



FRAMING LIVESTOCK AND CLIMATE CHANGE IN EASTERN AFRICA

Ambiguity and knowledge brokering
in science-policy interfaces

Laura Katherine Cramer

Propositions

1. Ambiguity is reduced when actors with different framings identify common ground.
(this thesis)
2. International institutions shape national governments' climate actions in eastern Africa.
(this thesis)
3. Project-driven science-policy interfaces are ineffective.
4. Knowledge brokers' awareness of their power leads to more inclusive policies.
5. Scientists hoping to inform policy need a deeper understanding of policy processes.
6. The current education system fails to effectively teach transdisciplinary research.
7. Cultivating multiple identities is a useful way to broaden one's worldview.

Propositions belonging to the thesis, entitled

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Ambiguity and knowledge brokering in science-policy
interfaces

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To my family and friends,
thank you for all your support.

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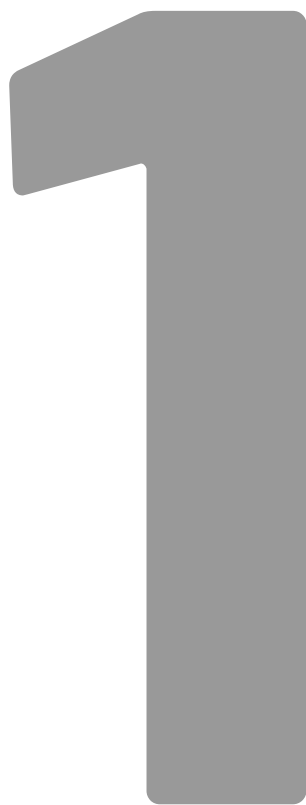
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CHAPTER 1



General Introduction

1.1 Problem statement: Dealing with ambiguity around livestock and climate change in science-policy interfaces

The current news on climate change is rife with stories that place a large part of the blame for global warming on livestock farming because of its contribution to global greenhouse gas emissions (GHGEs). People with an interest in agricultural development within low- and middle-income countries (LMICs) may also be aware of the negative effects climate change is having on livestock production in these contexts through more frequent and extreme droughts, decreased feed and forage quality and quantity, increased animal pests and diseases and more (Rojas-Downing et al. 2017). This dilemma of livestock being both affected by climate change and contributing to it is one dimension creating ambiguity around how to frame the problem. Additional elements such as how to prioritize sustainable development interventions and how to transform food systems to be more equitable and better meet population needs also contribute to a broader conceptualization of the problems and the ambiguity surrounding them. The term ambiguity is used to describe a circumstance in which there is confusion over whether something is a problem or not, who is responsible for it and what might be done to address it (Giordano, Brugnach, and Pluchinotta 2017). Related to the livestock sector in eastern Africa, there is ambiguity around whether the most important problem is the negative impacts that livestock keepers are facing because of the changing climate or the large contribution of livestock production to GHGEs within the region, particularly methane which is a potent GHG. What takes priority as the most important problem to address depends on one's background and experience.

Those working in the livestock development sector may see the most important problem as that of helping livestock keepers adapt to climate change, while someone coming from an environmental perspective may identify the need to reduce GHGEs as urgent. Another person looking at levels of food security and nutrition in eastern Africa may point to the need to increase levels of protein consumption from animal-sourced foods for those whose intake is below recommended levels despite the

GHGEs produced. These various ways of viewing the problem of livestock and climate change demonstrate the ambiguity that arises from the diversity of interests, beliefs and values among the actors involved (Giordano, Brugnach, and Pluchinotta 2017).

Addressing the ambiguity around livestock and climate change and assessing the tradeoffs and synergies between livestock production and climate goals is a challenge that can be addressed through discussions within science-policy interfaces, where actors can come together to exchange views and understand the problem framings of others. The ambiguity of the situation means that an answer will not become clear just through generating more evidence to inform decision making. Science-policy interfaces have a role to play in serving as a space for dialogue and knowledge exchange, where actors from different backgrounds and expertise can openly discuss their views on the problems and possible response options. These spaces allow for active communication between experts and decision makers, creating conditions for establishing the credibility, salience and legitimacy of knowledge (Cash and Belloy 2020; Cash et al. 2003). Knowledge brokers operating within science-policy interfaces are actors who play active roles in supplying information and making connections between researchers and decisions makers (Turnhout et al. 2013).

The international conversation surrounding livestock production's environmental impact, including GHGEs, often clashes with how low-income countries frame the vulnerability and adaptation challenges faced by their livestock keepers. This discrepancy arises from how evidence is presented. Policy discussions become muddled due to different knowledge systems, expertise, and stakeholder interests (Brugnach and Ingram 2012). Framing, shaped by experiences, values, and economic realities, diverges between countries and even within them (Giordano, Brugnach, and Pluchinotta 2017). This makes it difficult to agree on the problem and subsequently to identify optimal policy solutions at the national level, as problems and solutions presented internationally may not resonate with local contexts.

The use of evidence to inform policy making hinges on how stakeholders navigate ambiguity (Cairney, Oliver, and Wellstead 2016). Science-policy interfaces offer opportunities for scientists and policymakers to connect, often brought together

through knowledge brokering, but true collaboration requires actively engaging diverse actors (Bielak et al. 2008). Actors co-construct frames to discuss issues, emphasizing certain aspects and downplaying others – a fundamentally political process (Dewulf et al. 2009; Knaggård 2016). Science-policy interfaces can also be viewed as types of collaborative governance spaces (Koontz 2019), and within these spaces there are power asymmetries (Dewulf and Elbers 2018). The actors in these interfaces, including international and nongovernmental actors, exercise both pragmatic and framing power to shape discussions (Morrison et al. 2017). Much of the literature on framing, power, science-policy interfaces and ambiguity focuses on developed countries, and even in that literature the elements are not always brought together and investigated comprehensively. The interactions between various actors and their usage of strategies and power to shape climate policies in lower income countries through science-policy interfaces is not as well documented (Howland and Le Coq 2022; Ojha et al. 2016).

Eastern Africa's livestock sector, for example, can be framed in various ways, and these problem framings will shape potential solutions (Dewulf 2013). Actors within the science-policy interfaces of the region have differing levels of power to shape this framing (Dewulf and Elbers 2018). Framing strategies, along with the inherent ambiguity of approaching issues from multiple angles, all occur within complex policy networks. These networks are where scientists, policymakers, knowledge brokers and other actors navigate towards policy change (van Lieshout et al. 2012). Because there is a dearth of literature examining how actors interact through science-policy interfaces in lower income countries, it is not clear how actors involved in the climate change and livestock discussions in eastern Africa are using problem framing and exercising power to help navigate ambiguity around these complex issues.

To understand how actors are interacting and framing problems within these science-policy interfaces around livestock and climate change in eastern Africa, this dissertation is designed to answer the overall research question: *What framing and power strategies do actors within eastern African science-policy interfaces use to deal with ambiguity about livestock and climate change in policy discussions?*

The next section of this introductory chapter will provide a brief overview of the livestock sector in eastern Africa and the challenges it faces due to climate change. Section 1.3 will then present and describe key concepts that are used throughout this dissertation. The research sub-questions will be presented and expanded upon in Section 1.4, while Section 1.5 presents the methods and approaches used to complete this research. The chapter concludes with Section 1.6 giving an overview of the other chapters in the dissertation.

1.2 The crucial role of livestock in east African socioeconomics and the challenge of climate change

Livestock populations in eastern Africa represent significant assets for millions of households, contributing substantially to regional economies and serving multiple purposes within societal functions. These animals (including cattle, sheep, goats, camels and poultry) are estimated to contribute approximately 45% to the agricultural GDP of countries like Ethiopia and Kenya (ICPALD 2013a, 2013b). Beyond economic value, livestock are a form of savings and a source of credit for the people who keep them, facilitating social exchange through dowry payments and contributing to agricultural sustainability through provision of manure used as organic fertilizer for crops (Smith et al. 2013). They are also critical for food security, providing essential protein and micronutrients through milk, meat and eggs not just for the people who keep them but the general population at large.

Despite the importance of livestock production, the viability of this crucial sector is increasingly threatened by climate change (Godde et al. 2021). Erratic rainfall patterns and prolonged droughts are disrupting eastern African ecosystems. The resulting reduction in available grazing land and scarcity of water resources lead to malnutrition and mortality among livestock populations (Simpkin et al. 2020). This, in turn, triggers a cascading negative impact, jeopardizing not only regional food security but also the socioeconomic well-being of millions who rely on livestock for their livelihoods. Reduced milk and meat production can exacerbate existing nutritional deficiencies, and declining income from livestock sales can push families

deeper into poverty. Increasing levels of heat stress from high temperatures days are also expected to reduce feed intake and reduce milk output among dairy cattle (Thornton et al. 2021). Additionally, climate change is projected to exacerbate the spread of diseases among livestock, further compromising their health and productivity (Rojas-Downing et al. 2017).

A complex and ambiguous situation emerges. While livestock are foundational to eastern African well-being, they contribute significantly to GHGEs across the region (FAOSTAT 2020). Addressing this challenge requires a nuanced approach that balances the vital role of livestock in eastern Africa with the need to mitigate climate change. This necessitates the development and implementation of innovative technologies and management practices that effectively reduce methane emission intensities from livestock populations. Simultaneously, supporting the development of climate-resilient livestock breeds and implementing improved grazing land management techniques are crucial for fostering the adaptation of eastern African communities to a changing climate. Ultimately, ensuring the long-term sustainability of this vital sector and the livelihoods it supports necessitates a multi-pronged approach that balances economic development, environmental protection, and societal well-being. Achieving this balance requires dealing with the ambiguity around the topic and bringing together diverse actors in science-policy interfaces.

1.3 Key concepts and theories for the study of ambiguity around livestock and climate change in eastern Africa

There are several key concepts and theories that underpin the research presented in this dissertation. These come out of interpretive policy analysis, policy process theory, science-policy interfaces and collaborative governance concepts. This section will briefly define ambiguity, describe the concept of frames and interactional framing strategies and explain how these relate to the multiple streams framework of policy change. The role of knowledge brokers as described in this framework is also described. The section will then define the concept of science-policy interfaces and

use of evidence to inform policy before explaining the power in/power over framework for studying how actors exercise power in science-policy interfaces.

As described in the previous section, **ambiguity** occurs when people view a situation from different angles based on their own beliefs and values (Brugnach and Ingram 2012; Dewulf et al. 2005; Brugnach et al. 2011) and there is no clear agreement among stakeholders on how to define the problem and what to do to respond to it (Giordano, Brugnach, and Pluchinotta 2017). When circumstances are ambiguous, there are multiple possible interpretations of the situation and there is more than one way of framing a problem at the same time (Brugnach and Ingram 2012).

The concept of **framing** refers to how actors define and emphasize specific aspects of an issue. The concept of framing has been used in several disciplines (Van Hulst and Yanow 2014). Although there are divergent definitions for the concepts of frames and framing, in general frames can be said to 'define problems, ...diagnose causes, ...make moral judgements...and suggest remedies' (Entman 1993, 52). This framing can be influenced by ambiguity, the lack of clear and universally accepted understanding of a situation (Best 2008). Framing theory complements the concept of ambiguity by delving into how different actors frame the same problem, potentially highlighting different solutions. Framing theory has been used in several social sciences to explore how people assign meaning to different issues and events (Dewulf 2013).

Building on framing theory, the concept of **interactional framing strategies** adds an element of joint construction of frames. In interactions between researchers and decision makers, frames are 'communicative devices that individuals and groups use to negotiate their interactions' (Dewulf et al. 2009, 160). Interactional framing theory (Dewulf and Bouwen 2012) enables the investigation of the ways actors co-construct frames. This concept of interactional framing addresses the ways in which meaning is made through discourse (Dewulf et al. 2009) and is well suited to address the RQ.

Both problem framing and ambiguity are components of the **Multiple Streams Framework** (MSF) as a policy process theory (Shephard et al. 2020; Zahariadis 2003; Kingdon 1984). The MSF is used in this research as an underlying way to understand

policymaking processes within the case of livestock and climate change in eastern Africa. The MSF has a focus on ambiguity that aligns well with studying complex issues like livestock and climate change, where diverse perspectives exist (Brugnach and Ingram 2012). The MSF acknowledges a nonlinear process of policy-making by focusing on these three separate streams (problem, policy, and political streams) that exist independently but must come together simultaneously to create a window of opportunity during which policy change can occur (Cairney and Zahariadis 2016). In the *problem* stream, a set of actors identify and highlight issues of concern they believe need to be addressed. Framing a problem in a certain way highlights different solutions by emphasizing some aspects and downplaying others (Knaggård 2016), bringing implications for what may result when the streams within the MSF are coupled. In the *policy* stream, actors create possible solutions independently of whether they address problems raised in the national consciousness. These solutions are more likely to be adopted if they are technically feasible and align with accepted values. The third stream in the framework, the *political* stream, is where actors develop the will, motivation and opportunity to address an issue (Cairney and Zahariadis 2016; Béland and Howlett 2016).

In addition to the concept of policy entrepreneurs, the MSF defines actors that have credibility, access to decision makers and spend time framing problems as **knowledge brokers** (Knaggård 2016). The concept of knowledge brokering is contained within other science-policy literature, where knowledge brokers are described as supplying, bridging and facilitating the exchange of knowledge between actors (Turnhout et al. 2013). Phipps and Morton (2013) argue that knowledge brokers do not just bridge the gap between research and policy/practice, but rather create and work within a shared collaborative space. This role is becoming increasingly important in research organizations due to the growing emphasis on the impact agenda, which measures research quality by its influence on policy (Knight and Lyall 2013; Maag et al. 2018). However, there is no single definition of a knowledge broker (Haas 2015). Their roles and functions are not always clearly defined within organizations, and they can adapt to different situations, making each knowledge broker unique (Maag et al. 2018; Meyer 2010). For the purposes of this research, I

define a knowledge broker as someone who maintains contact networks in the political system and credibility within those networks (Knaggård 2016), who interprets knowledge to be understandable in a political context (Knaggård 2016; McGonigle et al. 2020; Turnhout et al. 2013) and who brings different groups together (Bracken and Oughton 2013) to exchange knowledge and develop shared solutions to identified problems.

The overarching focus of this dissertation is on **science-policy interfaces**, where scientists, policymakers, and other actors (including knowledge brokers) interact to exchange knowledge, collaborate on solutions and strategize to shape policy problems. Science-policy interfaces take place through publication of written information and interpersonal interactions (Sullivan et al. 2017). Within this dissertation research, science-policy interfaces were defined as spaces where stakeholders such as researchers, national ministry technical staff, development partner representatives and nongovernmental actors in the livestock sector interacted to discuss the challenges around livestock and climate change in Ethiopia, Kenya and Uganda. This dissertation takes the perspective that science and policy are interconnected and actors within both collaborate through evidence synthesis and knowledge brokering (Gluckman, Bardsley, and Kaiser 2021; Sundqvist et al. 2018). Science-policy interfaces serve as spaces where many diverse actors interact – both collaboratively and contentiously – to contribute to policymaking. Previous research on science-policy interfaces has mostly been conducted in high income countries (Cairney and Oliver 2017), but the approach is growing in lower income country contexts (Koch 2018; Clark et al. 2016). Donors giving resources for international development increasingly expect that research-for-development projects will generate evidence that is used to inform policy (Oliver and Cairney 2019; Evans and Cvitanovic 2018). Funders increasingly encourage scientists to engage with science-based stakeholder forums (Welp et al. 2006), and such activities take place in science-policy interfaces (Sullivan et al. 2017; Dunn, Bos, and Brown 2018; Watson 2005).

While science-policy interfaces are a useful space in which to examine how actors are co-constructing meaning through framing and informing decisions and policies, the issues of power need to also be considered. To be able to incorporate the exploration of how actors exercise power in science-policy interfaces, this dissertation uses the conceptual **framework of power in/power over** created by Dewulf and Elbers (2018). The power in/power over framework is useful for assessing power wielded by actors over cross-sector partnerships and *in* cross-sector partnerships (in this case science-policy interfaces). This framework is based on an understanding of power as “the ability to shape and secure particular outcomes” (Torfing et al. 2012, 48). Dewulf and Elbers further refine this definition to specify that “power here can be understood more specifically as the ability of individual actors to influence collective decisions of the partnership to their own advantage” (2018, 3), but in the context of science-policy interfaces we also understand power as the ability to influence collective decisions in the interest of others. Power within cross-sector partnerships, or in this case science-policy interfaces, deals with the ability of people and groups to sway the collective decision-making processes and thereby benefit from those decisions or exert influence so others on whose behalf they are working will benefit.

These complementary theoretical frameworks are used in different combinations across the chapters of the dissertation. The MSF underpins the research and provides the framework through which policy change happens. Science-policy interfaces are the primary unit of study, and how knowledge brokers use framing and exercise power to address ambiguity around livestock and climate change serves as the focus for this research.

1.4 Overall research question and sub-questions

This dissertation sets out to explore issues of framing and power within science-policy interfaces related to livestock and climate change. It is guided by the overall research question: *What frames and power strategies do actors within east African science-policy interfaces use to deal with ambiguity around livestock and climate change in policy discussions?* Answering this question can help guide actors within

these interfaces on how knowledge brokering can be used effectively to help use evidence to inform policymaking. Specific research questions help to further break down and examine the individual aspects of the overall research question.

Research question 1 (RQ1): *How are discussions in science-policy interfaces affected by ambiguity and tensions around livestock and climate change?* (Chapters 2, 3, and 4)

The narrative around climate change and livestock's contributions to it at a global scale has the potential to influence decisions made by international donors on climate finance for the developing world (Hartmann 2010). Although more nuanced understandings of livestock production acknowledge livestock as important components of mixed farming systems in developing countries (Smith et al. 2013), this distinction gets overshadowed by more prominent discourses that focus on unsustainable production practices in high income countries (Bailey et al. 2014). Chapters 2, 3 and 4 start from the understanding that actors approach the topic of livestock and climate change from different angles, and this results in different framings of the problem and ambiguity over what appropriate responses may be. The chapters all provide insights into how this ambiguity affects discussions within the science-policy interfaces.

Research question 2 (RQ2): *How do national and international actors use interactional framing and power strategies within science-policy interfaces related to livestock and climate?* (Chapters 2, 4 and 5)

To answer this question, each of these chapters examines ways actors interact to co-construct problem frames, broker knowledge and exercise power to help resolve ambiguity and tensions. Interactional framing theory posits that when actors hold frames that are not compatible it leads to framing differences, which are then dealt with through six possible interaction strategies (Dewulf and Bouwen 2012). In the science-policy interfaces where these strategies are being employed, there are international and nongovernmental actors who shape discussions through use of pragmatic and framing power (Morrison et al. 2017). This power can be used to shape the outcome of decisions made within science-policy interfaces.

Research question 3 (RQ3): *How can knowledge brokering help agricultural research-for-development organizations better achieve their aims of informing policy?* (Chapters 3 and 5)

This question is answered from both an empirical, analytical perspective in Chapter 3 and from a normative, personal experience angle in Chapter 5. Chapter 3 demonstrates that knowledge brokers are active in all three streams of the MSF by examining the case study of a Kenyan science-policy interface related to livestock and climate change. Chapter 5 draws from my experience of more than a decade operating within science-policy interfaces and being a participant in knowledge brokering activities of a large agricultural research-for-development organization.

1.5 Research approach and methods

The research presented in this dissertation was carried out using qualitative methods based in interpretive policy analysis (Schwartz-Shea and Yanow 2013; Yanow 2000). Approaching the research questions from this perspective allows for the consideration of how power, framing and interactions collectively help shape policy under conditions of ambiguity. The research adopted a general abductive approach (Haig 2018), using the Multiple Streams Framework (MSF) as a general basis for understanding how policy change occurs (Shephard et al. 2020). Stemming from the design of a research for development program called the Program for Climate-Smart Livestock (PCSL), which included social scientists and biophysical scientists interacting with practitioners (decision makers in government, donors and NGOs), this dissertation is transdisciplinary in nature. Transdisciplinary research combines concepts and knowledges from different disciplines with knowledge and experiences from stakeholders in civil society and public actors (Lawrence 2010). This dissertation uses theoretical frameworks from policy sciences in combination with biophysical data on GHGEs from cattle and small ruminants, productivity and animal nutrition research from livestock production systems and close collaboration with practitioners in the science-policy interfaces on national priorities and uses of power. This transdisciplinarity has resulted in research findings that would not have been

possible without combining methods and concepts from different disciplines and collaborating with actors to incorporate their experiences. Integrating these disciplines brings to light the importance of the livestock systems research for policy making – engaging animal nutritionists and husbandry experts in thinking about how their research leads to policymaking – and engages decision makers in thinking critically about the additional research needed in these fields.

This dissertation utilizes a qualitative multi-site case study design (Herriott and Firestone 1983), allowing for the investigation of the research question (RQ) and sub-questions across multiple cases while employing consistent data collection methods. This approach enabled in-depth learning within each case study and facilitated comparative analysis between them for the chapter in which all three cases were used. The Program for Climate-Smart Livestock (PCSL), a four-year project funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) through the International Livestock Research Institute (ILRI) in Ethiopia, Kenya, and Uganda, served as the central entry point for the research.

The study, because of its transdisciplinary nature, is an example of policy relevant research. My role as an observing participant allowed for the gathering of rich qualitative data during PCSL and other project meetings, interactions with government officials, and science-policy dialogues. Continual reflexivity throughout the course of the research (Ozano and Khatri 2018) was necessary to examine the structures of power and my positionality within the research. Ultimately, the engagement as a participant in these science-policy interfaces added strength to the findings because there was a level of access to a variety of actors that would not have been possible without such a close relationship to them as an actor within the science-policy interface. I reflect more on my positionality and the role of reflexivity in the research process within Chapter 6.

Thematic analysis (Braun and Clarke 2012) was used along with interpretive policy analysis (Yanow 2000; Schwartz-Shea and Yanow 2013) to analyze written documents relevant to each of the chapters. This involved collecting project documents,

workshop reports, and national livestock and climate change policies through expert advice, web searches, and citation tracking. This type of analysis was useful for conducting the framing analysis (Cornelissen and Werner 2014; Dewulf and Bouwen 2012; Van Hulst and Yanow 2014). Furthermore, semi-structured face-to-face interviews were conducted to explore perspectives on science-policy interfaces (SPIs) and the dynamics of livestock and climate change. Interviewees were purposively selected based on their involvement in PCSL and through snowball sampling. All interviews were conducted in English and digitally recorded for later transcription. Reflexivity was used to examine my own values and assumptions as well as my normative expectations to improve on the transdisciplinary nature of the research (Popa, Guillermin, and Dedeurwaerdere 2015) with the understanding that my identity both directly and indirectly influenced the research process (de Souza 2019). A description of the data collection and analysis methods for each research question is presented in Table 1.1.

Table 1.1 Data sources and analysis methods related to each sub-research question

Research question	Chapters	Objective	Data sources	Analysis methods
RQ 1	2, 3, 4	To explore how discussions in SPIs are affected by ambiguity around livestock and climate change	Participant observation; Semi-structured interviews	Framing analysis and interpretive policy analysis of policies and other relevant documents
RQ 2	2, 4, 5	To assess how framing and power strategies are used in SPIs	Participant observation	Thematic analysis, Framing analysis
RQ 3	3, 5	To examine how agricultural research-for-development organizations can better use knowledge brokering to inform policies	Participant observation; Semi-structured interviews	Thematic analysis; Framing analysis; Reflexivity

1.6 Overview of the dissertation

The next four chapters of this dissertation are article-based chapters. RQ1 is addressed by Chapters 2, 3 and 4 by focusing on science-policy interfaces where livestock and climate change are discussed. Chapters 2, 4 and 5 address RQ2 through examining framing strategies (Ch. 2) and power in and power over science-policy interfaces (Ch. 4 and 5). RQ 3 is addressed by Chapters 3 and 5 by focusing on how knowledge brokers interact in the agricultural research-for-development space. Chapters 2 and 3 have been published and Chapter 4 is under revision. Chapter 5 is a perspectives piece that has been published, and Chapter 6 presents a synthesis and general discussion.

Chapter 2 explores the frames around livestock and climate change used within science-policy interfaces in the focus countries of Ethiopia, Kenya and Uganda. It describes the tensions between adaptation and mitigation and the interactional framing strategies used by actors to navigate these tensions, which helps answer RQs 1 and 2. **Chapter 3** focuses on Kenya and the roles that knowledge brokers play within science-policy interfaces. Using the Multiple Streams Framework, the chapter demonstrates that knowledge brokers are active in all three streams and demonstrates the need to consider international organizations as actors within the relevant science-policy interfaces, helping answer RQs 1 and 3. **Chapter 4** presents a broader perspective of agricultural development within the context of low emissions resilient development in Uganda. This chapter uses the power in/power over framework to examine how actors exercise power to address tensions and shape policy decisions within science-policy interfaces and in doing so helps answer RQs 1 and 2. Zooming out even further, **Chapter 5** draws on more than a decade of personal experience within the agricultural research-for-development space and presents my perspective on how incorporating clear roles for knowledge brokers into research-for-development organizations can help better make use of evidence within policy and decision making, speaking to RQs 2 and 3. **Chapter 6** offers a synthesis of the findings from the article-based chapters and provides answers to the research questions along with thoughts on a future research agenda.

CHAPTER 2



Livestock and climate change frames and interaction strategies in East Africa: Exploring tensions between adaptation and mitigation options

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Abstract

East African livestock systems, which support many livelihoods, are suffering from climate change but also contribute a large portion of national greenhouse gas emissions. There are various ways to frame livestock and climate change problems and solutions. We use data from interviews, policy documents and participant observations of science-policy interfaces in Ethiopia, Kenya and Uganda to answer: (1) How do frames used by scientists and policymakers affect discussions about climate change and livestock keeping in East Africa? and (2) What framing interaction strategies are employed to deal with ambiguity in science-policy interfaces? Findings show emphasis is given to framings describing livestock and climate change problems and less to response framings. While adaptation and mitigation are both used as issue frames in general discussions, funding availability to address climate issues draws attention to the need for measurement, reporting and verification systems, leading to more concrete discussions on mitigation-related response options and less attention on adaptation. Actors use different interactional framing strategies to co-construct meaning around problems and response options. The findings highlight the need for governments and partners to co-create knowledge on how livestock interventions can address adaptation and mitigation simultaneously to move away from the adaptation-mitigation divide in response framings.

2.1 Introduction

Livestock are vital assets to many households across East Africa and contribute significantly to GDP. Although livestock's GDP contributions have been undervalued (Serra et al. 2020), efforts to calculate the sector's contributions to agricultural GDP show it contributes approximately 45% in Ethiopia and Kenya (ICPALD 2013b, 2013a). Beyond economic value, livestock serve many other functions (e.g., credit, dowry payments, wealth, organic fertilizer, and food security) (Smith et al. 2013). Climate change is having multiple effects on livestock keepers in East Africa which will negatively impact production systems. Climate change affects livestock in many ways, including reduced feed quantities and quality, increased heat stress and greater disease pressures (Rojas-Downing et al. 2017). Although the livestock sector is vulnerable to climate change, in East Africa the sector is also one of the largest contributors to greenhouse gas emissions (GHGE) (FAOSTAT 2020).

Livestock production and animal-source foods consumption have come to the forefront in debates over climate action, mainly in industrialized nations. Consumers can decrease their carbon footprint by reducing meat and dairy intake and countries can take actions to reduce ruminant numbers (Ripple et al., 2014). The narratives around climate change and livestock's contributions in industrialized countries have the potential to influence decisions made by donor agencies on adaptation and mitigation programming and funding in the developing world (Hartmann 2010). Although more nuanced understandings of livestock production acknowledge livestock as important components of mixed farming systems in developing countries (Smith et al., 2013), this nuance gets drowned out by more prominent discourses that focus on unsustainable animal production practices in industrialized economies (Bailey et al. 2014).

