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The Climate Security Inequality Nexus: A critical analysis of pathways and synergies

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Abstract

Inequality is a key component of any crisis, whether it is related to climate, conflict, or a global pandemic, as it can reveal why some people and regions are disproportionately impacted over others. While interaction of climate impacts with structural inequalities can exacerbate already existing risks of insecurity and fragility, it can also leave room for institutions and interventions to address unequal power relations between actors and find paths for social cohesion and peace. Focusing on the central role of inequality as a driver, an outcome, and an intermediary variable in the climate-security-inequality nexus, this paper attempts to connect dots that have remained relatively underexamined in existing discourse. Bringing multi-disciplinary literature on inequality-conflict and inequality-climate linkages in conversation, the paper seeks to unpack interrelated pathways through which inequality-related resource, livelihood and food insecurities can translate to conflict risks. Using the case of how and to what extent CGIAR publications on land, water, and food systems have engaged with this nexus, it further aims to highlight advances and gaps in synergistic understanding of relationships between climate-fragility risks, resilience, and peace. The paper relies on the following methods: 1) a review of academic and grey literature, and 2) co-occurrence analysis of keywords extracted from a corpus of 14,675 publications from CGIAR's Global Agricultural Research Data Innovation Acceleration Network (GARDIAN). Key findings emerging from the review and co-occurrence analysis support that while inequality has typically been studied in relation to either climate or conflict, there is greater scope for examining context-specific mechanisms through which inequalities at the intersection of gender, age, ethnicity, income, tenure, region, and more, may shape and be shaped by climate related security risks. Therefore, any effort to enhance resilience of climate vulnerable communities and build peace must also involve seeing and acting through the lens of inequality.

Executive Summary

Introduction

- Inequality is a key component of any crisis, whether it is related to climate, conflict, or a global pandemic, as it can reveal why some people and regions are disproportionately impacted over others. While interaction of climate impacts with structural inequalities can exacerbate already existing risks of insecurity and fragility, it can also leave room for institutions and interventions to address unequal power relations between actors and find paths for social cohesion and peace.

- While climate in and of itself may not lead to violence, climate impacts may interact with a range of contextual factors to act as a "threat multiplier," exacerbating existing stresses, pressures, and insecurities.

- Any understanding of climate security nexus remains incomplete without unpacking the role of inequality as a driver, an outcome, and an intermediary variable in this nexus.

Aims

- Focusing on the central role of inequality as a driver, an outcome, and an intermediary variable in the climate-security-inequality nexus, this paper attempts to connect dots that have remained relatively underexamined in existing knowledge.

- Bringing multi-disciplinary literature on inequality-conflict and inequality-climate linkages in conversation, the paper aims to unpack interrelated pathways through which inequality-related resource, livelihood and food insecurities can translate to risks of conflict and violence.

- Using the case of how and to what extent CGIAR publications on land, water, and food systems have engaged with this nexus, it further aims to highlight advances and gaps in synergistic understanding of relationships between climate-fragility risks, resilience, and peace.

Methodological Framework

- The paper relies on the following approach and methods:

1) a review of academic and grey literature to unpack potential pathways through which climate impacts may interact with exacerbating drivers as well as mitigating factors to act as a "threat multiplier."

2) co-occurrence analysis of keywords extracted from a corpus of 14,675 publications from CGIAR's Global Agricultural Research Data Innovation Acceleration Network (GARDIAN). The analysis uses standardized keywords from these publications matched with FAO's AGROVOC. The results are evaluated and visualized as network graphs.

- Using keywords as indicators of what CGIAR contributions (extracted through the nexus-specific search) focus on, the co-occurrence analysis aims to illuminate (even if partially) where, and how CGIAR research have contributed to the climate security inequality nexus, and where lies the scope to do more. Instead of using the co-occurrence analysis as a standalone method, it has been used to support, complement, and compare insights emerging from the review of literature.

Key Findings

- Overall key findings emerging from the literature review and co-occurrence analysis support that while inequality has typically been studied in relation to either climate or conflict, there is greater scope for examining context-specific mechanisms through which inequalities at the intersections of gender, age, ethnicity, income, education, religion, location, and more, may shape and be shaped by climate related security risks.

- Analysis of the search results in GARDIAN indicate the scope for more dedicated focus on Africa, which involves going beyond the more frequently studied regions like South Asia and South America, and countries like Kenya in East Africa. This comparatively lesser focus on Africa deviates from the trend in literature on climate, food security, and conflict, which tends to heavily zoom in on sub-Saharan and Sahelian regions in Africa.

- When "climate" is used as a target term for the network visualization, it can be seen to directly co-occur with keywords like "agriculture", "poverty", "adaptation", "violence", and "land". It is further seen to have second-order co-occurrence with hunger through poverty. This gives an estimation of the kind of themes that have been prominently studied by CGIAR contributions in relation to climate.

- While the keyword “violence” co-occurs directly with “climate”, the keywords “conflicts” or “security” do not. However, the target term “security” directly co-occurs with “equality” and “equity,” while the target term “conflicts” directly co-occurs with “equity” and only indirectly co-occurs with “climate” and “agriculture” through “violence.”

- Although some of these co-occurrences are not as strong as those between “climate” and “poverty”, “climate” and “adaptation”, for instance, they can still be indicative of general areas CGIAR contributions have focused on with respect to this nexus.

- The target term “tenure” depicting use and access to resources under resource inequality pathway directly co-occurs with keywords “land” (strong co-occurrence), “equity” and “conflicts” (weak co-occurrences). And although “tenure” is linked with “climate” via a second-order co-occurrence, this pathway on resource related inequality is found to emerge as the one most closely aligned with the climate security nexus, compared to the other pathways focusing on livelihood and food insecurities.

- For the pathway on livelihood insecurity, nexus-specific keywords like “climate”, “agriculture”, and “violence” are found to co-occur (both first-order and second-order co-occurrences) with the target term “farming” (and not with target terms “livestock” and “fisheries”), after they have been disaggregated based on the type of livelihood. This is indicative of a gap as well as scope in developing understanding of climate security inequality nexus to address livelihood-related insecurities for pastoral and fishing communities.

- For the pathway on food insecurity, nexus-specific core keywords such as “climate”, “violence”, “conflicts” among others, are not found to co-occur with the target term “foods” in the network visualization, indicating an existing gap in more directly linking CGIAR contributions on food systems to climate security inequality nexus.

- The analysis further finds first-order co-occurrence between “climate” and the target term “resilience,” highlighting a scope for resilience and climate to be studied more in tandem with keywords like “cooperation”, “peace”, and “stability”.

- Finally, while the target term “cooperation” is found to directly co-occur with keywords like “resources”, “development” and “systems”, as well as actors depicted

by keywords “organizations”, “agencies”, “authorities” and “stakeholders”, there is scope for this area to not only be more sensitive to the climate security nexus, but also for examining the role of multidimensional inequalities in shaping whether outcomes would be related to possibilities of cooperation or risks of conflict.

- The findings pave way for advancing the understanding that any effort to enhance resilience of climate vulnerable communities and build avenues for cooperation and peace must also involve seeing and acting through the lens of inequality.

Key Messages

- Climate and conflict-sensitivity in programming and policy should address inequality as a core component. This should involve not only concerns and solutions around reducing inequality, but also how to address root causes of inequality across specific dimensions and contexts characterized by relative fragility as well as stability.

- There is scope to integrate research focus on climate and conflict-related risks and resilience, by making inequality and inequity a core concern of studies on climate security nexus.

- When it comes to understanding climate-conflict linkages, there is scope to move key research and policy focus on security from states and national contexts to focus on people (communities, households, individuals), especially women, youth, marginalized groups, and regional contexts.

- Programming efforts targeting adaptation and development for a climate vulnerable region would need to consider both existing structural inequalities as well as systemic inequity and inequality as outcome of adaptation itself, with implications for issues around maladaptation, political insecurities, and human rights.

- Policies addressing mitigation of risks and climate vulnerability and policies targeting reduction of inequality at national and regional levels should not follow parallel paths. Rather they must be considered as integral parts of the same framework.

1. Introduction

Inequality is a key component of any crisis, whether it is related to climate, conflict, or a global pandemic, as it can reveal why some people and regions are disproportionately impacted over others. Any understanding of climate-conflict nexus remains incomplete without unpacking the role of inequality as a driver, an outcome, and an intermediary variable in this nexus. While climate in and of itself may not lead to violence, climate impacts may interact with contextual factors to act as a "threat multiplier," exacerbating existing stresses, pressures, and insecurities (CNA 2007, Marc, Verjee, and Mogaka 2015).

The idea of climate as "threat multiplier" has been critiqued for oversimplified assumptions around how it can exacerbate insecurities to increase the likelihood of violent conflict (Daoudy 2021), overlooking its potential for peacebuilding (Abrahams and Carr 2017). For instance, in response to the debate sparked by climate-induced conflict hypothesis around the 2011 uprising in Syria (Kelley et al. 2015), key roles played by political economy and institutions have been recognized (Selby 2019). Grasping the indirect and non-linear linkages between climate and conflict therefore merits uncovering how inequalities entrenched in existing social structures may inform and mediate this complex relationship.

The extent to which individuals and groups are vulnerable to the effects of climate extremes and variability is refracted through social, economic, political, and cultural inequalities, otherwise called 'structural inequalities' (Dani and Haan, 2008). Structural inequalities are the product of the interactions of discriminations based on gender, age, ethnicity, race, religion, culture, unequal access to basic services and unequal opportunity for participation and choice. Several studies show how structural inequalities significantly reduce opportunities to escape poverty and generate a self-reinforcing cycle of unequal relations in roles, functions, decision rights, and opportunities (Andrews and Leigh 2009; Wilkinson and Pickett 2009; Kerry et al. 2010; Dang et al. 2020).

Inequality and Conflict

The complex relationship between inequality and conflict has been a matter of debate in literature. While a previous body of work claimed that they are unrelated (Collier and Hoeffler 2004, Fearon and Laitin 2003), recent scholarship challenges this rejection and highlights the nexus between inequality and conflict (Østby 2008). This body of scholarship extends beyond the notion of

class struggle based on discontent arising from economic exploitation, and Gurr's (1970) relative deprivation theory which attributes perceived differences between a person's actual and desired situation as preconditions for grievances and conflict. Both relative deprivation and class conflict approach speak of one kind of inequality – a "vertical inequality" between individuals mainly characterized by their class positions in a stratified society.

Clearer, however, is the relationship between "horizontal inequality" and a higher risk of conflict. Defined by Stewart (2008) as "inequalities in economic, social or political dimensions or cultural status between culturally defined groups", HIs share similarities with other concepts like Horowitz's (1985) "ranked ethnic groups" or Tilly's (1999) "categorical inequalities" that highlight inequalities between groups rather than individuals. The notion of horizontal inequality emerged to improve explanations for how organised political violence comes about at the intersection between group identity and material inequalities beyond simple income or wealth (Oslo source, 2017). Any collective response then requires objective inequality to be translated into an inter-subjectively perceived grievance, with discontent arising from the comparison between the situation of an underprivileged group and a privileged group. Whilst this process is far from automatic and its occurrence heavily debated, it is evident how the identity markers that may cause this (language, religion, migrant status, gender, regional identity, ethnicity) vary greatly according to context, and that the role of group leaders in framing reality in response to internal and external opportunities (Gurr, 1993; Cederman, Gleditsch and Buhaug, 2013; Cederman, Wimmer and Min, 2010; Østby, 2013), and facilitating mobilisation cannot be ignored (Kalyvas, 2006).

Inequality and Climate

When it comes to the climate-inequality nexus, the relationship between inequality and climate is neither unidirectional nor linear. Those who are the most disadvantaged are also more vulnerable to climate variability not just because they live in marginal areas identified as climate hotspots, but also because they may lack capital, power, and influence relative to other members of society (World Bank 2016). However, as much as pre-existing inequalities can increase climate vulnerability and exposure and decrease coping capacity, climate impacts themselves can also contribute to increased inequality. Diffenbaugh and Burke (2019) demonstrate, for example, how global warming has increased economic inequality between countries in the global south and those in the global north as increasing temperatures disproportionately affect production systems in countries more susceptible

to climate impacts. From a climate justice perspective, regions with the least carbon footprints and relatively less influence in shaping international policy are also often those bearing the brunt of climate impacts (Harlan et al. 2015).

However, climate-related inequalities are not exclusively felt between but also within countries (Islam and Winkel 2017). Marx, Espagne and Ngo Duc (2017) find that agricultural losses caused by climate variability are likely to be felt specifically by poorer households and will contribute to progressive revenue inequality. Similarly, Pacillo et al. (2020) find that the effect of climate variability is regressive, with its disproportionate burden borne by the "last mile" groups including poor, agricultural, rural households and minorities in Vietnam and Indonesia, who thereby become trapped in a downward spiral of poverty and exclusion.

Another within-country dynamics can be related to internal population movements in response to environmental shocks and stresses (Hunter et al 2015). This may begin as a temporary movement, but then become more permanent, as inequalities get magnified by climate impacts (Black et al 2011, Van Praag & Timmerman 2019). Such dynamics can also be visible within broader regions. For example, the Sahel region of Africa has been recognized as one of the worst affected by climate change, with almost 7 million people facing food insecurity and more than 2.5 million displaced from their homes (Adepoju 2019). To better understand impact pathways and inform policy on multiple linkages between climate change, food insecurity and conflict, it is therefore imperative to focus on "climate inequalities" (Dietz et al 2020).

Unintended consequences of response to climate risks through policy and adaptation efforts, including how migration gets framed as a response, can actually serve to reproduce existing inequalities (Faist 2018). Higher levels of inequality between and within countries can be linked with poorer environmental outcomes as adaptation becomes maladaptation, perpetuating a "vicious circle of maladaptive growth." Analysis suggests that environmental degradation, identified as a multiplier of inequality, can then contribute to increasing welfare inequality, reflecting people's agency in making decisions around allocation of time between leisure and labor activities, and income between adaptation and consumption (Antoci, Russu and Ticci 2020). Thus, though communities and regions can be equally exposed to the same climate related threats, not everyone can equally afford and be able to adapt to these threats. Moreover, unequal distribution of benefits from climate adaptation practices can also act trigger risks of insecurity and conflict (Abrahams and

Carr 2017). This is why policies and programs focusing on environment and climate must integrate and address inequality as a core component of their agenda, with the aim to be sensitive to peace and security risks along context-specific pathways. In response to call for a *unifying conceptual framework* in climate-inequality nexus (Islam and Winkel 2017), a holistic understanding of the role of inequality within the climate security inequality nexus can be gained by combining the following:

1) **Inequality as *driver* of violence:** The idea here is to *begin with inequality* and make queries around how inequality-related grievances and cleavages can be the main driver of conflict in a region also affected by climatic stressors. This approach focuses on the role of inequality in creating a situation where impact of events like drought can act as catalyst for risks of insecurity and conflict. For instance, in the absence of effective institutions to address pre-existing grievances, water-related conflicts could be facilitated by triggers like drought or water cuts (Ide et al 2021).

