

BLANCA GONZÁLEZ-MON
DEVELOPMENT DISSERTATION BRIEF

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TRADE NETWORKS AND SOCIAL RELATIONSHIPS IN CHANGING SOCIAL-ECOLOGICAL SYSTEMS



Trade Networks and Social Relationships in Changing Social-Ecological Systems

Blanca González-Mon

Development Dissertation Brief, 2024:02

to

The Expert Group for Aid Studies (EBA)

Blanca González-Mon is a postdoctoral researcher at the Stockholm Resilience Centre, at Stockholm University. She works as a sustainability scientist developing and applying methodologies that bring together empirical knowledge of diverse case studies and methods rooted in different disciplines. Her research aims to understand complex human-environmental problems, such as the adaption and transformation of food systems in a poly-crisis context.

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Sammanfattning

Dagens livsmedelssystem är alltmer sammanlänkade, på lokal, regional och global nivå, och står inför stora utmaningar. Man kan tala om en ”polykris” som påverkar produktionen och handeln med livsmedel på olika nivåer. De nätverk som binder samman livsmedelsproduktionen med konsumenter runt om i världen behöver förhålla sig till flera typer av pågående förändringar.

Denna avhandling av Blanca González-Mon undersöker vilken betydelse olika handelsnätverk har för anpassningen till olika förändringar inom dagens livsmedelssystem, genom fallstudier av fiske- och jordbruksnäringen i Mexiko och Sydafrika. Handelsnätverk kan ses som komplexa sociala system som omfattar en rad olika sociala relationer mellan aktörer på olika nivåer. Några av resultaten i avhandlingen kan vara av särskild relevans för internationellt utvecklingssamarbete. För det första är det viktigt att förstå de ömsesidiga beroenden som finns mellan olika aktörer. Det kan finnas ett behov av att bedöma sådana beroenden när man utformar och genomför internationella samarbetsprojekt. Risker med att ignorera sådana beroenden är till exempel oönskade kaskadeffekter, exempelvis på fiske- och jordbruksnäringar i andra länder.

För det andra kan man bidra till leverantörskedjors motståndskraft mot förändringar genom en bättre förståelse för befintliga relationer och hur de är socialt strukturerade i nätverk. Detta påverkar leveranskedjornas förmåga att hantera förändringar.

Sammanfattningsvis efterlyser avhandlingen en större medvetenhet om komplexiteten i våra livsmedelssystem, och hur de påverkas av de stora utmaningar som vi står inför.

Abstract

Food systems today are increasingly interconnected across local, regional and global scales, facing a context of poly-crisis that is affecting the production and trade of food. Thus, the trade networks that connect food production to consumption around the globe face the need to respond to multiple types of changes. This thesis investigates the role of trade networks, which are embedded social relationships, in responding to changes across different food systems, including case studies of fisheries and agriculture in Mexico and South Africa.

This thesis by Blanca González-Mon has two key findings of relevance for international development cooperation. First, there is a risks of unintended cascading effects when ignoring interdependencies across different geographies and spatial scales, which highlights the need for assessing such interdependencies when designing and implementing international cooperation actions.

Second, there are opportunities in engaging with social relationships interlinked with trade to contribute to supply chain resilience in international development contexts, beyond local-level actions. This requires a better understanding of existing relationships, and how they are socially mediated and structured in networks, influencing the capacity of supply chains to deal with change.

Overall, the thesis calls for a complexity-aware approach that accounts for the social and social-ecological embeddedness of cross-scale food production and trade systems.

1 Introduction

Our food systems are experiencing major challenges. In a world shaped by globalization, a diversity of actors, relationships and networks, connect food producers in different geographies to consumers near and far. Thus, food systems are increasingly interconnected. Changes to food systems can emerge at local, regional, and international level, cascade through trade networks and affect multiple actors in ways that are often unpredictable and increasingly complex (Folke et al., 2021; Galaz et al., 2011; Österblom et al., 2017).

The production and distribution of food is affected by environmental changes, such as those driven by climate change (e.g., increased frequency of extreme events such as droughts). Such changes threaten the capacity of agricultural systems to guarantee food security, as described in a recent report by The Intergovernmental Panel on Climate Change (IPCC) (Mbow et al., 2019). In fishery systems, oceanographic changes are changing the availability and distribution of fish, affecting fishing communities around the globe (Cheung et al., 2010; Pinsky et al., 2020).

