises based on focus group discussions	BS, RA	Remote
April - November 2021	Field notes, based on phone calls	LP	Remote
October - November 2021	Reflexive writing exercises based on survey	BS, AO, FM, KA	Remote
November 2021	End of survey interview	BS, AO, FM, KA	Remote
January 2022	Interviews and focus group discussions	Smallholders	In-person
January 2022	Field notes, based on interviews and focus group discussions	LP	In-person
March 2023	Interviews and focus group discussions	Smallholders	In-person
March 2023	Field notes, based on interviews and focus group discussions	LP	In-person
March 2023	End of fieldwork interview	BS	In-person

6.5 Case study analysis and discussion

In the following sections, we present our analysis of how conducting fieldwork through remote collaboration affects equity outcomes for researchers and participants. Mirroring the mapping of equity issues to the social equity framework in Section 6.3, our analysis here is disaggregated into four dimensions and explores how each of the themes presented in Section 6.3 are affected by remote ways of working. We contextualise and discuss our findings with reference to other studies that have found similar or contrasting results.

6.5.1 Contextual equity

Our fieldwork was a British-Ghanaian collaboration and therefore took place against the backdrop of deep inequities resulting from colonialism, development, and globalisation (Sultana, 2007). We found that various forms of contextual inequity between the groups of actors persisted whether the research was conducted remotely or in-person. As a Northern partner, whether conducting remote or in-person fieldwork, LP benefitted from the abundant privilege disparities which are often endemic to Northern-Southern research collaborations (Weir et al., 2019). Compared to her Southern colleagues, she came to the project with significantly more access to information, training, and publishing opportunities in the global North-centric academia (Bradley, 2006; Nhemachena et al., 2016). These aspects, combined with being the headline recipient of grant funding, meant that financial allocations on the project were

controlled by LP from a distance and gave her disproportionate influence in determining the project agenda and administration from the start (Bradley, 2006).

Contextual inequities were apparent in the interpersonal dynamics of our remote collaboration. When working side-by-side during long days in the field, researchers often have the opportunity to develop friendships and close relationships that go beyond research team hierarchies (LaRocco et al., 2019). When conducting research remotely, however, there are fewer opportunities to build trust and strengthen relationships outside of work-related interactions. Although the team deliberately dedicated time on phone and video calls to relationship-building and discussing non-work matters throughout the project, these conversations could not replace the liminal time spent together in-person travelling to and from field sites, sharing meals in the evenings, and facing daily fieldwork challenges. Towards the start of the project, BS, the lead Ghanaian field researcher, expressed surprise that *"[LP] is approachable, which makes it easy for me. It's not a master-worker dynamic"* [BS, training session, 7 May 2021]. However, despite our collective efforts LP still felt a sense of separation and a hierarchical dynamic with her in-field colleagues several months later, describing finding it *"hard to connect with the team remotely, especially when you're working with people you've never met"* [LP, field notes, 14 September 2021]. This softened when LP later returned to Ghana and worked with team members in-person, noting that *"meal-time chats"* and *"working in the field together"* meant that she and BS *"connect[ed] more as a team"* [LP, field notes, 10 January 2022].

On the other hand, by always being distanced, remote work mediates the uneven dynamics in international collaborations in which Northern researchers will 'always eventually leave again' to return to their home countries or institutions (LaRocco et al., 2019, p858). LP's absence during remote fieldwork also meant that she and the smallholder researcher participants were not directly confronted by their vast contextual differences, such as educational level and wealth, as they did not meet. Remote fieldwork did not change the existence of these inequities, but they were the backdrop against which the research took place. Instead, differences between researchers and participants were embodied by smallholder interactions with Ghanaian research team members. The context between the Southern researchers and participants is similar whether the Northern researcher is physically present or not, although LP's absence mediated how the project was perceived (see Section 6.4). The Ghanaian researchers' positionality and level of privilege differed greatly from the participants', despite being of the same nationality. As Sultana (2007) describes, being from an educated background and proficient in English can play into a hierarchy in which rural people exhibit deference towards urban, educated elites. In our fieldwork, one researcher described having to *"bring [him]self to [participants'] level"* when conducting surveys because community members *"consider [him] higher than them"* [FM, phone call, 30 November 2021]. Another researcher summarised: *"I'm one of them, but I'm not one of them"* [BS, interview, 29 March 2023]. Because of their status as highly educated, relatively wealthy city-dwellers, the Ghanaian researchers perceived a gulf of lived experience: *"To their issues, their challenges, and their sort of livelihoods, I'm an outsider"* [BS, interview, 29 March 2023]. The feeling of being

an outsider has been well-documented in research projects where researchers working in Northern institutions return to their home country to conduct fieldwork (Mandiyanike, 2009; Oriola and Haggerty, 2012; Sultana, 2007). In the case of our project, Ghanaian team members were visiting from a Ghanaian research organisation but with the power, resources, and financial backing of a distant Northern institution and the contextual advantages that conferred.

6.5.2 Distributive equity

In conducting fieldwork remotely, we found that the benefits and risks of field research were distributed differently between Northern and Southern research partners. The tangible benefits for Northern researchers of conducting in-person fieldwork have been discussed in the literature and these advantages were moderated for LP in doing remote work. For Northern researchers across several disciplines, first-hand experience of conducting fieldwork is a requirement for career progression (Ballamingie and Johnson, 2014). Other studies found that when field plans were disrupted during the COVID-19 pandemic, researchers missed out on these opportunities, which was a particular concern for doctoral researchers, who, lacking a career track record, are arguably the most vulnerable group among researchers at institutions (Jackman et al., 2022; Paula, 2020). In our remote research project, LP also forwent this first-hand field experience, which was a driving motivation for her return to Ghana to conduct interviews in-person once pandemic restrictions had lifted. LP found that working remotely disconnected her from the research process and participants, affecting her lived

experience of the research and the richness of her understanding. This echoed Postill's (2016, p66) 'twin anxieties' of ethnographic fear of missing out and aversion to thin descriptions when studying culture remotely. LP wrote that she *"missed the human connections"* and, upon hearing about the lively discussions held in the focus groups and seeing photographs sent by the team, *"wished [she] could have been there"* [LP, field notes, 9 June 2021].

Without her oversight, LP initially had concerns about the inexperience of the field team and, specifically, how the surveys and focus group discussions were being conducted and noted down: *"Is the team sending me field notes a barrier to them making comprehensive but scrawling, messy notes?"* [LP, field notes, 9 April 2021]. Any decline in the quality of data collected during the remote collaboration would have ramifications for the whole team as publication co-authors, but would especially be a risk for LP's doctoral thesis. Moreover, LP felt that her own understanding of the research context and data was impacted by her absence. In relying on written reports and second-hand descriptions, she missed the richness and rigour that come from immersion in a field site and witnessing people's body language in communications (Howlett, 2021; Johnson et al., 2021). As BS described at the end of the focus group discussions, *"you can't really get the picture, because you're not here"* [BS, phone call, 20 June 2021]. LP's notes also reflect this disconnect: *"I feel quite out of touch with the lives of farmers having not been to Ghana for two years. It's hard for me to tell the reality [of the research topic] on the ground"* [LP, field notes, 14 September 2021]. This reflects the experiences of Burrell (2016) who, compared to her experiences of in-person fieldwork, found that relying on notes, videos and photos shared by partners in remote collaborations removed

the sensory experience of fieldwork and reduced her memory of the research and ability to uncover meaning. In a positive outcome during a global health project in Kenya and Tanzania, Willows et al. (2023) found that the remote research partners were insufficiently familiar with the field research to justifiably interpret the qualitative findings on their own, leaving more room for their Southern colleagues to contribute to data analysis and lead publications.

For the Ghanaian research partners in our project, remote work provided benefits in the form of increased field experience and budget allocation. By default, LP would typically have led the fieldwork as both the funding provider and the person whose doctorate was being collected for. Whilst LP was in the UK, however, lack of phone or internet connection in the study villages rendered it impossible to be involved in the fieldwork in 'real-time', limiting her input to debriefs at the end of the day and suggestions for future field days. Leadership roles were therefore adopted by Ghanaian partners, one of whom noticed that, through remote work, her communication skills, team management and coordination, and self-confidence had improved [BS, interview, 29 March 2023]. BS further said that the role provided an opportunity that *"raised the bar"* for her, boosting her experience to a level that would have been unlikely if LP had been present the whole time [BS, interview, 29 March 2023]. Our findings therefore concur with Nguyen et al. (2022) who argue that, when adequate support is provided, remote collaborations can empower Southern research partners to take on more substantial roles.

In our case study, remote work also provided opportunities to shift the financial distribution such that the Ghanaian researchers benefitted from a higher share of the research budget allocation. Money that would otherwise have been spent on LP's flights and accommodation was instead allocated to the salaries and subsistence of the in-person research team, allowing more Ghanaian researchers to be hired than would otherwise have been. On the other hand, being absent from physical fieldwork meant the risks of fieldwork and daily travel discomforts (Kaplan et al., 2020, 2023) were borne only by the Ghanaian team members. In debriefs, team members cited issues such as headaches and dirty clothes caused by road dust, fatigue during hot afternoons, and uncomfortable interactions with some community members [AO, phone call, 14 November 2021; BS, phone call, 14 November 2021; FM, phone call, 14 November 2021; KA, phone call, 15 November 2021]. Our remote ways of working did not significantly affect the costs and benefits borne by research participants, as the researchers provided the same 'tokens of appreciation' to survey interviewees and focus group discussion members whether LP was present in the field or not. However, LP's absence did mediate some participants' expectations and interests related to project benefits and outcomes, as discussed in Section 6.5.4.

6.5.3 Procedural equity

Remote fieldwork led to increased decision-making capacity for the Ghanaian researchers in our case study but did not substantially affect procedural equity between researchers and participants. Like others who shifted to remote

collaborative fieldwork, our 'chain of command' changed, shifting daily decision-making and redistributing power to Southern scientists (Willows et al., 2023). LP's field notes reflect how, when conducting interviews in-person, she was *"making decisions on the fly about [who] we [spoke] to"* [LP, field notes, 4 January 2022] and described feeling the weight of having the final say in day-to-day decision-making, even though she was less familiar with the landscape and research context. By contrast, when working remotely, it was not possible for LP to be involved in daily decisions as they arose during fieldwork due to limited internet connectivity in the study villages. Instead, Ghanaian research team members made decisions about, for example, who to include in focus groups, between themselves and informed LP afterwards when they had returned to their hotel at the end of the day. LP reflected on this in her field notes: *"[Team members] are making field decisions without me. It sounds like these were the right calls but I wasn't consulted… But maybe this kind of decision delegating and trusting my team is exactly the kind of non-colonial approach I'm trying to foster?"* [LP, field notes, 10 April 2021]. As with Vietnamese researchers on a remote project described by Nguyen et al. (2022), the Ghanaian researchers in the team were empowered to adopt a larger role in the production of knowledge, including selecting research participants, working with community gatekeepers, solving unexpected issues, deciding how to conduct focus group discussions, and determining what was relevant to record and transcribe. The field team decision-making was also rather more egalitarian in LP's absence, a dynamic we had aimed to engender during training. One team member relayed that the pilot survey had been a *"great team effort"* in which the researchers had *"combined ideas and all brainstormed as a team"*

[FM, phone call, 27 October 2021]. Although some hierarchies remained, due to LP appointing BS as the 'lead field researcher', or the team defaulting to the relative seniority in their FORIG roles, they were somewhat flattened in LP's absence. This seemed largely driven by the absence of any Northern researchers, who often have the de facto final say due to their role as the employer and headline recipient of fieldwork funding. However, although remote working resulted in Southern researchers leading the daily decision-making in the field, it did not address the overall shaping of the research agenda or how collected data was used, as these decisions were largely made in between field visits.

Whilst remote work can empower Southern researchers to take on more leadership and daily decision-making roles, such collaborations can still perpetuate dynamics of Northern institutions limiting Southern researchers to roles related to gathering data rather than project ideation and data interpretation (Nhemachena et al., 2016). Doing fieldwork remotely or in-person also did not alter the fundamental dynamic of researchers, rather than participants or affected communities, setting agendas, whether they were Northern or Southern researchers. Despite our efforts to take smallholders' views and guidance into account, ultimately, the research team had the final call on the research direction, who was interviewed, and how. We discuss below how participants reported disappointment in their interests not being carried through to tangible, timely outcomes.

6.5.4 Recognitional equity

Recognitional equity is the dimension in which participants were most impacted by remote fieldwork, as it refers to their rights to having wishes and expectations met and recognition of their interests in research processes and outcomes. In particular, we found that LP's absence from the field affected what participants wanted and expected from fieldwork outcomes. During our remote survey interviews, many participants requested some kind of assistance as an outcome of the research, most commonly related to help accessing farm inputs or financial assistance. One survey team member reflected that he thought farmers were willing to participate "*because they expect some help to come for them"* [field notes, FM, 20 October 2021]. Participants' expectations of help as a direct outcome of fieldwork seemed to amplify when LP was present in the field, due to her positionality as a Northern researcher. The expectation that foreign researchers may provide financial assistance has been long documented, with other researchers noting that their whiteness was read by potential respondents as an indication of wealth and potential to provide monetary contributions (LaRocco et al., 2019; Twyman et al., 1999). When LP conducted interviews in-person, her travelling to Ghana seemed to signal to participants a greater ability for the project to meet and represent their interests. This was indicated by smallholders saying, for example, *"You've come all the way from the UK to speak to us. I feel like you sympathise with our issues and want to help find ways to make things easier for us"* [smallholder farmer, interview, 29 March 2023]. The Ghanaian colleagues also noticed a difference between the surveys and focus group discussions for which LP was absent, and the interviews when she was physically present: *"The moment*

they see you, [those expectations of help] are already there" [BS, interview, 29 March 2023].

As well as requests for financial or material assistance, participants frequently asked that LP represent their interests to those in positions of power, expecting that she might have some link to figures of influence. This echoes the experiences of LaRocco and Shinn, who found that, in contrast to their Motswana colleague, the colour of their skin and their American nationality consistently 'allowed people to assume that our presence might benefit them in some way, including providing a conduit through which to speak to their government' (LaRocco et al., 2019, p859). Like these authors, LP was careful to make no guarantees or promises that people's lives would change as a result of the work and made efforts to set realistic expectations of LP's relative lack of power or influence, especially given her student status. However, as evidenced in her field notes, when in the field, LP became *"tired of letting people down"* [LP, field notes, 6 January 2022] and struggled with the inequity of participants' expectations not being met and the risk of field research being extractive. Participants' expectations for help also seemed to affect the responses that people gave when LP was present in the field. The field team noted: *"With you being here, there's a tendency for people to over-exaggerate, especially when it comes to the challenges that they face… They try to modify in a way that seems like they need more to be done... Because they think you will directly help them"* [BS, interview, 29 March 2023]. This dynamic not only ties in with equity issues related to participants' expectations for help not being met, but also with researchers' own vulnerability to

manipulation or exploitation if participants distort or exaggerate information to further certain interests (Kirsch, 1999; Ballamingie and Johnson, 2014).

On the other hand, LP travelling to visit Ghana from the UK made some participants feel valued and met Ghanaian cultural norms around the importance of face-to-face visits: *"We're encouraged by this conversation and the fact you've come all the way from wherever you came from"* [smallholder farmer, interview, 29 March 2023]. Furthermore, LP visiting in-person and asking open questions through interviews and focus group discussions gave participants an opportunity to represent their interests directly to the project leader and levy critiques of the research process. In speaking directly to smallholders, LP was held to account by participants as she was asked to *"lend [her] voice"* and advocate at her university for more tangible outcomes from Northern-led research [smallholder farmer, focus group discussion, 20 March 2023]. These sorts of challenging exchanges contributed to LP agitating in her department and university for changes to fieldwork practices (Picot and Grasham, 2022).

LP's visits also risked creating expectations of future visits and establishing relationships which would come to an abrupt end once LP had finished with her planned data collection (Kirsch, 1999). For example, when LP travelled again to the study villages in 2022 and 2023, having explained her absence was necessitated by pandemic travel restrictions, one participant noted LP's return with approval: *"You always come to check on us, how things are going, and you've continued your work. It's not like others who just come one time and never come again. So we are really appreciative of the fact that you keep coming"* [smallholder farmer,

interview, 21 March 2023]. While the Ghanaian colleagues were also frequently asked about follow-up visits during the survey, their visits did not have the additional expectations that can be induced by the presence of foreign researchers. However, regardless of who conducted the research, some participants expressed frustration and feeling *"cheated"* at having been involved in various research projects, including ours, without tangible beneficial results: *"People always come here, pick our knowledge, pick our minds, and then they go, and nothing comes out of it"* [smallholder farmer, focus group discussion, 21 March 2023]. In this regard, the lead Ghanaian field researcher surmised, *"If the approach is right, it doesn't matter who does it"* [BS, interview, 29 March 2023]. Remote work can therefore affect inequities related to participants' expectations for benefits, but does not fundamentally alter dynamics of extractive research as long as the distribution of beneficial outcomes remains unchanged.

6.6 Conclusion

This research examined how four dimensions of social equity relate to conducting fieldwork in the global South through remote collaborations between Northern and Southern researchers. Drawing on a case study of doctoral research on smallholder farming communities in Ghana, we consider three key groups of actors: researchers based in the global North, researchers based in the global South, and participants in the global South.

We found that remote fieldwork did not alter the broad context in which fieldwork occurs. Remote collaborations still take place within global inequities between Northern and Southern researchers, as funding is still channelled through Northern institutions, meaning that Northern researchers ultimately determine how the project takes place and who adopts which roles. Contextual inequities between researchers and participants also persist during remote fieldwork. With Northern researchers absent, the dynamics focus instead on differences between researchers and participants of the same nationality, often with differences in class, education, and wealth.

For distributive equity, we found that conducting fieldwork remotely can shift the benefits and budget allocation towards Southern researchers. In particular, the Ghanaian colleagues gained more research experience. However, the Northern researcher missed out on first-hand field skill development that is valuable for academic career advancement and was concerned about lacking a rich understanding of the research context. On the other hand, the Northern researcher's absence meant that any discomfort related to daily fieldwork

challenges was borne solely by Southern partners. Benefits for participants were not affected as our approach to compensating research involvement and the research outcomes remained consistent whether the Northern partner was present in the field or not.