2) **Inequality as *intermediary* between climate and violence:** In this approach, the idea is to *begin with climate,* and understand how climatic factors may interact with or be conditioned by existing inequalities and socio-political factors to exacerbate risks of conflict, insecurity, and violence (Koubi 2019). This approach is receiving growing attention in literature on climate security nexus that ask questions like how climate may act as a "threat multiplier" across diverse contexts. However, when it comes to studying inequality as part of this approach, it might tend to be treated as more of a contextual factor, resulting in missing nuances of its role in the nexus.

3) **Inequality as *outcome* of violence:** The idea for this approach would be to *begin with conflict.* In fragile settings with existing conflict dynamics, inequality can be reproduced, and further worsened by climate impacts, increasing *exposure* and *susceptibility*, and decreasing coping and recovering *ability* of disadvantaged groups, thereby perpetuating a vicious cycle of violence, often fuelled by presence of armed groups offering alternative mode of survival (Islam and Winkel 2017, Buhaug and von Uexkull 2021).

4) **Inequality *as* violence:** This approach can also be thought of as an overarching perspective relevant for all the previous three approaches, where inequality is itself considered a form of violence. Although the literature on inequality and structural violence is yet to substantially

focus on the climate security nexus, there is scope to unpack how structural violence (Galtung 1969) entrenched in inequality could be experienced by climate vulnerable people at the intersection of gender, age, class, ethnicity, and more. The concept of "slow violence" related to climate can be useful here, "an attritional violence that is typically not viewed as violence at all" (Nixon 2011). Inequality is foundational for understanding such invisible forms of violence (Davies 2019) at the heart of the nexus, which further opens the door for adopting an intersectional lens.

Structure of the Paper

The paper is structured around three key sections. Section 2 focuses on potential pathways through which the climate security inequality nexus mainly operates at the intersection of land, water, and food systems. Section 3 analyzes how and to what extent CGIAR contributions have focused on climate security inequality nexus for land, water, and food systems, identifying existing gaps and possible avenues for future research. It relies on a co-occurrence analysis of keywords from CGIAR contributions, and pivots around the three pathways identified in section 2. Based on the review and analysis in the previous sections, section 4 identifies key messages and entry points for research, policy, and programming, with the view to advance synergistic understanding of the nexus between climate security risks, resilience, and peace, through the lens of inequality.

2. Pathways in Climate Security Inequality Nexus

The factors that make a society vulnerable to conflict are the same factors that make a society vulnerable to climate impacts, namely inequality and instability (Vivekananda et al 2014). Therefore, understanding the role of inequality is fundamental to unpacking complex relationships and pathways through which climate variability can exacerbate risks of conflict, insecurity, and violence. But while interaction of climate impacts with structural inequalities can exacerbate already existing risks of insecurity and fragility, it can also leave room for institutions and interventions to address unequal power relations between actors and find paths for social cohesion and peace.

There is no single deterministic pathway linking climate variability, inequality, insecurity with fragility and conflict risks. These pathways are neither unidirectional, nor predictive of a certain outcome. Rather they represent potential emergent scenarios based on existing understanding of interactions

between key contextual factors (including mitigating factors) and exacerbating drivers, through which climate may act as a threat/risk multiplier. “A New Climate for Peace” report (Rüttinger et al. 2015) identifies the following seven compound climate-fragility risks:

- Local resource competition
- Livelihood insecurity and migration
- Extreme weather events and disasters
- Volatile food prices and provision
- Transboundary water management
- Sea-level rise and coastal degradation
- Unintended effects of climate policies

These climate-fragility risks are interconnected by growing pressures from climate change, population growth, urbanization, environmental degradation, and uneven economic development and inequality. Arguably, these risks can be conceived as components or channels informing pathway dynamics for the climate security inequality nexus. In an attempt to move beyond notions of national security and inequality between states and concentrate on inequalities and risks of insecurity and violence within countries, the pathway dynamics for this nexus can be visualized to operate through multiple channels at the level of regions, communities, and households.

The logic of framing potential pathways for the climate security inequality nexus draws on existing understanding in literature, relying on an integrative framework combining climate-fragility-conflict nexus with climate-resilience-peace nexus. This risk/resilience framework of climate security attempts to weave together mechanisms of a negative cycle between fragility, vulnerability, insecurity and conflict risks, and a positive cycle capturing how, in a relatively stable context, the presence of inclusive institutions can sustain peace by enhancing resilience and strengthening human security (Vivekananda et al 2014). Figure 1 builds on the negative and positive cycles to represent key mechanisms and channels through which multidimensional structural inequalities interact with land, water, and food systems to translate impacts of climate into potential risks of insecurity and violence under conditions of relative fragility as well as stability. These interactions are complex and non-linear, with the potential to also inform the possibility of peace and cooperation in relatively stable or fragile contexts.

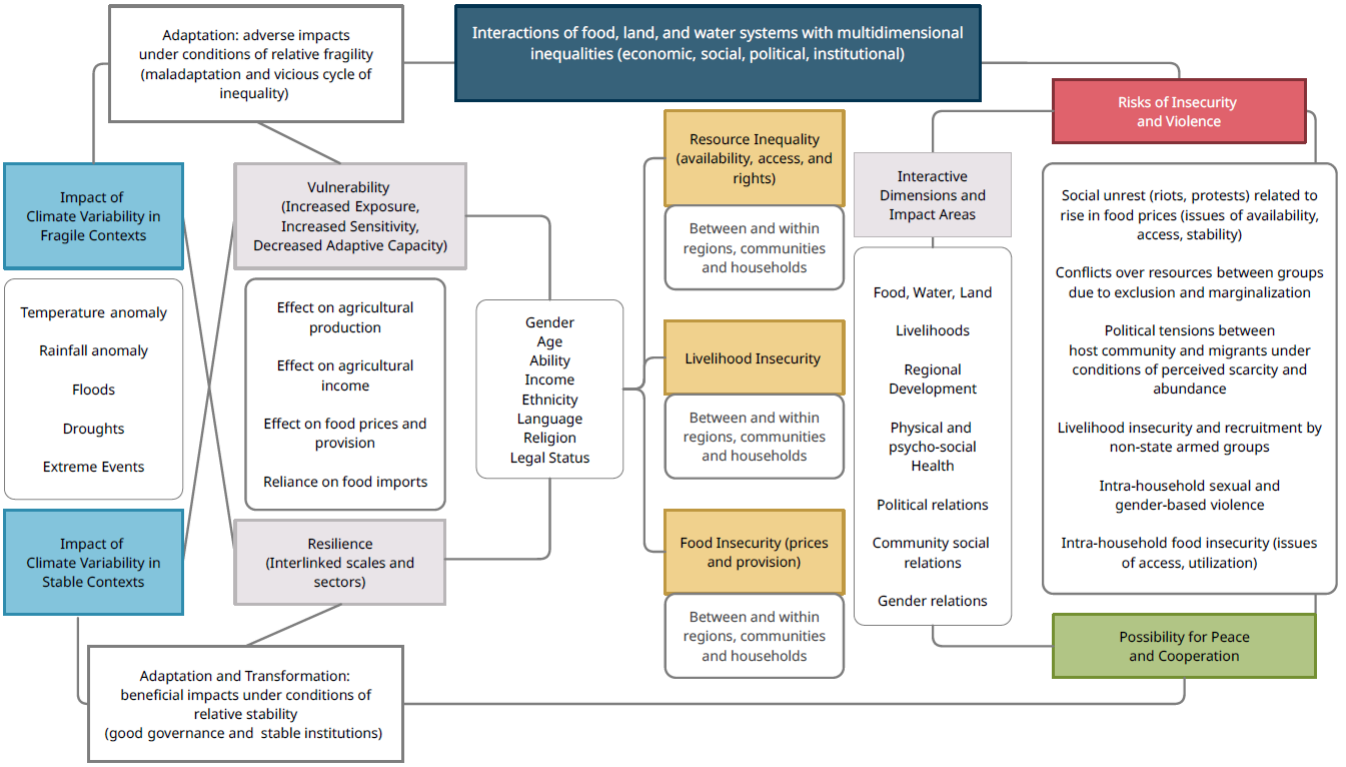

Figure 1: Pathways for the climate security inequality nexus

Based on the above discussion and insights from literature, the following key channels could be identified for framing pathway interactions:

Resource inequality (availability, access, and rights) pathway

There exist debates around how scarcity of resources such as land, water and food can potentially inform risks of conflict (Evans 2011). Homer-Dixon (1994) identifies environmental change, population growth, and unequal resource distributions (where resources tend to concentrate in the hands of a few) as likely drivers, conceptualizing the following two kinds of interactions between these drivers: *resource capture and ecological marginalization*. In “resource capture” population growth, when combined with resource depletion and degradation can result in unequal access to resources, and thereby scarcity. For “ecological marginalization” it is unequal resource access that together with population growth can affect the availability of resources, contributing to scarcity. Together they form a vicious cycle whereby ensuing competition over scarce resources, and associated grievances can translate into risks of violent conflict. Today, with climate as part of this

nexus, the continued albeit partial relevance of this understanding can be realized from "local resource competition" being listed as one of the seven compound climate fragility risks in "A New Climate for Peace" report (Rüttinger et al. 2015).

However, this line of thinking where scarcity drives conflict has been critiqued as it arguably ignores larger political and economic factors. This is because an over-emphasis on scarcity as a stand-alone driver can disproportionately keep the spotlight on certain kinds of actors (individuals, households, communities), while overlooking the critical role played by structures and institutions in shaping the "politics of inequality and allocation," that can then inform security risks, including water and food insecurity (Allouche 2011).

While actual and perceived scarcity or abundance of key resources like land and water may contribute to conflict dynamics, the availability of these resources could be affected by environmental factors, with stresses and shocks from climate variability acting as a major driver. Inequality may also lead to environmental consequences by contributing to environmental degradation. This can affect rural communities dependent on key resources like land and water for their food and survival, in turn promoting competition and unsustainable resource use. This can be driven by asymmetric power relations. Those who are poor and vulnerable have less political power, and therefore less influence over policy decisions around environment (Boyce 2018). Inequality may also determine the incentive and ability for people to engage in collective action around conservation and management of critical shared resources (Baland and Platteau 2018).

Case Study 1

Community-based conservation efforts, involving rural communities as participants and beneficiaries, and intended to ameliorate existing insecurity and conflict outcomes, can actually inform risks of further conflict over communal resources. In Kenya's drought-prone East Pokot, along with neighboring counties of Samburu, Turkana, Laikipia and Baringo, violence associated with livestock raids, and facilitated by the proliferation of small arms and weapons since the 1980s (Mkutu 2008), is increasingly becoming embedded in political conflicts over control of land, infrastructure and territorial rights along ethnic lines and administrative boundaries (Schlee 2010, Greiner 2012). This can be further connected with effects of interventions in existing land use and tenure systems, such as the establishment of conservancies on group ranches that can limit pastoral mobility and alienate groups from claims over lands, especially if they fail to consider regional communal dynamics related to past and ongoing struggles over access and use of common pool resources (Greiner 2012).

Africa Climate Security Observatory-Impact Pathways for Kenya

Livelihood insecurity pathway

Where economies are dependent on rain-fed agriculture, climate-induced adverse effect on agricultural production would negatively affect agricultural income and livelihood (Gawande et al 2017, Blakeslee & Fishman 2018). But income related inequality is not the only driver for climate related risks of insecurity and violence. The interaction between social inequalities, political marginalization, and human security challenges such as food insecurity can accelerate a downward spiral of "climate-conflict trap" for fragile contexts (like the Lake Chad basin) with histories of armed violence, and continuing presence of non-state armed groups and state security forces. With livelihoods being eroded by such climate-conflict linkages in fragile situations, people may flee from the violence and migrate to other places. Nonetheless their migration may further result in increased resource competition, dependence on humanitarian aid, and related discontent in relatively peaceful areas (adelphi 2020).

Case Study 2

In the Lake Chad region of Nigeria, lack of sustainable alternatives can push people towards activities like deforestation and shifting cultivation, resulting in further environmental degradation and biodiversity loss in this fragile ecosystem (Kombe et al 2016). Left without sustainable livelihood options and support, a situation worsened by weak governance, unequal development outcomes, lack of public goods and services, political marginalization of the region, and conflict between state and non-state actors, often resulting in inhibited access to the basin's resources, people desperate for survival are likely to be recruited by non-state armed groups such as Boko Haram (Nett and Rüttinger 2016). Furthermore, livelihood related stresses can have deteriorating effects on social cohesion between groups, within groups and even within families, fuelling tensions, sexual and gender-based violence, and criminality (Owonikoko & Momodu 2020).

Africa Climate Security Observatory-Impact Pathways for Nigeria

This lends support to the argument that rather than focusing on predicting risks of future conflicts, understanding on-going conflict dynamics and risks of violence (Buhaug et al. 2008) in fragile settings could be vital since climate-related events may amplify these risks in ethnically fractionalized contexts (Schleussner et al. 2016). This can help generate a more nuanced understanding of historical factors and power structures shaping existing inequalities that may then interact with effects of climate variability to shape risks of violence and insecurity. Similar linkages could be examined in relatively stable contexts, where inequalities in access to peace-time employment may inform the ability of certain populations to cope and recover from climate-related livelihood erosion, as well as the opportunity to turn to illicit activities as alternative strategies for survival. Inequalities and differential vulnerabilities to climate impacts may further marginalize those left with few options

but to liquidate their limited assets in times of crisis, with the effect of asset erosion, including their diminished capacity for labor, keeping them in poverty traps with dire consequences for food security (Olsson et al. 2014).

Food insecurity pathway

Adverse climatic conditions can lead to higher food prices by dramatically reducing crop yields and the subsequent supply of crops (Gitz et al. 2016). This can then reduce the purchasing capacity of socio-economically disadvantaged groups, shaping grievances and therefore the likelihood of conflict. Climate-related income shocks from agriculture and livestock production can lead to higher food prices in the market and create food insecure conditions through unequal access to food. Climate-induced economic downturns may also result in worsening of actual or perceived economic inequality in a region. In the absence of strong governance structures, this can then fuel discontent and grievances through relative deprivation, contributing to the likelihood of low-level conflict, such as protests against food price rise and civil conflict when groups feel politically excluded (Cederman et al. 2013, Koubi 2019).

