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**Gender Equity Considerations in Food Environments of Low
and Middle Income Countries**

A Scoping Review

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ABSTRACT

This study presents the results of a scoping literature review of gender equity in food environments of low- and middle-income countries. We start by examining the concept of food environments; and find that dividing the concept into two parts, one related to the food supply chain, and the other related to consumer behavior is useful for categorizing literature. One key finding is that although we specifically concentrated our search on articles related to gender in the food environment, the articles found focus more on the food supply chain and/or consumer behavior rather than specifically on the food environment. Most of the articles related to the food supply chain are based on studies conducted in Africa while most of the consumer behavior articles are from studies done in Asia. While gender equity is a topic of interest and is often said to be a priority for international development, relatively few articles were found about how gender equity impacts and/or is impacted by food environments. Those that do exist suggest that a food systems approach to healthier diets consider gender roles and responsibilities (i.e. gender division of labor and time use concerns), gendered access to and control over resources, and gender in decision-making processes. Gender norms related to these issues can present barriers to achieving the desired outcomes of food system interventions; on the other hand, they may also offer opportunities or clues about how to better move forward to achieve both food and nutrition security, and gender equity and equality goals.

Keywords: gender, equity, food systems, food environments, consumer behavior, food supply chain

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ACRONYMS

5DE	5 domains of empowerment
A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ANH	Agriculture, nutrition, and health
BMI	Body mass index
CB	Consumer behavior
CIAT	International Center for Tropical Agriculture
FAO	Food and Agriculture Organization of the United Nations
FEWG	Food Environment Working Group
FSC	Food supply chain
HAZ	Height for age Z-score
HLPE	High Level Panel of Experts
IFPRI	International Food Policy Research Institute
LMIC	Low- and middle-income countries
PRISMA	Preferred reporting items for systematic reviews and meta-analysis
WAZ	Weight for age Z-score
WEAI	Women's Empowerment in Agriculture Index

INTRODUCTION

A food system includes all the activities, actors, and other factors that influence food production and dissemination in a society. The Committee on World Food Security High-Level Panel of Experts on Food Security and Nutrition (HLPE) (2017) report on Food Systems provides a framework that is useful for identifying and understanding challenges and opportunities to achieve healthier diets. This framework includes food system elements – the food supply chain, food environment, and consumer behavior – drivers of change, and outcomes.

Food systems exist within social (and economic) systems that are governed by formal and informal institutions. Formal institutions include regulations, laws and the legal system while informal institutions include social norms that guide behavior. Institutions can be thought of as the “rules of the game” (North, 1990). These rules often differ by sex/gender, class, race, ethnicity, age, and other social identities, and result in, reinforce, and exacerbate inequalities and inequities. In relation to food systems and nutrition, these inequalities and inequities pose different challenges (and opportunities) for diverse groups of people to achieve healthy diets.

While we recognize that all social identities are important and interact in ways that guide and limit individual behavior and actions, in this paper, we focus specifically on gender inequities and how gender, specifically, relates to the elements of the food system. Gender inequities and inequalities are issues that permeate all aspects of life, including food, diets, and nutrition. However, the links between these issues are often nebulous. Gender is a social concept that is based on social norms that guide men’s and women’s behavior and, as such, often go unnoticed by most people. Gender norms, which determine the roles, responsibilities, access to and control over resources, and in general the behavior of men and women in society, have resulted in gender inequities and inequalities, which often then further reinforce gender norms and power dynamics.

There is little research about gender and food systems. However, there is an established body of literature

exploring gender issues related to agricultural production in low- and middle-income countries (LMICs) (see for example FAO, 2011; Quisumbing et al. 2014; Doss 2018; Udry, 1996), gender in agriculture for nutrition programs (for example Kadiyala et al., 2014; Verhart et al., 2015; Malapit, 2019) and there is an ever-growing body of literature about gender in agricultural food supply (or value) chains (for example Farnworth, 2011; Vargas Hill and Vigneri, 2011; Rubin and Manfre, 2014). The studies related to the food supply chain (including production) focus on things like the lack of recognition of women's roles on-farm (i.e. their unpaid family labor) and discrimination in employment and wages in value chains. Previous research has shown that women have less access to agricultural assets and resources, such as land, fertilizers, and agricultural equipment, and that this leads to lower agricultural productivity than could otherwise be obtained (FAO, 2011). Others have shown that women have less opportunities in agri-food supply/value chains as employees and earn less than their male counterparts (Farnworth, 2011). Gender and value chain research has also found that by commercializing subsistence or "women's" crops, these crops become profitable and men tend to take over more and more of the activities, and gain the monetary benefits (World Bank, 2009; Vargas Hill and Vigneri, 2011). However, gaps still exist around women's roles and gender inequalities across different agri-food value chains as well as across various geographical locations.

Most of the consumer behavior and nutrition literature in LMICs focuses on women as mothers, and their reproductive roles, both biological and social, that influence children's nutrition. On the consumer behavior side, many articles have examined women's roles and behaviors as related to their own and their children's nutritional outcomes. Recent studies have also examined the link between women's empowerment and/or autonomy and nutritional outcomes (Quisumbing and Malapit, 2015; Komatsu et al., 2018). While nutrition research and development projects often target women (of reproductive age) and children, there is less on gender inequities related more broadly to consumer behavior. So, this literature often focuses on what women (and children) consume, their knowledge and preferences of food, with little about how men's roles, preferences, knowledge and attitudes also affect women and children's

diets. Few studies focus on men's roles, or comparing men's and women's roles, and how they contribute to nutritional outcomes (Malapit 2019). Much less research has focused on gender and food environments, and specifically about the dimensions and aspects of food environments. Considering the three elements of food systems (i.e. food supply chain, food environment, and consumer behavior), the food environment seems to be the least studied in terms of gender inequities.

Objectives of the review and research questions

The overall objective of this review is to provide input for how to incorporate gender equity considerations in food system innovation approaches to healthier diets. In this paper, we review and discuss how gender is considered in the food system literature with a focus toward the food environment. We also identify gaps in the literature and what types of research might be prioritized moving forward. The following specific research questions are addressed in this paper:

1. How is gender addressed in the literature related to the food environments of LMICs?
 - How is gender conceptualized, operationalized, and analyzed in this literature?
 - How is gender linked to healthier diets, other food system outcomes, or other elements of the food system in general?
2. What evidence of gender inequities and/or inequalities exist in food environments of LMICs?
 - Where are the inequities/inequalities (both geographically and in the food system)?
3. What types of interventions/innovations have been used to address gender inequalities in food systems and what lessons can be learned from them?

One main finding of this study is that although it was designed to identify literature related to gender inequities in food environments of LMICs, very few studies directly related to food environments were found; most of the research relates more directly to food supply chains and consumer behavior with little specifically about food environments. In the next section we describe the design of the scoping review. Then, we present the results, followed by a discussion of what the results mean for integrating gender in

food system innovation work, and some key research areas to address gaps and improve the ability of food system innovations to address gender while pursuing the main goal of providing healthier diets. We then end the paper with a few concluding remarks.

METHODS

We use a scoping review to address the research questions. Scoping reviews are useful to get a broad understanding of an issue, to identify the types of evidence available, to understand how a concept is defined and used in the literature, and/or to examine how research is conducted on a certain topic (Anderson et al, 2008; Peters et al., 2015; Peterson et al., 2017; and Munn et al., 2018). Munn et al. (2018) explain that scoping reviews are appropriate for addressing any of the following six indications (p. 2), to which our research questions align well to five of the six points¹ as shown in Table 1:

- *To identify the types of available evidence in a given field*
- *To clarify key concepts/ definitions in the literature*
- *To examine how research is conducted on a certain topic or field*
- *To identify key characteristics or factors related to a concept*
- *As a precursor to a systematic review*
- *To identify and analyse knowledge gaps*

Table 1. Research Questions and Scoping Review Indications

Research Questions	Related Scoping Review Indication(s) (Munn et al., 2018)
1. How is gender addressed in the literature related to food environments of LMICs?	To examine how research is conducted on a certain topic or field.
a. How is gender conceptualized, operationalized, and analyzed in the literature?	To clarify key concepts/definitions in the literature.
b. How is it linked to healthier diets, other food system outcomes, or other elements of the food system in general?	To identify and analyze knowledge gaps. To identify key characteristics or factors related to a concept.
2. What evidence of gender inequities and/or inequalities exist in food environments of LMICs?	To identify the types of available evidence in a given field.
a. Where are the inequities/inequalities (both geographically and in the food system)?	To identify and analyze knowledge gaps.
3. What types of interventions/innovations have been used to address gender inequalities in food systems and what lessons can be learned from them?	To examine how research is conducted on a certain topic or field. To identify key characteristics or factors related to a concept.

Source: Authors' and Munn et al., 2018

¹ The objectives and research questions of this scoping review aligned with all of the indications except that it was not done as a precursor to a systematic literature review.

We used the PRISMA-ScR checklist (Tricco et al., 2018) and Peters et al. (2015) to guide our scoping review. The research objectives and questions guided the inclusion/eligibility criteria; we specifically searched for articles that included gender and the elements or dimensions of the food environment as discussed in the HLPE (2017) and by Turner et al. (2017) in LMICs that were published after 2000. We searched Web of Science and Scopus databases for articles. The following section describes the search terms used and their justification and how the search was conducted.

Key Concepts and Search Terms

The research questions guided the search for articles to include in the scoping review. Thus, in order to begin, we first clarified the key terms. The following sub-sections explain the search terms that were used.

Food Systems & Food Environments

We draw on the food systems framework presented by the HLPE (HLPE, 2017), which represents the science-policy interface of the UN Committee on World Food Security. The HLPE (2017) describes the food system as including all elements and activities related to the production, processing, distribution, preparation and consumption of food, the market and institutional networks for their governance, and the dietary, socio-economic and environmental outcomes of these activities. This framework clearly distinguishes the linkages and feedbacks between three key components: food system drivers; food system elements; and food system outcomes.

The food system framework identifies five main drivers of food system changes: biophysical and environmental; innovation, technology and infrastructure; political and economic; socio-cultural; and demographic drivers (HLPE, 2017 citing Ingram, 2011). The main outcome of interest in the food system framework is healthier diets and improved nutrition but it also recognizes and considers health,

environmental, economic and social outcomes. For purposes of this paper, we focus primarily on the three elements of food systems: food supply chains, consumer behavior, and food environments.

The *food supply chain* consists of all the actors and activities from production to consumption; specifically including production, storage, distribution, processing, packing, retailing, and marketing (HLPE 2017). *Consumer behavior* reflects all the choices consumers make about what food to acquire, store, prepare, eat, and how to allocate food within the household. It is influenced by tastes and preferences, convenience, and culture, tradition, and beliefs. Consumer behavior is largely shaped by the food environment (HLPE, 2017).

The *food environment* is the interface between the food supply chain and consumers (HLPE, 2017 and Turner et al., 2017). While the HLPE (2017) report focuses on market issues and mentions aspects such as proximity, affordability, food promotion, advertising, quality, and safety, Turner et al. (2017) distinguish between the external and personal food environments or in other words the factors that are external/exogenous to the consumer, such as availability, prices, and marketing regulation, and those that are internal/endogenous, such as accessibility, affordability, convenience, and desires. Each of these dimensions also has associated aspects, that further explain and describe the dimensions.

The search terms and inclusion criteria for this study focus on the food environment. We use the dimensions and associated aspects of the external and personal food environments presented by Turner et al. (2017) to guide the search.

Gender: Equity, Equality, and Women's Empowerment

The main research objective is focused on gender equity. We adopt the definition of equity used by the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH) from Harris and Mitchell (2017), which draws on Jones (2009):

[Equity is] based on the idea of moral equality i.e. the principle that people should be treated as equals and that despite many differences, all people share a common humanity or human dignity. The three principles of equity are: equal life chances [no transmission of disadvantage], equal concern for people's needs [which will differ between groups and individuals], and meritocracy [fair access to opportunities]. This speaks to the Sustainable Development Goals concept of 'no-one left behind', and the avoidance of systematic marginalization through structural approaches to tackling inequity. (p. 3-4)

As evidenced in the above quote, the distinction between equity and equality is not so clear cut; thus, we use both terms in the search for articles. We also are aware of recent studies looking at women's empowerment related to agricultural value chains and/or nutrition and diet outcomes (for example Malapit and Quisumbing, 2015; Komatsu et al., 2018; Farnworth, 2011; Kadiyala et al., 2014; Verhart et al., 2015; Malapit, 2019); therefore, we include empowerment as another search term related to gender equity that is important for identifying relevant literature. Empowerment is often defined using Kabeer's (1999) definition: "the process by which those who have been denied the ability to make strategic life choices acquire such an ability" (pp. 435). This definition includes three components: resources, agency, and achievements. One must have the resources available, then the ability to make choices (agency), to achieve the outcomes they desire.

Literature Search

The scoping review was conducted following guidelines from PRISMA – using both the equity extension checklist (Welch, Petticrew, Tugwell, White, & Bellagio, 2012) and the scoping review extension checklist (Tricco et al., 2018). Based on the research questions, we identified the five topics to include in the search: (1) Gender, (2) Equity, (3) Food, (4) External Food Environment and (5) Personal Food Environment (see Table 2). All the topics were combined with the following Boolean expressions:

(1) AND (2) AND (3) AND ((4) OR (5))

Each one of the topics (4) and (5) was divided in four groups which were combined by the Boolean expression “OR”. These groups were chosen according to the food environment dimensions of the Agriculture, Nutrition, and Health Food Environment Working Group (ANH-FEWG) framework (Turner et al. 2017). Several related search terms were used for each topic and were combined by the Boolean expression “OR” (see Table 2).

Table 2. Topics included in the literature search.

Gender (1)	AND	Equity (2)	AND	Food (3)	AND	Availability (4.1)	External Food Environment (4)	
						OR		
						Prices (4.2)		
						OR		
						Marketing & Regulation (4.4)		
						OR		
						Accessibility (5.1)		Personal Food Environment/ Consumer Behavior (5)
						OR		
						Affordability (5.2)		
						OR		
Convenience (5.3)								
OR								
Desirability (5.4)								

Note: *Each topic included a variety of specific search terms to capture different keywords related to the topic.
Source: Authors.

The search was conducted in the electronic databases of Scopus and Web of Science, two broad-based databases covering both social sciences and health/nutrition literature. All keywords, titles and abstracts were investigated for the combined search terms in both databases.² Only journal articles published in English from the year 2000 through 2018 were considered for inclusion; we did not include books, book chapters, opinion pieces, editorials, letters, retracted articles, short surveys, or notes. Furthermore, only

² Because of the extensive number of articles found in Scopus database, filters by subject area and document type were applied (and are available upon request). In WoS database no filter was applied.

journal articles that presented research and included a description of the research methodology were included; therefore, those articles that were primarily opinion pieces or did not specify the research method were excluded.

Screening Process (for eligibility/inclusion)

The initial search identified 400 articles, which were further screened for inclusion or exclusion. First, the titles and abstracts of the articles were screened independently by two of the authors for relevance; in case of disagreement during the process, the article was automatically included in the next phase. If an article was deemed appropriate for inclusion, it was also determined if the article was primarily related to the external or personal food environment and classified as such.³ After this screening phase and classification, one of the authors read and determined final inclusion or exclusion of each article, working independently; one person focused on articles related to the personal food environment/consumer behavior and another on the articles related to the external food environment/food supply chains.⁴ Snowball searches were also conducted by reviewing the reference lists of included articles.

In the end, we had two lists of selected articles for inclusion in the review; one list related to the external food environment (or the food supply chain) and the other related to the personal food environment (or consumer behavior). Note that we used search terms related to the different dimensions of the food environment as described in Turner et al. (2017). This limited the search and we cannot say it includes all relevant literature on food supply chains or consumer behavior; however most of the literature identified speaks to these other elements of the food system and as such gives an indication of the kinds of evidence available and the different ways that gender is considered across all three elements of the food system.

³ Although some articles covered both the personal and external food environment, we classified them as one or the other based on the main focus of the paper.