Approaching the topic of livestock and climate change from different angles results in differing framings of the problem and ambiguity over what appropriate responses may be. Depending on actors' identities, their power in relation to others and the setting in which they interact, the strategies they use to discuss different angles and deal with the ambiguous nature of the problems and responses can change. The

objectives of this paper are to analyze the frame interactions between actors within science-policy interfaces (SPIs) in Ethiopia, Kenya and Uganda and understand how these affect discussions. This paper aims to answer two research questions (RQs):

1. How do frames used by scientists and policymakers affect discussions about climate change and livestock keeping in East Africa?
2. What framing interaction strategies are employed to deal with ambiguity in science-policy interfaces?

Understanding framing differences and interaction strategies is a step toward determining the best options to support livestock keepers in the face of climate change and toward reducing ambiguity around response options. Researchers and donors emphasize using science to inform policy (Oliver and Cairney 2019) but this focus on evidence-based policy is not without critique (Saltelli and Giampietro 2017). Funders encourage scientists to engage with science-based forums (Welp et al. 2006), and such activities take place in SPIs (Dunn, Bos, and Brown 2018). Much of the research on SPIs is from industrialized countries (Cairney and Oliver 2018), but the topic is growing in lower income contexts (Koch 2018). Given the differing contexts of these settings, however, it is unwise to assume that the conclusions of studies based in industrialized countries apply to lower income countries (Koch 2018). For example, the focus on SPIs in lower income countries includes linkages with global processes and the influence of international non-governmental organizations (NGOs) that are well-skilled in preparing science documents for use in policy processes (McConney et al. 2016). Examining the framing of adaptation and mitigation options for livestock and climate change within SPIs in East Africa can contribute to the understanding of how science and policy actors interact in developing countries.

The concept of framing has been used in several disciplines (Van Hulst and Yanow 2014). Although there are divergent definitions for the concepts of frames and framing, in general frames can be said to 'define problems, ...diagnose causes, ...make moral judgements...and suggest remedies' (Entman 1993, 52). The use of different frames can be helpful to focus on certain aspects of issues at specific times, but there are disconnects between frames used by different actors which result in

some aspects being neglected. We explore how frames are used and what framing strategies are employed to help stakeholders deal with ambiguity around livestock and climate change within SPIs in Ethiopia, Kenya, and Uganda.

2.2 Theoretical framework

We employ complementary theoretical frameworks to answer our RQs. We focus on SPIs to study interactions between researchers and decision-making processes. Interactional framing theory offers a framework to analyze how actors construct meaning and react to the actions and statements of other actors.

Interactions within SPIs are rarely linear processes (Dilling and Lemos 2011). The process is often non-linear and complex, and there is 'limited pragmatic advice on when and how to mediate the science-policy interface' (Dunn, Bos, and Brown 2018, 144). Several disciplines have examined evidence production and use (Oliver and Boaz 2019), and there is a wide literature on knowledge utilization for policy but it is often not linked to policy process theories (Blum 2018). This disconnect between knowledge utilization and policy theory literatures can be addressed by research on SPIs that couples the two areas (Blum 2018). Although policy does not have an agreed-upon definition among scholars, here we use it to mean an idea expressed by a government body that outlines a problem and how it will be addressed (Evans and Cvitanovic 2018). For this research, science encompasses all academic undertakings including social and biophysical research (Wesselink et al. 2013) and is also referred to as knowledge or evidence. Ambiguity refers to a situation in which there is confusion among actors as to whether something is a problem or not, whose problem it is and what might be done to handle it (Giordano, Brugnach, and Pluchinotta 2017).

SPIs are defined as 'social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making' (van den Hove 2007, 815). While evidence-based policymaking has been criticized for oversimplifying problems and recommending flawed policy solutions (Saltelli and

Giampietro 2017), SPIs are being seen as venues for co-production of knowledge and decision-making (Maas, Pauwelussen, and Turnhout 2022; Howarth et al. 2022). There has been limited study of SPIs across the Global South (Wagner et al. 2023), however this is changing as researchers and governments seek ways to work together to address topics such as food systems and climate change (Singh et al. 2021; Eroğlu and Erbil 2022). Studies of SPIs in developing countries reveal the need to adjust policy process theoretical frameworks (Cramer, Crane, and Dewulf 2023) and the importance of involving a wide range of actors (Scarano et al. 2019). In developing countries, the emphasis on co-framing of problems and co-designing of solutions through SPIs is particularly important to ensure that participants are acknowledged as contributing valuable knowledge alongside scientists (Buyana 2020).

Our use of framing theory draws from interactional framing literature (Dewulf et al. 2009). In interactions between researchers and decision makers, frames are 'communicative devices that individuals and groups use to negotiate their interactions' (Dewulf et al. 2009, 160). SPIs take place through publication of written information and interpersonal interactions (Sullivan et al. 2017). Interactional framing theory (Dewulf and Bouwen 2012) enables us to investigate the ways actors co-construct frames. As such, and given the hybrid settings in which science and policy interact (Saltelli and Giampietro 2017), we do not distinguish between the origins of the frames used. This approach comes from the understanding that frames which are not compatible lead to framing differences. There are six interaction strategies (Table 2.1) that can be used to deal with frame differences: (a) frame incorporation; (b) frame disconnection; (c) frame accommodation; (d) frame polarization; (e) frame reconnection (Dewulf and Bouwen 2012); and (f) frame exploration (Dewulf, Craps, and Dercon 2004). This concept of interactional framing addresses the ways in which meaning is made through discourse (Dewulf et al. 2009) and is well suited to address the RQs.

Table 2.1 Definitions of framing interaction strategies

a. Frame incorporation	'Incorporating a downgraded reformulation of a challenging element into your own issue framing'
b. Frame disconnection	'Disconnecting the challenging element from the ongoing conversation as irrelevant, unimportant or the like'
c. Frame accommodation	'Accommodating your own issue framing to the challenging issue element'
d. Frame polarization	'Polarizing the difference by reaffirming your own issue framing or an upgraded version of your own issue framing'
e. Frame reconnection	'Reconnecting frames by taking both elements seriously and taking away the incompatibility between them'
f. Frame exploration	Allowing an ambiguity to exist or surface while questioning the difference between frames

Sources: a-e (Dewulf and Bouwen 2012, 179); f (Dewulf, Craps, and Dercon 2004)

2.3 Methods

We use a qualitative multi-site research design that allows the same RQs to be investigated in multiple case studies and using the same data collection techniques (Herriott and Firestone 1983). This allows for learning within the individual cases and for comparison between them. The Program for Climate-Smart Livestock (PCSL) served as the entry point. PCSL was a four-year project funded by the German Federal Ministry for Economic Cooperation and Development (known by the acronym BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (Society for International Cooperation, known as GIZ) through the International Livestock Research Institute (ILRI) in Ethiopia, Kenya and Uganda. These countries have distinct characteristics but are like other East African countries facing comparable challenges. They are in the same region but have different governance structures; they are affected by climate change; livestock is economically significant; and all have ratified the Paris Agreement. They differ in their climate and livestock policy frameworks, but through PCSL and other activities they all engage in SPIs on livestock and climate change.

2.3.1 Data collection

We used multiple data collection methods. Participant observation was key to gathering evidence on the interactional framings between actors. The lead author used participant observation to collect in-depth qualitative data during project meetings, interactions with government officials and science-policy dialogues. The data collected included statements made during the meetings plus who was present (or absent), the convening organizations and who determined the agenda. As an embedded PCSL researcher, she also recorded interactions between project scientists and policymakers.

The main interactions took place during PCSL-convened Learning Platform (LP) meetings in each country. We explained the research to the participants, and they signed informed consent forms before audio recording started. We used these recordings to supplement notetaking and produce transcripts of key portions. The LP meetings involved actors engaged in livestock and climate change topics from ministries of agriculture, development partners, NGOs, universities and research institutes. There was a mix of those involved in policy processes and those involved in research and development projects. Almost all participants were nationals of the country where the meeting was held. The exceptions who were foreigners were the PCSL project leader, the lead author (an American with dual Kenyan citizenship), an FAO representative who attended in Ethiopia and a Dutch embassy representative who attended in Uganda.

Other SPI meetings involving discussions on livestock and climate were included as opportunities arose, and these involved actors who were present in the LP meetings due to the close-knit nature of the livestock and climate community. Many meetings shifted to virtual formats during the Covid pandemic. We acknowledge there may be additional framings around livestock and climate change at sub-national or local levels, but for the scope of this research we limited our focus to national and regional SPIs.

We also used content analysis to capture frames used in written documents. Relevant project documents, workshop reports, and national livestock and climate change

policies were collected through expert opinion, web searches and citation tracking. At least five policy documents (e.g., National Adaptation Plans, Nationally Determined Contributions, etc.) were reviewed per country, along with peer-reviewed articles and technical reports on the topic.

The lead author conducted face-to-face interviews to explore views on SPIs and livestock-climate change dynamics. Interviewees were selected through purposive sampling based on involvement in PCSL and through snowball sampling. Interviews were semi-structured and continued until data saturation became evident. Interviews were conducted in English and digitally recorded for later transcription. A total of 38 interviews were held with ILRI scientists, government ministry staff, university faculty, national agricultural research organization scientists, NGO representatives, and members of civil society organizations. There were 14 interviews of people based in Kenya, 12 with people based in Uganda, 11 with Ethiopia-based respondents, and one with a respondent engaged in the SPIs of East Africa but based outside the region.

2.3.2 Data analysis

Field notes, collected documents, and interview and meeting transcripts were loaded into QSR International's Nvivo 12 qualitative data analysis software. Using a thematic analysis approach (Braun and Clarke 2006) that contributed to our framing analysis, we developed a preliminary coding structure that was then adjusted as data were coded. After coding, we analyzed the problem frames and response options frames to compare across the countries.

One LP meeting from each country was selected for detailed analysis of interactional framing strategies. These meetings began with a presentation from PCSL's Principal Investigator. They presented findings of a policy coherence analysis conducted as part of PCSL (Ashley 2019). The Uganda meeting (October 2019) was followed by Kenya (December 2019) and Ethiopia (January 2020). We transcribed discussions and coded the interactional framing strategies used by participants. We focused on discussions relating to livestock-specific adaptation and mitigation actions. Additional discussions were omitted from the analysis.

Following the concept of act—interact—double interact from Dewulf and Bouwen (2012), we used the presentation as the act in most sequences and then a participant's first introduction of a framing difference as an interact, with subsequent discussions regarding that framing as double interacts. There were a few sequences that began with new acts, such as the presenter posing a question to generate additional discussion. As many participants as possible were allowed to contribute, which led to occasional branching in the discussions, e.g., a speaker would present their point of view, another speaker would contribute on a different topic, and the third would respond to the point of the first. This required a slightly different approach to code interactions with many speakers. We had to identify the sequences to clearly label the act, the related interact, and the double interacts following that interact. The double interacts were coded according to the six possible interaction strategies. We then analyzed the use of and patterns present in these strategies.

2.4 Results

This section is structured in two parts. The first presents the issue framings used by individuals during interviews and meetings and by institutions within publications. The issue framing is dissected into problem framings and response option framings. These findings respond to the first research question by describing the frames used in SPIs. The second part uses meeting transcript extracts to highlight interactional framing strategies employed by actors in SPIs. These findings contribute to both RQs by examining how the employed frames affect science-policy discussions and how the interaction strategies are used to deal with ambiguity. Combining these two approaches is a novel way to explore what individuals verbalize and what institutions publish in documents and to analyze what strategies are used to adjust and modify framings or to deal with differences during interactions. This research responds to the need for better understanding developing country contexts in which science interacts with policymaking by offering empirical evidence related to both knowledge utilization and policy process theory.

2.4.1 Problem and response option framings

The dominant livestock and climate change problem and response option framings within SPIs are summarized in Table 2.2. The issue framings are common across all three of the countries except #4, which was only used in Kenya and Ethiopia. The response options framings are presented alongside their corresponding problem framing. These problem and response framings are not presented in any particular order, and since they were largely similar across countries they are presented together, and we note where there were small differences between countries. Their frequency of use has not been quantified because we are interested in the qualitative differences between the frames and the strategies that are used when the framings are advanced during science-policy interactions.

The first issue framing identified is that climate finance interventions and other funding sources place emphasis on options that can achieve 'quick wins' in the livestock sector (#1A). This frame was used most often in Kenya. Several interviewees – particularly those from international organizations – noted that there is an overemphasis on actions such as developing measurement, reporting and verification (MRV) systems for governments to be able to quantify livestock sector GHGE, while not enough attention is paid to interventions that will help livestock keepers adapt to climate change. The corresponding response to this problem framing is that the livestock sector needs more funding specifically for adaptation (#1B). A related but slightly different framing is used to note that discussions regarding climate-smart agriculture focus primarily on crops and tend to ignore livestock (#2A). To counter this, experts advocate for livestock-specific projects using the CSA approach (#2B). This frame was used equally across countries.

An overarching concern with how climate change will affect livestock is another problem framing (#3A). Respondents from all three countries and from international organizations gave examples of how livestock production will suffer, including the deterioration of rangelands and increase in woody browses, rainfall changes and increased droughts, increased diseases, feed and water shortages, reduced growth and reproduction, all leading to reduced productivity. The corresponding response

option framing highlights maintaining adaptation as the priority in climate action (#3B), which is what all three countries propose in their policy documents.

Table 2.2 Problem and response framings of livestock and climate change within national science-policy interfaces

	A. Problem framing	B. Response options framing
1	Climate finance and other funding sources focus on 'quick wins' which are often mitigation-related	More funding needed for issues which take longer/are more difficult to solve, e.g., improving feeding and breeding for more adapted/heat tolerant animals, disease surveillance and control, rangeland rehabilitation, etc. that relate to adaptation
2	Livestock are often left out of CSA discussions	Livestock-specific CSA projects such as PCSL; giving greater attention to livestock in general in CSA projects and policies
3	Climate change is affecting livestock (drought, diseases, heat stress, dwindling pasture lands and overgrazing)	First priority should be adaptation and increasing productivity; mitigation not a priority.
4	Pastoralists keep too many animals, causing environmental degradation and contributing to high GHG emissions	Better linkages to markets to develop the value chain and de-risking through insurance to make pastoralism more profitable will help limit the numbers kept
5	Livestock production contributes high GHGs. Ruminants contribute more emissions than monogastrics	Improved feeding to reduce emissions intensities; incentivizing production of monogastrics to help reduce emissions by reducing numbers of ruminants; breeding for lower emitting ruminants.
6	Too much emphasis on the Ethiopian lowlands where adaptation is a priority	Consider both adaptation and mitigation and select low emissions development pathways
7	Emissions are high because too many animals die from poor health	Increasing productivity can allow people to keep fewer, more productive animals and reduce emissions intensities
8	Accurate measurements and livestock data are lacking	Functional livestock MRV systems can help countries access climate finance
9	African countries are not high emitters and should focus primarily on adaptation	African countries can contribute to mitigation by adopting adaptation solutions that have mitigation co-benefits
10	African livestock emissions intensities are high compared to other countries	Countries should contribute to mitigation by reducing these intensities
11	Livestock and meat/ASF consumption are portrayed negatively, affecting donor perceptions	Need to publish evidence on how livestock are important to livelihoods and Global South nutrition

In Kenya and Ethiopia, a problem framing in interviews and meetings related to pastoralists' herd sizes. Some respondents and meeting participants framed large herd sizes as a problem contributing to environmental degradation and high GHGE (#4A). We note not everyone agreed with this framing, leading to the use of interactional framing strategies to deal with framing differences (described in the next subsection). Those who put forth this problem framing offered a response option of better linking pastoralists to markets and providing risk management through livestock insurance (#4B). Beyond pastoralists, there is a framing that highlights the high GHGEs from ruminants (#5A). This problem framing corresponds to the response option framing emphasizing the potential for mitigation within the livestock sector (#5B). Response options include improving feeding practices, especially for cattle, to reduce emissions generated per unit of milk or meat (known as 'emissions intensities') and, especially in Ethiopia, encouraging the production of monogastrics (e.g., chickens) to shift away from ruminants.

One of the problem framings relates only to Ethiopia and was used by an interview respondent and the same person during the LP meeting. The concern was that there has been too much attention on livestock in Ethiopian rangelands, while more livestock exists in the highlands (#6A). The response option proffered was to balance attention on livestock in different systems and opt for low emissions development strategies that can be implemented in highland mixed crop-livestock systems (#6B).

The issue of animal health is a problem framing that identifies animal deaths as an additional cause of high GHGE (#7A). This problem was mentioned most frequently by Ethiopian respondents and meeting participants. When animals die due to diseases, they have contributed GHGEs while alive without resulting in meat production (beef cattle), or achieving the optimal number of lactation cycles (dairy cows). The corresponding response option involves improving animal care and management to reduce losses due to diseases (#7B).

One of the most dominant problem framings employed by actors is the issue of inaccurate and/or missing livestock data (#8A). This has been an area of much discussion, particularly in Uganda, and the correlated response option is the focus of

many projects and activities. 'Activity data', as they are known by GHG inventory experts, include population numbers of different types of animals (e.g., adult males, adult females and calves), body weight per animal type, daily weight gain, milk yield, and more (FAO and GRA 2020). The lack of these data poses a problem for accurately knowing livestock sector GHGEs. If a country does not have detailed data, it must use emissions factors published by the Intergovernmental Panel on Climate Change, which most experts agree are not accurate for East Africa's livestock systems. Part of the response option framing to the issue is improved measurement and tracking of emissions by type of animal and feeding strategy. Part of PCSL's work was to help improve these baseline data so they become part of national MRV systems and help track emissions reductions resulting from interventions. Improved livestock MRV systems are essential to access climate finance because they provide a way to measure GHGE intensities reductions (#8B), and this was discussed in all three countries.

Despite the focus on improving livestock MRV systems, some meeting participants in Kenya and Ethiopia used a problem framing that the focus countries are not high emitters compared to industrialized nations and should therefore focus primarily on adaptation rather than mitigation (#9A). In response to this problem framing, other participants offered a response option of selecting adaptation measures that have co-benefits (#9B), e.g., improved feeding practices can improve animal health and productivity while also reducing emissions intensities. A different problem framing used in both Kenya and Ethiopia is the relatively high emissions intensities in the focus countries compared to elsewhere (#10A). The response option related to this problem is to reduce the intensities through concerted efforts to improve production systems (#10B).

Finally, an issue framing that came primarily from representatives of international organizations based in Kenya and Uganda is the challenge brought by negative portrayal of livestock and consumption of animal source foods (ASF) within industrialized country media and the perceived effect on donor willingness to fund livestock programs in low-income countries (#11A). ILRI respondents framed the

problem of securing research funding for livestock and climate change considering the pushback against excessive ASF consumption in industrialized countries. In response, ILRI is working to publish evidence on livestock's importance to ecologies, livelihoods and nutrition in low-income countries (#11B).

These framings were used by the full range of actors within the SPIs, except for framing #11 which was used mainly by individuals from international organizations. We did not find any other correspondence between the types of actors and the framings they used. The different framings were employed at different times by the various actors depending on their individual backgrounds, interests and the context in which they were speaking. Individuals from international organizations, when using framings related to adaptation, indicated that these come from government priorities. We reflect more on this in the discussion section.

2.4.2 Interactional framing strategies

Participants within SPIs used varying interactional framing strategies when discussing topics related to climate change and livestock. The interaction strategies used during each of the double interacts are presented in Table 2.3. Each sequence (S) focuses on a framing presented above. The number of the framing is provided at the beginning of each sequence and corresponds to the numbering in Table 2.2 (next page).

Table 2.3 Interaction framing strategies used during Learning Platform meetings

Ethiopia		Kenya		Uganda	
S1 (#4)	Disconnection <i>topic closed</i>	S1 (#9)	Accommodation Exploration	S1 (#8)	Disconnection Polarization
S2 (#6)	Exploration Incorporation <i>topic closed</i>		Accommodation <i>topic closed</i>		Accommodation <i>topic closed</i>
S3 (#5)	Incorporation Polarization Exploration Incorporation Reconnection <i>topic closed</i>	S2 (#10)	Reconnection Exploration Reconnection Incorporation <i>topic closed</i>	S2 (#3)	Incorporation <i>topic closed</i>
S4 (#10)	Exploration Disconnection <i>topic closed</i>	S3 (#4)	Incorporation <i>topic closed</i>	S3 (#8)	Polarization <i>topic unresolved</i>
S5 (#1)	Accommodation Disconnection Polarization <i>topic closed</i>	S4 (#8)	Incorporation Incorporation Polarization Reconnection <i>topic closed</i>	S4 (#8)	Polarization Polarization Disconnection Incorporation Incorporation Reconnection Incorporation Disconnection <i>topic closed</i>
S6 (#7)	Disconnection <i>topic closed</i>				

During the Ethiopia meeting, six sequences included 14 double interacts focused on adaptation and mitigation. The discussion focused mainly on framing #5, regarding the high GHGE produced through livestock (especially ruminants) and framing #1, on the divide between funding for quick wins and more difficult issues. The most frequently used interactional framing strategy was disconnection (four instances out of 14). Incorporation and exploration were each used thrice (see Table 2.4).

The meeting in Kenya had fewer sequences related to adaptation and mitigation; the meeting included discussion on the government's capacity to develop and implement policy, which falls outside this analysis's scope. The Kenya meeting discussions centred around the livestock sector's ability to contribute to mitigation because of high emissions intensities and the need for good MRV systems, relating to framings #8, 9 and 10. The strategies most frequently employed were incorporation (four instances) and reconnection (three instances) out of 12 double interacts.

In Uganda, quantifying and monitoring livestock emissions dominated discussions. These relate to framing #8. Polarization and incorporation were each used four times out of 13 double interacts (Table 2.4). The meeting in Uganda presented a challenge in coding because there were times when a speaker was not responding directly to the previous speaker but to someone who had contributed earlier. In some instances, responses were omitted from the analysis because they did not fit within the scope of adaptation and mitigation discussions. In the case of Sequences 3 and 4, these both originate from the same act, which was a question posed by the ILRI presenter. The topic in sequence 3 remained unresolved as a new Interact in response to the same act started sequence 4. We described this challenge in the methods section.

Table 2.4 Total number of times each framing strategy was used per country meeting

	Ethiopia	Kenya	Uganda	Total
Incorporation	3	4	4	11
Accommodation	1	2	1	4
Disconnection	4	0	3	7
Polarization	2	1	4	7
Reconnection	1	3	1	5
Exploration	3	2	0	5
Total	14	12	13	39

Frame #8 was the most dominant within these selected LP meetings, which is likely a result of the content of the presentation given by the ILRI project leader who convened the meetings. Frames #10, 5 and 1 followed as the most frequently discussed.

The most frequently used interaction strategy was incorporation (used 11 times), followed by disconnection and polarization (7 uses each) (Table 2.4). We present transcript excerpts from the interaction strategies to illustrate how they were used. The excerpts have been shortened to reduce their word counts but the key aspects illustrating the interactional framing strategies are included. We have used [...] to indicate where words were omitted. The pronouns ‘they’ and ‘their’ are used in singular form to refer to individuals to avoid revealing participants’ gender and help preserve anonymity.

2.4.2.1 Incorporation

This was the most frequently used strategy in the studied meetings. Incorporation is used when a speaker agrees with a portion of what the previous speaker has said but incorporates that aspect into a broader framing of their own. Someone using incorporation accepts that the first speaker had a valid point but does not fully take their framing on board, instead using part of it to support their own framing which has differences from that of the first speaker. To illustrate this, we use an extract from the Kenya meeting. Participant 1 starts a new topic (the act) and brings up policy implementation at local levels. Participant 2 builds on this to shift the framing from not just a need to implement policies at local level but also the need to collect data from farmers and reward them for using good practices. The presenter then takes on board the point about rewarding and incentivizing farmers (through access to finance) and incorporates that aspect into the broader framing of the need for MRV and adaptation tracking. In doing so, the presenter reduces ambiguity around what the problem is by specifying how policy implementation and tracking adaptation are linked to accessing climate finance for the livestock sector.

Extract 1. Illustration of frame incorporation from Kenya S4 (frame #8)

[ACT] Participant 1: My point is on the uptake of these policies, especially by counties, [...] Do the counties have the capacity to understand these policies and implement? I think we're still missing that aspect.

[INTERACT] Participant 2: If we look at the implementation perspective, and we look at a completely eroded extension system in the country. [...] Right now, we have hundreds of thousands of farmers who are doing things that are very clearly aligned with the SDGs but they're invisible, they're not counted, and it's not fair. They should be rewarded and incentivized to continue.

[DOUBLE INTERACT] ILRI Presenter: Well, that's the idea behind the MRVs and the adaptation tracking is that that's linked to finance but without those it's like a chicken and an egg. Without the tracking systems you can't get the finance, and without the finance you can't develop the tracking system.

[Incorporation]

Beyond this example from the Kenya meeting, incorporation was used in the Uganda meeting in discussions on availability and reliability of livestock data to accept a

portion of the framing that better data are needed and then incorporate that into a proposal for better collection methods and a suggestion on the need for a new policy requiring government sectors to fulfill data requirements of the Climate Change Directorate. In Ethiopia, incorporation was used by participants to agree partially with a previous speaker and then add additional elements to the topic from a slightly different angle. The strategy of incorporation allows speakers to contribute more to a discussion and add their own framings without disagreeing fully with what was already said. This helps reduce ambiguity by introducing additional information on a problem or its solutions.

2.4.2.2 Disconnection

To illustrate disconnection, which is used to remove a challenging element from discussion by casting it as incompatible with one's own framing, we present an exchange that took place in the Ethiopia LP meeting. The first participant to speak following the ILRI presentation, a representative from a government agency, asked a question regarding low GHG-emitting animal breeds. The presenter responded and the same speaker then continued their comments with an interact regarding pastoralism.

Extract 2. Illustration of frame disconnection from Ethiopia S1 (frame #4)

[ACT] Presentation on policy coherence report

[INTERACT] Participant 1: [...] for example in pastoral areas, [...]. The prestige is having more livestock and more livestock breeds. I think this will be a challenge. What is the solution for this? Are you going to limit the number of livestock for pastoralists or what?

[RESPONSE] ILRI Presenter: [passes the question on to Participant 2, who has a long history of work in pastoral areas]

[DOUBLE INTERACT] Participant 2: It has been said so many times that pastoralists are keeping livestock in large numbers of livestock for prestige, but these things have been changing. [...] They are now making rational decisions either to keep small, more productive, diverse type of herds than keeping large herds which can be lost in one drought or two.... In fact, you know, it was not for no reason that they were keeping large numbers of

livestock. It's not only for prestige. It was their risk management strategy. [...]
[Disconnection]

Participant 1 (P1) uses the framing of pastoralism being problematic due to the perceived desire for large herds. They challenge the presenter to provide a solution to this issue. The presenter acknowledges that is not a problem for them, as a scientist from an external organization, to solve (response was removed for brevity). To facilitate discussion, the presenter then invites another participant (P2) to contribute. P2 is a long-time ILRI collaborator with expertise in pastoralist systems. P2's double interact can be seen as a direct response to the interact of P1, and P2 uses disconnection to dismiss P1's view on pastoralists as irrelevant because they are outdated and not in line with how pastoralists are changing their practices. P2 further disconnects from P1's framing by noting that the large herd sizes were not just for prestige but served a needed purpose given the nature of that production system and the ecology to which it is adapted.

