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Closing Gender Gaps in Productivity to Advance Gender Equality and Women's Empowerment

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ABOUT THIS SERIES

This working paper, produced by the CGIAR GENDER Impact Platform, is one in a series of analytical working papers by our researchers. They were produced to inform the Food and Agriculture Organization of the United Nations to write the 2023 report on the *Status of Rural Women in Agri-food Systems.**

These evidence-based papers address key themes important for gender and social equality, and women's empowerment in agriculture and food systems. They each discuss:

- current status and emerging thinking
- the theme's relevance for transformative change toward more inclusive food systems
- the evolution of equality in agriculture and food systems over the past 10 years in low- and middle-income countries
- what has proved effective to ease structural constraints, and promote equality and empowerment
- specific suggestions about interventions, programs and policies that can help make agriculture and food systems more inclusive.

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ABOUT CGIAR GENDER IMPACT PLATFORM

Generating Evidence and New Directions for Equitable Results (GENDER) is CGIAR's impact platform designed to put equality and inclusion at the forefront of global agricultural research for development. The Platform is transforming the way gender research is done, both within and beyond CGIAR, to kick-start a process of genuine change toward greater gender equality and better lives for smallholder farmers everywhere. gender.cgiar.org.

* FAO. 2023. *The Status of Women in Agri-food Systems*. Rome.

DISCLAIMER
This working paper has gone through a process of nonblinded peer review by two reviewers external to the CGIAR GENDER Impact Platform, and has also been reviewed by the FAO team working on the 2023 FAO report on the *Status of Rural Women in Agri-food Systems*. The views expressed in this publication are those of the author(s) and do not necessarily reflect the views or policies of the Food and Agriculture Organization of the United Nations nor of the CGIAR GENDER Impact Platform.

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Abstract

In this paper we review research studies on gender-based productivity gaps in agriculture with an objective of assessing the nature of evidence since the wide-ranging productivity gaps reported in the SOFA *2010–2011* of FAO. Broadly, we address two questions. One, what are the trends in and extent of current gender gaps in productivity? Two, what has worked and what has not worked in bridging the gaps? We also critically examine the conceptualization of gender productivity gaps, including the measures of productivity, units of analysis and methods of estimating gaps. We find that recent studies offer more nuanced evidence on gender productivity gaps, which estimate gaps at the plot level and show heterogeneity in gaps across crops, productivity distribution, and regionally within countries. They show significant gender gaps, which vary between four and 28 percent, persisting across countries though temporal trends are difficult to infer due to methodological differences. There is less but mixed evidence on the impact of interventions in bridging gender productivity gaps, even when they improve productivity in general.

Keywords: gender equality, social equality, women's empowerment, food systems, productivity, labor, collective action

1. Introduction

COVID-19, accelerating climate change, and other recent crises have demonstrated that several countries in the global South are less resilient and tend to become even more food insecure with such shocks and stresses. The economic inequalities in societies are also rapidly growing and are a cause for concern. In this context where natural resources are constantly being degraded, maintaining or increasing farm productivity of smallholder farming households becomes very significant. Low agricultural productivity precludes the well-being of the producers, besides compromising overall production potential and food security. It also affects downstream value-chain actors and supply chains that contribute to incomes and jobs.

While women have been major contributors to agriculture and food systems directly through their engagement in production and other activities along value chains (FAO 2011; Kawarazuka et al. 2022), gendered differences in production and productivity continue to persist in many contexts (FAO 2011; Doss 2017). Differences in productivity between farm enterprises managed by women and men are broadly termed 'gender productivity gaps' (Challa and Mahendran 2015; Mugisha et al. 2019; Nchanji et al. 2021).

The FAO (2011) State of Food and Agriculture (SOFA) report of 2010–11 reported gender productivity gaps in the range of 20–30 percent based on a review of 27 studies. It also estimated that bridging these gaps would increase productivity by 20–30 percent on women's farms, and result in an overall increase of 2.5–4 percent in agricultural output. This could further increase if women were able to access more land. It would also have 'additional benefits' in the form of food availability and increased women's employment and wages.