⁴ Exclusion criteria for the external food environment (food supply chain) articles related to how gender was treated in the article; only articles that included comparisons of men and women were chosen for inclusion (those that focused only on women or sex of the household head were excluded). This criteria was not used for the personal food environment (consumer behavior) articles.

Data Extraction

Once the articles had been identified, they were reviewed, and data was extracted from each and included in a matrix.⁵ Table 3 lists the different data extracted from the articles and included in the matrix. The information in the matrix was tabulated to create tables, graphs, and/or charts to illustrate the results. Furthermore, the data was analyzed and synthesized for discussion of the results related to each of the research questions.

Table 3. List of data extracted from articles.

Authors (reference information)
Year of publication
Region(s) of study (Africa, Asia, and/or Latin America)
Country/countries
Rural/urban (or both)
Classification as Food Supply Chain (FSC) or Consumer Behavior (CB)
Methodology used
Study population and sample
Key findings/results
Food environment dimensions & aspects discussed
Gender concepts and analysis
Inequities/inequalities identified
Interventions and/or innovations (and lessons learned if applicable)

Source: Authors.

⁵ Data extraction was done in two rounds. The first round of data extraction was done by two of the authors and focused on the dimensions and aspects of the food environment. The second round of data extraction was conducted by a third author who reviewed each article and complemented the data from the first round and added more nuanced information about gender concepts, analysis, and the inequalities identified.

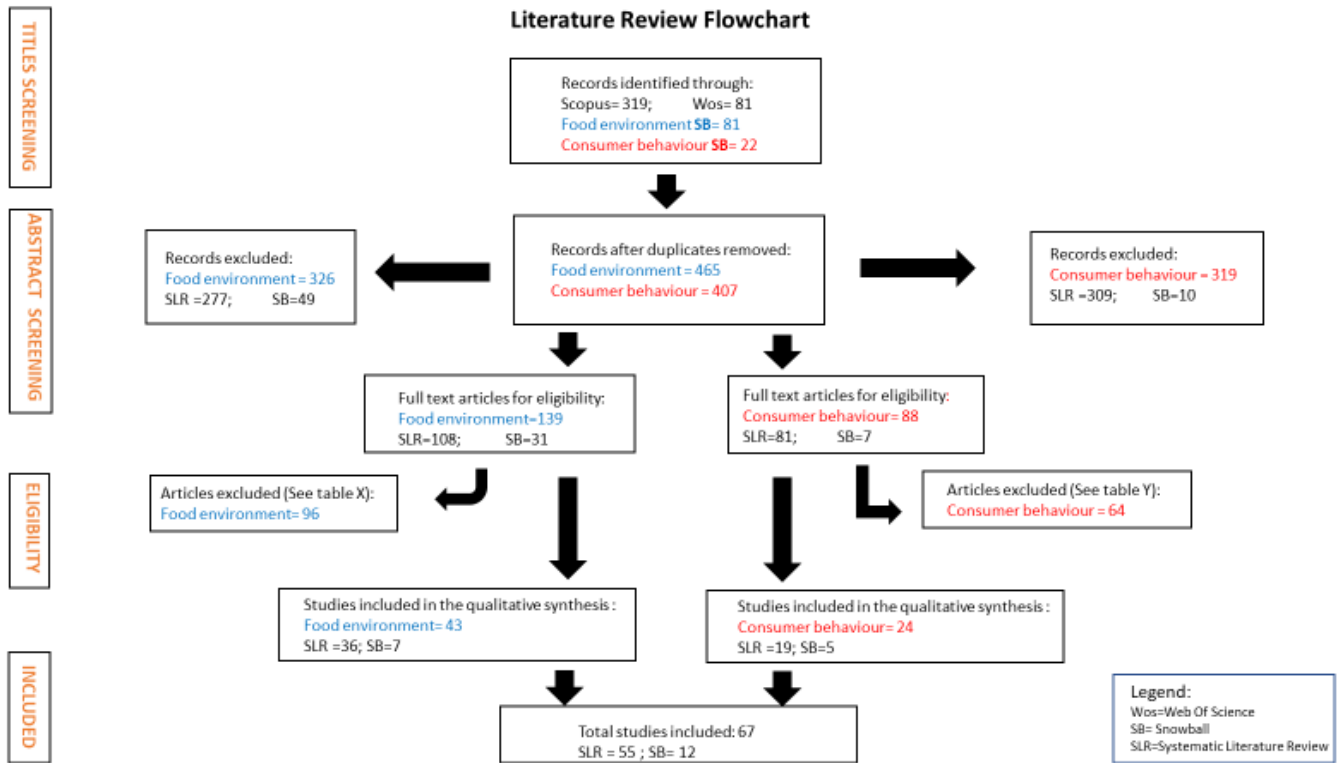
RESULTS

In this section we present the results of the literature review. We start by examining overall trends in the articles found - by region, rural/urban, place in food system, and year of publication. Next, we focus on how concepts related to gender and the food environment are discussed in the articles. We then examine the different gender inequalities, inequities, or other gender dimensions discussed in the literature. We conclude this section by exploring the few articles that discussed interventions and/or innovations and what lessons can be drawn from them.

Figure 1 shows the scoping review process. The initial search resulted in 400 articles (319 in Scopus and 81 in Web of Science) plus more than 100 articles from a snowball search.⁶ After removing duplicates and screening the abstracts and full articles, we include a total of 67 articles; 43 classified as food supply chain (FSC) articles and 24 as consumer behavior (CB) articles (see Figure 2). While the design of the review was focused on identifying articles related to the food environment, many of the articles we found related more broadly to food supply chains and consumer behavior, as well as the interaction of these two in the food environment. Several of them overlapped and discussed farmers as consumers, thus including both elements of both the food supply chain and consumer behavior (11 articles).

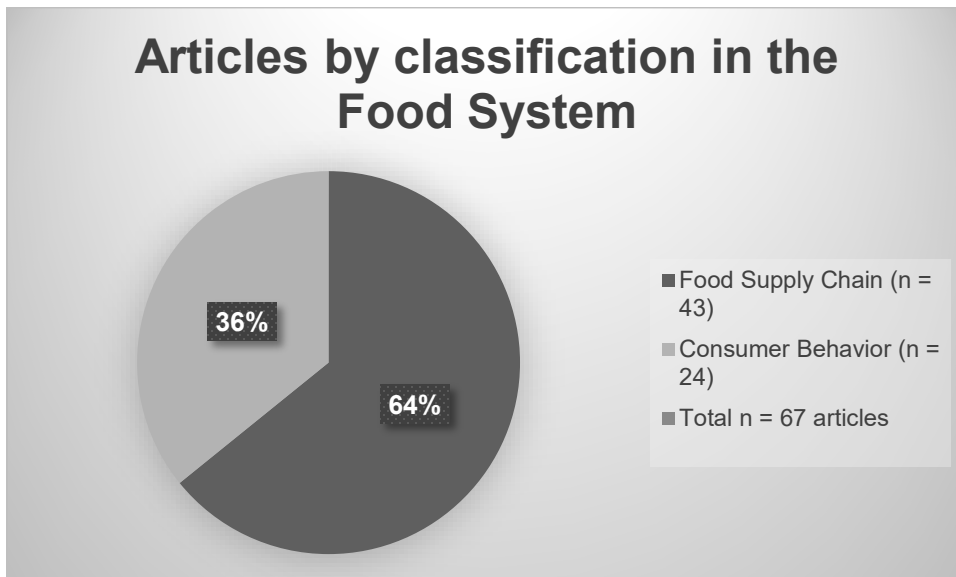
⁶ The snowball search included articles identified in the reference lists of the articles identified in the searches of Scopus and Web of Science.

Figure 1. Flowchart of scoping review process.



Source: Authors.

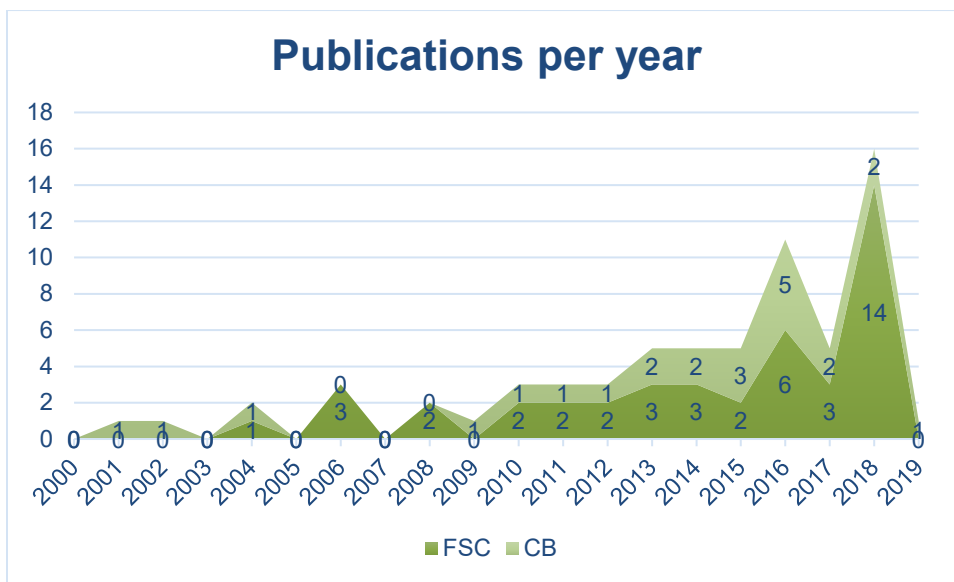
Figure 2. Proportion of articles classified as related to the Food Supply Chain (FSC) and Consumer Behavior (CB).



Source: Authors' calculations.

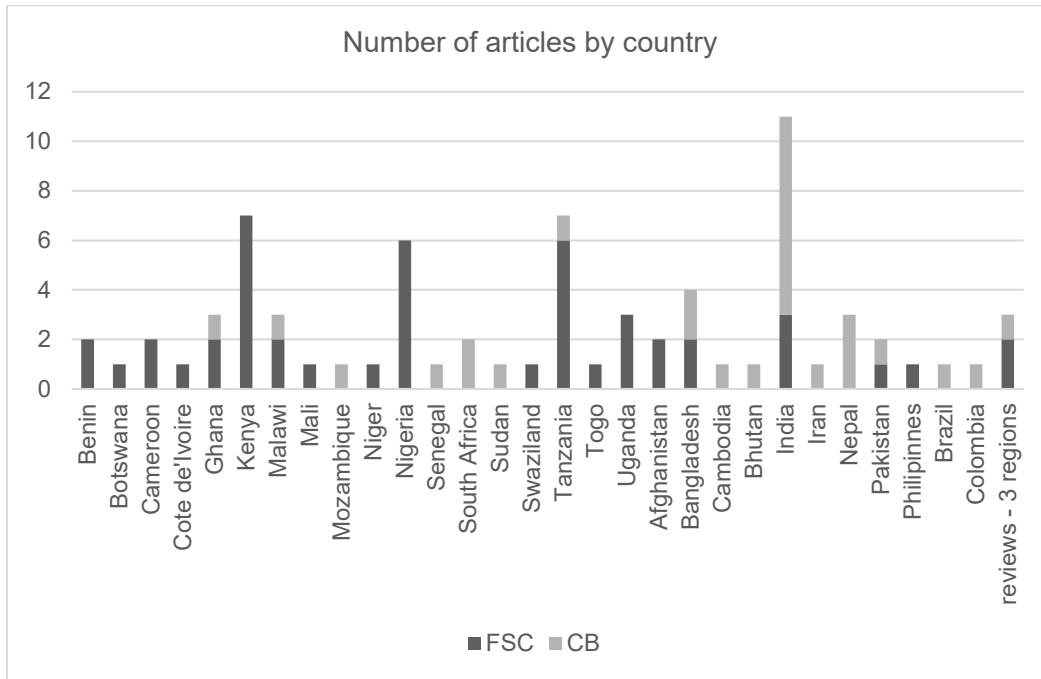
We searched for articles published since the year 2000. Figure 3 shows the articles found by year of publication. Most of the articles included in the review were published after 2010. Regionally, we find that most studies were from Africa and Asia. Most of the studies related to the food supply chain were based in Africa (36 articles) and some in Asia (9 articles), with two articles with information across Africa, Asia, and Latin America. On the consumer behavior side, most studies were from Asia (17 articles) and some from Africa (8 articles). Only a couple of articles addressed the issues in Latin America and one article had information from all three regions. Figure 4 shows the countries that were represented in the articles reviewed. Another geographical issue is that nearly all the articles focused on rural areas (or included both rural and urban areas); only three studies focused on urban areas alone (Figure 5).

Figure 3. Number of articles by year of publication.



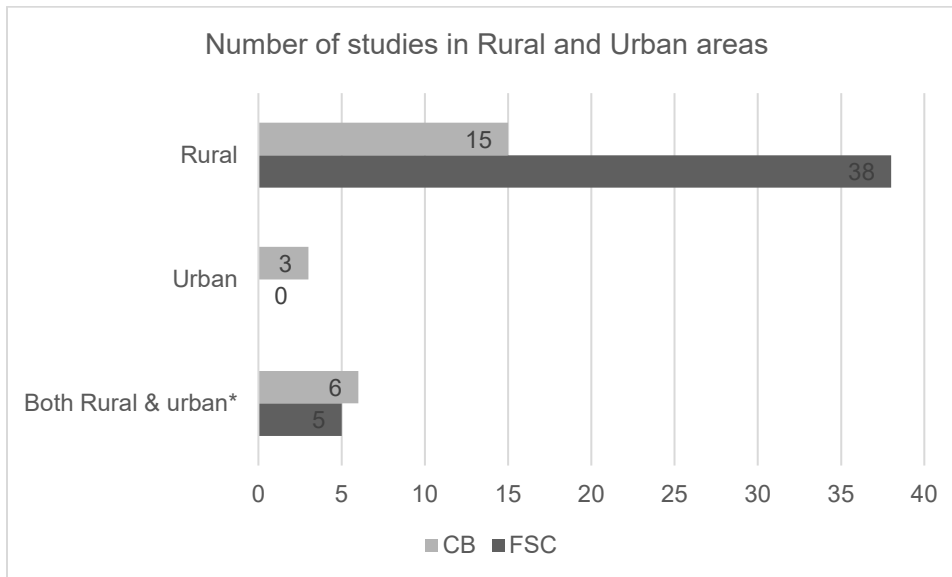
Source: Authors' calculations.

Figure 4. Number of articles by country.



Source: Authors' calculations.

Figure 5. Number of studies by rural, urban or both rural and urban locations.



Note: *This category includes studies with samples from both rural and urban areas as well as studies where it is unclear whether it was a rural or urban area.

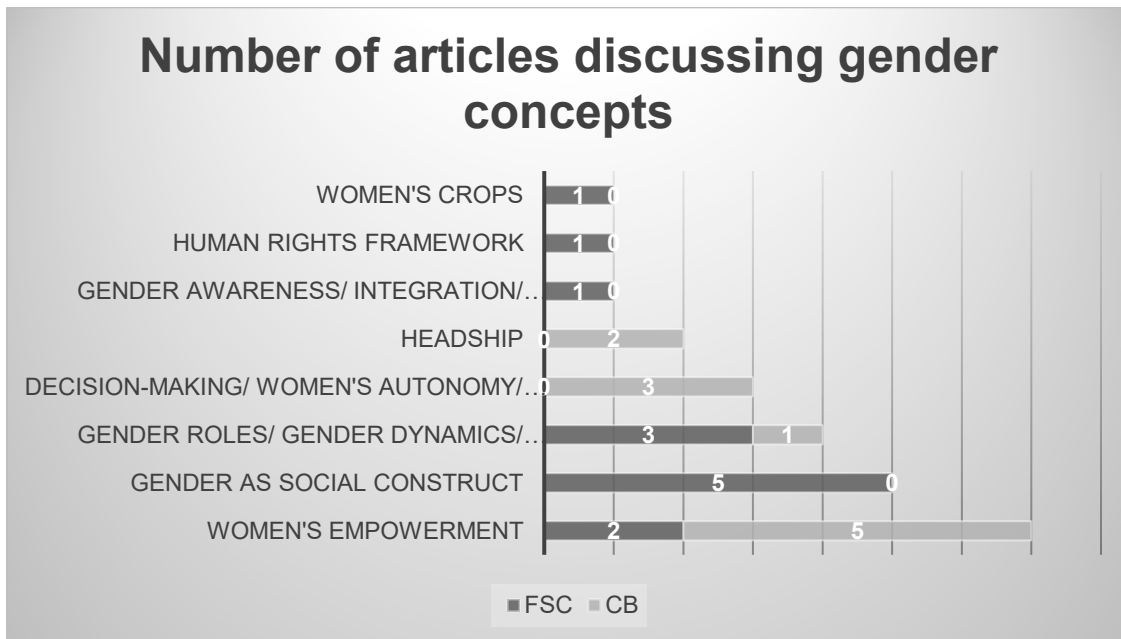
Source: Authors' calculations.