Disconnection was used several other times in the Ethiopia LP and during the Uganda meeting when a speaker dismissed a previous assertion as untrue or postponed a discussion topic. The speaker using disconnection would either offer an experience or a statistic that nullified what the previous speaker said or indicate that information on a particular topic was not yet available and would be addressed later.

2.4.2.3 Accommodation

The accommodation strategy involves reducing a difference between one's own framing and someone else's by adjusting one's own to better fit with the challenging element. We provide an example in Extract 3 from Ethiopia. A leader of a landscape and sustainable livestock production program asked about the presented findings regarding emphasis on adaptation in national policies. The presenter expounded on the findings, explaining there is greater emphasis on adaptation in policies but often higher funding available for mitigation activities. The presenter then asked for the participant's view. The participant responded using disconnection to offer a different framing from that of the presenter. In the response, they note they are working on adaptation in Ethiopia because of the low levels of income and that mitigation work

will take time. The presenter then gives a quick response to accept and accommodate the participant's framing rather than contradict it.

Extract 3. Illustration of frame accommodation from Ethiopia S5 (frame #1)

[ACT] Participant 1: [question about the findings regarding more emphasis on adaptation in Ethiopia]

[Response] ILRI Presenter: [clarification of point from presentation, inquiry about P1's experience]

[INTERACT] Participant 1: When it comes to Ethiopia, there is the central government and there are regions. We have different structures. [...] The livestock project is working together on MRV and we are also expected to do a carbon fund while doing the MRV. [...] But all these things, adaptation and mitigation, depend in some way on centralization; and the regions are working on their own. [...] pastoralism and livestock is a major living income. We said unless we teach them how to do adaptation, we will go straight to mitigation and those things might not be fruitful. In the case of Ethiopia, that's why adaptation is facing more attention than mitigation. [...] Especially in mitigation path it will take us time. That's why the adaptation is more.

[DOUBLE INTERACT] ILRI Presenter: And I think that's fine.
[Accommodation]

Accommodation was the least frequently used of the six strategies. We found that it was used to concede certain points and allow the discussion to move forward.

2.4.2.4 Polarization

A speaker using polarization increases the framing difference by re-emphasizing his/her own framing or building on the difference already emerging between previous speakers. To look at polarization, we use an extract from the Uganda meeting. The topics of livestock contributions to GHGEs and measuring those contributions dominated the meeting. The presenter posed a question about including livestock in the conversation on mitigation in the country (related to frame #5), which brought responses from participants regarding the issue of establishing a baseline of livestock sector emissions (frame #8).

Extract 4. Illustration of frame polarization from Uganda S4 (frame #8)

[ACT] ILRI presenter: One question we had that might focus the conversation. [...] What about the issue of whether to include livestock in the conversation on mitigation?

[INTERACT] Participant 1: [...] as a country we don't know how much of the emissions come from livestock. How can we think about mitigation without knowing how much we are contributing?

[DOUBLE INTERACT] Participant 2: In talking about the baseline, we can't run away from this target thing because it's a commitment now. We had little time to prepare the NDC [Nationally Determined Contribution] but the basis is on our first and second national communication. [...] The climate change department has put together already a GHG inventory for the different sectors. [...] How much we are contributing, we already know, we are trying to improve our data so we have concrete national data. [Polarization]

[DOUBLE INTERACT] Participant 3: I think if we say we are sure about emissions it's not true. We are guessing, we don't know how many cows we have. We need to put our house in order from the basics. Then we can give a definitive figure. [Polarization]

Participants 2 and 3 in this exchange both use polarization to set their statements apart from the previous speaker. P2 is a staff member of the Climate Change Department within the Ministry of Water and Environment. This person disputes P1's assertion that the baseline is not known and emphasizes their own framing that the baseline exists and they are trying to improve data collection. P3 disagrees with P2's assertion that the country knows its baseline and reaffirms the issue that they do not know the true figures. P2 takes the stance that Uganda is implementing the response option by establishing a baseline, even if it was done in less time than was ideal and will continue to improve the data going forward. P2 uses polarization to distance their stance from that of P1, who asserted that the country does not know the amount of livestock emissions. P3 then pulls back in the other direction toward the problem framing regarding lack of accurate measurements in the sector, openly saying that P2's statement is not true. P3 states outrightly that the country does not know how many cows it has, heightening the difference between P2's statement that they are working with their best emissions estimates and taking it to the level of not even

knowing the population of animals. This strategy was not able to reduce ambiguity around the issue.

The other uses of polarization we found were similar in the way they were used to create an obvious difference between one's point and that of the preceding speaker. Outright disagreement is not common in such stakeholder meetings, but it is used when a participant strongly pushes their own framing of an issue without conceding any points.

2.4.2.5 Reconnection

The reconnection strategy can be described as someone accepting a challenging element from another speaker and linking it with their own framing in an indirect way. This allows a speaker to take both elements seriously and deal with their incompatibility. The example of the reconnection strategy comes later within the same sequence used to illustrate polarization in Extract 4. Following several more statements regarding the availability or lack of livestock data in the country, an officer from the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) speaks (P4) and notes that there is a livestock census planned for the near future.

Extract 5. Illustration of frame reconnection from Uganda S4 (frame #8)

Continuation of sequence in extract 4, following several other double interacts regarding livestock data

[DOUBLE INTERACT] Participant 4: [...] To answer the issue of us guessing the numbers of livestock, we had a census in 2008, we have been using that record for a long time. The good news is that UBOS [Uganda Bureau of Statistics] and MAAIF are organizing to count all your livestock in February. Please, when that exercise comes up, be there because we really need the data. [Reconnection]

This same participant had been one of the earliest speakers to respond to the question about including livestock in mitigation, and that first interjection was a complaint about setting targets when there is no emissions baseline. After other speakers used polarization, disconnection and incorporation to deal with their framing differences, the MAAIF officer reconnects the CCD officer's assertion that

they have data with which they are working into their earlier framing to then accept that there are data available and in use, although they are quite out of date. This removes the incompatibility between the two sides by accepting that data do exist but are outdated and will be updated.

Reconnection was also used during the Kenya and Ethiopia meetings by speakers who took on another person's point and gave further explanation. They used reconnection to go back and adjust a previous statement to fit around a newer challenging element that was raised, folding them together.

2.4.2.6 *Exploration*

Framing exploration is not often included in framing strategies literature, but we include it here because we found several instances in which a speaker did not directly present a different framing but rather posed a question that pushed another speaker to further elaborate on the framing difference at hand. We show how this was done during the Ethiopia meeting in Extract 6. Following the ILRI presentation, a participant professed the view that the highlands should not be neglected since that area holds the majority of the country's livestock. The speaker mentions highlighting lower emitting species rather than shifting species, and the ILRI presenter poses a question to further explore the differences of that framing.

Extract 6. Illustration of frame exploration from Ethiopia S2 (frame #6)

[ACT] Presentation by ILRI Presenter

[INTERACT] Participant 1: Whenever we talk about livestock, we always think about lowlands. But where's most of the livestock in concentration in Ethiopia? I think we really need to think about that. When we think about shifting, it's not shifting but highlighting the importance of lower emitting species. I think we need to consider the highlands. [...] I think Ethiopia has this interest to move away from draft animals, for example. [...] I think whenever we think about livestock, let us please think where seventy percent of the livestock is concentrated in the highlands.

[DOUBLE INTERACT] ILRI Presenter: So, when you say lower emitting species you just mean sheep and goats rather than cattle or draft animals?
[Exploration]

[DOUBLE INTERACT] Participant 1: I think there's also an interest to move into poultry in the highlands. I think there's a big interest. Plus, yes, there are socio-cultural implications and considerations in the lowlands. [...]
Considering the mixed crop and livestock farming systems in Ethiopia especially in the highlands, there is need to think about livestock importance, so we need really integration of livestock, especially low emissions development within the livestock sector. [Incorporation]

By expanding the species under discussion from sheep and goats to also include poultry, P1 further is emphasizing the importance of working in the highlands because poultry are culturally not accepted by people living in the lowlands. If P1 had limited the species under discussion to sheep and goats, that could have included working in the lowlands to highlight importance of those species as part of mixed herds. The inclusion of poultry clarifies the framing as being focused mainly on highlands areas where it is socially acceptable to promote poultry farming. By posing the question to P1, the presenter was exploring P1's framing in more detail to have a better understanding.

The presenter was the speaker who used exploration in all but one of the instances. This strategy was used to probe further on a topic and give the participants more time to expand on their views. In one sequence of the Kenya meeting, another participant posed a question to explore a framing difference on the emphasis on adaptation among African negotiators in international fora.

2.5 Discussion

This research found the same sets of frames appearing in the interviews, policy documents and science-policy dialogues. Ten of the 11 frames that emerged from the document review and interviews were employed in LP meetings. The exception was Frame 2 (see Table 2.2): the issue of livestock being left out of CSA discussions. It was used during interviews, but did not arise during LP meetings, most likely because the PCSL meetings were a response to that problem framing. As a research-for-development project, PCSL was designed to address both adaptation and mitigation and so the issue was not applicable in its meetings. Frame 11, on the negative

portrayal of livestock in media, was mentioned during interviews and in the Uganda LP meeting. However, it did not elicit a framing difference during that meeting and therefore does not appear in any of the coded sequences.

The frames were similar across the three countries, although frame 4 did not appear in Uganda despite the pastoralist system being present there. Policy documents in all three countries embrace the CSA approach, which is a result of influence from international organizations promoting it (Faling 2020). Frame 8 (GHGE measurements) dominated discussions in Uganda. The discussions resulted in many framing differences that continued beyond that initial LP meeting and were still being discussed in subsequent meetings attended by the lead author. The similarity of frames across countries can likely be attributed to influences from international SPIs and interactions between government representatives facilitated by organizations such as GIZ and the World Bank. There are still differences between the framings, however, so we do not find that the actors have created an 'echo chamber' by converging on all the same frames as has been found in other research on online climate change discussions (van Eck, Mulder, and Dewulf 2020).

Adaptation-related discussions within SPIs were limited in range and scope by actors' frames. This is notable when considering policy documents in Kenya and Uganda declare adaptation to be the top priority (Republic of Uganda 2022; Government of Kenya 2016). In Ethiopia, the guiding policy document for growth and development is its Climate Resilient Green Economy plan that emphasizes achieving a middle-income economy that is resilient to climate change and develops in a low carbon manner (Federal Democratic Republic of Ethiopia 2011). Among the identified frames, only frames 3 and 9 are explicitly about putting the focus of livestock interventions on adaptation. Frame 1 relates to adaptation and the need to prioritize adaptation options despite mitigation actions often resulting in more easily achievable and measurable outcomes. The response option is to garner more attention to adaptation, but this is not a specific, actionable option. Frame 6 is about drawing attention away from adaptation in the Ethiopian lowlands and balancing the focus by looking at low emissions development pathways in the highlands. While this involves both

adaptation and mitigation, the offered response suggests reducing the focus on adaptation to cater for more emphasis on mitigation and actions that have adaptation co-benefits.

Overall, these adaptation-related frames drew relatively few discussions within the LP meetings despite the presentation given by the ILRI project leader on the results of a policy coherence analysis (Ashley 2019) covering both adaptation and mitigation. It is possible that adaptation does not receive as much discussion because there is generally more agreement on the need for adaptation, and therefore fewer framing differences around it. When discussed in the meetings, frames 3, 6 and 9 elicited incorporation, accommodation and exploration framing strategies. Disconnection and polarization were only used in conjunction with these adaptation-related frames during a discussion involving frame 1 in Ethiopia. By employing the theoretical framework of frames and interactional framing strategies, we can see that the general agreement around adaptation frames and less agreement on mitigation frames result in mitigation frames receiving much more attention during discussions and side-lining more technical and substantive discussions on adaptation options within these SPIs. The importance of this is that when governments are interacting with donors, designing policies and engaging in international climate policy negotiations these frames set the scene for what is discussed which shapes the actions they take. Although national policies prioritize adaptation, mitigation problem and solution frames receive more attention.

In interviews, where the guiding questions included both adaptation and mitigation, the frames that emerged were distributed between both issues. Within policies, the careful consideration placed on writing the documents allows for adequate coverage of adaptation problems and responses, in line with national priorities as mentioned above. Yet when actors came together within SPIs, the mitigation-related frames dominated discussion. Frames 4, 5, 7, 8 and 10 relate specifically to mitigation, and the bulk of discussions in the LP meetings revolved around these. This may be because there is more ambiguity around adaptation; it is seen as more challenging than mitigation, in terms of actions needed to reach targeted populations and means

needed to measure adaptation (Eriksen et al. 2021) and is therefore separated from discussions on the more manageable aspects of mitigation and MRV. This mismatch between perceived ease of intervention implementation for adaptation and mitigation actions and ability to track such is another reason adaptation options are not thoroughly discussed or implemented despite adaptation to climate change being the expressed priority of these governments.

By studying the use of interactional framing strategies, we can see this mismatch has implications for the ambiguity surrounding climate change and livestock in East Africa. In some cases, actors use reconnection to reduce ambiguity by bringing adaptation back into conversations by highlighting the adaptation pillar of CSA and using the term 'co-benefits'. Using this term reduces the divide between adaptation and mitigation interventions and recognizes that many actions have dual purposes, while still acknowledging the primacy of one over the other. This strategy for reducing ambiguity is similar to the dialogical learning and negotiations strategies identified within natural resource management settings (Brugnach et al. 2011). High levels of ambiguity around problem framing present challenges in developing common modes of action; dealing with ambiguity through processes that co-create new shared knowledge can be the starting point for joint action (Giordano, Brugnach, and Pluchinotta 2017). It is possible that co-creation of knowledge – such as how livestock interventions can achieve both adaptation and mitigation goals simultaneously – could help shift the framings and break down the adaptation-mitigation divide. This relates to similar findings that engagement between researchers and policymakers based on negotiation and reflection within an SPI is a productive way to approach climate change adaptation (Iyalomhe et al. 2013).

Without successful operationalization of the 'climate-smart' framing around the wins of livestock interventions having both adaptation and mitigation outcomes, actors must continue to be selective in their use of frames and actively choose which frame to use in which situation. Depending on the topic or host of a meeting, actors opt to strategically use frames they know will either create common ground with others in the room or set them in opposition to others. These choices, which affect

their ability to exercise power within the SPI, then influence the interactional framing strategies they employ to either find shared meaning or undertake oppositional modes of action by imposing their frame or ignoring the frame of others, similar to findings of Brugnach et al. 2011.

In reflecting on the effect of the topic/host of meetings, we consider that the meetings included here are representative of SPIs in these countries because they were convened as part of a research-for-development project exercise and included a diverse range of stakeholders such as government officials, NGO representatives, and local and international scientists. Meetings convened by governments or by donors may show different interaction patterns or frame usage given their differing levels of power and their interests. This study is inherently limited by the authors' access to other such meetings. Despite this limitation, the meetings we have included offer relevant science-policy interactions because they illustrate instances of bringing together a range of stakeholders to exchange knowledge, build trust and move toward co-production within policy spaces (Maas, Pauwelussen, and Turnhout 2022; Eroğlu and Erbil 2022). Research on the use of power within developing country SPIs to improve understanding of actors' levels of power and their ability to exercise it is emerging (Buyana et al. 2021) but more is needed to understand the use of power specifically around climate change discussions. The findings here contribute to the growing body of literature around science-policy interactions in developing country contexts as related to addressing climate change within the agriculture sector. Additional comparative future research on how livestock and climate change related frames and interaction strategies are used in East Africa compared to frames and use of interaction strategies in other low-income countries and in higher income countries could help shed light on possible implications for international climate negotiations and interactions between development partners and low-income countries.

2.6 Conclusion

In this paper, we have addressed the questions of how frames used by scientists and policymakers affect discussions about climate change and livestock keeping in East Africa and what framing interaction strategies are employed to deal with ambiguity in SPIs. Actors use many different problem frames when discussing livestock and climate change which include frames calling for adaptation and for mitigation in the sector. The response option frames offer solutions to both problems, but mitigation solutions are central during discussions within SPIs in Ethiopia, Kenya and Uganda. This results in adaptation options being ignored in favor of achieving quick wins from mitigation activities, which is contrary to national climate change priorities.

This research contributes to the literature on frames and interactional framing strategies in SPIs. A deeper understanding of the frames employed and how actors use interactional framing strategies can help understand the ways in which knowledge is used by different stakeholders in SPIs. Ethiopia, Kenya, Uganda and many other African countries have prioritized adaptation to climate change within their national policies and strategies. In applying the analysis to the domain of livestock and climate change discussions within three East African countries, an improved understanding of how adaptation and mitigation options are discussed within SPIs may be helpful for these countries to meet their national goals of prioritizing adaptation response options. By consciously working within SPIs to co-create new shared response option frames that incorporate a climate-smart approach to livestock production, national priorities can be better addressed. Interaction strategies that incorporate, accommodate or reconnect mitigation response option framings with adaptation response option framings can help reduce ambiguity and raise the prominence of the topic of adaptation within these SPIs.

CHAPTER 3



Knowledge brokers within the Multiple Streams Framework: The science-policy interface for livestock and climate change discussions in Kenya

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Abstract

Livestock production is affected by climate change, but also contributes to climate change through greenhouse gas emissions. This leads to ambiguity in how livestock are framed in climate and development policy processes. We use the Multiple Streams Framework (MSF) to investigate the role of knowledge brokers in Kenyan livestock and climate change policy processes. We analyse how knowledge brokers deal with ambiguity from different problem and response framings within science-policy interfaces using the case of a project that seeks to inform Kenyan policies relevant to livestock and climate change.

We identify ambiguity within the problem stream where actors recognise adaptation and mitigation as dual challenges of livestock and climate change. This ambiguity creates tension between actors but can be strategically deployed to help match the problem and policy streams. Actors use the terms 'climate smart' and 'co-benefits' to link the dual adaptation and mitigation needs. In the political stream, nationally defined priorities and external funding possibilities influence the political will and motivation to adopt identified response options. There are opportunities for knowledge brokers to address the ambiguities and translate knowledge during windows of opportunity when the streams are being coupled, but challenges exist, resulting in slow and inadequate development of policies.

This paper makes two contributions to the MSF literature. First, we further refine the concept of knowledge brokers and establish their role across all three streams. Second, we apply the MSF in a lower income country and demonstrate that international organizations must be among the actors considered.

3.1 Introduction

A situation that can be seen from different viewpoints or cast in varying lights creates ambiguity, which can make the exact problem or the appropriate responses unclear (Brugnach and Ingram, 2012; Giordano et al., 2017). Debates around livestock and climate change, at both global and national levels, present such ambiguity. In lower income and agrarian countries, many households depend on keeping livestock to meet nutritional and livelihood needs, to store assets, to hedge against risks, to provide organic fertilizer, and to fulfil other interests (Herrero et al., 2013; Randolph et al., 2007; Weiler et al., 2014). These livestock keepers and the related value chains are negatively affected by the changing climate (Godde et al., 2021; Rojas-Downing et al., 2017), causing many agrarian countries to prioritize adaptation in agriculture (including within the livestock sector) in their national responses to climate change. However, global environmental policy discussions emphasize the inefficiencies of livestock production systems in lower income countries, which result in high greenhouse gas emissions (GHGE) intensities when compared with industrialized countries (Caro et al., 2014; Forabosco et al., 2017; Steinfeld and Gerber, 2010). While many lower income countries, especially those in Africa, prioritize reducing vulnerability to climate change and improving adaptation in livestock systems (Nhamo, 2018), they have also made pledges to reduce GHGE as part of their international commitments. These alternative framings around livestock and climate change lead to ambiguity in which different stakeholders hold divergent, but still valid, views of the issue (Dewulf et al., 2005).

The presence of ambiguity results from different framings of problems and possible solutions (Giordano et al., 2017) around the topic of livestock and climate change. Ambiguity also arises due to differences in knowledge systems, expertise and stakes within a situation (Brugnach and Ingram, 2012). Given that climate change is a global issue, what is happening at international levels, for example in the negotiations within the United Nations Framework Convention on Climate Change (UNFCCC), interacts with national level activities and priorities. The way problems of livestock production's environmental impacts through methane emissions and other detrimental effects are presented and discussed in international arenas does not match up with the framing

of the vulnerability and adaptation issues for livestock keepers at national levels in low-income countries. This divergence is a result of differences in experiences, beliefs, values, economic positions and interests between countries and actors within those countries (Giordano et al., 2017). The most appropriate policy solutions then become difficult to determine at national levels. The problems and solutions are not always well aligned because while low-income countries wish to focus on adaptation, the international finance offered to support climate action is often disproportionately focused on mitigation and targeted to sectors other than agriculture. For example, in Kenya in 2018, only 11.7% of climate finance overall went to adaptation measures (Mazza et al., 2021).

The climate smart agriculture (CSA) approach lays out three pillars that should be addressed to ensure food security under the changing climate: sustainably increasing productivity, strengthening resilience and improving adaptation to climate change, and reducing GHGE from agriculture (Lipper et al., 2014). This approach can be applied to livestock production and includes such interventions aimed at improving quality and quantity of feed, veterinary care, manure management and breed types (Ericksen and Crane, 2018; Shikuku et al., 2017). However, the adoption of the climate smart approach requires that scientists and decision makers move beyond strict separation of adaptation and mitigation approaches to consider the trade-offs or synergies of actions in a holistic manner (Bryan et al., 2013). In this paper, we look at how the concept of climate smart livestock is applied in Kenya, and how knowledge brokers make connections within science-policy interfaces between researchers and government technical staff when ambiguity around how to address climate change within the livestock sector precludes straightforward solutions.

Much of the research on science-policy interfaces has been done in wealthy, industrialized countries (Cairney and Oliver, 2017), but the approach is growing in lower income country contexts (Clark et al., 2016; Koch, 2018). International development donors increasingly emphasize that researchers in development need to generate evidence to inform policy and to demonstrate research findings being taken up during policy formulation (Evans and Cvitanovic, 2018; Oliver and Cairney, 2019).

This is a distinct departure from the earlier school of thought that scientists should remain separate from politics (Jasanoff et al., 1998). Funders increasingly encourage scientists to engage with science-based stakeholder forums (Welp et al., 2006), and such activities take place in 'science-policy interfaces' (Dunn et al., 2018; Sullivan et al., 2017; Watson, 2005).

Science-policy interfaces offer opportunities for scientists and policy makers to interact, but active participation of actors requires bringing different groups together for successful knowledge brokering (Bielak et al., 2008). Evidence use in policy making is affected by the ways actors within the process deal with ambiguity around issues (Cairney et al., 2016) and co-construct frames used to discuss issues they want to address (Dewulf et al., 2009). Some aspects of a situation are accentuated and others are de-emphasized when it is framed as a problem, and this process is a political activity (Knaggård, 2016). The livestock sector in Kenya can be framed in multiple ways as described above; the possible options for addressing the issue will be shaped by how it is framed (Dewulf, 2013). These framings, and the ambiguity inherent within having multiple ways to approach the subject, are both set within, and emergent from, complex policy making networks. It is within these network that scientists and policy makers interact, along with other actors, to navigate toward policy change (van Lieshout et al., 2012).

This paper examines the case of livestock and climate change problem and response option framing in Kenya, with a particular focus on how a Nationally Appropriate Mitigation Action (NAMA) for the dairy sector was developed through the involvement of several institutions. The overall aim is to investigate how knowledge brokers deal with ambiguity surrounding problems and solutions in the Kenyan climate change and livestock science-policy interface. The next section describes the theoretical frameworks used in this paper. We then detail the research methods employed before presenting the results and providing a discussion of those results in context.

3.2 Theoretical framework

To answer our research questions on how problems are framed, how policy solutions are put forward in science-policy interfaces and how knowledge brokers deal with ambiguity, we employ the Multiple Streams Framework (MSF) (Kingdon, 2003). This framework has been applied in many different contexts to look at how governments make policy decisions under conditions of ambiguity (Cairney and Heikkilä, 2014; Zahariadis, 2003) and time constraints (Zohlnhöfer and Rüb, 2016). Ambiguity factors strongly in the MSF because complex issues can have vague and shifting definitions and can be seen in multiple ways and through different lenses (Brugnach and Ingram, 2012). The MSF acknowledges a nonlinear process of policy-making by focusing on three separate streams (problem, policy, and political streams) that exist independently but must come together simultaneously to create a window of opportunity during which policy change can occur (Cairney and Zahariadis, 2016).

These three streams will help us answer the research questions by allowing us to separate the problem setting from the solutions. In the problem stream, a set of actors identify, frame and highlight issues of concern they believe need to be addressed. This can be done by capitalizing on a 'focusing event' that helps bring attention to an issue (Birkland 1997 as cited in (Cairney and Zahariadis, 2016) or through routine monitoring of indicators that shows existence of a problem (Kingdon, 2003). In the policy stream, actors create possible solutions independently of whether they address problems raised in the national consciousness. These solutions are more likely to be adopted if they are technically feasible and align with accepted values. The third stream in the framework, the political stream, is where actors develop the will, motivation and opportunity to address an issue (Béland and Howlett, 2016; Cairney and Zahariadis, 2016). This stream includes the national mood, which is described as changing periodically in noticeable ways that have an influence on policy agendas and outcomes (Kingdon, 2003).

A key assumption of the MSF is that these streams are independent of each other. It is possible that an issue may garner attention as a problem, but not have a ready solution. Alternatively, policy solutions may be available for an issue that has not (yet)

been identified as a problem or may be promoted by a policy entrepreneur independently of whether it responds to an actual policy issue because it is a 'pet' solution. Furthermore, a problem and solution may be well matched, but the political will to address it and adopt the solution may not exist. The MSF is useful because it is a flexible enough metaphor (Cairney and Zahariadis, 2016) to be applied to lower income countries, while other policy theories formulated in an industrialized country context cannot readily be applied in agrarian contexts (Purdon and Thornton, 2019).

The concept of ambiguity is central to the MSF, which also makes it an appropriate framework for studying the case of livestock and climate change in Kenya. Ambiguity refers to the idea that an issue can be interpreted in different ways due to the complexities of language (Best, 2008; Dewulf et al., 2005) and because people can view a situation from different angles based on their own beliefs, values and experiences (Brugnach and Ingram, 2012), as noted with the topic of livestock production in the introduction. The idea of ambiguity fits closely with framing theory and helps examine the diverse ways in which actors can frame a problem. Framing theory has been used in a number of social sciences to explore how people assign meaning to different issues and events (Dewulf, 2013). Framing a problem in a certain way highlights different solutions by emphasizing some aspects and downplaying others (Knaggård, 2016), bringing implications for what may result when the streams within the MSF are coupled.

The MSF was originally applied at the federal level in the United States' presidential system of government (Cairney and Zahariadis, 2016), but it is now regularly used in other industrialized countries with parliamentary systems (Zohlnhöfer et al., 2015) and at sub-national levels and in international contexts such as the European Union (Cairney and Zahariadis, 2016). Its use is also being extended to lower income country contexts (Faling and Biesbroek, 2019; Goyal et al., 2020; Ridde, 2009; Sanjurjo, 2020). Further developments are also being made to adapt the framework to policy implementation processes (Fowler, 2019; Howlett, 2019).