Higher food prices in particular have been found to contribute to social unrest including riots and demonstrations, mainly in urban areas (Smith 2014, Raleigh et al 2015). Food price increases, influenced by adverse climatic impact on agricultural production and supply, can explain shifts from transient to chronic poverty, especially for net buyers spending a major share of earnings on food (Olsson et al. 2014). For example, the 2010-11 food price shocks in Egypt, coupled with its dependence on food imports, both affected the supply of food as well as demand through limited purchasing power of households. Lack of effective governance, provision of subsidies, as well as prevalence of corruption and cropping up of black markets in relation to the food scarcity ignited deep-seated grievances against the government, as the world witnessed millions of Egyptians protesting on streets during the Arab Spring of 2011 (adelphi 2020). Beyond the availability of food, there are other pillars of food security, including access, adequate utilization, and longer-term stability, which can be affected by interaction of climate related shocks and stresses with existing inequalities.

Food insecurity exacerbated by climate impacts vary among diverse social groups depending on age, ethnicity, gender, income, and class. Even though the world has made remarkable progress in

reducing extreme poverty, income inequality remains high. According to FAO 2020 report high-income inequality works as a source for undercutting the benefits of economic growth in reducing food insecurity (Holleman & Conti 2020). Women and female household heads have more negative repercussions than men due to food-price spikes. They suffer labor market discrimination, which confines them to informal and casual employment, as well as pay inequity (Botreau & Cohen 2019). Such conditions of food insecurity can make families spend bigger shares on food than on education and health. Conversely, in fragile conflict-affected settings or even in post-conflict situations, households may reduce their expenditure on nutritious food to save in anticipation of possible crisis in near future that might force them to relocate.

Case Study 3

In semi-arid and "post-conflict" northern Uganda, it has been found that households may respond to risks of insecurity and violence by changing their portfolios. For example, in rural areas with limited options for livelihood diversification, households may still engage in agriculture, but shift towards crops and activities with lower risks and returns. Similarly for livestock, instead of large grazing herds that may increase the likelihood of being targeted, households may opt for smaller livestock with lower value that can be contained within compounds. This can then feed a vicious cycle of insecurity for people in this region, as lower returns from markets (which stop operating during conflicts) may accompany lower investments in productive assets and activities in the long run (Rockmore 2020). And while this might mean people are able to save some capital as buffer against risk of violence and to use in case of migration, this can have far reaching impacts for food insecurity through decreased dietary diversity as well as poor nutritional and health outcomes for inhabitants of this region. Such a situation may thus ultimately result in a self-reinforcing loop, keeping people trapped through intergenerational transmission of poverty, inequality, and insecurity.

Africa Climate Security Observatory-Impact Pathways for Uganda

An intersectional lens

Climate-related food insecurity can further vary with the type of livelihood. For instance, drought-related food insecurity in sub-Saharan Africa is found to be more severe and long-lasting for pastoral groups than agricultural areas, with different recovery times of regions from the effects of drought in terms of food insecurity (Anderson et al 2021). Thus not only are the pathways interrelated, but questions like where groups are located, what type of livelihood they practice, how long it takes to recover from climate-related food insecurity, their ability to access and use scarce resources, and more, can be critical for advancing a holistic understanding of the risk/resilience framework of climate security in fragile as well as stable contexts. Inequality is at the core of this framework, as

disadvantaged groups facing unequal risks and outcomes along multiple axes of stratification are usually the ones getting trapped in vicious cycles of climate and conflict-related insecurities.

Placing the lens on gender inequality can be particularly relevant here to grasp how climate related risks for water, land, and food systems can have gendered impacts (adelphi 2020). On the one hand, with increasing "feminization of agriculture" and male out-migration driven by livelihood insecurity, women bear a dual burden of agricultural and household work, including food provision and collection of resources like fuelwood and water, while on the other, they often do not have the right to own property and land (e.g., Etale and Simatele 2021). Confronted by added responsibilities, yet constrained by a lack of rights, women (who are often part of trapped populations in rural areas) may be disproportionately impacted by risks of insecurity and violence within and outside their households. These risks involve but may not be limited to disease, malnutrition, food insecurity (access and utilization), and gender-based violence including domestic violence. Adopting a gender-sensitive lens for this nexus can be critical, because despite unequal power relations, women play a central role in adaptation (Aelst and Holvoet 2016, Etale and Simatele 2021). Moreover, an intersectional lens that not only considers inequalities based on gender, but also other axes like race, class, ability, age, ethnicity, legal status, and more, can become useful for understanding how these inequalities reproduce structural violence, especially in relatively stable contexts characterized by an absence of physical violence (Nicoson 2021).

3. Analysis of CGIAR Contributions

This section focuses on how and to what extent CGIAR contributions have focused on climate security inequality nexus for land, water, and food systems, identifying existing gaps and possible avenues for future research. Beyond a descriptive overview of what the search results yield, it relies on a co-occurrence analysis of keywords from CGIAR publications matched with AGROVOC, and pivots around the three pathways identified in literature review.

Keyword search strategy

Keywords were selected based on the review of literature, and the search was conducted using 61 keyword combinations, as shown in Table 1, including but not limited to core terms like "inequality",

"climate", "conflict", "food security", "livelihood", "equity", "risk", "resilience", "fragility", and "stability". The search strategy not only yielded results that were used for the analysis, but it also helped define and bind the climate security inequality nexus. After multiple search rounds, a saturation was reached when search results started yielding mostly overlapping publications.

Table 1: List of keyword combinations used for search strategy in GARDIAN

61 Keyword Search Combinations	Search Results (all publications)
Inequality	1731
Inequality AND Conflict	141
Inequality AND Climate	219
Inequality AND Climate AND Conflict	14
Inequality AND Food security	197
Equity AND Food Security	238
Food AND Inequality	445
Inequality AND Covid	24
Gender inequality	546
Gender inequality AND Food	149
Gender inequality AND Conflict	30
Gender inequality AND Climate	108
Group Inequality	357
Group Inequality AND Conflict	55
Group Inequality AND Climate	39
Income inequality	396
Land inequality	231
Structural inequality	255
Structural inequality AND Climate	35
Structural inequality AND Conflict	16
Inequality AND Migration	69
Equity AND Climate	277
Equity AND Conflict	92
Equity AND Adaptation	104
Equity AND Resilience	77
Inequality AND Resilience	91
Poverty AND Climate	1479

Poverty AND Conflict	343
Poverty AND Climate AND Conflict	72
Poverty AND Food	4583
Poverty AND Violence	101
Inequality AND Violence	69
Food Security AND Climate	8135
Food Security AND Conflict	263
Food Security AND Climate AND Conflict	110
Poverty AND Hunger	690
Inequality AND Hunger	47
Inequality AND Nutrition	139
Inequality AND Health	325
Inequality AND Livelihood	209
Inequality AND Justice	48
Inequality AND Cultur	147
Fragile AND Climate	135
Fragile AND Conflict	245
Food AND Peace	63
Food Security AND Stability	249
Fragile AND Peace	53
Fragility AND Climate AND Resilience	32
Stability AND Climate AND Risk	80
Food AND COVID	484
Food AND COVID AND resilience	64
Inequality AND Transformation	154
Climate AND Risk AND Transformation	125
Insecurity AND Transformation	69
Food AND Resilience AND Transformation	261
Conflict AND Transformation	130
Food security AND Transformation	706
Conflict AND Food AND Migration	29
Inequality AND Climate AND Capacity	53
Food security AND Climate AND Capacity	901
Inequality AND Climate vulnerability	75

See Figure 2 in Appendix

Descriptive Overview of Search Results

The preliminary search exercise reveals a higher number of search results for only “inequality”, but when used in combination with words like “climate” and “conflict”, the number decreases considerably, indicating a gap in how frequently CGIAR publications have considered this nexus. This also reveals a scope for using the climate security lens in programming and policy where mitigating inequality may be a central concern, in areas vulnerable to climate or conflict-induced risks, but its relationship with both climate and conflict may not have been fully explored.

The search strategy yields a greater number of results when the word “poverty” is used instead of inequality, in combination with “climate” and/or “conflict”. While inequality, in combination with “climate” and “conflict” yields only 14 results, “poverty” in combination with “climate” and “conflict” yields 72 results. Similarly, the word “poverty” when combined with “food” yields a greater number of results than “inequality” and “food.”

This can hint towards the prevalence of a largely economic understanding of inequality, connected with income and ownership of assets by individuals (vertical inequality), rather than manifesting from unequal power relations between groups (horizontal inequality) or between members of the same household (gender inequality).

Further, the search strategy also used words like “equity” to find nexus-specific studies on equity in relation to climate, food security, adaptation, and resilience. While on the one hand, words like “violence” and “fragile/fragility”, “insecurity” and “risk” were used in tandem to draw out contributions that might be focusing on climate-inequality-conflict linkages, on the other, words like “transformation”, “resilience”, “peace” and “stability” were used in the search in combination with the nexus-specific core terms to understand if any synergistic understanding has been developed and the potential to do so.

Which regions have been more in focus for the CGIAR publications?

The regions that occupy the spotlight here are South Asia and South America. There is scope for more dedicated focus on Africa, which involves going beyond the more frequently studied countries like Kenya in East Africa. This comparatively lesser focus on Africa deviates from the trend in literature on climate, food security, and conflict, which tends to heavily zoom in on sub-Saharan and Sahelian regions in Africa (Martin-Shields and Stojetz 2019). It might also be interesting to note that

when the word “equity” is used instead of inequality, in combination with “conflict” or “adaptation”, the regional focus shifts to Southeast Asia.

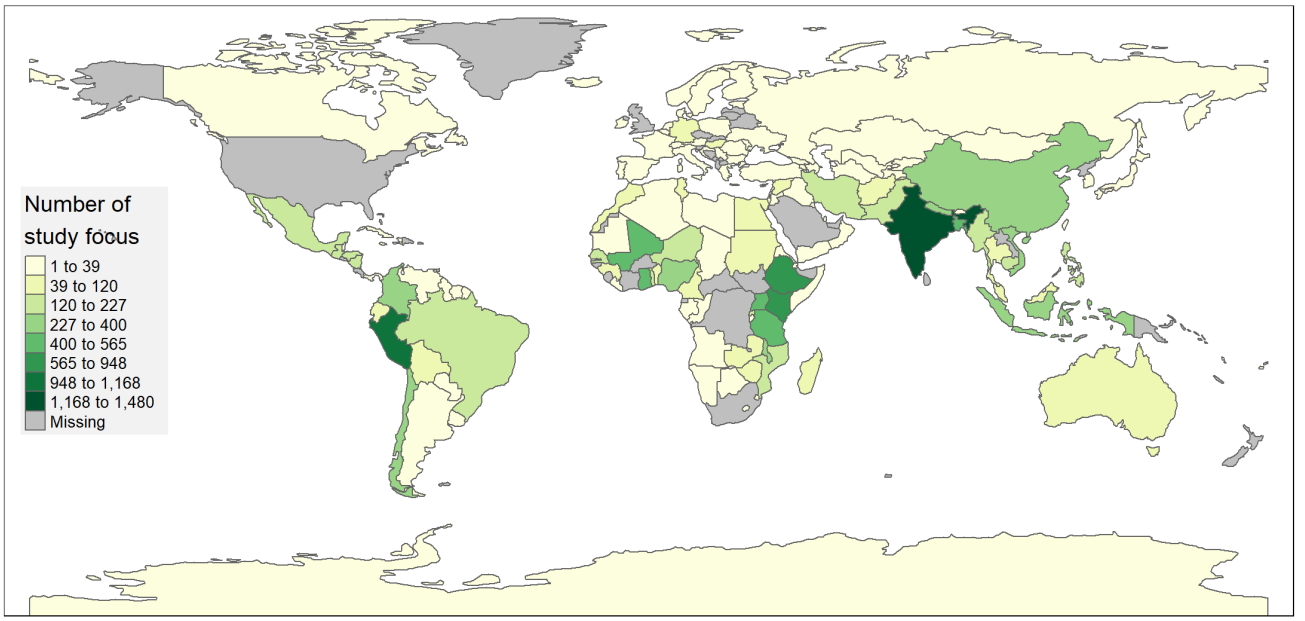

Figure 3: An overview of regional focus in CGIAR publications

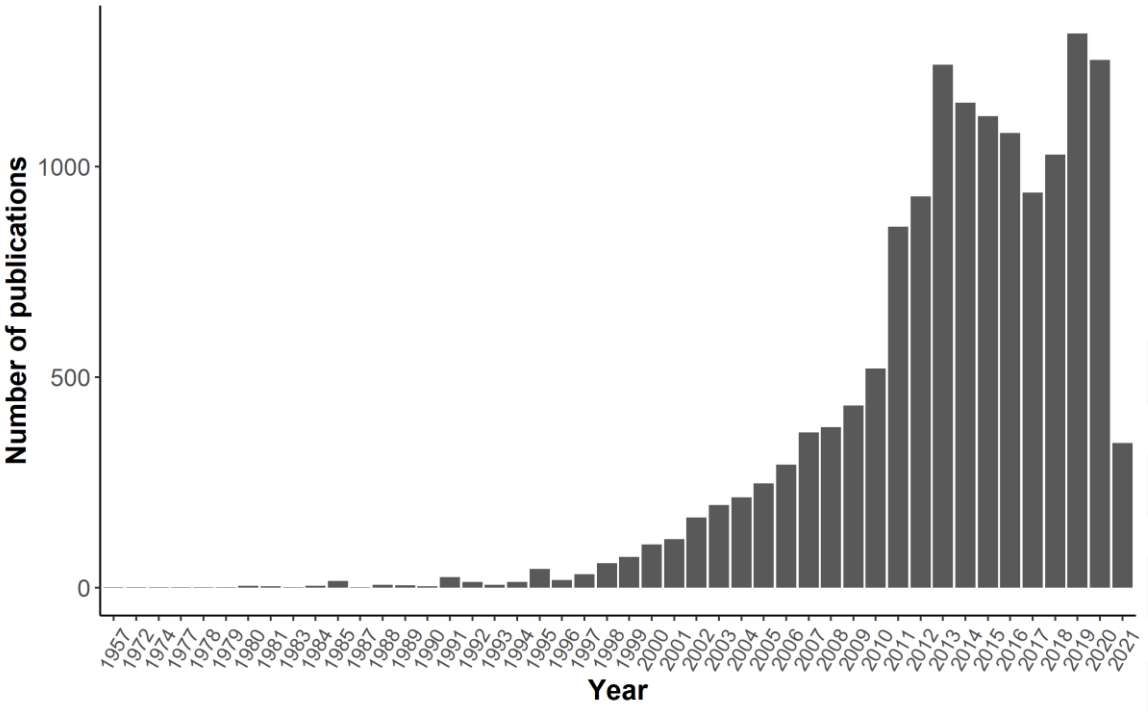

Figure 4: An overview of temporal trend in CGIAR publications

Can a temporal trend be discerned for the CGIAR publications based on the search results?