Several other political, economic and social factors are also affecting our food systems. For example, the Russia-Ukraine war affects food insecurity in import dependent countries, and the COVID-19 pandemic triggered changes that affected supply chains, from the local to global scale (Moseley & Battersby, 2020; Wood et al., 2023). Therefore, actors need to respond to multiple types of changes that simultaneously affect food systems.

Trade and trade networks are often seen as a mechanism that can respond to changes such as environmental shocks, especially when diverse types of markets and sources of food are included (Kummu et al., 2020; Wood et al., 2023). However, trade networks can also displace impacts across geographical regions and create spillover effects (Crona et al., 2016; Lewison et al., 2019; Liu, 2017; Zimmerer et al., 2018). These effects occur, for instance, when changes in

one country or location affect others, such as changes in fisheries policies in the US to address turtle bycatch that increased bycatch in other regions (Lewison et al., 2019).

Thus, trade creates interactions across spatial scales (i.e., cross-scale interactions), where production regions or communities can influence each other through their geographical connectivity. There is a need for a better understanding of this type of cross-scale interactions created through trade. This is addressed in this thesis by providing conceptual and methodological insights on the role of cross-scale connectivity. Actions that ignore such complexity risk creating unintended social and/or environmental outcomes (Levin et al., 2013; Lewison et al., 2019).

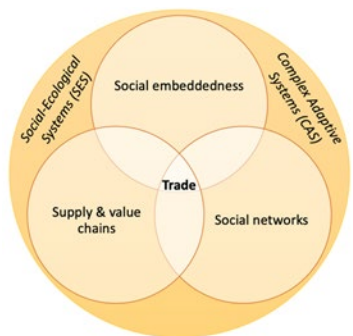
In addition, this thesis addresses a related research gap. That is the need to understand the role of social relationships and social networks for actor's capacity to respond to changes. In particular, the social relationships and network that mediate trade interactions.

Previous research has shown how trade is often embedded in social relationships, for example relationships of trust and commitment (Drury O'Neill, 2018; Fabinyi et al., 2018; Granovetter, 1985). Moreover, trade can also coexist with the exchange of different services between trading actors (e.g., loans), which may occur through formalized contracts or informal arrangements (Basurto et al., 2020; Liverpool-Tasie et al., 2020). This thesis provides insights regarding the types of relationships that coexist in food trade networks and how they can influence the capacity of food system actors to respond to changes. The thesis considers diverse types of changes, including but not constrained to environmental changes, and the multiple types of responses that fishers, farmers, and other supply chain actors may use to deal with such changes.

1.1 Aim

In this report, I will focus on one of the overarching research questions of the thesis: **What social relationships are interlinked with food trade networks and how do they influence fishing and farming practices to respond to changes?** The focus is on the social-ecological interactions, and on how these are mediated through trade networks. This implies moving beyond food production activities, to consider how diverse food system actors deal with changes. To do this, trade is conceptualized with a social-ecological perspective, drawing from concepts with diverse disciplinary origins (Figure 1 and Table 1).

Figure 1: Conceptualization of trade in this thesis based on the relationships between different concepts (see Table 1)



Source: González-Mon (2022).

It is important to highlight that a social-ecological perspective puts the focus on understanding the complexity of the relationships involved in food production and trade, where trade is embedded in economic, social and ecological systems (Folk et al., 2016). In this way, the connections created through trade imply interactions across different spatial scales, which this thesis aims to untangle by analyzing case studies of food trade connected to diverse markets (from local to global).

Table 1. Key concepts used in the thesis, modified from González-Mon (2022). See references and background in the original thesis

Concept	Definition
Changes	Dynamics of a system, which can be gradual or abrupt shocks; expected or unexpected; inherent to the system and emerging at different spatial scales.
Responses	An actor's actions or behaviors in response to different types of changes, which can be anticipatory or reactive, spontaneous, or planned.
Complex Adaptive System	Set of heterogeneous entities that interact leading to emergent system-level outcomes. These systems are characterized by their adaptation, dynamism, context-dependence and relationality, amongst other features. <i>Social-ecological systems</i> are complex adaptive systems, where the focus is on the two-way feedback interactions between human and natural systems (i.e., people and nature, the social and ecological components which cannot be seen as separated).
Social-ecological resilience	The capacity of a system to deal with change. It includes its capacity to persist, adapt, or transform into alternative pathways, placing particular focus on the relationships and processes of the intertwined social-ecological system.
Cross-scale	The interactions that occur between processes at different scales, referring here to spatial scales (e.g., between local and subnational processes and vice versa).
Supply/value chain	Concepts used interchangeably in this thesis to indicate the relationships and flows of food from production to consumption.
Trade network	A network based on <i>trade relationships</i> , which imply the exchange of food and/or services between actors in a food system. Here it is used interchangeably with the concepts of supply and value chains, but it emphasizes the complex networked (rather than linear) structures of those chains.