While some scholars are expanding the framework for use in studying policy implementation, it is also being further developed to better understand the role of

knowledge across the streams (Blum, 2018; Knaggård, 2016). The MSF includes some attention on the role of knowledge but “can benefit from further developing the possible types, carriers, and uses of such knowledge” (Blum, 2018, p. 96). Knaggård has developed the MSF to delve into and describe the role of ‘knowledge-broker’ (2016). In this conceptualization, the knowledge broker acts specifically in the problem stream (Knaggård, 2016). We distinguish the role of knowledge brokers from that of policy entrepreneurs by comparing the characteristics and actions of the two roles (Table 3.1). The concept of policy entrepreneurs has been well described (Cairney, 2018; Faling and Biesbroek, 2019). They are policy actors who take advantage of opportunities (Zahariadis, 2003) that arise through changing conditions to rally the support of others for their solutions (Mintrom and Luetjens, 2017). Policy entrepreneurs are seen as working within time constraints to try to couple policy problems with existing policy solutions (Jones et al., 2016). In comparison, knowledge brokers are less well described in MSF literature but are seen as having credibility, access to decision makers, and spending time framing problems without promoting a pet policy solution (Knaggård, 2016).

Table 3.1 Characteristics and actions of policy entrepreneurs and knowledge brokers from the literature

Policy entrepreneurs	Knowledge brokers
<ul style="list-style-type: none">• Either from within or outside the political system and willing to invest time, energy and reputation (Kingdon 1984)• Active in problem framing (Mintrom and Luetjens 2017; Cairney 2018)• Match specific policy solutions to existing problem frames, seizing opportunities created by shifting conditions (Cairney 2018)• Skillful at generating, brokering and disseminating ideas using advocacy and networking (Mintrom and Luetjens 2017)	<ul style="list-style-type: none">• Maintain contact networks in the political system and credibility within those networks (Knaggård 2016)• Frame conditions as political problems (without intent to match with specific policy solutions)(Knaggård 2016) and avoid suggesting specific policies (Knaggård 2015); refrain from coupling the problem to specific policy alternatives (Knaggård 2016)• Interpret knowledge to be understandable in a political context (McGonigle et al. 2020; Turnhout et al. 2013; Knaggård 2016)

The knowledge brokering concept also exists outside of the MSF as a way to explore and improve science-policy relations. Three conceptual frameworks have been proposed for knowledge brokering: the knowledge system framework, which focuses on production and use of knowledge; the transactional framework, with brokers linking between knowledge producers and users; and the social change framework, in which positive social outcomes are the aim of brokers who provide access and training to knowledge users (Ward et al., 2009). Further research has studied the repertoires of knowledge brokers and highlighted the actions of supplying, bridging and facilitating as key activity categories among knowledge brokers (Turnhout et al., 2013). This relates to earlier scholarship on knowledge utilization based on the 'two communities' model of science-policy interaction, in which scientists and policy-makers are seen as operating in different 'worlds' (Pregernig, 2014). While this conceptualization of the science-policy interface is not without criticism, we adopt this framing because it allows the creation of a third 'community': actors with policy-relevant knowledge who are not policy-makers but participate in policy-making (Lindquist 1990, as cited in (Radaelli, 1995). We conceptualize this third community as containing subsets composed of knowledge brokers in the science-policy interface and policy entrepreneurs. We maintain the MSF's distinction between policy entrepreneurs as promoting pet solutions and knowledge brokers as transmitting knowledge to policy makers.

Phipps and Morton (2013) also view the role of knowledge broker as creating and working in a shared collaborative space rather than bridging the gap between research and policy/practice. This is a growing role in research organizations where there is greater emphasis on the 'impact agenda', or the inclusion of assessing research impact within policy arenas as a measurement of quality of research- (Knight and Lyall, 2013; Maag et al., 2018). Overall, there is little consensus on what ultimately defines a knowledge broker (Haas, 2015) because their roles and functions are not traditionally spelled out in organizations, and they may take on different roles under different circumstances, giving each knowledge broker a unique role (Maag et al., 2018; Meyer, 2010). Acknowledging that knowledge brokers have different roles in

different institutions and situations, we also acknowledge that they have different motivations behind their actions and activities.

In interacting with different groups and transferring and interpreting knowledge, knowledge brokers ultimately are involved in creating a new type of knowledge: brokered knowledge (Meyer, 2010). They also wield power through their positions (Haas, 2015), and their decisions on who to call upon to answer which questions (Cairney et al., 2016) means they bring different groups together (Bracken and Oughton, 2013) and have influence over who contributes (or does not contribute) to policy processes, which gives them a level of power over evidence used to reduce ambiguity (Cairney et al., 2016). Given these very engaged roles, knowledge brokers cannot be considered neutral parties in their interactions (Shaxson et al., 2012) and further research is needed on the power relations surrounding knowledge brokers (Haas, 2015). The broad spectrum of knowledge brokering approaches (McGonigle et al., 2020) and activities (Maag et al., 2018) provides impetus to examine whether knowledge brokers are active across all three streams, thereby integrating the MSF with science-policy interface scholarship (Engels, 2005; Godfrey et al., 2010; Sullivan et al., 2017).

We combine the MSF with the concepts of science-policy interfaces and knowledge brokering and apply them to the aim of investigating how knowledge brokers deal with ambiguity in science-policy interfaces related to climate change and livestock in Kenya. We use these concepts to address three research questions in this paper: (a) How do knowledge brokers discuss issues in the problem stream related to climate change and livestock in Kenyan science-policy interfaces? (b) What role do knowledge brokers play in science-policy interfaces to develop climate change and livestock policy solutions within the policy stream? And (c) What strategies do knowledge brokers within science-policy interfaces use to deal with ambiguity in the political stream around climate change and livestock?

This paper contributes to the MSF theoretical refinement literature by offering an adaptation of the framework to a lower income country context that highlights the aspect of knowledge brokers as actors bringing together national ministerial

technical experts, development partner decision makers within international funding agencies and national and international researchers for the purposes of dealing with ambiguity. These alterations will help hone the framework for wider application across international contexts. We work toward these refinements by applying the MSF to Kenyan climate change and livestock discussions, with a focus on how these interactions are shaping research for development programs and setting national priorities.

3.3 Methods

3.3.1 Introduction to the Kenyan case study

This study is based on participatory action research (Lake and Wendland, 2018) resulting from the involvement of two of the authors (LC, TC) as scientists in ongoing discussions and work around livestock and climate change in Africa. A general abductive approach was used in this research, allowing for the MSF to provide a general theoretical framework and then for observations to help guide subsequent theory development (Haig, 2018). A major portion of the research comes out of the Programme for Climate Smart Livestock (PCSL), a four-year project funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the German Society for International Cooperation (GIZ) through the International Livestock Research Institute (ILRI) in Ethiopia, Kenya and Uganda. The program is relevant to the research questions because PCSL's research components are meant to inform national policies relevant to livestock and climate change in the three focus countries. The program has worked with national partners to either use existing stakeholder platforms or form new ones to serve as science-policy interfaces in which to assess decision maker needs around these issues and to share knowledge generated from other aspects of PCSL. These 'Learning Platforms' were designed to hold quarterly meetings in each country. In the beginning the meetings were physical, but with the Covid-19 pandemic, some meetings were missed and then the format changed to virtual before continuing with a hybrid model. In addition to the Learning Platforms, PCSL had other components that worked to quantify emissions coming

from specific livestock systems in the three countries and identify farmer-led adaptation strategies for sharing with other farmers.

Additional research for the study comes from development of a NAMA for the Kenyan dairy sector. A consortium of partners including the Kenya State Department of Livestock, international donors and a research program hosted in part by ILRI collaborated to undertake the NAMA development. This case of a strategy development process is used to illustrate how all three streams of the MSF were coupled successfully and the role of knowledge brokers in that process.

3.3.2 Data collection and positionality

The first author of this study (LC) has been based in Kenya since 2010 and has been engaged with national stakeholders in agriculture and climate change science-policy interfaces since that time. In acknowledging the role that demographics and personal characteristics can play in interpretive research (Schwartz-Shea and Yanow, 2013), she has built strong relationships within a network of stakeholders and has worked to overcome differences of race, birthplace and nationality (gaining Kenyan citizenship in the process) to establish her credibility within this group of actors. She has played the role of a knowledge broker in the past, which allows for a unique point of view for this study which is focused on other brokers. As a PhD student in the PCSL project, she stepped back from an active knowledge broker role to a participant observer role to conduct research on the science-policy interactions and study other knowledge brokers and their activities from a research perspective. We propose that this position of familiarity improves data collection and interpretation of results because it allows for studying the science-policy interface using policy ethnography methods (Dubois, 2015). We note, however, that the first author has not analyzed her own interventions, as this paper is not meant to be a reflexive ethnographic study (Davies, 2012). Although the PCSL project has concluded, the first author remains engaged in the Kenyan climate change and agriculture science-policy interface and serves as a member of the steering committee of the CSA Multi-Stakeholder Platform described in the findings section.

The first and second author regularly take part in meetings and interactions with government officials, other research institutes and international development funders regarding the issues of livestock and climate change. These interactions provided additional sources of data for the study. The lead author presented the research topic for this paper and obtained informed consent from any meetings that were recorded and regularly reminded her contacts of her research topic during interactions to abide by ethics procedures. Discussions with key informants regarding the topic aided in further developing the research scope and applying and refining the theory, adding to the application of participatory action research (Ferreira, 2006). The opportunities for engagement within science-policy interfaces and the embeddedness of the researchers beyond the confines of PCSL lent additional strength and credibility to the research findings, although there were challenges that we present in the discussion section. The third author aided the first two to reflect on their roles as ILRI researchers embedded in the Kenyan science-policy interface and to examine how their positionality might affect how they were perceived by other actors and their interpretation of the data.

To examine how actors in science-policy interfaces deal with ambiguity resulting from different framings, we used participant observation of the Learning Platforms, plus additional livestock and climate change meetings held between December 2019 and May 2021. The selection of interactions to include in the research was based on the topic of the meetings. Meetings focused primarily on the issue of dealing with climate change in the livestock sector were included in the sample. Using detailed meeting notes and selectively transcribed audio recordings, we coded data based on the themes of framing, science-policy interactions and problem, policy and political streams. Although the MSF can be used to describe how policy decisions are made in legislative settings, we focus here mostly at the technical ministerial level, where science-policy interfaces are more direct and there is greater exchange between researchers and civil servants. A total of 14 meetings are included as empirical observations in these findings (see Annex 1).

Semi-structured interviews were also conducted between November 2019 and March 2020 to explore the topics of knowledge brokering and use of evidence in decision making. A total of 16 interviews were held with national and international scientists (including six from ILRI), technical experts within the ministries of agriculture and environment and other actors. These interviews were recorded and transcribed. The interviewees were selected based on their involvement in the existing science-policy interface related to livestock and climate in Kenya. Using a topical interview guide, they were asked to reflect on their involvement in policy (broadly defined) and decision-making processes as related to the two-communities theory of science-policy interfaces and the policy stream of the MSF. Those in government roles were asked about avenues through which they seek evidence or research findings to help shape policies, and those in research roles were asked to describe their interactions with policy makers and ways of sharing research findings with those in decision-making roles. Respondents were also asked whether they identify themselves as knowledge brokers. Based on responses to the question about self-identification as a knowledge broker and observations of the activities of individuals, three knowledge brokers were identified within the Kenya science-policy interface.

3.3.3 Data analysis

We coded transcribed interviews, meeting notes and selected meeting transcripts using Nvivo 12 to enable thematic analysis of the data (Braun and Clarke, 2012). We used a combination of deductive and inductive coding and coded for both manifest and latent themes (Joffe and Yardley, 2004). We initially used deductive coding categories based on our theoretical frameworks guiding this research—frames, ambiguity, knowledge brokering, policy stream, politics stream, problem stream and coupling of streams—and then we added sub-categories inductively as needed until no new themes emerged and the list of codes was sufficient for addressing the research questions. See Annex 2 for the resulting coding structure.

The analysis highlights how knowledge brokers react to and deal with ambiguities and different framings. We distinguish activities and discussions relating to livestock and climate change within Kenya that can be identified with each of the three streams of

the MSF and examine the roles that the knowledge brokers played in these activities. The knowledge brokers in this study are a lead agriculture negotiator with a long history of engagement in the climate change science-policy interface (KB1), an international consultant with many years of experience assisting the Kenyan government with GHG emissions calculations for the livestock sector (KB2), and the ILRI scientist who led PCSL (KB3). The following results section presents actions and ideas appearing in the problem, policy and political streams sequentially, and then uses one specific policy process – development of the Nationally Appropriate Mitigation Action (NAMA) for the dairy sector – to illustrate the roles of knowledge brokers acting across streams.

3.4 Findings

3.4.1 Discussing livestock and climate change issues in the problem stream

In defining the problems related to livestock as a consequence of climate change, actors in the Kenyan science-policy interface alternate between identifying the climatic changes (e.g., more frequent droughts and increased water and feed variability due to altered rainfall patterns) affecting livestock keepers and the high emissions intensities associated with the livestock sector. During many of the observed meetings, when the negative impacts of climate variability and shocks were raised, participants discussed them in relation to agro-pastoralists and pastoralists living in arid and semi-arid regions of Kenya. Respondents from the government and research organizations frame climate change as a problem for these livestock keepers, citing more frequent droughts that reduce their resilience and diminish their herds, making recovery difficult. The respondents cite such indicators as the increased frequency of droughts over the previous decades, the numbers of livestock deaths recorded as a result of drought and the recurring emergency food aid distributions to highlight these problems. Meeting participants and interview respondents mentioned the problem of emissions intensities, which was discussed in science-policy interactions in relation to the dairy sector that is primarily based in the wetter highlands. Researchers participating in the Learning Platform meetings

compared the emissions intensity of dairy production in Kenya to industrialized countries. Meeting participants viewed dairy farmers as contributing large proportions to the GHGE inventory of the country. This division of identifying negative climate change consequences for livestock keepers in drylands and high emissions intensities of dairy farmers in areas with higher rainfall was made explicit by a staff member from the Uganda Ministry of Agriculture, Animal Industry and Fisheries during a regional meeting on climate change and livestock on ILRI's Nairobi campus in 2019 when he remarked, *"Basically, for adaptation, you need pastoral communities, but for mitigation you can have it with more dairy farmers. You can be able to have those [mitigation] interventions."*

If these framings are taken as separate problems, no ambiguity arises. The difficulty comes when these different facets need to be combined and addressed within national legislation and policies and during international climate change negotiations. When the Kenyan delegation negotiates within the UNFCCC, they do so in coordination with the African Group of Negotiators and other blocs. These groups have historically resisted the push to prioritize global mitigation efforts and have asserted the need for wealthy countries to provide financial assistance to lower income countries to aid in dealing with the negative effects of climate change.

As much as Kenyan stakeholders declare that the country prioritizes addressing the negative effects of climate change, there are international donors and investors who have focused on the problem of high emissions intensities. An additional problem that is frequently identified by those both in government and in research is the lack of data for use in calculating GHGE accurately. This results in dual problems of high emissions intensities from livestock keeping in Kenya and not knowing just how high those intensities are.

In January 2020, when Kenya was experiencing the beginning of the worst locust invasion in 70 years, a team of representatives from NGOs, academia and research worked together with the Climate Change Unit (CCU) of the Kenya Ministry of Agriculture and Livestock Development (hereafter the Ministry of Agriculture) to convene a meeting with high-level Ministry officials. The effort was coordinated by

KB1, who has many years of experience in science-policy interfaces working for the Kenyan government, regional agencies and as an international negotiator. KB1 planned to use the locust invasion as a 'focusing event' to raise awareness of the threat posed by climate change to the agriculture sector and more prominently frame it as a problem facing Kenya. Despite knowing about the tenuous link between climate change and locusts, the meeting organizers used the locust invasion as an urgent situation with which to focus attention, as increases in pests are expected under climate change. Several planning meetings between the coalition of partners focused on how best to frame the problems. Advice from KB1 to the scientists included shifting from a primarily science-focused framing by removing what were deemed to be overly complicated graphs and instead using emotionally stirring images to convey the key messages as human impact stories to better communicate the urgency of the situation, thereby stimulating political commitments to address climate adaptation. In making sure that the Ministry's sub-sectors of crops, livestock and fisheries were all addressed, KB1 also acknowledged during one of the planning meetings the sentiment that livestock are overlooked in climate change and agriculture discussions: *"In the current arrangement and generally over the years there has been favouritism toward crops and discrimination against others."*

The focus of the first planning meeting was on communicating to high-level Ministry officials the science around the negative impacts of climate change on the agriculture sector and the need for adaptation, but mitigation was not excluded. KB3, other ILRI scientists and a participant from the State Department of Livestock all agreed that additional work was needed to reduce the emissions intensities within the Kenyan livestock sector. KB1 also made the link between revising the nationally determined contribution (NDC) and creating a low carbon, climate resilient long-term strategy for the country. In short, the ambiguity was not seen as a barrier but the focus was on climate variability and shocks as the immediate priority with emissions intensities discussed as offering potential future opportunities for climate finance.

3.4.2 The role of knowledge brokers in developing solutions in the policy stream

The policy stream encompasses possible solutions that may address issues bubbling up in the problem stream or may be ‘pet’ solutions that do not directly relate to something that has gained attention as a problem. While there are two quite distinct framings around livestock and climate change in the problem stream (i.e., livestock keepers are affected negatively by climate change; the livestock sector is contributing a large amount of the country’s GHGE), in the policy stream there is less distinction between the possible solutions. Kenya has adopted use of the CSA concept and has developed a national CSA strategy (Government of Kenya, 2017) and an implementation framework (Government of Kenya, 2018) to address the need for improving productivity, adapting to climate change and reducing GHGE. There is value acceptability for CSA among the majority of stakeholders and the three knowledge brokers. The Ministry of Agriculture CCU has worked with partners to set up a national CSA Multi-Stakeholder Platform and is working to establish linkages with county governments and their agriculture departments to set up county platforms as a means of on-the-ground execution of the CSA implementation framework. The CCU is also engaged with international development partners to improve the measurement, reporting and verification (MRV) system for livestock sector GHGE. KB2 is a frequent consultant contributing to the development of the MRV system, bringing data from research institutions and matching them to the Ministry’s needs. However, one interview respondent from the Ministry of Agriculture said of a livestock bill being developed: *“Unfortunately, I’ve been brought in very late...but when I look at it, I don’t see the eye of climate change issues in it. But it’s still on, I have an opportunity... probably we may have to look at how we can present in a more focused way some of these climate change issues into the livestock bill.”* This indicates that government policies and strategies are still not entirely aligned, and CSA is not fully embraced throughout the Ministry of Agriculture. While there has been creation of a specific climate change strategy and implementation framework, and funding is coming in for aspects of that work, the members of the CCU are trying to work more comprehensively to ensure that other livestock-related policies under development are also responsive to climate change issues.

One of the aims of the PCSL project was to enhance the capacity of countries to develop evidence-informed climate-smart livestock policies and strategies. The project designers envisioned this taking place through providing research findings on the technical feasibility of integrating the CSA approach within livestock systems through specific practices and technologies and improving decision support through the use of futures thinking exercises. To help fulfil this, ILRI conducted research on emissions from different manure management and feeding practices that will be used to calculate more accurate emissions factors for inclusion in Intergovernmental Panel on Climate Change (IPCC) methods. ILRI also conducted research on adaptation practices used by pioneering farmers at selected local research sites and developed adaptation tracking protocols to aid governments in monitoring the success of adaptation implementation. The PCSL Learning Platform established in Kenya was set up through the national CSA Multi-Stakeholder Platform convened by the CCU as a means through which to share this emerging evidence.

Researchers and policy makers use the term “climate smart” to build on its value acceptability and join the two conflicting problem framings to offer solutions that address both at the same time. They use the term in a strategic way to deal with the ambiguous nature of climate change and agriculture, by employing an umbrella term that can be applied to projects that focus overwhelmingly on just one of the three pillars. Actors also use the term “co-benefits” within the policy stream to pitch solutions that primarily have benefits on one side but will bring additional (co-)benefits to the other side. Because of Kenya’s national priority on adaptation, actors often discuss adaptation actions that offer mitigation co-benefits as a way to bring the two problem frames together more closely and reduce ambiguity. In the first meeting to plan the presentation to high-level Ministry officials, the use was made explicit by KB3: *“In livestock, mitigation has been our entry point even though I know adaptation is a more urgent need. For this presentation, we would frame livestock as adaptation with mitigation co-benefits.”*

Stakeholders in the science-policy interface also use co-benefits in the other direction. The World Bank is working with the Ministry of Agriculture, in consultation

with other livestock sector actors, to design a credit line for the dairy sector that would be conditional on recipients adopting measures to reduce GHGE intensities. During meetings to discuss this program design, the meeting organizers used “adaptation co-benefits” to achieve buy-in from those who might be reluctant to focus solely on mitigation. In virtual meetings, small group discussions were focused specifically on using co-benefits to ‘crowd in’ other actors. Beyond the emissions reductions expected from the implementation, participants described co-benefits such as higher incomes, lower production costs, increased food safety and higher quality products that would accrue to farmers and the general public.

The Learning Platform meetings convened by CCU and PCSL were mechanisms operating in the policy stream for sharing solution ideas. They constitute science-policy interfaces where ILRI and others in academia and research can share research findings with those working on program design and policy development within the Ministry of Agriculture, NGOs and civil society. It is not guaranteed that findings shared in these interfaces will make their way into program or policy design, however. One respondent noted that a technical directorate within the Ministry of Agriculture initiates policy processes, but revision of an existing policy or development of a new one is then taken on by the policy directorate. There has not been any participation from policy directorate staff in these interfaces.

The role of the three identified knowledge brokers in promoting climate-smart livestock development within these science-policy interfaces has been to invite relevant stakeholders who can serve different purposes, for example presenting new evidence, serving as a link with higher level Ministry staff, or making a compelling case for why solutions are needed. This knowledge broker role carries with it a level of power in deciding who will be invited to participate and who may be left out or not represented. KB1, KB2 and KB3 use this role strategically to invite those actors they know may have influence to bring funding on board, get official sign off for activities or even to omit individuals they know may disrupt or frustrate the process. They stay abreast of what is happening within the research arena, including at ILRI, and developments within the Ministry of Agriculture and the Climate Change Directorate

to be better able to act as a bridge between other actors and to help supply knowledge. Knowledge brokers do not necessarily need to be experts, as highlighted by KB1 during an interview: *"You see, that's the beauty about versatility: once you get into a space of science and policy, because you do not need to be an expert in that area, all you need to do is get the right evidence and people so that you're able to get the right information and to feed into the other processes."* By staying abreast of what is happening, these knowledge brokers are able to call upon the right people at the right time. They are not advocating for a specific policy solution to be adopted as policy entrepreneurs would do, but instead aim to bring together the people they deem necessary to address the issue of what should be done.

3.4.3 Dealing with ambiguity in the politics stream

Despite the funding being put toward improving the livestock MRV system mentioned in the policy stream, there was a feeling among some respondents that the livestock sector is not given enough attention within policy discussions and climate change negotiations. The attention, when agriculture is discussed, is seen to be primarily focused on crops, with livestock being neglected except as an avenue for pursuing mitigation targets. For example, a concept note from the Africa Low Emission Development Strategies Partnership to form a livestock community of practice, spearheaded by KB1, notes that "climate-smart livestock management has received much less attention than crop-based agriculture." This is despite the acknowledgement in the problem stream that livestock keepers need assistance to adapt. The perceived unwillingness of some stakeholders to address adaptation in the livestock sector drives some of the ambiguity around how to frame the problem and potential solutions, which then has political implications. Some respondents noted that the push for MRV and mitigation initiatives was being driven by international bodies and was reflective of the global mood around livestock production being harmful to the environment and contributing too much to GHGs. KB3 described the obstacles to receiving funding for PCSL in an interview: *"For a very, very long time, the livestock people at the [international foundation] did not want to talk about climate change, because it wasn't in their strategy. And I think that I—it's literally been two years*

of me just explaining to them why it's a challenge, explaining to them how our research is helping to solve that." Convincing BMZ to put money toward climate smart livestock development was not easy, according to KB3, because there is a wariness among donors to fund livestock programs given the negative attention within international discourse around livestock contributing to GHGE and environmental degradation in general. ILRI has a separate project that works toward providing information to global 'livestock champions' (high level individuals in the global agricultural development community) who can educate others through international fora on the importance of livestock to people's livelihoods and nutrition in lower income countries. This is in direct response to media attention emphasizing negative aspects of meat consumption and calls for shifts away from livestock production to plant-based diets as a way to combat climate change.

Although one interviewee recalled how donors were influential in setting funding priorities, which then drove specific project design, an interviewee from the CCU described how Kenya does have a say in what government priorities receive international funding.

"Of course, the donors will come with their own way of what they want to support. But I do believe that the countries have a lot of say in what the governments want supported. So, it's up to us to say that, 'yes, this is the way you want to support us. But this is where our problem, our main our key problem is'. So, for me, I feel like we cannot say we blame the institutions for dictating to us what they want to implement because I don't think they just come and dictate it on us. They also do a lot of consultations in development of these projects. So, unless we do not tell them, we do not put our feet down and say 'this is what we want'—and sometimes maybe we don't—then that is when the development partner will do it their way."

KB1 was critical of the ability of Kenya's representatives to insert the issue of livestock into the country's position statements, however. Because there are many competing priorities for attention, other issues overshadow that of the livestock sector, making it difficult to gain traction in the political stream.

At the national level, there is a push by government officials to mobilize climate finance from the international community to help cover the costs of actions in Kenya's

NDC, which includes both adaptation and mitigation. The most appropriate ways of measuring and tracking adaptation are under discussion, but building the national capacity to implement an effective MRV system is seen as achievable. This is leading to greater donor willingness to fund MRV projects than fund adaptation interventions. In one of the science-policy interface interactions, a participant noted, “When we mix adaptation and mitigation, mitigation will start taking over. We need to give adaptation due attention.” This relates to a concern of one of the respondents that the political issue can be seen through a different lens of pastoralists and agro-pastoralists—traditionally marginalized populations within Kenya—repeatedly being overlooked. The coalition that collaborated to organize the high-level Ministry of Agriculture meeting internally discussed the issue as one of agriculture competing against other sectors for budgetary allocation from the National Treasury. Achieving an increase in budget allocation would be a political win for the Ministry of Agriculture. Research organizations also contain political elements. KB3 described the struggle to get others within the institute to see the climate change-related aspects of their research and to incorporate more consideration of climate change in project designs.

3.4.4 The NAMA policy window and the role of knowledge brokers

An opportunity for advancing the topic of livestock within climate change discussions in the national agenda arose in recent years, and the three streams were coupled successfully during this window. This coupling resulted in completion of a NAMA for the Kenyan dairy sector.

Development of the dairy NAMA was led by a European consultancy firm which employed KB2 with inputs from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which was simultaneously supporting research at ILRI to develop GHGE factors from the Kenyan dairy sector (Goopy et al., 2018; Ndung’u et al., 2018) and to identify gender implications for low-emission development (Tavener et al., 2019). The NAMA is a policy option that was designed in response to the problem framing that prioritized reduction of emissions intensities from dairy. KB2 and KB3 assisted in developing the plan, calculating potential emissions reductions, targeting activities to geographic areas, and more. The

submission of a full proposal to the Green Climate Fund (GCF) stalled when the original international funding partner paused its support. Actors within the Ministry of Agriculture worked to find other partners to help continue pushing development of the NAMA forward. During the pause in the GCF preparation, the solutions proposed within the NAMA remained relevant, and the problem also stayed ripe. In 2020, when the World Bank was interested in funding climate finance in the livestock sector, a Kenya dairy sector project was selected to go forward as one of two projects from among many possibilities. This World Bank initiative planned to support activities similar to the NAMA. The original NAMA partner was reinvigorated and convened a meeting in March 2021 to convert the NAMA into a full GCF concept note. Thus, the three streams were ultimately coupled. KB2 and KB3 were active in sharing the work that had been done to that point on the national dairy GHG inventory and helping calculate potential emissions reductions, which helped the other stakeholders understand the potential outcomes of the program.