How Concepts Related to Gender and the Food Environment are Addressed

We only included articles that discussed gender in some way. Less than half (24 articles) explicitly discuss gender concepts. Figure 6 shows the number of articles with explicit discussions of different concepts related to gender. Seven articles (five related to consumer behavior and two related to the food supply chain) discuss women's empowerment. Five, all of them related to the food supply chain literature, discuss gender as a social construct. Four, three FSC and one CB, articles discuss gender roles and/or gender dynamics. Three (all CB articles) focus on women's decision-making, either autonomous decision-making or women's agency. Two focus primarily on a headship analysis comparing male- and female-headed households or comparing de jure and de facto female-headed households (both of these are CB articles). Other FSC articles focus on women's crops, a human rights framework, or gender awareness/integration (one article for each).

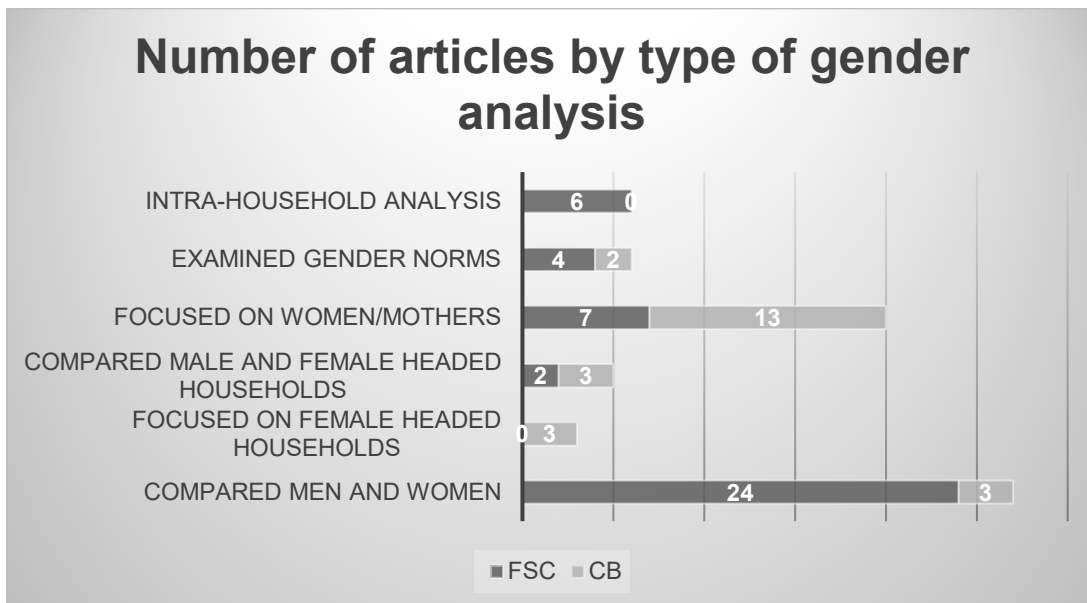
While less than half of the articles explicitly discuss gender concepts, all of them include some type of gender analysis (drawing on quantitative, qualitative, or mixed methods). Figure 7 shows how many of each type of article uses different gender analyses. The most frequently used gender analysis is a comparison of men and women (27 articles in total); this was mostly used by studies classified as FSC. The most frequently used gender analysis in CB articles (and the second most frequent overall) was the focus on women as mothers and/or caregivers (20 articles in total, 13 CB articles and seven FSC articles). Six FSC articles conducted an intra-household analysis, six articles (four FSC and two CB) focused on gender norms, five articles (two FSC and three CB) compared male and female headed households, and three CB articles focused exclusively on female headed households.

Figure 6. Number of articles explicitly discussing different gender concepts.



Source: Authors' calculations.

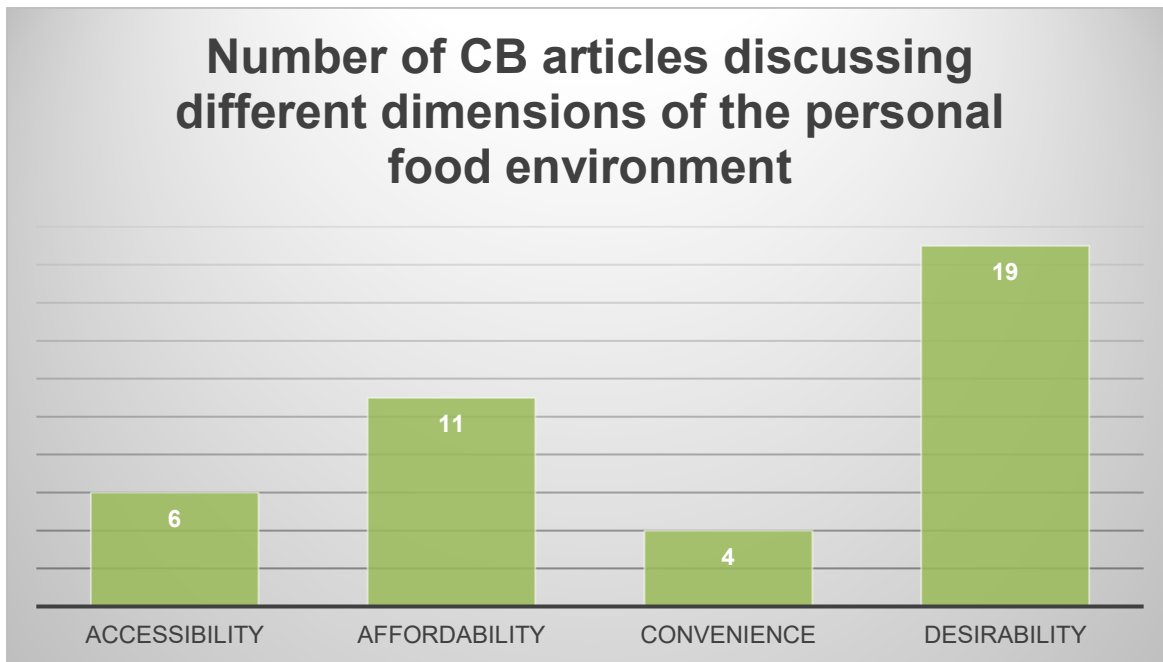
Figure 7. Number of articles by type of gender analysis.



Source: Authors' calculations.

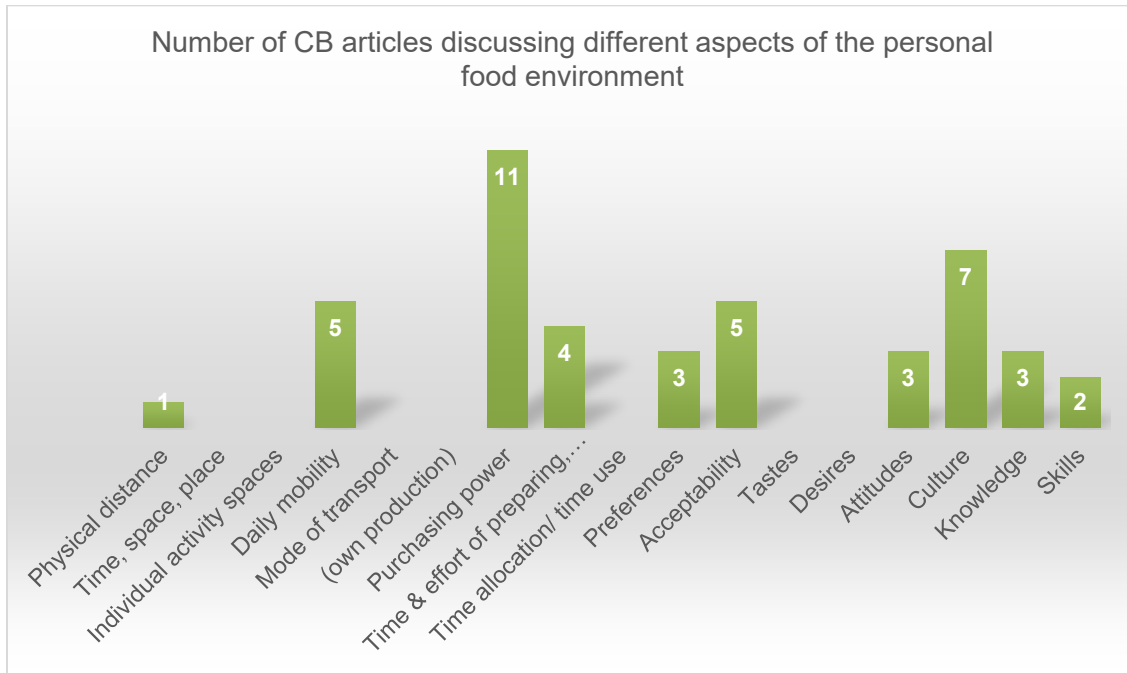
In terms of the food environment, we mapped some of the articles to the different dimensions of the external and personal food environment dimensions. All of the CB articles were mapped to the different dimensions of the personal food environment but not all the FSC articles could be mapped directly to the dimensions of the external food environment. Figures 8 – 11 show how many articles discuss the different dimensions and aspects of the external and personal food environments.

Figure 8. Number of CB articles discussing dimensions of the personal food environment.



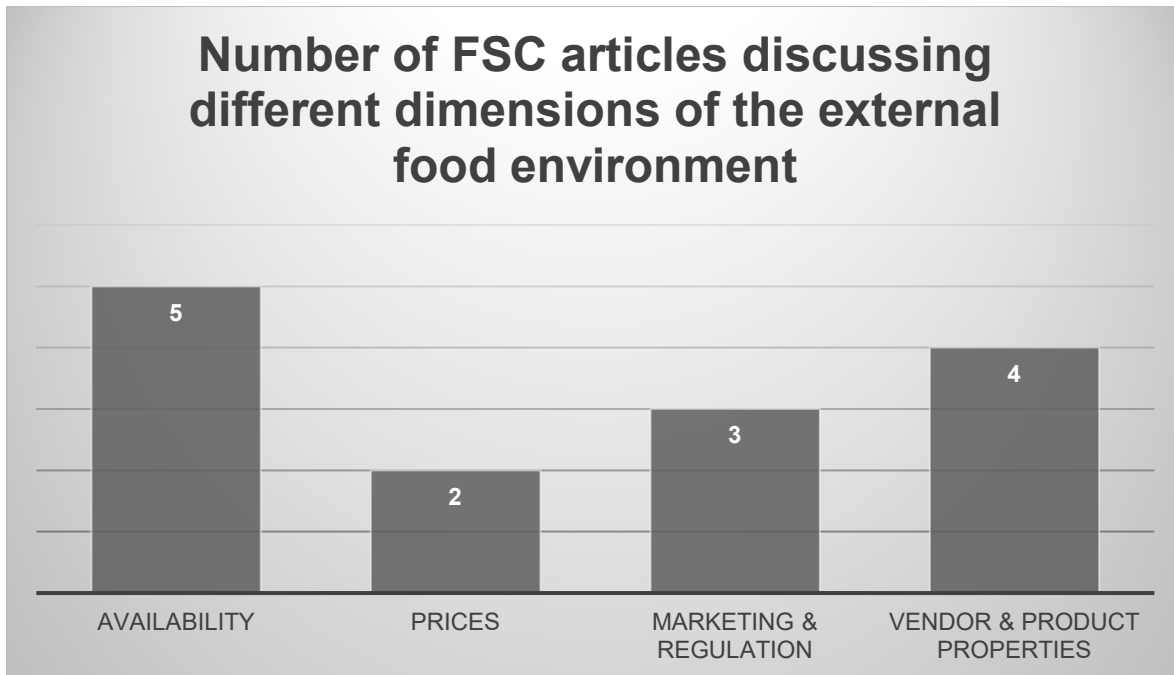
Source: Authors' calculations.

Figure 9. Number of CB articles discussing different aspects of the personal food environment.



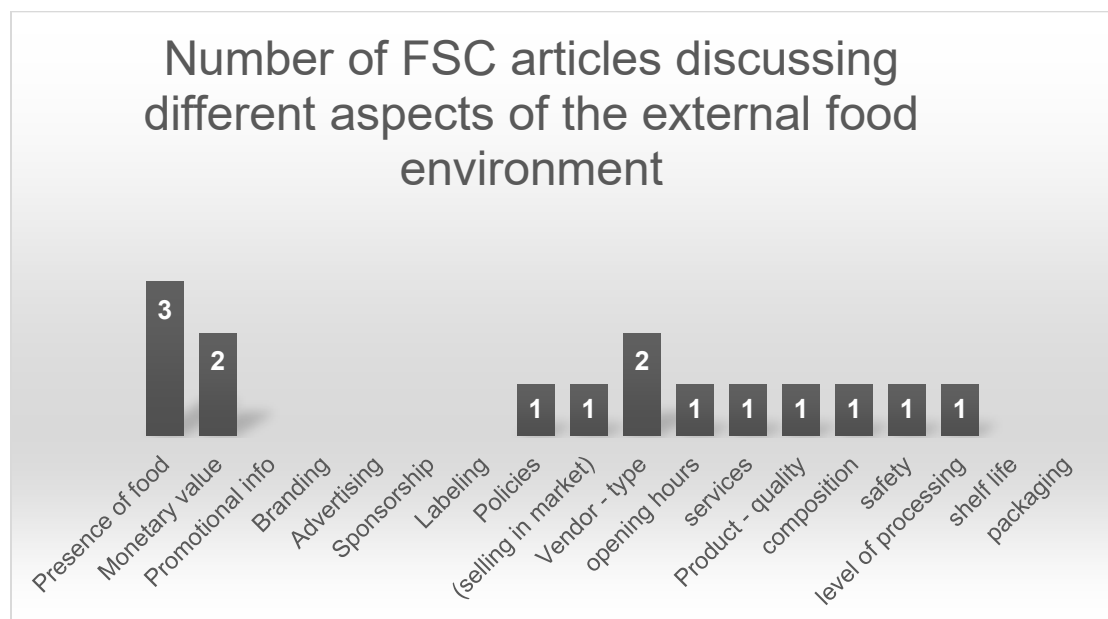
Source: Authors' calculations.

Figure 10. Number of FSC articles discussing different dimensions of the external food environment.



Source: Authors' calculations.

Figure 11. Number of FSC articles discussing different aspects of the external food environment.



Source: Authors' calculations.