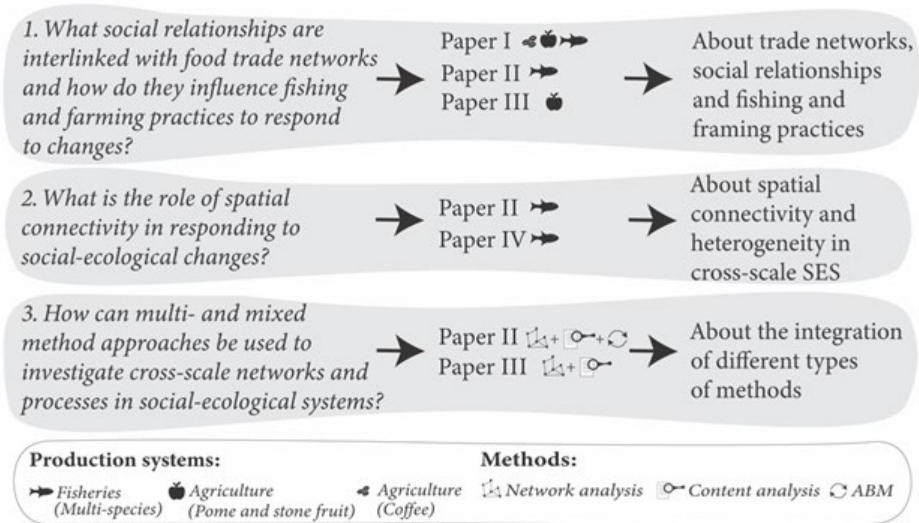
Concept	Definition
Social embeddedness	A concept that implies that economic actions take place within social relationships and networks.
Social relationship	The relationships between two or more actors based on inter-personal interactions. Types of social relationships addressed in this thesis include (but are not restricted to): friendship, trust, reciprocity, communication, or financial relationships. Social relationships are structured in <i>social networks</i> .

2 Research papers and methods

2.1 Research papers

The thesis included three research questions that were addressed in four research papers (Figure 2). This dissertation brief mainly focuses on papers I–III. Detailed descriptions and reflections on the methodological approaches used can be found in the original thesis.

Figure 2: The three research questions of the thesis linked to the papers that address them, and overarching topics emerging from them



Source: González-Mon, 2022.

The original research papers have been published with open access:






1. González-Mon, B., Bodin, Ö., Schlüter, M. (2023). Small-scale fisheries and agricultural trade networks are socially embedded: emerging hypotheses about responses to environmental changes. *Ecology and Society* 28(3). **(Paper I)**
2. González-Mon, B., Lindkvist, E., Bodin, Ö., Zepeda-Domínguez, J. A., & Schlüter, M. (2021). Fish provision in a changing environment: The buffering effect of regional trade networks. *Plos one*, 16(12), e0261514. **(Paper II)**




3. González-Mon, B., Mancilla-García, M., Bodin, Ö., Malherbe, W., Sitas, N., Pringle, C., Biggs, R., Schlüter, M. (2024). The importance of cross-scale social relationships for dealing with social-ecological change in agricultural supply chains. *Journal of Rural Studies* 105, 103191. **(Paper III)**
4. Gonzalez-Mon, B., Bodin, Ö., Lindkvist, E., Frawley, T. H., Giron-Nava, A., Basurto, X., Nenadovic, M., and Schlüter, M. (2021). Spatial diversification as a mechanism to adapt to environmental changes in small-scale fisheries. *Environmental Science & Policy*, 116, 246-257. **(Paper IV)**

2.2 Case studies

Papers I–III focus on different case studies, representing trade in fisheries and agricultural systems in Mexico and South Africa (Table 2). They investigate how trade networks respond to diverse types of changes in these settings (Table 2). Paper I and II mostly focus on environmental changes, while paper III addressed how actors respond simultaneously or sequentially to changes of different social, economic and environmental nature (Table 2).

