CGIAR INITIATIVE ON Gender Equality

An evidence synthesis of gender norms in agrifood systems: Pathways towards improved women's economic resilience to climate change

Anne M. Rietveld, Cathy Rozel Farnworth, Meghajit Shijagurumayum, Angela Meentzen, Rachel Voss, Rebecca Morahan, and Diana E. López

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Acronyms and abbreviations

FAO	Food and Agriculture Organization of the United Nations
HER+	The CGIAR Initiative on Gender Equality
IPCC	Intergovernmental Panel on Climate Change
LMIC	low- and middle-income countries
WP	work package

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Cattle, Myanmar (Cathy Rozel Farnworth)

Foreword

Harnessing Gender and Social Equality for Resilient Agrifood Systems (Gender Equality, abbreviated as HER+) is a CGIAR research initiative working to achieve climate resilience by strengthening gender equality and social inclusion across food systems in the Global South. It works with partners to support women to expand their voice and agency. The program aims to help women acquire and control assets, to help them adapt to climate change and related shocks, and to help them access services in market, financial and public sectors. Through conducting empirical research and scholarly reviews, HER+ aims to achieve a better understanding of four dimensions of inequality: (i) Women's lack of agency to set their own goals and make their own decisions, (ii) Women's lack of access to, and control over, resources, such as land and water, (iii) Restrictive social norms that discriminate against women, and (iv) Policies that fail to include and benefit women. Improved knowledge will ensure HER+ is well placed to develop measures to challenge and overcome the negative aspects of inequality.

This evidence synthesis was conducted as part of Work Package One (WP 1) of the HER+ initiative. WP 1 works with a range of partners *to address normative constraints that limit the capacities of women agri-food systems actors to build economic resilience to climate change challenges* through developing and using gender transformative approaches. To complement the evidence synthesis WP 1 is further tasked with conducting qualitative and quantitative assessments to better understand normative constraints in three agri-food systems (cassava, chicken, and fish). The combined evidence will be presented at stakeholder validation and consultation workshops to identify specific leverage points at different scales in the agrifood system. This knowledge will help us design and pilot a set of gender-transformative approaches to challenge harmful gender norms in ways which strengthen women's and men's agency in positive ways.

The purpose of the evidence synthesis is to provide entry points for gender transformative approaches to enable HER+ stakeholders to influence gender norms and to help women actors build economic resilience in the face of climate change challenges across agrifood systems in low- and middle-income countries (LMIC). This represents a knowledge contribution to the Intergovernmental Panel on Climate Change (IPCC) (2022) call to work towards climate-resilient development through developing partnerships with marginalized groups including women and girls, young people, indigenous peoples, local communities, and ethnic minorities.

Executive summary

The evidence synthesis aims to develop a systemic understanding of how women manage their livelihoods and organize food for household consumption when the agrifood systems within which they live are being affected, sometimes devastatingly, by climate change. The hypothesis is: *'Restrictive gender norms generally limit women's capacity to adapt to climate change and to build and maintain their livelihoods'.* To help evaluate this hypothesis, the evidence synthesis pulls together an extensive literature review with data from GENNOVATE fieldwork-based case studies.

> Food security and climate change have strong gender and equity dimensions. Worldwide, women play significant roles in food security albeit with differences across regions. Climate change impacts vary among diverse social groups depending on age, ethnicity, gender, wealth, and class. Climate extremes have immediate and long-term impacts on the livelihoods of poor and vulnerable communities, contributing to greater risks of food insecurity that can be a stress multiplier for internal and external migration. Empowering women and rights-based approaches to decision-making can create synergies among household food security, adaptation, and mitigation.
>
> IPCC, 2019

The primary focus of the evidence synthesis is on how gender norms facilitate, or hamper, women's abilities to put food on the table and to achieve economic resilience in the face of climate change. The conceptual framing examines the workings of gender norms and how they are contested through selected variables – women's power and agency, intersectionality, and women's location in their life course – to arrive at a picture of how women are negotiating climate change in their everyday lives. Diagnostic questions help to guide the analysis. For example, are women able to be pro-active, to take decisions to adapt and even transform their lives? Are women being pushed – through a range of gender norms which set limits on their agency – towards increasingly unviable livelihood strategies?

Findings are presented in two sections. Section 3 focuses on gender norms in relation to women's resilience in the food production system. Findings are structured according to the specific gender norms. Gender norms that are most significant in the household sphere are presented first, followed by discussion of gender norms which shape interactions in the community sphere. The section concludes with an appraisal of gender norms in the organisational sphere. Section 4 presents findings in the food consumption system according to specific themes such as food preparation and food preferences which details normative dimensions across different levels.

Section 5 briefly synthesizes the findings and is followed by a presentation of a conceptual framework on economic resilience pathways (Section 6). The framework provides women with three potential economic resilience pathways in response to their climate change-related challenges. These pathways are (1) absorptive resilience pathway, (2) adaptive resilience pathway, and (3) transformative resilience pathway. A final pathway, (4) inability to cope, does not facilitate resilience. This aims to help direct further, targeted research and development efforts.

Summary of Agrifood System Norm Findings

Table 1. provides a summary of the findings. With regard to food production systems, eleven norms are identified. Gender norms 1-5 are expressed most strongly in the household sphere. They suggest that men are primary breadwinners, holders of core productive assets, and are household heads and decision-makers. Women are normatively responsible for household management and childcare and for growing crops intended primarily for home consumption. This indicates clearly that women are not expected to possess the resources and decision-making power to generate significant incomes under their own control. Community sphere norms underpin and expand upon household sphere norms. They suggest that men, rather than women, are expected to speak in community or other meetings. This indicates that women are unlikely to have scope to bring their gender interests to core decision-making forums. Women and men tend to work within different knowledge and support networks, with women's networks receiving far less research and budgetary attention. Finally, women are not expected to build up significant capital, though they can establish small savings groups in the community sphere.

Organisational sphere norms serve to reinforce the norms just cited. Organisations rarely recognize women as significant food systems actors. They may proffer small projects directed at women, but overall, much programming tends to feed into and reinforce – rather than challenge, gender norms. As part of this, women are not recognized as decision-makers over land, and for this reason they may prefer to prefer to use their agency to secure usufruct rights rather than legal land rights. Finally, studies of large-scale investment programmes show that women's existing rights to land are rarely investigated and supported through such investments. Taken together, the eleven norms discussed make it challenging for women to work towards economic resilience in food production systems, and to properly understand and work around the challenges of climate change.

The second set of norms focuses on food consumption. In the household sphere, women are considered key to preparing food, yet men receive priority in food allocation in many countries. This has effects upon the health of women and children. In the community sphere women are expected to reproduce cultural food norms, even though this is becoming more challenging in some places due to the ways in which climate change (and other factors like urbanisation) is affecting the production of culturally important crops. Lastly, women are framed by external organisations as responsible for food provisioning. Women are targeted accordingly. However, the evidence shows that they do not have the decision-making power to act effectively.

Summary of agrifood system norms	
Food Production	GN 1. Men are primary income earners
	GN 2. Men are household heads and decision-makers
	GN 3. Women are responsible for childcare
	GN 4. Men manage productive resources such as land and other assets
	GN 5. Women grow subsistence crops
	GN 6. Men speak in public
	GN 7. Knowledge and support networks are mostly gender specific
	GN 8. Women should not build up capital
	GN 9. Women are not recognized as food system actors by organisations
	GN 10. Women are not recognized as decision makers over land
	GN 11. Women's communal land rights are ignored
Food Consumption	GN 12. Men receive priority in food allocation
	GN 13 . Women are responsible for food preparation
	GN 14. Women are expected to reproduce cultural food norms
	GN 15. Women are framed as responsible for food provisioning

Fish market, Myanmar (Cathy Rozel Farnworth)

1. Introduction

1.1 Setting the scene

Globally, climate change may force up to 132 million additional people into extreme poverty by 2030 (Soriano et al., 2022). The one third of the world's working population that relies on agrifood systems for their livelihoods is at special risk. An estimated 36 percent of working women and 38 percent of working men were active in agrifood systems globally in 2019 (FAO, 2023). Global climate change is systemically undermining these agrifood systems by altering temperature and precipitation patterns and increasing the incidence of extreme weather events. These shifts are destabilizing agricultural production and productivity (IPCC, 2022; Mbow et al., 2019). At the same time, global climate change is redistributing biodiversity. Species ranges are shifting as plants and animals seek out more tolerable conditions, or become maladapted and more vulnerable (Gallegos et al., 2023).

Simultaneously, agrifood systems are highly vulnerable to, and contribute to, climate and biodiversity crises. Thus, they must be a central part of discussions around ensuring climate-resilient development. Many agrifood systems contribute to greenhouse gas emissions, with estimates of up to a third of all emissions worldwide. The expansion of agrifood systems into hitherto unfarmed areas contribute to habitat destruction and pollution. These processes coalesce systemically with other challenges for agrifood system actors. The challenges include rapidly increasing human populations, greatly increased competition for natural resources, transboundary pests and diseases, increased conflicts, increased migration, and high levels of food loss and waste. Agrifood systems must also adjust to dietary transitions affecting nutrition and health, the introduction of advanced food production systems and their resultant impacts on farmer livelihoods, and new international governance mechanisms for responding to food and nutrition security issues (Calicioglu et al., 2019).

People working in agrifood systems are striving to maintain and improve their livelihoods amid these fast-paced and deeply challenging change processes. However, the gendered nature of agrifood systems means men's and women's experiences of these changes are not the same (Njuki et al., 2022). In many low-and-middle income countries (LMIC), agrifood systems are a more important source of livelihoods for women than for men. In southern Asia, for instance, more women (71 percent) than men (47 percent) work in agrifood systems. In

sub-Saharan Africa, 66 percent of women and 60 percent of men do so. In many countries around the world young women (particularly aged 15 to 24) are strongly reliant on employment in agrifood systems (FAO, 2023). Although women are at the heart of agrifood systems, they typically encounter fewer opportunities and more constraints than men (UNFCCC, 2019). Women are less likely than men to work as entrepreneurs and independent farmers, and they often grow less lucrative crops and raise smaller, less valuable livestock (FAO, 2023). Women's abilities to access off-farm and non-farm work is also frequently constrained (UNFCCC, 2019).

In part for these reasons, the negative impacts of climate change disproportionately affect women and marginalized groups, such as indigenous people or minority populations. Their livelihoods are frequently more dependent on natural resources. In many cases, they are more exposed and less able to adapt to and recover from climate risks, fuelling a cycle of increasing vulnerability and inequality (UNFCCC, 2019). An intersectional social vulnerability perspective acknowledges that women are not inherently vulnerable due to their biological sex *per se*. More commonly, women experience different vulnerabilities relative to men (and to each other) due to "complex, dynamic and intersecting power relations and other structural and place-based causes of inequality" (IPCC, 2014: 6). These processes interact in the meeting spaces between gender, class, ethnicity, age, (dis)ability, and other social identities. They can deepen discrimination and undermine agency for some people and strengthen privilege and agency for others. Consequently, "people who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change and also to some adaptation and mitigation responses" (IPCC, 2014: 6). These restrictive structures and processes are largely mediated by social norms, which when specifically prescribing discriminatory norms for women and men, are referred to as gender norms. Gender norms denote what approved conduct is for women and men in a particular context (Pearce and Connel, 2016). Gender norms shape human interactions across spheres of influence ranging from the household to the community and to institutional and national levels.

Equitable agrifood system development is an important means to address women and men's vulnerabilities and to build resilience. Resilience often refers to the ability of a system, whether a farm, agribusiness, community food system, or wider agrifood system, to weather and bounce back from disturbances. Resilience can also be considered from the individual human perspective as, "the ability to draw upon a set of capacities to deal with shocks and stressors before, during and after a disturbance in a way that maintains or improves wellbeing outcomes, such as food security or adequate nutrition" (Bryan et al., 2023:1). Liru et al. (2021) suggest that resilience is the ability of people to anticipate and prepare for, respond to, and recover from the stresses and shocks of climate change. They distinguish between three forms of resilience. *Absorptive resilience* is reactive and describes the ability of individuals to cope with the impacts of climate change on their livelihoods within their immediate means. This is usually short-lived. If people are subjected to successive shocks, they may not be able to manage. *Adaptive resilience* refers to people's ability to manage future risks and to prepare for and cope with shocks, for instance, by adopting new technologies and taking advantage of opportunities presented by new challenges. Other authors similarly emphasize the importance of being able not only to manage risk, but to anticipate and prepare for change (Ado et al., 2019; Shadbolt and Olubode-Awosola, 2013). *Transformative resilience* is the most systemic. People change the rules of the game to help move beyond their vulnerability threshold. For this, they need access to resources. They need to change their practices (Liru et al., 2021). Beyer et al. (2016) also frame resilience in terms of surviving, adapting, growing and "even transforming" if necessary. They envisage multiple dimensions of change, suggesting that building resilience is about helping people, communities, and systems not only to return to previous states, but to emerge stronger from shocks.

1.2 Purpose and framing of the evidence synthesis

The primary purpose of the evidence synthesis is to describe how gender norms facilitate, or hamper, women's abilities to achieve economic resilience in the face of climate change challenges. The synthesis also creates a new conceptual framework termed economic resilience pathways to help develop insights on this topic. This evidence synthesis builds on the hypothesis that restrictive gender norms generally limit women's capacity to adapt to climate change and to build and maintain their livelihoods. Because of our primary interest in livelihoods, we focus on women's economic resilience.

1.2.1 Understanding gender norms

The conceptual framing of the evidence synthesis rests on an examination of the workings of gender norms in agrifood systems and how these norms become embedded or are contested. The conceptual framework helps us develop a picture of how women, in their everyday lives, are negotiating the challenges created by climate change. The socio-ecological model is built around the understanding that agrifood systems "encompass the entire range of actors, and their interlinked value-adding activities, engaged in the primary production of food and non-food agricultural products, as well as in storage, aggregation, post-harvest handling, transportation, processing, distribution, marketing, disposal and consumption of all food products including those of non-agricultural origin" (FAO, 2022: vii). These actors, and the gender norms that influence their attitudes and behaviors, operate at, and between, the individual, community, household, organizations, and enabling environment levels – or spheres of influence (Table 1). The use of the term "spheres" – instead of levels, which brings to mind boxed-in hierarchies – calls attention to the ways in which factors cross organizational boundaries in complex interactions (FAO et al., 2023).

A socio-ecological model is particularly valuable in visualizing elements of the complex interactions between individual, household, community, organizational and macro-environmental spheres of influence. Gender and social norms are expressed by, and through, informal social institutions, formal social institutions (policies and laws), individual and collective agency, and power relations. In turn, these norms combine with each other within and across spheres to influence the ability of women and men to achieve more resilient livelihoods. An individual's or gender group's status, power, and voice are strongly affected by the ways in which gender norms are interpreted and enforced in different spheres (Cole et al., 2014).

Gender norms around women's mobility provides one such example. Cultures which endorse purdah – the practice of secluding women to keep them out of the sight of strangers or men – may articulate this norm in the household sphere through teaching girls to observe the tradition. Gatekeepers such as village elders may punish transgressors in the community sphere. Organizations may tacitly endorse women's limited mobility by failing to develop creative ways to challenge gender norms in the communities they work with. They may also fail to develop supportive policies for women staff to help them move freely. Governments too may fail to promote women's mobility by neglecting to dedicate resources to public information campaigns.

Table 1. Spheres of influence. Source: FAO et al. (2023).

Spheres of influence	Individual (women and men)
	Household (Families, Intrahousehold relationships)
	Community (Leaders, Local service providers, Groups)
	Organizations (Public / private sector Development organization and civil society)
	Macro-environmental (Government, donors, development banks)

Farmers' meeting, Uganda (Anne M. Rietveld)

2. Methodology

The evidence synthesis aims to develop a systematic understanding of how women produce food. It aims to comprehend how they select and organize food for household consumption when the agrifood systems within which they live are undergoing transformation due to climate change. We hypothesize that restrictive gender norms generally limit women's capacity to adapt to climate change and to build and maintain their livelihoods. To help verify or challenge this hypothesis, the following questions are asked:

- Are women able to be pro-active, to take decisions to adapt and even transform their lives?
- Or are women being pushed, through a range of gender norms which set limits on their agency, towards increasingly unviable livelihood strategies?