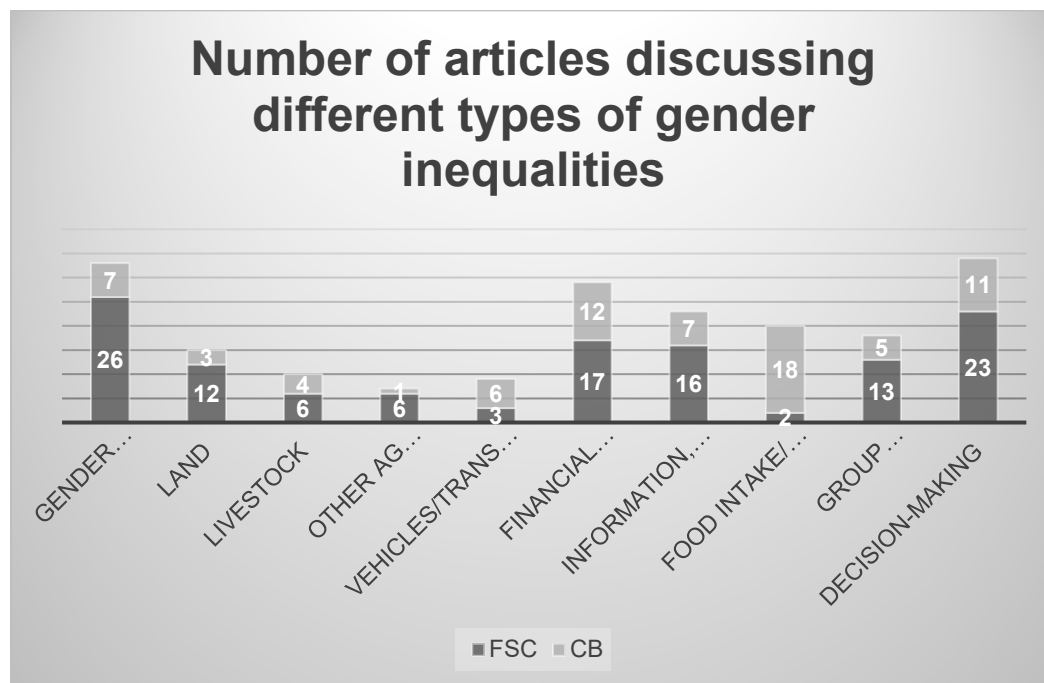
While our review focused on the food environment, the identified articles included evidence from both the food supply chain and consumer behavior elements of the food system. Most articles on the food supply chain focused on production of food on small-scale farms. There were fewer addressing other parts of the supply chain, and those that did focused mainly on short, simple supply chains (or traditional supply chains using concepts from HLPE, 2017).

On the consumer side, the review revealed studies mainly related to women as mothers, caregivers, and providers of food and nutrition to the family. Several of the consumer behavior studies focused on women's roles in both agricultural production, income-earning activities, and food preparation and cooking activities and the relationship with nutritional status and/or women's autonomy/empowerment. Furthermore, many of the articles included a nutritional outcome using a metric, such as body mass index (BMI), children's weight for age (WAZ), height for age (HAZ), or a dietary diversity score for the household, women, or children. Only a few of the identified articles included a discussion of obesity or micronutrient deficiencies.

Gender Inequities & Inequalities

The articles reviewed discussed several types of inequalities. We grouped the inequalities found following previous research related to gender and development: looking at the gender division of labor (and related time use allocation), access to and control over resources (including physical, financial, information, training, and extension, and food as different types of resources), and decision-making (sometimes referred to as women's autonomy or agency but we took a broader approach to look at decision-making more generally). The number of articles discussing each type of inequality is presented in Figure 12.

Figure 12. Number of articles discussing different types of gender inequalities.



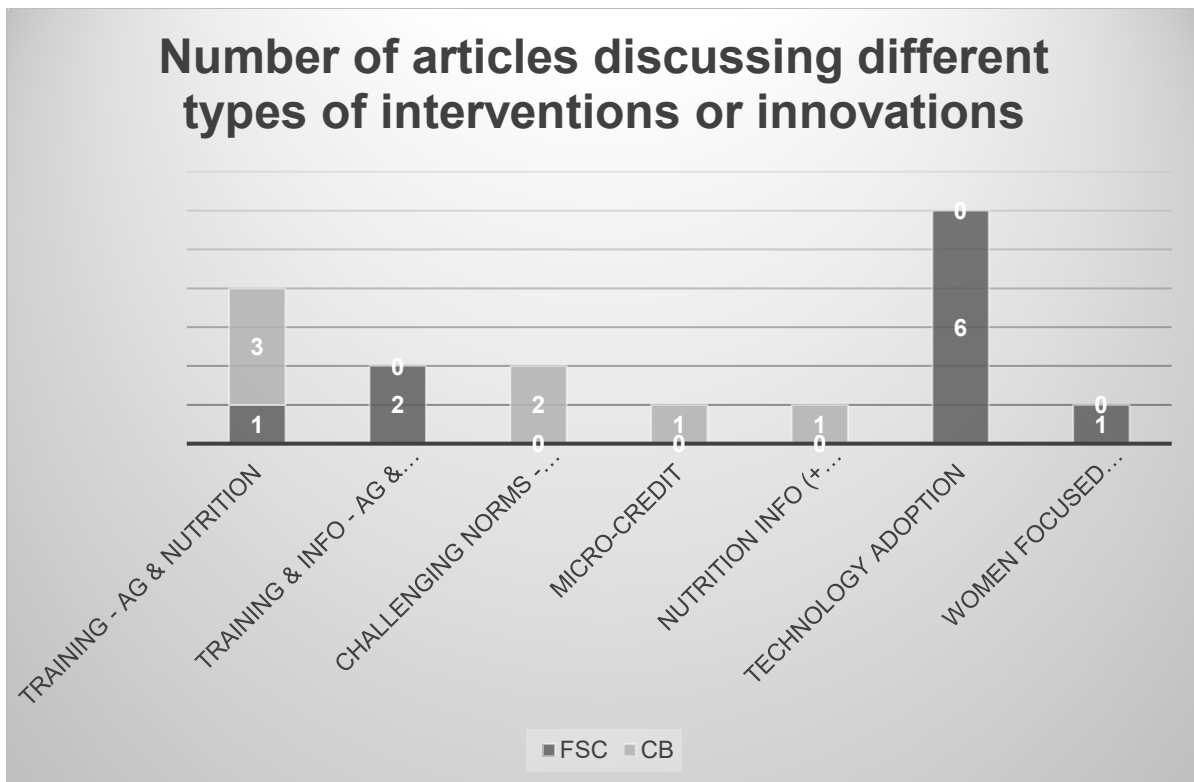
Source: Authors' calculations.

Interventions and Innovations

Seventeen articles (10 FSC articles and seven CB articles) discussed interventions or innovations. Figure 13 shows the different types of interventions and innovations discussed in the articles. Several focused on trainings; four on agriculture and nutrition trainings, two on agriculture or agroclimatic trainings and information, two had trainings oriented towards challenging social and gender norms (mainly around

eating practices within the home). One focused on a micro-credit intervention, another on providing nutrition information. Six of the FSC articles focused on agricultural technology or innovation adoption. One was specifically about a woman focused agricultural project. These articles all focused on changing behavior either at the production level in the food supply chain or consumer behavior; none of them focused on innovations or interventions within the food environment itself (with the possible exception of the micro-credit program that could arguably make food more economically accessible within the food environment).

Figure 13. Number of articles discussing different types of interventions or innovations.



Source: Authors' calculations.

DISCUSSION

While the review was designed to find articles related to gender in the personal and external food environment of LMICs, most of the articles identified relate more to the food supply chain or consumer behavior rather than directly to the food environment as described by Turner et al. (2017). However, many of the studies could be mapped to the different dimensions and aspects of the food environment as discussed below. In terms of geography, most of the consumer behavior studies were conducted in Asia while most of the food supply chain articles were conducted in Africa; this suggests that in Asia, more attention focuses on nutrition of consumers and in Africa, more attention is on agricultural production. The studies were predominantly rural, with few from urban contexts; this suggests a gap in the literature to consider a broad consumer base using a food system framework. This section discusses the results in more detail as they relate to each of the research questions. First, looking at how gender is conceptualized, operationalized, and analyzed within the food environment framework presented by Turner et al. (2017). Then, examining the different gender inequities and inequalities that were identified. And, finally, delving into lessons learned from the studies that discussed different interventions and innovations.

Conceptualizing Gender in Food Environments

Overall, less than half of the articles explicitly discuss the gender concepts used in their studies. This indicates a need for studies with a gender focus to clarify the gender concepts and/or frameworks they use and how they expect gender to be related to the food environment. Similarly, it is important for such studies to ensure coherence between their conceptual framework and the (gender) analysis conducted; this would help justify the choice of analysis, which varies in gender studies to include comparisons by headship, between women, between men and women, and among members of households (i.e. intra-household).

Relatively little was found directly related to gender inequities and inequalities in food environments of LMICs. The review found articles related to all dimensions of the external and personal food environment

but not all aspects of the dimensions were covered in the articles identified. All of the CB articles were mapped to the different dimensions and aspects of personal food environment; however, several of the aspects were not covered in these articles. Only about a third (14 of 43) of the FSC articles could be mapped to the external food environment directly; many of them dealt with agricultural production and therefore indirectly relate to the availability dimension of the external food environment, but since they did not directly map or relate to any of the aspects, they were not included in the results mapping to the external food environment. Furthermore, not all of the aspects of the external food environment were discussed in the articles identified. In terms of the CB articles, six mapped to the accessibility dimension, 11 to the affordability dimension, four to the convenience dimension, and 19 to the desirability dimension (as shown in Figure 8). In terms of the FSC articles, six of them mapped to the dimensions of the external food environment; with five (of the six) discussing availability, two prices, three marketing and regulation, and four vendor and product properties (as shown in Figure 10).

According to Turner et al. (2017), the accessibility dimension includes five aspects: distance, time, space and place, daily mobility, and modes of transport. Five of the articles discuss gender inequalities in daily mobility and one discusses issues of physical distance. In several contexts, it was noted that women face daily mobility challenges that can limit their access to markets and food. For example, Kjeldsberg et al. (2018) find that woman's mobility was an important factor related to woman's empowerment in the context of a nutrition-sensitive agriculture project in Nepal. Other articles found a relationship between the mother's freedom of mobility and nutritional outcomes for mothers and children. A review by Carlson et al. (2015) found a positive relationship between mothers' mobility and child nutrition. Similarly, Shroff et al. (2011) find a correlation between women's low autonomy in mobility and low weight for length in children in India and Sethurama et al. (2006) find a positive association between mothers' mobility and children's weight for age in India. Neogy (2011) noted that restrictions in women's mobility hindered their participation in a nutrition program and limited their ability to collect take-home rations in India. Aryal et al. (2018) find that, in Bhutan, physical distance to markets impacts household food security of

female-headed households more than male-headed households. Overall, more research is needed around gender and the aspects of accessibility in the personal food environment. Which women and under what circumstances face mobility issues and how does it impact food and nutrition security? The literature seems to indicate that it is correlated with religion and strict social gender norms that limit women's freedom of mobility, so understanding when and where these issues are present will be important for understanding gender inequalities in access to markets. Furthermore, more research is needed to understand gender issues related to physical distance, space and place, and modes of transport within the personal food environment.

The second dimension of the personal food environment is affordability, which includes the aspect of purchasing power (Turner et al., 2017). The articles mapped to this dimension and aspect of the personal food environment focused on three main topics: women's empowerment in terms of financial autonomy, comparing food expenditures by men and women, and sacrifices women make to feed their families. A review by Carlson et al. (2015) finds some evidence of a positive correlation between women's economic independence and children's nutritional status (some studies did not find a correlation). Shroff et al. (2011) find that mothers in India who have financial autonomy are more likely to exclusively breastfeed infants. Sharaunga et al. (2016) find that more empowered female heads of household in South Africa are more likely to have food secure households than those that are less empowered. Mudege et al. (2017) discuss how earning a bit of their own income and being able to make independent decisions about how to use it increased women's self-esteem in Malawi. Other articles discussed differences in food expenditures by men and women. Ibnouf (2009) find that although women earned less than men in Sudan, they spent more on food than men. Similarly, Kamath and Dattasharma (2017) find that female-headed households in India spend more on food than male-headed households. Mukerjee and Kundu (2012) find that women who participated in the micro-credit program in India had greater say in decisions about food (as well as about use of borrowed money and family and kinship matters). Chaturvedi et al. (2016) note that men in India were more likely than women to spend money on alcohol. Finally, some articles note that women

make sacrifices in terms of their own food intake, like giving up meat and fish or skipping meals altogether to work longer hours to ensure there is food for their families (Rafii et al., 2013 and McIntyre et al., 2011).

The third dimension of the personal food environment is convenience and includes the aspects of time use/allocation and the time and effort to prepare and/or cook food (Turner et al., 2017). Komatsu et al. (2018) find evidence from Bangladesh, Nepal, Cambodia, Ghana, and Mozambique that in households where mothers spent more time on food preparation, there was a greater household and child dietary diversity score. Chaturvedi et al. (2016) find that in India, there was a correlation between the amount of time mothers spent with their children and their nutrition status. Time constraints also impacted women's participation in an agriculture and nutrition program in Nepal (Kjeldsberg et al., 2018). And, Rafii et al. (2013) discuss women's limited time and trade-offs between working more hours to earn income and skipping meals in Iran. These articles stress the importance of understanding the multiple demands on women's time and how this influences time for food preparation and other dietary choices.

The fourth and final dimension of the personal food environment is desirability, and includes the aspects of culture, acceptability, preferences, attitudes, knowledge, and skills (Turner et al., 2017). Many of the consumer behavior articles discussed aspects related to desirability. Several of these deal with eating patterns within the household. For example, in some places men eat first, and women eat what is left afterward (Ibnouf, 2009; Neogy, 2010). Others showed that men ate the choicest morsels, which led to micronutrient deficiencies (iron and vitamin B1) among women in Nepal (Sudo et al., 2006). Other articles found discrimination in feeding practices between boy and girl children; boys were more likely to be exclusively breastfed than girls in India (Chaturvedi et al., 2016). In Brazil de Morais Sato et al. (2014) find that oftentimes women prepare food based on family members preferences. Other articles noted gender differences in nutrition knowledge and preference for different foods; Kimambo et al. (2018) show that nutrition knowledge is associated with consumption of traditional African vegetables. These articles

all relate to how preferences, attitudes, knowledge, acceptability, and cultural norms (especially those around eating patterns within the home) impact diets and nutrition. In this sense, it is important to understand these aspects for both men and women and how the gender dynamics around these issues play out within the household.

Many of the FSC articles focus on production, and as such are indirectly related to the availability of food, which is the first dimension of the external food environment discussed by Turner et al. (2017). Because the food system framework is oriented toward improved diets and nutrition of consumers, the emphasis in the food environment is also on consumers and the external elements that impact the food they can find in the food environment; whether food is available, the price of food, marketing and regulations, and vendor and product properties. On the other hand, most of the literature identified that relates to the food supply chain and the external food environment is more oriented towards producers and/or other value chain actors; focusing on things like production and processing practices, prices they receive and profitability, how they are affected by marketing and regulations (rather than on how these things impact the product/food they provide). As such few of the articles deal with the external food environment dimensions directly. Furthermore, the six articles that could be mapped to the external food environment dimensions are more oriented towards producers and value chain actors rather than consumers and/or the food products in the food environment.

In the FSC articles included in this review, the focus was more on production and a bit on other parts of the value chain (processing, marketing, etc.). For example, Sikira et al. (2018) provide a gender analysis of the dairy value chain in Tanzania. This article is mapped to the dimensions of availability, marketing and regulation, and vendor and product properties of the external food environment. It discusses the availability of milk and dairy products in Tanzania (and the presence of men and women actors along the value chain). In terms of marketing and regulation it focuses on how women dominate informal marketing of milk and men the formal market and thus the gendered implications of formal regulations. It also

discusses vendor properties in terms of men owning many of the milk kiosks and bars in the country while predominately women are employees selling the milk at these establishments. Behrman (2011) explores orange fleshed sweet potatoes in Uganda. This article is mapped to the availability dimension as it focuses on women's preferences for growing and providing nutritious food for their families. This article primarily focuses on availability of sweet potatoes through own production. Maunahan et al. (2018) examine men's and women's roles in banana processing in the Philippines to explore how to reduce post-harvest losses. This article is mapped to the dimensions of availability and product properties since it explores men's and women's roles at both the production and processing nodes of the value chain and how practices at these nodes impact product quality. They conclude that both men and women play roles in the production and processing of bananas that impact banana quality and that therefore women as well as men should have access to trainings and information to improve the product quality.