Some studies show that gender productivity gaps are primarily a result of unequal access to and control over productive resources, termed the 'endowment effect' (FAO 2011; Udry et al. 1995; Ragasa et al. 2013), while, others highlight the 'structural effect,' which is the difference in the returns between women and men from the same inputs (Quisumbing et al. 2001; Aguilar et al. 2015; Slavchevska 2015; Kilic et al. 2013; van der Meulen Rodgers 2018). Most studies find that both effects explain the productivity differences between women and men, but the extent of their respective contributions to the gender productivity gap varies. Understanding both the extent of gender productivity gaps and the factors that explain these gaps can help inform programmatic investments and policy changes to address endowment and structural effects.

This working paper reviews new evidence (from 2011–21) to (a) examine the trends and extent of current gender productivity gaps, and (b) what works in different contexts to bridge the gaps.[1] This paper is informed by the Gendered Food Systems conceptual framework (Njuki et al. 2021), referred to in the overarching working paper (Lecoutere, Kosec, et al. 2023). Social stratification, political, economic and market forces on the one hand; and environmental and climatic conditions on the other shape agriculture and food systems, and the participation and outcomes for different socioeconomic groups. Structural inequalities and related advantages and disadvantages differently influence women's access to resources and technology, as well as the risks and consequently productivity—leading to gender productivity gaps.

1. In the process of listing articles, papers and reports pertaining to gender; rural, agriculture, food systems and productivity were identified as keywords, as indicated in the annex in the overarching paper. These studies were then assessed for their eligibility on the basis of inclusion and exclusion criteria identified for this paper. The studies that met the inclusion criteria went through a full text review, after which 95 studies were finally included in the paper.

The rest of this paper is organized as follows. The second section deals with the conceptual and methodological challenges in measuring gender productivity gaps and understanding the evolution of approaches. Section three summarizes and analyses the recent evidence on gender productivity gaps. The fourth section explores which interventions have worked or not for bridging the gaps and dwells on the various factors contributing to the gaps. This section is followed by a brief discussion on the potential benefits of bridging the gaps. The final section provides recommendations for bridging gender productivity gaps and for better research and evidence in this area.

2. Measuring gender productivity gaps: shifts in methodological approaches

There have been significant shifts in methodological approaches used to measure gender productivity gaps in the last decade as researchers have responded to the various challenges they have encountered. The emerging thinking and practice are discussed below. This section highlights the evolution of thinking and practices across some key dimensions over the last decade are discussed below.

2.1 Productivity indicators

The reviewed literature on gender productivity gaps is largely focused on land productivity—which means crop yield measured in quantity of output per unit area of land. This also varies with respect to the number of crops considered for analysis—while some studies focus on single crops others consider the total harvest (all crops). A majority of the productivity measures based on single crops focused mostly on maize, rice and beans (Lodin, Paulson and Jirström 2014; Morgado and Salvucci 2016; Coker et al. 2017; Burke, Li and Banda 2018; Sell et al. 2018; Djurfeldt et al. 2019; Bello et al. 2021; Addai, Lu and Temoso 2021; Sadiq, Singh and Ahmad 2021). Studies that used more standardized surveys estimate productivity based on total harvest on unit land (van der Meulen 2018; Torkelsson and Onditi, 2018; Slavchevska 2015; Aguilar et al, 2015). However, both these measures (single crop versus multiple crops) provide useful insights into and limitations on estimating gender productivity gaps. For instance, gender-gap estimates based on a single crop do not necessarily represent gaps for all crops grown by women and men in a region or a country, or even on their own plots. For example, Malawi and Tanzania exhibit significant gender productivity gaps when all crops are considered, but gaps are absent in case of wheat (Djurfeldt et al. 2019; Torkelsson and Onditi 2018).