Table 2: Description of papers I–III regarding the contexts and responses on which they focus

Production system¹	Country	Type of change	Type of response in focus
Paper I   	Mexico and South Africa	Environmental changes: e.g., resource scarcity	Multiple responses: e.g., exit production, new markets, diversification
Paper II 	Mexico	Environmental changes: fluctuations in fish availability	Trade strategies and species diversification
Paper III 	South Africa	Environmental and other changes: e.g., droughts, weather changes, increase in costs, COVID-19, container shortages	Multiple responses: e.g., change varieties, collaboration, loans, marketing strategies, knowledge exchange

¹ Production Systems:  Fisheries (Multi-species)  Agriculture (Pome and stone fruit)  Agriculture (Coffee)

Source: Modified from Table 1 in González-Mon (2022).

Paper I applies a comparative research design, departing from a case of small-scale fisheries in Baja California Sur, Mexico, to investigate three additional case studies: coffee trade in Veracruz, Mexico; deciduous fruit (pome and stone fruit) trade in the Western Cape, South Africa; and small-scale fisheries in the Western Cape, South Africa.

Papers II and III analyse single case studies. Paper II focuses on a small-scale fisheries case study in Mexico, and Paper III on the deciduous fruit trade in South Africa.

All the food trade networks included in this thesis have one aspect in common, despite focusing on different production systems and countries. The production of food is commercially-oriented and reaches diverse types of markets (e.g., local, national, international). Some of the fish species in the fisheries cases are important for international markets, but small-scale fishers simultaneously target other species that are of great significance for local and national markets. Similarly, although the production of deciduous fruit and coffee is mostly oriented towards global markets, they also supply local and national markets in South Africa and Mexico, respectively. Therefore, these food products can be argued to play a role in the food security and nutrition of local populations¹ while, at the same time, being interdependent with global trade structures and processes. Papers II and III shed light into some of these interdependencies as it will be explained in sections 3 and 4.

2.3 Summary of the research methods

This research has applied a combination of different qualitative and quantitative methods. Qualitative content analysis was used to analyse interview data, which was the main research method in Paper I. The same approach was also used in papers II and III in combination with Agent Based-Modelling (ABM) and network analysis (Figure 3). ABM and network analysis can be generally understood as models that provide different ways of conceptualizing trade within social-ecological systems. Below I briefly explain how these methods were used in the thesis, although I refer to the original thesis and the published papers for details in how each method was applied.

¹ Except coffee, which is mostly linked to national specialty or niche markets and is not necessarily contributing to food security, although some of the food produced through agroecological practices in shade coffee plantations can play a role in increasing local food supply in coffee producing regions (Caswell et al. 2012, Fernandez, 2015).

ABM (in Paper II) allowed us to capture the dynamic aspects of trade, by modelling the interactions between different types of traders in a network when they interact and respond to changes in fish populations. These interactions ultimately affect fish supply in the markets, while actors also react to changes in supply, creating feedback interactions between the availability of fish in the “ecosystem” (the state of fish populations) and the market supply of fish.

I also used different types of network analyses in the thesis, which were especially useful to investigate the patterns of relationships amongst food system actors (e.g., diverse social and trade relationships). Network analysis offers a wide toolbox to analyse the structural aspects of trade, where networks can be mapped using secondary data (e.g., through interviews with experts in Paper I), using surveys or interviews with stakeholders (as in Paper II), or through participatory mapping processes (as in Paper III). Overall, network analysis puts the focus in the structures of trade, for example highlighting how actors’ network position influence their capacities to deal with changes (in paper II); or how different types of social relationships may coexist and be activated in response to same or different changes affecting the production and trade of fruit (in paper III).

3 Key findings

This section summarizes some of key results that emerged from papers I–III, which are of special interest in the context of international development cooperation.

3.1 Food trade networks are socially embedded and respond to changes through coping, adapting and transformative actions (Paper I)

We looked at three food trade networks connected to small-scale food production systems: Coffee trade in Veracruz, Mexico; deciduous fruit production in Western Cape, South Africa; and fisheries in the Western Cape, South Africa. First of all, we found that all trade networks can be described as socially embedded in business relationships. These business relationships tend to persist over time and are characterised by trust and commitment between the supply chain actors. **This implies that trade relationships go beyond economic or market-based interactions, and factors other than prices may also influence the structures and dynamics of food production and supply.**

Secondly, different types of supply chain actors (which we can refer to as “buyers”) can buy from small-holders, and these buyers can also trade with each other. These buyers are: informal traders, processors (in the case of coffee), packaging houses or fresh produce markets (in the case of fruit), commercial (larger-scale) farmers in the agricultural cases, and even directly exporters that have relationship with small-holders. Overall, we characterize these relationships between buyers in three types: 1) relationships between buyers with different capacities or functions in the supply chain; 2) relationships between buyers with similar capacities or functions in the supply chain; or 3) relationships between bigger commercial farmers who buy from small-holders and other buyers.