Andersson et al. (2016) and Masamha et al. (2018a) both focus on cassava value chains – Andersson et al. look at cassava leaves and Masamha et al. at cassava in general – and they are both mapped to all dimensions of the external food environment: availability, prices, marketing and regulations, and vendor and product properties. Cassava and cassava leaves are traditional rather than commercial value chains, and as such processing as well as production take place primarily at the local level, in the home or village. Women dominate many of the activities across the value chains. These studies show that the products are available at local markets and roadsides, as well as in urban centers and cross-border trading. They also discuss variations in prices by type (farmer, processor, wholesaler, retailer, or supermarket) and location (rural or urban) of vendors. In general, prices are lower at the farm gate and in rural areas, especially when purchased by middlemen. Women also process cassava chips to sell locally and receive low prices for these products. Masamha et al. (2018a) focus on different marketing channels (and relate this to prices). They both discuss different vendor properties, especially gender roles and how women are more likely to participate at the local level whereas men dominate in urban areas and in cross-border trading. FSC studies mapped to the external food environment tend to focus on value chain analysis, and most

relate to traditional (short, simple) supply chains rather than modern (and longer, more complex) supply chains. Most of the focus has been on women's roles (and the costs they bear in terms of workloads and the benefits they receive such as control of income) at the farm level; there is less in general about women's roles in other parts of the chains. Some information relates to women as employees and their roles as compared to men's roles, and a few articles discuss gender differences across formal and informal markets. Much more information is needed to better understand how gender dynamics play out across different types of supply chains, especially in longer modern food supply chains.

Overall, there is a gap in the literature about how gender inequities and inequalities influence and are influenced by the different dimensions and aspects of the external and personal food environment. More information is needed to better understand how food environment innovations may impact gender inequities and how gender inequities may influence the success of such innovations.

Gender Inequities and Inequalities in Food Systems Studies in LMICs

While it was challenging to map the articles, especially the FSC articles, to the different dimensions and aspects of the food environment, we did identify gender inequities and inequalities related to 1) gender roles, the gender division of labor, and/or time use; 2) land; 3) livestock and other agricultural resources; 4) transportation and mobility; 5) income and financial services; 6) information, knowledge, trainings, and extension services; 6) food; and 7) decision-making. Both FSC and CB articles discussed gender inequities related to these topics. The following sub-sections describe in more detail the information found about gender inequities and inequalities.

Gender Division of Labor and Allocation of Time

Across many contexts around the globe, gender norms dictate that a woman's domain is in the home, the private sphere, caring for the home and the household members, while a man's domain is in the public sphere, as a provider, a breadwinner. These gender norms are often so ingrained that neither researchers nor the participants of projects are aware of them, and they may cause bias in the way data is collected, or

the assumptions of a project and the way it is implemented. For example, who is invited to participate – in many nutrition programs, women (and their children) are invited to participate whereas in many agricultural programs, men have often been the targeted participants. As women's roles in agriculture and men's roles in household food choices and nutrition outcomes are recognized, this is starting to change. Another example is that of researchers who design questionnaires that assume (or allow for) only one household head, one primary agricultural producer (Deere, Alvarado and Twyman, 2012), who is typically a man and he is often classified as self-employed in agriculture, while his wife (and other household members), if they acknowledge participating in agricultural activities, are noted as unpaid family laborers.

Gender norms also impact perceptions of the men and women interviewed, how they perceive themselves and what they believe they are capable of (Kantor et al, 2015). For example, Tavva et al. (2013) found that women in Afghanistan are primarily seen as mothers and caregivers. Their role in agriculture is primarily helping husbands with livestock production and less so with crop production. In a study in Latin America, women in rice producing households identified themselves as housewives who supported their husbands in rice production activities, but by asking about all the different activities involved in rice production, it was found that women participated in most of them, and by the end of the interview, some of the women were recognizing themselves as rice producers (Twyman, Muriel, and Garcia, 2015). Similarly, Devi and Somoknanta (2016) note that owners of food processing plants in Manipur, India, believe that men are more capable than women of performing all kinds of tasks, given their greater physical strength and technical skills; thus, women are given jobs involving unskilled, semiskilled, and manual tasks in these food processing plants.

Thus, gender norms often dictate a fairly clear, although not a strict/constant, gender division of labor where women tend to be more involved in household activities or those close to the home that require less strength and allow them to multi-task (such as caring for children while doing other tasks), while men

tend to work outside the home, either in on-farm production activities or in other income-generating employment, cash cropping activities, and/or activities that require more strength.

In our review of the food supply chain literature, we find evidence that men are often more involved in income-generating activities and roles with higher commercial value (see for example Fischer et al., 2018; Sikira et al., 2018; Tavenner and Crane, 2018). Specifically, men are more likely than women to participate in the formal market, large-scale urban wholesale, cash crops labor, and sales or purchases of animals (Njuki et al., 2004; Mburu et al., 2012; Kimaro and Lyimo-Macha, 2014; Tavva et al., 2013; Mutenje et al., 2016; Mittal, 2016). They were also in charge of strength-requiring activities like loading, off-loading, security guarding, heavy machine operating, tree pruning, land preparation, ploughing, and harvesting (Njuki et al., 2004; Peter, 2006; Amaechina et al., 2010; Devi & Somokanta, 2016; Maunahan et al., 2018; Nakazi et al., 2017; Quaye et al., 2016; Adam, 2018). Women were typically performing lighter manual tasks, like grass cutting, animal care, chopping, winnowing, weeding, post-harvest processing, and storage (Grace, 2004; Njuki et al., 2004; Tindall and Holvoet, 2008; Amaechina et al., 2010; Kimaro and Lyimo-Macha, 2014; Tavva et al., 2013; Ingram et al., 2014; Waithanji et al., 2015; Mutenje et al., 2016; Nakazi et al., 2017; Fischer et al., 2018; Masamha et al., 2018a; Tavenner and Crane, 2018). Some articles also noted that women often multitask to combine household chores and farm activities, since they give very high priority to childcare and other reproductive, domestic labor (Quaye et al., 2016; Nakazi et al., 2017; Fischer et al., 2018).

The gender division of labor often reinforces power dynamics as well. For example, Tavenner and Crane (2018) argue that embedded gender power dynamics limit women's participation in the milk market; since milk marketing and control of the resulting income is a man's domain, women's participation is limited. Similarly, many agricultural development projects seeking to increase the income of women have focused on involving them in cash crops or creating markets for crops that were traditionally viewed as women's crops. Many such projects failed because men took over the crops and the resulting income.

This is not to say that gender norms and the gender division of labor cannot change; it in fact can change and has changed (at least marginally) in different contexts. For example, across various contexts, women are working outside the home. However, women still tend to be responsible for household and domestic chores like cooking, cleaning, and child (and elder) care activities, creating long work days for these women. Ibnouf (2009) finds that in rural Sudan, women work longer hours per day than men. Gurung et al. (2016) discuss how gender intersects with religion, describing how social and religious restrictions in Bangladesh do not allow women to work in the field; only women from the ultra-poor households work in the rice fields as casual workers.

In the consumer behavior literature, discussions centered more around women's time use, and specifically around the time they spent cooking and preparing food, as well as any trade-offs related to time use, such as choosing between working to earn an income and spending more time on food preparation activities. For example, Chaturvedi et al. (2016) find that time constraints are one of the drivers of undernutrition in India, specifically suggesting a trade-off between women working outside the home to earn an income and the time spent cooking/preparing food, which led to higher levels of eating convenience and fast-food items. In Iran, some women reported heavy time burdens of working outside the home to earn an income and working at home caring for their children which in some cases led to women neglecting their own nutrition and self-care; for example some women reported skipping lunch so they could continue working for an income (Rafii et al., 2013). Similarly, de Moraes Sato et al. (2014) find that about 20 percent of women in Santos, Brazil, do not have the time to prepare food for their families; thus, they rely on convenience and fast foods. In Karnataka, India, female household heads who are time constrained reduce the number of times they cook in the day, thus saving time, money, and fuel (Kamath and Dattasharma, 2017). Furthermore, Kjeldsberg (2018) find that women's work burdens in Nepal limit the time they have to participate in trainings and trying new things. Specifically, they discuss how time constraints and distance to markets influence women's choice of crops. Markets that are further away require more time

for transportation and marketing activities; thus, women have to consider whether the benefits from the extra income outweigh the extra cost in terms of time.

Land

With regard to land, a key productive asset for food production (at the beginning of the food supply chain) and arguably a productive asset that makes it possible for entrepreneurial activity (increasing access to credit and having a place to conduct such activity), our review revealed fifteen studies, 12 FSC articles and three CB articles, that had results showing gender inequalities. Gender differences in land impact production, and thus indirectly the availability of food in the food environment (although there are several other steps in the food supply chain that also impact food availability in food environments).

Several articles noted that women had less access and control over land, and even in cases where men and women had equal access to land, men often controlled more land. Two studies revealed that men had access to greater amounts of land compared to women (Muriithi et al., 2018; Gilbert et al., 2002). Quaye et al. (2016) find that non-Islamic communities provide women the same access to land as men, while in Islamic communities only men acquired these rights. While men and women in non-Islamic communities had equal access to land, men had more property rights (control) over land. Women's access to land was through their husbands. Furthermore, men's farm sizes were significantly larger than women's (Quaye et al., 2016).

Masamha et al. (2018a) mention cultural norms give men land rights and limit women's ability to own/access land in Tanzania; land is typically allocated to men from their parents when they marry. Four studies (Coker et al., 2017; Fonjong et al., 2013; Grace, 2004; Linonge-Fontebo, 2018) provided comparable findings on land inheritance, saying that land was mainly inherited by male family members and that women had limited control over it. Coker et al. (2017) find that in Nigeria, male rice farmers inherit land (90 percent) while women borrow or use communal land (76 percent). Seventy-six percent of women had trouble accessing land, while only nine percent of men encountered such problems. Fonjong

et al. (2013) discuss how in Cameroon, although legally men and women have equal access to land, customary traditions limit women's access and control. Land is owned and controlled by men in most rural areas. Even when men migrate into the city or die, control is given to a male relative or inherited by a male heir (rather than giving it to widowed women). Although lands may be at the disposal of the woman for small-scale agriculture, its management is not entirely in her hands. Among the most common arguments against female land inheritance are respect for traditional beliefs/practices (76 percent) and marriage (74.7 percent). Some traditional beliefs are unequivocal in holding that men and women are unequal and cannot be treated as equal, while others endorse the idea that women are part of a man's property, in which case property cannot beget another, as highlighted by 80.3 percent of female respondents. Linonge-Fontebo (2018) explores gendered access to and control over land in Cameroon. The Bakweri tradition allows only the male child to own and control land. A woman is expected to leave her father's compound someday, which prevents her from inheriting property on which "she cannot stay and manage." Moreover, there is no provision on the land registration form for joint application for a land certificate between husband and wife, resulting in husbands taking the lead.

Other Agricultural Production Resources

Overall, 10 articles (six FSC and four CB) had results related to gender differences in livestock and seven (six FSC and one CB) articles showed results related to gender differences in other agricultural resources. Three of the studies that examined gender differences in access to livestock found that women had less access to livestock than men (Luqman et al., 2018; Oladele and Monkhei, 2008; Gilbert et al., 2002). Two studies revealed that men owned greater amounts of livestock than women (Oladele & Monkhei, 2008; Gilbert et al., 2002). Others found that men and women own different types of livestock. Waithanji et al. (2015) found that in Meru, Kenya, men prefer cattle more than women. Women prefer poultry more than men and they equally prefer goats. Women earn and control more income from goat production than men. In terms of ownership, Nyongesa et al. (2017) discuss the fact that while women in Kenya can acquire

livestock (for example through group participation), their husbands believe the livestock belongs to them and they could sell or otherwise dispose of it without consulting their wives.

Other articles focused on gender differences in access to machinery and inputs. Kingkinginhoun-Medagbe et al. (2010) found that women's rice farming groups in Benin were given motor-cultivators like the men's groups, but that while the men's groups were given a driver, the women's groups were not, thus they had to wait for the drivers to finish cultivating the men's fields before they could use the motor-cultivators. This resulted in women planting late and thus producing less than men. Tindall and Holvoet (2008) identify access to inputs (e.g. ice for trading fish) as a key constraint in the fish value chain and it is more pronounced for women traders.

Transportation & Mobility

Both the food supply chain literature (three articles) and consumer behavior literature (six articles) discuss transportation and mobility issues. In the food supply chain, women tend to have less access to vehicles and means of transportation, limiting their involvement in the marketing of food. On the consumer behavior side, distance to the market is identified as an important aspect of the personal food environment. Distance, transportation options, and safety and cultural appropriateness of mobility are other aspects that influence women's access to such markets.

For example, in terms of distance to the market, Ipe and Basu (2015) found higher rates of energy deficiencies in women in more remote areas of the Himalayas than women in more accessible areas. Kjeldsberg et al. (2018) show that in Nepal, women's freedom of mobility, in some districts, is a constraint for accessing the market. Some women had to ask their husband's permission to go to the market; and while some women indicate that this does not prohibit them from going to the market and others suggest that this practice is changing (Kjeldsberg et al., 2018) some studies, such as Sethuraman et al. (2006) find that women's mobility (ability to move about freely), especially to the market, was statistically significantly correlated to better child nutrition outcomes. Aryal et al. (2018) found that in

Karnataka, India, when women did not face mobility constraints, there were no differences between male- and female-headed households' food security; however, in places where women could not move about freely, there were differences.

On the food supply chain side, Sikira et al. (2018) observed that cultural norms limit women's use of motorcycles and thus their ability to market milk in Tanzania. Two studies conducted in Africa examined the gender differences in their access to transportation (Masamha, et al., 2018a; Gilbert et al., 2002). Both studies agree that women have less access to transportation infrastructure. One of them particularly highlighted the fact that men in Malawi were twice as likely to own a bicycle than women (Gilbert et al., 2002). Masamha et al. (2018a) discuss cultural norms that limit women's ability to own bicycles.

Income & Financial Services

In terms of access to and control over income and financial services, many of the 17 food supply chain articles with related results discussed credit, while many of the 12 consumer behavior articles focused more on income (savings, money management, and/or cash transfer programs).

The literature related to food supply chains that investigated gender inequities in access to credit for agricultural purposes were conducted in Africa, apart from one that was conducted in Bangladesh (Gurung et al., 2016). Two studies revealed that women were often deprived of the opportunity to take loans from formal banking institutions due to their lack of assets. Their findings also agreed on the fact that women receive micro-credit from cooperatives or use their personal savings more often than men (Arimi & Olajide, 2016; Gurung et al., 2016). Another study in Kenya revealed that although more women (31.5 percent) than men (28.7 percent) had received credit, on average men obtained three times as much credit (Mburu et al., 2012). Differences among Islamic and non-Islamic communities regarding the access to credit of the two genders was recorded in Ghana. In particular, it was found that women in Islamic communities did not have access to and control over credit, while women in non-Islamic communities had equal access to credit as men (Quaye et al., 2016). Finally, limited access to credit for

women compared to men is reported in a study in Tanzania (Masamha, et al., 2018a) and another in Nigeria (Coker et al., 2017). Coker et al. (2017) found that in Nigeria, limited access to credit is a constraint for both men and women but more so for women; 100 percent of women rice farmers interviewed reported limited access to credit compared to 65 percent of men. Tindall and Holvoet (2008) find that women fish traders in Mali have less access to credit and financial services than men.

The consumer behavior literature discussed women's control of income (and household money management) along with prices, purchasing power, and affordability of food. Kamath and Dattasharma (2017) find that male- and female-headed households in Karnataka, India, have different spending patterns. Female-headed households spend more than male-headed households on food and they spend more on a variety of different foods. Ibnouf (2009) finds that while women earn less income than men, they spend a greater proportion on food for their families. Chaturvedi et al. (2016) find that men in India are more likely than women to spend income on personal consumption products rather than food for the family.