For procedural equity, we found that remote fieldwork shifts decision-making dynamics, allowing Southern researchers significantly more agency in daily decisions and providing leadership experience. In our case, the absence of a Northern research leader and funder also resulted in a more egalitarian team structure. However, overarching decisions about the research project and data analysis were still predominantly shaped by the Northern research leader outside the field and were therefore not changed by remote work, nor was the extent to which smallholders were involved in the research decision-making.

For recognitional equity, the absence of a Northern researcher during remote fieldwork seemed to alter participants' expectations, reducing the anticipation of direct assistance or benefits, including expectations that the researchers would have the power to represent their interests amongst policymakers. Participants, therefore, changed their responses when the Northern researcher was present, likely in the hope that it would lead to beneficial outcomes. A further recognitional equity difference was found with in-person fieldwork providing participants with the opportunity to directly represent their interests and concerns to the project leader and hold them accountable, which could not take place through remote fieldwork alone. Remote fieldwork also did not address

the fundamental dynamics of uneven beneficial outcomes for participants or mediate their frustration with continued research engagement without gain.

Overall, remote international fieldwork collaborations provide some unique opportunities to improve the social equity between Northern and Southern researchers but do not substantially improve equity outcomes for participants. Fundamentally, remote fieldwork conducted by Northern researchers in the global South occurs within the same North-dominated international research systems that have been critiqued. Remote fieldwork does not change the underlying inequity of Northern scientists setting research agendas and employing Southern researchers to collect 'raw data' to process back in Northern institutions (Nhemachena et al., 2016). Despite it providing more career experience and employment for Southern partners, remote fieldwork still provides the most benefits for Northern researchers as it sits within this established Northern-dominated research control setting. In remote work, Northern research may still be the scientists setting agendas, theorising and writing up results, a model commonly seen in North-South fieldwork collaborations, where Southern co-authors' most frequent role in collaboration with foreign researchers is the fieldwork and collecting data for analysis and knowledge generation elsewhere (Boshoff, 2009; Nhemachena et al., 2016; Nyamnjoh, 2004). Furthermore, due to funding flowing through Northern grants, foreign researchers often position themselves as the main actors and funding bodies demand Western partners be the leaders (Mawere and van Stam, 2019). Whilst these differences in access to resources and funding persist,

asymmetries will continue and North-South research partnerships will not be equitable (Flint et al., 2022).

For participants, remote research can also perpetuate dynamics of inequity as it does not intrinsically promote equitable practices, such as engaging participants throughout the research process and building knowledge-sharing processes (Chilisa, 2012; Polk, 2015; Smith, 1999). Whilst recommended equitable research approaches are possible within the remit of remote fieldwork, remote methods are not necessarily intrinsically more equitable.

The analysis presented in this paper was inevitably shaped by our cultural contexts as researchers and our perceptions of fairness (Di Gregorio et al., 2013), but we have tried to accurately represent the perspectives of participants through interviews and focus group discussions. Further research could be carried out to explore the extent to which project control and benefits can be shifted to meet the interests of Southern researchers and could also examine how remote collaborative fieldwork might fit in with participatory approaches that enhance equity outcomes for participants.

Whilst remote fieldwork can contribute to more equitable fieldwork in some aspects for North-South research collaborators, it does not, in its underlying structure, meet the goal of Southern-led research (Mawere and van Stam, 2019; Nhemachena et al., 2016), nor does it help with issues related to participants. There are also some practical limitations to conducting remote work. It relies on good internet connectivity and researchers having access to connected devices, which may require additional funding. It can also be harder to establish

relationships between research team members who miss out on time spent together in the field sharing meals and transportation. Remote collaborations, therefore, require deliberate effort to build trust and establish relationships. To conclude, remote fieldwork can have some positive equity implications for participants, and especially for Southern researchers, but does not address fundamental inequities in the status quo of Northern researchers leading fieldwork in the global South.

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CHAPTER 7

Conclusion

Having presented my three research papers, in the following sections, I summarise the key contributions of this thesis in light of the research questions originally posed. I then synthesise the insights gained across this body of work as a whole and the connections between them. Practical applications of these findings for policy and research communities are also considered. Finally, I reflect on the limitations of this project and recommend future research directions.

7.1 Summary of research findings

7.1.1 Key contributions of research papers

This thesis draws on a case study of smallholder cocoa farmers in the Central Region of Ghana to answer research questions through the main theoretical lenses of vulnerability, adaptation, and equity. The contributions of this thesis are made over three papers, each answering a different main research question.

Chapter 4 introduced an analysis of the effects of climate change to the literature on the food stability implications of producing cash compared to food crops. The study is at the household level, focusing on food access over the harvest seasons.

It evaluated the relative roles of cocoa and food crops in contributing to households' food access during the lean season and extreme and variable weather. Finding that food crops are essential to households' food security, the paper questioned the lack of government extension support for these crops compared to cocoa.

Chapter 5 added to the literature that theoretically frames multiple shocks and stressors by proposing a methodological framework for the analysis of vulnerability to multiple shocks. The paper made an empirical contribution to research on the impacts of COVID-19 by applying this framework to the novel shock context of interactions between COVID-19 restrictions, extreme climatic events, and food security. Unlike previous studies on COVID-19 and climatic event interactions, this research was at the household level, particularly assessing outcomes for incomes and food access.

Finally, Chapter 6 applied a social equity framework to the comprehensive analysis of fieldwork for the first time. It used this framework and drew on my doctoral research project to assess an emerging mode of remote social science fieldwork, namely remote collaborative fieldwork. Through this analysis, the paper added to lively debates on the distribution of outcomes of global North-South research collaborations and equity in fieldwork.

Table 10 below presents my thesis research questions and summarises the original theoretical, methodological, and empirical contributions each chapter makes in response to its corresponding question and the gaps in the literature that were identified.

Table 10. Summary of the key contributions and main findings of the three thesis papers

Paper	Research question	Key contributions and findings
Chapter 4. Cocoa vs. food crops: seasonal food security	What roles do cocoa and food crops play in households' food access during the lean season and climatic events and how is their climate adaptation supported?	**Contributions to literature** - Introduces considerations of climate change impacts to research on the food security implications of producing cash versus food crops and seasonal food stability and access - Directly compares provision and distribution of extension services between cocoa and food crops **Empirical findings** - Food crops play a key role in food access during the lean season that many households experience between cocoa harvests, and when cocoa yields are hampered by extreme and variable weather - Despite food crops' importance for seasonal food security, especially in a changing climate, government extension and adaptation support for food crops is unevenly distributed and limited, as government agricultural services focus on cocoa
Chapter 5. Vulnerability to multiple shocks	How did multiple shocks, including COVID-19 and climate change, interact to affect smallholders' vulnerability to food and income shortages?	**Contributions to literature** - Adds to the few household-level empirical studies that unpack vulnerability to climate change in the context of multiple shocks - Contributes household-level analysis to global- and regional-scale studies on the interacting impacts of climate change and COVID-19 **Methodological contribution** Methodological framework for unpacking vulnerability to multiple shocks, proposing the systematic analysis of individual and then interacting shock effects

		Empirical findings - In addition to individual effects, the effects of the three shocks interacted to amplify impacts on cocoa production and sales, food crop market sales, off-farm incomes, and purchasing of foods from market - Households adopted various coping responses, several involving food crops, but often their capacity to cope was exceeded and they experienced deep hardship from food insecurity and financial scarcity
Chapter 6. Remote collaborative fieldwork	How does conducting fieldwork through remote collaborations shape equity outcomes for Northern researchers, Southern researchers, and participants?	**Contributions to literature** - Contributes to debates on equity in global North/South fieldwork by considering remote fieldwork - Provides a more comprehensive assessment of equity in remote fieldwork by assessing trade-offs across four dimensions of social equity for both participants and researchers - Novel application of social equity framework to fieldwork **Empirical findings** - Contextual inequities between researchers and participants persist in remote and in-person fieldwork - Remote fieldwork may encourage the redistribution of certain benefits (research and leadership experience, budget allocation) and daily decision-making from Northern to Southern researchers - Remote fieldwork may moderate participants' expectations of Northern researchers' influence but does not substantively improve participants' equity outcomes or address concerns of unmet interests

7.2 Synthesis of insights across the thesis papers

This thesis poses the overarching questions: 'How do the interacting effects of climatic and other shocks shape cocoa smallholder households' vulnerability to food and income shortages, and their adaptation strategies?', and 'How does the way in which research on these shock effects is conducted further impact equity?' In answering these questions, the three papers collectively challenge three dominant tendencies. First, the propensity for climate change impacts to be considered in a silo in literature and policy. Second, the prioritisation of cash crops, particularly cocoa, over food crops. Third, problematic equity dynamics involved in Northern researchers travelling to conduct fieldwork in the global South for the data collection of research projects such as this one. Across my analysis related to these three areas, I draw on approaches related to vulnerability, adaptation, and equity. In the following, I synthesise how the research papers have contributed novel insights in each of these areas and the cumulative lessons that have emerged from this thesis.

First, this thesis has argued that food crops are key to mediating smallholders' vulnerability to income scarcity and food insecurity during three conditions: the lean season between cocoa harvests, periods of extreme and erratic weather, and when households are experiencing the negative effects of interactions between shocks. This thesis found that smallholders' cocoa production and sales can be particularly negatively affected by interacting shocks that have wide-spreading social, political, economic, and environmental effects. Cocoa production and purchasing is particularly sensitive because of its low climatic tolerance, and the

government-controlled buying and export system that is sensitive to national- and international-scale pressures. In contrast, more localised food crop consumption and trade may be differently or less affected. Chapters 4 and 5 show that in times of hardship and gaps in cocoa incomes, food crops, such as maize, cassava, and plantain, are essential for accessing food through direct cultivation and for providing some income from local sales to purchase food at markets. In doing so, they act as a 'backstop', sustaining households and facilitating coping strategies in multiple ways. Yet, as Chapter 4 shows, despite their importance, food crops in Ghana remain underserved in terms of agricultural extension receipt and adaptation support.

Second, this thesis situates climate change within the context of other shocks, particularly the global COVID-19 pandemic. There is an existing body of literature on vulnerability and adaptation to climate change and multiple stressors (Adger, 2006; McCubbin et al., 2015; O'Brien et al., 2004; Turner et al., 2003; McDowell and Hess, 2012; Räsänen et al., 2016), including among smallholder households in Ghana (Nyantakyi-Frimpong and Bezner-Kerr, 2015; Ahmed et al., 2016; Antwi-Agyei et al., 2017). This thesis makes a new empirical contribution by focusing specifically on shock events, rather than gradual stressors. I assess the impacts of the outbreak of COVID-19 as a sudden, unexpected shock and find that large-scale events, such as global pandemics, can interact with extreme and erratic weather events at the local level to the great detriment of smallholder households' food security and finances. Through this analysis, I argue that vulnerability can be better understood, and adaptation

better supported, if the interactions between climate shocks and other shocks are considered, and I provide a methodological framework for doing so.

Finally, this thesis has shown how field-based research itself can be vulnerable to the effects of multiple interacting shocks. Climate change is pushing academics to reconsider their research-related air travel and local or national-level shocks such as conflict or political unrest may also prevent or disrupt fieldwork plans (Baer, 2019; Langin, 2019; Postill, 2017). Yet the scale of the COVID-19 pandemic revealed the fragility of our conventional fieldwork travel model at a global scale. In other words, data collection processes can themselves be exposed and vulnerable to the same shocks that negatively affect smallholder farmer participants. In conducting data collection for Chapters 4 and 5 remotely, and then examining the equity implications of this approach in Chapter 6, this work as a whole has shown how fieldwork approaches can respond to interacting shocks. I have also explored how such a response, in this case, remote collaborative fieldwork, may shape equity outcomes. Like in-person approaches, researchers themselves are often the main immediate beneficiaries of remote fieldwork. Indeed, the submission of this thesis for consideration for a doctorate and the upcoming publications the thesis contains are evidence of the benefits that my team and I have accrued from this remote fieldwork. Yet, this thesis also demonstrates that remote research conducted according to stringent ethical practices and with the intention of hearing and amplifying smallholder farmer participants' voices may still fall short of providing equitable outcomes for participants.

7.3 Implications for political economy and policy

A few key conclusions arise when considering how this research is situated within the political economy of cocoa and food crop production in smallholder landscapes in Ghana. Cocoa has long-established, deep cultural and economic roots in Ghanaian society at the local and national levels. While this work acknowledges the significance of the cash crop for smallholders' incomes and the national economy alike, it highlights the fragility of the current cocoa production and marketing systems to both climatic and non-climatic shocks. Chapters 4 and 5 show how global cocoa prices, global environmental change, and international demand directly impact the income and food stability of cocoa farmers in smallholder communities. My thesis demonstrates the crucial role of food crops in buffering against these shocks and sheds light on their relative neglect.

As a major export crop, cocoa attracts significant government attention and resources. The Ghanaian government shows a clear prioritisation of cocoa, reflecting a longstanding political choice driven by the economic benefits of cocoa and aimed at boosting national revenue. However, this emphasis often comes at the expense of food crops that are vital for local food stability and incomes. Support for the production and climate adaptation of food crops is underserved, to the detriment of smallholder farmers' vulnerability, as Chapters 4 and 5 demonstrate. This thesis underscores the need for balanced agricultural support that recognises the dual importance of both cocoa and food crops and re-examines the social, political, and economic domination of the cocoa cash crop.

In practical terms, the findings of this thesis have important implications that could be incorporated into more balanced policy to better support smallholder farmers and address research inequities. Here, I suggest areas that urgently need policy support and institutional change.

At the district level, my research found MoFA officials struggling with funding limitations and overburdened extension officers, reflecting national staffing shortages. While COCOBOD district offices also face financial and staffing restrictions, the government body is able to provide more agricultural extension services and climate adaptation support to smallholder householders through wide-reaching and well-funded initiatives, such as the Productivity Enhancement Programme. The economic incentives of prioritising cocoa support are irrefutable, due to the revenue the cash crop brings to the Ghanaian government, the national economy, and smallholder households. But as cocoa dominates, farmers are suffering from failing food crops and inefficient local markets which need urgent attention. Yet, the recent development of the Tree Crop Development Authority seems like a step in the opposite direction, as the government has decided to allocate further limited resources to more export-driven cash crops (MoFA, 2018; Government of Ghana, 2020). In addition to running programmes such as Planting for Export and Rural Development, MoFA should consider allocating resources towards supporting smallholder farmers in the climate adaptation of key food crops, including cassava, maize, plantain, and vegetables. These overlooked crops are essential to households' food security and incomes, and their importance may only increase as climate change effects deepen and more frequent extreme weather events coincide with other shocks.

However, barriers to a policy shift that increases support for food crops could include potential resistance from entrenched private interests in the national cocoa sector, such as LBCs, and international stakeholders.

Government support for food crops must also go beyond adaptation measures to make crop production more climate-resilient. Chapter 4 demonstrated how smallholders' access to food, through purchase as well as production, is hampered by price volatility in response to regional extreme weather events, particularly when their own food crop yields fail. Chapter 5 also shows how the COVID-19 pandemic highlighted the vulnerability of local markets to disruptions from socioeconomic shocks. The government must learn from this lesson to find ways to protect households' access to affordable foodstuffs and safe pathways for selling their food crops, even in the face of intersecting shocks. Mandating a fixed sale price for locally traded food crops, similar to the fixed cocoa producer price, would be challenging and potentially unfeasible. Yet the government could consider other ways to protect smallholders' sales of food crops, for example, measures to facilitate the transport of harvested crops from farms to local markets and from local markets to urban centres. Furthermore, NGOs could help perhaps help to establish food crop cooperatives, similar to those that exist for cocoa in many smallholder communities.

Finally, consideration of the interests and equity outcomes for all stakeholders involved could become a cornerstone element of designing fieldwork plans in universities and research institutions (Picot and Grasham, 2022a). More financial and institutional support could also be provided for unconventional or remote

research models, for example, flexible funding and grants that more easily allow for budgetary allocation towards Southern field researchers, rather than stipulating spending on Northern partners' travel (Picot and Grasham, 2022b).

7.4 Limitations to this research

This research project has been constrained by certain logistical and methodological limitations. Some of these were explored in the specific empirical chapters to which they pertain, for example, related to the income data analysis and food security variables in Chapter 6. There are also some broader limitations that cut across the design and implementation of this research, which I consider below.

First, the sudden and disruptive outbreak of COVID-19 occurred shortly after my initial fieldwork scoping trip, but before I had started my data collection in earnest. The pandemic changed the topic of my doctoral research as well as the approaches to data collection (see COVID-19 impact statement in Appendix A). As shown in Chapters 5 and 6, the pandemic provided a novel opportunity to research a momentous shock and to try a different way of conducting fieldwork. However, it also significantly delayed and restricted my possible data collection approaches. In 2020 and 2021, fieldwork for the project was limited to methods for which I could feasibly train and manage a research team remotely and I therefore chose to conduct a survey. However, despite a comprehensive pilot study and iterative revisions, the survey failed to accurately capture participants' experiences for certain questions. For example, responses to COVID-19 referred only to direct health-related impacts and did not speak to the wider context of indirect effects which we were aiming towards. I discovered this limitation and then uncovered the multitude of indirect effects on households that are outlined in Chapter 6 in later in-depth semi-structured interviews when I returned to Ghana. My research design became an iterative process, with research questions

being honed and with new questions emerging after the survey had been collected. This meant, for example, that the survey questionnaire did not include variables that would have allowed quantitative comparison of households' ability to adapt their crop production to climatic effects. Furthermore, questions related to late 2020/2021 cocoa harvest payments were not included, as I had not yet heard about this shock (it was revealed during interviews in January 2022), despite it already having occurred.