Some studies such as Singbo et al. (2021) measured differences in sale values of harvest from men- and women-managed plots in Mali with maize, millet, groundnut and cotton. Some studies have used standardized national-level surveys to estimate gender productivity gaps by considering the value of all crops harvested per unit area of land (Aguilar et al. 2015; Slavchevska 2015; UN Women et al. 2015). However, gender differences in cropping patterns or adoption of cash crops influence the total value of crops, because men are more likely than women to cultivate cash crops (Torkelsson and Onditi 2018).

Labor productivity is also considered in some of the emerging research (Aly and Shields 2010; Palacios-López and López 2015). According to Doss (2017), this approach is problematic as it mainly focuses on time spent by men and women working on a piece of land but fails to take into consideration the difference in knowledge or management skills. Hence using labor productivity as a proxy to determine gender productivity gaps might result in unreliable and less meaningful estimates. [2]

Some studies considered differences in input use between women and men, and assessed their technical efficiency with inputs. In Uganda, men- and jointly-managed maize plots were

technically more efficient in the use of agricultural inputs (pesticides and inorganic fertilizers) than plots managed by women (Sell et al. 2018).

FAO (2011) did not include studies on gender productivity gaps in livestock or fish. Even after 2011, very few studies looked at productivity gaps in these sectors. Hoel et al. (2017) estimated the milk yield difference between men- and women-owned dairy cattle in northern Senegal. Only one study we reviewed highlights an aquaculture farm—looking at differences in yields of nine men and six women research farmers in on-farm research on feed in aquaculture farms in Zambia (Lundeba et al. 2022).

2.2 Unit of analysis

Earlier studies estimated gender productivity gaps in agriculture by primarily focusing on female- and male-headed households, where the household head is used as a proxy for the primary decision-maker in agricultural production (FAO 2011; Quisumbing, Haddad and Pena 1995) with a few exceptions focusing on women- and men-managed plots (Udry et al. 1995; Udry 1996). Yet, women who head their own households face different biases than women living in male-headed households (Burke and Jayne 2021; Djurfeldt et al. 2019). This dichotomous analysis ignores the majority of women in male-headed households, because only a small share of households across Asia and Africa are headed by women (FAO 2011). Focusing only on household headship undermines in-depth understanding of how cultural and societal structural differences influence women's productivity and their resulting efficiency (FAO 2011; Doss 2017). Recent evidence demonstrates a shift toward measuring gender productivity gaps between women- and men-managed farm plots (Torkelsson and Onditi 2018; Aguilar et al. 2015, Kilic et al. 2013; Slavchevska 2015; Mugisha et al. 2019). However, this approach of comparing men and women plot managers originated from and is applicable only to contexts where gender-segregated crop and livestock farming is practiced—in countries such as Kenya, Uganda, Malawi, Uganda, Niger and Ethiopia, to name a few (Aguilar et al. 2015; wa Gĩthĩnji, Konstantinidis and Barenberg 2014; Kilic et al. 2013; Backiny-Yetna and McGee 2015). While such information is relevant for formulating policies that aim to improve livelihoods by bridging gender productivity gaps (Mukasa and Salami 2015; Djurfeldt et al. 2019), it excludes plots that are mostly jointly managed.

Few studies (Slavchevska 2015; Sell et al. 2018; Burke and Wayne 2021) focus on measuring gender productivity gaps in contexts where women and men jointly cultivate the same plots; and they measure gaps between women- and men-managed plots as well as jointly managed plots. Studies within African contexts also contest the preoccupation with gender-disaggregated, plot-level analyses; and draw attention to the predominance of jointly managed farms (Gebre et al. 2021). In both Western and Eastern Africa, both jointly and individually managed plots are normal (Torkelsson and Onditi 2018; Smale et al. 2019), but joint plot management practice in Eastern Africa is not widely studied (de la O Campos, Covarrubias and Patron 2016). The survey questions in some countries such as Malawi allow only one person to be identified as plot manager (see Torkelsson and Onditi 2018). In many settings, female and male members of the household have roles and activities contributing to farming, and have some degree of input to management or decision-making on the

2. See Doss (2017) for an elaborate review of land and labor productivity; the limitations of both these measures of productivity; and the challenges in recording them precisely based on a respondent's recall of activities, inputs and outputs for a crop or a plot of land pertaining to the previous season or year.

farm. Therefore, a simple comparison between female- and male-managed plots is not only incomplete, but can also be misleading.