The capacity of smallholders to deal with change can be influenced by the buyers they are connected to and *their* capacities to deal with change. The buyers’ capacities to deal with change may also be influenced by their connections to other buyers. In this way, the horizontal relationships described here connect diverse smallholders who may produce in the same or different geographical regions. Therefore, **understating small-holders’ trade**

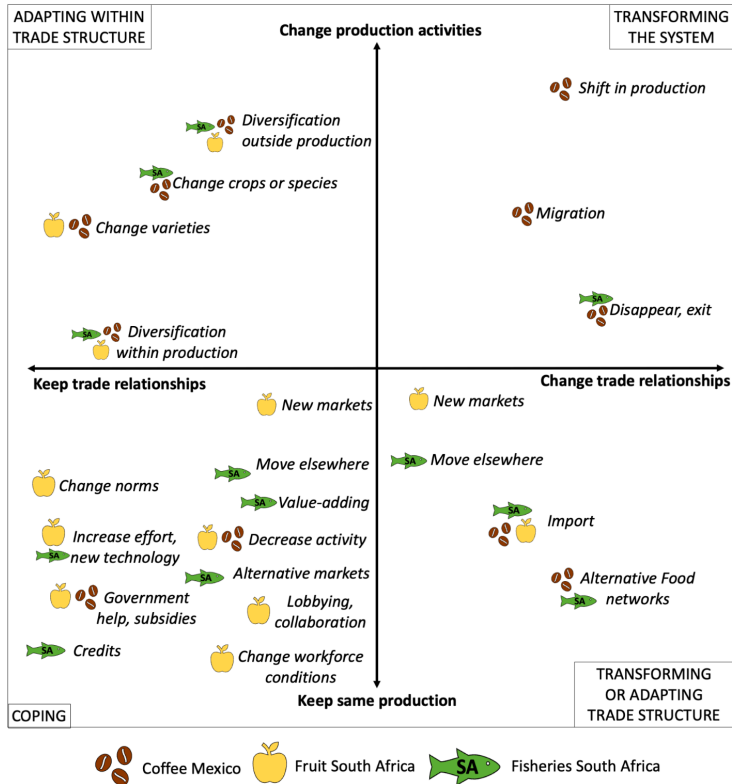
relationships as “networked” between diverse buyers can be a promising avenue for endeavours aiming to build capacities to adapt or transform beyond the farm level, acknowledging the cross-scale relationships that exist between diverse supply chain actors.

Third, we found that diverse actions can be used in response to environmental change. These actions can take place within existing trade structures and production systems (i.e., coping or adapting) or imply significant changes in the existing trade networks or production systems (i.e., transforming), as shown in Figure 3. We hypothesize that the embeddedness of trade relationships not only influences smallholders’ capacity to deal with changes, but it can also influence the specific ways in which supply chain actors respond to change.

Therefore, **the nature and structure of trade relationships may influence whether responses are more likely to be coping or adaptive, and whether smallholders can (and want) to transform their trade structures or production systems as a response to environmental changes.** The outcomes of these different ways of responding to change may be positive or negative, which remains a context-dependent, normative question.

The nature and structure of trade relationships deserves further attention in research and practice, to account for the cross-scale and socially mediated relationships that can influence local level actions.

Figure 3: Responses to changes mentioned in the three case studies in relation to whether they imply changes in trade and/or social-ecological relationships



Source: Figure 5 in González-Mon et al. 2023, published in Ecology and Society under Creative Commons Attribution 4.0 International License: <https://doi.org/10.5751/ES-14265-280309>

3.2 Responses to change in fish trade networks can create interdependencies and cascading effects between different markets and between fish populations (Paper II)

In Paper II (González-Mon et al. 2021), we developed a model based on the small-scale finfish fisheries in Baja California Sur, Mexico. The model builds on earlier research (González-Mon et al. 2017, 2019) and additional qualitative data collection and analysis about the trade structure and dynamics of this multi-species fishery. How the model was developed is described in detail in the thesis².