Figure 4 captures the temporal trend of a gradual rise in the number of CGIAR publications relevant to this nexus from the early 1990s. It can also be seen here that there appears to be a considerable increase in the volume of publications 2010 onwards. Furthermore, where only "conflict" is included as part of the keyword combinations, the year with the most frequent publications in relevance with those keywords tends to be older compared to where "climate" is used as part of the keyword combination.

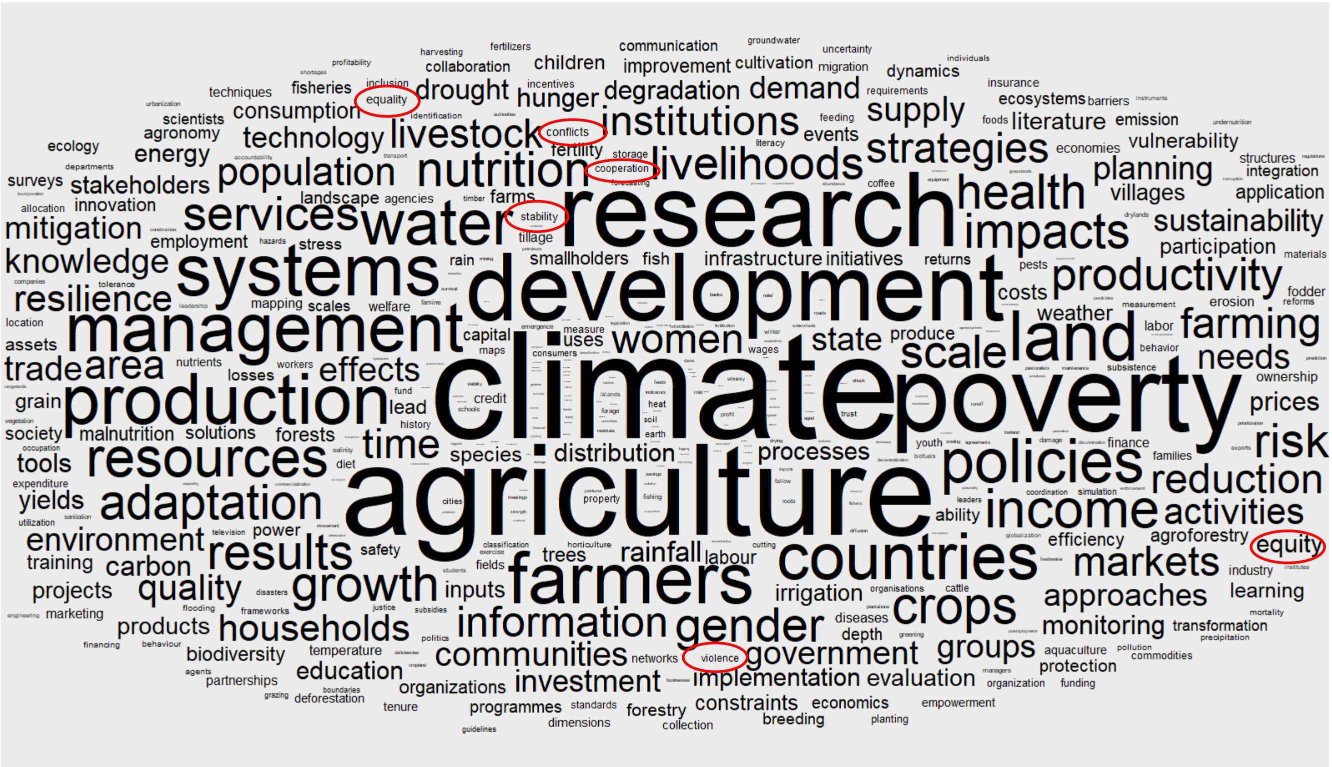

Figure 5: Word Cloud depicting keyword frequencies (based on search results)

Figure 5 represents a word cloud visualization based on keyword frequencies in the entire corpus of keywords pulled from the AGROVOC column for all 14,675 publications. This corpus was then cleaned by applying a frequency threshold. It is not surprising that the most frequently occurring words in the keyword corpus are "climate", "agriculture", "development", "poverty", amongst others, such as "farmers", "systems", "water" and "land", marking common CGIAR focus. Highlighted in red are the less frequently occurring words relevant to the nexus, including "conflicts", "violence", "equality", "equity", "stability" and "cooperation". While the word cloud is helpful for developing an

overall understanding of which words occur most frequently, further analysis can be useful to find which keywords co-occur with others, and how strongly they co-occur.

Co-occurrence Analysis of Keywords

Methodology

For each of the keyword combination search results, metadata files were downloaded from GARDIAN. These files (in JSON format) in were then converted to CSV format using R. Thereafter CSV files were merged, and duplicates removed, to create a unique list of CGIAR publications relevant to the climate security inequality nexus. This list consists of 14,675 publications. From this combined CSV with unique list of publications, the analysis draws on the column of standardized keywords matched with FAO's AGROVOC.

To find which keywords co-occur and how strongly they co-occur, specific reference words of interest to the nexus were identified to serve as target terms. Using insights from the section on pathways, the following words were mainly used as target terms.

```
refterms <- c ("climate", "conflicts", "equality", "ethnicity", "equity", "poverty", "tenure",
"livelihoods", "farming", "livestock", "fisheries", "foods", "markets", "allocation", "resilience"
"cooperation")
```

While some of these words, like climate, equality, poverty, equity, are used for insights regarding how the overall nexus has been studied, others like tenure, farming, or foods are used as proxies for understanding how nexus-specific pathways around resources, livelihoods and food insecurity might have been studied by the CGIAR contributions.

The collocation strength of keywords strongly co-occurring with these target terms was measured from co-occurrence matrix, using the function "calculateCoocStatistics" to calculate log likelihood. The results were evaluated and visualized as network graphs using the "igraph" package in R. To represent the co-occurrence analysis of keywords from the corpus as network graphs, a three-column data frame was constructed, containing information on the nodes (target word and co-occurring word) and edges (edge-weight values). Thereafter, a two-step process was followed to create the networks for each target or reference term, involving 1) obtaining co-occurrence terms for the target term in question, and 2) co-occurrences of the co-occurrence terms from step 1. The network graphs thus created reveal three types of information:

1) First-order co-occurrence: keywords directly co-occurring with each target term.
2) Second-order co-occurrence: keywords co-occurring with the primary co-occurrence terms for each target term.
3) Co-occurrence strength: how strongly the keywords co-occur with the target terms and with each other, weighted and shown by thickness of edges in the networks.

The strength of co-occurrence between keywords is given by the thickness of edges in the network. Keywords with direct ties with the target term represent first-order co-occurrences. These keywords in turn may or may not strongly co-occur with other keywords, representing second-order co-occurrences.

Using keywords as indicators of what CGIAR contributions extracted through nexus-specific search focus on, the co-occurrence analysis aims to illuminate (even if partially) where and how CGIAR research have contributed to the climate security inequality nexus, and where lies the scope to do more. Further, instead of viewing this analysis as a standalone method, it can be used to support, complement, and compare with insights emerging from literature.

Overall, by identifying the nature and strength of co-occurrence between keywords related to the climate security inequality nexus, the co-occurrence analysis can be used to go beyond highlighting the scenario at present to recommend potential future avenues for research, programming, and policy.

Key Findings

When “climate” is used as a target term for the network visualization (Figure 6), it can be seen to directly co-occur with keywords like “agriculture”, “poverty”, “adaptation”, “violence”, and “land”. It is further seen to have second-order co-occurrence with hunger through poverty. This gives an estimation of the kind of themes that have been prominently studied by CGIAR contributions in relation to climate. Further while the keyword “violence” co-occurs directly with “climate”, the keywords “conflicts” or “security” do not. Thus, understanding violence, including structural violence, which is connected to inequality and inequity could be key for understanding how the nexus operates.

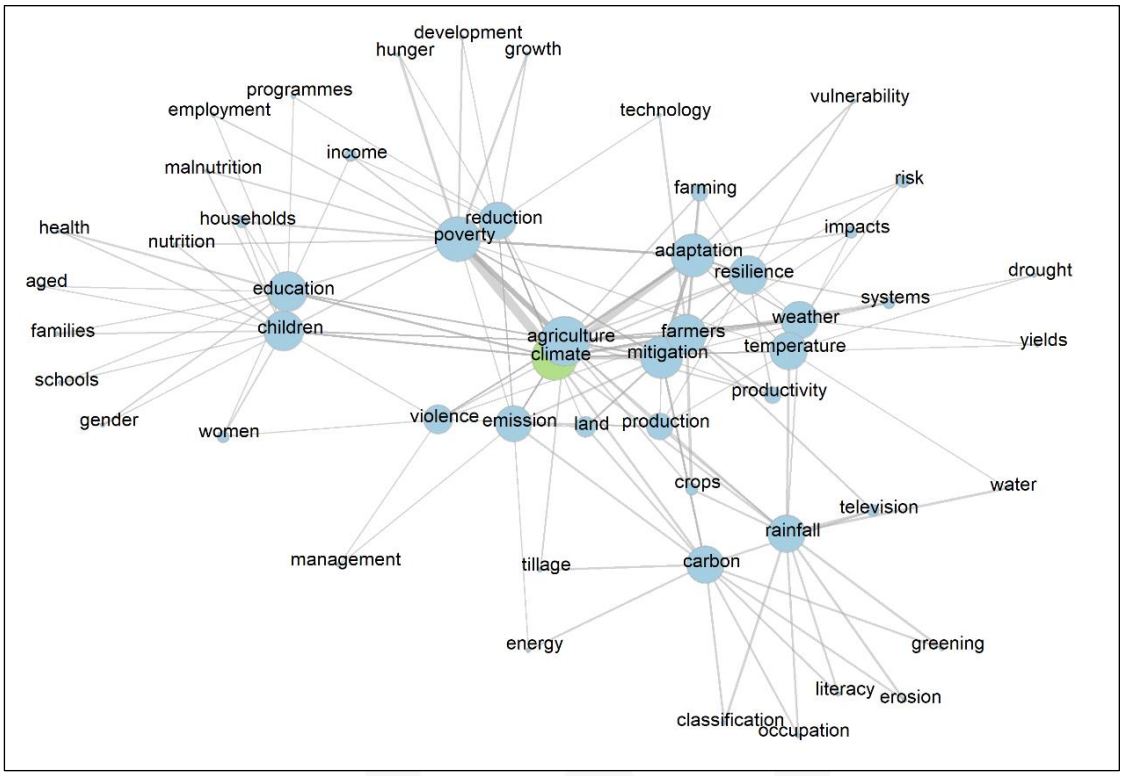

Figure 6: Network visualization with target term “climate”

To examine the multidimensional nature of inequality, studied by CGIAR contributions by using keywords as indicators of what the studies focus on, a network visualization was produced with the target term “ethnicity” (Figure 7).

Figure 7 reveals that inequalities related to the following dimensions have been studied to some extent by CGIAR within this nexus-specific context:

- Ethnicity
- Gender
- Age
- Income
- Health
- Education
- Employment
- Religion
- Location

These terms also co-occur with “violence”, which can be seen to co-occur with “climate” and “agriculture”, a clear indication that CGIAR contributions have to some degree focused on this nexus, albeit more prominently through agricultural system.

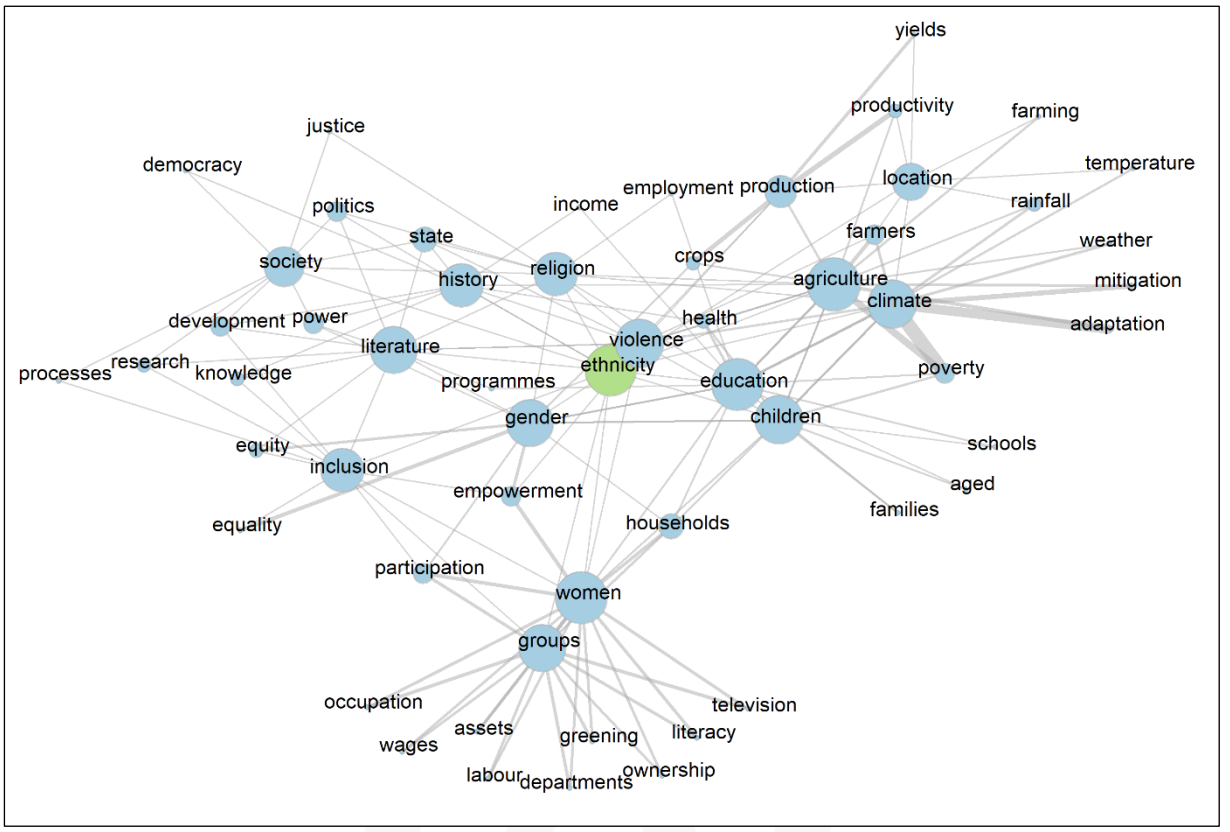

Figure 7: Network visualization with target term “ethnicity”

When the target term “security” is used for the network visualization (Figure 8), it is found to directly co-occur with both “equality” (stronger co-occurrence) and “equity”. It is also found to directly co-occur with “communities”, “empowerment”, “women” (strong co-occurrence), “crops”, and “labor”. Further, there is a second-order co-occurrence with “climate” through keywords “equality” and “empowerment”. The network graph also indicates second-order co-occurrences with keywords at the periphery of the network, like “resources”, “poverty”, “unemployment”, “health”, and “nutrition”. Thus, there is scope to better connect dots and strengthen linkages between security as a key area and resource, livelihood, and food-related pathways.