Estimating gender gaps in joint-production units is conceptually and methodologically difficult because the joint or collective output cannot be attributed to an individual. Few recent studies focus on how jointly farmed output varies across households, based on the degree of gender inequality within households and empowerment of women (using, for example, a gender parity index or women's decision-making power) (Avila-Santamaria 2017; Mobarok, Skevas and Thompson 2021).

2.3 Use of standardized 'big data' sets

Evidence on gender productivity gaps presented in FAO (2011) mainly relied on data from small, cross-sectional samples ranging from 79 to 300 respondents, that focused on a particular geographic location in the respective countries (e.g., Adeleke et al. 2008; Aly and Shields 2010; Horrell and Krishnan 2006; Tiruneh et al. 2001). Small samples generally suffer from low statistical explanatory power, with inflated or deflated coefficients and standard errors. Additionally, they did not use standardized data-collection tools, making productivity gap comparisons across regions or countries challenging. However, with the availability and use of standardized and nationally representative datasets such as the World Bank's Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) surveys in eight countries (Ethiopia, Malawi, Mali, Tanzania, Uganda, Burkina Faso, Niger and Nigeria) since 2012, recent studies have been able to rely on longitudinal and larger samples of more than 400 households or 1,000 plots, including detailed plot-level data along with sex-disaggregated characteristics of plot managers (Kilic 2013; Slavchevska 2015; Mukasa and Salami 2015; Ali et al. 2016; de la O Campos Covarrubias and Patron 2016; Buehren et al. 2019; Van Tran et al. 2019; Torkelsson and Onditi 2018; Aguilar et al. 2015). Use of such datasets not only improves the precision of the estimated models, but also makes comparative analysis possible. The small number of studies that rely on primary surveys also provide important regional and local insights in analyzing gaps (Djurfeldt et al. 2019; Smale et al. 2019; Addai, Lu and Temoso 2021).

2.4 Complementary data sources

The debate on self-reported output versus observed output (actual harvest data or plot size measurement) given the trade-off between cost and quality of data is worth mentioning. Lack of quality data on plot characteristics, which may differ by gender, has previously resulted in biased estimates of productivity (Slavchevska 2015). Increasing availability of remote sensing data, mobile apps and other innovative methods for collecting more-reliable data in a more cost-effective way make improvements in the measurements possible (Gourlay, Kilic and Lobell 2019). Besides conventional survey-based quantitative data, new sources of information such as laboratory data on soil nutrients (for soil quality) and geospatial data on plot location, fertility, slope and elevation are also becoming part of the mixed-methods research on productivity gaps (Oseni et al. 2015; Smale et al. 2019; Djurfeldt et al. 2019).

2.5 Decomposition of productivity gaps

The differences in productivity are largely analyzed using Oaxaca (1973) and Blinder (1973) decomposition methods (Aguilar et al. 2015; Palacios-López and López 2015; Mugisha et al. 2019). In using the Blinder–Oaxaca decomposition method, early studies decomposed gender productivity gaps at the mean, ignoring distribution effects. However, recent studies are using recentered influence functions, at quantiles, to reveal the nature and trajectory of the gender productivity gap (Donald, Lawin and Rouanet 2020; Kilic et al. 2013; Nchanji et al. 2021). Although these models explain the gender productivity gaps due to endowment effects (the part of the gender gap explained by the observable differences in resources and inputs), and attempt to explain the unobservable factors that influence gender productivity gap such as gender norms resulting from structural effects (World Bank and ONE Campaign 2014), this approach fails to unpack the nuances surrounding gender norms. The endowment

effect is large enough to account for the productivity difference in the studies that concluded 'unequal access to resources' as the main cause. Those in which the structural effect (the residual part) is significant, show that part of the gap emanates due to differences in returns in the observable factors of production. The use of descriptive statistics to explore intrahousehold gender productivity gaps between women- and men-managed plots might overestimate or underestimate productivity gaps, because they fail to consider or quantify the contribution of the individual endowment to productivity gaps (Peterman et al. 2011).