When travel restrictions were lifted and I was able to return to Ghana in 2022 and then again in 2023, time and budget limitations meant that my research visits were relatively short. I therefore had a short window of opportunity to approach policymakers for key informant interviews, in addition to interviews with smallholders. I prioritised the latter and concentrated my efforts on government officials at the district level, spending time visiting staff at the MoFA and COCOBOD offices in Assin Foso. I was unable to meet national-level policymakers based, for example, in Accra and Kumasi, though I made some attempts to form connections remotely, for example, interviewing MoFA's National Rice Desk Officer on Zoom. However, pursuing such connections was time-consuming and tenuous without face-to-face introductions, so I therefore focused on collecting and analysing local data. As a result of this prioritisation, this thesis is consequentially focused on smallholder household-level analysis of vulnerability and district-level decision-making around extension and adaptation support. This is a core strength of the data, resulting in a richness of analysis and understanding of analysis. However, the case study of cocoa-farming smallholder households in the Central Region of Ghana, on which this

thesis is based, is highly localised. While many findings, approaches and takeaways from this research are applicable across other regions in Ghana and other smallholder contexts globally, some results are necessarily context-specific.

The data collection and analysis, particularly the interviews I conducted in-person, were inevitably affected by my theoretical proclivities, and intersecting identities such as my gender, ethnicity, class, and understanding of the world. To address these biases, I sought input from my Ghanaian research partners and collaborators about my research approach and interpretations. I aimed to capture my colleagues' views and represent them through co-authorship in papers, often through gathering their input orally in discussions or through feedback processes such as Google Forms (see Chapter 6). I also aimed to accurately represent the voices of smallholders who were participants in the focus group discussions and semi-structured interviews. However, due to budget constraints, the live-interpretation English was transcribed and quoted in analyses, rather than hiring an interpreter to word-for-word translate the original responses in Twi in audio recordings and taking potentially more accurate quotes from these.

Finally, some of the smallholder interviews were relatively short as we did not wish to cause undue disruption to their day, particularly as our interviews often took them away from their farming or other livelihoods. Many smallholders who participated in our research expressed fatigue and dissatisfaction at having been involved in a number of research projects over several years with little return (see Chapter 6). Potentially contributing to this 'harm' to them is, therefore, a limitation of this work that I take seriously (Picot and Grasham, 2022a).

7.5 Future research directions

The lessons and limitations of this project point to interesting and valuable avenues for future research. In the discussion sections of my empirical papers, I raised several specific areas for further study. Here, I highlight future research directions that arise from considering the broader implications of these papers and this thesis as a whole.

First, my thesis has raised fundamental concerns about the relative roles and prioritisation of cocoa compared to food crops in a changing climate and in the context of other intersecting socioeconomic shocks. Future research could interrogate the value and importance of other cash crops compared to food crops in different locations. While cocoa in Ghana is context-specific in how the government controls its purchase and export, in many locations worldwide smallholder farmers cultivate climate-sensitive export crops and also food crops to eat and locally trade. My research has highlighted gaps and inequities in adaptation capabilities and support for food crops, which may exist in other contexts, too. This is worth researching elsewhere, given the risk of other smallholders experiencing seasonal food shortages, which will worsen with climate change, and when interacting with multiple shocks, which may jeopardise their cash crop production and income.

Having proposed a methodological framework for systematically unpacking vulnerability to multiple shocks in Chapter 5, I proceeded to demonstrate its implementation with the empirical analysis of smallholder farming households in the rest of the paper. I designed this framework to be widely applicable to

other contexts and hope that others might adopt it to inform studies of vulnerability to different interacting shocks in other sectors, locations and scales. In particular, researchers and policymakers could use it to examine how worsening climate change effects may interact with other non-pandemic socioeconomic shocks to the detriment of households and communities. Furthermore, my analysis in Chapter 5 was limited by the timing of the data collection to examination of the immediate effects of the COVID-19 pandemic outbreak, lockdowns and major restrictions, and households' short-term coping strategies. Now, several years later, there is an opportunity to study the longer-term effects of COVID-19 and its interactions with other shocks and households' capacity to adopt adaptation measures. A longitudinal study could take a resilience rather than vulnerability approach, examining the extent to which households have been able to recover and transform, and identifying barriers to their doing so (Folke, 2006; Folke et al., 2010; Miller et al., 2010; Walker et al., 2004; Béné et al., 2014; O'Brien, 2012). In a turbulent world, devastatingly harmful shocks will continue to occur, whether they are pandemics or of a different nature, and such learnings would provide an understanding of how to help households weather and adapt to them.

Chapter 6 was, according to my knowledge, the first application of the four dimensions of the social equity framework to the subject of equity in fieldwork. In this case, I applied the framework to structure the analysis of remote collaborative approaches. In the future, it could be appropriately applied to comprehensively consider the equity implications of other ways of conducting fieldwork. I used my own doctoral project as a case study to examine the merits,

drawbacks, and trade-offs of remote collaborative fieldwork, and it is, therefore, somewhat particular to our research team and smallholder participant communities. As global pressures and trends increasingly push collaborations online, more work is needed to examine how remote ways of working affect equity in other social science research contexts. What is most needed, according to my findings, are ways to improve outcomes for Southern research participants. We need to find ways to shift the balance of who gains from academic research, and to conduct fieldwork in ways that better immediately and directly benefit the individuals and communities who give researchers so much and whom it is our mission to support.

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APPENDICES

Appendix A. COVID-19 impact statement

As per the Social Science Division's guidelines, the following details the ways in which the COVID-19 pandemic impacted the completion of this thesis work.

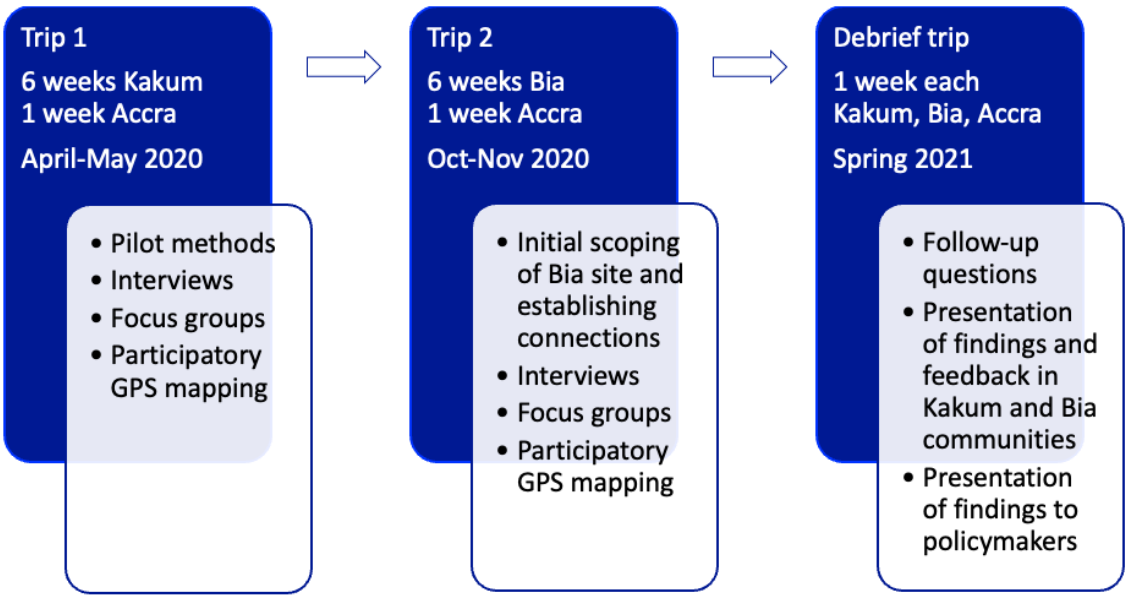
i. Impacts on work prior to the university closing

A brief summary of the work they were planning to complete before university buildings were closed and/or fieldwork became impossible.

I started this DPhil in October 2018, so when the COVID-19 pandemic broke out in March 2020, I had already spent 1.5 years setting up my research project and fieldwork. This meant that I could not change field sites and I was already fully committed to my research project. Most importantly, I had already conducted preliminary fieldwork in November 2019 to establish connections and set my research agenda with farmer interviewees, community leaders and my NGO research partner in Ghana (NCRC).

The figure below is taken from my Transfer of Status report (submitted on 12 March 2020) and shows my original pre-pandemic fieldwork plans for data collection in 2020 and 2021 that were disrupted by COVID-19.

Appendix Figure 4. Excerpt from Transfer of Status report (12 March 2020), showing planned fieldwork in three stages



The COVID-19 travel restrictions (spanning a total of 18 months) that prevented my original fieldwork plans are listed below:

- 1 April to 1 September 2020 (5 months): Ghana's international borders closed and all international flights suspended
- 1 September 2020 to 6 October 2021 (13 months): UK government advised against 'all but essential travel' to Ghana. It would have been risky and unethical to go against government guidance and travel, especially whilst I was not yet fully vaccinated
- January 2022: I travelled to Ghana as soon as travel restrictions had lifted and I had received my booster vaccination (December 2021).

ii. Impacts on the final preparation of the thesis

A brief summary of the way COVID-19 impacted on the final preparation of the thesis. This information could then form a basis for discussion at the DPhil viva and give Examiners additional means to assess the volume and standard of the work completed.

In total, changing to remote fieldwork delayed my data collection by 14 months. This meant that I only gathered my first empirical data for this doctoral project in June 2021, rather than in April 2020 as I had originally planned.

Being unable to travel to Ghana to conduct my doctoral fieldwork in-person meant that I had to switch to online remote ways of collecting data (as outlined in Chapter 3 on methods). At the outbreak of the pandemic, my supervisors and I waited several months to see if the pandemic and restrictions would lift and I would be able to travel to Ghana to conduct a delayed version of my original fieldwork plans. When it became clear that the pandemic would be long-lasting, I worked on establishing a new remote fieldwork approach. From September 2020 to June 2021, I worked to find qualified and available Ghanaian field researchers. This lengthy process involved interviewing them, hiring them, training them and setting up the revised fieldwork project remotely.

Working remotely altered the methods of data collection, as well as delaying the timing. Rather than conducting in-depth interviews myself, the field team carried out focus group discussions and a survey, as these seemed to be more feasible

for remote collaboration (see Chapter 3). Working remotely meant that I had less oversight of the data being collected day-to-day and was less able to be involved in daily decision-making (see Chapter 6), despite my efforts to keep in very frequent contact with the field team. I tried to mitigate this with regular scheduled catch-ups with team members, collecting reflexive feedback from the team with Google Forms, and spending time piloting and conducting iterative versions of the remote focus group discussions and survey questionnaire.

I had to wait until I was able to visit Ghana in January 2022 and March 2023 to gain more in-person understanding of the research context and conduct semi-structured interviews myself. These two trips were necessarily shorter than the field visits I had originally planned, due to time and budget constraints after a long and costly period of remote fieldwork, including paying for five FORIG researchers' travel, accommodation and salaries.

The pandemic also took a severe toll on my mental health, negatively affecting my ability to work on this research for multiple periods of several weeks or months. This meant that I also suspended my DPhil for two terms of sick leave.

iii. Relation of COVID-19-related research to overall thesis and research

If a student has included COVID-19-related research, they should include a brief statement of how it relates to their overall thesis.

As well as changing the way in which I conducted the research for this thesis, COVID-19 also altered and became part of the substantive topics of research in this project. The pandemic was a major shock that smallholder farmers in my study communities faced and presented an array of challenges to their food security and finances. Consideration of the effects of COVID-19, and its interactions with climate change (the original focus of this thesis), became the subject of the analyses in Chapter 5. Furthermore, the remote approach to fieldwork, which was prompted by COVID-19 restrictions, gave rise to the focus of the equity analyses in Chapter 6.

Appendix B. Data collection and training materials

8.1 Remote field team hiring document

Hiring document for prospective survey team members: 2021

Project summary

The field research leader(s) will conduct surveys with male and female farmers in rural communities around Kakum National Park. The aims are to understand more about:

- The food crops farmers grow alongside cocoa
- The identities of who grows food crops (e.g. farmers' gender, ethnicity, age, migration status, religion, position in household)
- The vulnerability of households and social groups to climate change
- The effects that COVID-19 has had on farming households

This study is part of Laura Picot's doctoral project at the University of Oxford. She will closely manage the fieldwork remotely from the UK and hopes to work collaboratively with field research leader(s) in Ghana to produce high quality research together.

Fieldwork research leaders

Scope of work

- Conduct surveys with male and female farmers in Twi
- Accurately translate responses and record on tablets in written English
- Daily debriefs with Laura in the UK via phone call/video call/WhatsApp
- Weekly field reflection reports via Google Forms
- Fortnightly debrief calls with Laura to discuss progress and suggest improvements
- Contribute ideas for improving the research process and the interviews

Desired capabilities

- Excellent level of fluency in English (oral and written) and Twi (oral). Ability to translate between the two languages
- Able to take highly accurate written notes
- Field research experience desirable, including conducting surveys and interviews
- Relates well to male and female farmers from different backgrounds. Experience working with farming communities desirable
- Takes initiative and ownership over work in order to act as an independent researcher
- Confident in giving feedback and making suggestions to improve the research process
- Adaptable to new or difficult situations, and makes sound judgements about what is important during the research process
- Committed to upholding a high ethical standard
- Interest in improving farmers' lives, equality and climate change

We are committed to equity in fieldwork and collaborating fairly with researchers in Ghana.

Note: prospective researchers were also provided with a summary of the findings from the data collected in the focus group discussons.

8.2 Focus group discussions guide for field team: 2021

Focus Group Discussions Materials: June 2021 (remote)

Aims of the focus groups

1. Understand themes around food/vegetable crops, shocks, weather patterns, COVID-19, gender dynamics and research participation
2. Shape the project research agenda and survey questions, incorporating farmers' views
   Introduce Bernice and Herith to farming communities around Kakum National Park

Focus group steps

1. Introductions: introduce yourselves, the study and Laura
2. Explanations: explain the focus group set up and how participants should behave
3. Consent: ask participants for consent and get them to sign the consent form
4. Discussions: conduct the focus group discussion + food crops and challenges ranking
5. Questions: ask participants if they have any questions for you
6. End: take photo of the group, thank them for participating and give gifts
7. Feedback: discuss how it went between yourselves and send Laura a message
8. Report: Using the recording and the notes you took, write up report of the discussion contents, group dynamics and your personal notes/reflection. Send report to Laura

Deliverables to Laura

1. Photo of original field notes
2. Photo of the group
3. Written-up record/transcript of discussion including:
   a. How participants were recruited
   b. Location of discussion (e.g. in public space/outside someone's house)
   c. Information about the participants (names, gender, age, jobs)
   d. Description of what was said (including name of who said what)
   e. Descriptions of the group interactions (e.g. silences, tone, disagreements etc.)
   f. Analysis and recommendations for future focus groups/research project agenda
   g. Personal notes/comments

Guide for researchers on conducting focus group discussions

- Discussion length = 1 to 2 hours. Encourage group to start concluding towards the end.
- Group size = 4 to 8

Steering the conversation and facilitating open discussion

- Ask an open question and let the group freely discuss the topic. Participants should speak to each other, rather than answer back directly to the researcher
- Keep your input to a minimum. Just enough to steer the conversation to relevant topics
- Be flexible. Allow participants to explore related new topics that emerge during discussion
- Gently encourage quieter members to voice their views if they are comfortable
- Encourage a dynamic of open discussion, listening and respect

The importance of social interactions

- Notice and record group dynamics (e.g. silences, tone, agreement/disagreements). Data on social interactions are important
- Allow disagreements/arguments to play out (record them), as long as they are relevant
- Treat participants as co-researchers. Their experiences and opinions will inform the project research agenda

Protocol for start of focus group discussion

Introductions

1. Introduce yourselves
2. Introduce Laura
    - We are asking farmers questions on behalf of Laura Picot and Bernice Sarpong
    - Laura is a researcher at the University of Oxford in the UK
    - She came to Ghana to speak to farmers in 2019 but can't come now because of COVID-19 travel restrictions, so we are doing research for her
    - Show photo of me
3. Introduce the project
    - We are interested in you and your households, the food/vegetable crops you grow and how you use them
    - There is not much research on food crops and their importance for local households
    - We aim understand your needs and concerns about food/vegetable crops, including what kinds of support would help you

Explanations

1. Focus group procedure
    - We will ask you questions about a few topics. We would like you to discuss these amongst yourselves and we will write down what you say
    - The discussion will take between 1 to 2 hours
    - What you say will shape the rest of the research we do for this project
2. Participants' behaviour
    - We ask you to be respectful and listen to others in the discussion
    - Please respect each others' confidentiality and do not repeat what was said today
    - We would like this to be an enjoyable and creative experience for you
    - Please feel free to be honest and openly share your opinions and experiences
    - We encourage you to use this opportunity to share knowledge and learning amongst yourselves

Consent procedure (use attached consent form)

1. Explain how the information will be used
    - We will use the answers you give to write research reports and papers
    - We will remove your names and personal information so no one can identify you
    - We will store all the information collected safely and securely
    - You don't have to take part, and if you change your mind at any point, you can leave
    - We will record the discussion on a phone so that we can fill in gaps if we have forgotten anything in our written notes. This will purely be used for research purposes only.
    - We will take a photograph of the group at the end of the discussion so Laura can see who we spoke to and she may use the photo in presentations about her research
2. Get consent
    - Do you have any questions?
    - Would you like to take part in the focus group discussion?
    - Are you okay with being recorded for research purposes?
    - Ask participants to sign the attached consent form (if a participant is unable to sign, the research can sign on their behalf if they give permission)

Focus group discussion questions

1. **Group members**
   - Find out participants names, ages, jobs
   - Do the participants all know each other?

2. **Community/village members**
   - What sort of people live in this village? (cover ethnic groups, migrants, religion, jobs)
   - What sorts of roles do men and women typically play in this village?
   - How can you if someone is a wealthier or poorer person in the community?

3. **Food and vegetables crops**
   - How are food and vegetable crops used? (cover both household consumption + markets)
   - Which food and vegetable crops are most important?
     - Ranking exercise = group should rank in order of importance + explain why
     - *[Capture what factors the group are using to determine importance]*
   - How are men and women differently involved in food and vegetable crops?
   - How do you store your food and vegetable crops?
   - Do you grow cocoa alongside food and vegetable crops?

4. **Markets**
   - Which market(s) do community members go to?
   - How do community members travel to market?
   - What do community members buy/sell?
   - Who in the household goes to market?
   - How is money from selling crops used? [Who controls the money?]

5. **Shocks and challenges**
   - What are the main difficulties/challenges related to food crops?
     - Ranking exercise = group should rank in order of importance + explain why
     - *[Capture what factors the group are using to determine importance]*
   - What do you do when facing these challenges?
   - What help do you get related your food crops?