The evidence synthesis responds to these questions by bringing together an extensive literature review with data from the GENNOVATE initiative – a globally comparative CGIAR research project examining how gender norms and agency influence men, women, and youth.

2.1 Literature Review

The starting point for the literature review is a gendered food system framework developed by Njuki et al. (2022), identifying three agrifood systems components: 1) food environment, 2) agri-food value chains, and 3) consumer behavior. To answer the research questions more fully, we also considered resilience and how farmers adapt their practices to a changing climate. Thus, two more agrifood system components were added: 4) economic resilience, and 5) adaptive capacity.

To identify appropriate literature, we used the Web of Science (WoS; https://clarivate.com). The search terms in Table 2 were cross-referenced with "gender" and "women". The following restrictions were applied: i) geographical focus on LMIC, (ii) agri-food system focus, (iii) analysis of primary data, (iv) written in the English language. Literature was generated across the five analytic domains resulting in an initial 611 articles for review. To ensure each article was only featured once, lists were compared in a multistage process. Multiple listings of the same article were removed, leaving the article in the most relevant analytic domain. Because of the high number of articles, an additional restriction,

(iv) articles from 2016 to 2022 only, was implemented. The food environment articles were reviewed before we set this limitation and therefore a few articles from 2016 and before are included due to their perceived significance. This overall process resulted in 524 articles for review.

A team of thirteen reviewers, including the authors of this report, examined literature in each analytical domain with the aim of preparing comprehensive annotated bibliographies. The deep reading process resulted in further articles being discarded. Articles were discarded if they showed no or insufficient focus on agrifood systems, or if gender issues were not meaningfully addressed. Ultimately, annotated bibliographies were developed for a final total of 431 articles. The articles discuss 77 different LMIC. A list of all reviewed literature is provided in Annex 1.

Notwithstanding their inclusion in the list with search terms, some topics (as cross-referenced with gender and/or women and subject to the restricting criteria) were underrepresented in the reviewed literature. The search yielded relatively few articles, only 25, for the analytical domain on consumer behavior. Within the analytical domain of food environment there were almost no articles discussing promotion and advertising of food. For the domain "agrifood value chains" none or few articles discussed food storage, distribution and processing or private sector and marketing.

Table 2. Search terms for Web of Science literature review

Cross-referenced	
Gender	
Women	
Analytic domains	
Food environment	Food availability/physical access/proximity; economic access/affordability; promotion, advertising and information; quality and safety
Agrifood value chains	Agricultural livelihoods; equitable livelihoods; climate-smart agriculture; conservation agriculture; livestock; crops; fish; gene flows; breeding. Production; processing; distribution; storage. Entrepreneurship; location in value chain; aggregators; cooperatives, private sector, farmer/producer groups; marketing; gender opportunities and constraints.
Consumer behavior	Symbolic, social, cultural values of food; food allocation in household; taste preferences; nutrition; health; dietary diversity.
Economic resilience	Vulnerability; resilience climate change; resilience agriculture; climate change; sensitivity shocks.
Adaptive capacity	Local/regional/national adaptive capacity; assets; flexibility; learning; social organization; agency.

Table 3. Overall article statistics

Overall Article Stats	
Total number of articles	431
Number of individual countries covered	77
Global study	26
Cross-region comparative study	18
Country comparative study	37

The geographic focus of the articles varied. Most articles focused on Africa (210), followed by Asia (150), Latin America (31), Oceania (20), Caribbean (7), Europe (2) and North America (2). The geographic focus suggests strong biases in research attention to certain countries, at least with respect to research published in English language journals. The country-wise breakdown of the articles is provided below. The total article count varies across countries and regions because some of the studies are regional or comparison or global studies which discuss multiple countries per article. A few non-LMIC were included because cross-country comparison studies did not exclusively evaluate LMICs.

Table 4. Article count - Africa Region

Eastern Africa	Western Africa	Southern Africa	Northern Africa	Central Africa
Ethiopia (22)	Benin (2)	South Africa (15)	Egypt (2)	Cameroon (3)
Somalia (1)	Burkina Faso (5)	Eswatini (3)		Democratic Republic of Congo (2)
Tanzania (18)	Ghana (32)	Lesotho (2)		Burundi (2)
Uganda (23)	Gambia (2)	Namibia (1)		Rwanda (2)
Kenya (31)	Mali (4)	Botswana (2)		
	Niger (3)	Zambia (10)		
	Nigeria (16)	Mozambique (3)		
	Senegal (7)	Zimbabwe (5)		
	Togo (2)	Madagascar (3)		
	Liberia (1)	Malawi (15)		
	Cape Verde (1)			
Total (95)	**(75)**	**(59)**	**(2)**	**(9)**

Table 5. Article Count – Asian region

South Asia	South East Asia	Central Asia	West Asia	South West Asia	East Asia
India (37)	Vietnam (13)	Tajikistan (1)	Iran (1)	Turkey (1)	China (2)
Bangladesh (28)	Philippines (8)	Uzbekistan (2)	Syria (1)		Taiwan (1)
Nepal (21)	Cambodia (5)	Afghanistan (2)	Palestine (1)		
Pakistan (10)	Myanmar (5)				
Sri Lanka (1)	Indonesia (5)				
	Malaysia (3)				
	Timor-Leste (1)				
	Laos (1)				
Total (97)	**(41)**	**(5)**	**(3)**	**(1)**	**(3)**

Table 6. Article count - Other Regions

Latin America	Caribbean	Oceania	Europe	North America
Colombia (7)	Haiti (3)	Solomon Islands (6)	Britain (1)	Canada (2)
Costa Rica (2)	Cuba (1)	Fiji (5)	Gran Canaria (1)	
Peru (4)	Grenada (1)	Papua New Guinea (3)		
Guatemala (4)	St. Lucia (1)	Vanuatu (2)		
Mexico (4)	St. Vincent and the Grenadines (1)	New Zealand (1)		
Brazil (3)		Samoa (1)		
Ecuador (2)		Micronesia (1)		
Chile (2)		Australia (1)		
Argentina (1)				
Bolivia (1)				
Galapagos Islands (1)				
Total (31)	**(7)**	**(20)**	**(2)**	**(2)**

The 431 articles were synthesized into five annotated bibliographies, one per analytic domain, producing five synthesis reports, which formed the basis of the evidence synthesis.

2.2 GENNOVATE Africa case study review

The global comparative CGIAR research project GENNOVATE examined how gender norms and agency influence men, women, and youth to adopt innovations in agriculture and natural resource management (Box 1.). The GENNOVATE data used in this report is derived from individual life history interviews from the Sub-Saharan Africa data set. The purpose of the individual life history interview instrument is: "to understand the life stories of how and why some women and men escape from poverty, remain trapped in poverty, or fall into deeper poverty; and how gender norms and capacities for exercising agency, livelihood innovation, and other dimensions shaped these different poverty dynamics" (Petesch et al., 2018). Data from this instrument include numerous examples of how gender norms affect women's agency across their life stages, and in turn how this affects their economic resilience. In many cases, respondents refer to aspects of climate change such as drought, floods or pests and diseases, or their use of climate smart technologies such as conservation agriculture. More specifically this data is employed in two ways. First, it provides testimonies in the form of women's voices to help build an understanding of how women themselves perceive their lives and climate change. The interviewees map out ways forward to develop economic resilience. Second, the GENNOVATE data helps to ameliorate data gaps in the literature review regarding how resilience might be affected by the stage of life within which women find themselves.

Box 1

GENNOVATE

The GENNOVATE methodology is a qualitative and comparative field research methodology consisting of seven data collection instruments. The GENNOVATE dataset consists primarily of qualitative data plus numerical information. It represents the largest qualitative dataset on gender and agriculture within the CGIAR. The project examines how gender norms influence the ways in which men, women, and youth adopt agricultural and natural resource management innovations. Eight CGIAR centers conducted 137 case studies in 26 countries across three continents between 2014 and 2016. For the evidence synthesis, GENNOVATE data were accessed in the software program Nvivo with coding embedded (Petesch et al., 2018).

An inductive, in-depth analysis of 82 individual life history interviews with women from 13 countries in East, West, and Southern Africa was conducted for the evidence synthesis (Table 7).

Table 7. Overview of GENNOVATE individual life history interview data from sub-Saharan Africa used in the evidence synthesis.

Region	Countries	Total countries	Total communities	Total life histories
East and Southern Africa	Rwanda, Uganda, DR Congo, Burundi, Ethiopia, Kenya, Tanzania, Malawi, Zimbabwe	9	30	60
West Africa	Nigeria, Burkina Faso, Niger, Mali	4	11	22
	TOTAL	**13**	**41**	**82**

2.3 Structure of the evidence synthesis

The evidence synthesis opens with an introduction, followed by explanation of the methodology. The latter combines a literature review with testimonies from rural women derived from the GENNOVATE initiative. The literature review draws upon 431 journal articles to report on empirical research conducted in LMIC across five analytic domains. It thus presents a comprehensive overview of the state of current knowledge on how gender norms and changes occasioned by climate change interact to affect women's economic resilience.

The findings summarize women's opportunities and challenges for developing economic resilience to climate change in:

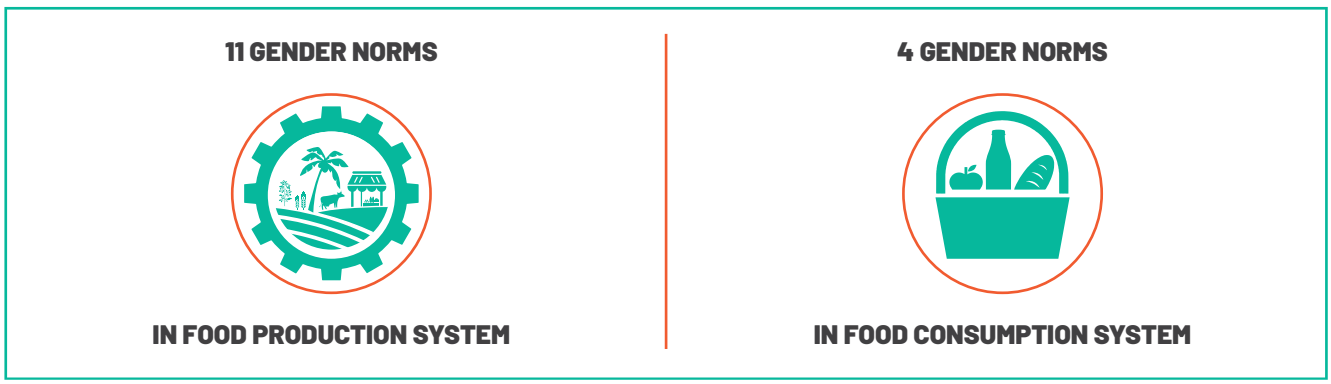
1. Food production
2. Food consumption

The evidence synthesis identifies the most important norms in each set of the findings. The analysis identified fifteen gender norms, each one of which is relevant to a particular sphere of influence. Eleven gender norms relate to food production, while four are associated with food consumption. The gender norms are formulated as either injunctive or descriptive norms. Injunctive (perceived) norms reflect people's discernments about what behavior is approved or disapproved by others. Descriptive norms reflect perceptions about what behaviors are typically performed. The framework for these norms is shown in Figure 1.

The synthesis leads to the development of the Economic Resilience Pathways Conceptual Framework. The framework builds in core system elements which the literature review fully or partly teases out of the literature: gender norms, power and agency, and intersectionality. It adds two further core system elements: life stage analysis, and personality traits. These elements are not well covered in the journal articles reviewed. However, they emerge as topics of interest from the GENNOVATE testimonies. The Economic Resilience Pathways conceptual framework identifies three potential economic resilience pathways: transformative, adaptive, and absorptive. Women (and men) can emerge onto these pathways and develop them as they advance their efforts to sustain their livelihoods and adapt to climate change. Household members may embark upon different economic resilience pathways even within the same family unit. This is turn affects their overall livelihood outcomes. A final pathway is termed inability to cope and, though described, is not a viable economic resilience pathway.

The Conclusion provides suggestions for further research within HER+ as well as other initiatives and work packages.

Figure 1. Gender norms across the production to consumption agrifood system



Feeding the fish in a women's SHG managed fishpond, India (Cathy Rozel Farnworth)

3. Women's opportunities and challenges for developing economic resilience to climate change in food production systems

Findings on gender norms in food production activities are discussed in relation to three spheres of influence: (i) household gender norms; (ii) community gender norms, and (iii) organizational gender norms (with a focus on research for development institutions). These three spheres of influence were selected through an inductive reading process whereby the findings from the literature review began to primarily coalesce around these three spheres. Less information was available on the individual and macro-environmental spheres of influence and therefore is not included here.

3.1 Household Sphere Gender Norms in Food Production Systems

Within the household sphere of influence, gender norms specifically relate to intra-household decision-making processes. They influence how income is generated and spent. The focus is on household members as individuals, as well as in terms of relationships between spouses, children and wider familial networks. Who decides, and who benefits, are key normative questions in this sphere of influence.

3.1.1 Gender Norm 1. Men are primary income earners

Gender norms in many locations brand men as the primary income earner (OECD, 2021). Consequently, men are widely expected to commercialize their food production activities and engage in market-orientated food chains (Malherbe et al., 2020; Hossain & Zaman, 2018; Porcher et al., 2022; Cáceres-Arteaga et al., 2020; Myeni & Wentink, 2021; Quiros et al., 2018). Conversely, the same gender norm tends to lock women into low-productivity, low income agri-food production and post-harvest activities with most of the resulting products consumed within the household. This norm – which in effect means that women should earn less than men – meshes with another gender norm that says women need to put food on the table. Women's limited ability to invest in more profitable crop and livestock portfolios can restrict their ability to meet these norms, and to respond to livelihood challenges more broadly, simply because they do not have enough money. In Ghana, women's lack of diversified income sources is a key factor for women's lower adaptive capacity to climate change compared to men (Abdul-Razak & Kruse, 2017). In part of the Ethiopian lowlands, one study showed that the income-generating opportunities for women become tied to those of her husband and the marital family, especially when they marry at a very young age. Such women may have difficulty developing their own sources of income and achieving economic resilience independently of their partners and wider family. They may struggle to improve the economic resilience of their household through independent income generation (Preslers-Marshall et al, 2022).

Gender norms promoting men's involvement in commercialized farming while discouraging women's involvement have implications for the kind of opportunities that young women can aspire towards. In rural Central Uganda a study showed that young men often aspire to enter commercial farming to generate an income. In contrast, young women see crop and livestock production as activities that support household food provisioning. Farming *per se* does not feature in the aspirations of young women, and indeed they dismiss farming as unsuitable as a future occupation. In reality, though, women may be forced to remain in agriculture due to their weak economic resilience and lack of resources (Rietveld et al., 2020).

When women nevertheless seek to engage in commercial agrifood chains, and particularly start earning significant incomes, their own families and community members at large may conceive this as a challenge to the gender norm that men should remain financially dominant. Such women can be construed as threatening family cohesion. In Makueni county in Kenya for instance, respondents argue that women who are financially independent from their husband undermine family unity (Po and Hickey, 2018). Similarly, in the Upper East Region of Ghana men report feeling uncomfortable with women's increasing contribution to household income. They perceive this as a threat to their role as household head and provider (Bryan and Garner, 2022). In Darjeeling, India, women involved in selling certified organic and FairTrade tea are accepted by their families and community members when they keep their businesses and incomes small (Sen et al., 2018). However, when women join self-help groups (SHGs) to take loans to expand their businesses, community norms negatively sanction their behavior, leaving their reputations severely threatened. These norms discourage many women from expanding their businesses.