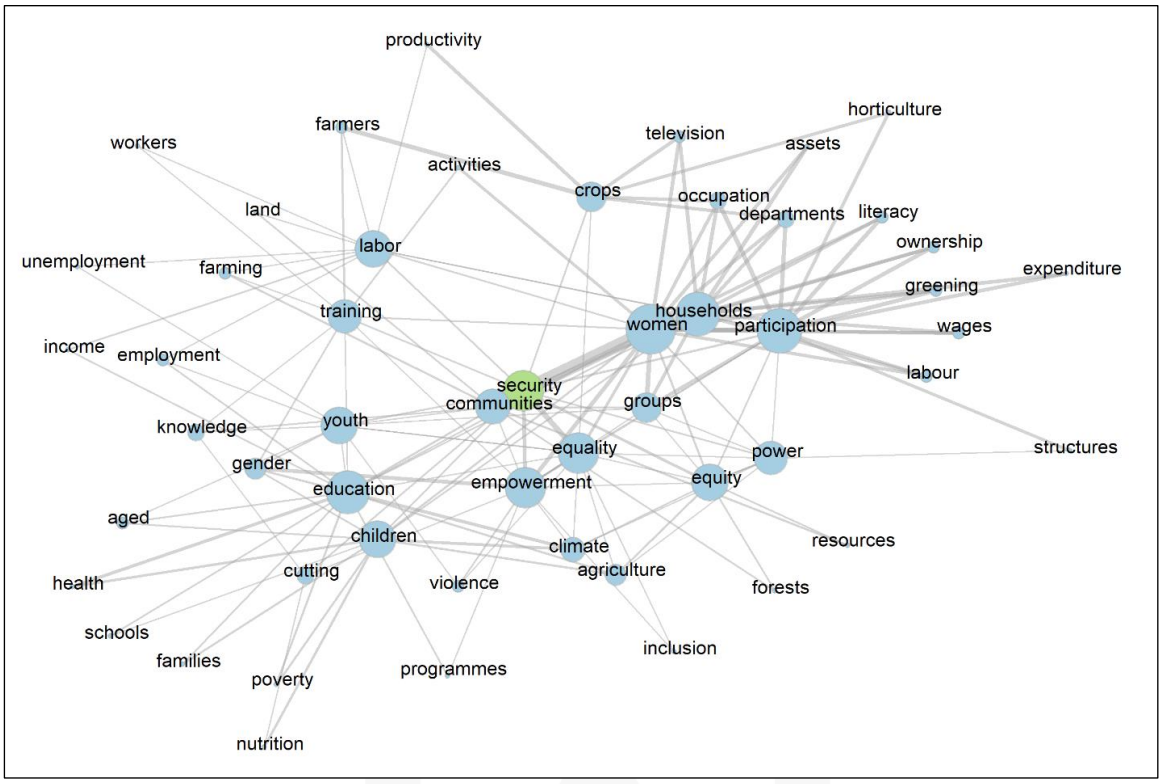

Figure 8: Network visualization with target term “security”

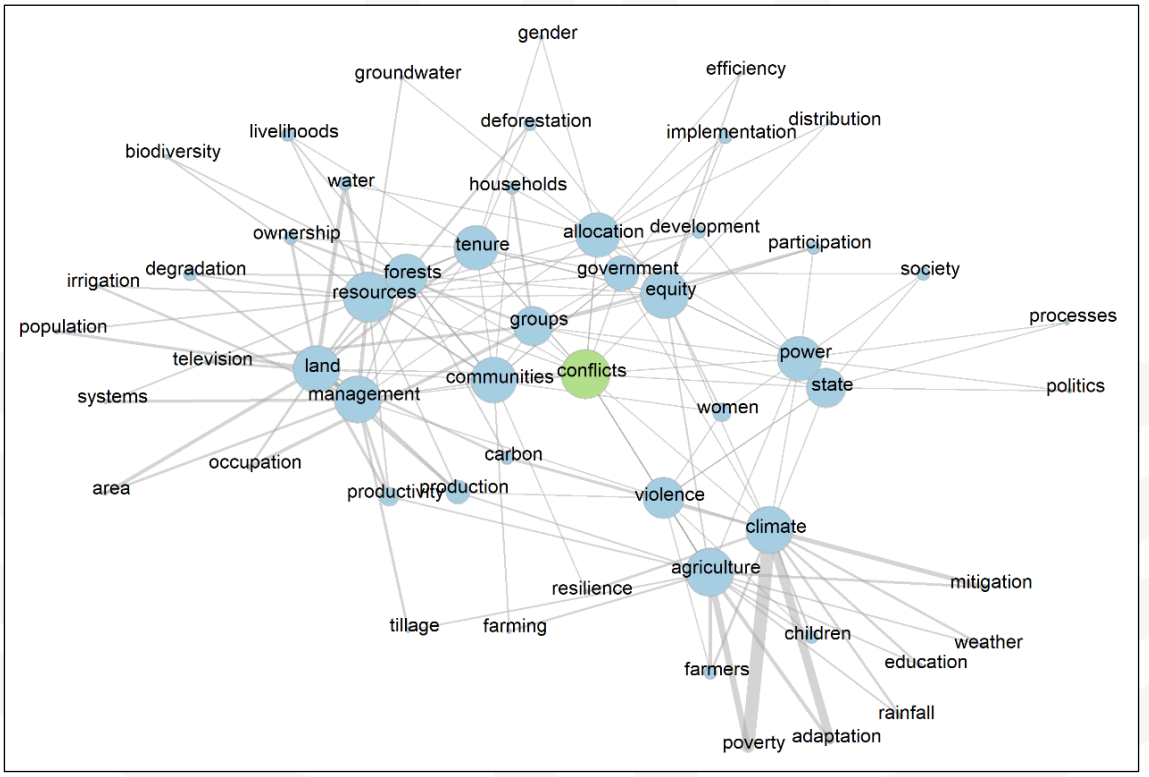

Figure 9: Network visualization with target term “conflicts”

When the exercise is repeated with the target term “conflicts”, network visualization (Figure 9) shows first-order co-occurrence with keywords like “equity”, “allocation”, “government”, and “groups”, as well as second-order co-occurrence with keywords like “climate” and “agriculture” (through “violence”), “tenure” through “groups” and “development” through “equity”. While these co-occurrences are not as strong as those between “climate” and “poverty”, “climate” and “adaptation”, for example, they can still be indicative of key concepts and thematic areas CGIAR publications have focused on with respect to this nexus.

While the evidence of direct co-occurrence in the network visualization gives an indication that climate-conflict linkages have been examined by CGIAR contributions, it is also clear from the narrow thickness of edges that the co-occurrence is not strong. Further, even where keywords co-occur strongly, they may not clearly illuminate the mechanisms or channels through which this nexus might operate. For instance, in the network visualization with the target term “poverty” (Figure 10), it is seen to directly co-occur with keywords like “climate”, “agriculture”, “adaptation”, “hunger” and “malnutrition” quite strongly. Further its second-order co-occurrence with “violence” (through “climate” and “agriculture”) is not only indicative of the role of poverty as a key driver in the climate security inequality nexus, but poverty can also be an indicator of structural violence faced by marginalized groups located at the intersection of multiple axes of stratification.

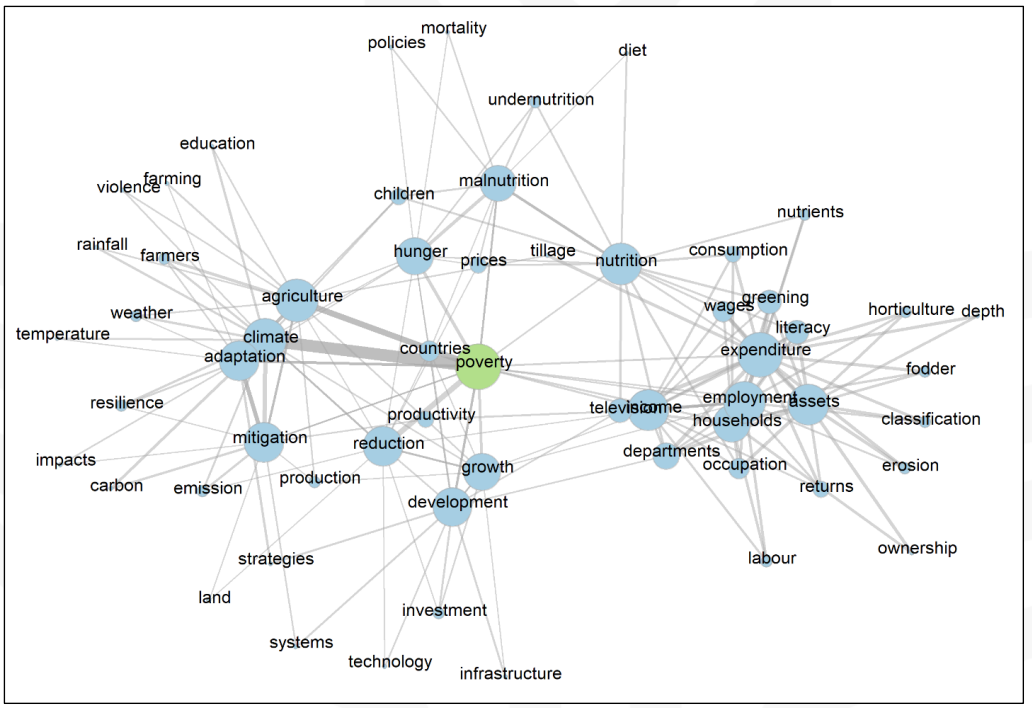

Figure 10: Network visualization with target term “poverty”

Resource Inequality Pathway

With the aim to understand how and to what extent CGIAR publications within climate security inequality nexus have engaged with pathway-specific inequalities around resources like land and water, with respect to not only their availability, but also access, use and rights, a network visualization was created with the target term “tenure” (Figure 11). FAO defines tenure as a relationship, an institution with societal rules, “whether legally or customarily defined, among people, as individuals or groups, with respect to land.” Given the definition, the resource under focus here would be land, but there is scope to also imagine the concept of tenure as a system determining “who can use what resources for how long, and under what conditions.” The decision to use the word *tenure* instead of *resources* to represent this pathway on resource inequality relates to the argument that it is not enough to focus on resource availability through framings on scarcity and abundance, but also consider issues of resource access, use, and rights. This is particularly the case for marginalized groups in climate vulnerable regions with unequal access to resources like land and water, instrumental for their capacity to cope and survive harsh climate impacts and related peace and security risks.

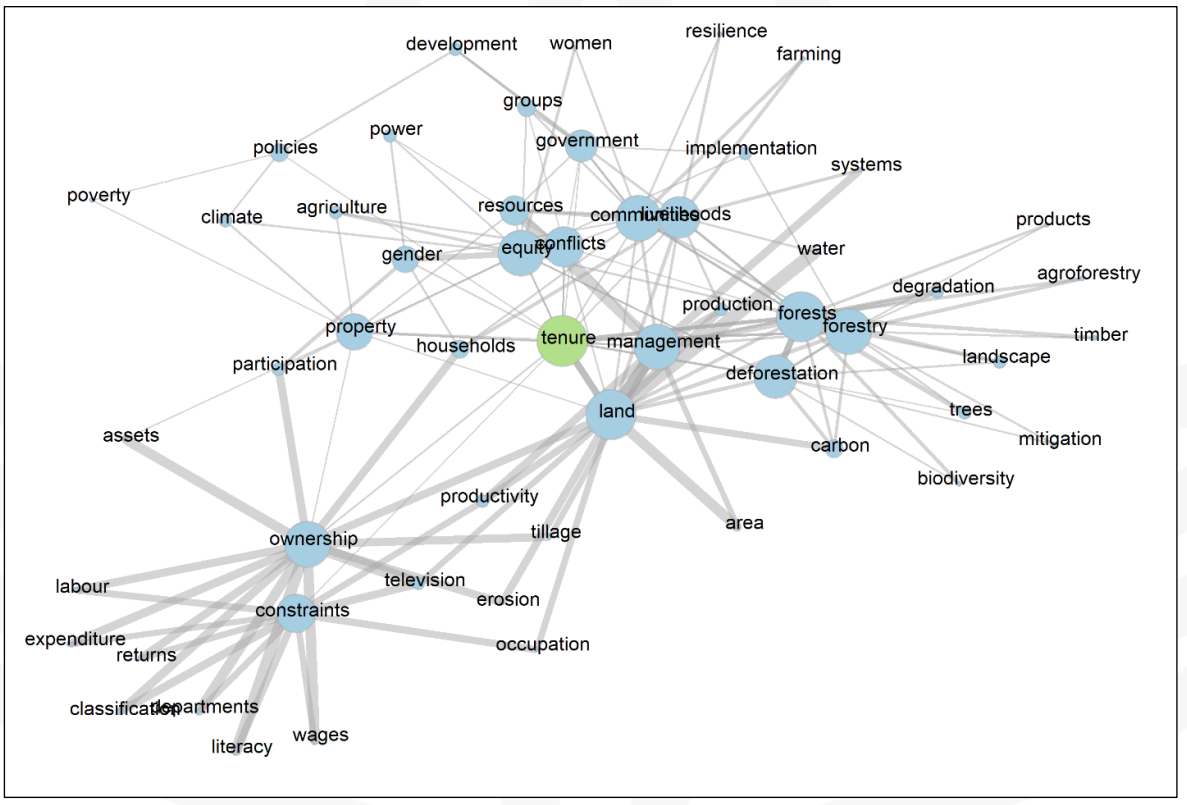

Figure 11: Network visualization with target term “tenure” for resource inequality pathway

Figure 11 reveal that among the entire keyword corpus extracted from the search process in GARDIAN, the term “tenure” is most likely to co-occur with the keyword “land”, which in turn strongly co-occurs with keywords like “management”, “carbon”, “productivity”, “water”, and “systems”. Tenure also co-occurs with keywords like “equity”, “conflicts”, and “gender”, although the strength of co-occurrence is not as strong. The network graph further shows that “tenure” also directly co-occurs with “communities” and “livelihoods”, as well as “ownership”. What could be interesting to note here is that “tenure” is linked with “poverty” through “property”, “climate” through “equity”, and “resources” through “equity”, “conflicts”, and “communities”.