6. **Unusual weather patterns**
    - Has there been any recent bad weather that has affected your food crops?

7. **COVID-19**
    - How has COVID-19 affected the community, markets for food crops and your households?

8. **Research participation**
    - How did you find the experience of participating in this research?
    - Are there any other related topics that you would like us to research?

8.3 Guide interview protocols for smallholder farmers, cocoa buyers, and market traders: 2022

Interviews with smallholder farmers - 2022

[If interviewee did not participate in prior survey:

Personal information

1. Name
2. Age
3. Gender
4. Born in this community/years lived here
5. Marital status
6. Ethnic group
7. Religion
8. Education level
9. Occupation
10. Position in household
11. Size of household

Agricultural information (if interviewee did not participate in prior survey):

12. Cocoa farming + land used
13. Food crop farming + land used + which crops grown
14. Who grows/sells/buys food crops
15. Income from cocoa, food crops, total income + how income is used]

Key questions for all participants

16. How do you use your food crops (including market interactions)
17. How has COVID-19 affected you and your household
18. How has COVID-19 affected your cocoa income (payment, relationship with buyers etc.)

19. How has COVID-19 affected your buying/selling at local markets?
    a. Buying foodstuffs (price and variety available)
    b. Selling (closures, demand, fear etc.)
20. How did you and your household respond to these effects?
21. Has anything else in the last two years affected your cocoa income?
22. Has anything else in the last two years affected your buying/selling at local markets? (including unusual weather patterns)
23. Who else should I talk to?
24. How did you find participating in this research?
25. Opportunity to ask me questions and tell me anything else relevant

Interviews with cocoa buyers

Key questions

1. Understanding the cocoa purchasing chain – who do you buy from? Do you sell it on?
2. How is your relationship with the farmers you buy cocoa from?
3. How has COVID-19 affected the cocoa market? (including the price)
4. How did you respond to these effects?
5. What other changes have there been in the cocoa market in the last 2 years?

Interviews with market traders

Key questions

1. Understanding the food crop chain – where do the crops you sell come from? Who do you sell to? Which crops do you sell and why?
2. What factors determine market prices?
3. How has COVID-19 affected markets? (including restrictions, their sales)
4. How did you respond to these effects?
5. What other changes have there been in food crop markets in the last two years?

8.4 Guide smallholder farmer interview protocol: 2023

Interviews with smallholder farmers - 2023

Demographic

Personal information

1. Name
2. Age
3. Gender
4. Marital status
5. Education level
6. Off-farm occupation (survey gaps)
7. Position in household

Household

8. Size + dependents (in village, children + outside remittances), receipt of remittances?
9. Occupations in household, farming + off-farm
10. Religion
11. Ethnicity
12. Migration pattern (inc. money came with)
13. Connections to other households in the area (family and chief)
14. Land
15. Income/assets?

Agricultural information

16. Cocoa farming + land used
17. Food crop farming + land used + which crops grown
18. Who grows/sells/buys food crops

Food crops vs. cocoa

Focus mainly on maize, cassava, plantain unless others are salient

19. Timing of incomes from food crops in the year
20. Role in non-shock times (including seasonal pattern, esp. plantain)
21. Importance of food crops vs. cocoa
    a. Income splits and how calculate it
    b. Investment (inputs, extension, land, labour etc.)
    c. Perception importance to household
    d. What you prioritise

Extreme/unusual weather patterns and events

22. Experiences and perceptions: last 2 years; longer trend
23. How badly were you affected? Why?
24. How did you cope?
25. Impacts on cocoa + food crops
26. Coping when cocoa is hit (role of food crops?); when food crops themselves are hit
27. Climate adaptation measures for cocoa/food crops
28. Who is eating from farms and is it happening during climate shock

Household vulnerability

29. Difference in household vulnerability = what makes a household more vulnerable?
30. What do people want to improve?
31. Household dependents
32. Food security and income security

Gender/intersectionality

Depends on who is in the room

33. Gendered farm roles for cocoa and food crops
34. Women's decision-making and access to land in household etc.
35. Who keeps/controls money from food crops and what is spent on

Research involvement

36. What do you think of being part of this interview
37. How do you feel about the researcher being a foreigner

Dissemination of existing results

38. How multiple shocks hit
39. Variety of coping strategies need
40. Write papers + send round one-pager

End

41. Who else should I talk to?
42. How did you find participating in this research?
43. Opportunity to ask me questions and tell me anything else relevant

8.5 Survey questionnaire

Questionnaire for survey conducted in November 2021. The survey was collected on tablets using Kobo Toolbox software.

Note: Participants were asked to specify further when the response 'Other' was given for a multiple-choice question.

Survey questions

Consent to participate

1. Have you introduced yourself and Laura? (Check yes)
2. Have you explained the project? (Check yes)
3. Have you explained how the information collected will be used? (Check yes)
4. Have you asked if the respondent has any questions? (Check yes)
5. Does the participant agree to take part in the survey? (Participant signs/puts an X)

Survey respondent

6. Name
7. Gender
    a. Female / Male
8. Age
9. Were you born in this community?
    a. Yes / No
    b. If No: How many years have you lived in this community?
10. Marital status
    a. Married /Never married/ Separated / Divorced / Widowed
11. Ethnic group
    a. Assin / Fante / Krobo / Ewe / Northern / Asante / Ga / Adangbe / Bono / Akyem / Akuapem / Other

12. Religion
    a. Christianity / Islam / Traditional / Non-religious / Other
13. Education level
    a. No formal education / Primary school / Junior High School / Senior High School / Tertiary, vocational, or higher education
14. Primary occupation
    a. Cocoa farming / Food crop farming / Labouring / Artisan / Trading / Formal employment / Other
15. Are you the main person responsible for growing food crops?
    a. Yes / No
    b. If No:
        i. Gender of main person responsible for growing food crops
        ii. Age of main person responsible for growing food crops
16. Are you the household head?
    a. Yes / No
    b. If No:
        i. Name of household head
        ii. Age of household head
        iii. Was household head born here
        iv. Years household head has lived in this community
        v. Marital status of household head
        vi. Ethnic group of household head
        vii. Religion of household head
        viii. Education level of household head
        ix. Primary occupation of household head

Household composition

17. Number of children (age under 18) in the household
18. Number of adults in the household

Farmhands

19. Does your household have land, or are you a labourer/farmhand?
    a. Household has farm / Household has home garden when they grow crops, but no separate farm / Labourer or farmhand
    b. If Farmhand:
        i. Do you have your own land elsewhere?

Land

20. Does your household grow cocoa?
    a. Yes / No
21. How long have you been farming cocoa? (years)
22. Total area of household's farm (acres) – not including house
23. Area of land used only for cocoa (acres)
24. Do not include intercropping with other crops
25. Would you like to expand your cocoa land?
    a. Yes / No
    b. If Yes: Are there any barriers to you expanding your cocoa land?
26. Do you intercrop your cocoa with food crops?
    a. Yes / No
    b. If Yes: Area of land intercropped with cocoa and food crops (acres)
27. Area of land used only for food crops (acres) - Only count land that is used only for food crops, not intercropped with cocoa

Ownership of land

28. Ownership of land used for growing only cocoa
    a. No land farmed for cocoa only / Own or customary freehold / Pay annual rent or leasehold / Sharecropping / Family land / Other
29. Ownership of land used intercropped (cocoa + food crops)
    a. No intercropped land / Own or customary freehold / Pay annual rent or leasehold / Sharecropping / Family land / Other

30. Ownership of land used only for growing food crops
    a. No food crop only land / Own or customary freehold / Pay annual rent or leasehold / Sharecropping / Family land / Other
31. Do you lease any land to other people to farm? - Tick all that apply
    a. Yes (rental income) / Yes (sharecrop) / No
    b. If Yes: What is your income from this land (GHS)?

Growing food crops

32. Which crops does your household intercrop with cocoa? - Tick all that they grow
    a. Maize / Cassava / Plantain / Oil palm / Rice / Tomatoes / Cocoyam / Okro / Onions / Peppers / Garden eggs / Other vegetables / Fruits
33. Which crops does your household grow on land separate to cocoa? Tick all that they grow
    a. Maize / Cassava / Plantain / Oil palm / Rice / Tomatoes / Cocoyam / Okro / Onions / Peppers / Garden eggs / Other vegetables / Fruits
34. How does your household use food crops?
    a. Subsistence or household consumption / Sale / Both
35. Which food crops does your household sell? - Tick all that apply
    a. Maize / Cassava / Plantain / Oil palm / Rice / Tomatoes / Cocoyam / Other vegetables / Fruits
36. Which food crops generate most income? - List top 3 in order

Storing food crops

37. How often do significant parts of your food crops yields go to waste?
    a. Never / Rarely / Sometimes / Often / Always
38. Why do your food crops sometimes go to waste? - Tick all that apply
    a. Too much yield to eat it all / Not enough market demand to sell it all / Hard or expensive to get to market / Lack of storage / Lack of labour to harvest it all / Crop ruined due to bad weather / Other

39. How often do food crops go to waste?
    a. Never / Rarely / Sometimes / Often / Always
40. How often do hired labourers help with cocoa?
    a. Never / Rarely / Sometimes / Often / Always
41. How often do hired labourers help with food crops?
    a. Never / Rarely / Sometimes / Often / Always
42. How often do your children help with cocoa?
    a. Never / Rarely / Sometimes / Often / Always
43. How often do your children help with food crops?
    a. Never / Rarely / Sometimes / Often / Always
44. How often do you store some of your harvested food crops?
    a. Never / Rarely / Sometimes / Often / Always
45. How do you store food crops? - Tick all that apply
    a. Maize silo / Granary / Refrigerator / Outside on farm / Other

Use of food crops

46. What are the main benefits of growing maize? - Tick top options they mention (up to 3)
    a. Easy or cheap to grow, e.g. requires few inputs / Helps cocoa to grow, e.g. provides shade / Grows on infertile soil / High profit from sale / High demand for sale, easy to sell / High nutritional value / Delicacy or delicious / Versatile, can process into many different foodstuffs / Cheap to convert into foodstuffs or meals / Stores well or easily / Grows in seasons when other food crops are not available / Provides income between cocoa harvests / Resilient to unusual weather patterns / Other
47. What are the main benefits of growing cassava? Tick top options they mention (up to 3)
    a. See options for maize above

48. What are the main benefits of growing plaintain? Tick top options they mention (up to 3)
    a. See options for maize above
49. Which of these factors is most important in deciding which food crops to grow? - Chose one
    a. Household food needs / Market price or profitability / Easy to grow, suitable land / Provide shade for cocoa / Resistant to unusual weather patterns

Selling food crops

50. Are you the main person responsible for selling food crops?
    a. Yes / No
    b. If No:
        i. Gender of main person who sells food crops
        ii. Age of main person who sells food crops
51. Where do you mainly sell food crops?
    a. At market / Buyers come to village or home
    b. If Buyers come:
        i. Where are the buyers from?
    c. If At market:
        i. Which market do you mainly sell food crops at?
        ii. Estimated distance to main market (km)
        iii. Time taken to get to main market (hours and minutes)
52. Which crops does your household buy? (e.g. from market/in the village) - Tick all that apply
    a. Maize / Cassava / Plantain / Oil palm / Rice / Tomatoes / Cocoyam / Yam / Other vegetables / Fruits

Unusual weather patterns

53. How did the higher temperatures and irregular rainfall in the last year (2021) affect your cocoa and food crop farming? - Describe impacts
54. How did the higher temperatures and irregular rainfall in the year before (2020) affect your cocoa and food crop farming? - Describe impacts. Put ‘can't remember’ if the participant cannot recall unusual weather impacts in 2020
55. How affected were these crop yields [cocoa, maize, cassava, plantain, tomato] by this unusual weather in the last 2 years? - Answer only for 2021 if they can't remember 2020
    a. N/A - don't grow this crop / Much lower yields / Somewhat lower yields / No impact / Somewhat higher yields / Much higher yields
56. How did your household respond to the effects of this unusual weather in the last 2 years? - Tick all that apply. Answer only for 2021 if they can't remember 2020
    a. Ate less food quantity / Ate less food variety / Ate different food / Bought more food / Sold less food crops / Sold more food crops / Switched to growing different food crops / Grew food crops on different land / Increased storage of food crops / Sold non-farm assets / Sold livestock / Engaged in wage labour / Petty trading / Received assistance from the government / Relied on friends or relatives or neighbours / No response / Other
57. Were the above responses for 2021 or 2020?
    a. 2021 only / 2020 only / Both years
58. When the household has less money than usual, do you sell more of any crops to supplement your income? - Tick all that apply
    a. Maize / Cassava / Plantain / Oil palm / Rice / Tomatoes / Cocoyam / Other vegetables / Fruits

COVID-19

59. How do you feel about COVID-19? - Do they have fear? Do they believe in the virus?
60. Do you agree with the COVID-19 restrictions in your district/region? E.g. school closures, ban on social gatherings, travel restrictions
    a. Strongly disagree / Disagree / Neither agree nor disagree / Agree / Strongly agree
61. How have COVID-19 restrictions affected your household's income? - Tick all that apply
    a. No effect / Less cocoa income / More cocoa income / Job loss / Less income from funerals, weddings, social gatherings / Less remittances from children or relatives / More income / Other
62. How has COVID-19 affected your household's farming? - Tick all that apply
    a. No effect / Fewer agricultural information or extension visits / Less availability of agricultural seeds, inputs, technologies, etc. / Lack of labour for hire / Less access to credit or financing / Lack of household labour due to illness or death / Wastage of cocoa crop / Wastage of food crops / Other
63. How has COVID-19 affected your household's sale of cocoa? - Tick all those that apply
    a. No effect on market activity / Higher cost of transport to market / Fewer taxis going to market / Fewer buyers coming from other towns or cities for food crops / Fewer local buyers for food crops / Lower buying price for food crops / Less demand for food crops / Wastage of food crops / Fear of catching COVID-19 at market / Other
64. How has COVID-19 affected your households marketing of food crops? - Tick all those that apply
    a. See options for cocoa above
65. How has COVID-19 affected your household's purchasing at markets?
66. Describe other impacts of COVID-19 on household

Food security

67. How often do you and your household members have enough to eat in the day? E.g. equivalent of 3 square meals
    a. Never / Rarely / Sometimes / Often / Always
68. Was there a time last year when it was hard to get enough (quantity) food to eat?
    a. Yes / No
    b. If Yes:
        i. How many months did that last?
69. Was there a time last year when it was hard to get enough variety food to eat?
    a. Yes / No
    b. If Yes:
        i. How many months did that last?
70. How did your household cope with these food deficits? - Tick all that apply
    a. No deficits / Ate more food crops, rather than selling them / Skipped a meal or meals / Sold assets / Worked for food / Relied on friends, relatives, neighbours etc. / Other

Agricultural information

71. Does your household have access to agricultural information on cocoa?
    a. Yes / No
72. Who provides agricultural information on cocoa? - Tick all those that apply
    a. COCOBOD extension officer / MOFA extension officer / Government forestry division / NGO / Researchers / Farmer association / Neighbouring farmers / Friends / Relatives / Church or mosque / Indigenous knowledge / Radio or TV / Internet / Print media or newspapers / Other

73. Does your household have access to agricultural information on food crops?
    a. Yes / No
74. Who provides agricultural information on food crops? - Tick all those that apply
    a. See options above for cocoa

Income

75. Total annual household income from cocoa - net (GHS) - Please put 0 if they have none
76. What is income from cocoa used for? - Tick all that apply
    a. Household expenses, including school fees, hospital bills etc. / Agricultural inputs / Foodstuffs / Personal items / Given to others, e.g. wards and relatives / Other
77. Total annual household income from maize - net (GHS)
78. Total household income from cassava - net (GHS)
79. Total annual household income from plantain - net (GHS)
80. Total annual household income from other food crops - net (GHS)
81. What is income from food crops used for? - Tick all that apply
    a. See options for cocoa above
82. Off-farm household income sources - Tick all those that apply
    a. Petty or small trade / Alcohol brewing / Casual labour / Livestock / Formal employment / Remittances from relatives or children / Pensions / House rental / Other
83. Total off-farm annual household income (GHS) - i.e. excluding cocoa and food crops, participants may need help in calculating this
84. What is off-farm income used for? - Tick all that apply
    a. See options for cocoa above

Household assets

85. Does your household own these assets? - Tick all they possess
    a. Roof made mostly of iron or steel / TV / Motorbike / Car or vehicle / Tractor / Refrigerator / Mobile phone / Radio / Hoe / A house in another village or town
86. How many sheep does your household possess?
87. How many goats does your household possess?
88. How many chickens does your household possess?

Anything else?

89. Is there anything else that you would like to tell us about related to these topics? - Please take notes
90. Any other information for Laura that was not captured in the survey?

Locations

91. Village
    a. Kwameamoabin / Bankyease / Abaase / Dosii / Asorefie / Aboabo / Homaho
92. Where was the survey conducted?
    a. Participant's home / Participant's farm / Participant's business or place of work / Public space / Other
93. Record survey location (GPS co-ordinates using Kobo Toolbox software)

Photos

94. Take a photo of respondent if they give permission
95. Take a photo of respondent's home if they give permission

8.6 Field research team's reflexive written reports

Daily, weekly, and end-of-fieldwork reflexive written reports were collected in 2021 from the field research team members (focus group discussion researchers and survey researchers) using Google Forms. The questions asked are provided below.

Weekly field reflections report: Focus group discussions team

The aim is for you to reflect on your experiences and feelings this week.

1. Name
2. Date
3. What did you do this week?
4. What went well?
5. What was challenging?
6. What did you enjoy/not enjoy?
7. What did you learn this week?
8. Any suggestions/ideas for improvements?
9. Anything else you want to say?

Daily field reflections report: Survey team

The aim is for you to reflect on your experiences and feelings this week.

1. Name
2. Date
3. How did today go?
4. What challenges did you face today?

Feedback on survey

5. How many surveys did you conduct?
6. How long did each survey take?
7. Are there any questions respondents found hard to understand or answer?
8. Are there any survey questions that you think we should change/reword?
9. Are there any questions you think we should remove from the survey?
10. Is there anything you think we should add to the survey?
11. How did the respondents find participating in the survey?
12. Did anyone refuse to take part in the survey? (Yes/No)
13. If yes, why did they not want to take part?
14. Anything else you want to say or feedback to Laura?