Elsewhere, the importance of cash crop production to men is such that they may demand money from women to finance their efforts, particularly when other forms of formal and non-formal credit are sparse. A study conducted in one community in Madyha Pradesh, India found that some men demand money from their wives' SHGs to invest in wheat production. Women who refuse can suffer gender-based violence and, even if they comply, they are left with the responsibility for paying back the loans (Farnworth et al., 2022).

Across the GENNOVATE data set, women refer to men's unease with their financial success. In Malawi for example, one woman highlighted that men want to retain decision-making power and control over assets: "*I was given a plot by my mother and the goats by the Concern organization. Major decisions are made by my husband as he says women have less wisdom and the husband should keep everything. You know, they say that a woman is not capable of keeping any asset because she is less intelligent*" (Malawi, woman, aged 39).

In many countries, both women and men out-migrate. The literature available to this study focused mainly upon the effects of men's outmigration, though some literature evaluated women's outmigration. In Makueni county, Kenya, for instance, some unmarried women out-migrate. They are in the minority because norms designate them as household caretakers and consider them to be vulnerable in urban areas. These norms reduce women's incentives to seek economic opportunities through outmigration (Crossland et al, 2021.) In Vietnam, women farmers are generally less mobile and less equipped to take up alternative off-farm occupations (Hagedoorn et al., 2021). Within the household sphere of influence, one effect of men's outmigration, whether for the long or short term,

can be labor shortages on the farm. In Northern Benin and Madagascar, women typically remain on the farm and bear the brunt of impacts caused by climate change. They only have the capacity to cultivate for household subsistence, and due to the lack of market interactions, experience low economic resilience (Dah-gbeto and Villamor, 2016; Randriamparany and Mahefosoa, 2022). In Zambia, the adoption of climate smart practices is threatened by the outmigration of men – particularly in upland areas – in the dry season for fishing. This makes it hard for women to carry out essential monitoring and other activities on their family fields, which require considerable time spent walking from one field to another (Estrada-Carmona et al., 2020).

3.1.2 Gender Norm 2. Men are household heads and decision-makers

Throughout LMICs men are considered as the head of household and the primary decision-maker (OECD, 2021). The primary decision-maker typically wields power over how income is to be used and how assets (land, tools, human resources, etc.) are to be deployed. Sen's (1990) theory of cooperative conflicts contends that households are not mutually beneficial institutions. Rather, they comprise bargaining processes that are gendered and unequal and may not act in the interests of all household members (Sen, 1990). This theory suggests, when applied to agrifood systems, that although women work across the various production and processing stages of a wide range of crops, livestock and fish – including those primarily designated for sale – they do not necessarily receive income commensurate with their work. They may not have much say in how income is spent (Acosta et al., 2019). Evidence for this is found in many studies. In Rwanda and Burundi, for instance, value chain analyses of root, tuber and banana crops found positive correlations between the value of these food chains and men's dominance in decision-making (Okonya et al, 2019).

However, when men are no longer available to act as household head, the gender norm identifying the masculine gender with household headship can give way to a recognition that women are household heads with corresponding decision-making power (Badstue et al., 2020). The GENNOVATE data show that widowed women respondents experience more power and agency following the death of their husbands because they are now able to take decisions over their farms and businesses themselves. A woman from western Uganda explained: "*Before I used not to decide for myself because I had a husband whom I would follow in each and every thing. Now I'm a widow and I make all the decisions myself.*"

Yet the pervasiveness of the combined norm that men are household heads and correspondingly exercise primary decision-making power means that the ability of women to take on these roles can be challenged. It is not uncommon for men relatives or in-laws to attempt to assume the role of head of the household and exercise decision-making power accordingly. Women vary in their ability to challenge these processes.

GENNOVATE data cites how a widow from Ethiopia described how her eldest son tried to assume control over her farm and associated enterprises. She resisted by paying for him to take driving lessons so that he could earn money as a driver. In return she expected him to leave her in charge of her businesses. He acquiesced. However, another Ethiopian widow married the younger brother of her late husband because this was the only way for her to remain on the land and maintain her access to the livelihood assets she needed to survive. Several other women respondents to GENNOVATE surveys reported that their decision-making power lessens as their sons mature and take on more responsibility. They may also lose their main sources of income. This in turn negatively impacts upon their capacity to achieve economic resilience.

Male outmigration, however, is challenging the norm that men are household heads and key decision-makers. In some cases, men's outmigration provides opportunities for women to strengthen their decision-making power. The GENNOVATE database provides several examples. For instance, a 48-year-old Ethiopian woman reports an increase in her decision-making power over time, partly due to her husband's frequent absence, but also because of his practical reasoning.

> *"I influence my husband very much. He travels most of the time and as a result I have to make decisions. I made decisions about our children's education too … My relationship with my husband is the most important thing because he supports me and understands me. When I started working with the kebele [local administration] some of his relatives and friends were telling him why would you allow her … but he said "She is the one who builds the family. She is a very strong woman, and I am blessed so I do not want to spoil this.*

In this particular case, the respondent had been taken out of school at the end of sixth grade by her father. He planned to marry her in an exchange deal with her brother marrying her would-be spouse's sister. However, her father fell ill and she was forced to take on the farm work, including ploughing. This led her father to comment:

> *she was born a girl by mistake*

Although the respondent takes decisions – including *"minor decisions"* such as renting land – she noted that she never tells anyone else in the community that she does so. She tells people that her husband still takes the final decision on big matters.

In their multi-country study focusing on livestock innovation, social norms and women's empowerment, Galiè *et al.* (2022) identify drivers of increased women's decision-making at a meta-level and community level. Meta-level forces include changes underway that are exogenous to the community, such as universal education, market forces, technological change, and labor migration – all of which are gendered. At a local level, Galiè et al. (2022) argue that women's existing control over livestock and recognition as livestock farmers constitute potential building blocks of women's empowerment. Male outmigration provides an opportunity for women's control to translate into actual empowerment by increasing women's decision making. Similarly, in Ghana, male outmigration leads to women's increased participation in intra-household decision-making. Off-farm petty trade strengthens their participation even more (Wrigley-Asante et al., 2017). In northern Benin, male outmigration leads women to become primarily responsible for maintaining the agricultural system. Although relative to men they continue to experience low agency, their sense of identity and solidarity with other women is strong (Dah-gbeto and Villamor, 2016).

Conversely, other studies suggest women's sense of well-being may decline, even though they may feel empowered by men's outmigration. In jute-producing communities in Bangladesh, little evidence was found to suggest that women are taking on new roles when men out-migrate, and overall men's out-migration does not appear to enhance the welfare of women who remain in agricultural households. Interestingly, women's empowerment increases in jute-producing households when another female household member, rather than a male household member, migrates. One hypothesis for this is that having multiple adult women within a household may lead to more competition between women regarding control over resources or relative standing (de Brauw et al., 2021).

Norms structuring intra-household dynamics also change in extended families when men out-migrate. In Uzbekistan, women in wheat-farming households where men have out-migrated reported improvements in their relationship with their mothers-in-law, as the latter's wellbeing becomes tied to that of their daughters-in-law. Respondents agree that support from husbands and in-laws, and mothers-in-law, is important in enabling women to successfully take on previously male-dominated farm management roles (Najjar et al., 2022). Conversely, a South Asian study covering Nepal, India and Bangladesh found that mothers-in-law exercise considerable power over their daughters-in-law, thereby limiting changes that could potentially strengthen the latter's agency (Leder, 2022). However, Leder (2022) cautions against an overly simplistic and binary understanding of male out-migration as leading either to women's empowerment or vulnerability. Women have mixed and heterogenous experiences. In the absence of their husbands, new spaces emerge for women, as they increase their geographical mobility, social engagement, and financial management. At the same time, being both socially and spatially excluded from mostly male networks can increase women's struggles to access resources such as water and land when male family members are absent. Furthermore, markets often continue to be normatively framed as male spaces meaning that women must request boys or male neighbours to go on their behalf.

Vegetable market, Myanmar (Cathy Rozel Farnworth)

3.1.3 Gender Norm 3. Women are responsible for childcare

Women's abilities to develop sources of income are often associated with their location in their life course. Their earning potential clashes with the almost universal gender norm that women are primarily responsible for childcare, care of ill people and relatives, food preparation and other household tasks (Bornstein et al., 2016).

GENNOVATE data shows that young women are faced with dilemmas that are nearly impossible to overcome. Many reported that having young children motivates them to seek economic resilience and to engage in activities that allow them to be prepared for unforeseen events and emergencies. Women across communities and countries indicated that everything they do (starting a business, investing in agriculture, finding a job, etc.) is to ensure that their children have better lives. Yet the gender norm that women have to take on childcare and other tasks reduces the amount of time they have to become economically resilient. Pregnancies, breastfeeding and taking care of small children takes up considerable time in the lives of young women. Life is particularly difficult for women in poor households with many young children, especially if they are single.

As children grow up, however, they increasingly engage in economic activities, especially as they get older. Such children often work part-time as agricultural laborers in women's or family's plots or for other farmers. Since they usually live with their mother, they provide help with household chores and offer comfort and emotional support. A Malian woman (aged 41) explained:

> *"Ten years ago, I could not do business because of my children, but today, as the children have all grown up, I can sell millet beignets (fouroufourou) and cultivate a little. So, even though I still depend on my husband, I can get by a little bit more now than a decade ago.*

A woman from Morogoro Region, Tanzania described how she gave birth to three children within five years and thus had no time to farm or conduct business for many years. Now that her children have grown up, she experiences more agency and power. She has time to go to the market to purchase goods and to do business. She has time to farm. Similarly, a woman from Maradi Region, Niger began millet cultivation on her own account once her son got married. Her new daughter-in-law took her place in the kitchen, preparing meals for the extended family. Finally, a Malian woman (aged 38) in a polygamous marriage explained that:

> *"My personal income increased thanks to an overall increase in the family income but also thanks to my first daughter and her husband. Since my daughter got married, she and her husband send me almost everything I need so I can save money.*

3.1.4 Gender Norm 4. Men manage productive resources such as land and other assets

Across many agrarian societies, men frequently control and administer productive assets in their role as household heads (OECD, 2021). This norm affects women's economic resilience since farming hinges on adequate access to productive resources; most essentially land but also agricultural tools and machinery, and inputs such as seeds and fertilizer. Additional norms – varying in intensity by location – can combine with this norm to restrict women's agency over resource use even more. These include a norm that household heads should exercise guardianship of family members, especially women and girls (OCED, 2021). This norm can serve to limit women's mobility, whether to access fields and natural resources beyond the homestead or to sell produce at markets (Lodin et al., 2019; Rietveld and van der Burg, 2021; Molina et al., 2022). Another norm, that household heads have the right to decide how to allocate women's labor, means that women may not be able to decide how best to dedicate their time (Mayanja et al., 2022; Presler-Marshall et al., 2022).

These norms can be weakened when women hold key resources in their own name. In Ghanaian cocoa systems, women who operate their own cocoa plantation on their own land report high levels of decision-making autonomy whether they are married or not (Friedman et al., 2019). Their autonomy allows them to diversify their income-generation opportunities. Interestingly, women's autonomy appears to contribute to more, rather than less, unity in the marriage. Married couples collaborate with, and support, each other on their respective farms leading to *"purposefulness and future orientation"* among both women and men. Conversely, women cocoa farmers without their own land work on their spouse's land, experience low levels of decision-making power, and have limited options to diversify their incomes (ibid.).

Elsewhere, some Kenyan parents express ambitions for their daughters to buy their own land to reduce their dependence on norms that privilege men's ownership and control (Po and Hickey, 2018). The GENNOVATE data provides limited evidence of women seeking control over land in the face of resistance from in-laws. An Ethiopian woman explained that she fought her husband's in-laws in court on behalf of her daughters:

> *"In 2011 my in-laws went to the court to claim the land my father-in-law gave to my daughters. This court case was opened just before my husband died but ended in 2013 after I appealed to the Supreme Court which decided to give my daughters the land and the case was closed once and for all.*
>
> Ethiopia, Woman, aged 48

Successes like these, though, are uncommon in the GENNOVATE testimonies. Women in Tanzania and Kenya, for instance, related how in-laws seized their land and that they could not get it back.

Indeed, gender norms in patrilineal customary land tenure systems tend to associate land management and allocation decisions with traditional authorities and with male heads of households (Witinok-Huber and Radil, 2021). In Northern Togo (Essossinam, 2021), Cameroon (Azong et al., 2018) and in the Sahel part of Sudan (Dossou-Yovo et al., 2019) sons are more likely to inherit land than daughters. In Colombia, the generational transfer of land – and family businesses – favors first-born sons over daughters (Rios et al., 2022). In such patrilineal systems women usually access land through their relations with men rather than having their own rights to land. Since relational access to land hinges on close bonds with men, unmarried women or divorcees can find it very difficult to access land unless they enter a relationship with a man (Po and Hickey, 2018). However, this does not necessarily mean that the couple have full decision-making rights over the land while their parents-in-law are alive. In one case study from the GENNOVATE data the Kenyan respondent (aged 54) explains:

> *"We do not have the title deed because the shamba was in the name of our father-in-law [then my mother-in-law]. Things have not changed because the land is now owned by my mother-in-law. Even my husband cannot sell because he does not have the title. I can only make decisions about what to plant but never to sell it.*

Insecure land access generally makes it difficult for women to move beyond coping strategies to build economic resilience to climate change. Across southern Africa, women can find it difficult to invest in agricultural innovations, including climate smart agricultural practices, when they lack secure access to land and effective decision-making power over it (Makate et al., 2017). In Uganda, land ownership predicts selected adaptive behaviors which build economic resilience, such as engaging in non-farm enterprises, well excavation, pasture development, and improved livestock management among pastoralists (Nkuba et al., 2019).

The GENNOVATE data alludes to women facing considerable difficulties around adopting conservation agriculture because they cannot prevent illicit livestock grazing on their land. Presumably, men's clout in the community prevents illegal grazing. A Malawian respondent (aged 48) reported an overall reduction in resilience due to cattle intruding on her crops and having to abandon her previous agricultural practice.

> *"I started practicing conservation agriculture [CA] on a ¼ acre plot. As of now I am laying down stalks and I have been planting maize for the past 3 years. I grow maize in consecutive years instead of practicing crop rotation … There is a problem of worms that feed on the roots of maize in the CA plot and I do not know the reason. The yield on a CA plot is low if less fertilizer is used. But the main problem with CA is the livestock which tramp on the stalks and cause damage. Another problem is when there are only a few stalks of maize. We use ordinary grass and other crop residues. I tried to put grass on one side of my plot and there was no problem it worked very well.*

Gender norms awarding men primacy over land are becoming stronger still in many locations due to increasing pressure on land because of climate change, land fragmentation and population growth. Hence, women's access to land is increasingly threatened as men tend to prioritize their own production to secure income.

In Western Uganda, for instance, women's reduced access is resulting in weakened production of food crops for home consumption, which in turn is contributing to lower nutritional diversity and to higher food insecurity among family members (Rietveld et al., 2021). In Northern Ghana, the scenario of women renting land or "begging" for land from community or family members is becoming more common. The quality of land acquired, however, tends to be poor. Women are reluctant to invest in improving the land or adopting new technologies because this could result in the land being reclaimed by the owner (Bryan and Garner, 2022). In a Cameroonian study, women noted that even in the middle of the growing season male relatives can take over the land and crops they are cultivating (Azong et al., 2018). Such scenarios limit new technologies to promote economic resilience among women.