2.6 Use of mixed-methods analyses

A positive development in recent analyses is the trend toward mixed-method study designs, complementing quantitative data with qualitative to explore and offer more insights into unobservable factors such as social gender norms that lead to gender productivity gaps (Djurfeldt et al. 2019). For example, UN Women, UNDP, UN Environment and World Bank (2015) conducted qualitative studies mainly employing focus group discussions and key informant interviews in Uganda, Malawi and Tanzania to understand the contributors to productivity gaps (that had been measured using large-scale, national-level, quantitative data). Mugisha et al. (2019) use vignettes in the life course of married couples to explain the gender productivity gaps in groundnut production measured through quantitative methods. Their study highlights the cultural significance of local groundnut varieties in a woman's life from the time of her marriage; and how women favor a local variety for its taste, oil content, ease of plucking and cooking—which, however, turns out to be a disadvantage in terms of productivity.

2.7 Intersectionality

There is increasing recognition of the importance of intersectional analysis in understanding gender productivity gaps. For instance, women from female-headed households have been reported to be less productive than women in male-headed households—these gaps are associated with difference in access to and control over production resources (Aguilar et al. 2015; Ironkwe, Ewuziem and Ezebuiro 2012; Sadiq et al. 2021; de la O Campos, Covarrubias and Patron 2016). A few studies have shown that educated women plot managers have higher yields than men plot managers due to the ability to efficiently manage productive resources at their disposal (Oseni et al. 2015; Singbo et al. 2021). A study by Singbo et al. (2021) in Mali where maize, millet, groundnut and cotton are cultivated, younger women- and men plot managers were shown to be more productive than older plot managers.

3. Changes in gender productivity gaps

This section presents the patterns over time in gender productivity gaps reported by 36 reviewed studies that focused on crops, livestock and fish. Out of these, 34 were conducted in sub-Saharan Africa and two in Asia (see annex).

FAO (2011) reported wide-ranging gender productivity gaps across countries, most of which clustered between 20 and 30 percent, with a focus mostly on male- and female-headed households. The recent studies offer more nuanced evidence on gender productivity gaps, and focus more on plot management (though a few still look at household headship).

3.1 Gaps by gender indicator

As indicated in the previous section, a trend toward comparing productivity gaps between women and men plot managers is evident, though some studies continue to compare women- and men-headed households to estimate the gap (see annex). Women who head their own households generally have lower productivity (Gebre et al. 2021; Ragasa et al. 2013; wa Gĩthĩnji, Konstantinidis and Barenberg 2011), but this difference is not strictly a gender productivity gap because of the contribution of male members in female-headed households and female members in male-headed households.

Gender productivity gaps vary based on the gender variables analyzed in these studies (de la O Campos, Covarrubias and Patron 2016). Because of the wide variation in contexts and methodologies, it is difficult to draw robust comparisons to discern trends—but recent evidence reveals a continuing but slight reduction in gender productivity gaps, varying geographically and across crops. As illustrated in table 1, the reported gender productivity gaps range between 10 and 28 percent on plots managed by women and men (considering multiple or all crops across different years) (World Bank and ONE Campaign 2014; Kilic et al. 2013; Backiny-Yetna and McGee 2015; Slavchevska 2015; de la O Campos, Covarrubias and Patron 2016; Singbo et al. 2021; Torkelsson and Onditi 2018; UN Women et al. 2015; van der Meulen 2018). In table 1, we present evidence on country-level gaps estimated for women and men plot managers, and productivity measured for all crops.[3] All studies reviewed—including those measuring gender productivity gaps for particular crops and between women and men household heads—are presented in the annex.