Weekly field reflections report: Survey team

The aim is for you to reflect on your experiences and feelings this week.

1. Name
2. Date
3. What went well this week?
4. What was challenging?
5. What did you learn this week?
6. How did you find working with the rest of the team?
7. Any suggestions/ideas for improvements?
8. Anything else you want to say?

End of survey reflections report: Survey team

These are questions about your overall experience of the survey fieldwork. Please answer all the questions in as much detail as possible. Laura will reflect on your answers in her PhD thesis and use them to inform future fieldwork.

Questions about the fieldwork experience

96. Overall, how did the farmers find participating in the survey?
97. Overall, what were the most positive things about the fieldwork?
98. Overall, what were the most difficult things about the fieldwork?
99. What would you have changed or done differently?

Questions about working with the team

100. Overall, how did you find working with the rest of the field team? What went well and what didn't go well?
101. How did you find working with Laura remotely? What went well and what didn't go well?

Questions about your career

102. What did you learn during this fieldwork?
103. How will this fieldwork experience affect your career?
104. Is there anything Laura can do to support your career going forward?

Questions about the research project

105. What do you think about the value and purpose of the project research questions and aims?
106. Any research ideas or suggestions for the rest of the project?

Anything else?

107. Anything else you want to say?

Thank you for sharing your reflections with me and for all your fantastic work on the survey!

Appendix C. Publications on research equity

8.7 Code of Conduct for Ethical Fieldwork





LAURA PICOT AND CATHERINE FALLON GRASHAM



CODE OF CONDUCT FOR ETHICAL FIELDWORK

This guide provides principles and questions to help researchers improve equity in their fieldwork. It prompts reflection and conversation on better practice beyond institutional ethics review processes. The Code addresses themes and issues that can arise across geographies, methodologies, disciplines, researcher experience levels and project scales.

Researchers are encouraged to work with their project partners and field teams to adapt the Code to their specific fieldwork context. We recognise that research often takes place under tight time and/or funding constraints, and researchers should do what they can within these limitations. We encourage experienced researchers and those with large research projects and budgets to be particularly ambitious. The Code should be incorporated into early planning stages and then implemented throughout the research process: before, during and after fieldwork.

More information and references can be found in the Supplementary Toolkit.



1 SETTING RESEARCH OBJECTIVES

Research must **do no harm**

Field research should aim to be **relevant and reflect local needs,** whilst recognising that groups often have differing views

Where appropriate, research should principally **benefit local communities** and participants involved in the fieldwork

Researchers must consider the **short- and long-term effects** of their planned research

Researchers must **not overstate the benefits** that may accrue as a result of the fieldwork

Where appropriate, **local communities and research partners should be given opportunities** to provide input on all project stages, including funding applications and setting research questions

Could your presence **harm the community?**

What is the **purpose of your fieldwork?**

Who are you **engaging** in research design?

How are you **creating space for locals** to raise issues and interests important to them?

Are you including **questions the community itself would like** to explore through research?

Could you conduct a **scoping visit to explore the interests and needs** of local communities?

What **benefits** will your research bring?

Are you **trying to do too much** in the time available?

How will you conduct research with participants who have **conflicting interests?**



2 ESTABLISHING WAYS OF WORKING

Research that would be **prohibited in a high-income country should not be conducted** in low-income countries

Researchers must **prioritise people's dignity, safety and wellbeing** over the project goals

Methods and approaches must be **socially, culturally and environmentally sensitive**

Researchers should aim to **minimise their project's environmental and carbon footprints**

Researchers must **engage with all relevant ethical regulations** and **insurance policies**

Researchers **should not accept funding** that would require **unethical behaviours**

Researchers should **undertake pre-fieldwork training**, including on mental health and safety, to prepare for fieldwork stress and how to look after their and others' wellbeing

Researchers should **consider their physical and mental health** before engaging in fieldwork

Before fieldwork, researchers must **prepare contingency plans** in case things go wrong

Researchers should **know emergency help protocols** and contact procedures / numbers

What **ethical principles** do you and your research partners commit to upholding? (e.g. respect, trust, care and honesty)

How are you **looking after** your own and your research teams' **mental health and wellbeing?**

How are you **protecting field team members** who may be at risk due to their gender, sexual orientation, religion etc.? (including yourself)

Have you considered alternative research approaches that would **reduce flying?** (e.g. by increasing local researcher involvement)

What will you do if **faced with cultural expectations that are illegal**, such as bribery?

What **accountability mechanisms** are in place to ensure ethical practices are adhered to? What will happen if they are not upheld?

Is someone in your home institution **up to date with your fieldwork plans?**

Are research partners, participants and local communities **able to give feedback,** including anonymously?

Are you **allowing sufficient time** in the field to set up logistical arrangements that are fair and not overly burdensome to research staff / communities before collecting data?

3 WORKING WITH FIELD TEAMS AND FIELD RESEARCH STAFF

Expectations of roles, behaviours and responsibilities should be set clearly before fieldwork starts

Researchers should **discuss and develop the budget with research staff** before finalising it

Research staff's **tasks and responsibilities should not be beneath** their expertise level

Research staff's **local knowledge** should be respected

Local researchers should be **encouraged, trained and enabled** to lead projects

Research staff's **contributions must be fairly recognised** and made visible, including through appropriate co-authorship according to their wishes and other ways they have identified that would be helpful to them

Researchers should **support their staff's career development** and future employment

Research staff must be provided with f**air working conditions,** including reasonable hours, remuneration, sick leave and holiday

Researchers should **not ask staff to take on risks** they would find too high themselves

Research staff must be **protected from potential risks** related to their work (e.g. physical danger or political persecution)

Researchers must carefully **set expectations with local people** who help out on projects but are not working as paid team members

How are you **selecting field research staff?**

Have you established a **collaborative research agreement,** consented to by both parties?

How are you **addressing team power dynamics and hierarchies** related to members' age, gender etc., or related to your control of the project budget and decisions?

How would you **handle disagreements** with staff about appropriate ways of working?

Are **field staff involved** in all project stages?

How are you creating space for field staff to **share their knowledge, ideas and criticisms?**

How can you **align research staff's tasks** to the skills and expertise they want to develop?

How do you ensure the work and expertise of research staff are **recognised and visible?**

How can you **support your research staff's future careers,** especially at early stages? (e.g. research stays, help with applications)

How can you **balance time/budget constraints** whilst providing fair working conditions?

Are there differences in how you and your field research staff are perceived and treated?

Do you consider **all field team members** engaged in collecting data **to be researchers?**

How do you **refer to field team members?** As "field assistants"? Or as "field researchers" or "field research staff"?

4 BUILDING CROSS-CULTURAL RELATIONSHIPS

Researchers should only conduct fieldwork with the **advance consent of the community**

When negotiating entrance into the community, **researchers must be clear, open and honest** about their purpose, the research process, how their information will be used, and any benefits that may arise

Researchers should **familiarise themselves with cultural norms and customs** beforehand, e.g. gender norms, dress, greetings and offensive behaviours

Researchers **should not generalise across contexts** or assume that local cultural norms are the same as in other places they have visited and/or conducted research before

Researchers **should not try to impose their own lifestyle or customs** on local communities

Researchers should **make efforts to learn the host country language** to avoid placing the total burden on others to speak English

Researchers must **respect local communities' knowledge,** experience and realities

Researchers must fully consider expectations and power inequalities before entering into any friendly, romantic or sexual relationship. **Researchers should not engage in any such relationship** with research participants

As far as possible, **researchers should avoid making promises** (e.g. to provide certain benefits), but they must honour any made

Researchers **must not use illiteracy or language barriers as an excuse** to not give full information to participants and communities

Are you **allowing sufficient time** to engage with and build trust in the local community before you start collecting data?

What **power dynamics and imbalances** are there between you and the community?

How do you **handle local ethical values if they are different** to your own?

How do you **respond to personal questions**, e.g. about religion, family or relationships? What if these are illegal or outside of the cultural norm in the host country?

What do you do if you are expected to gift or participate in **events involving drugs / alcohol?**

What do you do if faced with **behaviour that you consider harmful or unethical** but is locally culturally acceptable? (e.g. referring to local justice procedures rather than attempting to immediately intervene in a situation, as this may have unforeseen consequences)

What sorts of **relationships are appropriate** between you / research partners / participants / local communities?

How do you navigate **boundaries between being a researcher and a friend?**

How do you respond to **people in need?** Do you have a **duty of care?**

Do you offer **compensation** to participants?

How do your **position and personal identities** affect your interactions (e.g. race, ethnicity, gender, sexual orientation, class, religion, age, disability, seniority, nationality, marital status)?

5 USING RESEARCH FINDINGS

Researchers should only report on matters they **understand well**

Wherever appropriate, researchers **should share research findings** with participants and local communities in formats and languages accessible to them

Researchers must **avoid perpetuating harmful stereotypes** about participants or local communities

Researchers should **engage with the ethics** of capturing photographs and video footage of participants and local communities

As far as possible, **data collected should be made open** and available to all researchers, regardless of their location

Where possible, when taking samples, specimens should be **deposited at local institutions**

Can you **involve participants** in data analysis?

Who has the final say about how results are interpreted? What if participants or field staff disagree with your interpretation?

Do you have your **research subjects' best interests** in mind?

Could your research results be used to oppress or undermine the host communities or individuals / groups within them?

Have you **budgeted time and money for disseminating** your results to research participants?

How can you disseminate your results amongst participants **in a meaningful way?**

Who should profit if the research findings are financially profitable?

Who owns the research data, results and any samples collected?

6 CREATING A LASTING POSITIVE IMPACT

From early on, researchers should **consider what lasting positive impacts** are within their capacity to leave. Researchers with long or large-scale projects may be more ambitious

Researchers should **aim to build partnerships that will last** and, where appropriate, work to maintain relationships with research partners and local communities after fieldwork ends

Where possible, researchers should **support lasting opportunities for locals,** such as jobs and training programmes

At a minimum, research **must not leave behind economic or employment vacuums** or dependencies

Researchers should try to **share the lessons** they have learned doing fieldwork with others conducting research in the same context

What **positive legacies** can you create?

How can you **strengthen local capacity** and independent research in the host country?

Can you **push for positive policy changes?**

Could you **align with grassroots movements?**

Can you **support academic opportunities for local researchers,** such as more local funding opportunities and non-English publications?

Can you **build a positive pathway for future researchers** who will enter the same communities?

How will you report and learn from incidents in the field? To whom will you de-brief?

How can you **share what you have learned** with other researchers?



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CODE of CONDUCT for ETHICAL FIELDWORK

LAURA PICOT & CATHERINE FALLON GRASHAM, UNIVERSITY OF OXFORD

SUPPLEMENTARY TOOLKIT

HOW TO USE THE CODE OF CONDUCT

The Code is a handy guide to navigating ethical challenges that arise during fieldwork. It addresses the gap left by existing institutional ethics review processes, including interpersonal power dynamics, conflicts of interest and working with field teams. The Code is for any researcher who does fieldwork, across different disciplines, country contexts and career stages. It is designed to be a living document, adapted to your specific fieldwork context by you and your research partners. We encourage you to use the prompts as a starting point for self-reflection and conversation with your fieldwork teams. In larger teams, an ethics champion could ensure the group upholds ethical behaviours whilst recognising each individual's responsibility. Students may use the Code to facilitate discussions with supervisors and set expectations around support before they embark on fieldwork.

The Code is deliberately ambitious in scope to prompt researchers to think critically about their fieldwork practices. Not all points may apply to your specific fieldwork or be possible to implement within your time and financial constraints. We encourage researchers, particularly students and early career researchers, to focus on what you can do. Experienced researchers and those with large research projects and budgets may aim to be more ambitious. It is important to note that researchers' own positionality and intersectional identities (e.g. race, gender, sexual orientation, age, disability etc.) will affect ethical dynamics in the field.

Universities and research organisations have an institutional responsibility to support fieldworkers in their endeavours towards ethical practice. In addition to the Code and the resources listed below, we encourage researchers to take full advantage of training offered by your department, division or research institution. We also recommend learning from other researchers from your institution and the host country who have conducted fieldwork in the same area.

PROCESS FOR DEVELOPING THE CODE OF CONDUCT

The Code was commissioned by the School of Geography and the Environment, as suggested by the Graduate Collective's template for change on dismantling systemic racism. Currently, University of Oxford researchers are only required to complete Central University Research Ethics Committee (CUREC) processes if they are conducting research with human participants, and CUREC is limited to issues such as gaining participants' consent and secure storage of personal data. However, a wide range of ethical issues and interpersonal dynamics can arise through interactions with research partners, participants or local communities during fieldwork, regardless of the type of research being conducted. This Code of Conduct addresses that gap.

We started by searching for best practice examples of guides for ethical fieldwork and found a lack of relevant or comprehensive examples from other universities, research institutions, funding bodies or NGOs. We, therefore, expanded our literature review to include grey papers, academic networks/blogs and some peer-reviewed articles. We also consulted researchers working on similar initiatives in other institutions. Using this information, we compiled a set of ethical issues that can arise during fieldwork. We gathered feedback on the draft Code of Conduct and additional recommendations document through focus group discussions with field researchers, at different career stages, living in the Global North and the Global South.

LANGUAGE AROUND "FIELDWORK" AND "FIELD ASSISTANTS"

There are debates concerning the problematic use of the term "fieldwork" (see this **blog post** by Rachel Strohm) and "field assistants". It has been argued that "field" is a neo-colonial term that 'others' those that participate in research studies and perpetuates the unequal power relations between Northern researchers and Southern citizens. Where there is a colonial history to contend with, we encourage field researchers to also reflect on this language. Our Code is intended to be used by any researcher, of any country, in any country, hence we have decided to retain use of the generalisable term "field". However, we discourage the term "field assistants" and suggest a shift towards more empowering and equalising language such as "field researchers" or "field research staff".

LINKS TO RESOURCES

University of Oxford research integrity and ethics

These open-access documents are particularly useful for researchers who do not have established ethics procedures at their research institution.

- **University policies and codes of practice** (e.g. collecting personal data from participants)
- **Best practice guidance** (e.g. **Social science research conducted outside of the UK**)

Free online research ethics training courses

- **Global Health Training Centre: Social Science, Ethics & Communities**
- **Introduction to Research Ethics: Working with People**
- **People Studying People: Research Ethics in Society**
- **Community Based Research: Getting Started**

Working with vulnerable groups

- **Research with Refugees in Fragile Political Contexts**
- **Ethical guidelines for research with displaced people**
- **Research with children: ethics, safety and avoiding harm**
- **Community-based Participatory Research: Ethical Challenges**

Working with indigenous communities

- **Guidelines for approaching research in indigenous settings**
- **Code of Ethics for research with indigenous communities**

The ethics of care in field data collection

- **The ethics of care**
- **Compassionate research**

Compensation for research assistants, participants and local communities

- **Participant compensation in global health research: a case study**
- **Ethical and practical considerations of paying research participants**

Wellbeing of field research staff (including women, BIPOC and LGBTQIA+ staff)

- **"This isn't getting easier": Valuing emotion in development research**
- **Vicarious [secondary] trauma training, University of Oxford**
- **Preventing Harassment in Fieldwork Situations Report, University of Washington**
- **Sexual(ized) harassment and ethnographic fieldwork: A silenced aspect of social research**
- **The fieldwork initiative (sexual trauma in fieldwork)**
- **Sexual violence during research**
- **Protecting BIPOC scholars in the field**
- **Advice for women travelling abroad**
- **LGBTQIA+ foreign travel advice**
- **Safe Overseas Travel Guidance for Staff with Protected Characteristics**
- **Fieldwork and disability: an overview for an inclusive experience**

Relationships in the field

- **Sex, romance, and research subjects: an ethical exploration**
- **The field as a landscape of desire: sex and sexuality in geographical fieldwork**
- **Masculinity and frank consideration of sexual attraction in fieldwork**

Conflicts with your own ethical value system

- **Concealing researcher identity in fieldwork**
- **Everyday risks and professional dilemmas: fieldwork with alcohol-based subcultures**

Flexibility in the field

- **Getting Prepared to Be Prepared: How Interpersonal Skills Aid Fieldwork in Challenging Contexts**
- **Mediating messiness: expanding ideas of flexibility, reflexivity, and embodiment in fieldwork**

Remote [management of] field data collection

- **Doing fieldwork in a pandemic**

Guidelines for ethical photography

- **Upholding the rights of the people in the pictures**
- **Bond's Ethical Guidelines for the collection and use of content**

Comics about fieldwork challenges

- **MDG Comics**
- **Bukavu Comic Series**

References

The following documents were drawn upon in developing the Code of Conduct.

Existing Ethics Guidelines

- **A Guide for Transboundary Research Partnerships: 11 Principles (KFPE, 2012)**
- **Charter of Decolonial Research Ethics** (Decolonidad Europa, 2013)
- **Ethical Guidelines for Community/Ecology Fieldwork & Research** (Mary Watkins, Pacifica Graduate Institute, 2017)
- **Global Code of Conduct for Research in Resource-Poor Settings** (TRUST, 2018)
- **Guidance for research in response to humanitarian emergencies** (Wellcome Centre for Ethics and Humanities, 2020)
- **Guidelines for healthy global scientific collaborations** (D Armenteras in Nature Ecology & Evolution, 2021)
- **Power, Prestige & Forgotten Values: A Disaster Studies Manifesto** (JC Gaillard et al., 2021)
- **Research Ethics: A practical guide** [guide and flowchart] (Oxfam, 2020)
- **Research Ethics Guidance** (Social Research Association, 2021)
- **San Code of Research Ethics** (South African San Institute, 2017)
- **Six fieldwork expectations: Code of conduct for teams on field projects** (Sara Perry, 2020)
- **Statement on Ethics** (American Anthropological Association, 2012)
- **Statement on Professional Ethics** (Association of American Geographers, 2009)
- **Ten simple rules for Global North researchers to stop perpetuating helicopter research in the Global South (Haelewaters et al. in PLOS Computational Biology, 2021)**

Blogs, networks and opinion pieces

- **Africa's next decolonisation battle should be about knowledge** (David Mwambari, 2019)
- **Ethics in development research: 'doing no harm' when conducting research in the global South** (German Development Institute (DIE), 2021)
- **Field Research Methods Lab** (London School of Economics, 2021)
- **How to truly decolonise the study of Africa** (Robtel Neajai Pailey, 2019)
- **(Silent) Voices blog – Bukavu Series** (Governance in Conflict Network, 2020)

8.8 Correspondence in Nature – Fieldwork: institutions can make it more ethical

CORRESPONDENCE | 06 September 2022

Fieldwork: institutions can make it more ethical

By Laura E. Picot ✉ & Catherine Fallon Grasham

Daily fieldwork encounters with local communities, research teams and collaborators must be navigated carefully. They can involve cultural differences and produce uneven power relations. Even when studies that entail collecting data from animals or human participants undergo review by institutional ethics boards, those processes do not necessarily consider how to share the benefits of the research, distribute responsibilities equitably and disseminate findings.