3.1.5 Gender Norm 5. Women grow subsistence crops

In many places, there is a norm that women should restrict themselves to subsistence production with potentially limited engagement in farm gate sales. This norm goes together with the norm that men are primary income earners and household heads, as well as to the norm that women should put food on the table. Crops which are primarily grown for home consumption are frequently termed "women's crops" while commercial crops are frequently termed "men's crops" (Okonya et al., 2019; Durairaj et al., 2019; Fischer et al., 2020; Fischer et al., 2017; Tapia et al., 2018). The terminology of women's and men's crops does not intrinsically relate to who works with the crop, livestock or fish during production and processing or use, nor does it refer to any intrinsic property of the specific commodity (Mayanja et al., 2022). Rather, the terminology is situational: the "gender identity" of an agrifood commodity can vary greatly by location and as gender norms change over time (Hill and Vigneri, 2014). In some locations, women and men actively struggle over who controls certain commodities, particularly when these become more lucrative. In these struggles, men often – but not always – gain control (Curry et al., 2019; Baada et al., 2023). Even so, small livestock like poultry and goats are frequently managed and sold by women, whereas men tend to manage and sell more lucrative large livestock like cattle (Po and Hickey, 2018). Similarly, men frequently assume the more profitable niches in aquatic food chains. This includes the coastal fishing systems in the Philippines (Quiros et al., 2018), Fiji (Thomas et al., 2021), and Bangladesh (Hossain et al., 2018), and in inland lake fishing in Malawi (Nagoli and Chiwona-Karlton, 2017), Tanzania (De la Torre-Castro et al., 2022) and Zambia (Estrada-Carmona et al., 2019).

Women may consider their identification with subsistence cropping to be a positive mechanism for ensuring sufficient, and where possible, nutritious food to put on the table. In some locations, this can be a more reliable route to household food security than relying on income from selling agricultural products. In areas with weak markets, which experience low productivity, income generated from market sales might be insufficient to buy adequate and healthy food. The income generated may be required for other needs, such as school fees or clothing, or men may spend it on themselves (Mwongera et al., 2017; Ngcoya and Kumarakulasingam, 2016; Rietveld et al., 2020).

In the Barotse Floodplain in Zambia, women cultivate a wider range of crops than men, including neglected and underutilized crops important for household nutrition (Estrada-Carmona et al., 2020). Subsistence crops, particularly when a diverse portfolio is planted, may facilitate climate change adaptation and resilience more effectively than cash crop production based around monocultures, such as in Sudan, where men's exclusive focus on cotton, sesame, and cocoa limit their drought mitigation options (Dossou-Yovo et al., 2019).

Woman with traditional yoghurt gourd, Kenya (Anne M. Rietveld)

3.2 Community Sphere Gender Norms in Food Production Systems

Within the community sphere of influence, gender norms pertain to how decision-making processes are enacted by the community. Normative gender questions include who is represented, who speaks and whose ideas count. Gender norms also structure formal and informal knowledge and support networks. Whose knowledge counts, and who is targeted for knowledge development, constitute key gender questions in this sphere of influence.

3.2.1 Gender Norm 6. Men speak in public, also for women

Several gender norms frequently combine to restrict women's ability to participate effectively in mixed-gender discussions in the community sphere of influence. Gender norms may enforce women's silence thus making it difficult for them to speak up in public and be listened to. Community gender norms are frequently reinforced by the household sphere of influence gender norms described above. These norms may allocate household and care work to women thus restricting the time they have available for meetings. Normative perceptions that men are decision-makers, breadwinners and key asset-holders may combine to undermine the rationale for women to be present at community meetings even if they are able to attend. A partial outcome of these exclusionary gender norms are further gender norms which may reflect and embody more subtle processes that deny women's gender interests and needs as legitimate topics of public concern (Ardener and Chapman, 2007; Cowan, 2007; Ardener, 1972). Gender norms around women's mobility at household and community levels may hamper their involvement in discussion processes as well as broader agrifood system activities. Taken together, gender norms can fuse into a potent blend, invalidating decision-making roles and participation of women in community decision-making processes. These norms can prevent women from addressing climate change and building skills for economic resilience.

This potent mix is further stirred by the ways in which gender norms structure and influence the interactions between community partners and external organizations in the organizational sphere of influence. The literature review shows that these experiences are shared across LMIC. In Peru, women rarely speak up in community meetings and planning sessions related to climate adaptation due to gender norms that discourage women from expressing their ideas in public (Erwin et al., 2021). In Guatemala, women encounter resistance when taking leadership positions and have trouble "speaking loudly" in discussions with men (Ortiz and Peris, 2022:14). In Bangladesh, women describe norm-related barriers to receiving training on adaptation to saltwater intrusion, experiencing a lack of voice when they try to challenge gender-based wage disparities as daily laborers in farming (Hossain and Zaman, 2018). In Nepal, men report access to a wider set of information sources (including community meetings) than women (Paudel et al., 2022). Mobility restrictions exclude women from participating in the development of producer cooperatives for organic farming projects in Odisha, India. Women farmers therefore are not trained on new organic methods, but rather rely on their husbands, or more general opportunities provided in village level meetings (Altenbuchner et al, 2017). On the Solomon Islands, women serve as community leaders in church-based organizations and in women's organizations, but they are not invited to participate in, nor to lead, community bodies that discuss issues of concern to the whole community, including climate change (Malherbe et al., 2020). In Papua New Guinea, men access a wide range of information sources, in contrast to women who generally access fewer sources and are neglected by external formal information providers (Friedman et al., 2019).

Turning to sub-Saharan Africa, in South Africa, women are frequently less aware and less involved than men in community initiatives, policies, and strategies seeking to facilitate adaptation. However, women are more vulnerable to the impacts of climate change due to their weak productive assets (Sibiya et al., 2022). In Liberia, women demonstrate less participation and leadership in farmer and community groups (Witinok-Huber and Radil, 2021). Women's limited engagement with community and formal networks affects their ability to adapt to climate change challenges. Membership in farmers' organizations is a significant predictor of adaptation in Cameroon (Awazi et al., 2019) and of lower vulnerability in Bangladesh (Khan et al., 2022). The GENNOVATE data highlights how poverty can cause further marginalization. A Zimbabwean woman (aged 60) explained:

> *"I have no confidence because I do not dress well like other women. I do not have shoes therefore I cannot stand in front of the others barefooted. The fact that I have always been poor and have no money has made me unable to make many decisions in my life. I also do not*

have cattle or even an ox drawn plough. Thus, I found it very difficult to grow crops satisfactorily. I do not go to the meetings even those held by the agriculture extension officer. I just hear that donors such as AFRICARE are in the village, but I never attend the meetings.

In many cases, the absence of men does not mean that their voices are absent from household and community discussion processes. While men may leave the farm in the hands of women when they out-migrate, they often maintain their decision-making power in their role as head of household. This can be a significant constraint because it potentially hampers timely and effective decision-making on the farm itself and in community decision-making bodies. Women in Uzbekistan are getting more involved in neighbourhood associations such as water use associations, in part due to male out-migration. Yet the few men remaining still hold the highest offices in these associations and take the most important decisions. Although women act as accountants, office managers or lawyers, or as members of the women's committee, gender norms still forbid them from speaking first in community meetings. Women's farms are often represented by a male relative (Najjar et al., 2022).

Woman extension worker, India (Anne M. Rietveld)

3.2.2 Gender Norm 7. Knowledge and support networks are mostly gender-specific

Men's knowledge networks are not necessarily open or receptive to women, and conversely women may operate knowledge networks primarily with other women (Farnworth, 2019; Lamontagne-Godwin et al. 2018), though not all networks are gender-exclusive. In the case of seed networks, for instance, informal seed exchange and knowledge sharing networks between farmers and their communities can support adaption to climate change because farmers are able to innovate with seeds recommended by other farmers. Men in Ethiopia are more likely to share seeds and information with other men farmers, while women share almost equally with men and women farmers (Tadesse et al., 2016). In Peru, seed potato selection and management are carried out in the household sphere. This is combined with engaging in seed exchange networks in the community sphere and beyond. Together this constitutes an informal seed system that is effective at conserving biodiversity and in which women traditionally occupy a central role (Molina et al., 2022).

In some locations, women's focus on subsistence agricultural practices and gathering wild foods facilitates their support to household food security and nutrition (and to some extent sales) in ways that allow them to develop extensive gendered ecological knowledge and skills. Such knowledge positions women to support climate change adaptation. Women serve as *de facto* curators of resilience-enhancing biodiversity, for instance, in forest gardens in Sri Lanka (Melvani et al., 2020) and as key participants in seed exchange systems in Peru (Molina et al, 2022). Women's ecological knowledge can also support disaster response. For example, in Bangladesh, women's responsibilities for managing the farm and household during men's outmigration provides them with specialized skills for managing post-cyclone soil salinity (Khalil et al., 2019).

In East Africa, many women have more extensive informal knowledge exchange networks than men at the local level. Patrilocal marriage arrangements – allowing women to take their seed and knowledge with them – strengthens networks among sometimes geographically distant communities. Women and men farmers' separate social networks expose them to different crop varieties and different sources of crop information (Otieno et al., 2021). The same processes apply to some communities in Ethiopia. Women can play a significant role in sharing seeds outside of their community when they move to their new home upon marriage. At the same time, women

maintain family ties with their extended family in other villages or regions allowing them to share their newly acquired information and seed (Tadesse et al., 2016).

Informal support networks are frequently organized along gender lines. For example, mixed-gender support networks of fishers and fish traders are rare (Drury O'Neill et al., 2018). Women fishers and traders in Zanzibar, Tanzania, participate in fewer and weaker informal networks than men. However, research shows that non-financial support networks in this location are essential for establishing resilience (food security and survival on narrow margins) in the fishing industry. Men benefit more than women through support relationships among fishers and traders. They receive fish for home consumption, deferred payment schedules and discounts that women generally do not receive (Drury O'Neill et al., 2018).

Kinship based networks can be important for some women. For instance, women farmers' coping strategies during lake recessions of Lake Chilwa in Malawi – and in other times of crises – are mainly based on kinship networks in matrilinear communities. Sisters engage in mutual aid and food sharing (Nagoli and Chiwona-Karltun, 2017). Women farmers in Papua New Guinea develop close informal interactions, based on a kinship-based "sharing" model, primarily fostered in church groups (Friedman et al., 2019).

More formalized collective structures can strengthen women's agency in particular domains. Older women in Mali, although subject to the broader authority of older men, utilize indigenous women-led institutions in times of shortage. Women members explain they experience increased self-efficacy and resilience, allowing them control over agricultural decisions they lack at home (Wood et al., 2021). In Senegal, women processors of fortified flour report large changes – more confidence, connections, and financial autonomy – after joining women's groups (O'Brien et al., 2022).

When men out-migrate this can have significant impacts upon community labor relations in the agrifood systems they leave behind. For example, in highland communities in Peru, male outmigration to work in mines leaves women primarily responsible for farming. The traditional reciprocal labor exchange system, *huaypo*, which operates at community level, compensates to some degree for labor shortages. However, although women and men both participate in huaypo, the gendered nature of the system means that women are not expected to conduct work that is normatively ascribed to men. This can mean that men farmers who have stayed behind are unwilling to reciprocate labor on women-managed farms (Molina et al, 2022). A GENNOVATE respondent in Ethiopia (aged 29) explained that she attempted to adopt new agricultural practices, but failed because she was not part of an exchange labor scheme:

> *"The cultivation practice around the new variety demands a large number of human laborers during tilling and planting. This is a big challenge to some of us who cannot not afford to hire additional labor or who are not involved in debbo/wonfel [reciprocal labor].*

In Nepal, women in many locations are increasing their work in agricultural activities while continuing household work due to long-term male outmigration (Poudel et al., 2020; Bhawana and Race, 2020). The restructuring appears to be so complete in some locations in Nepal that agriculture collapses when women themselves out-migrate in an attempt to escape the pressure (Maharajan et al., 2020).

3.2.3 Gender Norm 8. Women should not build up significant capital

Access to credit is widely found to be a consistent predictor of adaptive capacity in food systems (Abdul-Razak & Kruse, 2017; Antwi-Agyei and Nyantakyi-Frimpong, 2018; Autio et al., 2021; Sadiq et al., 2019). In South Africa, access to credit is a good predictor of people actually undertaking climate adaptation practices (Thinda et al., 2020). However, women frequently lack tangible assets and have less access to finance than men. The confluence of gender norms discussed above privilege and concentrate men's agency. The gender norm that men primarily hold assets – particularly larger assets – is compounded by the widely held gender norm that women should not build up financial assets or property. This latter notion threatens to undermine the gender norm that men are breadwinners and are crucial to the success of patrilineal kinship networks. As a consequence, women find it hard to build up collateral, making it even more difficult to obtain credit. This scenarios has played out in South Africa (Maltitz et al., 2021), Nepal (Poudel et al., 2020), Fiji (Thomas et al., 2019) and Liberia (Witinok-Huber and Radil, 2021).

Self-help groups and similar forms of women's self-organized banking, such as round tables or savings groups, can play an important role in filling the gap between formal financial institutions and private money

lenders. Women in Uzbekistan, for example, explain that formal banking institutions often exhibit negative attitudes towards women entrepreneurs. This forces them to resort to informal sources of credit such as rotating funds when investing in mechanization for wheat production (Najjar et al, 2022). In Makoko, Lagos State, Nigeria, women entrepreneurs in the fishing industry rely on informal credit facilities and women lenders (called "fish mammys") for start-up funds and operational costs (Oloko et al, 2022). In Cameroon, women's involvement in village savings and loans associations (VSLA) has been shown to improve their overall decision-making power, which may in time translate into an improved ability to build economic resilience (Azong et al., 2018).

The GENNOVATE dataset cites saving groups in different forms and across countries as making important contributions to securing and improving livelihoods and starting up new enterprises. The majority of women interviewed in Burundi, Uganda and Rwanda save with at least one group. These savings groups enable women to pay for the costs of medical emergencies, education, weddings, funerals, furniture, land, house construction, new enterprises and other costs. A Malawian woman (aged 32) outlined how women use their savings to strengthen their economic resilience in farming:

> *"We contribute 500 kwacha in weekly installments. Now we are able to buy fertilizer at cheap prices. We just add this to the expensive one that we additionally buy. As a result, we are able to buy more fertilizer, which implies that we have more inputs. This enables us to get increased yields and have more crop to sell.*

These groups are frequently organized on the basis of membership of a specific clan within a wider ethnic group, or geographical proximity. Some have been set in motion by the efforts of an external organization such as an NGO but others are indigenous. The amounts saved vary widely in accordance with women's income and their household wealth. Some savings groups are informal organizations, while others are officially registered saving and credit organizations. In Mali and Niger, women save the money they earn by working collectively on each other's farms. In these groups women tend to receive an annual lump sum pay-out. Apart from the direct financial benefit of the saving alliance, respondents frequently value the camaraderie of being in a women's saving group. A Malawian woman (aged 48) explained:

> *"In our Bank Mkhonde, we discuss on rules and regulations for the club. We also assist each other when in need such as funerals and weddings. We remind each other that a person should fear God and have respect for each other. We encourage each other to create developmental projects to raise money so we go and do piece work (ganyu) in other peoples' fields. We agree either to share the money or have a party where we buy drinks and food at the end of the year.*

Ethiopian women respondents particularly highlighted the importance of mutual support and friendship within the group, beyond building up savings on an individual level. Members of Orthodox Christian savings groups called *Mahiber* celebrate festivals together, for example. One woman (age 48) reported setting up her own credit group which unites Muslims and Christians.

> *"The members are 30 women who are contributing 5 birr every month. The idea is for women to come together and just relax at least two to three hours on the 29th of the month which is Medihanialem Day. In the Ethiopia Orthodox Christian religion, every day is dedicated to a certain saint or Jesus Christ and the 29th is dedicated to Jesus Christ (Medihanialem). Despite all the members being Muslim, they use the same name for the day they meet and called their Edir [saving club] "Medihanialem Edir."*

In Tanzania, one respondent (aged 52) reported how her land had been claimed by her in-laws when her husband died. Her social networks – family and close colleagues – came together to provide her with some land. She now raises livestock and plants crops.

3.3 Organizational Sphere Gender Norms in Food Production Systems

The organizational sphere of influence focuses on how the gender norms of external organizations support or challenge gender norms. Do research partners and development actors recognize women as agrifood system actors? Do they recognize women's knowledge?