Mudege et al. (2017) find that while production of orange-fleshed sweet potatoes increase women's income, men's income increased more (or more men controlled the income). Thus, women's lack of control over income limited their possibilities to acquire other assets such as livestock, land, and agricultural equipment. Gurung et al. (2016) show that the transformation from rice farming to commercial aquaculture made women more dependent on their husband's income and they had less control over income use. Kasente (2012) shows that in Uganda, women are almost always at the bottom of the value chain, contributing labor for the production of coffee but not controlling the benefits or income associated with their labor.

Group membership (collective action)

Eighteen articles discussed some aspect of gender and group membership. The five CB articles focus mainly on the importance of groups for nutrition and gender equity outcomes. For example, Mukherjee

and Kundu (2012) compare women's decision-making power in India between women who participated in a micro-credit self-help group and those who did not; they find that women who participated had a greater say in household decisions related to food (and use of borrowed money and family and kinship matters). Kjeldsberg et al. (2018) focus on social support as a domain of women's empowerment, they find that women face challenges to participating in group meetings; these challenges include a lack of social support from their families, time, and labor constraints due to domestic responsibilities. Sharaunga et al. (2016) do not find statistically significant correlations between women's group membership and household food security in South Africa. Other studies focus on how group-based projects can challenge gender norms and improve nutritional behavior. For example, Neogy (2010) describes a project in India that used participatory activities and sharing of information with pregnant mothers' support groups; the project challenged gender norms around pregnant women's food intake and provided information about men's roles in determining the sex of the baby in order to help reduce the stigma around mothers who give birth to daughters. Auel et al. (2001) explain how a project in Senegal targeted grandmothers to participate in group activities that provided nutritional information and worked with them to change behaviors toward younger women of reproductive age; this project resulted in increased nutrition knowledge and nutrition behavior change of younger women.

The 13 FSC articles that mention group membership focus mainly on gendered dimensions of participating in agricultural or farmer groups. Several discuss participation rates between men and women (Tindall and Holvoet, 2008; Behrman, 2011; Alex, 2013; Nyongesa et al., 2016; Zossou et al., 2017; Masamha et al., 2018b). Some of the articles focus on the challenges that women face in participating and/or acquiring leadership positions. For example, Nyongesa et al. (2016) discuss how in dairy groups in Kenya, there are few women leaders; women are often the majority of members and do a lot of the work associated with producing milk, but they are less likely to be leaders and to control income generated from milk sales. Tindall and Holvoet (2008) describe how a group of fish traders in Mali is composed equally of men and women, but there is only one woman on the management committee. Masamha et al.

(2018b) explain how women are disempowered in the leadership domain of the 5DE of the Women's Empowerment in Agriculture Index (WEAI) in Tanzania; many women are too time constrained to participate, and when they do they are not confident to speak and express themselves in public. Alex (2013) describe a project that actively recruited and trained more women than men for a rice production project in India; however, fewer women than men were in leadership positions. This article also briefly touched on the challenges of social stigma of women in these positions and the lack of toilet facilities for women that may limit their participation and leadership. Finally, some of the FSC articles discussed how women's participation in groups can have benefits for the women themselves and for other outcomes. Waithinji et al. (2015) mention that women in goat dairy groups in Kenya had higher incomes, likely related to the information and trainings they received related to goat nutrition, health and breeding. Kimaro and Lyimo-Macha (2014) show that women who participated in dairy groups in Tanzania had more access to and control over livestock and income than those women who did not participate. Behrman (2011) discuss how women in groups had more knowledge of sweet potatoes and their nutritional benefits than women who were not in groups. In terms of other benefits of women participating in groups, Mai et al. (2011) discuss benefits in terms of forest quality, and the management of community forest groups when women participate. Fonjong et al. (2013) mention that women in Cameroon create farmer organizations in order to access communal lands (and sometimes to pool resources to purchase land); however, access to communal land does not provide strong, long-term property rights and therefore limits long-term investments by these groups. And, Ingram et al. (2014) discuss how forming women's groups can help upgrade value chains, though they do mention the possibility of elite capture by a few women.

Information, Knowledge, Training, and Extension Services

We found 23 articles that have results related to gender differences in access to information, knowledge, trainings, and extension services; 16 articles related to the food supply chain and seven articles related to consumer behavior.

Training

Two Asian and two African studies provide evidence on gender differences in access to training. Female workers in food processing industries in Manipur, India, were found to receive limited training on quality awareness and hygiene maintenance, as mostly men were attending such training (Devi & Somokanta, 2016). In Kenya, it was revealed that men were receiving more production- and marketing-related information from cooperative associations compared to women. The same study also found that women were less trained on livestock marketing compared to their male counterparts (Waithanji et al., 2015). Similarly, a Kenyan descriptive analysis recorded more men (41.4 percent) than women (36.7 percent) to have received training on livestock production and marketing in the last five years (Mburu et al., 2012). These findings were also supported by a study in the Philippines, which shows men receiving more training than women through their cooperative associations, fellow growers and multinational companies (Maunahan et al., 2018). Two of the CB articles discuss how trainings are important for improving nutrition behavior and gender equity outcomes. Kjeldsberg et al. (2018) show that in Nepal, group-level training increased women's self-efficacy. In Senegal, Aubel (2001) discuss how trainings with grandmothers improved their nutrition knowledge and nutrition behavior of younger women.

Information

Zossou et al. (2017) examine gender differences in access to different sources of information for rice farmers in West Africa. They do not find statistically significant differences between men and women, except in Benin, where women have more access to information sources. Mittal (2016) finds, in her study in two districts in India, that although fewer participated (less than 20 percent of the participants were women), women listen to agro-climatic information messages on mobile phones as long as men do. Masamha et al. (2018a) found that women have limited access to communication services (that limits their access to information). Neogy (2010) concluded that while information and knowledge are important, they are not enough, especially when such information is in conflict with existing social norms and traditions. Two CB articles focus on information and another two on educational levels that indirectly

deal with information. Carlson et al. (2015) find some evidence that low education levels are associated with low levels of women's autonomy. Aryal et al. (2019) also find differences in educational levels between male- and female- (de jure and de facto) headed households in Bhutan, and that it is a factor in household food security. Kimambo et al. (2018) find that men in Tanzania had greater nutritional knowledge than women. Noronha et al. (2013) found that providing pregnant women with nutrition information (as well as nutrition supplements) reduced anemia levels.

Extension services

All studies that investigated gender differences in access to extension services were conducted in Africa, apart from one conducted in Pakistan (Luqman et al., 2018). The findings of three studies (Luqman et al., 2018; Masamha et al., 2018a; Waithanji et al., 2015) agreed on the fact that women have less access to extension services compared to men, with one of them especially revealing that 78.7 percent of women in Pakistan have no access to agricultural extension services compared to 1.3 percent of men (Luqman et al., 2018). Owusu et al. (2018) find this as well; women rice farmers in northern Ghana have significantly less contact with extension agents. Luqman et al. (2018) find that the top barriers for women in agricultural extension were lack of proper transportation facilities for female extension staff, absence of female extension staff, lack of social security for rural women, lack of recognition and appreciation of women's work and lack of land rights for rural women. In Ghana, Islamic communities were found to deprive women of equal access to extension services, while this was not the case for non-Islamic communities (Quaye et al., 2016). Extension services in Benin prioritize male farmers for the provision of drivers for the motor-cultivators, forcing women to plant later and thus have significant yield losses (Kinkingninhoun-Médagbé et al., 2010).

Knowledge

Kimambo et al. (2018) found that, in Tanzania, men had more knowledge than women about the nutritional benefits of consuming traditional African vegetables. Mudege et al. (2017) identify men's and women's perceptions or knowledge of the benefits to growing orange-fleshed sweet potatoes. Women

focused on nutritional and health benefits during pregnancy and for their children. Women also found that they could use the potatoes for bartering and trading. Men perceived that they had more energy and they controlled the income from selling orange-fleshed sweet potatoes. One CB article discussed knowledge. Neogy (2010) explains that a project challenging gender norms was motivated in part by the fact that women were aware of increased nutritional needs during pregnancy but did not practice them; therefore, a project was developed to challenge social and gender norms around eating practices that helped improve pregnant women's food intake.

Food

Most of the articles related to gender differences in access to food are consumer behavior articles (18 of 20). Social (and gender) norms influence our relationship with food, what it means, how we prepare it, and how it is distributed between households and within the household among different household members (de Morais Sato et al., 2014). De Morais Sato et al. (2014) find that the most nutritious food is eaten by the wealthiest families. Also, many women eating with their families rely on fast food. Women, in their roles as mothers and caregivers, are often responsible for the preparation and cooking of food but do not always have complete access to and control over it. Some studies found that when women have (more) control over the household food supply, their children have better nutrition outcomes as measured by weight for age (Sethuraman et al., 2006). In several contexts, it was found that women eat smaller portions, less protein, and after other family members. Ipe and Basu (2015) found that in the Indian Himalayas, women eat smaller portions than men and specifically have higher deficiency rates of protein than men. Ibnouf (2009) observe that in rural Sudan, traditionally men eat first and thus eat the choice pieces and the women eat afterwards. Similarly, Neogy (2010) found that women in India are expected to eat less and after the other family members have eaten; furthermore, they note that women were more likely to be the victims of violence for not preparing tasty food (as well as for incidents like children crying, and/or saying no to sex).

Eating order hierarchies are not just between men and women, but also with other household members (Harris-Fry et al., 2017). There is some evidence that (in some contexts) baby boys are more likely than baby girls to be breastfed exclusively (Chaturvedi, S. *et al.*, 2016). Furthermore, women in their roles as caregivers prepare and cook food with the preferences of other household members in mind (Harris-Fry et al., 2017). Some studies noted that women self-sacrifice to care for other household members. For example, in Iran, female heads of household reported reducing their consumption of meat and fish so that there was more for their children and other family members; these women also at times neglected their own health care in order to provide for their children (Rafii et al., 2013).

Examining the food supply chain literature, we find that different types of households and production systems influence gender differences in access to food. For example, Gurung et al. (2016) argue that the transformation from rice farming to commercial aquaculture in Bangladesh reduces women's access to rice and fish for consumption. And, Tibesigwa and Visser (2016) find that in South Africa, female-headed households are more food insecure than male-headed households; female-headed households tend to produce subsistence agriculture, while male-headed households are more likely to sell part of their agricultural production.

Decision-Making

Understanding decision-making processes is important for programs and projects that want people to change behavior, like changing diets or eating patterns, or adopting/using a food system innovation. So understanding how decisions are made and who makes decisions can support these projects with critical information about how to design and implement them. Both the food supply chain (23 articles) and consumer behavior literature (11 articles) discussed women's participation in decision-making processes within the household and farm.

On the food supply chain side of the food environment, most farm management decisions are often made by men (or jointly by the family). In Nepal, Kjeldsberg et al. (2018) found that production decisions are made by the family; women beneficiaries who increased their knowledge through trainings shared that information with family members to make decisions. Nyongesa et al. (2017) find that, in Kenya, women make many/the majority of agricultural decisions related to subsistence food crops, while men dominate decision-making over commercial crops (like maize and mango). Mutenge et al. (2016) briefly discuss women's participation in decision-making in Malawi. There, men tend to make decisions about cash crops while women tend to make decisions about subsistence crops. Furthermore, a woman's participation in household decision-making was positively correlated with her participating in the decision about what agricultural technologies to adopt. Tavva et al. (2013), find that in Afghanistan, agricultural decisions are (almost) exclusively made by men; they may consult their wives, but they make the decisions. Masamha et al. (2018b) find women are less empowered than men in making production decisions.

Men dominate decisions on income allocation, investments, input use, product disposal, land issues, livestock, fertilizer use, farm equipment, cash crops, credits, seeds, pesticides, use of the dairy proceeds, and crop quantity (Peter, 2006; Behrman, 2011; Mburu et al., 2012; Masamha et al., 2018a; Nyongesa et al., 2016; Mutenje et al., 2016; Nyongesa et al., 2017). Women were responsible for decisions on storage practices, crop produce, quantities sold, seed cleaning and purification, threshing, milling, legume crop variety, and household maintenance (Mutenje et al., 2016; Nyongesa et al., 2017).

On the consumer behavior side of the food environment, we found articles discussing women's participation in decisions around what foods to purchase, how much of the household budget to allocate to food, and whether women's autonomy was correlated with nutritional outcomes. Naz et al. (2014) discuss that while women self-report high levels of participation in household food and nutrition security, few are satisfied with their decision-making power in the household. Osorio et al. (2018) find that in

Colombia, women's autonomy is associated with lower levels of chronic child malnutrition. Mukherjee and Kundu (2012) find in West Bengal, India, that men continue to dominate, especially in household money management decisions, even though women's participation in self-help micro-credit groups increased their participation in household decision-making.

Interventions & Innovations – What Has Worked and Lessons Learned

While most articles did not specifically focus on interventions that were effective (and/or efficient) at achieving the dual goals of healthier diets and gender equality, several articles focused on different types of innovations or interventions focused on producers or consumers (or in a few cases at both, looking at producers as consumers).

Some of the studies focused on trainings (and/or information dissemination), specifically exploring how training related to agricultural practices impacts adoption of technologies, or how training related to agriculture and nutrition improves agricultural production and consumption of nutritious foods, and one article focused more on using mobile phones to disseminate agroclimatic information. Mudege et al. (2015) found that while women benefit through a small increase in income, men likely benefit more from the trainings and information related to orange flesh sweet potatoes in Malawi. Ipe and Basu (2015) focus on women participating in nutri-gardens and water management practices; their participation in the program led to increased household dietary diversity scores. Kjeldsberg et al. (2018) found that the trainings with women related to agriculture and nutrition in Nepal supported women's self-efficacy and increased women's decision-making power. Arimi and Olajide (2016) found some gender differences in adoption of rice technologies by gender as a result of the trainings provided; in general women adopted the recommended planting dates, use of inorganic fertilizer, and recommended seeding rates more than men, and more men than women adopted the recommended spacing. Mittal (2016) found no differences between men and women listening to agroclimatic information on mobile phones. Due to differences in participation by only women compared to men and women and the different objectives of the projects, it

is difficult to pull out specific lessons learned. It seems that women and their households can benefit from women-only trainings and that it is important to provide information and trainings to both men and women when possible.

Six of the FSC articles focused on agricultural technology/innovation adoption. Owusu and Owusu-Sekyere (2018) explores gender differences in rice production in northern Ghana; they find that male rice farmers have higher average yields than female rice farmers, which results from men using more seeds and fertilizers. Murithi et al. (2018) compare adoption rates of different sustainable agriculture practices by gender of the plot manager (male, female, or joint) in western Kenya. They find no difference in the adoption of push-pull pest management by male and female plot managers. Jointly-managed plots were more likely to receive manure and soil and water conservation measures than male- or female-managed plots. Gilbert et al. (2002) find that female-headed households are less likely to adopt fertilizer than male-headed households in Malawi; however, if provided with the inputs, there is no difference in adoption rates, suggesting that female-headed households face financial barriers making fertilizer application difficult. Kolade and Harpham (2014) found no statistically significant differences in agricultural technology adoption in southwest Nigeria. Fischer et al. (2018) explore gender and sustainability of mechanized forage choppers in Tanzania. They find that men tend to appropriate the technology, suggesting a need for a broader gender/equity approach for introduction of mechanization projects. Alex (2013) describe the case of mechanization of rice production with a rice production group in India; in this example, men and women received equal wages; some women ran the machinery and/or held managerial roles and were seen as equal to the men, but there were fewer women in these roles. These articles suggest the importance of understanding gender differences in access to inputs and agricultural resources, which seem to be key determinants of gender differences in adoption rates.

Kantor et al. (2015) examine aquaculture projects in Bangladesh that were women-focused. Their results focus on how gender dynamics, especially gender power dynamics, influence who participates and

benefits in agriculture projects and conclude that it is important to include men in the projects and address the gender power dynamics to ensure a more equitable level of participation and sharing of benefits.