Researchers need institutional support to implement ethical fieldwork guidelines (see, for example, *Nature* **606**, 7 (2022) and the Code of Conduct for Ethical Fieldwork; go.nature.com/3wizgtx), including adequate budgets. These should incorporate funding for practices that improve ethical rigour. Funding might need to be extendable, given that engaging with partners and communities to ensure that research has local relevance can be time-consuming. And researchers must be given the tools to interpret ethical guidance in their type of fieldwork.

Publishers and institutions need to recognize contributions by research partners from low- and middle-income countries. Moreover, institutions should ensure that ethics is a mainstream part of fieldwork training. They could incentivize ethical fieldwork when awarding grants and in hiring and promotion.

Nature **609**, 245 (2022)

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8.9 Article in Research Ethics – Safeguarding research staff "in the field": a blind spot in ethics guidelines

Review Article

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Safeguarding research staff "in the field": a blind spot in ethics guidelines

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Abstract
Across disciplines there is a large and increasing number of research projects that rely on data collection activities in low- and middle-income countries (LMICs). However, these are accompanied by an extensive range of ethical challenges. While the safeguarding of study participants is the primary aim of existing ethics guidelines, this paper argues that this "do no harm" principle should be extended to include research staff. This study is a comprehensive review of more than 80 existing ethics guidelines and protocols that reveals a lack of safeguarding research staff regarding the ethical challenges faced during data collection activities in LMICs. This is particularly the case when it comes to issues such as power imbalances, political risk, staff's emotional wellbeing or dealing with feelings of guilt. Lead

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organizations are called upon to develop guiding principles that encompass the safeguarding of research staff, which are then to be adapted and translated into specific protocols and tools by institutions.

Keywords
Ethical guidelines, ethical procedures, ethical protocols, research fieldwork, safeguarding research staff

Ethics guidelines: History and blind spots

There has been a steep increase in the number of research projects taking place in low- and middle-income countries (LMICs) across disciplines in recent years (Haug et al., 2021), triggered in part by calls for more evidence-based policies (Kaplan et al., 2020; Reddy, 2019; White, 2019). This trend has been accompanied by a growing popularity of primary qualitative and quantitative data collection activities in LMICs by disciplines such as political and economic sciences, but also global health (Humphreys, 2015). Just as is the case globally, data collection activities in LMICs can involve an extensive range of ethical challenges that transcends academic disciplines, and these challenges vary between and within countries (Abimbola, 2019; Bhutta, 2002; Bradburd, 1998; Scheyvens et al., 2003). Overall, there is a lack of ethics training across disciplines that adequately prepares researchers to prevent or deal with ethical challenges, although some sciences have a longer history of "field research" and being better equipped (Chiseri-Strater, 1996; Jacobs-Huey, 2002).[1]

Historically, to "do no harm," fundamental ethics requirements have been developed that are enacted via guidelines such as the *Nuremberg Code (1947)*, the World Medical Association's *Declarations of Geneva (1948) and of Helsinki (1964)*, as well as the *Belmont Report* (1978). Though the principle of "do no harm" is not without limitations (Hugman et al., 2011; Kaplan et al., 2020), it has contributed to the adoption of ethics standards by institutions worldwide, and helped to promote ethical research. However, these requirements often fail to address the complexities of today's international research collaborations and the specific context of research in LMICs (Schroeder et al., 2018). Furthermore, they focus mainly on safeguarding research participants (Morris, 2015). While it is of utmost importance to consider how best to "do no harm" for the study population, one should not forget the other major actors when thinking about safeguarding: the research staff. Particularly when working in LMICs, research staff can be exposed to substantial physical safety threats due to inadequate infrastructure, harsh weather conditions or insecurity in post-conflict settings (Bachmann, 2011; Canavati et al, 2017), and experience emotional distress particularly when working with survivors of sexual or physical violence where research staff is listening to traumatic

narratives and stories (Rothman et al., 2018; Wood, 2011). In highly deprived research settings, research subjects might seek help from the research staff which often leads to difficult role conflicts (Kamuya et al., 2014), and feelings of guilt and shame (Mayan and Daum, 2016).

Safeguarding (beyond the legal frameworks for workers' rights) is a critical ethical concern.[2] However, there are often unclear policies in place for the protection of personnel working "in the field," or those that are not regularly employed. Research staff might include, for example, co-authors, data enumerators, gatekeepers, cooks, and drivers, who are an integral part of every research project, yet do not all enjoy the same level of protection. Due to differences in culture, institutional norms, and intersectional identities, there are varying, and at times competing, expectations and interests in international research projects (Reid et al., 2021). In addition to disparities in employment conditions, experiences of working and safety in the field also vary greatly depending on an individual's race, gender, sexuality, and age. Given the stark power imbalances and differing expectations within some research teams, even seemingly simple management problems may evolve into ethical challenges (e.g., too-short time frames for data collection), with spillover impacts on the physical and emotional wellbeing of research staff. Contextual factors, such as working in geographically remote areas with little infrastructure or in politically unstable regions, can give rise to further challenges. Coupled with inadequate working conditions, these factors often increase risks for staff's physical and mental wellbeing (Vlassenroot et al., 2019).

This paper argues that beyond emotional and physical safety and working conditions, ethical issues also extend to the complexities of academic ownership and care for whose voices are acknowledged (Morton et al., 2022). Field research staff come from high-income countries (HICs) as well as LMICs. Within global research consortia, field data collection is often led by researchers from HICs, along the lines of global power inequities (Ong'era et al., 2021).[3] There has been a policy shift toward promoting the local ownership of the research process in keeping with the Paris Declaration on Aid Effectiveness, though in practice this remains to be seen in many research disciplines. The trend toward research being funded by international and national development organizations may further aggravate matters by reproducing structures of donor and recipient and imposing funding cycles that focus on short-term outcomes (Ashuntantang et al., 2021).

This research paper contributes by highlighting the ethical challenges faced by research staff collecting primary data in LMICs and identifies the vacuum of comprehensively addressing these in ethical guidelines. While safeguarding issues can arise in all countries and are of utmost importance at a global level, this paper focuses on LMICs as their contextual setting often pronounces ethical challenges (Steinert et al., 2021). Here, some challenges have received more attention, others have hardly been mentioned. This paper proposes solutions and concrete steps to

prevent and deal with ethical challenges at an institutional and individual level and we call upon lead institutions to develop a comprehensive set of guidelines for safeguarding research staff. Since there are no one-size-fits-all solutions, we urge individual organizations to develop more specific guidelines that address the persistent gap of safeguarding research staff conducting work in LMICs. This call for action is critical since ethics review processes often do not meet minimal standards (Aguilera et al., 2022; Sambiéni, 2018) or do not exist at all (Chin, 2013). This paper is structured as follows: after describing our methodology, an overview of the most important ethical challenges faced by research staff working in LMICs is provided and corresponding safeguards are presented. This is followed by a discussion that outlines further solutions and a call for action.

Needs versus practice: Gap analysis of ethical challenges in guidelines

Methodological approach

We employed an internet-based search strategy to identify existing guidelines which address ethical challenges encountered by research staff contributing to "field research." From June 2019 to December 2020 a Google-based search was conducted using a wide range of keywords and combinations (see Supplemental Table A1 for more details). Beyond universities, we reviewed humanitarian and funding institutions as well as journalist networks. In order to help mitigate for bias associated with non-publicly available institutional guidelines, an additional hand-based search of internationally well-known organizations was conducted, which the authors followed up through direct institutional contacts. It should be noted that this search was limited to English and German language guidelines, and these guidelines are predominantly from organisations based in HICs.

Research findings

In a previous systematic review, Steinert et al. (2021) identified nine types of ethical challenges that researchers may be exposed to during fieldwork (role conflicts, physical safety threats, emotional distress, power imbalances, work conditions, feelings of guilt, sexual harassment, political repression, issues concerning institutional review boards). Building on this work, we identify intersectional identities of field research staff as an additional challenge (Figure 1). In the following, we discuss each of these challenges in turn explaining the issue and how existing guidelines address it. We then present a brief summary of the solutions that the guidelines provide and identify the gaps in what is covered. These challenges are not unique to fieldwork in LMICs, but they are aggravated by contextual factors such as poverty, inequality, and the uneven power dynamics between researchers

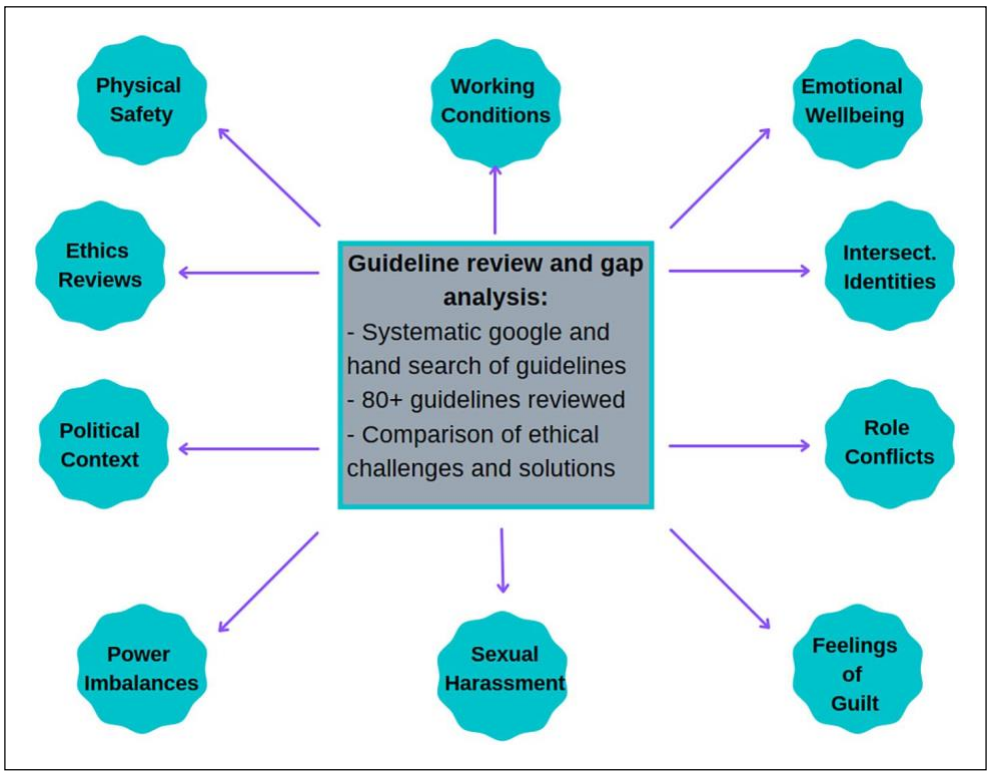


Figure 1. Overview—gap analysis.
Source: Authors' own depiction.

and participants. For a more comprehensive list of specific guidance on how to address each challenge, please refer to Supplemental Table A2.

Physical safety. The physical safety of field research staff working in LMICs is at risk in different ways and for various reasons. The World Bank projects that more than 50% of the world's poor will live in fragile countries by 2030 (World Bank, 2020) meaning that a significant proportion of global development research is focusing on conflict-affected and unstable states. This imposes security risks, including crime, unsafe travel modes, harsh weather conditions, and exposure to diseases, which threaten researchers' health and life. Security issues for foreign and domestic research staff are aggravated by strict project timelines and ambitious interview targets, leaving insufficient room for planning and safety buffers, while budget constraints may impose cuts on travel arrangements and proper housing.

Physical safety is discussed in a large number of guidelines focusing on preparedness, including risk management plans, awareness building (e.g., Tennessee Tech, 2017; Trust, 2018; University of California, 2019; University of Texas at Austin, 2010), clear management responsibilities (e.g., UN, 2006), and most

importantly, training (BERA, 2018; J-PAL, 2022). Guidelines, particularly from development practice (CARE International, 2014; UNESCO/Reporters Without Borders, 2015), provide specific guidance on personal conduct during violent events (bombing, assaults, land mines, etc.). Many guidelines promote working in teams, whilst also acknowledging that team members can be a potential threat or source of harassment (IADB, 2012). To counteract this risk, guidelines highlight the importance of proper reporting and information sharing (CARE International, 2014; European Commission, 2004; IFRCC, 2009; University of Bristol, 2012; World Food Programme, 2018), including "Incidence Management Hotlines" in larger organizations (World Food Programme, 2018). In general, physical safety is one of the challenges which is addressed well by guidelines.

Alcohol and drug use can have adverse effects on personal safety. Despite this, there can be immense pressure to engage in risky consumption of drugs and/or alcohol during fieldwork (e.g., Posselt and Nuñez, 2022; Schneider et al., 2021), especially if related to the research topic. The guidance for alcohol consumption for personnel doing field data collection is inconsistent and unclear ranging from "socially appropriate" (ISS, 2016), "healthy" (Dart Centre, 2007), "minimize" (WHO, 2011b) through to "avoid completely" (University College Dublin, 2015). While "avoid completely" is clear and appears superficially to be the ethical pinnacle, it lacks acknowledgment of the widespread role of alcohol and drugs across societies, and the expectations that field research staff may face to ensure recognition or credibility when collecting data in certain "milieus." Staff care (IASC, 2014) and peer-to-peer support (UNHCR, 2013) offer a starting point to tackle excessive alcohol consumption.

Working conditions. Working conditions comprise topics like working hours and rest periods which invariably impact upon the physical and mental demands of work tasks (International Labour Organization (ILO), 2021). However, we discuss those issues separately from *physical safety* and security as well as *emotional well-being*. This is also due to the fact that working conditions also touch upon other matters, including, for instance, fairness concerns with respect to wages. Budget and time constraints can limit the working conditions, and negative outcomes can be compounded by researchers' inexperience or institutional barriers (Bahn, 2012). Often, the hiring of research staff takes place under informal circumstances, where teams are paid cash-in-hand and lack the formal protection of contracts and insurance. With respect to risks, guidelines frequently mention low wages, high workload, no breaks, lack of insurance, and conflicting demands, as well as unclear expectations (CARE International, 2014).

Guidelines that relate to working conditions for research staff largely focus on the physical wellbeing of staff and the security aspects of the work (e.g., University of Toronto, 2011). Challenging working conditions are mentioned,

for example, long working hours. While existing guidelines discuss these issues for institutional staff members, there is little reference to working conditions that specifically relate to local staff.[4] Very few state that fair wages and insurance should be provided to local research staff, or, at a minimum, that realistic expectations about employment conditions should be set clearly and in advance (CUREC, 2017; Trust, 2018). Beyond security-related conditions, some guidelines discuss exposure to distressing situations, yet, instead of addressing the root causes imposed by working conditions, only coping mechanisms such as personal and organisational stress management are suggested (Antares Foundation, 2012; WHO, 2011b). Most guidelines related to working conditions are from humanitarian organisations; only a few universities and other research institutions have published such guidance.

Emotional wellbeing. Research work can expose staff to situations where they feel lonely or isolated, particularly if they are working far from home. This can provoke emotional reactions such as anxiety and fear, stress, insomnia, depression or burnout during, and after, fieldwork (Klocker, 2015; Simon and Mosavel, 2010; True et al., 2017). The emotional burden may be further increased if, for example, the research involves sensitive topics, includes vulnerable or severely deprived populations, is located in disaster- or war-affected settings, and/or includes participants who have survived physical or sexual violence (Cordisco Tsai and Tsai, 2018). When researchers interact closely with study participants and encourage them to disclose the potentially traumatic narratives, stories, and images, they are susceptible to substantial emotional distress and secondary (vicarious) trauma (Steinert et al., 2021). There is a harmful culture in academic fieldwork where fieldworkers may feel that they are expected to endure hardships and overcome them themselves in order to reach their full potential as researchers (Dominey-Howes, 2015; *and authors' own experiences*).

Against this backdrop, the emotional wellbeing of research staff is hardly addressed in existing guidelines. Research institutions tend to acknowledge the issue of emotional harm and the responsibility of institutions for good staff care, but without providing specific ideas or solutions to address this challenge (e.g., BERA, 2018). The exceptions are some British universities that provide online resources on culture shock, on giving regular debriefings after fieldwork, and on secondary (vicarious) trauma (e.g., University of Oxford, 2020). There is more mention of emotional wellbeing in guidelines from humanitarian organizations as there seems to be a higher sensitivity to the increased risk of depression, anxiety, and burnout among humanitarian workers. These guidelines focus primarily upon stress and burnout caused by distressing activities in disaster- or war-affected zones. Further guidelines from the field of journalism (e.g., Antares Foundation, 2012; Dart Centre, 2007) address emotional distress and trauma, particularly the

potentially adverse emotional impacts from interviewing traumatized persons. The World Health Organisation (WHO) (2011b) offers advice for psychological first aid (PSA) for researchers. Several guidelines mention regular debriefing meetings during fieldwork so that research team members can discuss experiences and feelings induced by the data collection. Frequent supervision and additional external support structures, such as mental health therapy and training, are also mentioned.

Intersectional identities. In the field, researcher characteristics such as gender, sexual orientation, race, religion, marital status, disability, and pregnancy can affect researchers' wellbeing in different ways (Mwambari, 2019). Cultural norms can impact upon how one is perceived and treated and can induce threats to physical safety as well as stigmatization and discrimination. There might also be impacts from legal restrictions, for instance, in countries where homosexuality is illegal (Orr et al., 2019; Pillay et al., 2022). Researchers' experiences may reflect the intersection of multiple factors, rather than single distinct factors (Hankivsky, 2014). Intersecting identities shape lived experiences and wellbeing, whether they are visible and perceived by others (e.g., race, physical disability, gender) or not (always) visible (e.g., sexual orientation).