3.5 Discussion

The discussion focuses on applying the MSF to livestock and climate change policy discussions in Kenya by (1) highlighting how knowledge brokers act across all three streams and navigate ambiguity and (2) expanding the MSF from the national mood to the global mood and emphasizing the need to consider international actors' roles in influencing policy and agenda-setting processes as part of this expansion.

3.5.1 Knowledge brokers active in all three streams of MSF

Our research expands the previous conceptualization of knowledge brokers acting in the problem stream (Knaggård, 2016) and highlights the roles that knowledge brokers play across all three streams of the MSF. The knowledge brokers in this research are active in the problem stream by helping frame problems and highlighting issues of concern such as climate change's effects on the most vulnerable livestock keepers and the need to consider gender-differentiated climate change impacts. The knowledge brokers are outside of the political system, but have connections to those

within it. For example, KBI is now external to the government but worked within the government earlier in his career and has maintained many contacts within various ministries. In their activities within the problem stream, the knowledge brokers help navigate ambiguity around climate change and livestock by prioritizing discussions around the need for adaptation among the most vulnerable livestock keepers but acknowledging the role that livestock production plays in contributing to national GHGEs.

Unlike policy entrepreneurs, who will push a specific policy, the knowledge brokers engage in the policy stream by promoting a menu of options for policy makers' consideration, acting as honest brokers and not favouring a particular solution. This can result in some policy solutions being left behind, as in the NAMA case where mitigation solutions were prioritized over adaptation solutions. Knowledge brokers who play the role of 'honest brokers of policy alternatives' (Pielke, 2007) help actors within science-policy interfaces identify and deal with the ambiguity inherent in the livestock and climate change discussion space but ultimately are also guided by the prevailing policy processes in the country, which may be influenced by external actors (a point on which we expand below). By linking policy makers with researchers who are producing evidence on both the emissions coming from the livestock sector and the opportunities for adaptation among livestock keepers, knowledge brokers assist the policy makers with evidence regarding both the need to adapt and to mitigate within the sector. Although they do not promote a specific policy solution, knowledge brokers still make use of their different forms of power to decide who should or should not be included in meetings. They should therefore not be seen as neutral actors.

Knowledge brokers participate in the political stream by advocating for livestock to be incorporated into climate change discussions and given equal treatment with crops within the agriculture sector. This involves pushing policy makers at national level and donors at international agencies to bring livestock issues to the forefront. This advocacy is made possible through their connections within and outside the political

system and their ability to interpret knowledge to be useful in a political context (refer to Table 3.1).

Within livestock and climate change science-policy interfaces, knowledge brokers are not necessarily wedded to any certain solution (like policy entrepreneurs usually are), but make the connections so that researchers and decision makers can exchange information on possible options, where they might be suitable, and for whom.

Knowledge brokers also differ from policy entrepreneurs in the amount of effort they expend on coupling streams. Whereas policy entrepreneurs invest time and energy into policy change or adoption, knowledge brokers are focused on identifying existing open windows and attaching themselves to ongoing processes. In the dairy NAMA, although KB2 and KB3 assisted in calculating potential reductions in GHGE intensities and selecting priority geographies, they were not pushing for the NAMA to be created, but stepped forward with solutions they had been researching when the opportunity to contribute arose. It is important to note, however, that activities in the policy stream (NAMA/GCF) and the problem/solution streams (ILRI) were both supported by the same research program in what is effectively a concerted external effort to create rapid change. This underscores the importance of MSF research examining international actors as key players in national policy arenas, which we discuss below.

Knowledge brokers within Kenyan livestock and climate change science-policy interfaces use ambiguity strategically in problem and response framings to connect with stakeholders who can match a given need at a given time. For example, if a donor is interested in developing a mitigation project, but some stakeholders are resistant to strictly addressing mitigation, a knowledge broker may highlight adaptation co-benefits to bring the hesitant party on board. The climate-smart approach aids in navigating this ambiguity by providing a framework through which the challenges of climate change and need for increased productivity can be addressed. The knowledge brokers in this case effectively handle the topic's ambiguity by maintaining a wide network and understanding the nuances of the problem framings used within different organizations. We acknowledge that this navigation of ambiguity can result in the neglect or loss of some problem framings, as seems to be happening with the

NAMA case drawing focus away from specific solutions for adaptation. Knowledge brokers are also attuned to the happenings in the political stream and understand the implications of addressing livestock and climate change within the broader field of national and international priorities.

3.5.2 Expanding the Multiple Streams Framework

Our research findings point to the need to expand the MSF to consider international actors within the framework. International donors hold a significant amount of power to influence actions in the Kenyan livestock and climate change arena, but the MSF, as originally conceived, does not include space for international actors. Our own positionality as international researchers conducting this research and publishing this paper illustrates how external actors are involved in these policy processes. In the case of this research, the first author is a member of the Steering Committee of the CSA Multi-Stakeholder Platform, a role that reflects her embeddedness within Kenyan stakeholder engagement and policy processes. In line with this, we have encountered issues of positionality that have been documented in other research on ethnography of policy translation, such as difficulties in being critical of policy processes (Mukhtarov et al., 2017) or becoming too similar to others in those processes (Peck and Theodore, 2012). This reflexivity has been useful in helping us consider our own roles in these policy processes.

We propose that in lower income countries, international donor agencies and research organizations must be considered across all three streams as actors who substantively shape discourses and actions, especially through simultaneous and deliberate engagement in multiple streams in pursuit of particular outcomes. This is similar to a recent finding that there are two separate policy entrepreneur roles: local policy influencers and international actors (Shephard et al., 2020). In the original applications of the MSF in industrialized countries, international donors were not conceptualized because they were not relevant, but as MSF expands to lower income country contexts (Ritter and Lancaster, 2018; Shephard et al., 2020), the role of donors becomes more prominent. We acknowledge that this is based currently on a narrow case which limits the generalizability to other contexts, although other

research has documented the role that international donors play in contributing to national priority setting (Forestier and Kim, 2020; Khan et al., 2018). We hope that others currently applying MSF to lower income countries will evaluate this addition to the framework.

Low-income countries often strive to meet funding agency demands (Ridde, 2009). Donors can influence what research takes place within national and international research institutes, including within ILRI, effectively laying a foundation for problem and solution framings. International funding agencies also influence whether and how a country's policy priorities receive funding. Developing a new policy or revising an existing one can be a costly process in Kenya, where public participation is required and funding to host meetings is often not available in the Ministry's budget. Technical Ministry staff rely on international development and research partners to help convene necessary meetings and generate knowledge instrumental to solutions. Partners with available financial resources (such as ILRI) often help set meeting agendas and exert power over the problem framings presented. Even ILRI, however, has its research agenda influenced by external donors. In effect, when large international funding organizations choose to invest in a particular goal in a certain country, they can act across multiple streams to heavily influence policy and agenda-setting processes. This is not to say that other, local actors lack influence through exertion of agency. It is important to differentiate international actors and agencies and understand their actions as global policy entrepreneurs (Shephard et al., 2020) or knowledge brokers.

The hesitancy of international donors to finance livestock and climate change projects due to the poor reputation of animal product consumption portrayed in the media influences what activities are, and are not, undertaken in Kenya. News stories of cattle contributing to GHGE abound, and these portrayals filter through to decision makers within donor agencies. This effect was felt when ILRI scientists were seeking funding for PCSL. Previous research has noted the influence of international partners on Kenyan policy, specifically the country's CSA strategy, noting that policy frames used by both the agriculture and environment ministries reflected the "signature of

global and bilateral donors and partners” (Faling, 2020, p. 234). Recalling Kingdon’s original use of the ‘national mood’ within the political stream (Kingdon, 2003), our research identifies a ‘global mood’ around livestock and environmental issues, a prevailing and intertwined set of influential discourses and institutions that shape financial flows. While there may be a dominant discourse among international research and development funders, it is not monolithic, and it is contested by other actors, meaning “global” should not be conflated with “universal”. Regardless, when applying MSF in contexts where research and policy formulation are heavily influenced by international organizations, the global mood is an essential addition to the MSF.

ILRI’s separate project (not related to PCSL) to equip global livestock champions with information on the importance of livestock keeping for nutrition and livelihoods is an attempt to add nuance to the debate around livestock and climate change that is influenced by this global mood around livestock production. ILRI scientists also use experiments and participatory action research to work on possible solutions for reducing GHGE from the livestock sector and helping livestock keepers adapt to climate change (Habermann et al., 2022; Leitner et al., 2021). This is an illustration of how, in the agriculture research for development space in which ILRI works, scientists do not necessarily limit themselves to received problem definitions, as noted by Knaggård (2016). Our findings show how knowledge brokers’ exertion of agency permits them to move across the three streams. These actors were not behaving as policy entrepreneurs, nor were they limiting themselves to a single stream. Because knowledge and knowledge sharing are relevant in both the problem and policy streams, and the use (or non-use) of knowledge takes place in the political stream, we propose that MSF will benefit from expanding its conceptualization of knowledge brokers’ behaviour to consider how they move across all three streams as discussed above.

3.6 Conclusion

Knowledge brokers deal with ambiguity resulting from different problem and response framings within science-policy interfaces as part of livestock and climate change policy discussions. Using insights from interviewees and observations from more than 18 months of participatory research within science-policy interfaces, we find that knowledge brokers use ambiguity in strategic ways – depending on the context and the purpose – to achieve their desired goals of bringing actors together to exchange knowledge. In cases where a donor is using a problem framing of high GHGE intensities in the livestock sector of Kenya, the knowledge brokers form connections with scientists able to advise on baseline emissions levels or interventions that can reduce GHGE intensities. When adaptation framing is needed, some of the same researchers may be called upon or others with different expertise more related to adaptative capacity. These knowledge brokers also keep abreast of international negotiations and understand the different framings used by governments, financial institutions and development partners. Strategic use of different framings helps navigate the ambiguity around climate change and livestock issues and creates room for dialogue between different sets of actors at different times.

The Multiple Streams Framework is useful for analysing the ways that different problem framings get coupled with appropriate policy solutions when the political timing is right. Greater incorporation of the understanding around these framings and their uses in science-policy interfaces can help further the conceptualization of knowledge brokers across problem, policy and political streams within policy processes. Applying MSF in developing country contexts requires consideration of international organizations' roles in shaping the three streams.

CHAPTER 4



How actors' power in and power over a science-policy interface shape a long-term strategy for agriculture in Uganda

This chapter has been submitted to a journal as:

Cramer L, Kabango F, Wamukoya G, Crane T, Dewulf A. *How actors' power in and power over a science-policy interface shape a long-term strategy for agriculture in Uganda.*

Abstract

The Paris Agreement encourages all Parties to submit long-term, low carbon development strategies. To comply with this, Uganda embarked on a process of developing an economy-wide long-term strategy and a sector-specific strategy on agriculture because of the importance agriculture plays in the country's economy and food security. We analyze the strategies actors used to exercise power in and power over the science-policy interface in which the agriculture long-term strategy was developed. We explore the tensions revealed through consecutive document revisions, how those tensions are managed in the meetings and in the text, and the direct and indirect strategies employed by actors to exercise their power to shape the strategy.

The process revealed several tensions that had to be managed. First, local adaptation goals competed for priority with global mitigation goals. Second, there was debate around focusing on narrower agriculture development goals versus taking a broader food systems approach. Third, participants contended with addressing general agricultural development versus maintaining focus on addressing climate change in agriculture.

National and international actors used financial and human resources, discursive legitimacy and authority as sources of power in strategies to influence the rules of the game in science-policy interface and to shape the strategy document itself. As national policies are increasingly influenced by global climate policy, examining the processes by which governments and other actors respond to these directives can help policymakers and researchers better understand the dilemmas that can arise and ways to address them in a productive manner.

4.1 Introduction

The 2015 Paris Agreement (2015) catalyzed enormous efforts to develop national level policies to address climate change (Kinley 2017). Countries that have ratified the Paris Agreement are expected to develop Nationally Determined Contributions (NDCs) and long-term low emissions strategies along with implementation plans. There are several trends within policymaking that converge to influence how countries develop policies and strategies to address climate change. First, there is an increasing call to link knowledge to action (Cash and Belloy 2020) and for science to inform policy (Bowers and Testa 2019), which was underway even before the spotlight turned to the climate crisis. Before climate change came to dominate these discussions, the use of science and evidence was being studied in policy formulation related to public health (Sarkies et al. 2017), ecology (Wall, McNie, and Garfin 2017), economics (Farah 2018) and more. As interest rises in using climate science and climate change evidence to inform climate policies, so does the interest in using science-policy interfaces to accomplish this (Wagner et al. 2021) and in exploring models of co-production (Wreford et al. 2019; Howarth et al. 2022).

Some science-policy interfaces are set up as collaborative governance spaces (Koontz 2019). This brings in an array of actors beyond government, such as scientists and civil society stakeholders, to participate in developing government strategies. In many countries, particularly lower income ones, actors include international organizations. There is growing influence of international climate frameworks on national policies and international actors on country policies (Moloney and Stone 2019). The 'globalisation and governance turn' in policy studies started in the late 1990s and early 2000s (Howlett, Mukherjee, and Woo 2015) but is taking on new life as focus is shifting to an interest in power asymmetries among actors (Morrison et al. 2017). With the interest in using science to inform policy, we can extend the concern over power asymmetries to collaborative governance processes, which often take place through cross-sector partnerships (Dewulf and Elbers 2018). Science-policy interfaces can be seen as cross-sector partnerships, and research can study how science is used in these collaborative governance spaces (Koontz 2019).

The focus on science-policy interfaces related to climate policymaking is another trend that is shaping how policies and strategies are being formulated. These interfaces contain and are influenced by international and nongovernmental actors who shape discussions through use of pragmatic and framing power (Morrison et al. 2017). Research is expanding around how climate researchers and policymakers interact (Baker et al. 2020; Howarth et al. 2022), but many of these studies focus on industrialized country contexts, where power asymmetries, involvement of international actors and resource availability of governments differ greatly from lower income country contexts. The ways in which national and international actors shape the development of national climate policies and strategies in lower income countries through science-policy interfaces is largely unexplored (Ojha et al. 2016; Howland and Le Coq 2022).

We examine this topic through analysis of the process of developing a climate resilient and low emission long-term strategy (LTS) for the agriculture sector of Uganda. We use participant observation of science-policy interface interactions and analysis of document versions to analyze the tensions that had to be managed to formulate a strategy with which all actors could agree. Agriculture is a key sector within the Ugandan economy, contributing approximately 20% of gross domestic product (GDP) and employing almost three-quarters of the population (MWE 2019). Ugandan agriculture is largely rain-fed and greatly affected by changing climate patterns, particularly reduced rainfall and changing rainfall patterns, which lead to declines in food production (Atube et al. 2021; Republic of Uganda 2022).

Furthermore, agriculture and land use change are also the biggest contributors to Uganda's greenhouse gas emissions (Republic of Uganda 2022). As such, the agricultural sector is an important intervention point in both increasing adaptation to climate change and achieving international commitments to mitigation. Agriculture is one of the priority adaptation sectors in the country's NDC; crops and livestock both have targeted adaptation actions. Under mitigation, actions such as agroforestry, irrigation (to reduce new farmland expansion) and livestock management will contribute to reduction of GHGs below the business-as-usual scenario (Republic of Uganda 2022). While countries are only required to submit an economy-wide LTS to

the UNFCCC under the Paris Agreement, the importance of agriculture within Uganda justifies the development of an agriculture sector-specific LTS.

In exploring how this Ugandan agriculture LTS was developed within the context of increased calls for evidence to inform policy and a focus on the collaborative nature of climate governance, our overarching research question is, **'How do national and international actors within a science-policy interface exercise power when shaping a national climate strategy document?'** We answer this through two specific questions:

1. What tensions are revealed in the process of writing this strategy and how do those tensions affect subsequent revisions?
2. What indirect and direct strategies are employed by national and international actors to exercise their power to shape the resulting document?

In support of these objectives, the next section presents a theoretical framework to structure how we will operationalize these questions. Our methods for collecting and analyzing data within the conceptual framework are presented in the third section, including a reflection of ourselves as authors and our various positionalities in relation to the process about which we are writing. The results section presents the findings, and in the discussion section we highlight the implications of these findings on the policy process within Uganda and reflect on whether the theoretical framework and findings are applicable to other contexts. We end with a conclusion summarizing the findings and suggesting further research.

4.2 Theoretical Framework

There are different models of how science is used in policymaking (De Donà and Linke 2022). Sundqvist et al. (2018) idealize two different perspectives: on the one hand, science and policy are seen as two separate worlds, "with different functions, logics and motivations," with a defined gap between them. On the other hand, science and policy can be characterized as 'tightly coupled' and part of the same functional world, and "the gap has deliberately been bridged" (pg. 457). In this paper, we take a 'one

world' approach and focus specifically on science-policy interfaces, which relate to the ideas of evidence synthesis and knowledge brokering (Gluckman, Bardsley, and Kaiser 2021). As part of the 'one world' approach, we see science being used in collaborative governance processes, although critical studies highlight how this can add additional conflict to policy debates (Koontz 2019). There are other influencing factors beyond science contributing to policymaking and collaborative governance processes (Grundmann and Rödder 2019) including the issues of power (Purdy 2012).

We are particularly interested in analyzing how science-policy interfaces serve as spaces where many diverse actors interact – both collaboratively and contentiously – to contribute to policymaking. These spaces allow for active communication between experts and decision makers, creating conditions for establishing the credibility, salience and legitimacy of knowledge (Cash and Belloy 2020; Cash et al. 2003). We look at how scientists and decision makers, along with other stakeholders, interact through science-policy interfaces, which we consider a form of cross-sector partnership.

We adopt the conceptual framework created by Dewulf and Elbers (2018) for assessing power wielded by actors both *over* cross-sector partnerships and *in* cross-sector partnerships. This framework is based on an understanding of power as “the ability to shape and secure particular outcomes” (Torfing et al. 2012, 48). Dewulf and Elbers further refine this definition to specify that “power here can be understood more specifically as the ability of individual actors to influence collective decisions of the partnership to their own advantage” (2018, 3), but in the context of science-policy interfaces we also understand power as the ability to influence collective decisions in the interest of others. Dewulf and Elbers also distinguish between *having* power and *exercising* power: the former “is about being able to enforce one’s own intentions, interests, preferences, or will, over those of others” while the latter is also sometimes called influence and relates to an individual’s “actual use of their capacity to get others to change their behavior” (Dewulf and Elbers 2018, 4). Power within cross-sector partnerships, or in this case science-policy interfaces, deals with the ability of people and groups to sway the collective decision-making processes and thereby benefit

from those decisions or exert influence so others on whose behalf they are working will benefit.

The conceptual framework developed by Dewulf and Elbers (see Figure 4.1) that we adopt for this research focuses on “power in cross-sector partnerships” and “power over cross-sector partnerships”. In using the framework to examine power *in* and power *over*, there are three important sources: resource-based power, discursive legitimacy and authority. Resource-based power refers to such things as access to finance, technology, knowledge and/or human resources. Discursive legitimacy is “the ability of an actor to represent a particular view, or speak on behalf of an issue in the cross-sector partners” (Dewulf and Elbers 2018, 5). Participants in the science-policy interface have greater discursive legitimacy depending on their experience in the relevant fields and their personal backgrounds. The third source of power, authority, is “the socially acknowledged right to take action or make decisions based on position within hierarchical settings” (Dewulf and Elbers 2018, 5).

The Dewulf and Elbers (2018) framework further describes how actors try to influence the outcome of cross-sector partnerships by exercising their power to influence collective decisions. This power can be exercised at the levels of *power in* and *power over* the partnership. Actors can employ different strategies to exercise their power and thereby influence the outcomes of the partnerships. Using *power in* the partnership, they can either withhold or invest resources to shape the feasibility of collective decisions, appeal to discursive legitimacy to frame those decisions or invoke their authority to force or reject such decisions. Using *power over* the partnership, it is possible for actors to shape the outcome by exercising their power to set several different rules. These include participation rules (who can participate and how), agenda rules (defining the issue and mission), sequence rules (steps to be taken through the interaction), task rules (structuring partnership activities), information rules (how and when information will be used and with whom it will be shared) and decision-making rules (how decisions will be made in the partnership). These six types of rules can be shaped by any of the three sources of power.

We use this framework to answer the research questions above. In the next section, we describe how we used our methods to undertake the study through this *power in* and *power over* framework.

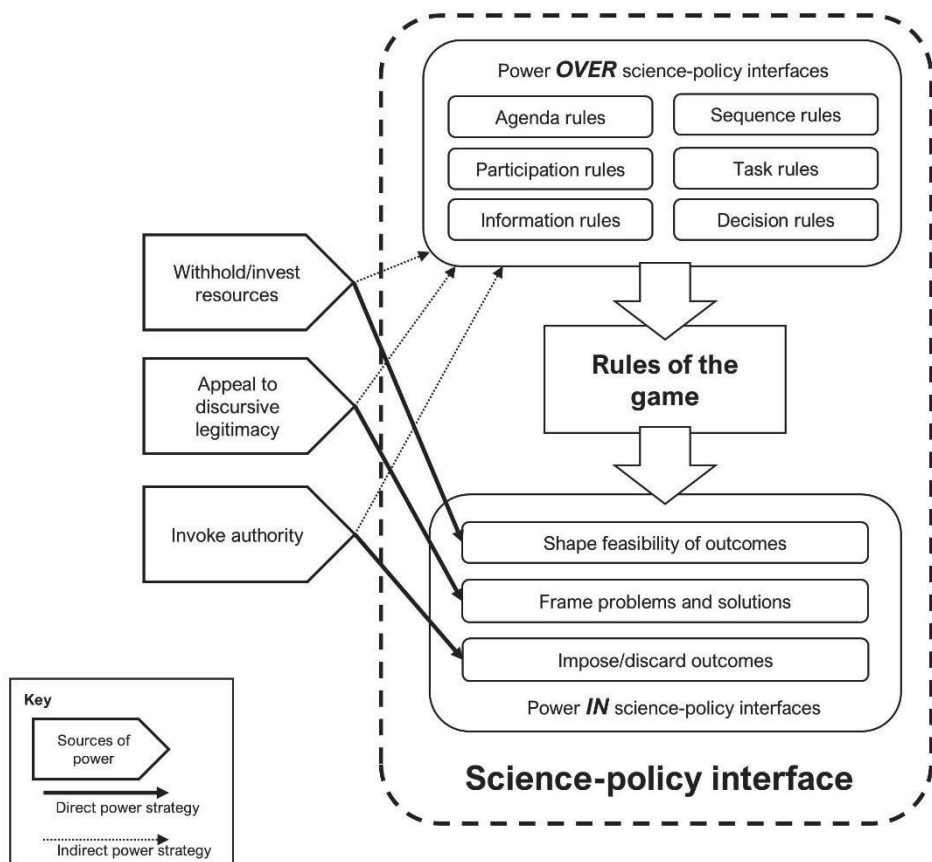


Figure 4.1 Sources of power in strategies for exercising power in and power over science-policy interfaces (Source: Adapted from Dewulf and Elbers 2018)

4.3 Methods

4.3.1 Case study research and positionality

Several of this study’s authors were actors directly involved in the science-policy interface used to develop Uganda’s agriculture LTS. This study is therefore a case study (Flyvbjerg 2011) of the process in Uganda and is based on analysis of the

document's evolution, as well as participant observation (Iacono, Brown, and Holtham 2009; Jorgensen 1989). Given the direct involvement of several co-authors, we had access to the versions of the document produced and participated as key actors in the workshops to discuss and co-design the strategy. This allowed us first-hand experience and observations within the process. The lead author (LC) was responsible for data collection and the other authors who were central to the LTS development contributed to data analysis and developing the discussion section.

The process began in early 2020, when the focal point for agriculture and climate change in the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) requested the Africa Group of Negotiators Expert Support (AGNES, co-author GW) for assistance in developing an LTS for the agriculture sector that would feed into the economy-wide strategy of the country. AGNES reached out to technical partners - the Food and Agriculture Organization (FAO) of the United Nations and the then-active CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) for financial and technical support. These two entities provided funding for consultants and meetings to support the strategy development. A series of LTS drafts were produced which were discussed via virtual meetings and in-person technical workshops. During this time, the original MAAIF contact point retired and was replaced by another staff member (co-author FK), who took over as the official contact point in MAAIF while the first person continued to be involved as a technical and policy expert in crafting the LTS.

Because some of the authors were central to the LTS development process, it is important for us to critically examine our positionalities as we present this analysis. Reflexivity requires that researchers assess not only the influence they have on the research process in which they are involved, but also how the research affects them (Probst and Berenson 2014; Mackieson, Shlonsky, and Connolly 2019). We are a diverse group of authors, and each of us played a different role, and thus had different sources of power, within this research. Our ability to discuss and reflect on these roles lends strength and credibility to the findings. LC was a participant in the technical team, provided financial resources to the LTS process through CCAFS and

then other funding through the International Livestock Research Institute (ILRI) and remained cognizant of her status as an international actor in the Ugandan setting, along with the sources of power they possessed. FK is Ugandan and was central to the development of the LTS given his role in MAAIF and his connection to GW. As a Kenyan, GW is also an international actor in the Ugandan setting and served as policy expert and a central figure in the LTS process due to his role in connecting many of the actors. The other two authors (TC and AD) are external actors to the Uganda setting and were not involved in the LTS drafting process. As PhD supervisors of the lead author, they provided theoretical guidance to the development of this manuscript and as external actors to the LTS development provided a balance to the perspectives of those authors who were heavily involved in the process.

4.3.2 Data collection

This research used two complementary data sources. The first type of data collected were texts: these were the multiple, iterative drafts of the LTS produced by the consultant based on feedback from the virtual and in-person meetings. Ten drafts of the LTS were produced between the first version in September 2021 and the version that was completed in May 2022 and presented to the MAAIF Senior Sector Management in October 2022. Each time an early draft was completed, it was shared with the technical team, which consisted of the current and former MAAIF staff members, GW, LC and about 15 subject matter experts in Uganda. Later drafts were shared only between the consultant, the current and former MAAIF staff members, GW and LC, with the consultant eventually completing her contract in April 2022 and being released from the process (see Figure 4.2). As of the time of writing this manuscript, the comments collected from the Senior Sector Management and the stakeholder validation workshop were being incorporated by a small technical team to revise the document for final approval by the MAAIF management and forwarding to the Cabinet for approval.

There were several virtual meetings and in-person workshops held during this process (Fig. 2), and the second type of data collected for this manuscript is participatory observations recorded by the lead author during these meetings. These

observations consisted of how these meetings were structured (agenda rules), who was invited and attended the meetings (participation rules), what feedback they provided on the content of the draft strategy, any discussions around that feedback and how that feedback was (or was not) used in subsequent drafts (task rules). The observations also included how resources were invested or withheld to shape the outcomes, any appeals made by participants to discursive legitimacy, and instances of authority being invoked to shape outcomes. Table 4.1 presents how the two sources of data are aligned with the research questions and methods of analysis.