3.3.1 Gender Norm 9. Women are not recognized as food system actors by organizations

The normative framing associating small and less lucrative food chains with women, and larger more lucrative food chains with men, is partly steered by the gender norms embodied in other food actors in the organizational and macro-environment spheres (Table 1). This has implications for the way the macro-environment is structured, for example, around land legislation or how producer organizations are constituted and legally recognized. It also has implications for the kind of services and support offered to agrifood actors by organizational actors, especially in terms of extension advice, business advice, and finance and knowledge development around climate mitigation and adaptation. Often, organizational norms are congruent with local gender norms. For instance, the community recognizes the gender norm that men are household heads, which then reinforces interventions that focus on men as household breadwinners and primary actors in food chains. In a positive feedback loop, men are groomed as the primary generators, holders, users and transmitters of agricultural knowledge and innovation, and become ever more knowledgeable over time (Benitez et al., 2020). The development of men's technical knowledge is thus often valued more highly and receives more investment in terms of capacity development and material support (such as access to climate smart seed varieties) than the development of women's knowledge (Benitez et al., 2020).

Similarly, organizational actors frequently buy into gender norms that prioritize men as breadwinners. This often translates into organizational efforts that focus on men as primary targets for crop, livestock, and fish commercialization interventions (Mudege et al., 2017).

In some cases, external partners do target women specifically through local networks. In Uttar Pradesh, India, a new project works through a community group to train women to contribute to crop seed selection and development. The project provides women with knowledge on how to distinguish grain, seed, and varieties effectively. The women can then assume important decision-making roles about crop production and seed procurement in their households (de Boef et al., 2021). Yet even when organizational actors attempt to counteract gender norms by targeting women, they may fail to ensure that the gains are sustained. It is well established in the empirical literature that value chain projects which specifically aim to commercialize "women's crops" may result in men taking control of the crop when it becomes commercially lucrative. Sweet potato value chain projects struggle with male capture in Mozambique (Mayanja et al., 2022) and Malawi (Mudege et al., 2017). The new, most profitable value chain activity – vine (seed) multiplication – is dominated by men even though women were also targeted. The benefits women receive from selling their orange fleshed sweet potatoes are more limited (ibid.). Nevertheless, women's abilities to exercise agency in a particular agrifood chain can differ considerably between contexts even within in the same country. In Kenya, for instance, one study found ethnic differences due to variation in cultural norms. Kalenjin women appear to experience limited agency compared to Kikuyu women when it comes to owning or managing cows and making use of opportunities in dairy food chains (Bullock and Crane, 2021).

In aquatic food systems, women's work in offshore and coastal fisheries is commonly undervalued. Organizational actors frequently undercount their activities, which involve small-scale, nearshore fishing and gleaning for home consumption (Santos, 2015; Furkon et al. 2019). This norm ignores women's contributions to household food security and animal source food-based nutrition. However, men's work – in open-water fishing, with higher catches and with higher levels of sales – is more widely recognized and captured statistically. Men's work therefore receives more policy response (Purcell et al., 2021). In Fiji, accurate and accessible information on women in the fisheries sector is scarce because their activities are not always counted as fishing by external actors. This norm contributes to underestimates of catch volumes, uncertainty around fishery resources, and the exclusion of women's needs and aspirations from fisheries management and policy decisions (Thomas et al., 2021).

Crop and livestock agrifood systems exhibit similar tendencies. In rural Pakistan, many rural young women engage in small-scale income generation activities from their homesteads, such as caring for livestock. Some women are employed as hired agricultural laborers, depending on locally prevalent gender norms around mobility. Because women's work is rarely reported in

official statistics and assessments, agricultural investments fail to identify and work with women to promote their efficacy as food actors and to strengthen their rights and protections as hired laborers. Consequently, opportunities are missed to strengthen their economic resilience (Petesch et al., 2022). Globally, policymakers, researchers, livestock breeders, private sector players, and extension systems more broadly fail to recognize women as primary livestock keepers. This harms livestock system development and the potential for adaptation to climate change because women are not included in training and are insufficiently targeted for service provision. The sidelining of women's livestock knowledge means that opportunities to improve the efficacy of livestock interventions are missed (Galiè et al., 2022). Many opportunities to strengthen women's economic resilience and to contribute to nutrition objectives are missed because decisions are based on normative assumptions around women's roles in agrifood chains, rather than hard data. This neglect has the potential to contribute to enormous cumulative losses over time as women become systemically weakened across generations.

3.3.2 Gender Norm 10. Women are not recognized as decision-makers over land

Women may struggle to express their agency over land when gendered institutional norms combine with household and community norms, even in cases where matrilineal land tenure systems exist (Djurfeldt et al., 2018). However, this normative picture is changing in some locations.

Customary land tenure systems, which in matrilineal systems might give preference to women's over men's land-rights, sometimes play a role in restricting women's abilities to out-migrate as they seek better economic opportunities. Around Lake Chilwa in Malawi, for instance, men are more likely than women to out-migrate. Women fear losing their land rights in this matrilineal system. Spousal separation is in turn leading to marriage instability (Nagoli and Chiwona-Karlton, 2017).

In some contexts, norms which deny, or limit, women's land ownership constrain their ability to participate in decision-making processes and knowledge networks. A study conducted in wheat-growing communities in Madhya Pradesh, India, found that women are excluded from public extension because land ownership is a criterion for registration as a farmer. To become informed about farming practices including new technologies,

Groundnut vendor, Zambia (Cathy Rozel Farnworth)

women must rely on their husbands, discussions with other women, and their own empirical knowledge from working as laborers (Farnworth et al., 2022). A study in Peru found that public agricultural system actors effectively excluded local women from meaningful participation in discussions around community adaptation strategies. Women's exclusion was increased by: 1) conducting discussions in Spanish, a language many older women did not master; 2) restricting the right to vote about community water management to landowners only, who were mostly men; and 3) by failing to encourage women to voice their opinions in public (Erwin et al., 2021).

However, gender-equitable land reforms can assist women to become more economically resilient. Land ownership reform frequently strengthens women's agency because they can decid for themselves on the adoption of climate-smart practices. In Rwanda women-headed households invested in bunds, terraces and check dams following land registration (Ali et al., 2014 cited in Zhang et al., 2021). In Ethiopia women-headed households responded the same way, and additionally planted trees. The decision to plant trees represents strong confidence in land ownership since trees are long-lived (Quisumbing and Kumar, 2014 cited in Zhang et al., 2021). Control over

land provides collateral for accessing finance, for example in Kenya (Autio et al., 2021) and Ghana (Maguire-Rajpaul et al., 2020), as in many other countries.

Nevertheless, legal reforms to grant women land tenure can be challenging to enact due to the pervasiveness of local norms that privilege men's decision-making over land. In Namibia, the Communal Land Reform Act (2002) grants women equal rights when they apply for access to communal land. The act also protects widows' rights to their deceased spouse's land. In practice, women struggle and often fail in their land negotiations with local male-dominated authorities. Widows remain at risk of eviction (Mwetulundila, 2021). In Kenya, the Constitution (2010) codifies women's rights to land. However, many women surrender their rights in order to preserve relationships with parents, spouses, and parents-in-law. They defer to gender norms designating men as household heads, building trust and reciprocity with parents-in-laws and protecting their land access should they become widows. They also build relationships with neighbours to enable them to rent land (Po and Hickey, 2018). In Mtubatuba, South Africa, in the context of customary law, women similarly negotiate a degree of independence (Ngcoya and Kumarakulasingam, 2016).

Family preparing food, Myanmar (Cathy Rozel Farnworth)

GENNOVATE data provides several examples of women who were able to purchase land by successfully negotiating with their spouses and wider kin. The households in which these women live were among the relatively better-off households in terms of wealth. These women were typically supported by their husbands. For example, a woman (aged 42) from western Uganda narrated how she bought a plot in her name in the nearest town. The purchase of the plot changed her relationship with her husband. Now they plan together. An Ethiopian woman (aged 48) noted that the land she has purchased provides a measure of security, but is insufficient for resilience:

> *"Of course, we have diversified our source of income, however, we still depend on the land and the rain, so we are still vulnerable however, we would not be devastated. My husband is a skilled businessperson so that skill is also an insurance as long as he stays healthy. Our children are all in school, since they are well educated, we are sure they will at least help each other.*

3.3.3 Gender Norm 11. Women's communal land rights are ignored

The conversion of communal lands into privately-owned land is a global phenomenon. Men are more likely than women to obtain legal recognition when land is privatized because gender norms widely assume that households are unitary and headed by men. Poor and marginalized people frequently lose out. They may find it hard to demonstrate use rights over land because their voice is generally weaker in such processes (Claeys et al., 2022).

In western Uganda, the disappearance of communal lands is reducing options for women. They may not be able to keep small ruminants or to gather sufficient firewood for cooking because these activities depend on communal lands (Rietveld et al., 2021). In Northern Ghana, the conversion of communal land to privately-owned land has gone hand in hand with increased tractor-based mechanization. Tractor use led to the removal of park-land trees such as shea *(vitellaria paradoxa)* and dawadawa *(parkia biglobosa)*, trees for over which women have traditionally held harvesting rights. These tree products form the basis of women-controlled value chains and provide them with an important source of income. Following removal, women have been forced to engage in less lucrative and environmentally harmful activities such as selling charcoal and wood for sale in urban markets (Kansanga et al., 2020). Similarly in Indonesia, women lost their roles in traditional slash and burn (swidden) farming systems when communal land rights were converted to individual land rights to plant oil palm. Women's specific roles, responsibilities, rights and complex indigenous cosmology in swidden systems was replaced by male-dominated oil palm systems. Women obtained a few limited benefits, but overall were left with less land and fewer rights. To make matters worse, women worked longer in the remaining swidden system to compensate for shortened fallows on less land (Maharani et al., 2019). In the Iringa Region of Tanzania, the New Forests Company prohibited common land that women relied on for sourcing non-timber forest products, grass for making baskets and bean cultivation common land that women had relied on for their livelihoods. Compensation was geared towards men's losses and failed to factor in those of women. This resulted in women becoming more reliant on their spouses, having higher workloads, less income, and less food security (Gmür, 2020).

Lunch, Myanmar (Cathy Rozel Farnworth)

4. Women's opportunities and challenges for developing resilience to climate change in food consumption systems

This section focuses on gender norms in the consumption node of food chains and in consumer behavior. Gender norms are identified and described across the household, community and organizational spheres of influence to identify the ways in which they shape food allocations, food preparation, food preferences, and responsibility for food preparation.

4.1 Household Sphere Gender Norms

4.1.1 Gender Norm 12. Men receive priority in food allocation

Levels of food security and nutrition can vary greatly between communities in the same geographic area or region (Haq et al., 2022), and between individuals living in the same household (Broussard, 2019). The gender norm underpinning these discrepancies is one that preferentially awards more food, and more nutritious food, to one gender – which is nearly always men and boys. This norm reflects considerations around men's perceived workloads and their higher standing in family hierarchies (Sedlander et al. 2021; Blum et al., 2019).

Gender norms upholding food discrimination directly contribute to women and girls' lower calorie and nutrient intake in many countries, negatively impacting women and girls' health. In parts of South Asia, women's lower nutritional status compared to men's is well-documented (Clarke et al., 2019; Quisumbing et al., 2021; Bhat et al., 2021; Harris-Fry et al., 2022; Kehoe et al., 2019). Daughters-in-law appear to be particularly disadvantaged

in terms of food consumption (Sedlander et al., 2021; Blum et al., 2019; Pun et al., 2016). A study conducted across rural communities in Maharashtra state in India showed that half of the women sampled were chronically energy deficient (body mass index <18.5 kg/m2) and over 75% of non-pregnant and non-lactating women were anaemic (Kehoe et al., 2019). In sub-Saharan Africa, studies conducted in Ghana (Nyantakyi-Frimpong et al., 2018), Kenya (Bukachi et al., 2022; Dumas et al., 2018), South Africa (Mngomezulu et al., 2022), Tanzania (Bonatti et al., 2019) and Senegal (Leone et al., 2022) indicate that men are more likely than women and children to consume animal source foods.

Pregnant women can face dietary restrictions which compromise their own health and that of their fetus and babies, as shown by studies in parts of India (Nguyen et al. 2021), Myanmar (Diamond-Smith et al., 2016) and Ethiopia (Saldanha et al., 2012). Dietary restrictions sometimes exclude pregnant women from consuming nutritious food items such as eggs and dairy products despite the efforts of local health professionals. Underlying reasons for the restrictions include traditional beliefs about specific food items negatively affecting the pregnancy or the baby. Some cultures maintain the practice of regular fasting, such as the orthodox Christian communities in Ethiopia, which do not exempt pregnant women.

Women report limiting their food intake in times of crisis and food insecurity in favor of men and children in Fiji (McKenzie et al., 2022), Java (Hartini et al., 2005), Chile (Galvez et al., 2015), Tanzania (Bonatti et al., 2019), Uganda (Durairaj et al., 2019) and Zambia (Ragsdale et al., 2022). In Zambia, women had higher rates of household hunger than men of the same household. This might be because men tend to eat first and are therefore less aware of hunger among other household members. Another factor could be that women are more aware of looming food shortages in the household, consequently limiting their intake. This finding suggests that experiences and perceptions of individual and household food insecurity can diverge (Ragsdale et al., 2022). Studies also show that disasters may deepen existing food biases. For instance, following cyclones in Bangladesh, some women reported not eating for up to a week because men were prioritized when food was scarce (Jordan, 2019). Women living with a disability may also be additionally disadvantaged. A study conducted in India showed that some women in both poor and wealthy families who had recovered from mental illness received insufficient food and drinking water from their families (Poreddi et al., 2015).

Women are not necessarily compelled to restrict their food intake and or to limit that of other women in the household. Indeed, as noted above men may not realize that women in their home are eating less. Rather, the phenomenon of women eating less food and less nutritious food suggests that they have internalized discriminatory gender norms through a process of socialization that starts at birth. There is also evidence that the provision of food to different household members can vary not only by gender, but also across the life course. Adolescent girls in rural areas of Bangladesh explained that "In food insecure households, if they are short on meals, first the adult woman gives up her meal and then the teenage girl" (Blum et al., 2019). In the context of food shortages caused by climate stress such as floods and droughts, women and girls from poor households in Nepal sacrifice food intake first in their households. Girls from these households were reported to consequently halt their education and were more likely to marry early, thereby alleviating food security pressures on their households (Dilshada et al, 2019). Another Nepalese study found that some mothers-in-law ration their pregnant daughters-in-law's food intake. The daughters-in-law complain that food they receive from their mothers-in-law is often insufficient. The household was poor and suffered food shortage generally. Daughters-in-law, having a lower status, received the least food during shortages (Pun et al., 2016). In the context of South Asia, Sraboni and Quisumbing (2018:33) state that

> *"even if the evidence shows that directing resources to women, rather than men, is more likely to improve household well-being, particularly in relation to health and nutrition (…) , a woman investing more in sons than in daughters may be motivated by self-interest rather than altruism, given the prevailing male advantage in labor markets and property rights, women's need for male mediation in the community, and women's dependence on sons in widowhood or old age.*

This study (Sraboni and Quisumbing, 2018) and a second one (Hossain and Kambhampati, 2021) both suggest that women's empowerment in Bangladesh positively contributes to a household's food security and child nutrition in general. However, boys tend to benefit more from their mother's empowerment than girls, who remain more vulnerable to malnutrition.

In Nairobi, Kenya, women typically serve their husbands first. This is considered a sign of respect for his position as head of the household and ensures that he receives what is perceived as the best pieces of meat (Bukachi et al., 2022). In another study, Tanzanian women from the Dodoma region argue that the practice of men receiving more food (especially meat) is an expression of love by women for men (Bonatti et al., 2019). Findings like these may suggest strong internalization of norms by both women and men which can actually harm women's health. The findings likewise suggest – similar to Sraboni and Quisumbing (2018) above – that women may well be making conscious investments in maintaining and improving their household relations for similar reasons as posited for the South Asian context.