How one is perceived and treated may be at odds with how one identifies, and intersecting identities can influence how a research project as a whole is perceived by participants and local communities (ISS, 2016). LGBTQI+ field research staff may have to contend with conflicts between their actual and perceived identity, and/or their sexuality being locally unacceptable, or even illegal, and then assess how to minimize the resulting risk. Many researchers have worked in areas where they did not feel safe because of their identity, expression, or presentation, and some individuals are excluded from fieldwork in particular contexts because it is too dangerous (Olcott and Downen, 2020). The heterogeneity of security concerns for different identities might, however, be used as an excuse to exclude particular groups from the research process. In this respect, gender affects treatment in the field, both in terms of in cultural norms, acceptable behaviours and power dynamics, as well as risks of sexual harassment (see following section). It is also important to consider (gendered) cultural norms around behavior. In some places, it may be frowned upon for women (or men) to be seen consuming alcohol, engaging in romantic flirtation (even "off the clock") or even speaking loudly (Porter and Schänzel, 2018; Schänzel and Porter, 2022; *authors' own experiences*).

Many guidelines do not address how researchers' intersectional identities affect their safety and wellbeing in the field and fail to raise awareness about how researchers' experiences and their treatment by respondents and other staff can vary widely. Where mentioned, most pertained to gender and sexuality, with few referencing race or other characteristics. However, race plays an important part in

fieldwork interactions; field team members may experience racism and/or xenophobia, depending on the context in which they are working, and one's ethnicity in relation to that of the participants can bias social interactions and their responses (Adida et al., 2016).

Some institutional codes of conduct demand that researchers do not perpetrate acts of discrimination (see e.g., ASA, 2018), but do not address how researchers themselves may deal with discriminatory behaviour or attitudes. Others make broad references, such as "safety and security briefings should take into account the varying needs within a team, bearing in mind that staff of a particular race, ethnicity, caste, gender or sexual orientation may be especially vulnerable to threat." (Antares Foundation, 2012, p. 11), but do not go into specifics about how to safeguard team members.

Role conflicts. Role conflicts during field data collection arise from the positionality of field researchers in relation to the research participants and communities. Researchers can feel tension between their need to collect data and a perceived duty of care. Particularly, in situations where respondents and target populations are in need, field researchers might often be unsure whether and how to make use of their privileged position to support communities (Bachmann, 2011; Canavati et al., 2017). Offering support has been discouraged for "objective" research, and the researcher's role as a passive observer. However, when even small gestures of kindness can make a big difference to the lives of those affected by poverty, doing nothing can lead to moral and emotional distress (J-PAL, 2022).

Guidelines strongly emphasize the need to protect research participants to avoid undue intrusion in communities (ASA, 2018; Government of Canada, 2018) and to serve communities through reciprocity and solidarity (WHO, 2016). However, there is little explanation of how this should be done, although one guideline suggests briefing researchers on how to communicate benefits and manage expectations (J-PAL, 2022). Another discusses the difficulty of raising safeguarding concerns about research participants that may be detrimental to the research, for example, when talking to researchers may cause harm in previously traumatized communities (DFID, 2016). Moreover, knowing how and whether to report safeguarding concerns of participants, and local community members, might be further complicated where there are unclear legal or regulatory processes.

Guidelines predominantly advocate that the safety, mental health, and welfare of researchers is paramount and should have precedence over project goals (AAG, 2009; IASC, 2014; Oxfam, 2020; Trust, 2018; University of Otago, 2006; WHO, 2011b, 2016, 2017). However, it is not clear what level of risk to the researcher is acceptable in pursuit of research, or in meeting an ethical responsibility towards research participants.

Feelings of guilt. Feelings of guilt, while being closely linked to emotional wellbeing, are particularly problematic in HIC-LMIC research collaborations where there are wide differences in living conditions between researchers and research participants (Bachmann, 2011; Steinert et al., 2021). Combined with the potential stressors of culture shock, (secondary) trauma and risks to personal safety, feelings of guilt can contribute to destabilizing field research team relationships (Gouda et al., 2016; Pollard, 2009; *and authors' personal experiences*).

While discussing the potential of feelings of guilt arising during field data collection, there is a lack of nuance offered to explain or normalize such feelings in ethics guidelines (despite being relatively well-explored in the peer-reviewed literature). Guilt is noted as a symptom of poor mental health (IASC, 2014; UNHCR, 2013) including post-traumatic stress disorder (PTSD) (Antares Foundation, 2012) and stress (ISS, 2016). The Dart Centre (2007) guidelines talk about two different types of guilt: "observational" what one sees during fieldwork, and the guilt of leaving loved ones behind. However, specific guidance on how to manage feelings of guilt are absent in ethics guidelines.

Sexual harassment. Sexual aggression is common everywhere in the world and can affect people of all genders (Abrahams et al., 2014), yet there are few relevant codes of conduct and sexual harassment policies (Clancy et al., 2014). Incidents of sexual harassment, discrimination, and violence in the field are under-reported, including those perpetrated within field teams themselves (Clancy et al., 2014). Researchers may find themselves in positions where they feel pressure to engage in sexual dynamics to maintain relationships with colleagues, superiors, or research communities/participants (see e.g., Groes-Green, 2012).

Most guidelines frame these issues around protection from sexual exploitation, abuse and harassment (PSEAH) for participants (UKCDR, 2019; World Food Programme, 2018), and ensuring that researchers do not perpetuate sexual misconduct (Oxfam, 2020), or exploitative sexual relationships (APA, 2017). There are, however, some specific guidelines which address sexual harassment towards researchers. These tend to focus on taking steps to reduce personal risk, such as avoiding traveling alone at night and covering up with layers of clothing, as well as what to do if one is harassed (e.g., ISS, 2016). Many advise that researchers familiarize themselves with cultural norms around gender and sex before undertaking fieldwork (e.g., UNESCO/Reporters Without Borders, 2015). Some research institutions are also taking steps to provide training and support to prevent sexual harassment when their researchers undertake fieldwork (e.g., University of Washington, 2018). Yet, the existing material contains insufficient guidance around boundaries, the definition of sexual exploitation/misconduct (especially beyond the researcher-participant relationships), management of expectations, and for recovery from incidents of sexual harassment.

Power imbalances. Unequal power dynamics between research partners from HICs and LMICs are an inherent ethical challenge in the majority of research collaborations (Herman et al., 2022; Schroeder et al., 2018). Institutions and individuals from HICs dominate most parts of the research process by setting the agenda, defining methods and tools, owning the data and often having the sole right to the data collected (Odjidja, 2021; Trisos et al., 2021). Oftentimes, this builds on and further protracts existing global power imbalances. These inequities can lead to safeguarding concerns when they produce adverse circumstances for research staff. For instance, researchers in LMICs may have limited leverage to negotiate adequate access and ownership of the data collected or recognition that may be vital for their careers (Sibai et al., 2019).

Often, there is no credit given to local contributions and knowledge even though they play a major role that goes beyond data collection efforts (Lansford et al., 2019). This fosters asymmetric knowledge production processes where local contributions are not adequately acknowledged and authorship is limited to HIC researchers. When not considering the vast diversity of LMICs and local perspectives, this may induce context-insensitive research and risks increasing research fatigue (Jumbam, 2020). There has been a recent increase in acknowledgment of these problems in academia (Liverpool, 2021); voices from LMICs are contributing to the growing debate on decolonizing research practice (Ong'era et al., 2021).

The challenges associated with power imbalances that lead to adverse conditions for research staff are addressed in ambiguous ways or mostly not at all. Some mention it as a problem, and highlight the importance of local knowledge production (e.g., CIRAD, 2017; DFID, 2016; UKCDR, 2019). However, the collected guidelines do not provide solutions or suggest tools. There seems to be greater sensitivity towards the topic in social anthropology and in sociology guidelines with mention of some of the challenges (e.g., Association of Social Anthropologists of the UK and the Commonwealth, 2011). Larger organizations such as the AFDB (2018), describe the abuse of power in hierarchies more generally, including how this can affect lower-level staff negatively, and how to counteract the problems. There are a few guidelines that focus explicitly on the topic of power imbalances and provide a comprehensive list of problems with potential solutions (e.g., COHRED, 2016; KFPE, 2018).

Political context. Over the past decades academic freedom improved globally as measured by expert surveys. However, recent years indicate a reversal in several countries, including several examples from the Global North (Coppedge et al., 2021). Research in politically unstable or authoritarian settings may be subject to political repression, which ranges from allegations of being a spy, attempts of intimidation and harassment by police officers or local authorities, to the confiscation of IDs or imprisonment (Steinert et al., 2021). While foreign researchers have the option to leave the host country, local staff are particularly at risk of

mistreatment (Mwambari, 2019). Political repression may hamper research in terms of access to the field (e.g., travel bans, restrictions of permits, data seizure), but more importantly impair the wellbeing of research staff (relating also to physical and emotional wellbeing).

Given the large amount of research in authoritarian or politically fragile settings, as well as on sensitive political topics, there is remarkably little guidance on how to handle these situations, and with it, potential political repression. Guidelines from the academic sector highlight the importance of conducting rigorous research and safeguarding respondents in those settings (Association of Social Anthropologists of the UK and the Commonwealth, 2011). More applied guidelines for safeguarding can be found in journalism and the NGO sector with links to political violence and the highlighting of digital security issues (UNESCO/ Reporters Without Borders, 2015). However, these guidelines focus upon protection of the (international) researchers rather than the team as a whole, or the LMIC research staff in particular.

Ethics reviews. There is consensus that research with humans carries risks and benefits that require independent ethical review, as stated in foundational codes like the Nuremberg Code (1947), the Helsinki Declaration (1964), or the Belmont Report (1979). Institutional review boards (IRBs), which are oftentimes associated with universities and research institutes, have a responsibility to conduct these ethical assessments. However, review boards from HICs may not be able to consider the ethical concerns that apply to a diverse set of partner LMICs sufficiently and may impose conditions which are simply not practicable on the ground. Many research projects still only rely on ethics reviews from the country that funds the research (Sieber and Tolich, 2012, and *authors' personal experience*). This leads to a lack of representation and consideration of ethics assessments from local ethics bodies. Additionally, review boards in LMICs, if they exist at all, can suffer from a lower regulatory capacity, which induces concerns that HIC researchers might deliberately conduct research in LMICs in order to engage in "ethics dumping" (Schroeder et al., 2018; Wassie et al., 2019). Even if ethics boards from both countries are involved, international research projects run the risk of getting lost in diffuse accountability processes. Thus, contradictory demands can impose barriers for research, harming, rather than assisting the research staff (Makhoul et al., 2014). This is compounded by the fact that, in some institutions, safeguarding research staff is narrowly considered as physical health and safety, but not broadly addressed in ethics review processes.

In general, guidelines address the need to seek appropriate local ethics approval with respect to human participants research in LMICs only in a very limited manner. An exception is the Global Code of Conduct which explicitly states the importance of seeking ethical approval in the country where the research is carried out,

even if the project has already been approved by the home country (Trust, 2018). University-specific regulations in most instances only mention the general need for an application for ethics approval at the respective university (e.g., UCLA, 2020; University of Oxford, 2020) but not a call to seek approval from a review board (or other relevant authority) in the country of research. This is in line with guidelines and requirements for ethics approval by different funding bodies, including the National Science Foundation (2020), the European Commission (2019), and World Health Organization (2011a, 2011b) as well as from research journals (e.g., BMJ, 2009). The safeguarding of research staff is usually a minor part of these ethics processes; they have a clearer focus upon safeguarding with respect to the study participants.

Discussion and call for action

The need for clear ethics guidelines that address the safeguarding of research staff is critical since formal ethics reviews seldomly adequately consider the protection of research staff, particularly partners from LMICs. For this reason, guidelines often remain the only benchmarks to prevent and assess ethical challenges with respect to research staff.

From our challenge-specific gap analysis, it is clear that there are certain challenges that are more prominently addressed in ethics codes and guidelines than others. The securing of physical safety of staff during "field research" is the most established area in the reviewed guidelines. Here, specific solutions are provided and institutional support offered. This can also be seen with respect to ensuring adequate working conditions of research staff; however, the focus is disproportionally on physical wellbeing (i.e., safety concerns) rather than covering the diverse issues relevant to the broad field of working conditions. While stress management is more prominent in several guidelines, it is often regarded as an individual responsibility. A more rounded view of the emotional wellbeing of research staff (also considering changing working conditions) is lacking, and guidelines offer few potential solutions at the institutional level. As implicitly revealed in various guidelines, by shifting the responsibility to individual staff, institutions risk adoption of unhealthy coping mechanisms, including drug/alcohol use or sex (along uneven power lines). While the problem of power imbalances is mentioned in some guidelines, solutions or tools are rarely presented to address them. Some guidelines mention the importance of preventing discrimination and harassment, but do not provide concrete advice about how to anticipate and avoid them. A more general discussion of the challenges arising from the positionality of the research staff is missing in guidelines. Also, challenges such as the political context, context-insensitive demands from institutional review boards, and feelings of guilt are hardly addressed at all.

In many instances, the responsibility to safeguard is placed on the individual researcher explicitly (e.g., University of Bristol, 2012) by leaving it to the individual to, for example, judge whether it is safe to go into the field, or by not referring to the ethical challenges of research staff at all. Some, but few, guidelines describe institutional solutions (mostly in the field of physical safety and security) and discuss responsibilities around staff hierarchies and legal liabilities. On one hand, this makes sense as individual researchers may be expected to know the context better than their central institution. As a result they benefit from flexibility to carry out their research with a degree of responsibility for field research staff and self-care. This is particularly important for those team members who are managing others and/or have more experience and relative power due to their position in the research team and in society. On the other hand, (especially early career and more inexperienced) researchers may lack the capability to undertake a thorough risk assessment when working in new and unfamiliar contexts. Institutions should differentiate between aspects that the individual researcher or project should consider, and at the same time take responsibility for issues that can, and should, be borne at the institutional and legal level.

Most guidelines have been identified from humanitarian organisations, with fewer from journalism and international organizations. In general, study participants remain the predominant focus of ethical guidelines and principles. For those acknowledging challenges with respect to research staff, a strong focus on institutional research staff, who are usually formally employed and originate from HICs, was evident from our analysis. Local research staff, sometimes working without formal contracts, are mentioned only in a few instances and safeguards are very limited, leaving this group as a blind-spot to be covered by future guidelines.

Overall, we did not find any set of guidelines that addresses all the ethical challenges under consideration in this paper comprehensively. We recognize that there is a need to strike a balance between the proposal of comprehensive and concrete mechanisms for addressing ethical challenges while leaving room to react to the specific characteristics of the work. Therefore, we maintain that there is a need for the development of a comprehensive set of guiding principles that covers the wide range of ethical challenges local and international research staff in different positions might face. Lead organizations are called upon to provide such an encompassing set of guiding principles. Here, the KFPE's 11 principles and 7 guidelines (KFPE, 2018) but also the codes coming from journalism (e.g., Dart Centre, 2007) or guidelines developed by humanitarian organizations (e.g., CARE international, 2014) serve as good examples among the reviewed guidelines. As there is no "one size fits all" solution, due to the particularities of the research conducted, organizations could adapt these more general principles to their specific research and country contexts. Concrete steps and solutions should be taken to clarify, and strengthen,

the responsibility of institutions in safeguarding field research staff, instead of it leaving it solely with the individual researcher. Guidelines and principles in the country, or community, of research should be taken into consideration as they might help to adequately localize the ethical challenges and solutions faced by research staff (e.g., Callaway, 2017).

This paper stresses the need to acknowledge and address ethical challenges faced by research staff engaged in data collection efforts in LMICs and gives an overview of the tools and solutions mentioned in various guidelines. As our search for guidelines was limited to English and German language guidelines, researchers are advised to also search for further guidelines in their country as well as the country where data collection takes place.

Overall, guidelines do not make up for the need to generally raise awareness about the consideration of research staff when thinking about safeguarding. A research project is only ethical if it also considers the protection and safeguarding of all of the research staff who are involved.

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Ethical approval

Given that no animals and humans were subject of this research, the authors did not go through an ethical review.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. What is ethical research in low- and middle-income countries has been under intense discussion. Even terms such as "fieldwork" have been argued to be problematic. We use the term in quotes as a way to refer to an academic sub-field rather than the field in a literal sense. Moreover, we strongly acknowledge recent calls for more sensitive use of language in international research (e.g., Hommes et al., 2021).
2. We understand safeguarding as the prevention of harm and the promotion of welfare of the respective subject, here the research staff (Aktar et al., 2020).
3. See for instance El Kadi (2017) on Decolonizing Development Studies.
4. Throughout the paper, we use the terms of "institutional" and "local" staff to refer to the dichotomy between staff originating from HICs and LMICs. Yet, we strongly acknowledge the complexity of collaborative research projects, which may also cover "institutional" staff, based in formal settings of collaborating organisations, and "local" staff, based in the study location, who originate from the same LMIC.