The model represents two fishing regions or communities, where fishers can fish two different fish species that are consumed in two different markets and are not substitutable (Figure 4). For example, this could be a species like red snapper that is mostly exported to international markets, and a species like leopard grouper that is important in local and national fish consumption. In this region, fishers sell their catch exclusively to one fish buyer or trader. This is the same in many other small-scale fisheries around the world. The traders can buy from several fishers in one community, but some traders also buy from other traders buying fish in the same or different communities. The model therefore illustrates the trade network where traders can trade with each other (depending on their needs and the existing network), and ultimately transport and sell the fish to the end markets (Figure 5).

In this study, we investigate how different trade network structures influence the capacity to provide fish when there are fluctuations in fish availability. The following three key findings emerged from the analysis of this model, which should be interpreted against the assumptions described in the original publication. First, the existence of a trade network where traders from one

² For a dynamic explanation, see the: “The Small-Trade model: an illustrated story”; available at the Stockholm Resilience Center TV YouTube channel: <https://www.youtube.com/watch?v=46O2QOE2-Zo>

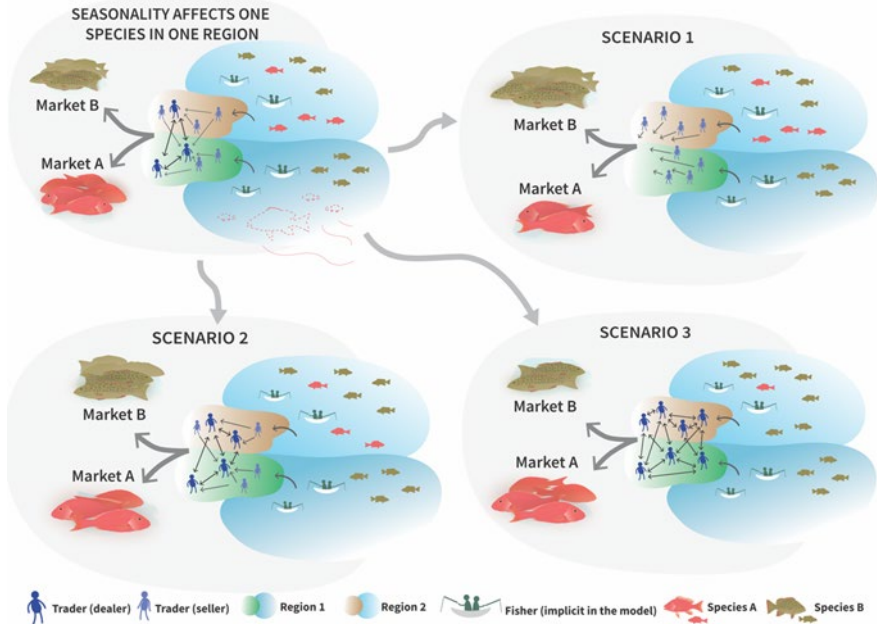
region can buy fish from traders from another region, increases the capacity of the network to buffer or decrease the scarcity of one fish species in the markets when that species is less available/abundant (for example, due to seasonality, environmental change, or policies such as closures or bans affecting one region). However, this comes at the cost of increasing the exploitation of other species (e.g. decreasing the populations). This shows that **changes affecting one region or community, might have implications in another community when they are connected through trade. Similarly, changes in one fish species, may affect another species.**

Second, the increase of one species on the market driven by trade (Species A), can also lead to a decrease on the market of another species (Species B), as shown in scenarios 2 and 3 (Figure 4). This is important to note, as **it opens the door to investigate when and how changes and responses affecting one market (e.g., the international market), could also impact and generate cascading effects in other markets (e.g., local markets).**

Third, we show that at the actor level, being able to buy from other traders increases actors' capacity to deal with fluctuations in fish availability and maintain a more stable provision of fish. The number of connections increases this capacity until networks become *too* connected, in which case more connections do not necessarily imply higher fish supply and less fluctuations in variability. Therefore, trade networks can influence individual's capacity to deal with fish fluctuations and maintain their fish provision.

Even if we only offer a stylized representation of such dynamics, our results warn against policies or interventions that do not account or assess the potential implications of interdependencies between species and markets. Moreover, they highlight the potential of trade networks to deal with changes such as fish fluctuations, which are expected to increase given the current context of environmental changes.

Figure 4: Structure of the model and examples of three scenarios exploring how different trade networks could respond when one fish species cannot be caught in one of the fishing regions. Note that the number of fish of each species in the markets and in the ecosystem varies between scenarios 1 to 3, which represent the outcomes of the model



Source: González-Mon 2022, based on González-Mon et al. (2021). Illustrations modified from an illustration by Evelina Jonsson /Azote for the Small-Trade model video.