Even though the keyword “equality” in the corpus is missing here, the direct co-occurrence with “equity” and “conflicts” can be suggestive of how the pathway may operate. For communities disproportionately impacted by climate and conflicts, questions of ownership, use and access to resources are critical, as inequality in these dimensions can then push them towards unsustainable livelihood strategies, like deforestation, leading to environmental degradation and reduction of vital carbon sinks, thereby feeding a vicious loop of struggle over access to common pool resources, worsening environmental conditions and risks of insecurity and violence. Hence, although “tenure” is linked with “climate” via a second-order co-occurrence, this pathway on resource inequality is found to emerge as the one most closely aligned with the climate security inequality nexus, compared to the other pathways focusing on livelihood and food insecurities.

Livelihood Insecurity Pathway

For the pathway on livelihood insecurity, nexus-specific keywords like “climate”, “agriculture”, and “violence” are found to co-occur (first-order co-occurrence and second-order co-occurrence) with the target term “farming” (Figure 13), but not with target terms “livestock” and “fisheries”, after disaggregating keywords based on the type of livelihoods sensitive to climate variability. When the target term “livelihoods” is used (Figure 12), the network visualization mostly reveal co-occurrence with keywords like “production”, “productivity”, “communities”, “resilience”, resources like “land” and “water” along with their “management”, and types of livelihoods. The keyword “climate” can be seen to occur only at the periphery of the network graph.

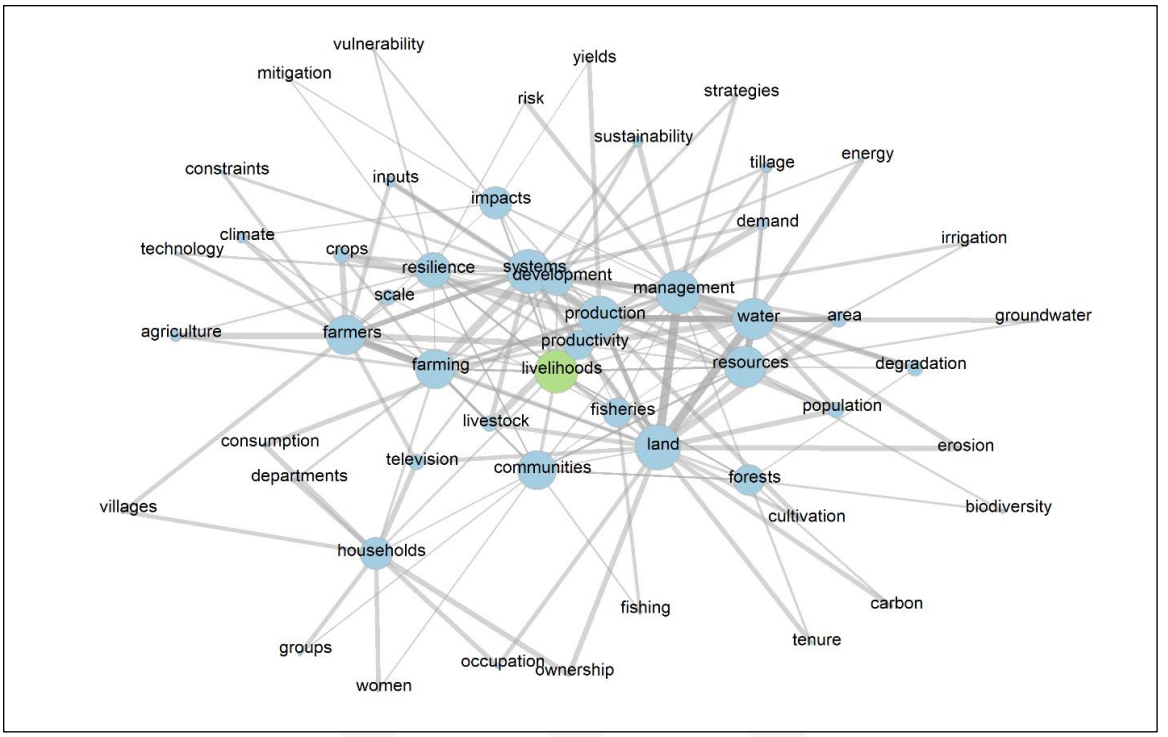

Figure 12: Network visualization with target term “livelihoods” for livelihood insecurity pathway

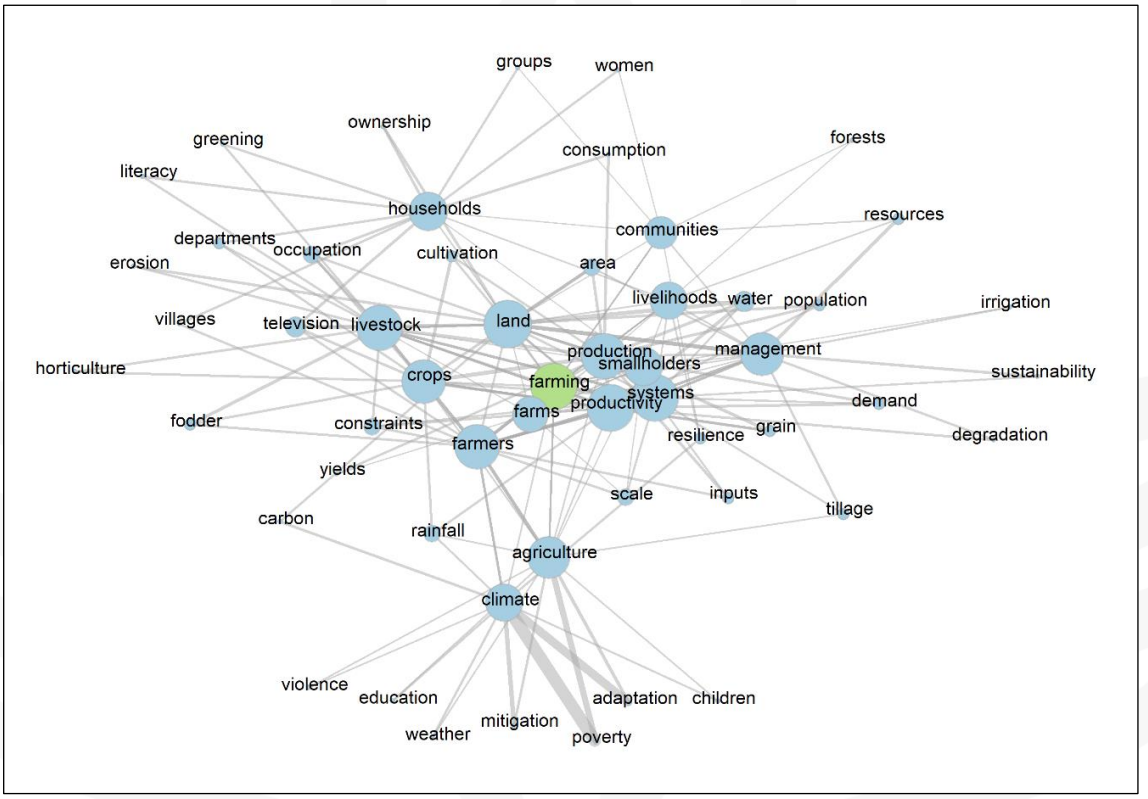

Figure 13: Network visualization with target term “farming” for livelihood insecurity pathway

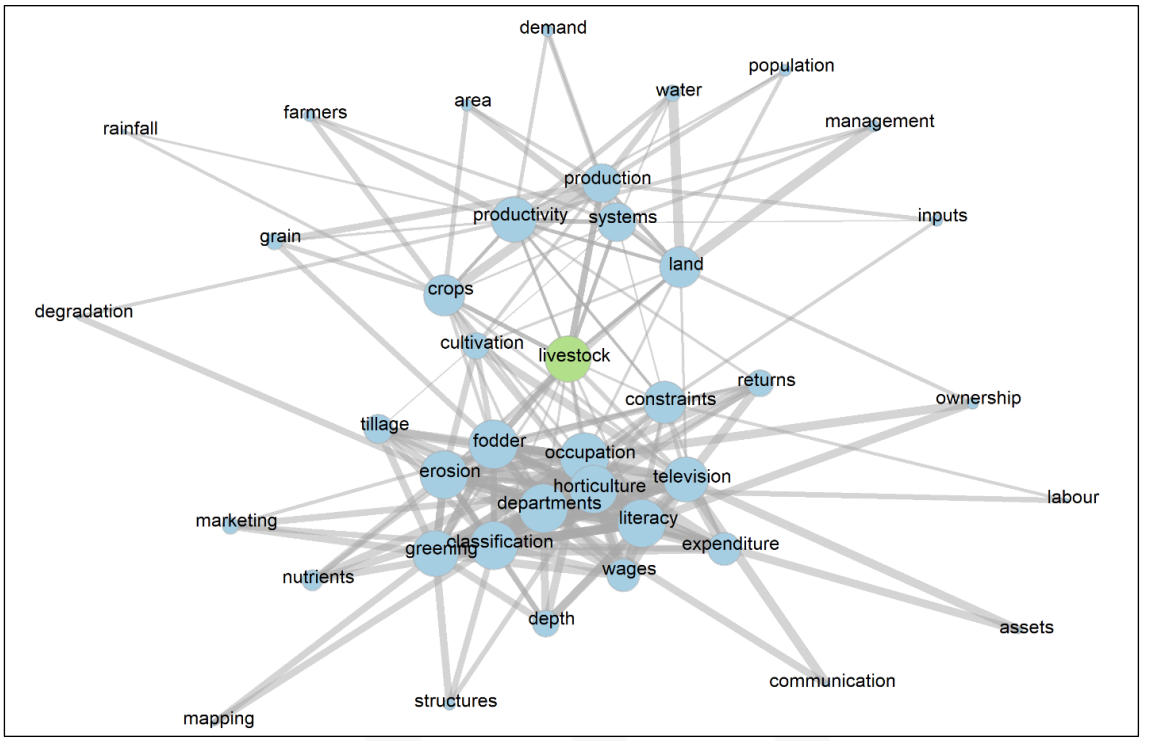

Figure 14: Network visualization with target term “livestock” for livelihood insecurity pathway

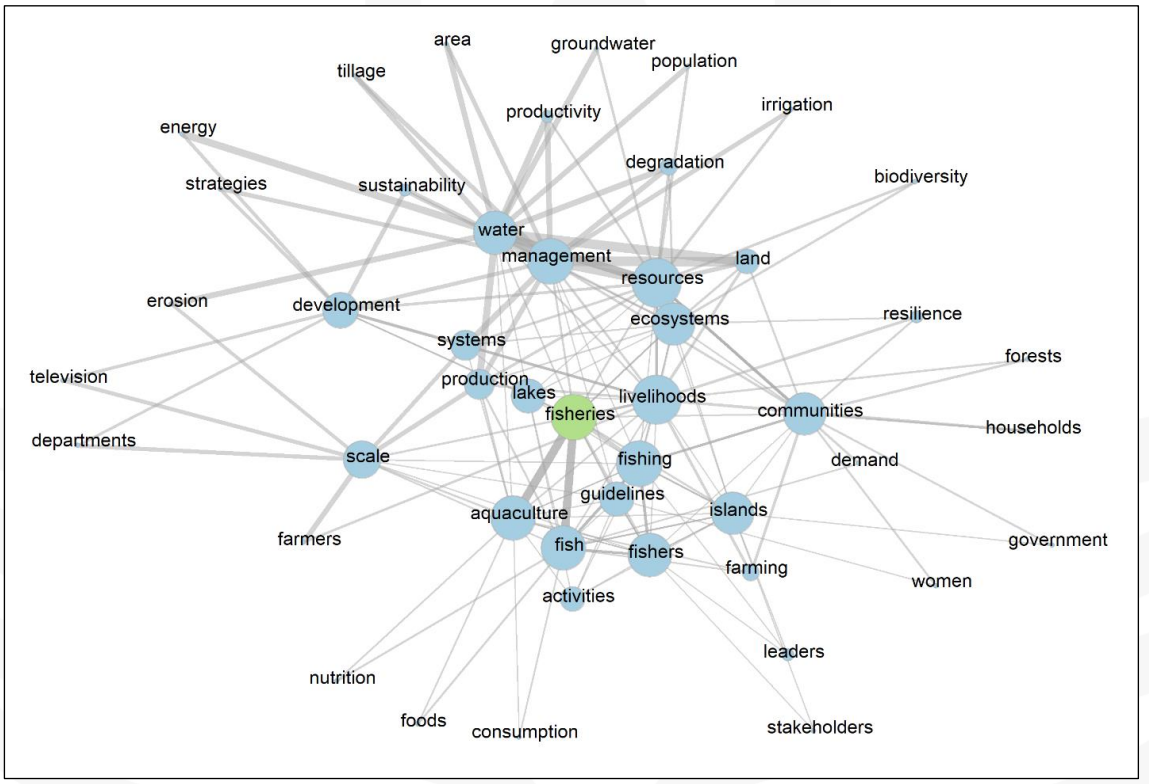

Figure 15: Network visualization with target term “fisheries” for livelihood insecurity pathway

In Figure 14 with “livestock” as the target term, and Figure 15 built around “fisheries” as the target term, there is an absence of nexus-specific keywords like “climate” and “violence”, although keywords like “systems”, “production” and “land” co-occur with “livestock”, while “livelihoods” and “resources” co-occur with “fisheries” along with “ecosystems”. Despite second-order co-occurrences with keywords like “communities” and “resilience” (Figure 15), and “rainfall” and “degradation” (Figure 14), the keyword “climate” does not directly appear in either of these network visualizations. This is indicative of a gap as well as scope for developing nexus-specific understanding to address livelihood-related insecurities beyond agricultural livelihoods, with greater dedicated focus on how inequality may play a key role in making pastoral and fishing communities vulnerable to climate security risks.