Nevertheless, the gender norm that women should deny themselves food in favor of men is declining in some places. In Nairobi, Kenya, men are more inclined to cede control over the purchase of high value meat to their spouse if she contributes to household income (Bukachi et al., 2022). In Fiji, where gender norms have long prescribed that men should eat first, men's traditional role as provider was used to justify men's preferential treatment. However, the same rationale is now being applied to women who have entered the formal workforce. Women themselves are arguing that they, too, have a right to a fair share of food. As one woman explains,

> *"our culture is that men should have more food and us women, we will eat what is left … But now, for me at home, I will be very honest, my husband and I will eat the same amount of food. Sometimes, I will eat more food than him and he will say 'hey, you have more' and I will tell him, 'I am doing more work than you'.*
>
> McKenzie et al., 2022; p 3150

In urban low-income neighbourhoods in Dhaka, Bangladesh, some young married and pregnant women are experiencing augmented control over household resources and increased mobility, and they increasingly purchase food – which was uncommon in the past. Intra-household food allocation in favor of men is declining. These normative shifts appear to be due to these women living in nuclear family units rather than with their in-laws, or close to natal kin from where they take some of their meals (Levay et al., 2013).

Street cafe, Myanmar (Cathy Rozel Farnworth)

4.1.2 Gender Norm 13. Women are responsible for food preparation

Globally, food preparation is normatively associated with women. Cooking tasty, healthy, and economical meals is widely deemed a key characteristic of being a good wife and is considered a normative way for women to demonstrate their love and dedication to their family. Men from Fiji explained that preparing food for the family is women's way of showing their love and care for their husbands and families (McKenzie et al., 2022: 3149).

The dishes women prepare are frequently influenced by men's and to a lesser extent children's dietary preferences. The dietary preferences of husbands and children, and extended family members such as sons-in-law, are prioritized in many households in Kerala, India (Daivadanam et al., 2015). In Chile and Uganda, many newly married women change their purchasing, eating, and cooking food habits to meet the food preferences of husbands and in-laws (Gálvez et al., 2015; Auma et al., 2020). Preparing food which does not align with the husband's preferences can provoke gender-based violence as a quote from a Pakistani woman illustrates:

> *He (the husband) says that it (the food) looks as bad as my face and throws it on my face. He says if you cannot cook well … don't cook at all… that's why no matter what I eat … I try to make food that he likes.*
>
> Chowbey, 2017: 175

Around a quarter of women respondents in a large-scale study across different states in Nigeria justify gender-based violence when the wife burns the food (Antai et al., 2009).

Yet women's ability to put preferred meals on the table is frequently constrained by the gender norms that men are household heads, primary decision-makers, and primary controllers of resources. Women commonly have limited say over how much household crop and livestock production needs to be to set aside for consumption, or what to buy at the marketplace. In peri-urban areas in Tanzania, for instance, a disjuncture emerges between women's responsibility to put milk on the table for home consumption and women's limited decision-making power over whether money can be spent on buying milk (Galiè et al., 2021). Among the Maasai in Kenya, women are responsible for milking cattle and experience some control over the allocation of milk for home consumption and sale. Despite this norm, Maasai women operate within an overarching decision-making framework managed by men. They report having to "steal" milk from their spouses to use at home (Yurco et al., 2022). Similarly in the center-west region of Burkina Faso, women's lack of financial autonomy was identified as a contributing factor to the sub-optimal diets of mothers and children (Compaoré et al., 2021).

The GENNOVATE data provides evidence, however, that women are not necessarily left alone with the burden of trying to secure food. An Ethiopian woman (aged 40) explained:

> *I have helpful relationships with my neighbors and even with the first wife of my husband. We cooperate with each other as well. She helps my family if we run out of food and I'll do the same and even my son sends her money too. In the same way I have peaceful relationships with my neighbors. These links are valuable especially at times of crises and emergencies to help each other.*

Across regions, cases of men compromising their household's food and nutrition security by spending money on alcohol, extra-marital relations, polygamy and other personal needs are reported in many countries, for instance in Tanzania (Bonatti et al., 2019; Mchome et al., 2020), Kenya (Yurco et al., 2022), Burkina Faso (Compaoré et al., 2021) Fiji (McKenzie et al., 2022), The Philippines (Torelli, 2020) and India (Sedlander et al., 2021). The GENNOVATE data suggests that in times of significant food shortage women find it very hard to cope – though the experience can force some women into becoming more resilient. A Zimbabwean woman (aged 52) recalled:

> *In 2008, there was so much hunger in my house that I would walk for very long distances in search for food. Those distances I used to walk gave me more power to make decisions. As a mother I now take drastic decisions to make sure I do not get to that level whereby my children have to go hungry so I can easily make all decisions alone.*

The gender norm that allocates women responsibility for preparing food simultaneously hinders men from doing so. This can limit men's abilities to provide healthy and affordable meals for their families and themselves. A study on the resilience of child-headed households in Eswatini (formerly known as Swaziland) showed that girl household heads receive assistance from community members to procure food and fulfil the wide range of tasks (whether normatively male or female), which women household heads are allowed to do. However, single-male household heads are not expected to fulfil women's roles. This leads to hardship for boy household heads who are not expected to cook yet find it very difficult to procure support for this role. They attempt to secure cooked food from neighbours which can be very challenging (Mkhatshwa, 2017).

In many cultural contexts women are normatively ascribed responsibility for a wide range of productive activities as well as household chores and care work. The time required can limit the time they have available to prepare sufficient and healthy meals for their household. In the Morogoro Region, Tanzania, women report being overburdened by farm and domestic work. This limits the time they must (breast) feed their children adequately, contributing to childhood stunting in the study area (Mchome et al., 2020). In Burkina Faso, women's high workloads are perceived as a barrier to improving maternal and child nutrition by both women and men

(Compaoré et al., 2021). The pressures on women appear to be increasing in some areas. For example, women in Nyanzi Region, Kenya describe how their increasing workload in cattle production – due to men's increasing off-farm employment – is compromising their time to prepare meals. Consequently, they sometimes skip lunch and their children sometimes do not eat before going back to school. Yet serving evening meals late or failing to graze the cattle adequately put women at risk for repercussions from the husband, including gender-based violence (Dumas et al., 2018).

Elsewhere, women are trying to overcome their lack of time to prepare food by turning to convenience and fast foods. In Fiji, Micronesia and the Solomon Islands, women increasingly prefer convenience foods although these foods negatively affect nutrition (McKenzie et al 2022; Corsi et al., 2008; Vogliano et al., 2021). In Teheran, Iran, women's time constraints lie beneath the increased consumption of fast foods and unhealthy diets in general (Farahmand et al., 2012). In other locations, however, women's improved income generation capacity is enabling them to secure better and healthier foods for their families. In rural Indonesia for instance, households with female off-farm employment had significantly better dietary quality than households where only male household members were employed. Higher incomes alone could not explain this effect (Chrisendo et al., 2020).

Woman fruit vendor, Kenya (Anne M. Rietveld)

4.2 Community Sphere Gender Norms

4.2.1 Gender Norm 14. Women are expected to reproduce cultural food norms

Cultural food norms interact with gender norms to influence the kinds of food people eat. Preferences are not static but are influenced by broader factors, including urbanization and the advertising industry. The latter in particular attempt to influence cultural food norms in order to maximise their profits. These factors, among others, combine to shape and potentially hamper women's ability to exercise their agency in favor of healthy diets.

Cultural food norms can impact upon nutritional practices among different ethnic communities in the same agro-ecological zone. In Vietnam, one study found large diversity in breastfeeding practices across mothers from four different ethnic groups. Although there is a slight correlation with food insecurity that affects the dominant kin group less than the other three ethnic communities, suboptimal breastfeeding practices are mostly attributable to food-related cultural norms among some ethnic groups (Nguyen et al., 2016). Sometimes different kinds of knowledge convey conflicting nutritional messages resulting in sub-optimal diets. In some parts of Myanmar women restrict the intake of certain foods after giving birth. Despite being knowledgeable about healthy foods to eat post-partum, they conform to traditional beliefs which are promoted by mothers-in-law (Diamond-Smith et al., 2016).

Cultural food norms frequently dictate that a specific food item is an essential element of meals. However, when the agro-ecological suitability for the production of such food crops changes due to climate change, its availability and affordability may well decrease. Nevertheless, changing availability and affordability frequently does not stop women from aiming to maintain the consumption of these preferred foods. This can negatively affect overall dietary diversity and quality. In Central Java, Indonesia, for instance, rice is a priority food. During an economic crisis when prices for rice doubled, women prioritized rice consumption and reduced their purchase of animal source foods and vegetables (Hartini et al., 2005). When culturally preferred foods are simply unavailable, women may resort to consuming cheap, nutritionally poor convenience foods rather than learn to cook new foods, as shown by a study of migrant pregnant women in Cape Town, South Africa (Hunter-Adams and Rother 2016). Migrants willing to adapt to new food cultures, however, can maintain or improve

their dietary diversity, as shown in a study of Liberian refugees in a refugee camp and Ghanaians living around the camp (Mandelbaum et al., 2019).

The consumption of orphan[1] or indigenous crops, or locally available wild foods (including plants, animals, and insects), can be constrained by cultural food norms. These norms can vary by the gendered geographies within which certain foods are found. Women's mobility and other factors such as age can also influence consumption. Some cultural norms identify wild foods as a food of last resort. For instance, in Maharashtra, India, young rural women express reservations about using indigenous plants because of community perceptions that they are dirty and for poor people (Kehoe et al., 2019). In southwestern Ethiopia, women and men perceive edible forest plants as a fallback food to be accessed only in times of famine (Nischalke et al., 2017). The identification of certain foods with poor people and thus to be avoided is reflected in other studies. For instance, a nutrition project in Mali promoting whole grain consumption found that cultural norms intersect with gender norms to stigmatize whole grain preparation and consumption. Bran is perceived as a by-product of white flour production. It is sold for animal feed or to poor people. Furthermore, since milling is no longer necessary for whole grains, whole grain food preparation saves time and is associated with women being lazy. Indeed, when whole grains are used to prepare the staple dish "tô", this variation is literally referred to as *"tô of the lazy"* (Bauchspies, 2017). Cultural food norms are affected by age, too. Adolescents in rural Bangladesh and Ghana prefer to eat the same foods as their peers (Islam et al., 2019; Janha et al., 2021). In rural Bangladesh, these peer norms consider homemade food uncool and classify specific foods as feminine (spicy and sour food) or masculine (energy drinks and sweet foods) (Islam et al., 2019).

However, elsewhere people are more likely to consume wild foods. This may have the effect of boosting the nutritional value of their meals. In such cases, their knowledge on which foods to procure, where to find them, and how to prepare them is likely to be gendered. For example, in Central Madagascar, the wild edible plants that women and men can identify is significantly different. Women and girls are more likely to identify plants growing in habitats near the homestead that can be eaten as a whole. These are key components of foods prepared by women. Men can identify more endemic edible plants growing in remote pastures and undisturbed habitats (Porcher et al., 2022). On the Barotse floodplains in Zambia, women and men access different water bodies for fishing. They catch different species and sizes of fish, and hold knowledge accordingly (Estrada-Carmona et al., 2020). Another study indicated that in the forests of southwestern Ethiopia men have more knowledge of indigenous edible plants than women. This is because forests are culturally considered men's territory, thus limiting women's abilities to learn about edible wild plants (Nischalke et al., 2017). In parts of rural Malawi, children collect and consume wild food regularly. Wild foods – both plant- and animal-based – form an important part of their diets. Children learn about locations to gather and the different varieties of wild foods from their mothers and grandparents and through peer-group learning (Maseko et al., 2017).

Overall, the literature suggests that women have a stronger interest than men in procuring and serving healthy food. In Brazil for instance, women are more likely than men to consider that organic food is nutritious. As a consequence, women are more likely to purchase organic foods (Martins et al., 2019). Similarly, in Ho Chi Minh city, Vietnam, women are more likely than men to purchase organic foods due to their stronger interest in health and nutrition issues. In addition, Vietnamese women in this study expressed greater concerns than men around the consumption of genetically modified organisms. These concerns strengthened their tendency to buy organic (Pham, 2020). In Maputo, Mozambique, women and people with a higher level of formal education are more likely to eat healthy foods such as orange-flesh sweet potato than men and people with lower formal education levels (Brouwer et al., 2021). In Kwa-Zula Natal, South Africa, women are generally more concerned about nutrition than men. Women buy fruits and vegetables and grow them when kitchen gardens are available. They try to ensure that the whole family consumes these foods. However, men mostly seek to eat meat (Mngomezulu et al., 2022).

Nevertheless, both women and men can favor less healthy foods for a variety of reasons. In some locations, men's higher mobility and access to money compared to women goes hand in hand with increased consumption of convenience foods. In Malaysia for example, low-income men from different ethnic groups eat out regularly whereas women consume mostly home-cooked and

[1] Orphan crops are crops which are not traded in large volumes, particularly internationally, yet may be key to local diets. They can be high in nutritional value. Examples include: Finger millet, tef, yam, cassava and a variety of leafy vegetables. They are often grown by smallholders for subsistence production.

more nutritionally diverse meals. In addition, Malaysian men frequently consume more sweet beverages than women (Eng et al., 2022). Women and girls can be more strongly affected than men by cultural norms that favor thinness. The desire "to get skinny" is identified as one of the reasons underlying unhealthy food habits among adolescent girls in Guatemala (Kurschner et al., 2020). Sensitivity to negative perceptions around obesity affect the consumption behaviors of adult women in Chile (Gálvez et al., 2015). Furthermore, there is some evidence that some men attempt to control the diets of their wives. A Peruvian study shows that women establish rules around children's eating behavior during the week, while men "spoil" children with junk food on weekends (Rozas and Busse, 2022).

4.3 Organizational Sphere Gender Norms

4.3.1 Gender Norm 15. Women are framed as responsible for food provisioning

In some locations, gender norms widely associate women with selecting foods that contribute to nutritionally balanced and sufficient diets, to the extent that women may compromise on income-generation and thereby their economic resilience. Women's lower incomes from fisheries compared to men's in Samoa, for instance, is linked to women's tendency to retain part of their catch for household consumption (Purcell et al., 2021). Across cities in western and eastern Kenya, women's households were perceived by women and men as being more food secure than households headed by men; women-headed households prioritize food security by retaining enough food at home to act as a buffer against shortfalls (Lutomia et al., 2019). Nevertheless, men's traditional responsibilities in many societies include household food provisioning and supporting women's nutrition. For example, breastfeeding women in Nsukka region, Nigeria, are encouraged by their husbands to have a healthy and diverse diet (Onah et al., 2022). Yet nutrition interventions and nutritional studies frequently focus on women and ignore men, thereby contributing to the creation of gender norms that award sole responsibility for putting food on the table to women (Vercillo et al., 2020).

Poorly planned nutrition interventions can add to the pressures women face in trying to provide healthy and sufficient food for the households, simultaneously undermining local gender norms that support men in provisioning roles (McKenzie et al., 2022). In the Dodoma Region in Tanzania, for example, men called their wives "over-empowered" after they received training on health and nutrition that challenged traditional gendered food provisioning responsibilities and behaviors. The authors conclude that

> *"knowledge development in food security projects that interferes with household practices and power structures must first develop an environment where knowledge can be expressed safely.*
>
> Bonatti et al., 2019

Some women fight to re-establish gender norms that award men provisioning roles. For example, in rural Southeastern Tanzania, women report their husbands to the local leaders when they do not provide the minimal support expected (Mchome et al., 2020).

The institutional reinforcement of gender norms that undermine men's identification with food provisioning is likely to harm the ability of household and community members to adapt to climate change. Women may well find themselves grappling alone with changes in the availability of certain foods. They may need to find new ways to procure and prepare foods when energy sources or other circumstances change. They may need to accommodate broader changes in consumption preferences. Framing women as the sole responsible person for food preparation in the household will not help them to juggle the complicated mix of decisions around food preferences, availability, affordability, knowledge, and preparation (McKenzie et al., 2022).