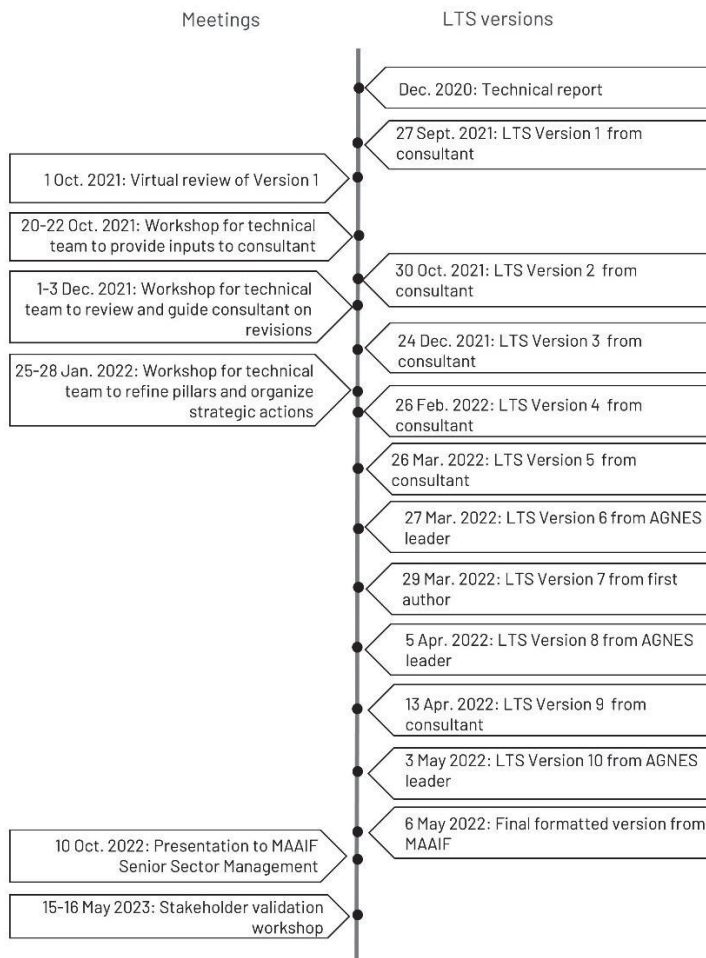


Figure 4.2 Timeline of LTS versions produced and meetings convened during the revision process

Table 4.1 Research questions and the correlated data collection and analysis methods to answer them

Research question	Data collected	Methods of analysis
What tensions are revealed in the process of writing this strategy and how do those tensions affect subsequent revisions?	Iterative drafts of the LTS document Participant observations	Tracking what changed from version to version Coding of notes to identify how actors shaped the text through their discussions
What indirect and direct strategies are employed by national and international actors to exercise their power to shape the resulting document?	Participant observations	Coding of notes to identify when power strategies were used (a) directly and (b) indirectly

4.3.3 Data analysis

We began by analyzing the drafts of the LTS document to see what changed from one version to the next. We examined it section by section. For example, we compared the text under the headings of title, vision, goal, purpose and objectives within each version as well as how the pillars of the strategy were organized and what was contained within each pillar from one draft to the next. To do this, we used an excel spreadsheet to record the wording from each version and then to note what changed between each version. This first level analysis then allowed us to look more deeply at the changes being made. In a second level analysis, we identified and interpreted the tensions that shaped the changes.

We then combined the text changes and interpretations of tensions in the document with the *power in* and *power over* framework to understand the sources of power used to make these changes. We assessed how the sources of power (resources, discursive legitimacy and authority) were exercised by different actors to set the rules within the science-policy interface and influence the edits that were made from one version to the next. This was done by coding the participant observation notes according to the sources of power and rules of the game as contained in the framework. We used the information on which organizations provided funding for

which activity as per the resource aspect of the framework. Authority and discursive legitimacy were analyzed by examining the background of the participants based on data gathered from participant observations. The combination of textual analysis and participant observation allowed us to answer the research questions as stated above.

4.4 Results

In this section we first present an analysis of the changes that were made through the different document versions and the tensions that shaped those changes. We then describe how actors within the science-policy interface used sources of power to influence the content of the resulting policy document.

4.4.1 Iterative changes and tensions revealed through subsequent versions of the LTS

This first part of the results covers the first research question: What tensions are revealed in the process of writing this strategy and how do those tensions affect subsequent revisions?

We present a sampling of iterative changes to illustrate how the text evolved from the full-length technical report to the version of the agriculture LTS presented to the MAAIF Senior Sector Management. In Table 4.2 we present changes in the title, vision and goal. The technical report was not formulated as a policy document and therefore did not contain a vision or a goal. When the consultant created the first version of the strategy based on the technical report, the title indicated a timeframe to the end of the century. This was updated in the next version to the middle of the century based on instructions from the technical team who felt that 2100 was too far in the future even for a long-term strategy. Other changes made to the title were the prioritization of the term 'resilience' before 'emission' and the shift from 'low emission' to 'low carbon'. By the last version, the word 'change' was removed to refer only to 'climate resilient'.

Table 4.2 Changes in the title, vision and goal of the document

	Title	Vision	Goal
Technical report (2020)	Long term low carbon, climate resilient agricultural development pathways for Uganda	N/A	N/A
Version 1 (Sep 2021)	Long Term Low Emission and Climate Change Resilient Agricultural Development Strategy for Uganda: 2022/21 – 2100/2101	A low emission and resilient agriculture sector where resource use is efficient and productivity is high contributing to sustainable agro-industrialisation and inclusive prosperity.	To reduce greenhouse gas emissions by 24.2% (1) by 2030 and limit temperature rise to 1.5°C by 2100 (2).
Version 2 (Oct 2021)	Uganda's Climate Change Resilient and Low Carbon Agricultural Development Strategy 2050	A competitive, prosperous agricultural sector that is climate resilient and sustainable contributing to a low-carbon economy by 2050	To build resilient commercial agriculture sector responsive to a low-carbon economy by 2050
Last forms	Uganda's Climate Resilient and Low Carbon Agricultural Development Strategy 2050 (From Version 7 , 29 Mar 2022)	A climate resilient, low carbon and inclusive agriculture sector that contributes to a sustainable, competitive and prosperous economy by 2050 (From Version 3 , 24 Dec 2021)	The goal of the Strategy is to build a climate resilient, low carbon agriculture sector in line with transformation agenda from subsistence to commercial (From Version 6 , 27 March 2022)

In the first version the vision also placed 'low emission' before 'resilient', and this was changed in the second version to first describe the sector as being 'competitive', 'prosperous' and 'climate resilient and sustainable'. The order of these adjectives gets shifted in the third version, which becomes the last form as of the writing of this manuscript. These changes were made following lengthy discussions in the first two in-person workshops (in Oct. and Dec. 2021) over the meaning of these words and the significance of placing certain words before others. The word resilience still comes before low carbon, as in the title. This prioritization of resilience also comes through in the changes to the goal. The first version of the goal focuses only on emissions and

temperature targets. This gets reoriented in the second version to reflect resilience and commercialization and finally solidifies in the sixth version to refer to the 'transformation agenda' which aligns it to Uganda's national agricultural policy. This re-ordering of the terms 'low emission' and 'resilient' in each of the elements reflects a **tension around placing local adaptation goals ahead of global mitigation targets.**

The tension was dealt with by continuously prioritizing the Ugandan goal of resiliency, thereby retaining the international need to reduce emissions but always placing it second after the national emphasis on resilience. One of the comments received from the Senior Sector Management also related to this tension. The technical team was instructed to avoid tagging the justification on international agreements but rather to emphasize the benefit to Ugandans. Participants in the stakeholder validation meeting in May 2023 debated the usefulness of indicating in the text that the agriculture LTS is a strategy developed to meet an international commitment or to create an internal vision regardless of what the international community requires. As of the writing of this paper, the technical team was working on reframing the introduction of the agriculture LTS to show how the strategy will be of local benefit to garner the required approval of the MAAIF senior policy makers.

Another key area that went through many changes was the structuring of the strategic actions or key pillars within the strategy. While the first version submitted by the consultant was closely aligned to the structure of the technical report and had priority actions defined in the livestock, crop, fisheries and apiary sub-sectors, by the second version this had been reworked by the consultant to include a list of 13 priority strategic adaptation and mitigation actions (see Table 4.3). This list of 13 was no longer divided by sub-sector and was deemed by workshop participants to be too long and diffuse. Actors at the technical team workshop in December 2021, after much debate, decided it was better to maintain the sub-sectors to organize these strategic actions. During the meeting, participants were split into small groups to re-organize the actions from the second version of the document into fewer pillars. The sub-sectors were brought back and several cross-cutting topics (e.g., extension, financing) maintained. This resulted in seven pillars included in the third version of the document. In the workshop held at the end of January 2022, the AGNES team

leader (GW) pushed for this list to be reduced further to avoid appearing to be presenting a shopping list. The final agreement was to incorporate the issues of financing and extension into the enabling environment pillar. Land and water management actions were shifted to either the livestock or crops pillar depending on their highest relevance.

Another discussion around how to organize the pillars resulted in a decision to maintain the focus on sub-sectors to align with the structure of MAAIF and position the LTS to be implemented through sub-sector specific projects. Here we see a **second tension** being reflected in the changes of the text: **between that of focusing on broader food system actions and on limiting the strategy to a narrower focus on primary production**. The 13 pillars in the earlier version contained such actions as dealing with waste, strengthening regulations and providing access to credit, which deal with concerns beyond farm-level production. The final pillars put the emphasis back on the sub-sectors and ensured they are first resilient and then leading to low carbon development. The broader goals are not dismissed completely; they get subsumed under the fourth pillar that encompasses several aspects of the 'enabling environment' and still contain elements of research, extension and financing that go beyond farm-level production. Priority actions from the first version are not all dropped; they get incorporated under the sub-sector pillars. For example, the first priority action in the original draft on genetic improvement appears under both the livestock pillar (as 1.2.1 Scaling low emitting livestock genetics) and the crop pillar (2.1.1 Strengthening diverse seed systems). Other examples are priority action 5 from the original version on pests and diseases management which was subsumed under the crop pillar (2.1.4 Pest and disease management) and action 7 (digital agricultural information and early warning systems) which appears in the last version under the enabling environment pillar as 4.3 Climate information systems and early warning.

Table 4.3 Changes in the pillars of the LTS document between selected versions

<p>Version 2 (30 Oct. 2021) "Priority strategic adaptation and mitigation actions"</p> <ol style="list-style-type: none"> 1. Strengthen genetic improvement of animals and crops to adapt to climate change and reduce emissions. 2. Promoting Indigenous Knowledge and Good Agricultural Practices for climate change adaptation and mitigation 3. Strengthen operationalization of a climate-responsive extension system 4. Support establishment of improved water management infrastructure to build resilience to drought and floods 5. Strengthen systems for climate-smart pests and diseases management 6. Promote integrated agricultural systems and livelihood diversification 7. Strengthening Digital Agricultural Information and Early Warning Systems for Resilient Development 8. Support Conservation, restoration and rehabilitation of natural resources (catchment areas, wetlands, rangelands and habitats of pollinators) 9. Facilitate efficient and sustainable management of agricultural related waste. 10. Promote climate resilient postharvest agricultural systems to minimize losses at an affordable cost 11. Strengthen regulations, standards and incentives for resilient and low carbon agricultural food system 12. Support increased access to affordable agricultural credit to enable the transition to climate-resilience agriculture 13. Strengthen climate change and adaptation research 	4
<p>Version 3 (24 Dec. 2021) "Priority Strategic Actions (pillars)"</p> <ol style="list-style-type: none"> 1. Develop a climate resilient and low carbon livestock sub-sector 2. Develop a climate resilient, low carbon and sustainable crop sub-sector 3. Develop and promote a sustainable climate resilient and low carbon fisheries sub sector 4. Strengthen sustainable land and water management to accelerate progress toward a climate resilient and low carbon agriculture sector 5. Strengthen operationalization of a climate-responsive agricultural extension system 6. Mobilize financing to support development of a climate resilient and low carbon agriculture sector 7. Enabling environment for development of a climate resilient and low carbon agriculture sector 	
<p>Version 4 (26 Feb. 2022) Strategic Intervention Areas (Pillars)</p> <ol style="list-style-type: none"> 1. A climate resilient and low carbon livestock sub-sector 2. A climate resilient and low carbon sustainable crop sub-sector 3. A sustainable climate resilient and low carbon fisheries subsector 4. A conducive enabling environment 	

A **third tension** that was noted during the workshops is that of **addressing general agricultural development goals versus maintaining the focus on aiding the agriculture sector to adapt to and help mitigate climate change**. Participants would begin discussing issues such as land fragmentation or the poor availability of veterinary extension officers in the country, which are general concerns of agricultural development. When such topics arose, some participants reminded others of the purpose for which the LTS is meant to achieve – addressing climate change. Thus, any actions recommended for inclusion in the agriculture LTS had to be linked back to either climate change adaptation or mitigation. In the case of the state of veterinary services that was raised during the stakeholder validation meeting in May 2023, the facilitator bridged the divide between a desire to see an improvement in the current state of veterinary service provision and the relationship to climate change by reminding participants that pests and diseases are expected to increase due to climate change. This made the case for allowing the LTS to include an action on improving human resources to deal with the current poor veterinary service. In creating that linkage between veterinary care and increasing pests and diseases due to climate change, it paved the way for the MAAIF technical team to address the concern of the stakeholders within the LTS document. Since the document was still undergoing changes as of the writing of this manuscript, we do not have the final version to illustrate the change made because of this tension.

4.4.2 Direct and indirect power strategies used by science-policy interface actors

This section presents results related to the second research question: What indirect and direct strategies are employed by national and international actors to exercise their power to shape the resulting document? We first deal with indirect strategies because these are used to set the ‘rules of the game’ and then we present the direct strategies used to exercise power in the interface.

a. Indirect power strategies (Power over)

Key actors used sources of power to exercise *power over* the interface by setting the rules of the game. **Participation rules** lay out who can participate, in which roles and under what conditions. MAAIF was the convener of the meetings, so the person in

charge of climate change matters for MAAIF **invoked their authority** to decide who to include in the physical meetings. As actors providing **financial resources**, CCAFS/ILRI and FAO were invited to send representatives to participate as agriculture technical experts. These experts relied on **discursive legitimacy** to validate their contributions to the process. There were written comments on the early LTS versions received from international FAO staff, but it is not clear whether these were ever incorporated in subsequent revisions. The participation rules of the science-policy interface weighed in favor of those physically present. Additional physical participants were MAAIF technical experts from the three subsectors, retired MAAIF personnel and local academics. The AGNES team leader was included as the central node connecting actors, and he also relied on **discursive legitimacy** to help set the rules of the game. The consultant was hired to lead the writing of the document but broke the unwritten participation rules when she started another job early in her consultancy and was unable to participate fully in subsequent technical team meetings. This led to a change in the participation rules along the way, with the consultant becoming less important toward the end of the process when it was clear that the final work, such as refining the monitoring and evaluation (M&E) framework, would have to be completed by the rest of the technical team.

According to the Dewulf and Elbers (2018) framework, **agenda rules** include the scope and objectives of the joint work and help define the mission, thereby setting parameters on what will and will not be addressed. Within the science-policy interface convened for creating the agriculture LTS, the agenda rules were determined largely by a plan developed by GW to work on agriculture LTSs in four countries, one of which was Uganda. His **discursive legitimacy** as an actor involved in global climate negotiation processes and his **authority** as a policy expert in the region afforded him indirect power over setting the agenda rules, along with his ability to secure investment of **financial resources** by CCAFS (LC) and FAO. The first step of the plan was to commission a situation analysis of the agriculture sector, followed by the technical report and then development of the LTS as a policy document. Along the way, there were questions raised about the costing of the agriculture LTS, but the work of creating a full budget for the strategy was not undertaken due to a **lack of**

financial resources. In this way, LC and actors from FAO exercised indirect power and limited the scope of work to just the strategy document.

Sequence rules are used to determine the flow of interactions, including the time given for each step and when in the process other stakeholders are consulted. In the Uganda agriculture LTS process, FK/MAAIF was the main actor setting the sequence rules, although GW contributed to setting deadlines for the consultant to keep the process moving. Once a last draft from the technical work was ready in May 2022, it was up to FK to present this to the senior management within the Ministry and to determine the next steps. Comments were received from the senior management, and FK used his **authority** to decide that a broader stakeholder consultation to solicit wider inputs would be carried out so that the senior management and other stakeholder comments could be addressed together.

The **task rules**, which define the structuring of interface activities, changed during the LTS development in conjunction with the changes in participation rules. Once the consultant's contract ended, the task of finalizing the LTS document for presentation to the Senior Management fell to FK, GW and LC. There were specific changes GW wanted made to the executive summary, and he asked LC to review and refine the M&E framework with support from others within ILRI.

Actors in the science-policy interface also exercised *power over* the partnership through indirectly influencing **information rules**, mostly through determining how to use information. The nature of the partnership was such that subject experts were asked to distil technical information into a policy-type document. Those actors who had more experience in developing policies (especially those who had worked for a long time in the Ministry and had since retired from government service) invoked their **discursive legitimacy** as policy experts to set boundaries around how information from the technical report would be utilized in the strategy document as well as whether or not to include concepts and phrases in the strategy that were not aligned with existing Ugandan government policies and priorities. The debate over whether to include the term 'food systems' is an example of this indirect power being exercised over the interface. A member of the technical team with greater **discursive**

legitimacy due to his long history of working in the government of Uganda exercised power over a less seasoned members by explaining that high level policymakers who will read and approve the LTS document have not yet taken on board the concept of food systems and therefore to include the term too prominently would jeopardize the strategy's adoption. As a result, the term 'food systems' appears just three times in the 56-page document.

The **decision-making rules**, covering how decisions were made within the science-policy interface, were to some extent determined by the pre-existing relationship of GW. and the former MAAIF climate focal point and their experiences as negotiators within the UNFCCC. In those negotiation spaces, collective decisions are made through consensus, and if there is lack of agreement on a particular item, the related document text covering that topic is bracketed to indicate a lack of consensus. This method was used at least twice during the core team workshops to develop the LTS. Adoption of this decision-making rule gave all actors the space to express their views, and when there was disagreement, it allowed the process to move forward without getting stuck on one item of contention. GW, FK and the actors from MAAIF with greater **authority** then reached a decision among themselves on which text to use when finalizing the document.

b. Direct power strategies (Power in)

According to the Dewulf and Elbers (2018) framework, the first strategy available to actors in the science-policy interface is to **withhold/invest resources to shape the feasibility of collective decisions**. These can be resources such as money, expertise, information and/or contacts. GW, as an international actor in the interface, held a source of power because he was the link to the resources held by FAO and ILRI-CCAFS (both international organizations), and he could have withheld those linkages if he had wanted. Theoretically, there were other partners that could have funded the consultancy to prepare the LTS, so LC/CCAFS had a limited source of power as the project funding that part of the work. If LC had insisted on operating a particular way to which others in the interface did not agree, CCAFS may have been dropped from the interface and the opportunity to fund the consultancy given to another

organization also interested in helping develop Uganda's agriculture LTS. Given GW's central role and level of power, when he instructed the consultant to add in a section on the current status of the Uganda agriculture sector, she did so as requested, and no one questioned this instruction. The Ugandan actors in the interface invested their resources of time and expertise in shaping the collective decisions within the LTS. The expertise consisted of both policy knowledge and technical knowledge in the sub-sectors. These investments shaped the document into a locally owned long-term strategy.

These resources are all interdependent, leading to a high need for pooling of resources and negotiation around how they were to be used. Without the external funding, MAAIF would not have been able to contract the consultants and hold the technical workshops or stakeholder validation meeting. Without the human resources of time and expertise brought by the Ugandan actors, the international actors would not have been able to develop a strategy document that was locally created and owned. This pooling of resources was made possible in part because of existing relationships between the Ugandan and international actors and their aligned desires to create an outcome that would be useful to the country's agriculture sector.

The second strategy for exercising power within the interface is to ***appeal to discursive legitimacy to frame problems and collective decisions***. This strategy was used particularly in structuring the pillars within the document. It took several versions and two in-person meetings to reach a decision on how to frame these strategic actions. GW exercised his power through his discursive legitimacy gained from his background of policy development in the region and negotiating at the international level. FK, the former MAAIF climate focal point and other national technical experts exercised their power by referencing local knowledge of Uganda's existing agriculture policies and the organizational structures in MAAIF. GW pushed for structuring the pillars around the areas which eventually became the strategic

objectives of the LTS¹. The national actors retained their position of having the pillars structured in line with the sub-sectors.

When tensions arose during technical workshops regarding (1) focusing on broader food systems actions and limiting the strategy to a focus on primary production, and (2) addressing general agricultural development goals versus maintaining focus on climate change, participants relied on their discursive legitimacy to argue their cases for why a particular stance should be taken within the strategy document. This legitimacy often came from having served in the government for many years and having previous experience developing policy documents. More experienced members of the team had a power advantage over the participants who did not have as many examples on which to draw.

The third strategy is to **invoke authority to impose/discard collective decisions**. As national actors, the MAAIF staff used their authority to put the emphasis on resilience and adaptation over mitigation. This was not in opposition to GW's or LC's position, but it had to be made explicit to the consultant so she could take on board the prioritization of resilience and adaptation over mitigation and incorporate it throughout the document. Although there were consultants hired to lead the process of developing the situational analysis, technical report and agriculture LTS, and other stakeholders were invited to give inputs and help shape these documents, the power to ultimately to adopt or not adopt the strategy lay with the authority of MAAIF. In this sense, the Ministry holds the highest level of power over the agriculture LTS within the science-policy interface. There is a large power imbalance because no other actor can impose or discard the outcome. Once a revised version incorporating the Senior Management comments and the stakeholder comments has been approved by the Minister, it still will need to go to the Cabinet where it will be adopted or send back to the ministry for whatever reason.

¹ The four specific objectives of the Strategy are: (a) To enhance climate resilience of agricultural systems, value chains and livelihoods; (b) To promote sustainable, low carbon food systems and climate-smart agro-industrialisation; (c) To promote and support generation, packaging and use of climate and agriculture information; and (d) To strengthen the enabling environment to support the transformation of the agricultural sector to a climate resilient and low carbon pathway.

4.5 Discussion

Previous work on science-policy interfaces has focused on how science gets used in policymaking (Koontz 2019), and other scholars have examined how power is exercised in policy making (Cairney 2019). This research is an attempt to marry these two topics through examining the role of direct and indirect power strategies in science-policy interfaces. Our framework and results are designed to answer ‘How do national and international actors within a science-policy interface exercise power when shaping a national climate strategy document?’. This responds to recent calls for a more nuanced appreciation of relationships and power dynamics in formulating climate policy beyond just seeing climate change as a technical problem that can be fixed with technical solutions (Scodanibbio et al. 2023).

We present this discussion with the knowledge that “empirical discussions of power are also normative” (Cairney 2019, 89). Our interests in this topic stem from our collective desire to see local technical staff and policymakers exercise greater power in developing policy responses to climate change. Elsewhere it has been acknowledged that “[i]n the developing world, the construction of knowledge about climate change vulnerability, and the consequent framing of adaptation policy, is largely driven by international actors and their generic world views” (Ojha et al. 2016, 418). Our individual preference, which we admit may not be the official view of our employing institutions, is for national actors to have more power in these science-policy interfaces because they have deeper knowledge of the local conditions and will be the ones to implement these policies.

4.5.1 Power sources of national actors vis-à-vis international actors in science-policy interfaces

In applying the *power in* and *power over* framework to the case of the Ugandan agriculture LTS, we see that national actors were able to exercise their power by drawing on discursive legitimacy and invoking authority over the outcomes. The investment of human technical resources by national actors into the process also maintained a focus on national priorities within the document. Establishing informal participation rules around being physically present for at least some of the in-person

meetings to have one's inputs incorporated into subsequent versions also aided in preventing too much external influence in the development of the document. This exercise of indirect power over science-policy interfaces assisted national actors in maintaining local control over policy development even when international actors were investing resources. Being more explicit about task rules and sequence rules can help all actors have a clear understanding from the beginning about the process the policy development will follow.

It would be unrealistic to suggest that international actors should not become involved in lower income country climate processes and science-policy interfaces. Given the inevitability of their engagement in these processes due to organizational mandates and project goals of informing such activities, they should be able and willing to recognize and respect the boundaries of their power and influence. The ultimate authority to adopt the agriculture LTS is held by the Government of Uganda, so organizations such as FAO and ILRI must understand the limits to their sources of power when it comes to imposing or discarding the outcome of collective decisions.

One of the challenges that the LTS core technical team encountered during the agriculture LTS process was the inability to fully exercise power over the consultant to accomplish the desired results. Because the sources of power were pooled between entities (MAAIF selecting, ILRI contracting, AGNES advising), there was reduced recourse for any of the entities to act when the team felt that the consultant was not delivering up to the expected standard. Devising ways to consolidate the sources of power within MAAIF (e.g., providing financial resources to the ministry that it could use to contract a consultant) would help avoid such an issue. Such consolidation, however, would increase the risk that power asymmetries lead to less effective interfaces (Arai et al. 2021).

4.5.2 Actors exercise sources of power to address tensions in document content

We look beyond the national-international actor dichotomy to examine how national actors in the Uganda science-policy interface exercised sources of power. When overlaying the power in/power over framework on the tensions revealed through stakeholder engagements and revisions of the document, we see a richer picture of

how sources of power are exercised to influence the outcome of the document. The document revision process revealed three key tensions (1) around prioritizing local goals over global targets, (2) between focusing on broader food system actions and limiting the strategy to a narrower focus on primary production, and (3) between addressing general agricultural development goals versus maintaining the focus on aiding the agriculture sector to adapt to and mitigate climate change.

The final substance of the agriculture LTS will depend on how the actors in the science-policy interface exercised their sources of power – particularly appealing to discursive legitimacy – to minimize or eliminate the inclusion in the document of items that spoke mainly to international goals, focused on broad food systems concerns or were aimed at general agricultural development issues. In the case of developing the Uganda agriculture LTS, seasoned professionals with many years of experience in developing government policy exercised their discursive legitimacy to deal constructively with the tensions as they arose.

4.5.3 Usefulness of the power in/power over framework

The power in/power over framework has not been empirically applied before to the best of our knowledge. It was useful in analyzing how the agriculture LTS changed throughout its many versions because of the interactions between the science-policy interface actors. It would not have been possible to conduct this analysis without the participant observations and our engagement as actors in the process. Future research on how documents change from an earlier draft to the final version would also require similar observational data collection if the power in/power over framework is to be used. If such data are not available, a different approach would be needed for purely textual analysis, but this would miss out on the interpretive perspective that comes with active engagement. The power in/power over framework could also be used in contexts that do not generate written documents. We added the element of differentiating between national and international actors. This is important for science-policy interfaces where researchers originating from other countries may have their legitimacy to participate in national discussions questioned by those in the focus country (Ojanen et al. 2021). Future research could also

investigate whether other dimensions could be added to enrich the framework, such as examining gender, age or other social factors that affect actors' sources of power.

We did not use the concept of 'institutional fields' from the Dewulf and Elbers (2018) framework. This aspect of the framework may be applicable in a cross-sectoral partnership (the original setting for which it was conceived), but in a science-policy interface where most participants come from an agricultural technical background it was not as relevant. Taking this a step further, we also acknowledge that our application of this framework focuses heavily on the individual actors and therefore does not align completely with the Foucauldian concept of power within social structures (Dewulf and Elbers 2018).

The power in/power over framework was originally designed to apply to cross-sector partnerships. In applying this framework to a science-policy interface we have found that it may be useful in future to add a fourth source of power: access to data/evidence. In the science-policy interface of this case study, those actors with access to evidence (or to others who had evidence) – such as climate data to project rainfall and temperature trends and up-to-date data on national greenhouse gas emissions – were able to use that source of power to shape the contents of the agriculture LTS. This source of power may look different in different contexts depending on the extent to which actors in the science-policy interface have access to public sources of data and the level of science communication around a given topic (Faehnrich and Ruser 2019).