In the articles related to consumer behavior, we found that some projects are oriented towards women – one study related to micro-credit and one related to nutrition information. Mukherjee and Kundu (2012) found that women in West Bengal, India, who participated in self-help micro-credit groups had higher levels of decision-making; more of these women made decisions alone than women not in such groups. Noronha et al. (2015) found that providing nutrition information to women (in addition to nutritional supplements) in southern India had a positive impact on anemia levels of pregnant women. These studies show that projects focused on women can have positive benefits.

Two of the consumer behavior articles focused on projects that challenge gender norms. Neogy (2010) discusses a project in India that challenged notions around women eating less and after other family members, and their heavy workload even during pregnancy; their results suggest that programs that bring awareness and begin to challenge unconscious biases are important for changing behaviors. Aubel et al. (2001) examine a project that targeted changing attitudes of grandmothers to change norms around young women's diets, nutrition, and health behaviors. They conclude that involving older women/grandmothers in nutritional programs helps improve child and maternal health. It acknowledges and utilizes the role of grandmothers' advice to young mothers, while also empowering them. These papers suggest that it is important to understand the roles of different men and women to work with them to bring awareness and begin to challenge gender norms that reinforce gender inequities and inequalities.

Although not identified during the review (because it was not a journal article), we also found a brief detailing two case studies, one in India and one in Guatemala, about women's collective action. A case study in India found that women's collective action can be effective at improving nutritional outcomes and empowering women (Brody, 2015). The case study from Guatemala shows that holistic approaches

that understand and work with the local traditions and norms can be effective at simultaneously addressing food security, gender equality, and agro-ecology. These cases suggest the importance of recognizing that change is slow and that working with local social norms, by acknowledging the existing structures and implementing innovations that work within them, can help create change from within. They give an example of home gardens, which acknowledged women's roles in the home as caregivers, but with additional space for women to meet and participate in trainings (agro-ecological and leadership), which gave some of the women the space and opportunities they needed to make changes and slowly start changing the local gender norms. (Brody, 2015).

CONCLUSIONS

Overall, this review revealed gaps in the literature related to gender and food environments in LMICs. There is little evidence about how gender inequities and inequalities influence or are influenced by the different dimensions and aspects of the food environment. While there is some indication that women's mobility, time constraints, financial constraints, and issues related to cultural social gender norms around food and eating practices correlate to food and nutrition security of women, children, and households, more evidence is needed to better understand these dynamics and how to improve the situation. More studies focused on gender inequities using a food system, and especially focused on food environments, is needed to ensure that food system innovations and interventions can improve food and nutrition security while reducing (or at least not increasing) gender inequalities.

We found several studies that included a gender dimension related to food supply chains and consumer behavior (or the external and personal food environments) in LMICs; however, less than half of them provide conceptual definitions or frameworks to support the operationalization of gender and/or the gender analyses conducted in the studies. The variety of ways that gender is conceptualized and analyzed show the complexity of gender issues; some studies focus on comparing women, others on comparing men and women, still others on households, either comparing male- and female-headed households or comparing men and women within households via intra-household analysis. All of these are valid and interesting analyses that can illustrate how underlying gender norms at different levels and in different contexts influence behavior and impact food systems.

While we found a lack of evidence about gender dynamics in food environments, we found several gender inequities and inequalities in both the FSC and CB literature related to 1) gender roles, the gender division of labor, and/or time use; 2) land; 3) livestock and other agricultural resources; 4) transportation and mobility; 5) income and financial services; 6) information, knowledge, trainings, and extension

services; 6) food; and 7) decision-making. Gender inequities and inequalities in these areas are all influenced by and influence the food system.

Finally, we found few studies that focus on food system interventions and innovations that seek to improve nutrition and address gender inequities and/or inequalities. The studies that were identified show the importance of collective action for challenging restrictive gender norms. Along with the information about gender inequities and inequalities discussed in the previous paragraph, these studies provide guiding questions to consider when developing and implementing interventions and innovations in food systems to achieve dual goals of improved nutrition and reducing gender inequities. Some questions to consider based on the results of this review include the following:

- How does unequal access to resources and inputs affect who can participate, use, and/or benefit from the innovation or intervention?
- What are the potential constraints (such as time, mobility, access to and control over resources, financial, and decision-making power) that may limit participation by some social groups, including some women? How will that impact the intended impacts of the intervention and/or innovation?
- How will information be disseminated to ensure equal access for both men and women, and different groups of women (and men)?
- Should the focus be on a woman-only project/group or a mixed sex group?
 - Woman-focused projects are good for situations when women are not likely to participate in mixed sex groups and to give women a space of their own to grow and develop. They can help increase women's participation and benefits from interventions and thus reduce gender inequalities.
 - Mixed sex groups and finding ways to include men is also important, especially when men can limit women's participation or restrict their access to benefits. It is also important to include men and other women (i.e. grandmothers, mothers-in-law, etc.) to begin to change gender norms across all social groups and create positive change.

By learning from previous experiences, we can create positive change within food systems that both improve nutrition and reduce gender inequalities. As more projects are implemented with these dual goals, more research is needed to systematically examine the results and keep learning about what works and what still needs improvement.

REFERENCES

- Adam, Ali Goni. 2018. "Role of Men and Women in Agro-Input Business in North West, Nigeria." *Journal of Agricultural Extension* 22 (1): 15. doi:10.4314/jae.v22i1.2.
- Alex, Jiju P. 2013. "Powering the Women in Agriculture: Lessons on Women Led Farm Mechanisation in South India." *The Journal of Agricultural Education and Extension* 19 (5): 487–503. doi:http://dx.doi.org/10.1080/1389224X.2013.817342.
- Amaechina, E. C., E.C. Nwagbo, and E.C. Eboh. 2010. "Men and Women in Irrigated Agriculture in Southeastern Nigeria." In *Proceedings of the 3rd IASTED African Conference*, 31–36. Gaborone, Botswana.
- Anderson, Stuart, Pauline Allen, Stephen Peckham, and Nick Goodwin. 2008. "Asking the Right Questions: Scoping Studies in the Commissioning of Research on the Organisation and Delivery of Health Services." *Health Research Policy and Systems* 6 (1): 7. doi:10.1186/1478-4505-6-7.
- Andersson, Karolin, Johanna Bergman Lodin, and Linley Chiwona-Karlton. 2016. "Gender Dynamics in Cassava Leaves Value Chains: The Case of Tanzania." *Journal of Gender, Agriculture and Food Security* 1 (2): 84–109.
- Arimi, Kayode, and B. Rasak Olajide. 2016. "Comparative Analysis of Male and Female Adopters of Improved Rice Production Technology in Ogun and Ekiti States, Nigeria." *International Journal of Agricultural Resources, Governance and Ecology* 12 (3): 246. doi:10.1504/IJARGE.2016.078305.
- Aryal, Jeetendra Prakash, Khondoker Abdul Mottaleb, and Dil Bahadur Rahut. 2018. "Untangling Gender Differentiated Food Security Gaps in Bhutan: An Application of Exogenous Switching Treatment Regression." *Review of Development Economics* 23 (2): 782–802. doi:10.1111/rode.12566.
- Aubel, Judi, Ibrahima Touré, Mamadou Diagne, Kalala Lazin, El Hadj Alioune Sène, Yirime Faye, and Mouhamadou Tandia. 2001. "Strengthening Grandmother Networks to Improve Community Nutrition: Experience from Senegal." *Gender & Development* 9 (2): 62–73. doi:10.1080/13552070127743.
- Behrman, Julia. 2011. *HarvestPlus Reaching End Users (REU) Orange-Fleshed Sweet Potato (OFSP) Project*. IFPRI.
- Brody, Alyson. 2015. "Gender and Food Security," BRIDGE: development & gender. InBrief. IDS: Sussex.
- Carlson, Gwen J., Katarzyna Kordas, and Laura E. Murray-Kolb. 2015. "Associations between Women's Autonomy and Child Nutritional Status: A Review of the Literature." *Maternal & Child Nutrition* 11 (4): 452–482. doi:10.1111/mcn.12113.
- Chaturvedi, S., S. Ramji, N.K. Arora, S. Rewal, R. Dasgupta, and V. Deshmukh. 2016. "Time-Constrained Mother and Expanding Market: Emerging Model of under-Nutrition in India." *BMC Public Health* 16 (1): 1–13. doi:10.1186/s12889-016-3189-4.

- Coker, Ayodeji Alexander Ajibola, Emmanuel Oladipo Akogun, Cornelius Owoniyi Adebayo, Shaba Mohammed, Mercy Nwojo, Halimat Sanusi, and Hamdalat Opeyemi Jimoh. 2017. "Gender Differentials among Subsistence Rice Farmers and Willingness to Undertake Agribusiness in Africa: Evidence and Issues from Nigeria: Gender Differentials among Subsistence Rice Farmers." *African Development Review* 29 (S2): 198–212. doi:10.1111/1467-8268.12273.
- de Moraes Sato, Priscila, Patrícia da Rocha Pereira, Isis de Carvalho Stelmo, Ramiro Fernandez Unsain, Mariana Dimitrov Ulian, Fernanda Sabatini, Paula Andrea Martins, and Fernanda Baeza Scagliusi. 2014. "Eating Practices and Habitus in Mothers. A Brazilian Population-Based Survey." *Appetite* 82 (November): 16–28. doi:10.1016/j.appet.2014.07.002.
- Deere, Carmen Diana, Gina Alvarado, and Jennifer Twyman. 2012. "Gender Inequality in Asset Ownership in Latin America: Female Owners versus Household Heads." *Development and Change*, 43(2): 505-530.
- Devi, Wairopkam Premi, and Thounaojam Somokanta. 2016. "Gender, Technology, and Work: Case of Women Employees in Selected Food Processing Industries in Manipur." *Gender, Technology and Development* 20 (1): 81–104. doi:10.1177/0971852415619497.
- Doss, Cheryl R. 2018. "Women and Agricultural Productivity: Reframing the Issues." *Development Policy Review* 36 (1): 35–50. doi:10.1111/dpr.12243.
- FAO, 2011. *Women in agriculture: Closing the gender gap for development*. The state of food and agriculture. Rome: FAO.
- Farnworth, Cathy Rozel. 2011. "Gender-Aware Value Chain Development." UNWomen.
- Fischer, Gundula, Simon Wittich, Gabriel Malima, Gregory Sikumba, Ben Lukuyu, David Ngunga, and Jacqueline Rugalabam. 2018. "Gender and Mechanization: Exploring the Sustainability of Mechanized Forage Chopping in Tanzania." *Journal of Rural Studies* 64 (November): 112–122. doi:10.1016/j.jrurstud.2018.09.012.
- Fonjong, L., Lawrence Fombe, and Irene Sama-Lang. 2013. "The Paradox of Gender Discrimination in Land Ownership and Women's Contribution to Poverty Reduction in Anglophone Cameroon." *GeoJournal* 78 (3): 575–589. doi:10.1007/s10708-012-9452-z.
- Gilbert, Robert A, Webster D Sakala, and Todd D Benson. 2002. "Gender Analysis of a Nationwide Cropping System Trial Survey in Malawi." *African Studies Quarterly* 6 (1 & 2): 223–243.
- Grace, Jo. 2004. *Gender Roles in Agriculture: Case Studies of Five Villages in Northern Afghanistan*. Case Studies Series. Afghanistan Research and Evaluation Unit.
- Gurung, Kamala, Humnath Bhandari, and Thelma Paris. 2016. "Transformation from Rice Farming to Commercial Aquaculture in Bangladesh: Implications for Gender, Food Security, and Livelihood." *Gender, Technology and Development* 20 (1): 49–80. doi:10.1177/0971852415618747.
- Harris, Jody, and Becky Mitchell. 2017. "Equity in A4NH Research: A Review of Current Work and Future Opportunities." Institute of Development Studies.

- Harris-Fry, Helen, Niva Shrestha, Anthony Costello, and Naomi M. Saville. 2017. "Determinants of Intra-Household Food Allocation between Adults in South Asia: A Systematic Literature Review." *International Journal for Equity in Health* 16 (107). doi:<https://doi.org/10.1186/s12939-017-0603-1>.
- HLPE. 2017. *Nutrition and Food Systems. A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome.
- Ibnouf, Fatma Osman. 2009. "The Role of Women in Providing and Improving Household Food Security in Sudan: Implications for Reducing Hunger and Malnutrition." *Journal of International Women's Studies* 10 (4): 144–167.
- Ingram, Verina, Merel Haverhals, Sjoerd Petersen, Marlene Elias, Bimbika Sijapati Basnett, and Sola Phosiso. 2016. "Gender and Forest, Tree and Agroforestry Value Chains Evidence from the Literature.Pdf." In *Gender and Forests: Climate Change, Tenure, Value Chains and Emerging Issues*, 13–26. New York, USA: Routledge.
- Ipe, Mary, and Sejuti Basu. 2015. "Nutrition Insecurity for Women in the Marginal Agro-Ecosystems of the Indian Himalayas." *International Journal of Agricultural Resources, Governance and Ecology* 11 (3/4): 280–310. doi:10.1504/IJARGE.2015.074092.
- Kabeer, Naila. 1999. "Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment." *Development and Change* 30: 435–464.
- Kadiyala, Suneetha, Jody Harris, Derek Headey, Sivan Yosef, and Stuart Gillespie. 2014. "Agriculture and Nutrition in India: Mapping Evidence to Pathways." *Annals of the New York Academy of Sciences* 1331: 43–56. doi:10.1111/nyas.12477.
- Kamath, Rajalaxmi, and Abhi Dattasharma. 2017. "Women and Household Cash Management: Evidence from Financial Diaries in India." *European Journal of Development Research* 29 (1): 73–92.
- Kantor, Paula, Miranda Morgan, and Afrina Choudhury. 2015. "Amplifying Outcomes by Addressing Inequality: The Role of Gender-Transformative Approaches in Agricultural Research for Development." *Gender, Technology and Development* 19 (3): 292–319. doi:10.1177/0971852415596863.
- Kasente, Deborah. 2012. "Fair Trade and Organic Certification in Value Chains: Lessons from a Gender Analysis from Coffee Exporting in Uganda." *Gender & Development* 20 (1): 111–127. doi:10.1080/13552074.2012.663627.
- Kimambo, Johnson James, M Muendo Kavoi, John Macharia, and Ngoni Nenguwo. 2018. "Assessment of Factors Influencing Farmers' Nutrition Knowledge and Intake of Traditional African Vegetables in Tanzania." *THE AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT* 18 (2): 13353–13371. doi:10.18697/ajfand.82.17035.
- Kimaro, E G, and Joyce Lyimo-Macha. 2014. "Gender Roles in Small Holder Dairy Farming: Pertinent Issues on Access and Control over Dairy Farming in Arumeru District, Tanzania." *Journal of Culture, Society and Development* 3: 30–35.