Woman's pig farm, Tanzania (Cathy Rozel Farnworth)

5. Synthesis of Findings

The evidence synthesis aims to develop a systemic understanding of how women manage their lives and livelihoods when these systems are being affected by climate change. Are women able to be pro-active, to take decisions to adapt and even transform their lives? Or are women being pushed, by a range of gender norms which set limits on their agency, towards increasingly unviable livelihood strategies? The findings suggest that, in the context of agrifood production systems, eleven gender norms affect the ability of women to achieve economic resilience in the face of climate change. A further four gender norms affect women's ability to consume and to provision healthy and sufficient food to their families.

It is important to appreciate that the evidence synthesis refers to systems that privilege one gender over another. It does not in any way attribute "blame" to individual women or men, preferring to see their attitudes and behaviors as outcomes of gendered normative systems. The evidence synthesis also recognizes that these systems are undergoing constant change because of complex interactions between forces for change such as climate change, urbanization, and conflict (among many others) and gender norms.

Overall, the analysis of gender norms exemplifies how gender norms perpetuate inequities and challenge women's abilities to become economically resilient in the face of climate change. Understanding better how which gender norms affect women's ability to build economic resilience opens opportunities for targeted gender-transformative development interventions. Gender-transformative change approaches could be effective in promoting gender-equal attitudes and behaviors between, and across, spheres of influence.

For clarity, the gender norms described have been presented separately. However, in reality they intermesh and systemically reinforce each other. For example, widely held gender norms define men as breadwinners and primary income earners. This is reinforced by – and in turn reinforces – a gender norm that men should be the primary holders of household assets and take decisions over how these assets are used. These norms are further reinforced by additional gender norms that consider men to be primary knowledge holders in the household and community spheres of influence, thereby denigrating women's agrifood system knowledge. These norms, and others, combine with further restrictive gender norms.

For example, the gender norm that women are primarily responsible for household care dynamically interacts with the norm that they should source and prepare food. Ironically, even though women provide food, they are not entitled to be primary consumers of the most nutritious elements of a meal, or they are expected to eat less, in many locations globally.

The findings further suggest that there can be discrepancies between how gender norms are enacted in the community, and how they are understood by actors working with these communities. For instance, development actors may continue to develop interventions addressing longstanding gender-restrictive norms that privilege men's decision-making and control over assets. However, in reality the normative landscape may have changed. Women may, for example, be gaining decision-making power in agri-food systems when men out-migrate. Macro-level actors, perhaps in an effort to simplify interventions, may fail to perceive and acknowledge the actual practice of equality in intra-household decision-making, and other indications that gender norms do not always perpetuate inequalities. They may also skate over evidence that women and men can be affected very differently by gender norms at different life stages. These examples call for greater attention to the realities of how gender norms are enacted in communities and how dynamics might vary over time and space.

The findings provide some evidence that women strategize to enact their agency, challenge or circumvent gender norms, and promote their economic resilience. Further research is required on these strategies to ensure that climate smart interventions empower women themselves to disentangle the knot of restrictive gender norms. Conflicting norms between different spheres of influence may also present opportunities for women's empowerment and this should be studied as well.

Maize farming on tied ridges, Malawi (Amon Chinyophiro)

6. Economic Resilience Pathways Conceptual Framework

This section builds on the evidence synthesis to propose an Economic Resilience Pathways Conceptual Framework (Figure 2) that could be used to structure further research into women's economic resilience in the face of climate change. The framework develops the notion of "economic resilience pathways" to conceptualize how women can emerge onto, or be pushed off, livelihood pathways that lead to different forms of economic resilience over time. The overall aim of the framework is to deepen systemic understanding of gendered food systems. In the process of analysing the literature for the evidence synthesis, it became clear that several core systems elements required analytic attention. In addition to gender norms, the following four additional core systems elements emerged as important.

The first of these are the concepts of *power* and *agency*. Power as a concept seems to be under-articulated and defined in the publications surveyed. Foucauldian understandings that power might be "diffuse rather than concentrated, embodied and enacted rather than possessed, discursive rather than purely coercive" (Gaventa 2003) are displaced in favor of a suite of more simple agentic concepts. Whereas agency could be about doing things differently, power is a relational phenomenon that emerges from interactions between components in ways that help to structure agency (Kok et al., 2021). A critical evaluation of the power and agency literature is warranted, as is further empirical research.

Second, the literature explored in the evidence synthesis insufficiently captures how *intersectionality* impacts the enactment of gender norms and affects women's economic resilience in agrifood production and consumption systems. Yet these factors are central to understanding how women (and men) living different intersectional identities work towards building economic resilience. Initiating enquiry into the ways in which different identities intersect, including race, age, income, class, caste, and other social markers, is an important part of data production and analysis (Mackay 2019; Crenshaw, 1989). Intersectionality is not about having multiple identities but rather about understanding how power structures operationalize and privilege certain

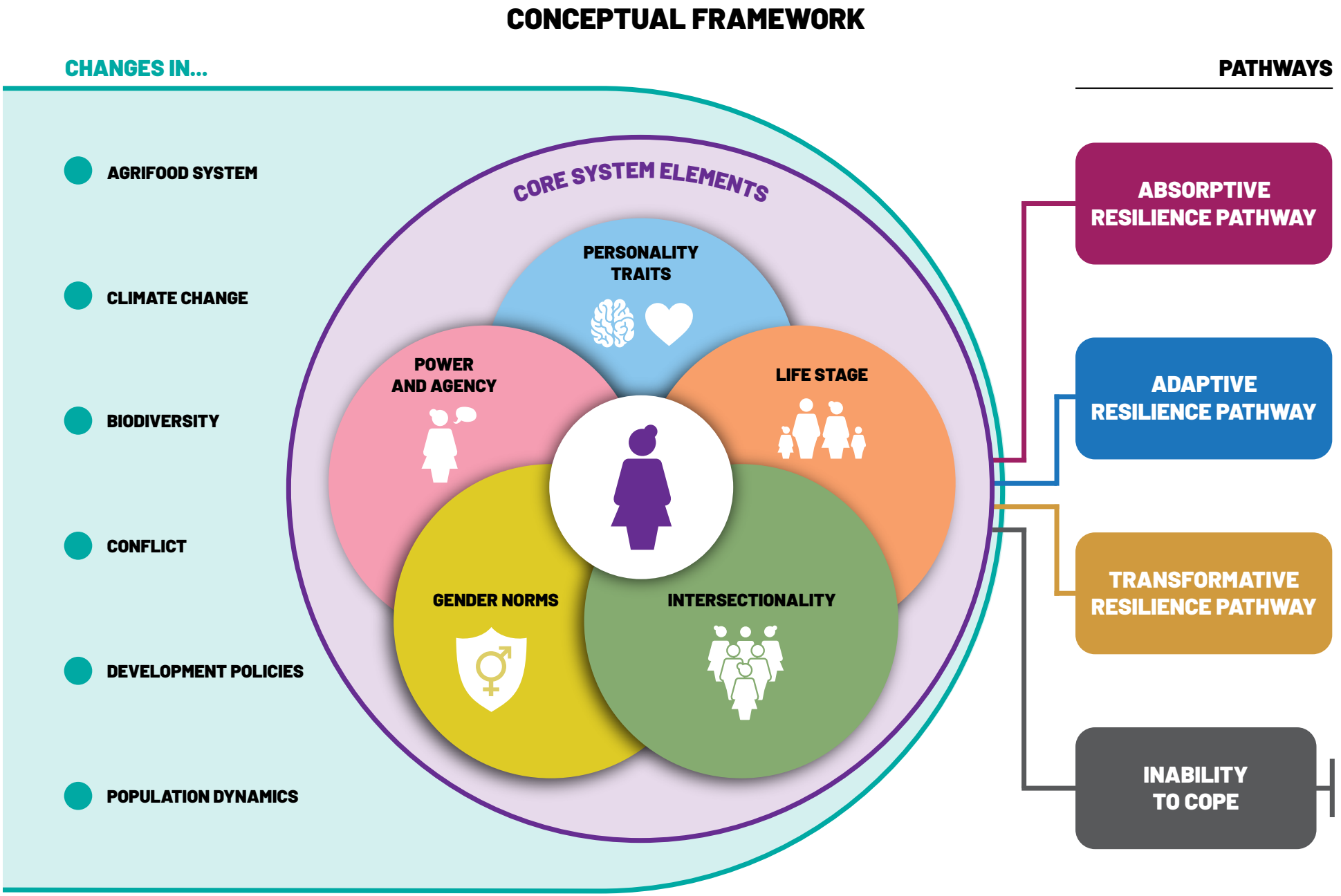
identities and marginalize others. Various forms of group-based horizontal relations of marginalization can layer disadvantage upon disadvantage, for instance being economically poor, a woman, a widow, elderly, and a member of a discriminated-against caste (Farnworth et al., 2018).

Third, the relevance of including *life stage analysis* is particularly suggested by the GENNOVATE data. Women respondents repeatedly indicated that their economic resilience is affected by their age, marital status, and the ages of their children. Limited data from the literature review similarly suggested that life stage impacts how gender norms shape women's experiences and resilience. Life stage analysis draws upon many research traditions including psychological and biodemographic (Black et al., 2017). It would be interesting to develop a partnership with researchers in one of these domains.

Fourth, neither the literature review or the GENNOVATE life history data was able to explain why some women thrive and others in similar circumstances do not. One definition of personality is that it is a set of traits and mechanisms within the individual that are organized and relatively enduring, and that influences their interactions with, and adaptations to, the intra-psychic, physical and social environments (Larsen and Buss, 2005). The Big Five Model/ Five Factor Model of personality, otherwise known as the OCEAN scale, is one of the most well-known and widely accepted models to measure and define personality in the field of psychology (John et al., 2008). It suggests that everyone exhibits five core traits: (i) Openness (to experience) - a characteristic that describes curiosity, imagination and insight. People low on the spectrum stick to more traditional views and they like routines, (b) Conscientious people take care to be punctual, are sticklers for details, well-managed, neat and have strong self-discipline, (c) Extraversion. People scoring high on extraversion are more active, talkative, enjoy attention and recharge by being around others, (d) Agreeableness is defined as being good natured, forgiving, helpful, and more likely to go along with what others say, (e) Neuroticism describes the tendency of some people to frequently feel worried and insecure and have more difficulty regulating their emotions. An assessment of *personality traits* could expand our understanding of how gender and cultural norms interact to allow or inhibit the expression of traits which, for example, promote women's economic resilience. As an example, it could be hypothesized that a woman who is open to new experience may nevertheless find it impossible to attend extension meetings because gender norms prohibit women's mobility in public spaces.

Overall, each one of these five core system elements (including gender norms) could be singled out for empirical research in interaction with one or two other core system elements to help researchers understand how gendered economic resilience pathways are created.

FIGURE 2. The Economic Resilience Pathways Conceptual Framework



6.1 Economic resilience pathways

Figure 2 brings the ideas outlined above together. It posits that it is possible to discern distinctive pathways that women may emerge onto, based on the interactions of gender and social norms, intersectionality, personality traits, lifecycle, and their power and agency. These pathways carry them towards different forms of economic resilience. The three pathways are: absorptive resilience pathway, adaptive resilience pathway, and transformative resilience pathway. Women who are unable to join one of these three pathways may fall in a fourth, inability to cope. Improving women's abilities to move onto higher level pathways requires nuanced interventions aimed at strengthening women's economic resilience. To build these, two or more of the five core systems elements described can be investigated and gender transformative approaches developed.

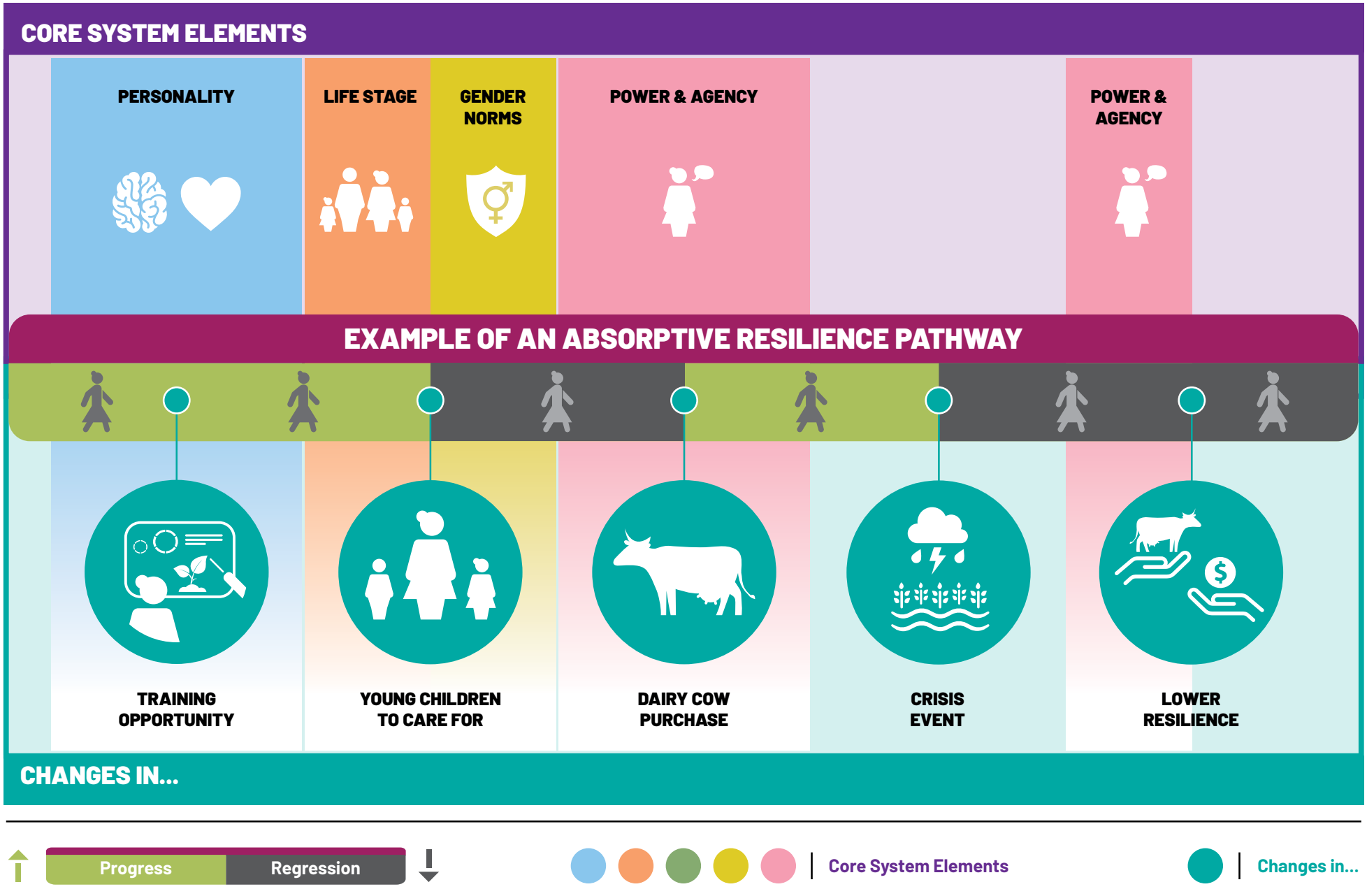
6.1.1 Pathway 1. Inability to cope

This pathway represents a decline in economic resilience. Individuals and people in households and communities fail to cope with the impacts of climate change. They may embark on a slow downward trajectory or face rapid systemic collapse of their livelihoods. In the former, people may be forced to choose coping mechanisms, such as selling core assets, that negatively influence their well-being and future adaptive capacity over time up to the point of exhaustion. The latter scenario may arise due to severe and *ad hoc* crises such as those caused by disasters like flooding or drought. In the household sphere, collapse may occur due to the death or chronic illness of an economically key household member. This scenario is characterized by the narrowing or eventual absence of options.