4.5.4 Studying policy document creation as a methodological tool

This research stems from the view that documents, including policies, should be seen as items created to produce particular meanings rather than as neutral objects (Drew 2006). The bureaucratic process of drafting policy documents can be seen as a technical, apolitical exercise, but "interrogating the archaeology of the document allows for exposing the political moments that disappear as soon as consensus is reached and put on paper" (Weisser 2014, 48). The method of combining analysis of an evolving document and participant observations of interactions leading to the document evolution is methodologically innovative and can be used within other

settings to examine how policy formulation takes place. The findings presented here indicate the possibility of generating differently formulated policy documents depending on the actors involved and their sources of power. This case study example demonstrates that international actors can exercise important sources of power in climate policy processes, which may result in very different outcomes depending on the motives and strategies of those actors. As the climate policy debate and international negotiations continue rising in importance—including discussions around carbon credit markets and loss and damage, for example—information on who is involved in these processes in developing countries and what strategies they employ becomes increasingly important to shed light on how policies are being crafted. Undertaking similar studies to track the development of national policies using document draft evolution and participant observation of the actors involved can provide a method for understanding how climate policies are generated and adopted. This is critical because such national policy documents then shape investments in climate action, both on the part of national governments and their development partners.

4.6 Conclusion

This research has revealed the power strategies used by actors within a science-policy interface to shape a long-term strategy for the agriculture sector of Uganda. We have examined how actors withhold or invest resources, appeal to discursive legitimacy and invoke authority to both set the rules of the game (indirect power) and determine the outcomes of the science-policy interface interaction (direct power). In the course of developing a long-term strategy for the agriculture sector in Uganda, actors exercised their sources of power to deal with three tensions that arose: (1) tension around prioritizing local adaptation goals over global mitigation targets; (2) between that of focusing on broader food system actions and on limiting the strategy to a narrower focus on primary production; and (3) between addressing general agricultural development goals versus maintaining the focus on aiding the agriculture sector to adapt to and help mitigate climate change. The interactions within the

science-policy interface resulted in many iterative versions of the agriculture LTS. Subsequent versions reflected the inputs of the science-policy actors, which helped shape the document into a strategy acceptable to MAAIF Senior Management for adoption. In applying the power in/power over framework to this case study, we find it important to distinguish between national and international actors and their sources of power. In the case of the Uganda agriculture LTS, the pooled resources and shared direct and indirect power were successful in part due to pre-existing relationships between the key actors. Future applications of the power in/power over framework may consider adding access to evidence as a fourth source of power – access to data/evidence.

CHAPTER 5



Linking science with policy: the importance of incorporating clear roles for knowledge brokers into research-for-development organizations

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Abstract

Agriculture and food systems research and international development work will not proceed at the necessary speed without clear attention to the role of knowledge brokers within science-policy-practice interfaces. For research to be taken up and incorporated in policy frameworks, knowledge brokering is essential. Scaling of research for development findings will happen through other impact pathways as well, such as development of business models with the private sector, but development and implementation of robust and coherent policies informed by credible evidence is necessary for institutionalizing the work of agriculture and food systems research. Such policies are needed at multiple levels, and knowledge brokers are needed at these different levels as well. Examples of the importance of knowledge brokers in agricultural research for development from the livestock sector and its interaction with the climate change arena are used to illustrate this call for more attention to knowledge brokering.

5.1 Introduction

Successfully reforming agricultural research and development systems to meet current and future needs will require a multitude of approaches. The challenges to reducing hunger and poverty are immense: climatic change, malnutrition, inefficient markets and political instability are among the biggest but certainly not the only hurdles that need to be addressed. A key approach to tackling these challenges will be linking the research produced into decision making processes so evidence can be used in formulating policies and developing priorities for investment. These efforts, sometimes referred to as 'boundary work' (Hoppe, Wesselink, and Cairns 2013) are gaining prominence in institutions such as CGIAR, a global research partnership of international agricultural research centers. Critically examining the success factors needed for such boundary work is crucial. The activity of linking science with policy must be deliberate; it is an area of research itself.

Current agricultural research for development systems do not conduct enough research or put enough emphasis on the methods and approaches for engaging with policy makers. This science-policy engagement needs to be deliberate and carried out by dedicated people within these systems. Such people dedicated (full-time or part-time) to linking research with policy processes are knowledge brokers and can serve a clear role in elevating the efforts toward engaging in science-policy interfaces. Such knowledge brokering deserves to be given more prominence within agricultural research for development institutions so it is seen as a legitimate role with clear methods, activities and performance indicators. It is not a new activity within agricultural research (Klerkx et al. 2012) but treating knowledge brokering and science-policy engagement with more importance will help agricultural research organizations and institutions in other sectors to better understand the needs of policy makers and to make better use of their research findings for informing policymaking.

It should be understood that there must be a two-way nature to the engagement. Not only should knowledge brokers be translating research findings into usable evidence for policymaking, but they should also help their organizations better understand the

needs of policymakers and thereby adapt their research agendas in ways that can help support policy processes. This will help support the co-design of research and co-design of policies. While co-designing research agendas is important to meet the needs of policymakers, agricultural research for development organizations should not completely forego their science-led research agendas. There are areas of research that will not be in demand by policymakers, but which are critical for advancing science and which may anticipate future policymaker needs. These should remain as part of the organizations' commitments to addressing societal concerns.

5.2 Why should organizations such as CGIAR engage in policy processes?

CGIAR as a boundary organization with a research-for-development goal needs to be plugged into the multifaceted problems faced by low- and middle-income countries struggling to feed growing populations under climate change and other social and environmental stressors, but its institutional culture has been dominated by technical science. Within the climate change sector, there is a call for a faster shift to understanding climate change not just as a technical problem needing technical solutions but as a complex challenge encompassing problems related to power dynamics, trust and other social issues (Scodanibbio et al. 2023). The agricultural research community needs to make this shift with more urgency as well. This is not to say that CGIAR should abandon its half-century of research on crop breeding and other foundational science but to encourage them and other agricultural research for development institutions to broaden their views on what constitutes the challenges involved in solving hunger, poverty and environmental challenges in the 21st century. The CGIAR portfolio does already include research on areas like gender transformative approaches within agricultural development, foresight and policy analysis, market improvements and more.

To successfully use findings from these areas and from biophysical research to inform policymaking, organizations need to understand how to connect with policy

processes. How policymaking occurs is also an area of research, and having scientists who are present during the processes makes it possible to observe the practices of policymaking (Corson, Campbell, and MacDonald 2014). Having spent several years researching and engaging in policy processes related to livestock and climate change in East Africa, I have gained valuable experience as a participant observer and a knowledge broker within science-policy interfaces, particularly in Kenya where I am based. When trying to address complex topics like climate change and agriculture, the links with practice and implementation are critical. There is a need to understand the political economy surrounding policymaking, the interactions with international and regional policies and priorities, the other stakeholders involved in the processes, etc. Engaging in these spaces requires one to move within various networks, make connections between research evidence being generated and policy processes and provide the overarching messages that should be taken into consideration.

These connections can be made by having people who play the role of knowledge broker within agricultural research organizations such as CGIAR. Knowledge brokers should be embedded in research teams so they are part of research projects instead of being separated into service units such as corporate communications. Knowledge brokering is not just a function but a skill that takes practice. It is not a must that every scientist undertakes a knowledge broker role, as some will be better suited to it or interested in it than others. To be effective, knowledge brokers need legitimacy within the role by ideally having a science background and a policy background or at least some amount of experience in both. Successful knowledge brokers understand how policy processes work in their given context (because policy processes differ between governments, locations and levels) and know where and how to connect with what is happening in agricultural research. They can also feed the demands of policy makers back into the research world. This two-way interaction should help set the research agendas of agricultural research organizations.

Knowledge brokers should also play a research function by conducting research on engagement in such policy processes, including at multiple levels (regional, national and subnational). Their research on science-policy interfaces can help improve the

interactions between research institutions and the decision makers they wish to inform. From my own experiences, raising the issue of the importance of knowledge brokering within my institution has brought more attention to the role and the way it can help in achieving theories of change and organizational objectives.

5.3 What does it take to engage in policy processes and how can this be incentivized and measured?

Knowledge brokers need to have high levels of networking ability to successfully connect into science-policy interfaces. They must build relationships within policy networks; they also need credibility within those networks. Establishing that credibility requires on-the-ground, in-country engagements and relationships with policymakers formed over the course of years. I have found that consistently interacting with Kenyan ministry staff and other stakeholders in the agriculture and climate change arenas and demonstrating my commitment to understanding and supporting national priorities has been instrumental in building credibility and legitimacy. My physical appearance as a white American woman has been somewhat of a hindrance when first meeting other stakeholders in the Kenyan science-policy interfaces because I might be seen as a foreigner living in the country temporarily who does not have sufficient motivation to understand the local context with enough depth. I have learned to counter this by establishing my positionality as someone who has married a Kenyan, gained dual citizenship and is intending to remain in the country indefinitely. This is not to say that all knowledge brokers need to follow this path, but establishing common ground with stakeholders within science-policy interfaces is crucial for building the relationships necessary for knowledge brokering.

Agricultural research for development organizations also need knowledge brokers who can span research areas and disciplines within their organizations. While researchers can be very specialized in their areas of expertise, policymaking requires broad-based comprehension of many different issues. Knowledge brokers need to be able to strip down complex issues and simplify things for policymaking; they need

to interpret knowledge to be understandable in a political context (Cramer, Crane and Dewulf, 2023). This includes being able to translate evidence from specialized ‘islands of knowledge’ into socially relevant transdisciplinary outcomes (Meinke et al. 2006). Knowledge brokers should also be aware of the complex field of actors involved in science-policy interfaces and the power held by themselves and by other stakeholders. These aspects are not typically part of the terms of reference for scientists employed in agricultural research institutes, so encouraging researchers to take on this role requires changes in institutional structures or performance management criteria.

Knowledge brokering can be incentivized by adding it as a criterion for evaluation and promotion within agricultural research for development organizations to help the overall institutions and their employees shift their focus and achieve better impact. Specific knowledge broker roles can be established that can be evaluated based on the engagements they cultivate between the research institution and stakeholders within policy networks. This helps address a challenge identified in an earlier CGIAR reform process wherein researchers in the CGIAR feel a tension between generating ‘scientific outputs’ and trying to achieve ‘development outputs’, which speaks to a broader issue around whether CGIAR is a research organization or a development organization (Leeuwis, Klerkx, and Schut 2018). Under the current reform of the CGIAR structure, impact platforms have been created in its five impact areas (in brief: climate, environmental health, gender, nutrition and poverty reduction). These impact platforms can be seen as the organization’s foray into becoming more of a boundary organization, and as such knowledge brokering should be elevated as one of the activities that are expected going forward. Those inhabiting such a role should not be evaluated based on actual inclusion of evidence in policy making, however, because this is too far outside the sphere of control and many other factors play into policymaking processes. How to measure and evaluate those in knowledge brokering roles should be discussed and trialled within a community of practice so people taking on these roles can learn from one another.

5.4 Cautions around engaging in science-policy interfaces

One of the key considerations when engaging in knowledge brokering is that policy processes take time and may not align with research funding cycles. A longer-term view is needed from research organizations, and knowledge brokering efforts should not be contained solely within projects because the timelines for informing policy are different. Retaining knowledge brokers by funding part of their time from core funds rather than 100% project funding can help agricultural research institutions ensure the relationships cultivated over time are maintained.

Not all agriculture research that is funded and conducted should be aimed at informing policy. There will be some research topics that are not requested by policymakers, and those topics are still important for research for development organizations to pursue. There should be a balance in an institutions research portfolio of activities that are informed by policymaker needs and those that advance knowledge on addressing societal problems but are not based on the needs of decision makers whether because the problem has not yet come to the fore in political discourse or is not welcomed as a topic of discussion among those in power.

Those engaging in knowledge brokering roles should be aware that there will be colleagues who do not see eye-to-eye with them and will be uncomfortable with what they perceive as being 'political' (Donmoyer 2012). Strong and clearly communicated organizational strategies can stave off much of the criticism but will not curb it entirely. Based on my own experience, there will also be peer reviewers who perceive manuscripts describing research on science-policy interfaces as being written from a 'development practitioners' perspective' and seemingly unfit for publication in journals. In such cases, knowledge brokers must come to terms with justifying their engagement in science-policy interfaces as people with multiple identities. They are employed by their organization, but operating in the interfaces with other stakeholders adds additional responsibilities to their roles.

It is critical to remain conscientious of these multiple roles one plays. In delving into the practice of knowledge brokering and working within science-policy interfaces, I have learned to 'work the hyphen' and explore the 'Self-Other border' (Fine 1994) by

examining what role I play within those interfaces rather than just sitting on the outside and contributing to 'Othering' of policymakers by only writing about them and setting them starkly apart from myself and other researchers. This social science research plays an important role in agricultural research for development and should not take a back seat to the research on technical solutions to the world's problems.

5.5 Conclusion

The benefit of having knowledge brokers within agricultural research-for-development systems is that research findings are more likely to be used to inform policy formulation and implementation. Knowledge brokers can also help these research institutions better understand the needs of policymakers and shape the research agenda where necessary to meet those needs.

My recommendation is to institutionalize the role of knowledge brokers within research institutions and create specific means of evaluating their performance that are different from how those strictly conducting research are evaluated. They should not be fully tied to short-term projects but must have longer time horizons for their activities so that they have time to build the necessary relationships with other stakeholders in relevant science-policy interfaces.

Finally, agricultural research for development organizations such as CGIAR should develop a research agenda around the topic of knowledge brokering. This can help further our understanding of how knowledge brokers exercise power, the effective qualities of knowledge brokers and the benefits of employing people who have diverse backgrounds outside of research.

CHAPTER 6

6

Discussion, reflections and recommendations

6.1 Introduction

Livestock keepers in eastern Africa, as with many other regions around the world, are dealing with increasingly frequent and severe extreme weather events plus slower onset changes such as increased temperatures and changes in precipitation patterns that are negatively impacting feed and forage availability, milk production, animal growth rates and diseases. These stresses put their livelihoods at risk. At the same time, livestock keepers in eastern African countries are being blamed for contributing to GHGEs and are being looked at as responsible for reducing their livestock emissions (either in absolute terms or in emissions intensities). Deciding how to respond to these challenges requires dealing with ambiguity and understanding how actors within science-policy interfaces exercise power to achieve policy outcomes. The research presented in this thesis, which looked at the role of ambiguity and power strategies in science-policy interfaces, helps provide a better understanding of the framings around climate change and livestock in eastern Africa.

This thesis set out to answer the overall research question: ***What framing and power strategies do actors within eastern African science-policy interfaces use to deal with ambiguity about livestock and climate change in policy discussions?*** I answer this overall question in this first section. I then present the key findings of the specific research questions in Section 6.2. This section also highlights the key conceptual, methodological and empirical contributions from the previous chapters. Section 6.3 discusses the limitations of this research and the potential for future research to further advance knowledge on this topic, and Section 6.4 delves into positionality and reflexivity. The chapter concludes with Section 6.5 focusing on the relevance of this research for society and policy with an emphasis on practical implications.

In answering the overall research question of this thesis, the actors of interest for this research were government technical staff, scientists working on these topics in the region and civil society actors engaged in dialogues on these issues. The research presented here shows that these actors use both adaptation and mitigation framings when it is strategic. This depends on the audience within a given meeting or

conversation, the reason a meeting or workshop was convened and the benefits that can be gained by using different framings.

These actors give adaptation frames higher importance when discussing national priorities and developing country policy documents. As noted in Chapter 3, this aligns the problem and response options for dealing with livestock under climate change with national strategies and policies on climate change. In such documents, it is common for adaptation to be mentioned first with mitigation coming afterward. This was seen in the engagements with the Ugandan stakeholders when developing their long-term climate strategy as shown in Chapter 4. The terms adaptation and resilience were always placed before mitigation in any description of the long-term strategy or its components focused on agriculture sub-sectors. These adaptation-focused framings were prevalent within spaces concentrating on national issues.

Conversely, mitigation framings were employed by actors when addressing global concerns around livestock production and its contributions to climate change. In these cases, the purview of the problem shifted from being about national concerns across multiple sectors to being about concerns around the production of livestock globally and its level of greenhouse gas emissions (GHGEs) in comparison to other sectors. Mitigation framings became especially strategic when there was the possibility of funding to address reductions of GHGEs, as seen in the development of the Nationally Appropriate Mitigation Action (NAMA) for the dairy sector in Kenya. Although Kenya's national priorities focus on adaptation to climate change, most climate finance available globally is related to mitigation. Therefore, for actors to access such funding they need to be strategic in their framing of issues. It is advantageous to acknowledge that livestock production, in this case specifically the dairy industry, is an area where GHGEs can be addressed to access funding that can benefit livestock keepers.

Both adaptation and mitigation framings are combined in the approach of climate smart agriculture (CSA). All three countries include CSA in their national policies and strategies. At the actor level, framing interaction strategies used in meetings where adaptation and mitigation problem and response options were discussed, and which

incorporated or accommodated both adaptation and mitigation framings, were useful in dealing with ambiguity. These strategies were able to bring the two divergent framings closer together and acknowledge that response options within one could also act as a response to the other. Using a CSA approach also helped bring adaptation to greater prominence when the focus became centered on mitigation options.

Specific actors known as knowledge brokers navigate the science-policy interfaces (SPIs) in which livestock and climate change are discussed and interact with other actors to help use evidence to inform policymaking. Their interactions involve both framing strategies and power strategies to deal with ambiguity. As shown in Chapter 3, knowledge brokers use ambiguity strategically to bring actors together to exchange knowledge depending on the context and the purpose. When a funder is using a mitigation problem framing, knowledge brokers form connections with scientists able to advise on baseline emissions levels or interventions that can reduce GHGE intensities. Either the same researchers or others with different expertise more related to adaptative capacity are called upon when adaptation framing and response options are needed. The knowledge brokers are strategic with whom they bring into the SPIs. This is a form of power within those interfaces.

Other ways in which actors in the SPIs exercise power to deal with ambiguity is by investing or withholding resources. This use of material power has been documented in other developing country settings (Butler et al. 2022). The international agencies that have invested in helping Ethiopia, Kenya and Uganda develop CSA strategies and implementation frameworks are using their power over financial resources to reduce ambiguity by applying the CSA approach. Actors within the national governments exercise power in SPIs related to livestock and climate change by appealing to discursive legitimacy and invoking authority. For example, in developing the long-term strategy in Uganda (Chapter 4), the government staff members used their authority to maintain the focus on agriculture sub-sectors as a way to organize the strategy. Other actors within the SPI appealed to their discursive legitimacy by

providing examples of how the strategy would need to be aligned with existing government policies for it to be accepted by the higher government authorities.

This thesis has shown that actors in SPIs use a variety of framing and power strategies to deal with ambiguity around livestock and climate change in policy discussions.

6.2 Key findings answering the specific research questions and contributions to literature

6.2.1 RQ1: How are discussions in science-policy interfaces affected by ambiguity and tensions around livestock and climate change?

Ambiguity around the issue of livestock and climate change leads to differences in problem framing by various actors, although the range of problem framings is similar across Ethiopia, Kenya and Uganda. The problem framing used by different actors depends on their roles, backgrounds, experiences and goals as related to policy processes. The differences in problem framing then lead to tensions around the response options available. For example, actors who use an adaptation problem framing will propose response options that offer solutions for that problem framing. Mitigation-related problem framings will be met with corresponding solutions aimed at mitigation. Neither framing is incorrect, and therefore none of the solutions can be deemed correct or incorrect.

The discussions in SPIs are affected by this ambiguity and these tensions, and as a result the most appropriate response options are not clear. As stated above, the national priorities in the three focus countries are around adaptation of livestock keepers to the changing climate. However, the global mood to address climate change by focusing on emissions from animal agriculture pushes response options within the livestock sector toward mitigation framings. Ambiguity still exists within different mitigation framings though. Different actors present different problem framings around large numbers of animals in pastoralists herds and advocate for response

options that would aim to reduce those herd sizes. Other actors focus on the dairy sector as a low-hanging fruit where, they argue, it is more feasible to achieve mitigation goals through improved feeding and better breeds. These response options are directed toward reducing emissions intensities. Because resources are finite – and because there are so few climate finance resources going to the livestock sector – it is not possible for governments and development partners to work on all these response options at once, and there is no clear way to determine which is more important and should be prioritized.

The lack of agreement on mitigation frames as well as the larger share of climate finance going toward mitigation means that those topics get more attention and discussion. Although it is generally easier to measure GHGEs than it is to track adaptation (Njuguna et al. 2023), the difficulty in establishing baselines and achieving Tier 2 measurements in GHG reporting systems results in adaptation options becoming sidelined because there is less to discuss. There is general agreement that livestock keepers need to adapt but less funding is available to help with this and there is less awareness of how to measure it. This creates a tension between those promoting adaptation framings and response options and those focused on mitigation. The national priorities for adaptation are reiterated within meetings of the SPIs, but when possibilities for funding arise the discussions often shift back to mitigation because of donor interests.

The concept of CSA allows actors in SPIs to bring adaptation back into conversations by highlighting the adaptation pillar of CSA and using the term ‘co-benefits’ to either describe accompanying effects of mitigation response options that boost adaptation or added advantages of adaptation options that will reduce GHGEs. SPIs offer spaces for dialogue where actors can come together, facilitated by knowledge brokers, and co-create knowledge around livestock interventions that achieve both adaptation and mitigation goals simultaneously. This can help shift the framings and bridge the adaptation-mitigation divide. Such co-creation can help deal with ambiguity around problem framing and find common ground for developing mutually agreed actions.

Empirical contributions: Documenting livestock and climate change framings and their uses in science-policy interfaces in developing countries

In conducting the research presented in Chapter 2 and documenting different frames and tensions surrounding livestock and climate change in eastern Africa, I have contributed to filling an empirical gap with evidence that can be useful in addressing livestock and climate change in eastern Africa in a transdisciplinary manner. These content contributions can be formulated for an audience working on climate smart livestock from a technical perspective, allowing actors from different backgrounds and institutions to come together and discuss where their differences lie. Chapter 2 also makes a contribution to the growing body of literature on science-policy interfaces in developing country contexts, which has been noted to have focused primarily on wealthy, industrialized countries in the past (Cairney and Oliver 2017).

Conceptual contributions: Expanding the Multiple Streams Framework to better accommodate developing country contexts

Applying the Multiple Streams Framework (MSF) (Kingdon 1984; Shephard et al. 2020) to a developing country context resulted in two key contributions to the literature around modifying the MSF to be relevant for non-U.S. applications (Cairney and Jones 2016). First, the research presented in this thesis has highlighted the need to include a focus on 'global mood' alongside the 'national mood' within the MSF. From the time that Kingdon first developed the MSF for application within the U.S. in the 1980s, there have been significant changes to global cooperation and policy processes, particularly around climate change and sustainable development. The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, which led to the signing of the United Nations Framework Convention on Climate Change (UNFCCC) was a major milestone in the international process to address climate change (Mintzer and Leonard 1994). These international negotiations now shape national policy processes and funding mechanisms. The global mood surrounding how to address the changing climate must be considered when studying national policy change processes because the national level priorities will be

influenced by these international discourses. This thesis demonstrates how this occurs within the topic of livestock production.

A second conceptual contribution is on the need to consider international organizations within SPIs. Much of the literature on SPIs has focused on industrialized, developed countries (Clark et al. 2016). Chapter 3 of this thesis contributes to the growing body of literature documenting SPIs in lower income, developing countries (Koch 2018). Given this shift in context, this thesis demonstrates that international organizations (research institutes, non-governmental organizations, donors and others) are active and play significant roles in SPIs of developing countries. This research shows that their contributions to these interfaces, including the power strategies they use to influence policy discussions, must be considered when studying SPIs in those contexts.

Methodological contributions: Tracking policy development through document version history

In answering the research question on how ambiguity and tensions affect discussions in SPIs, this thesis also contributed to a data analysis methodology using different document versions to track policy development (Chapter 4). This approach allowed for the tracking of inclusion or removal of specific terms or approaches as the document was developed, and it also allowed tracking of the reorganization of sections within the document across different drafts. These changes were matched with the discussions that happened during key meetings, but the method also allowed for tracking changes made by people with access to the draft and which were not discussed in workshops. This method is similar to Karlsson-Vinkhuyzen (2013) but is not an oft-utilized method, probably because it requires close interaction within a given policy development process. For embedded researchers or knowledge brokers who wish to document how a policy or strategy was formulated and what contributed to its final design, this method may be useful in combination with participant observation of the policy process.

6.2.2. How do national and international actors use interactional framing and power strategies within science-policy interfaces related to livestock and climate?

In addition to exploring how discussions in SPIs in eastern Africa on livestock and climate change are affected by ambiguity and tensions, this thesis also examined ways in which actors interact to co-construct problem frames and what power strategies they use to help deal with these ambiguities and tensions. The research was based on interactional framing theory which holds that framing differences are created when actors use different frames that are not compatible. These framing differences are then dealt with through six possible interaction strategies (Dewulf and Bouwen 2012). International and nongovernmental actors in the SPIs shape discussions through use of pragmatic and framing power (Morrison et al. 2017). This power can be used to shape the outcome of decisions made within SPIs.

The use of interactional framing strategies was documented in this thesis primarily in Chapter 2. After presenting the different problem framings in use in the SPIs, I used examples from meeting transcripts to illustrate the interactional framing strategies that were employed by the actors involved. I found general agreement around adaptation frames and less agreement on mitigation frames. This resulted in more attention on mitigation frames during discussions. Consequently, there was less substantial discussion on adaptation problem framings and related response options. Some actors used the interactional framing strategy of reconnection, in which an actor accepts a challenging element from another speaker and links it with their own framing in an indirect way, to highlight the adaptation pillar of CSA and bring an adaptation framing into the discussion using the term 'co-benefits'. This strategy allowed actors to bring adaptation and mitigation framings closer together and to highlight the dual nature of many climate-related interventions in the livestock sector. This strategy for addressing ambiguity is similar to the dialogical learning and negotiations strategies identified within natural resource management settings (Brugnach et al. 2011).

This research question was also addressed by examining the use of power strategies in Chapter 4. This chapter highlighted the use of discursive legitimacy and invoking of

authority to shape the Uganda agriculture LTS document and deal with the tensions as they arose. The national government actors from the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) employed their authority to guide how the document was shaped in terms of aligning the objectives to the sub-sectors already outlined in existing policy documents. Members of the SPI engaged in developing the LTS also used their discursive authority generated by many years of acting in the science-policy space in eastern Africa to shape the document in a way that kept it focused on the climate change related aspects without getting too broad and encompassing general agriculture development related issues. Both national and international actors also exercised power through investing human resources in the LTS development process. Those that participated in the physical meetings were able to exercise greater power than those submitting suggestions to the document virtually.

Looking beyond the specific examples involved in this research, research for development organizations such as CGIAR should be aware of how the various resources they bring to SPIs are ways of exercising power. Chapter 5 highlights my perspective from this research and my other experiences in SPIs and engaging with knowledge brokers on how human resources, financial resources and access to data/evidence are forms of power we exercise when engaging in SPIs to achieve outcomes of informing policy.