Food Insecurity Pathway

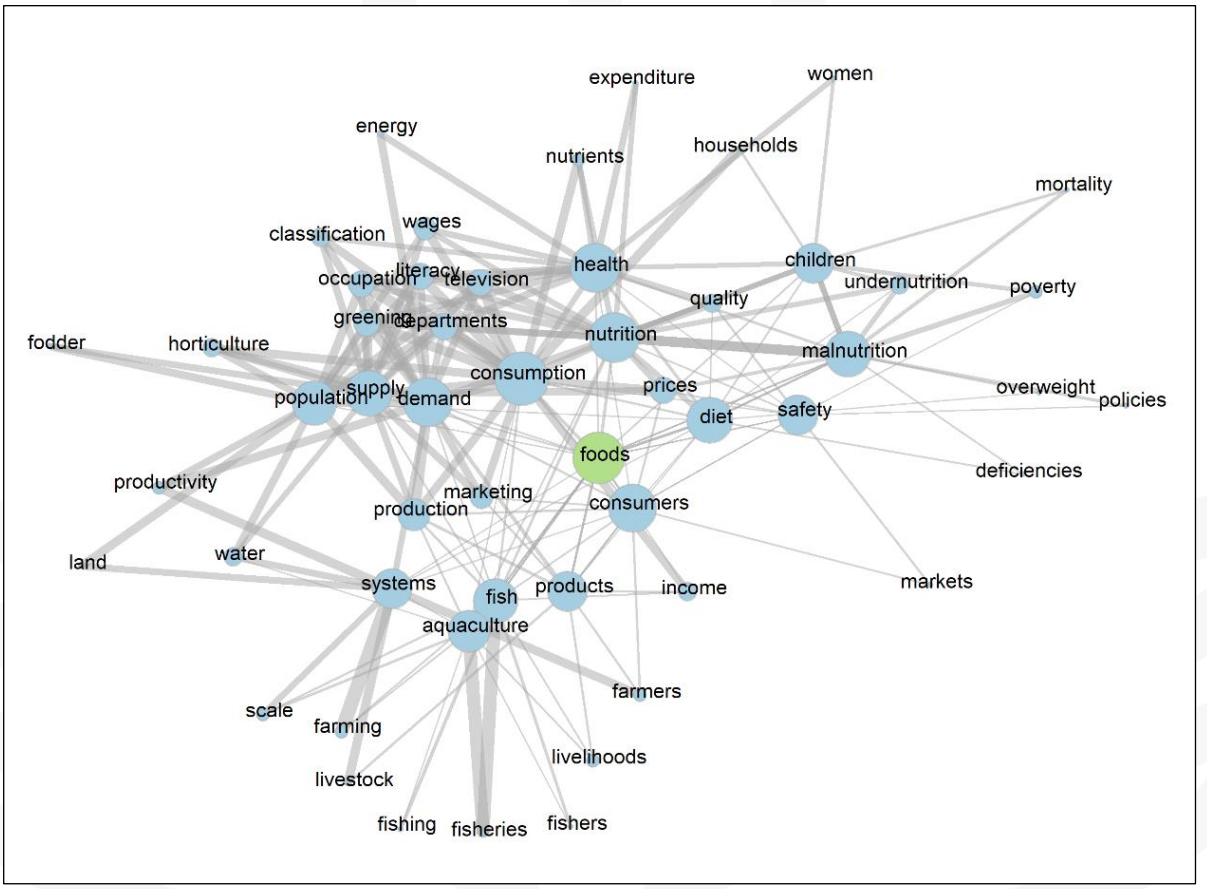

Figure 16: Network visualization with target term “foods” for food insecurity pathway

For the pathway on food insecurity, nexus-specific core keywords such as “climate”, “violence”, “conflicts” among others, are not found to co-occur with the target term “foods” in the network visualization (Figure 16), indicating an existing gap in more directly linking CGIAR contributions on food systems to climate security inequality nexus. However, direct (through not strong) co-occurrences with keywords like “systems”, “consumption”, “prices”, “nutrition”, “demand” as well as second-order co-occurrence with “income” and “markets” through “consumers”, can be indicative of a focus beyond just the production side to also consider food provision, nutrition, and health outcomes. The direct co-occurrence with “prices” is further suggestive of a mechanism working through one of the compound climate fragility risks on volatile food prices and provision, reportedly linked with conflict and security risks like severe food insecurity, food riots and public protests.

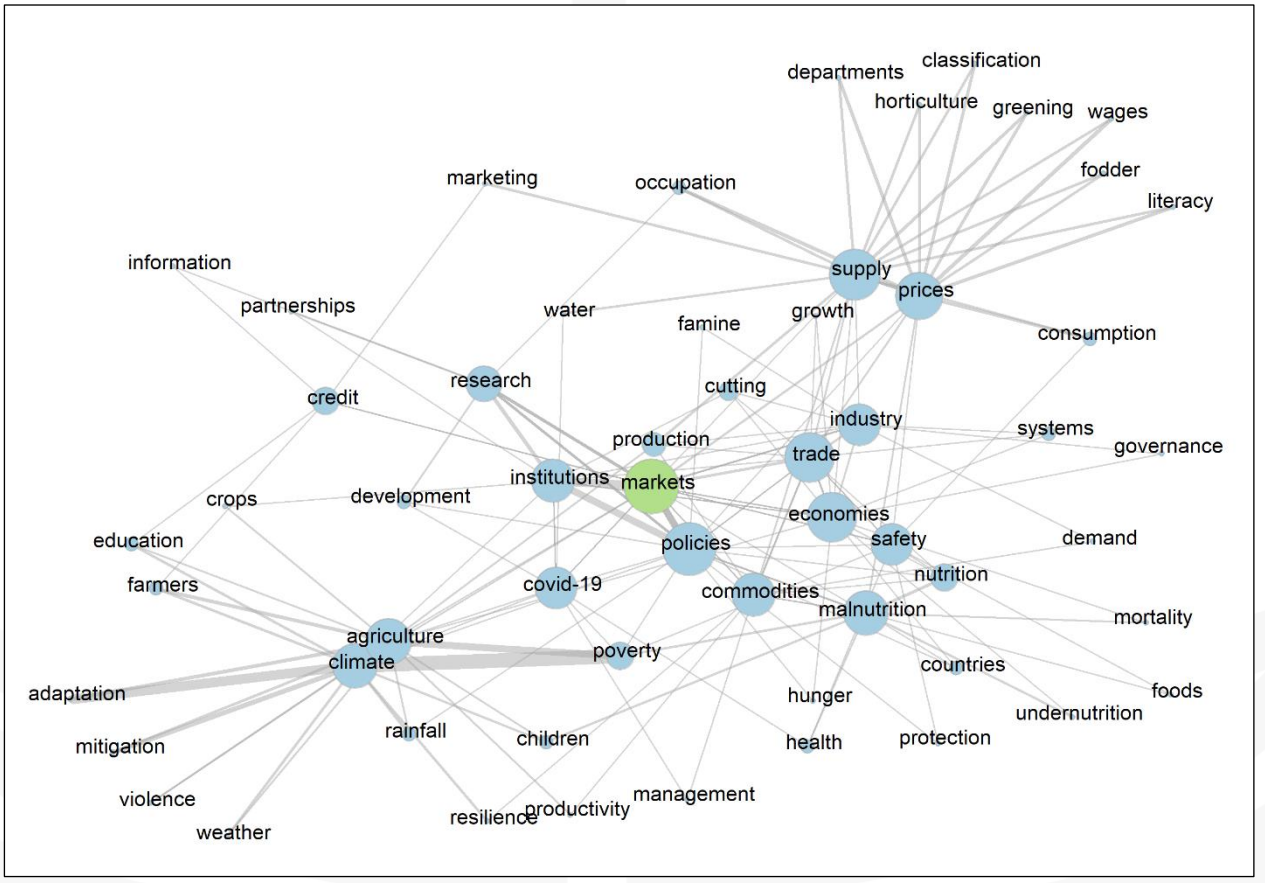

Figure 17: Network visualization with target term “markets” for food insecurity pathway

To unpack this further, a network visualization was created with the target term “markets” (Figure 17). Though the keyword “foods” can be seen at the periphery of this network graph, it may be worthwhile to note that first-order co-occurrences with keywords “institutions”, “policies” (strong), “economies”, “prices” and “malnutrition” (weak) could still be indicative of how this pathway

operates. The usual cluster of keywords around “climate” including “agriculture” and “violence” are further found to co-occur with markets in this network graph. Thus, instead of sole focus on food production, considering aspects like food supply and prices, along with relevant policies and institutions, can be critical for tracing channels through which disruptions in local food markets can lead to adverse nutrition and health outcomes, especially for those already susceptible to experience hunger and food insecurity. However, links with keywords like “conflicts” or “equality” are not apparent here, which supports the gap identified above.

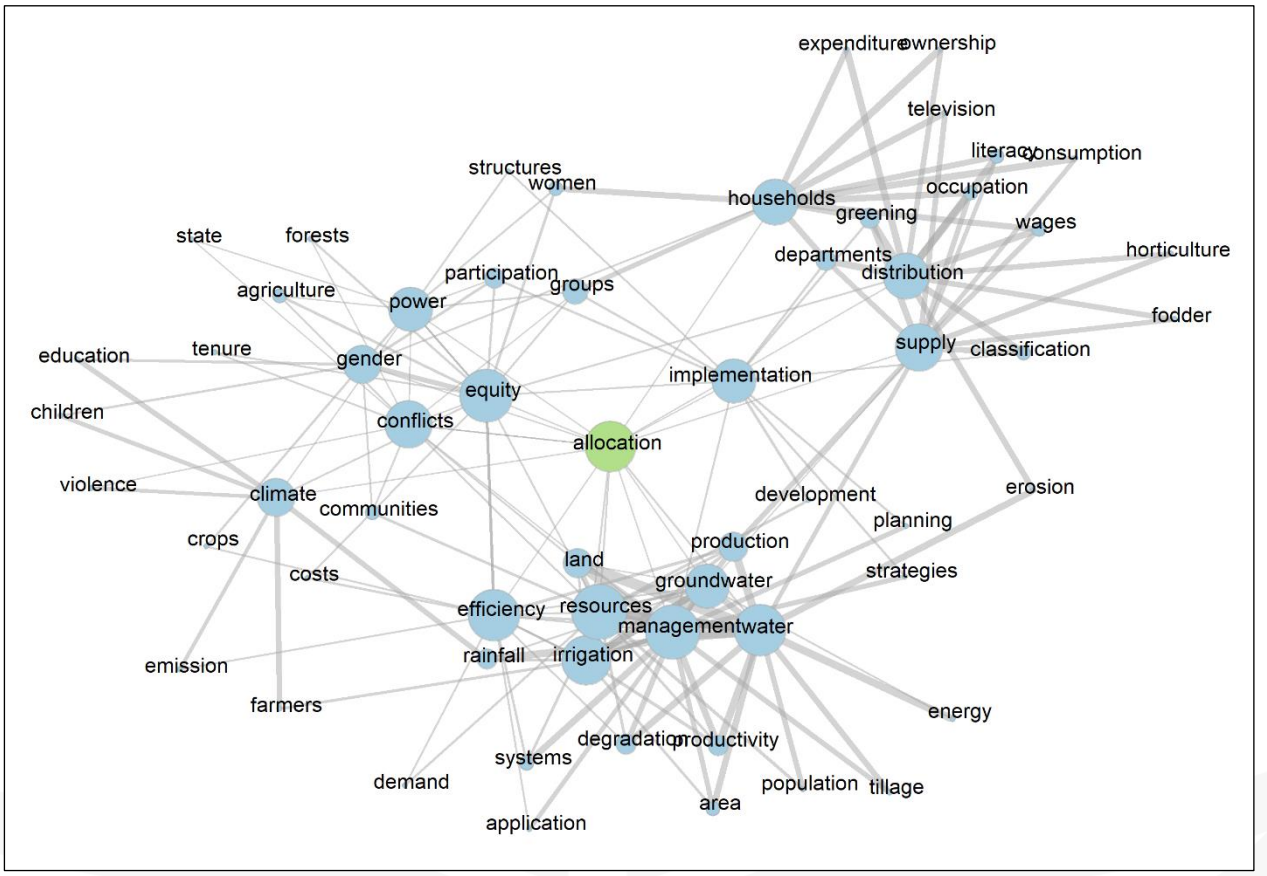

Figure 18: Network visualization with target term “allocation”

Network visualization created with the target term “allocation” (Figure 18) further support insights from the pathway-specific network graphs. As part of the mechanism for resource management and governance, allocation can be crucial for understanding conflict risks and resolution, along with climate impacts on livelihood and food insecurity. Directly co-occurring with keywords “climate”, “conflicts”, “equity” and “resources”, as well as indirectly co-occurring with “violence” and “tenure”, the target term “allocation” can be posited to be a key aspect of the climate security inequality nexus, as captured from the keyword corpus of CGIAR contributions coming closest to focusing on

the nexus. Furthermore, “allocation” is indirectly linked to “development” and “distribution” through “implementation”, and directly co-occurs with “supply” (though not very strongly), indicating the scope of research, policy, and programming to engage more deeply with each of the pathways in climate security inequality nexus.

Climate Security, Resilience and Peace Nexus: Towards Synergies?