6.1.2 Resilience Pathway 2. Absorptive resilience pathway

Coping with the immediate impacts of climate change on their livelihoods mean focusing on the "now" and near future. Coping responses are usually ex-post responses to shocks or stresses and constitute short-term and/or relatively minor coping measures rather than longer-term, larger-scale strategies. These responses may aim to maintain well-being at pre-shock levels, but they are often associated with a slow deterioration in wellbeing. This may include reducing how much food is eaten, taking children out of school, or drawing down assets (Bryan et al., 2022; Nguyen et al, 2020). This scenario is characterized by a limited number of available pathways that are often unsuccessful.

FIGURE 3. Example of an absorptive resilience pathway

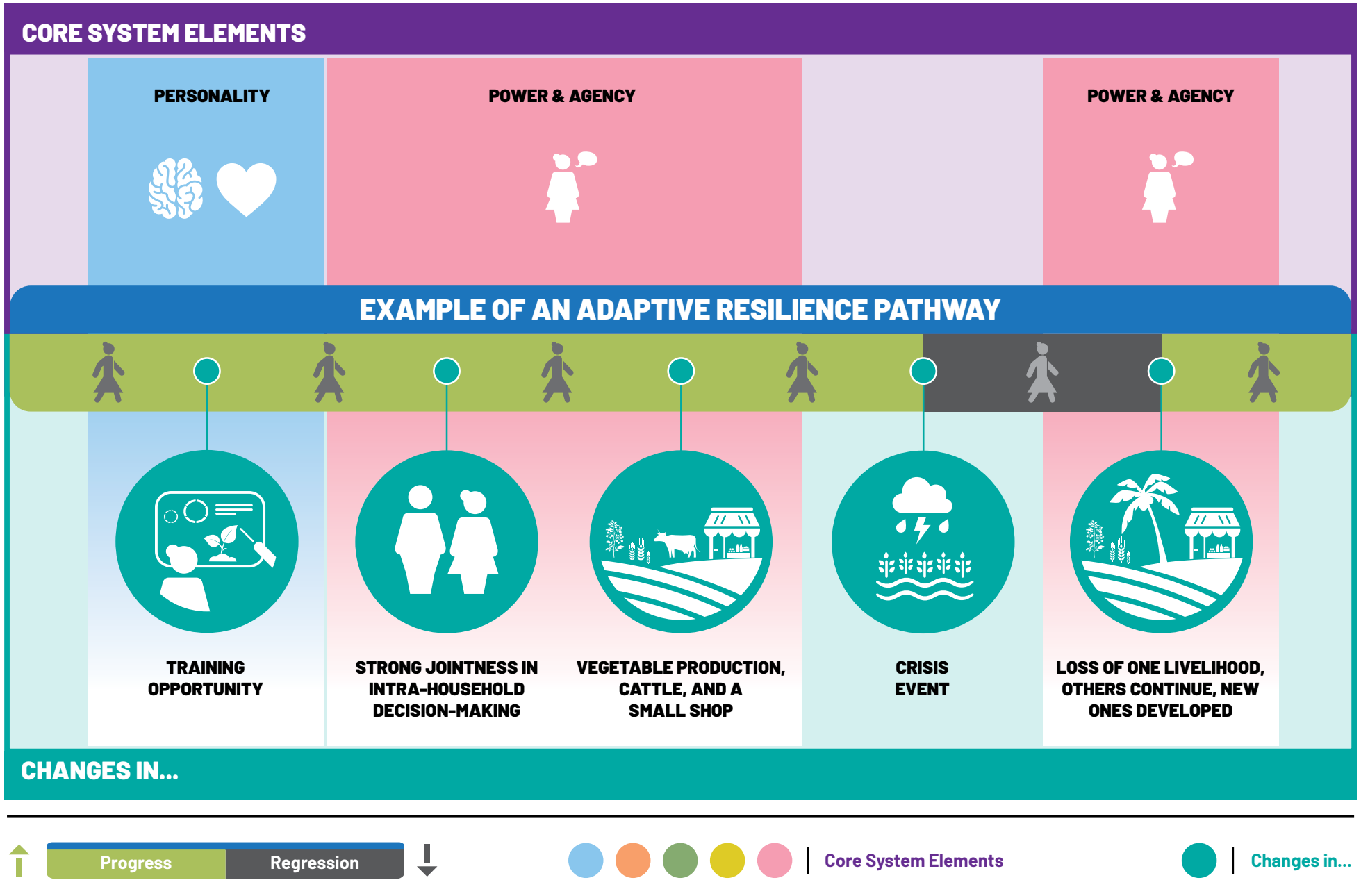


There will be many kinds of absorptive resilience pathway. In our hypothetical example, a single woman exhibits "willingness to learn" personality traits and signs up for training in a new agricultural technology. However, her progress is limited due to her life stage and the way in which local gender norms structure the ways she spends her time. She has several young children to care for which limits her time for income generation. Nevertheless, her use of the new technology initially enables her to produce a good harvest. She uses her power and agency to sell her crop and purchases a dairy cow to diversify her livelihood options. However, the following year there is a disastrous weather event. Her field is flooded, and the crop dies. She is forced to sell her dairy cow. This lowers her economic resilience and there are few other options around her home for earning money. The future is unclear. She may experience a downward trajectory for a while or find a way to slowly recover. However, an absorptive resilience pathway suggests that people on this pathway are highly vulnerable to systemic shocks and find it hard to actively shape their lives over the long term.

6.1.3 Resilience Pathway 3. Adaptive resilience pathway

Adaptive capacity involves having the means to forecast and manage future risks and to put anticipatory coping measures in place to prepare for further shocks. Strategies like diversifying production or livelihood activities help to manage risk, and farmers may also engage in climate-friendly farming activities to minimize the impact of climate change over the medium to longer term (Byran et al., 2022; Lawson et al., 2020; Jost et al., 2016). This scenario requires the presence of several valid livelihood options to select from, or which can be developed.

FIGURE 4. Example of an adaptive resilience pathway

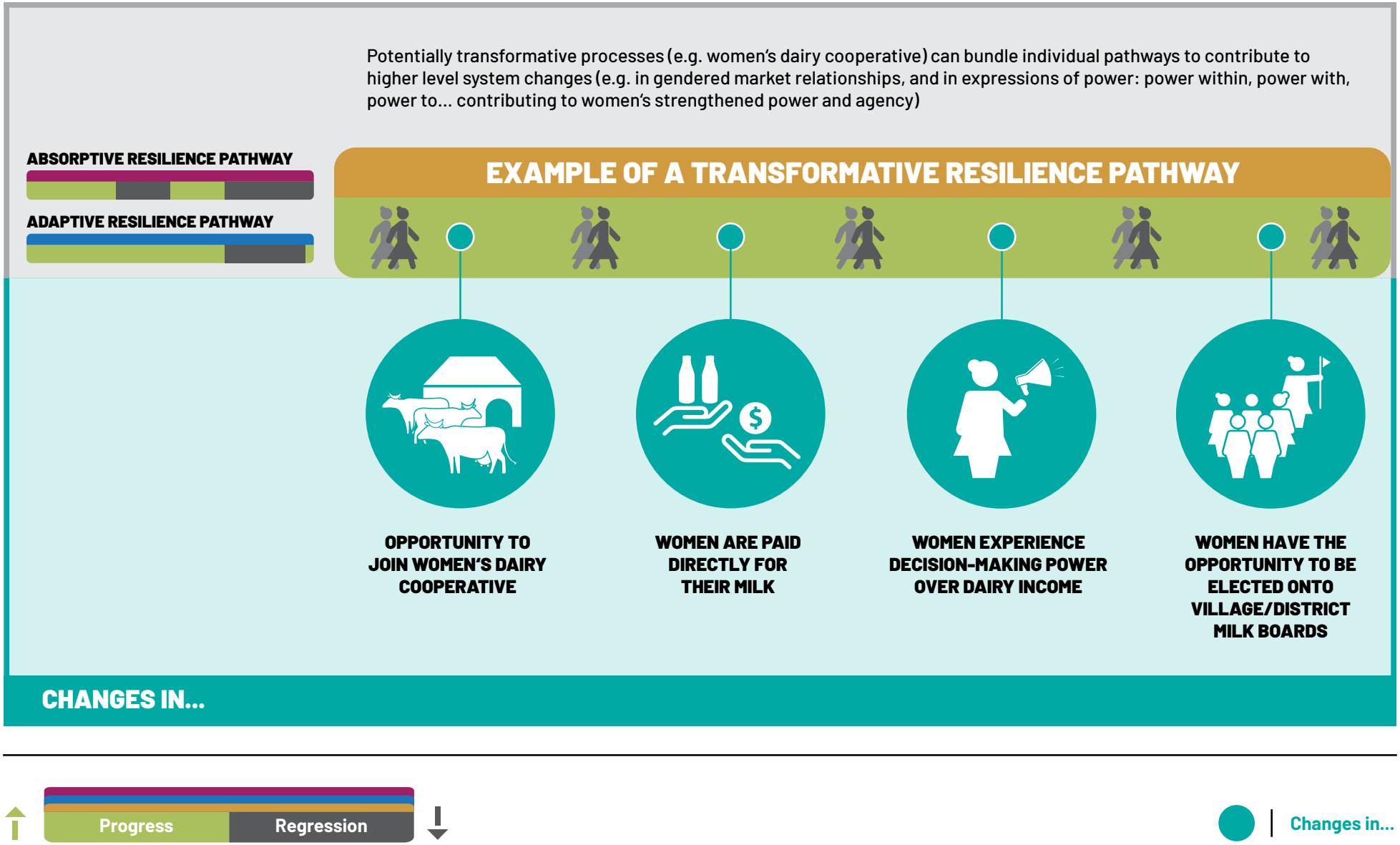


The hypothetical example suggests that the woman is open to experience (personality traits) and that she and her husband share responsibility in intra-household decision-making (strong agency) They invest in a range of livelihood portfolios, including vegetable production for home consumption and sale, livestock keeping, and in a small shop. Some of these activities are managed individually and some jointly. Although there is a crisis event which results in the loss of their vegetable garden for a couple of years, they are able to continue with their other businesses and, over the longer term, plan a new livelihood option – in this case fruiting trees - which is less vulnerable to weather-related crisis events.

6.1.4 Resilience Pathway 4. Transformative resilience pathway

People build resilience through their formal and informal institutions, changing the way their whole agrifood system works. This is by definition a higher-level action. Individuals in households and communities may exhibit some capacity to transform their livelihood systems or shift aspects of the local food system. However, they lack the capacity to change the wider agrifood system. For systems transformation, people need to develop their collective agency to act through organizations and institutions, such as community groups, women's organizations, their value chain partners, and others. Gender transformative approaches can include actions that directly address underlying gender and social constraints and inequalities. These might include actions such as organizing quality and low-cost child-care, enabling mothers of young children to employ more income-generating activities, or ensuring farming women from different castes can join a cooperative management board (Bryan et al., 2022; Farnworth al., 2022; McOmber et al., 2019).

FIGURE 5. Example of a transformative resilience pathway



In this hypothetical example, inspired by case-studies by Farnworth et al., (2023) and Sims and Rodriguez-Corcho (2022), individual women who were previously on adaptive or absorptive resilience pathways have come together to bundle their pathways. They join a dairy cooperative that has provides women with technical training in improved cattle and buffalo breeding strategies, fodder management, livestock veterinary care, and in appropriate milking. Men are free to join these training events. Women are paid directly for their milk into their own bank accounts although men can take milk to the point of sale. Women from different backgrounds (caste, ethnicity, or other, etc.) who previously did not meet with each other come together to discuss topics of mutual concern at regular women-only meetings. Consequently, women experience improved confidence in themselves as individuals, power with other women, and enhanced power to advance their goals. Women now experience decision-making power over how to allocate dairy income. Their decision-making power is starting to influence their husband's decisions over how to manage land and other assets. In addition to the opportunity to be elected to village milk boards, some women are now elected on mixed gender dairy marketing boards at district level.

6.1.5 Concluding comments

There are limits to freedom of choice as the development and range of economic resilience pathways are necessarily hemmed in by higher-level systemic constraints. The nature of potential economic resilience pathways available in any location will be affected by the environment within which women live and act: infrastructural development, governance systems, local agroecology, the impacts of climate change, and a wide range of other variables, including the vigour of local markets, and so on. Thus, different potential economic resilience pathways will be "on offer" to women in their communities in different locations. Similarly, the abilities of women to create new economic resilience pathways will vary.

It is also likely that the economic resilience pathways on offer vary between different family members in a household, and within different communities in the same agrifood system. Our model assumes that households, and individuals within them, may embark on different pathways. They may create new pathways - or follow pathways traditionally followed by a particular gender. Local gender norms may facilitate male heads of households to hold more assets and engage in a wider range of market relationships than women and junior male and female household members, and thus be better situated to seek out stronger economic resilience pathways.

Women's engagement with adaptive and particularly transformative economic resilience pathways has the potential to feed back into and reshape local gender norms. This is because adaptive and transformative behaviors by women will inevitably challenge and disrupt these norms. These behaviors could incur negative repercussions aimed at maintaining the existing gendered system. Positive responses are likely to facilitate women's economic resilience and their empowerment over time.

Farmer with her children and calf, Uganda (Anne M. Rietveld)

7. Conclusion

The evidence synthesis illustrates the diverse ways through which gender norms influence women's engagements in agrifood systems and shape the economic resilience pathways they are able to follow, influencing their efforts to respond to climate change. First, after systematically reviewing the global literature centred on LMIC, the evidence synthesis documents gender norms that influence women's economic resilience in agri-food systems. These gender norms are highly interwoven and mutually reinforcing, shaping behaviors and opportunities from production to consumption in ways that can leave little scope for women's individual and collective agency. Second, we present an Economic Resilience Pathways Conceptual Framework. This framework is designed to analyse in detail, and systemically, how gender norms intersect with women's power and agency, intersectionality, life stage, and personality traits. The framework describes women's ability or inability to cope with, adapt to, and contribute to agrifood system transformation in the face of climate change. Gender transformative research using the Economic Resilience Pathways Conceptual Framework has the potential to deepen women's economic resilience over time, and indeed to transform agrifood systems for the better.

Important lessons emerging from the evidence synthesis include:

- Limited though intriguing evidence suggest that intersectionality and women's life stage influence women's economic resilience in significant ways.
- Gender norms governing women's roles and power in agrifood systems are changing in response to climate change and other forces, with implications for how women respond to future climate shocks.
- Gender norms may be enacted differently in different spheres of influence.
- Paying attention to local realities is important, in particular the ways in which gender norms interact and co-influence each other within and between spheres of influence.
- Despite shifts in gender norms, and despite larger changes, women can find themselves censured by their family or their community for stepping out of traditional gender norms in response to economic imperatives such as male out-migration.

- Women may experience strong support from other women in savings groups, religious organizations, reciprocal labor associations, and other groups.
- Critical moments, such as climate disasters, offer potentially pivotal moments of change which could grant women unusually high levels of agency to overcome restrictive gender norms, without being negatively sanctioned. This has not been studied systematically, though there are some hints that women, on an individual level, can achieve positive outcomes that improve their situation.

It is evident that the intermeshed gender norms identified through the evidence synthesis influence women's economic resilience to climate change in largely negative ways. As a consequence, Gender transformative approaches will necessarily play a critical role in interventions to build women's economic resilience in all the normative dimensions outlined in this report. Gender transformative approaches will need to work within and across spheres of influence to untangle gender norms. It will be important to strengthen women's individual and collective agency through multifaceted interventions which – for instance, simultaneously increase women's income generation potential, their control over their income, and their capacity for collective action. These efforts can be complemented by training and interventions that elevate women's knowledge, and which position them as decision-makers in their communities. Engaging men in this process will be essential, not only as supporters but also as beneficiaries of processes which promote women's and men's equality. In all this, paying attention to intersectional identities will be core.

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