Men-managed plots in Malawi were 24 percent more productive compared to women-managed plots, with the gaps attributed to limited access to financial support and labor-market imperfections (Palacios-López and López 2015). The study by Slavchevska (2015)' in Tanzania estimates (with household-fixed effects) a higher gap of 21 percent between women-managed plots and other plots. The gaps for Ethiopia and Rwanda range between 11 and 12 percent. However, these studies compare women- and men-managed plots and ignore the jointly managed plots, which are the most common system in many countries. On an average in Nigeria, women plot managers are 18.6 percent less productive, where the gender gap in access to and control over land is very large, and women's plots are less likely to be flat and irrigated (Mukasa and Salami 2015).

The gender gap in productivity does not diminish when controlling for a range of resource or plot-level characteristics. For example, gender productivity gaps are higher in many cases when land size and other characteristics are controlled for (World Bank and ONE Campaign 2014; Slavchevska 2015; van der Meulen 2018). Women usually manage smaller plots and produce more, and this inverse relation between plot size and productivity hides the magnitude of gender productivity gaps (Slavchevska 2015; de la O Campos, Covarrubias and Patron 2016). When land size was controlled for in Uganda and Niger, the average gender productivity gap between women- and men-managed plots increased—and was strikingly much higher in Niger—mainly attributed to gender differences in land characteristics, including plot elevation, and perceived control over land (World Bank and ONE Campaign 2014). However, in Malawi where women own more land than men because of matrilineal systems, controlling for land size shows a reduction in the gender productivity gap from 25.4–4.5 percent in women- and men- managed plots (Kilic et al. 2013). Further, the gender indicator (household headship or plot management) used in gaps analysis influences the extent of gaps, but also the underlying factors contributing to the gaps. Ragasa et al. (2013), based on the gender of household head, find that in Ethiopia gaps are largely due to differences in input access between women and men. However, Aguilar et al. 2015, based on gender gaps between plot managers show that 57 percent of the gap remains unexplained, even after accounting for key production resources such as access to land and other inputs.

3. As discussed above, gender variables—whether head of the household, or plot manager or owner—do not accurately depict the decision-maker in the household. Plot manager is considered the best approximation (de la O Campos, Covarrubias and Patron 2015). Also, for country-level gender gaps, productivity measured for all crops is a better standard to assess aggregate gaps.

Some studies that focus on the value of output also reveal gender gaps. In Malawi, Tanzania and Uganda, the value of agricultural output per year (computed assuming standardized, crop-specific prices) from women's plots was lower by US$100 million, US$105 million and US$67 million, respectively, compared to men's plots (UN Women et al. 2015).

Table 1. Gender productivity gaps between women and men plot managers

	Country	Commodity	Gender productivity gaps	Study
1	Uganda Niger	Multiple crops	13% (33% after controlling for land size) 19% (66% after controlling for land size)	World Bank and ONE Campaign 2014
2	Malawi	Multiple crops	Labor productivity—women 44% less productive Land productivity—women 24% less productive	Palacios-López and López 2015
3	Niger	Multiple crops	18.3%	Backiny-Yetna and McGee 2015
4	Tanzania	Multiple crops	Women 8% less productive compared to joint- and men-managed plots. Controlling for regional (enumeration area) factors and time variant (changes due to different study periods) effects led to an increase in gender gaps by 14% and 21%, respectively.	Slavchevska 2015
5	Nigeria	Multiple crops	11% (north) 27.4% (south)	Oseni et al. 2015
6	Ethiopia	Multiple crops	women-managed plots 23.4% less productive than men-managed plots.	Aguilar et al. 2015
7	Malawi	Multiple crops	women-managed plots 25.4% less productive than men-managed plots. Controlling for key production resources led to reduction in gender productivity gaps by 4.5%.	Kilic et al. 2013
8	Uganda	Roots, pulses, oils, cereals, bananas, coffee, vegetables and fruits	17.5% (30% after controlling for land size and farmer characteristics)	Ali et al. 2016
9	Malawi, Tanzania and Uganda	Multiple crops	28%—Malawi 16%—Tanzania 13%—Uganda	Torkelsson and Onditi 2018