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Appendix

Guideline references

Type of institution	Name of issuing institution (year)	Name of guideline	Weblink
International Organization	African Development Bank Group (AFDB) (2018) (*)	Code of Ethics	https://www.afdb.org/en/about-us/organisational-structure/ethics-office
Scientific Association/Society	American Association of Geographers (AAG) (2009) (*)	Statement on Professional Ethics	http://www3.aag.org/cs/resolutions/ethics
Scientific Association/Society	American Psychologists Association (APA) (2017) (*)	Ethical Principles of Psychologists and Code of Conduct	https://www.apa.org/ethics/code/ethics-code-2017.pdf
Scientific Association/Society	American Sociological Association (ASA) (2018) (*)	Code of Ethics	https://www.asanet.org/sites/default/files/asa_code_of_ethics-june2018.pdf
Foundation	Antares Foundation (2012) (*)	Managing Stress in Humanitarian Workers. Guidelines for Good Practice	https://antaresfoundation.org/filestore/si/1164337/1/1167964/managing_stress_in_humanitarian_aid_workers_guidelines_for_good_practice.pdf
Scientific Association/Society	American Psychological Association (APA) (2016)	Ethical Principles of Psychologists and Code of Conduct	https://www.apa.org/ethics/code/ethics-code-2017.pdf
Scientific Association/Society	Arbeitsgemeinschaft Entwicklungsethnologie e.v AGEE (2013)	Ethische Leitlinien für die entwicklungspolitische Praxis	http://entwicklungsethnologie.org/wp-content/uploads/2013/04/Ethische-Leitlinen-AGEE-deutsch-6-9-2013.pdf
University	Arizona University (2018)	Safety Guidelines for Field Researchers	https://www.asu.edu/ehs/documents/field-researchers-manual.pdf
Scientific Association/Society	Association of Social Anthropologists of the UK and the Commonwealth (2011) (*)	Ethical Guidelines for Good Research Practice	https://www.theasa.org/downloads/ASA%20ethics%20guidelines%202011.pdf
NGO	Australian Red Cross (2013)	Psychological First Aid	https://www.redcross.org.au/globalassets/cms-assets/documents/emergency-services/psychological-first-aid-an-australian-guide.pdf
Scientific Association/Society	British Educational Research Association (BERA) (2018) (*)	Ethical Guidelines for Educational Research	https://www.bera.ac.uk/wp-content/uploads/2018/06/BERA-Ethical-Guidelines-for-Educational-Research_4thEdn_2018.pdf
Journal	BMJ (British Medical Journal) (2009) (*)	Guide to Ethical Approval	https://www.bmj.com/content/338/bmj.b450
NGO	CARE International (2004)	International Safety & Security Handbook	https://reliefweb.int/sites/reliefweb.int/files/resources/care-safety-and-security-handbook.pdf
NGO	CARE International (2014) (*)	International Safety & Security Handbook	https://www.care.org.au/wp-content/uploads/2014/12/CI-Personal-Safety-and-Security-Handbook-2014.pdf
NGO	Council for international organizations of Medical Sciences (CIOMS) (2016)	International Ethical Guidelines for Health-related Research Involving humans	https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf
Research Center	CIRAD (2017) (*)	CIRAD Code of Ethics	Chartedeontologique ENG.pdf (cirad.fr)
NGO	Council on Health Research for Development (COHRED) (2016) (*)	Research Fairness Initiative Reporting Guide	Microsoft Word—RFI_ReportingGuide_20160908.docx (svri.org)
University	Dart Centre at Columbia University (2007) (*)	Trauma & Journalism. A Guide For Journalists, Editors & Managers	DCE_JournoTraumaHandbook.pdf (dartcenter.org)

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Appendix. (Continued)

Type of institution	Name of issuing institution (year)	Name of guideline	Weblink
Government (organization)	Department for International Development (DFID) (2016) (*)	Review of Ethics Principles and Guidance in Evaluation and Research	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/524635/Ethics-principles-report-2016.pdf
Scientific Association/Society	Development Geographies Research Group	DEVERG Ethical Guidelines	https://developmentgeographiesrg.org/darg-ethical-guidelines
University	Edith Cowan University (2012)	Keeping Academic Field Researchers Safe: Ethical Safeguards	https://ro.ecu.edu.au/cgi/viewcontent.cgi?referer=http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=12&ved=2ahUKEwiX8LPNy-HjAhWBsKQKHT6qAAwQFjALegQICBAC&url=http%3A%2F%2Fro.ecu.edu.au%2Fcgi%2Fviewcontent.cgi%3Farticle%3D1616%26context%3Decuworks2012&usg=AOvVaw1MV2AkXu39m8PbGtb76K7g&httpsredir=1&article=1616&context=ecuworks2012
University	Erasmus University Rotterdam (2016)	Security Guidelines for Field Research in Complex, Remote, and Hazardous Places	https://repub.eur.nl/pub/93256/
International Organization	European Commission (2004) (*)	Report on Security of Humanitarian Personnel	https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf
International Organization	European Commission (2019) (*)	Horizon 2020 Programme Guidance. How to Complete Your Ethics Self-assessment	https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf)
Government (organization)	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2019)	Ethik- und Verhaltenskodex der GIZ	Ethik- und Verhaltenskodex.pdf (giz.de)
Government (organization)	Government of Canada (2018) (*)	Tri-Council Policy Statement Ethical Conduct for Research Involving Humans	https://ethics.gc.ca/eng/documents/tcps2-2018-en-interactive-final.pdf
Scientific Association/Society	Inter Academy Partnership/Inter Academy Council (2012)	Responsible Conduct in the Global Research Enterprise	https://www.interacademies.org/sites/default/files/publication/file.pdf
	Inter Agency Standing Committee (IASC) (2014) (*)	Recommendations for Conducting Ethical Mental Health and Psychosocial Research in Emergency Settings	iasc_mental_health_2014.pdf (iom.int)
International Organization	Inter American Development Bank (IADB) (2012)	Code of Ethics and Professional Conduct	http://passthrough.fw-notify.net/download/794325/; http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=37198737
NGO	International Federation of Red Cross and Red Cresent Societies (IFRCC) (2009)	Managing Stress in the Field. International Federation of Red Cross and Red Crescent Societies	https://whocares-pss.info/wp-content/uploads/2022/05/Managing-stress-in-the-field_IFRC.pdf
NGO	International Federation of Red Cross and Red Crescent Societies (IFRCC) (2007)	Stay Safe. The International Federations Guide for Security Managers	https://reliefweb.int/sites/reliefweb.int/files/resources/Stay-Safe-management-EN.pdf
University	International Institute of Social Studies of Erasmus University (ISS) (2016) (*)	Security guidelines for Field Researchers in Complex, Remote, and Hazardous Places	https://repub.eur.nl/pub/93256/
Research Center	Abdul Latif Jameel Poverty Action Lab (J-PAL) (2022) (*)	Ethical Conduct of Randomized Evaluations	https://www.povertyactionlab.org/resource/ethical-conduct-randomized-evaluations

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Type of institution	Name of issuing institution (year)	Name of guideline	Weblink
NGO	Medica mondiale	Self-reflection and Self-care	https://www.medicamondiale.org/fileadmin/redaktion/5_Service/Mediathek/Dokumente/English/Manuals_Handbooks/02_Basic-level_module1_selfreflexion_medica-mondiale.pdf
University	Michigan Technological University (2018)	Safety Protocol and Information for Field Research	https://www.mtu.edu/ehs/docs/field-safety-guide-school-of-forestry.pdf
Funding Body	National Science Foundation (2020) (*)	Code of Federal Regulations 45 CFR 690.101-124	https://www.nsf.gov/bfa/dias/policy/docs/45cfr690.pdf
NGO	Österreiches Rotes Kreuz (2015)	Psychische Erste Hilfe Handbuch	https://apps.who.int/iris/bitstream/handle/10665/44615/9789241548205_ger.pdf;jsessionid=9E48299F651BE6072B33580EDA694D9D?sequence=57
NGO	Oxfam (2020) (*)	Research Ethics: A Practical Guide	https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621092/gd-research-ethics-practical-guide-091120-en.pdf;jsessionid=8332FFE03F56542C61F23E381F991DB4?sequence=1
University	Portland State University (2015)	Safety Guidelines for Fieldwork	https://ondeck.pdx.edu/environmental-health-safety/sites/g/files/znldhr2931/files/2020-10/Safety.Guidelines.for_.Fieldwork.pdf
Journalism	Reporters Without Borders (2015)	Safety Guide for Journalists	https://rsf.org/sites/default/files/2015-rsf-safety-guide-for-journalists.pdf
NGO	Research Fairness Initiative/COHRED (2018a)	RFI Summary Guide	https://rfi.cohred.org/wp-content/uploads/RFI_Summary_Guide_1.pdf
NGO	Research Fairness Initiative/COHRED (2018b)	Rfl Reporting Guide	https://rfi.cohred.org/wp-content/uploads/RFI_Reporting_Guide_2.pdf
NGO	Research Fairness Initiative/COHRED (2018c)	RFI Implementation Guide	https://rfi.cohred.org/wp-content/uploads/RFI_Implementation_Guide_3.pdf
Scientific Association/Society	Royal Geographical Society	Advice and Resources: Ethical Assessment	https://www.rgs.org/in-the-field/in-the-field-grants/advice-and-resources/safe-and-ethical-research/
NGO	Save the Children (2004)	So You Want to Involve Children in Research?	https://www.savethechildren.org.uk/content/dam/global/reports/education-and-child-protection/so-you-want-to-involve-children-in-research.pdf
Scientific Association/Society	Social Research Association (2003)	Ethical Guidelines	https://the-sra.org.uk/common/Uploaded%20files/ethical%20guidelines%202003.pdf
Scientific Association/Society	Swiss Commission for Research Partnership with Developing Countries (KFPE) (2018) (*)	A Guide for Transboundary Research Partnerships (3rd edition)	https://kfpe.scnat.ch/en/11_principles_7_questions/uuid/i/13beb0f7-4780-5967-a257-bd6cc3d5e424-A_Guide_for_Transboundary_Research_Partnerships_%283rd_edition_-_2018%29
University	Tennessee Tech (2017) (*)	Safety Guidelines for Field Researcher	https://www.tntech.edu/safety/pdf/SAFETY_GUIDELINES_FOR_FIELD_RESEARCHERS_1.pdf
Scientific Association/Society/University	Trust (2018) (*)	Global Code of Conduct for Research in Resource-Poor Settings	https://www.globalcodeofconduct.org/wp-content/uploads/2018/05/Global-Code-of-Conduct-Brochure.pdf

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Appendix. (Continued)

Type of institution	Name of issuing institution (year)	Name of guideline	Weblink
International Organization	UNDP (2017)	Code of Ethics	https://www.undp.org/sites/g/files/zskgke326/files/undp/library/corporate/ethics/UNDP%20CODE%20OF%20ETHICS%20-%202017%20version.pdf
International Organization	UNICEF (2006)	Guidelines on the Protection of Child Victims of Trafficking	https://gdc.unicef.org/media/4531/download
International Organization	UNICEF (2013)	Ethical Research Involving Children	https://childethics.com/
Government (Organization)/Funding Body	United Kingdom Collaborative on Development Research (UKCDR) (2019) (*)	Safeguarding in International Development Research	https://www.ukcdr.org.uk/wp-content/uploads/2019/06/20190603-UKCDR-Safeguarding-Briefing_updated.pdf
International Organization/NGO	UNESCO/Reporters Without Borders (2015) (*)	Safety Guide for Journalists—A Handbook for Reporters in High-Risk Environment	https://rsf.org/sites/default/files/2015-rsf-safety-guide-for-journalists.pdf
International Organization	United Nations (UN) (2006) (*)	United Nations Field Security Handbook	http://psm.du.edu/media/documents/international_regulation/united_nations/other/un_field_security_handbook.pdf
University	University of Otago (2006) (*)	Stress and Mental Fatigue Guidelines	STRESS AND MENTAL FATIGUE GUIDELINES (otago.ac.nz)
International Organization	UNHCR (2013) (*)	Mental Health and Psychosocial Support: For Staff	51f67bdc9.pdf (unhcr.org)
University	University College Dublin (2015) (*)	Fieldwork Safety Guidelines	UCD Fieldwork Safety Guidelines_Rev.1 2015.pdf
University	University of Bristol (2012) (*)	Health and Safety Guidance for Research Undertaken in the Community	http://www.bristol.ac.uk/safety/media/gn/research-comm-gn.pdf
University	University of California, Berkeley (2015)	Safety Guidelines for Field Researchers.	https://ib.berkeley.edu/courses/bio1b/field/pdf/SafetyGuidelinesforFieldResearchers.pdf
University	University of California (2019) (*)	Field Operations Safety Manual	https://www.ucop.edu/safety-and-loss-prevention/_files/field-research-safety/uc-field-research-safety-manual.pdf
University	University of California Los Angeles (UCLA) (2020) (*)	Guidance and Procedure: Funding Applications & UCLA IRB Review	https://ora.research.ucla.edu/OHRPP/Documents/Policy/4/Funding_App_IRB.pdf
University	University of Central Florida (2017)	Field Research Safety Guidelines	https://ehs.ucf.edu/wp-content/uploads/sites/3/2019/08/Field-Research-Safety-Guidelines.pdf
University	University of Melbourne (2020)	Field Work Guideline	https://safety.unimelb.edu.au/__data/assets/pdf_file/0011/1834472/field-work-guidelines.pdf
University	University of Texas at Austin—Environmental Health and Safety (2010) (*)	Safety Guidelines for Field Researchers	https://ehs.utexas.edu/programs/labsafety/documents/FieldResearchers-SafetyGuidelines.pdf
University	University of Toronto (2011) (*)	Guideline on Safety in Field Research	https://ehs.utoronto.ca/wp-content/uploads/2015/10/Guidelines-on-Safety-in-Field-Research.pdf
University	University of Oxford—Social Sciences Division (2020) (*)	Fieldwork	https://socsci.web.ox.ac.uk/research-fieldwork
University	University of Oxford - Central University Research Ethics Committee (CUREC) (2017) (*)	Researcher Safety, Including Interviewing in Non-public and Consideration When Employing Local/Casual Staff for Research Projects/Fieldwork	https://researchsupport.admin.ox.ac.uk/files/bpg01researchersafetypdf

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Appendix. (Continued)

Type of institution	Name of issuing institution (year)	Name of guideline	Weblink
University	University of Oxford—Wellcome Centre Ethics and Humanities (2020) (*)	Guidance for Research in Response to Humanitarian Emergencies	https://www.researchgate.net/publication/340898400_Guidance_for_research_in_response_to_public_health_or_humanitarian_emergencies-2
University	University of Washington (2018) (*)	Preventing Harassment in Fieldwork Situations: Report from the University of Washington's Respect and Equality in Fieldwork (REIF) 2017 Committee	http://psc.apl.washington.edu/HLD/REIF/RespectandEqualityinFieldwork_RecommendationsandReportUW_Jan2018.pdf
University	Villanova University (2017)	Field Research Safety Guidelines	https://www.villanova.edu/content/dam/villanova/fmo/documents/EHSAssets/Services/Field%20Safety%20Guidelines%20-%20Final.pdf
University	Western Sydney University (2015)	Fieldwork Safety Guidelines	https://www.westernsydney.edu.au/__data/assets/pdf_file/0020/7058/7058_Fieldwork_Safety_Guidelines.pdf
International Organization	World Bank	DIME Research Ethics	https://dimewiki.worldbank.org/wiki/Research_Ethics
Market Research Network	World Esomar Research (2001)	How to Commission RESEARCH	https://www.esomar.org/uploads/public/knowledge-and-standards/codes-and-guidelines/ESOMAR_Code-and-Guidelines_HowTo-CommissionResearch.pdf
International Organization	World Health Organization (WHO) (2016) (*)	Guidance For Managing Ethical Issues in Infectious Disease Outbreaks	https://apps.who.int/iris/bitstream/handle/10665/250580/9789241549837-eng.pdf?sequence=1
International Organization	World Health Organization (WHO) (2017) (*)	Code of Conduct for Professional Research	https://www.who.int/docs/default-source/wpro---documents/regional-committee/nomination-regional-director/code-of-conduct/ccrr.pdf?sfvrsn=b2cb450_2&ua=1
International Organization	World Health Organization (WHO) (2011a) (*)	Standards and Operational Guidance for Ethics Review of Health-Related Research With Human Participants	https://www.who.int/publications/i/item/9789241502948
International Organization	World Health Organization (WHO) (2011b) (*)	Psychological first aid: Guide for field workers	Psychological_first_aid_Guide_for_field_workers.pdf (aaptuk.org)
International Organization	World Health Organization (WHO) (2001)	Putting women first: Ethical and Safety Recommendations for Research on Domestic Violence Against Women	Thirddoc (who.int)
International Organization	World Food Programme (WFP) (2018) (*)	Protection From Harassment, Sexual Harassment, Abuse of Authority, and Discrimination	https://docs.wfp.org/api/documents/WFP-0000073615/download/?_ga=2.174926946.1126328162.1580727315-743013685.1580727315
NGO	World Vision (2011)	Psychological First aid: Guide for Field Workers	http://www.aaptuk.org/downloads/Psychological_first_aid_Guide_for_field_workers.pdf
Research Center	3ie (2018)	3ie Safeguarding Policy	https://www.3ieimpact.org/sites/default/files/2020-02/3ie-Safeguarding-Policy.pdf

Guidelines with a (*) are referenced within the document, whereas other guidelines were part of our review and may serve as additional reference.

Appendix D. Photographs of fieldwork

8.10 Smallholder cocoa and food crop farming context

A smallholder's cocoa farm



Chemical inputs for cocoa



A group of smallholder farmers removing the beans from harvested cocoa pods



Drying the cocoa harvest



A cocoa buyer bagging the cocoa harvest



The Assin Foso depot of a Licensed Buying Company (LBC)



A smallholder farmer's cassava, plantain, and cocoyam crops



A technological demonstration outside the MoFA district office in Assin Foso



Examples of off-farm income sources: a bar, a food stall, and a home-based store







8.11 Local market context

A market seller interview participant measuring gari (cassava flour)



A market trader advertising her food crops for sale



8.12 COVID-19 context

The hustle and bustle of Nyankumasi market (before the outbreak of COVID-19)



Posters next to the door of a village church showing COVID-19 restrictions



8.13 Fieldwork and data collection

An impromptu focus group discussion during my scoping trip (2019)



COVID-19 measures taken during a remote focus group discussion: social distancing and face masks (photograph taken by Bernice Sarpong, 2021)



A semi-structured smallholder farmer interview with COVID-19 masks (2022)



A family preparing cassava during our interview (2023)



Giving bars of soap as a tokens of appreciation to focus group discussion participants (2021)



Joining an NCRC Community Resource Management Areas (CREMA) meeting with smallholder cocoa farmers and community leaders (2019)



The field team on the last day of fieldwork in 2023 (from left to right: me, Eckow, Bernice, our driver Charles, and Genia)



With my colleagues and friends, George and Sule, at Teacher Alex's wedding (2019)



Auntie Fausti, a smallholder farmer, teaching me to balance bananas in 2019



Saying goodbye to Bernice in 2023, at the end of two years of remote and in-person fieldwork together