3.3 Responses to diverse types of changes in a global fruit supply chain include social relationships (Paper III)

In paper III (González-Mon et al. 2024), we analyse the supply chain of deciduous fruit (pome and stone fruit) in the Western Cape, South Africa. About 50% of the fruit volume is exported to international markets such as Europe. In particular, we investigate how social relationships between internal and external actors in the supply chain influence responses to changes, and map the social networks used in responding to changes. The following three key findings emerged from this manuscript.

First, our study highlights that multiple types of changes can challenge activities throughout the supply chain. In this case, environmental changes such as droughts and changes in weather patterns were mentioned alongside other types of changes such as the increase in production- and labour costs, the COVID-19 pandemic and the associated transport logistic challenges (i.e., container shortage). Actors' responses could sometimes be used to address multiple changes, such the development of netting in the fields, which respond to both droughts, changes in weather patterns, and increases in costs. **This shows the importance of applying a broader lens when investigating the capacity of supply chains to respond to changes and their associated responses, to account for a broader poly-crisis context.**

Second, we found four types of social networks that are of importance in responding to diverse types of changes: 1) collaboration networks (through coordination, collaboration and reciprocity), 2) knowledge exchange networks (through communication, learning and research), 3) networks of financial relationships (through aid, loans and insurance), and 4) marketing networks (through marketing strategies for the local markets and certifications for international markets). These networks include both internal (e.g., farmers, packaging houses, exporters) and external (e.g., government authorities) actors.

This result shows **the role of multiple types of social networks for the capacity of food supply chains to deal with changes.**

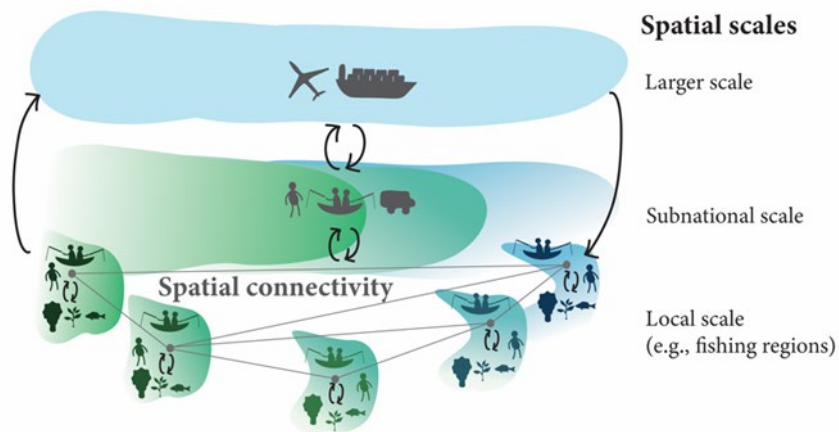
Third, we found unequal participation of market actors in these important social networks. In this fruit supply chain, actors connected to international markets played a prominent role. For example, they participate in networks for collaboration, knowledge- and financial exchange. The supply chain is also connected to national markets, including informal traders. But the informal traders had limited participation in the social networks used in responding to changes. This could imply that actors such as informal traders, which have been shown to play an important role for food security of low-income households in cities such as Cape Town (Battersby et al., 2014, 2016), may not be involved in key responses to changes. However, they may suffer the consequences of changes in produce availability and in farming and trading practices. Overall, this shows that **the question of who is involved in these networks deserves particular attention in research and other projects. Especially when international and national markets interact, and such interactions may lead to unintended dynamics with important consequences for food security.**

4 Insights for international development cooperation

This thesis adds to current supply chain approaches in development contexts (e.g., Stammer and von Drachenfels 2011 or Herold 2020, regarding value chain promotion and development), by investigating different types of social and social-ecological relationships in which supply chains are embedded, with implications for their capacity to deal with change. Through the combination of diverse types of methods, I tried to understand and explain the structure of social and trade networks, as well as some of the processes through which trade creates interactions across spatial scales.

Looking at these cross-scale processes and structures, moves the focus from local-level actions and interventions for adaptation, towards recognizing the crucial interdependencies that connect fishing and farming communities with each other and with local, national and international consumers worldwide (see Figure 5).

Figure 5: Conceptualization of a cross-scale approach to food production and trade. Processes at local, regional and international spatial scales can influence each other through cross-scale interactions (black arrows). Local production regions or communities can influence each other through their spatial connectivity created, for example, by trade networks. Projects and interventions should take into account such spatial and cross-scale connectivity



Source: González-Mon 2022.