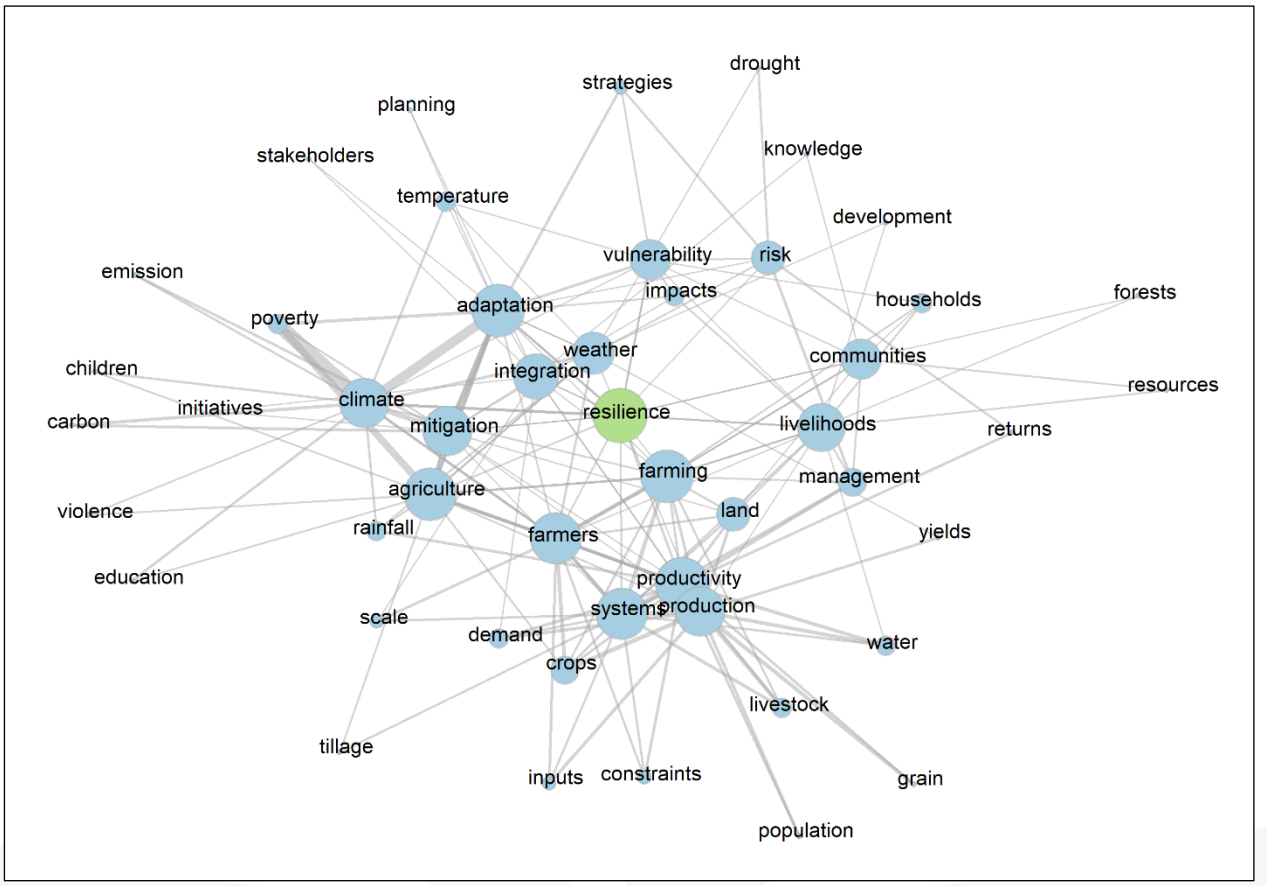

Figure 19: Network visualization with target term “resilience”

Network visualization with the target term “resilience” (Figure 19) highlights there is direct co-occurrence with keywords “livelihoods”, “agriculture”, “climate”, “adaptation”, “mitigation” along with “communities” and “systems”. This indicates that while building resilience could be an integral part of climate adaptation, with the spotlight tending to be focused on agricultural livelihoods, there is scope to move from an adaptive to a more transformational approach through which inequalities reproduced by power structures and societal norms could be addressed. Any resilience building exercise should ask questions like whose resilience, resilience to what, in which context, and towards what end. Here even as keywords “violence” and “risk” are part of the network, there remains the

opportunity for resilience and climate to be studied more in tandem with keywords like "cooperation", "peace", and "stability" by CGIAR contributions.

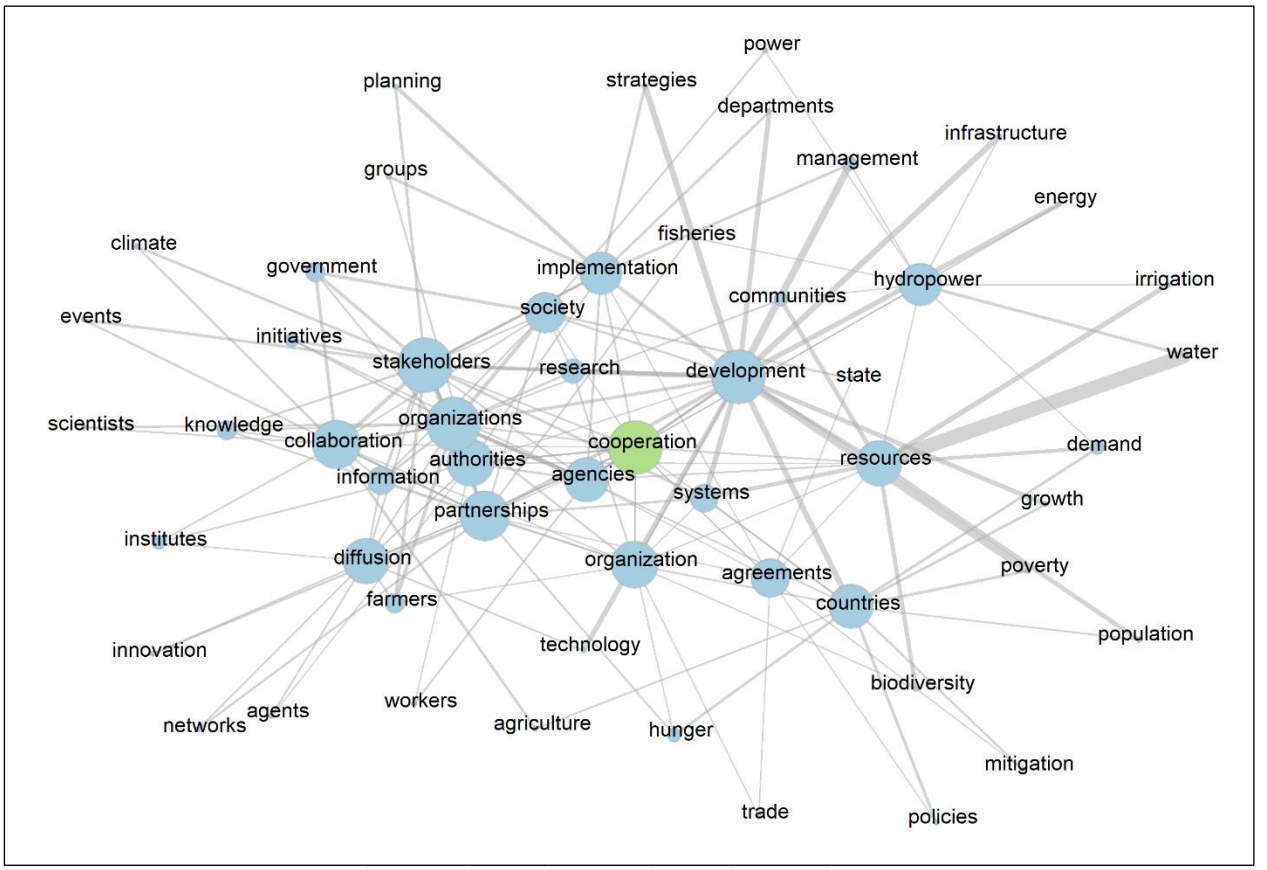

Figure 20: Network visualization with target term "cooperation"

Finally, while the target term "cooperation" (Figure 20) is found to directly co-occur with keywords like "resources," "development" and "systems" and actors depicted by keywords "organizations," "agencies," "authorities," and "stakeholders," there is scope for this area to not only be more sensitive to the climate security nexus, but also for examining the role of multidimensional inequality in shaping whether outcomes would be related to possibilities of cooperation or risks of conflict. For instance, "cooperation" is linked with "water" and "hydropower" through "resources", while directly co-occurring with "development", "society" and "systems", indicating both that it is considered in works on water-energy-development nexus, as well as its potential to inform socially inclusive and equitable development outcomes.

4. Key Messages and Entry Points

Key Messages

- Not shift the spotlight but expand the spotlight to explore synergies between climate security risks, resilience, and peace nexus through the lens of inequality.

- Climate-smart research for development and conflict-sensitive programs and policies must also integrate inequality as a core component.

- Not only should there be reliance on technological solutions but also collaborative governance approaches to address unequal power relations and distribution of rights and resources.

- Expand key research and policy focus on security from states to focus on people (communities and households) and local regional contexts.

- Leverage the lens of inequality to advance understanding of climate security nexus as intersectional.

Research recommendations

- Research on climate security inequality nexus must not only consider inequality as driver and intermediary variable but also as outcome of nexus-specific pathways, including adaptation and development efforts. Research on the nexus must also consider inequity and injustice reproduced by socio-ecological and political economic systems.

- Research examining complex linkages between inequality and violence is needed, including *inequality as structural violence*, to generate empirical evidence, analytical tools, and conceptual frames for advancing critical understanding of inequality as part of the nexus.

- To go beyond income inequality and factor in the role of social inequalities and systemic inequities in the nexus, multi-method approaches combining large-*N* statistical analysis with ethnographic field methods and historical understanding would be needed to strengthen existing analytical and theoretical frameworks.

- Empirical focus would need to move beyond overwhelming attention on certain regions and sub-regions as typical examples of climate-conflict nexus, to broaden geographical scope of analysis. It would require critical awareness and interrogation of assumptions that characterize certain contexts as "naturally" violent and conflict-prone, reproducing what is called a "streetlight effect" (Adams et al. 2018). Moving beyond such convenience-based sampling would allow research to also pay attention to relatively stable contexts and peaceful outcomes, crucial for conceptual and analytical development of climate-resilience-peace nexus.

Policy and Programming recommendations

- Programming efforts targeting adaptation and development for a climate vulnerable region would need to consider both existing structural inequalities as well as inequality as outcome of adaptation itself, with implications for issues around maladaptation, political insecurities, and human rights.

- Policies addressing mitigation of risks and vulnerability around climate variability and policies targeting reduction of inequality at national and regional levels should not follow parallel paths. Rather they must be considered as integral parts of the same framework, using the les of climate security.

- Food security related policies and programs at national and regional scales would need to move beyond a focus on innovation and technological solutions, to engage with evaluating and shaping governance approaches to address unequal distribution and access at multiple levels.

- Climate-sensitivity and conflict-sensitivity in programming and policy should address inequality as a core component. This should involve not only concerns and solutions around reducing inequality, but also how to address root causes of inequality across specific contexts characterized by relative fragility as well as stability. This is crucial for generating empirical evidence and policy solutions for climate-fragility-insecurity-conflict nexus with far ranging implications for key impact areas involving food, water, and land systems.

Appendix

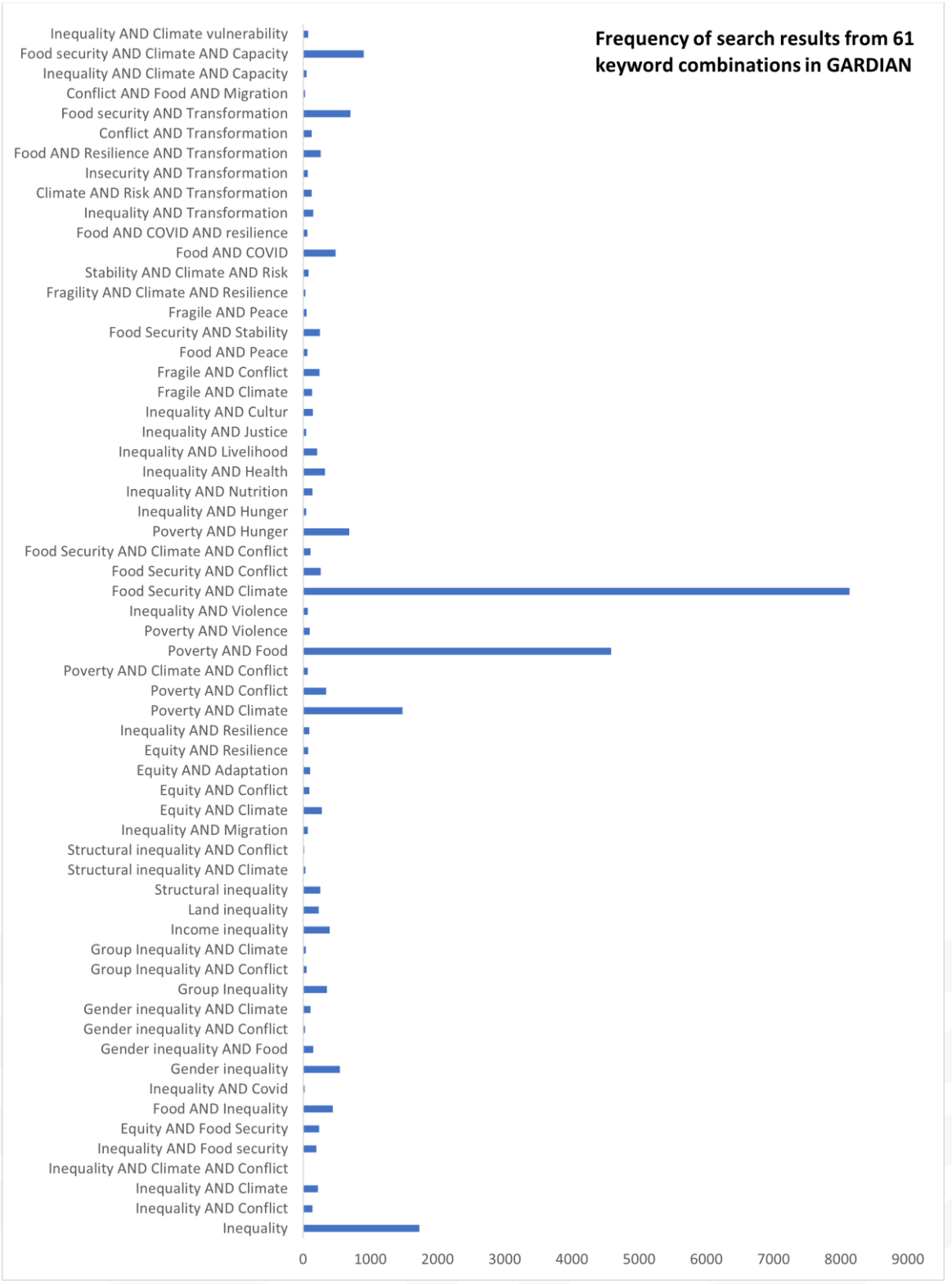

Figure 2: Search results in GARDIAN

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