- Kinkingninhoun-Médagbé, Florent M., Aliou Diagne, Franklin Simtowe, Afiavi R. Agboh-Noameshie, and Patrice Y. Adégbola. 2010. "Gender Discrimination and Its Impact on Income, Productivity, and Technical Efficiency: Evidence from Benin." *Agriculture and Human Values* 27 (1): 57–69. doi:10.1007/s10460-008-9170-9.
- Kjeldsberg, Cecilie, Niva Shrestha, Miti Patel, Dale Davis, Gary Mundy, and Kenda Cunningham. 2018. "Nutrition-sensitive Agricultural Interventions and Gender Dynamics: A Qualitative Study in Nepal." *Maternal & Child Nutrition* 14 (3): 1–9. doi:10.1111/mcn.12593.
- Kolade, Otuwaseun, and Trudy Harpham. 2014. "Impact of Cooperative Membership on Farmers' Uptake of Technological Innovations in Southwest Nigeria." *Development Studies Research* 1 (1): 340–353. doi:10.1080/21665095.2014.978981.
- Komatsu, Hitomi, Hazel Jean L. Malapit, and Sophie Theis. 2018. "Does Women's Time in Domestic Work and Agriculture Affect Women's and Children's Dietary Diversity? Evidence from Bangladesh, Nepal, Cambodia, Ghana, and Mozambique." *Food Policy* 79 (August): 256–270. doi:10.1016/j.foodpol.2018.07.002.
- Linonge-Fontebo, Helen N. 2018. "The Question of Land Access and Ownership by Women in Cameroon: A Case Study of the Bakweri Women." *South African Review of Sociology* 49 (1): 18–33. doi:10.1080/21528586.2018.1473166.
- Luqman, Muhammad, Raheel Saqib, Xu Shiwei, and Yu Wen. 2018. "Barriers to Gender Equality in Agricultural Extension in Pakistan: Evidences from District Sargodha." *Sarhad Journal of Agriculture* 43 (1). doi:10.17582/journal.sja/2018/34.1.136.143.
- Mai, Y H, E Mwangi, and M Wan. 2011. "Gender Analysis in Forestry Research: Looking Back and Thinking Ahead." *International Forestry Review* 13 (2): 245–258.
- Malapit, Hazel Jean L., and Agnes R. Quisumbing. 2015. "What Dimensions of Women's Empowerment in Agriculture Matter for Nutrition in Ghana?" *Food Policy* 52 (April): 54–63. doi:10.1016/j.foodpol.2015.02.003.
- Malapit, Hazel J. 2019. "Women in agriculture and the implications for nutrition." In *Agriculture for improved nutrition: Seizing the momentum*. Chapter 6. Fan, Shenggen; Yosef, Sivan; Pandya-Lorch, Rajul (Eds.). Wallingford, UK: International Food Policy Research Institute (IFPRI) and CABI. <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/133099> Malapit, Hazel Jean L., and Agnes R. Quisumbing. 2015. "What Dimensions of Women's Empowerment in Agriculture Matter for Nutrition in Ghana?" *Food Policy* 52 (April): 54–63. doi:10.1016/j.foodpol.2015.02.003.
- Masamha, Blessing, Vusilizwe Thebe, and Veronica N. E. Uzokwe. 2018a. "Mapping Cassava Food Value Chains in Tanzania's Smallholder Farming Sector: The Implications of Intra-Household Gender Dynamics." *Journal of Rural Studies* 58: 82–92.
- Masamha, Blessing, Veronica N. E. Uzokwe, and Vusilizwe Thebe. 2018b. "Women's Empowerment in Traditional Food Value Chains at the Micro-Level: Evidence from Cassava Smallholder Farming in Tanzania." *Agroecology and Sustainable Food Systems* 42 (1): 28–47. doi:10.1080/21683565.2017.1325433.

- Maunahan, M.V., P.A. Nuevo, and J.M. Resorez. 2018. "The Role of Gender in Maintaining Quality and Reducing Postharvest Losses: The Case of 'Bungulan' (Musa Genome AAA) Bananas for Export." *Acta Horticulturae*, no. 1210 (August): 21–28. doi:10.17660/ActaHortic.2018.1210.3.
- Mburu, S, J Njuki, and J Kariuki. 2012. "Intra-Household Access to Livestock Information and Financial Services in Kenya." *Livestock Research for Rural Development* 24 (2): 1–7.
- McIntyre, Lynn, Krista Rondeau, Sharon Kirkpatrick, Jennifer Hatfield, Khaled Shamsul Islam, and Syed Nazmul Huda. 2011. "Food Provisioning Experiences of Ultra Poor Female Heads of Household Living in Bangladesh." *Social Science & Medicine* 72 (6): 969–976. doi:10.1016/j.socscimed.2011.01.011.
- Mittal, Surabhi. 2016. "Role of Mobile Phone-Enabled Climate Information Services in Gender-Inclusive Agriculture." *Gender, Technology and Development* 20 (2): 200–217. doi:10.1177/0971852416639772.
- Mudege, Netsayi N., Sarah Mayanja, and Tawanda Muzhingi. 2017. "Women and Men Farmer Perceptions of Economic and Health Benefits of Orange Fleshed Sweet Potato (OFSP) in Phalombe and Chikwawa Districts in Malawi." *Food Security* 9 (2): 387–400. doi:10.1007/s12571-017-0651-9.
- Mukherjee, Arghya Kusum, and Amit Kundu. 2012. "Microcredit and Women's Agency: A Comparative Perspective across Socioreligious Communities in West Bengal, India." *Gender, Technology and Development* 16 (1): 71–94. doi:10.1177/097185241101600104.
- Munn, Zachary, Micah D. J. Peters, Cindy Stern, Catalin Tufanaru, Alexa McArthur, and Edoardo Aromataris. 2018. "Systematic Review or Scoping Review? Guidance for Authors When Choosing between a Systematic or Scoping Review Approach." *BMC Medical Research Methodology* 18 (1): 143. doi:10.1186/s12874-018-0611-x.
- Muriithi, Beatrice W., Kassie Menale, Gracious Diiro, and Geoffrey Muricho. 2018. "Does Gender Matter in the Adoption of Push-Pull Pest Management and Other Sustainable Agricultural Practices? Evidence from Western Kenya." *Food Security* 10 (2): 253–272. doi:10.1007/s12571-018-0783-6.
- Mutenje, Munyaradzi, Henry Kankwamba, Julius Mangisonib, and Menale Kassie. 2016. "Agricultural Innovations and Food Security in Malawi: Gender Dynamics, Institutions and Market Implications." *Technological Forecasting and Social Change* 103 (February): 240–248. doi:10.1016/j.techfore.2015.10.004.
- Nakazi, Florence, Jemimah Njuki, Michael Adrogu Ugen, Paul Asete, Enid Katungi, Eliud Birachi, Ruth Kabanyoro, Isaac Joseph Mugagga, and Grace Nanyonjo. 2017. "Is Bean Really a Women's Crop? Men and Women's Participation in Bean Production in Uganda." *Agriculture & Food Security* 6 (22). doi:https://doi.org/10.1186/s40066-017-0102-z.
- Naz, Madiha, Izhar Ahmad Khan, and Babar Shahbaz. 2014. "Role of rural women in agriculture and household food security in Faisalabad District." *Pakistani Journal of Agricultural Science* 51 (3): 759–763.
- Neogy, Suniti. 2010. "Gender Inequality, Mothers' Health, and Unequal Distribution of Food: Experience from a CARE Project in India." *Gender and Development* 18 (3): 479–489.

- Njuki, J.M., V.B.M. Kihyo, A. O’Ktingati, and F. Place. 2004. “Male vs. Female Labour in an Agroforestry System in the Central Highlands of Kenya: Correcting the Misconception.” *International Journal of Agricultural Resources, Governance and Ecology* 3 (1/2): 154–170. doi:10.1504/IJARGE.2004.004650.
- Noronha, Judith A., Aparna Bhaduri, H. Vinod Bhat, and Asha Kamath. 2013. “Interventional Study to Strengthen the Health Promoting Behaviours of Pregnant Women to Prevent Anaemia in Southern India.” *Midwifery* 29: e35–e41.
- North, Douglass. 1990. *Institutions, Institutional Change and Economic Performance (Political Economy of Institutions and Decisions)*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511808678
- Nyongesa, Dave, Anthony O Esilaba, Rosemary Emongor, and Edward Bikketi. 2017. “Assessment of Gender and Innovations in Climate- Smart Agriculture for Food and Nutrition Security in Kenya: A Case of Kali Watershed.” *International Journal of Agricultural Resources, Governance and Ecology* 13 (2): 109–137.
- Nyongesa, Dave, Martin Kiogora Mwirigi, David Yongo, and Stella Makokha. 2016. “Gender-Concerns: Do They Matter in Smallholder Dairy Groups in Kenya?” *International Journal of Agricultural Resources, Governance and Ecology* 12 (1): 1–17. doi:10.1504/IJARGE.2016.074673.
- Oladele, O I, and M Monkhei. 2008. “Gender Ownership Patterns of Livestock in Botswana.” *Livestock Research for Rural Development* 20 (10): 1–7.
- Osorio, Ana María, Gustavo Alfonso Romero, Harold Bonilla, and Luis Fernando Aguado. 2018. “Socioeconomic Context of the Community and Chronic Child Malnutrition in Colombia.” *Revista de Saúde Pública* 52 (August): 73. doi:10.11606/S1518-8787.2018052000394.
- Owusu, Victor, Emmanuel Donkor, and Enoch Owusu-Sekyere. 2018. “Accounting for the Gender Technology Gap Amongst Smallholder Rice Farmers in Northern Ghana.” *Journal of Agricultural Economics* 69 (2): 439–457. doi:10.1111/1477-9552.12236.
- Peter, G. 2006. “Gender Roles and Relationships: Implications for Water Management.” *Physics and Chemistry of the Earth* 31 (15–16): 723–730. doi:10.1016/j.pce.2006.08.035.
- Peters, Micah D.J., Christina M. Godfrey, Hanan Khalil, Patricia McNerney, Deborah Parker, and Cassia Baldini Soares. 2015. “Guidance for Conducting Systematic Scoping Reviews.” *International Journal of Evidence-Based Healthcare* 13 (3): 141–146. doi:10.1097/XEB.000000000000050.
- Peterson, Jessica, Patricia F. Pearce, Laurie Anne Ferguson, and Cynthia A. Langford. 2017. “Understanding Scoping Reviews: Definition, Purpose, and Process.” *Journal of the American Association of Nurse Practitioners* 29 (1): 12–16. doi:10.1002/2327-6924.12380.
- Quaye, Wilhelmina, Solomon Dowuona, Mary Okai, and Nanam Dziedzoave. 2016. “Gender Dimensions of Decision Making on Production Assets and Challenges Facing Women.Pdf.” *Development in Practice* 26 (1): 77–90. doi:10.1080/09614524.2016.1112364.
- Quisumbing, Agnes R., Ruth Meinzen-Dick, Terri L. Raney, André Croppenstend, Julia A. Behrman, and Amber Peterman (eds). 2014. *Gender in agriculture: Closing the knowledge gap*. FAO. Springer: Dordrecht.

- Rafii, Forough, Naima Seyedfatemi, and Mahboubeh Rezaei. 2013. "Factors Involved in Iranian Women Heads of Household's Health Promotion Activities: A Grounded Theory Study." *The Open Nursing Journal* 7 (1): 133–141. doi:10.2174/1874434601307010133.
- Rubin, Deborah, and Cristina Manfre. 2014. "Promoting Gender-Equitable Agricultural Value Chains: Issues, Opportunities, and Next Steps." In *Gender in Agriculture: Closing the Knowledge Gap*, edited by Agnes R. Quisumbing, Ruth Meinzen-Dick, Terri L. Raney, André Croppenstedt, Julia A. Behrman, and Amber Peterman, 287–313. Dordrecht: Springer Netherlands. doi:10.1007/978-94-017-8616-4_12.
- Sethuraman, Kavita, Richard Lansdown, and Keith Sullivan. 2006. "Women's Empowerment and Domestic Violence: The Role of Sociocultural Determinants in Maternal and Child Undernutrition in Tribal and Rural Communities in South India." *Food and Nutrition Bulletin* 27 (2): 128–143. doi:10.1177/156482650602700204.
- Sharaunga, S., M. Mudhara, and A. Bogale. 2016. "Effects of 'Women Empowerment' on Household Food Security in Rural KwaZulu-Natal Province." *Development Policy Review* 34 (2): 223–252. doi:10.1111/dpr.12151.
- Shroff, Monal R., Paula L. Griffiths, Chirayath Suchindran, Balakrishna Nagalla, Shahnaz Vazir, and Margaret E. Bentley. 2011. "Does Maternal Autonomy Influence Feeding Practices and Infant Growth in Rural India?" *Social Science & Medicine* 73 (3): 447–455. doi:10.1016/j.socscimed.2011.05.040.
- Sikira, A.N., E M Waithanji, A Galie, and I Baltenweck. 2018. "Gender Aspects in the Dairy Value Chain in Tanzania: A Review of Literature." *Livestock Research for Rural Development* 30 (4): 1–10.
- Sudo, N, M Sekiyama, M Maharjan, and R Ohtsuka. 2006. "Gender Differences in Dietary Intake among Adults of Hindu Communities in Lowland Nepal: Assessment of Portion Sizes and Food Consumption Frequencies." *European Journal of Clinical Nutrition* 60 (4): 469–477. doi:10.1038/sj.ejcn.1602339.
- Tavener, Katie, and Todd A. Crane. 2018. "Gender Power in Kenyan Dairy: Cows, Commodities, and Commercialization." *Agriculture and Human Values* 35 (3): 701–715. doi:10.1007/s10460-018-9867-3.
- Tavva, Srinivas, Malika Abdelali-Martini, Aden Aw-Hassan, Barbara Rischkowsky, Markos Tibbo, and Javed Rizvi. 2013. "Gender Roles in Agriculture: The Case of Afghanistan." *Indian Journal of Gender Studies* 20 (1): 111–134. doi:10.1177/0971521512465939.
- Tibesigwa, Byela, and Martine Visser. 2016. "Assessing Gender Inequality in Food Security among Small-Holder Farm Households in Urban and Rural South Africa." *World Development* 88 (December): 33–49. doi:10.1016/j.worlddev.2016.07.008.
- Tindall, Charlotte, and Katrien Holvoet. 2008. "From the Lake to the Plate: Assessing Gender Vulnerabilities throughout the Fisheries Chain." *Development* 51 (2): 205–211. doi:10.1057/dev.2008.6.
- Tricco, Andrea C., Erin Lillie, Wasifa Zarin, Kelly K. O'Brien, Heather Colquhoun, Danielle Levac, David Moher, et al. 2018. "PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation." *Annals of Internal Medicine* 169 (7): 467. doi:10.7326/M18-0850.

- Turner, Christopher, Suneetha Kadiyala, Anju Aggarwal, Jennifer Coates, Adam Drewnowski, Corinna Hawkes, Anna Herforth, Sofia Kalamatianou, and Helen Walls. 2017. "Concepts and Methods for Food Environment Research in Low and Middle Income Countries." *Innovative Methods and Metrics for Agriculture and Nutrition Actions (M)*. London, UK.
- Twyman, Jennifer, Juliana Muriel, and María Alejandra García. 2015. "Identifying women farmers: Informal gender norms as institutional barriers to recognizing women's contributions to agriculture." *Journal of Gender, Agriculture and Food Security* 1(2): 1-22.
- Udry, Christopher. 1996. "Gender, Agricultural Production, and the Theory of the Household." *The Journal of Political Economy* 104 (5): 1010–1046.
- Vargas Hill, Ruth, and Marcella Vigneri. 2011. *Mainstreaming Gender Sensitivity in Cash Crop Market Supply Chains*. 11–08. ESA Working Paper. Agricultural Development Economics Division, Food and Agriculture Organization of the United Nations.
- Verhart, Noortje, Annoek Wijngaart, Mona Dhamankar, and Katrine Danielsen. 2015. *Bringing Agriculture and Nutrition Together Using a Gender Lens*. 2015–6. KIT Working Papers. KIT and SNV.
- Waithanji, Elizabeth, Jemimah Njuki, Samuel Mburu, Juliet Kariuki, and Fredrick Njeru. 2015. "A Gendered Analysis of Goat Ownership and Marketing in Meru, Kenya." *Development in Practice* 25 (4): 188–203. doi:10.1080/09614524.2015.1002453.
- Welch, Vivian, Mark Petticrew, Peter Tugwell, David Moher, Jennifer O'Neill, Elizabeth Waters, and Howard White. 2012. "PRISMA-Equity 2012 Extension: Reporting Guidelines for Systematic Reviews with a Focus on Health Equity." *PLoS Medicine* 9 (10): e1001333. doi:https://doi.org/10.1371/journal.pmed.1001333.
- World Bank, Food and Agriculture Organization, and International Fund for Agricultural Development. 2009. *Gender in Agriculture: Sourcebook*. Washington, D.C.: World Bank Publications.
- Zossou, Espérance, Aminou Arouna, Aliou Diagne, and Rita Afiavi Agboh-Noameshie. 2017. "Gender Gap in Acquisition and Practice of Agricultural Knowledge: Case Study of Rice Farming in West Africa." *Experimental Agriculture* 53 (4): 566–577. doi:10.1017/S0014479716000582.

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