Being aware of these complexities in the understanding of food production systems has implications for development cooperation contexts, in line with recent studies that manifest the need to apply system-based and relational perspectives in development processes (Haider et al., 2021; Preiser et al., 2018; Reyers et al., 2022).

I showed how actors and dynamics affecting one region can influence others and create cascading effects between markets. This is in line with a broad body of literature that has been compiling empirical evidence of such types of cascading and spillover effects across scales (Lewison et al., 2019; Liu, 2017; Zimmerer et al., 2018).

I also showed how responses to changes may involve social relationships amongst the multiple actors that participate in a global supply chain, and therefore farm-level responses may be influenced by (and influence) relationships with actors operating at multiple scales. This supports extensive literature on the role of social networks and social capital for resilience in developing contexts and beyond (Carmen et al., 2022; Cleaver, 2005; Rockenbach & Sakdapolrak, 2017).

For actors working with trade in an international development cooperation context, I wish to highlight two findings. First, the risks of unintended cascading effects when ignoring cross-scale and spatial interdependencies, which highlights the need for assessing such interdependencies when designing and implementing international cooperation actions. Second, the opportunities of engaging with cross-scale relationships to build supply chain resilience in international development contexts, which requires better understanding of existing social relationships and how influence the capacity of supply chains to deal with change.

In summary, there are four general insights regarding trade networks in a changing context:

1. Trade networks are socially embedded across contexts, and therefore, social processes and motivations matter in trading systems.
2. Different types of social relationships can influence fishing and farming practices and the way smallholders respond to the diverse types of changes affecting today's food systems. This could ultimately influence the development trajectories of food production landscapes.

3. Social and trade network structures influence people's capacities to respond to change, which may ultimately influence their capacity to contribute to food security (i.e., in the availability and stability dimensions of food security).
4. The spatial heterogeneity of environmental changes and local social-ecological contexts influence people's capacities to respond to change, so that dynamics affecting one location can have cascading effects into other regions. Trade networks can create such interconnections between regions or communities.

These insights may have the following implications for policy and practice:

- Development interventions affecting existing supply chains, or actions aiming to promote supply chains connected to smallholders, need to consider the importance of social relations that sustain supply chain processes and can influence their capacities to deal with changes. The characteristics of such social relationships are context-dependent, and therefore attention to the specific context is key. **This implies developing approaches that go beyond market and economic considerations alone.**
- **Social relationships and networks are central in developing the capacities of trade networks to deal with changes.** However, awareness is needed to the potential role of such networks in reinforcing existing inequalities and the exclusion of often marginalized actors (e.g., informal traders, smallholders).
- **Supply chain approaches need to account for the dynamic nature of the social-ecological setting in which they are embedded.** Therefore, contributing to the resilience of supply chains and trade networks implies moving beyond planning for responses to a single type of change (e.g., climate change), to responses that deal with the multiple types of changes that can affect food production and trade.

- Development projects or interventions should assess the interactions across spatial scales created through trade to avoid unintended social and environmental outcomes. Actions and intervention at one scale or in one community affect others. Changes or developments in existing trade networks can have consequences that reach beyond the actors that are directly involved, and that cascade through the exiting cross-scale structures and processes.
- Linked to the above, **interactions between global and local trade need to be investigated to avoid potentially negative impacts on food security.** Actions aiming to strengthen links to international markets should assess the potential implications on local food security. Such projects should also consider the risks of market specialization, as the diversification amongst diverse markets has been suggested to increase the capacity of supply chains to deal with drivers shocks and changes (e.g., Davis et al., 2021; Kummu et al., 2020).
- Overall, this thesis highlights the **importance of a complexity-aware approach to development cooperation, that considers the multiple social and ecological relationships in which trade is embedded, which span from local to global scales.**

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How does trade networks in the agriculture and fishing industries manage to respond to challenges and crisis to secure sustainable food systems? This thesis investigates the role of trade networks as social systems in responding to changes across different food systems, based on case studies in Mexico and South Africa.

Hur klarar handelsnätverk inom jordbruket och fiskeindustrin av omställningar och förändringar för att säkra hållbara livsmedelssystem, givet de kriser som vi står inför idag? Denna avhandling undersöker handelsnätverkens roll som sociala system, och deras kapacitet att reagera på förändringar i olika livsmedelssystem, baserat på fallstudier i Mexiko och Sydafrika.

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