Empirical contributions

The research contained in this thesis that addresses this second specific research question made an empirical contribution to the literature by demonstrating an application of the power in/power over framework (Dewulf and Elbers 2018) in a developing country setting. The presentation of these findings can be useful not only for other social scientists interested in the interactional framing strategies and power dynamics within SPIs but can be of practical application for livestock technical scientists who wish to have a better understanding of how they can more effectively and conscientiously engage with decision makers who can benefit from their research. The co-authoring of Chapter 4 with two of the key knowledge brokers in the

Uganda LTS science-policy interface also demonstrated the transdisciplinary nature of this thesis. Before the joint analysis and writing of that chapter, my policy practitioner co-authors told me they had not considered the power dynamics of an SPI in such a way. It helped them to see the different ways in which they and others in the interface were exercising power.

Conceptual contributions

This research contributes conceptually to the field of livestock and climate change technical research and the literature on power within SPIs. The findings presented on how interactional framing strategies are used to deal with ambiguity are a contribution to the technical field of livestock and climate change research because understanding how actors engage with each other and with different problem and response option framings can help livestock technical scientists understand with whom they need to engage to share their findings more effectively. It can also help such researchers better understand their sources of power when engaging in SPIs.

The application of the power in/power over framework to science-policy interfaces in Chapter 4 provides an example of how this framework can be used beyond cross-sector partnerships. The suggestion to consider adding 'access to evidence' as a fourth source of power in this framework is a contribution to the concept of power within SPIs. As research for development organizations increasingly engage with decisionmakers to inform policy, as highlighted in Chapter 5, it is useful for the knowledge brokers and scientists involved in those efforts to have a framework they can use to examine the sources of power held by which actors, including themselves.

6.2.3 How can knowledge brokering help agricultural research-for-development organizations better achieve their aims of informing policy?

Answering this specific research question was aided by the transdisciplinary nature of this thesis. Bringing together a variety of actors in the science-policy interfaces created by the Program for Climate Smart Livestock (PCSL) allowed me to collect data on how people with different expertise and different objectives shared information. By observing those actors that I identified as knowledge brokers, as well as by

examining my own behavior and actions as an employee of an agricultural research-for-development (AR4D) organization (see section 6.4 for more on this topic), I was able to see how knowledge brokering is a key activity for using evidence to inform policy. The research presented in Chapter 3 illustrates how knowledge brokers are active across all three streams of the Multiple Streams Framework: the problem stream, the policy stream and the political stream. Documenting how knowledge brokering across all three streams can help AR4D organizations identify how to more effectively engage in partnerships and advocacy that lead to the goal of policies that are informed by science without these organizations (or their researchers) becoming policy entrepreneurs (Mintrom and Norman 2009; Cairney 2018) which makes some scientists uncomfortable.

One of the recommendations I put forward in Chapter 5 is for AR4D organizations to support knowledge brokers with partial core funding to retain them within the institution and provide them some respite from project-based timelines. This would allow them to remain part of ongoing science-policy interfaces in the countries where they are based or networks to which they belong. Long-term engagement (more than a three-year typical project cycle) in these SPIs helps these knowledge brokers build and maintain their credibility and also helps add in the element of iterativity through which continuous, dynamic and multi-directional interactions take place in SPIs (Sarkki et al. 2015). The feedback loops that are created through this iterativity in SPIs allows knowledge brokers to help guide organizational research priorities based on needs expressed by policymakers. This, in turn, can help AR4D organizations better achieve their aims of informing policy because their research becomes better tailored to policymaker needs.

Conceptual contributions

This thesis has made two conceptual contributions to the Multiple Streams Framework, both presented in Chapter 3. First, I have documented how knowledge brokers are active across all three streams of the MSF through the case study of the livestock and climate change science-policy interfaces in eastern Africa. Previously, knowledge brokers were conceived of as only being active in the problem stream

(Knaggård 2016). Showing how knowledge brokers operate also in the policy and political streams builds on the framework. Additionally, I have joined with others in proposing the inclusion of international actors in the MSF. Cairney and Zahariadis (2016) suggest that international organizations or other countries could exert external influence on other countries' policy agendas, and Ridde (2009) documents how UNICEF and WHO coupled the political and policy stream to implement a health policy in Burkina Faso. In a recent review of the MSF in new political contexts, the authors identify a distinct policy entrepreneur role for international civil society actors (Shephard et al. 2020). This thesis confirms that international actors need to be considered as playing key roles in policy agenda setting and decision-making processes.

6.3 Limitations and future research

The search for knowledge will never be complete, and there are additional questions that emerge from any research. Based on the findings presented in this thesis and the limitations that were inevitable in the research, several future research topics can be identified.

First, this thesis has only presented research focused on the national level, and it was not feasible within the time span of this project to look at regional or international levels or to go down to sub-national levels or into detail around specific livestock production systems. In the future, additional research could examine how power strategies and framing are used at an international level around livestock and climate change, particularly in UNFCCC negotiation processes. Comparative research on frames around livestock and climate change used in eastern Africa and those used in other regions could also shed light on how local contexts influence problem framings and their related response options. Investigations into possible response options not identified due to a lack of corresponding problem framings may lead to potential interventions previously unconsidered for a given country, region or production system.

Second, not all actors were represented in the SPIs under study; international donors and private sector actors were notably absent. It is not clear what this means for programmatic action. Future transdisciplinary research should engage more deliberately with such actors and could help identify additional problem and response framings. After most of the data for this thesis had been collected, the topic of carbon markets and rangelands rose in importance, especially in Kenya. Research on interactional framing and power strategies involving discussions on this topic could be useful for charting a way forward for Kenya and other countries and would engage more with private sector actors.

Third, the research contained in this thesis was limited in scope and stopped at the discursive level. Future research could go further and take stock of what interventions are being implemented in the livestock and climate change space and how these interventions match with national priorities and donor/investor objectives. Globally, very little climate finance is going toward agrifood systems, and climate finance for adaptation is declining (Galbiati et al. 2023). Future research could help actors in science-policy interfaces engage with practitioners to demonstrate the disconnects between national priorities and project funding and implementation.

6.4 Positionality and reflexivity: Multiple identities, inside and out

It is necessary for researchers to disclose their positionality in relation to their work to acknowledge how it has affected their research and findings (Holmes 2020). My positionality can be described by locating myself in terms of (1) the research participants, (2) the research context and process, (3) the research subject (Savin-Baden and Major 2010). I will first situate myself in relation to the research participants. Discussions on positionality and reflexivity often include references to the insider-outside debate. In the case of this PhD research, I consider myself to hold multiple identities (Stryker and Burke 2000) and to see these as situated along a continuum rather than as binary states (Holmes 2020; Merton 1972). I acknowledge

that there are certain aspects that are static and I cannot change, and I will also describe these. As a white female, first impressions of me formed by national government staff in the focus countries of research or by other international scientists in the research space may lead people to believe I am a temporary resident in Kenya, here to do research for my PhD and then planning to move on to another research position elsewhere. I am constantly faced with the need to establish my position as being married to a Kenyan and having gained Kenyan citizenship since moving to the country in 2010. Conversations around the farming business of my husband and my two Kenyan-US children have helped me gain credibility with national policymakers and knowledge brokers over many years. My contacts now even do some of this credibility establishment on my behalf. For example, during a meeting with a high-level official in the Kenyan Ministry of Agriculture and Livestock Development, one of the knowledge brokers who has been a key part of this research made a point of highlighting my Kenyan-ness to the ministry official to help break the ice.

I find it important to establish myself as a Kenyan citizen quite frequently when I meet someone new because people make assumptions about me due to my skin color and accent. When I dispel these assumptions, and thereby bring attention to my multiple identities as a US citizen and a Kenyan, a researcher and the wife of a local farmer, I gain greater acceptance as part of the agricultural and climate policy community in Kenya and among continental level policymakers in Africa. Many years of building these relationships resulted in my inclusion in the Kenyan delegation listed as an agriculture negotiator at COP28. This highlights my multiple identities as someone involved in the livestock research community but also someone with a deep knowledge of climate change policy processes across scales. I consider this to make me an insider in science-policy interfaces. Before beginning the research for this thesis I was already a member of such an interface, and therefore I have taken an emic perspective within this research (Holmes 2020). This insider perspective has afforded me a great deal of access to the research participants and also enhanced my perspective through which to interpret the data. Conversely, I have received pushback on some of my publications for taking too much of a 'practitioner' perspective. I have come to understand that there is no ideal perspective from which

to view the issues. There are advantages and disadvantages of various positionalities, and how one views these depends on one's own nature and positionality.

Another aspect I cannot change is my age. I consider myself a non-traditional (read: older) PhD student, which is not unique among those working toward PhDs in eastern Africa but is unusual for others from my background. I started as a PhD student at 39 and will finish when I am 44. In the research context of science-policy interfaces in eastern Africa, this has been an advantage because youth are not always afforded as much respect as older people. Beyond age, I will admit that I did not always feel completely comfortable as a PhD student because I do see myself as more situated within the policy and practice community. In this sense, while I am an insider within the science-policy interface research context, I feel more comfortable toward the policy end of the science-policy continuum even though I am employed in a research-for-development organization.

This brings me to my positionality with the research context and process. I continued to work my 'regular' job within the International Livestock Research Institute (at varying levels of effort) while doing this research. The research process was very applied work, and it was hard to put a clear definition on 'data collection activities' because almost everything I was doing for my other work was related to the research topic. Over the years of working on the PhD my role as a student decreased and the paid work increased. Many people with whom I interact assume I am already finished. In this sense, some of the conversations I had with people had significance for me as related to my research, but for them were perhaps just casual work talk. In these cases, I would often refer to my ongoing PhD research on science-policy interfaces to show how the topic was related. I also had the opportunity at times to refer people to some of my published articles and found it helpful to raise the subject of knowledge brokering and policy engagement with others in CGIAR who are doing similar work.

This made the work even more applied and transdisciplinary because I could discuss this as a research topic with scientists from other disciplines who were interested in reaching policy makers with their evidence. Studying the problem from different theoretical perspectives is one way of incorporating reflexivity into transdisciplinary

research (Knaggård, Ness, and Harnesk 2018). Conducting my research as a participant observer embedded in science-policy interfaces from the science side gave me a great deal of insight into how evidence sharing can be improved for greater effectiveness. Another aspect of my embeddedness and relationship to the research context is that as other scientists learned of my 'ins' with east African policy makers, it seemed that I became more valued as a way to reach the target audience for some engagement activities. This required further reflections on what power I might possess within partnerships and how to navigate those responsibilities on both sides.

Finally, my positionality in relation to the research subject of livestock and climate change has altered over the course of the PhD project. When I began the research with identifying the problem and response options and frames, I felt relatively neutral toward each of them. As time passed and I continued interacting with the research subjects (both policymakers and researchers), I have found myself moving more toward advocating for the importance of adaptation response options. The inputs of my university supervisor were important for helping remind me to take a step back and maintain the role of science-policy interface researcher at times whenever this started to become a blind spot.

As with any research, there is a need for understanding one's positionality and undertaking reflexivity throughout the research process. Navigating multiple identities perhaps requires even more frequent reflexivity to continuously examine the different roles played and how they might affect each other. Inhabiting different roles and stepping back to look at how this has affected my views on the topics, my relationships with the research participants and my role in the research process has enriched the findings presented in this thesis. For those engaging in science-policy interfaces, understanding their positionality can help them understand how others may see them and identify ways they can work to establish greater credibility or legitimacy if done with authenticity.

6.5 Recommendations

The aim of this research has been to help actors within eastern Africa livestock and climate science-policy interfaces to better understand the framing and power strategies in use and how to engage with them to deal with ambiguity in their work. Being transdisciplinary in nature, the research process and collaboration with participants has already aided in some of the findings making their way into people's thought processes. Additional recommendations for the livestock debate in general and for science-policy interfaces and knowledge brokers are below.

6.5.1 Recommendations regarding the livestock and climate debate in general

Given the ambiguity surrounding the issues, there will never be complete agreement between actors on the most appropriate interventions. This thesis, however, offers suggestions on how to find common ground. By identifying actions that can simultaneously address adaptation and mitigation within eastern African livestock production systems, these two problem framings can be addressed with a common response option. Technical, climate-smart solutions in the livestock sector that meet both objectives are possible. This may not always be the case, and in instances where one framing emerges more strongly than another this research provides some strategies for actors to accommodate, incorporate or explore the framings of others.

My recommendation is that actors engaged in the livestock and climate debate should appreciate the specific context of the livestock production systems and agroecological conditions around which the debate is situated. Lumping together all livestock production is not productive and ignores too many differences between systems. A better understanding of the framings of other actors and their histories and backgrounds can also help actors have more fruitful interactions. This research has shown that international actors should be cognizant of the context in which livestock keepers in eastern Africa are operating and therefore the problems that decisionmakers are trying to address in their climate policies. Recognizing these different aspects can help address interaction problems within SPIs (Van Enst, Driessen, and Runhaar 2014) and lead to more effective communication between actors. Similarly, those from scientific disciplines focused on livestock production

(animal nutrition, forage agronomy, animal health, etc.) can gain a broader perspective of how their research fits into policy making processes and how it contributes to international climate debates. They can strategically make use of knowledge brokers who are able to take the complex issues and interpret the knowledge to be understandable in these political contexts. This can help get their specialized evidence translated into socially relevant transdisciplinary outcomes (Meinke et al. 2006).

6.5.2 Recommendations for actors in science-policy interfaces

This thesis also offers insights into science-policy interfaces within developing countries and the perspectives of various actors participating in knowledge brokering activities. For research organizations engaging in these interfaces, reflecting on their various forms of power is essential to avoid overshadowing local actors or usurping authority from national governments. It is also important for researchers from technical backgrounds to have a deeper understanding of issues around framing and interaction strategies so they can more effectively engage with others in SPIs to promote the use of evidence in decision making. This research also offers lessons for policy makers to understand interaction strategies, navigate ambiguity and consider a wider range of viewpoints to build more inclusive policies.

Individuals who engage in knowledge brokering activities can benefit from this research by understanding the importance of being reflexive on their roles in science-policy interfaces and giving greater consideration to aspects of power and framing. By increasing their awareness of ambiguity and how to address it knowledge brokers can help other actors find the common ground that is needed to evaluate which interventions will help meet the intended outcomes of different actors. As noted in other research, co-production of knowledge and active reframing of issues can help knowledge brokers act as a conduit between scientists and policymakers (Gluckman, Bardsley, and Kaiser 2021). This thesis has demonstrated that effective knowledge brokers not only help with framing problems but also are key enablers of finding relevant response options and identifying opportunities to capitalize on political will to address a given problem.

As CGIAR undergoes its current reform and seeks to achieve greater impacts through engaging in decision making and policy making, its leadership should consider how to make use of existing knowledge brokers not just at national levels but also at regional, continental and international levels. Science-policy interfaces such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) offer avenues for scientists to place their work in a societal context. Engaging in these processes (at any level) requires time and persistence. CGIAR can foster a more deliberate culture of knowledge brokering by incentivizing these activities of supplying information and making connection between researchers and decision makers alongside the more traditional evaluation metrics for scientists such as publications. This can aid knowledge brokers to engage in science-policy interfaces as part of an expanded role in their research-for-development institutions.

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Annexes

Annex 1. Meetings attended as part of participant observations

Date	Meeting	Location
9 December 2019	Kenya PCSL Learning Platform meeting Topic: presentation of a policy coherence report	Nairobi
14 January 2020	Preparatory meeting for high level Ministry of Agriculture meeting	Nairobi
21 January 2020	Preparatory meeting for high level Ministry of Agriculture meeting	Nairobi
17 February 2020	Post COP25 Kenya civil society meeting	Nairobi
19 February 2020	Regional partner visit to ILRI campus	Nairobi
29 July 2020	Scenario development for Kenya long-term strategy in agriculture	Online
30 July 2020	PCSL regional online workshop for Learning Platforms Topic: GHG mitigation in agriculture	Online
6 August 2020	PCSL regional online workshop for Learning Platforms Topic: Climate change adaptation in East African livestock systems	Online
13 August 2020	PCSL regional online workshop for Learning Platforms Topic: Scenarios for change: using the future to enable transformative change	Online
2 September 2020	Development of a credit line with environmental conditionalities for the dairy sector in Kenya	Online
12 November 2020	Building back better through accelerated implementation of Kenya Climate Smart Agriculture Strategy (webinar)	Online
25 November 2020 2 December 2020	PCSL Learning Platform Kenya futures thinking workshop (2 half-day sessions)	Online
12 April 2021	Developing a common Kenyan position on the Koronivia Joint Work on Agriculture	Online
21 April 2021	Kenya PCSL Learning Platform meeting Topic: Livestock in Kenya's NDC, small ruminant emissions factors, and adaptation tracking	Online

Annex 2. Coding structure used

Ambiguity

- Contradicting data
- Disagreement on time scale of importance
- Disagreement on what the issue is
- Focus on cattle, lack of emphasis on other species
- Knowledge on CC
- Non-existence of ambiguity
- Priority setting
 - Donors and funding driving priorities
 - International discourse influence on national agenda
 - Priorities driven by internal national priorities
- Questioning of data

Frames

- Issue frames
 - Adaptation issue
 - Attraction of finance
 - CC impacts on livestock production
 - Drought
 - Feed and fodder
 - Heat
 - Pasture and grazing
 - Rain and water variability
 - Future of pastoralism
 - Governance concern
 - Concerns about institutions and capacity
 - Implementation of policies
 - Policies not supportive of livestock keepers
- Livestock development challenges
 - Conflicts over resources
 - Diseases
 - Environmental degradation
 - Extension
 - Feed availability and quality
 - Intensification
 - Investment in the sector
 - Land tenure
 - Poor markets
 - Problems with breeds
 - Productivity
 - Sustainability
 - Weather challenges
- Livestock excluded from CSA discussions
- Mitigation issue
 - Absence of or problems with data

- Emissions intensities
- Multiple purposes of livestock
- Resilience
- Social inclusion concern
- Technical concern
- Trade-offs
- Relationship frames
 - Coordination between actors
 - Information co-production
 - Information sharing
 - Integration and info sharing of research programs
 - Local research not up to international standards
 - Policy makers not interested in social concerns
 - Researcher engagement with decision makers
 - Science-policy collaboration
 - Staff overturn
 - Technical info too technical
- Response option frames
 - Adaptation to CC
 - Climate smart practices
 - Extension
 - Intensification incentives and activities
 - Low emissions development
 - Mobility
 - MRV
 - NAMA
 - NDC
 - Negotiations
 - Policy
 - Rangeland management SLM
 - Research
 - Resource mobilization
 - Risk reduction
 - Synergies between adaptation and mitigation

Multiple Streams Framework

- Coupling of streams
- Knowledge brokering
 - Creation of credibility
 - Formation of coalitions and partnerships
 - Interpretation or translation of knowledge
 - Multi-stakeholder platforms
 - Use of knowledge in a political context
- Policy stream
 - Policy and program design
 - Policy review or revision
- Politics stream

- Political motivation
- Political opportunity
- Political will
- Problem stream
 - Competing priorities
 - Identification of CC as a problem for livestock
 - Lack of data for MRV
 - Livestock as a problem for environment

Summary

Livestock production systems in eastern Africa are being negatively affected by climate change while also contributing a large share of national greenhouse gas emissions (GHGEs) for the countries in the region. This dilemma of livestock being both affected by climate change and contributing to it is one dimension creating ambiguity around how to frame the problem. There is ambiguity, in part, around whether the most important problem is the negative impacts that livestock keepers are facing because of the changing climate or the relatively large contribution of livestock production to GHGEs within the region. What takes priority as the most important problem to address depends on one's background and experience. The different problem framings and potential responses are discussed within science-policy interfaces by actors from various institutions holding diverse views.

This thesis highlights the complexity and multifaceted nature of these science-policy interfaces related to livestock and climate change in eastern Africa. Science-policy interfaces are spaces in which discussions between researchers and decision makers take place as a way of informing policy with evidence. **Chapter 1** introduces this along with other key concepts and theories used in the research. The objective of the overall thesis is to answer the question *What framing and power strategies do actors within eastern African science-policy interfaces use to deal with ambiguity about livestock and climate change in policy discussions?* This chapter also introduces three specific research questions which are then answered in the subsequent chapters.

The specific questions are:

1. How are discussions in science-policy interfaces affected by ambiguity and tensions around livestock and climate change?
2. How do national and international actors use interactional framing and power strategies within science-policy interfaces related to livestock and climate?
3. How can knowledge brokering help agricultural research-for-development organizations better achieve their aims of informing policy?

Chapter 2 contributes to answering the first and second specific research question. It explores the frames around livestock and climate change used within science-policy

interfaces in the focus countries of Ethiopia, Kenya and Uganda. It describes the tensions between adaptation and mitigation and the interactional framing strategies used by actors to navigate these tensions. The findings show that emphasis is given to framings describing livestock and climate change problems and less to response framings. While adaptation and mitigation are both used as issue frames in general discussions, funding availability to address climate issues draws attention to the need for measurement, reporting and verification systems, leading to more concrete discussions on mitigation-related response options and less attention on adaptation. Actors use different interactional framing strategies to co-construct meaning around problems and response options, highlighting the need for governments and partners to co-create knowledge on how livestock interventions can address adaptation and mitigation simultaneously to move away from the adaptation-mitigation divide in response framings.

Chapter 3 focuses on Kenya and the roles that knowledge brokers play within science-policy interfaces. It contributes to answering specific questions 1 and 3. Using the Multiple Streams Framework, the chapter demonstrates that knowledge brokers are active in all three streams. The chapter identifies ambiguity within the problem stream where actors recognise adaptation and mitigation as dual challenges of livestock and climate change. In the political stream, nationally defined priorities and external funding possibilities influence the political will and motivation to adopt identified response options. There are opportunities for knowledge brokers to address the ambiguities and translate knowledge during windows of opportunity when the streams are being coupled, but challenges exist, resulting in slow and inadequate development of policies. The chapter also demonstrates the need to consider international organizations as actors helping shape problems and share knowledge on potential response options within the relevant science-policy interfaces.

Chapter 4 presents a broader perspective of agricultural development within the context of low emissions resilient development in Uganda. This chapter uses the power in/power over framework to examine how actors exercise power to address

tensions and shape policy decisions within science-policy interfaces and in doing so helps answer RQs 1 and 2. The findings show that national and international actors used financial and human resources, discursive legitimacy and authority as sources of power in strategies to influence the rules of the game in a science-policy interface and to shape the strategy document being produced. Throughout development of the policy document, the tensions that arose centered on the competition between local adaptation goals and global mitigation goals, the debate on narrower agriculture development goals versus a broader food systems approach and the need for general agricultural development weighed against a focus on addressing climate change challenges.

Zooming out even further, **Chapter 5** draws on more than a decade of personal experience within the agricultural research-for-development space and presents my perspective on how incorporating clear roles for knowledge brokers into research-for-development organizations can help better make use of evidence within policy and decision making, speaking to RQs 2 and 3. This chapter argues that encouraging knowledge brokering activities by scientists and others who are able to take complex technical findings and translate them to be relevant in a societal context can help research-for-development institutions ensure their research is reaching those who can use it for policy making.

Chapter 6 offers a synthesis of the findings from chapters 2-5 and provides answers to the overall and sub-research questions along with thoughts on a future research agenda. It highlights how actors, including government technical staff, scientists, and civil society representatives, strategically employ both adaptation and mitigation framings depending on their audience, objectives, and the potential benefits of each framing. This dual perspective, enabled by using the climate smart agriculture approach, allows actors to address the ambiguity and tensions between local adaptation needs and global mitigation imperatives. It also emphasizes the pivotal role of knowledge brokers in science-policy interfaces. These specific actors are adept at using framing and power strategies to inform policy discussions. Knowledge brokers strategically connect actors and resources to facilitate the co-creation of

knowledge and bridge the gap between adaptation and mitigation strategies. This chapter identifies the empirical and conceptual contributions of this thesis to understanding how science-policy interfaces function in developing countries, suggesting that international actors and global moods significantly influence national policy processes.

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Those who know me well know that I have a terrible memory, so if I have forgotten to name and thank anyone here it is entirely unintentional. Thank you to everyone who has helped me on this adventure.

About the author

Laura Cramer grew up in Stroudsburg, Pennsylvania, USA. After completing high school, she attended the Honors College at Indiana University of Pennsylvania (IUP) where she majored in Anthropology with a focus on food and nutrition. She then worked for Counterpart International in Washington, DC on various food security and sustainable agriculture projects for three years. She spent one year working on Fully Belly Farm in Guinda, California learning about sustainable agriculture firsthand.



Laura started a master's degree in international agricultural and rural development at Cornell University in 2006. Following her coursework, she was employed in the Emerging Markets Program and then the Cornell International Institute for Food, Agriculture and Development (CIIFAD, now known as Cornell Global Development). She completed all her degree requirements and earned her MPS degree in 2010.

Laura moved to Kenya in 2010 where she started consulting for several organizations, including the International Livestock Research Institute (ILRI). After several years of consulting assignments, she became fully engaged with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). In 2019, she had the opportunity to join the Program for Climate Smart Livestock (PCSL) as a PhD Fellow and began as an external candidate at Wageningen University. She continued working part-time, and when CCAFS came to end she transitioned to working for the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project and several other projects at ILRI. Laura's research interests are in science-policy interfaces, stakeholder engagement, international climate negotiations and food systems policy and decision-making.

Laura Katherine Cramer
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan



Wageningen School
of Social Sciences

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
A1 Managing a research project			
WASS Introduction Course	WASS	2019	1
Research internship (work with CCAFS)– position as Science Officer in Flagship on Policies and Priorities for CSA	CCAFS/CGIAR	2020	4
<i>“Knowledge brokering within the Multiple Streams Framework: The science-policy interface for livestock and climate change discussions in Kenya”</i>	5th International Conference on Public Policy (ICPP5), virtual presentation	2021	1
Scientific writing and publishing	Nature Masterclass	2020 - 2021	0.4
Journal peer reviews	<i>Evaluation and Program Planning Weather, Climate and Society Earth System Governance</i>	2021 - 2022	3
PhD writing retreat	WASS	2022	1
A2 Integrating research in the corresponding discipline			
Qualitative Research: Epistemology and Methods	ILRI/WUR	2020	6
Analysing Discourse: Theories and Methods CPT56306	WUR	2020	6
B) General research related competences			
B1 Placing research in a broader scientific context			
Research methodology: from topic to proposal (completed remotely with Peter Tamas)	WASS	2019	4
LAND01x: Landscape Leadership: Catalyse Sustainable Development in Landscapes	WageningenX	2020	1
Capacity Development Fellows Seminars at ILRI (certificate?)	ILRI	2019 - 2020	0.4
Presentation at Water and Climate Governance seminar	PAP	2021	0.2
FFESx: Sustainable Food Security: The value of systems thinking	WageningenX	2020	2
Nvivo training	ILRI	2020	1

B2 Placing research in a societal context			
Blog posts (2)	CGIAR	2019 - 2022	0.2
Guiding investments in climate-smart livestock systems in east Africa			
Building continental capacity for African climate leadership			
Engagement = Communication = Value	ILRI	2020	0.5
Online magazine article: Climate change is already hitting Africa's livestock - here's how to address the risks	The Conversation	2021	0.3
Co-organization of National Learning Platform meetings in Ethiopia, Kenya and Uganda as part of ILRI's Program for Climate Smart Livestock	ILRI	2020 - 2021	1
Facilitation of pre-COP27 AGNES workshop	African Group of Negotiators Expert Support	2022	1
Engagement at COP27	ILRI	2022	1
C) Career related competences/personal development			
C1 Employing transferable skills in different domains/careers			
Supervision of a student intern (Edwige Marty)	ILRI/CCAFS	2020	1
Total			36

*One credit according to ECTS is on average equivalent to 28 hours of study load

Colophon

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