	Country	Commodity	Gender productivity gaps	Study
10	Ethiopia, Malawi, Rwanda, Tanzania and Uganda	Multiple crops	28%—Malawi 16%—Tanzania 13%—Uganda 10.6%—Ethiopia 12%—Rwanda	van de Meulen Rodgers 2018
11	Mali	Millet, maize, groundnut and cotton	23%	Singbo et al. 2021

Several studies have considered **regional differences** in gender productivity gaps, as summarized in table 2. Similarly, gaps vary widely for the same crop or multiple crops **between regions** within countries. The relationship between gender and agriculture is complex, which produces heterogeneity in gender differences in agricultural productivity across regions (Slavchevska 2015). In Mozambique, the difference was attributed to the southern region being more developed than the center-north (Morgado and Salvucci 2016). Unlike in northern Nigeria, women- and men-managed plots in the south did not have differences in fertilizers and pesticide use, or plot sizes (Oseni et al. 2015).

Table 2. Regional difference in gender gaps

	Country	Commodity	Gender indicator	Gender productivity gaps by region in the country	Study
1	Ethiopia	Multiple crops	Women- and men-managed plots	Southern Nations, Nationalities, and Peoples' (SNNP) Region—61.4% Tigray—33.1%	Aguilar et al. 2015
2	Mozambique	Multiple crops	Women- and men-headed households	Center-north 20% Southern region—no gap	Morgado and Salvucci 2016
3	Nigeria	Multiple crops	Women- and men-managed plots	Northern Nigeria—28% after controlling for observed factors of production Southern Nigeria—no significant difference	Oseni et al. 2015
4	Ghana	Rice	Women- and men-managed plots	Upper East region of Ghana in favor of women—18% Northern and Upper West regions—not significant	Addai, Lu and Temoso 2021

3.2 Gaps by type of crop (cash or food crop)

Productivity gaps, as mentioned earlier, also vary by the type of crop grown (table 3). While women seem to fare better than men in terms of productivity for cash crops, the type of crop grown by women is dictated by local social norms, resource constraints and market access—so, few women tend to grow cash crops. In Malawi, men plot managers grow more cash crops that fetch better market value—for example, tobacco and cotton—while women plot managers produce subsistence crops such as cassava and groundnut. Women engage in subsistence farming due to limited access to inputs such as improved seeds and inorganic fertilizer. Evidence suggests that the gaps are narrower for cash crops than for subsistence

crops when women cash-crop-plot managers are supported financially through subsidies, which help them overcome resource constraints (Nsanja, Kaluwa and Masanjala 2021).

Table 3. Gender productivity difference by type of crop

	Country	Commodity	Gender indicator	Gender productivity gaps	Study
Cash crops					
1	Ghana	Rice	Women and men plot managers	18% in favor of women plot managers	Addai, Lu and Temoso 2021
2	Uganda	Banana and coffee	Women and men plot managers	17.5% in favor of women plot managers	Ali et al. 2016
Staple crops					
3	Uganda	Maize	Men- and women-headed households	an average of 0.08 tons per hectare in favor of men-headed households	Larson et al. 2015
4	Uganda	Groundnut (a fast, previously staple crop that is rapidly becoming a commercial/cash crop—so is a staple or a cash crop in different contexts)	Women and men plot managers	50% average 63% new varieties 44% local varieties —all in favor of men plot managers	Mugisha et al. 2019

3.3 Gaps in livestock and fisheries

Hoel et al. (2017) reported that, in Senegal, men-owned dairy cows produce 10.6 percent more milk per day than those owned by women in the same households. Men generally owned more of the Métis breed which produces more milk. Women tended to keep local cattle breeds (Gobra) and depend mostly on open grazing in common areas. In addition, cows owned by women were six percentage points less likely to have been vaccinated in the last year, or given commercial feeds and mineral salts.

3.4 Patterns by intersectionality

Besides spatial heterogeneity in gender gaps, there are also within-gender differences due to other intersectional factors. In Niger, gender gaps vary between farmer groups with varying productivity levels—the gap is widest (34 percent) among the 'most productive farmers' and least (four percent) among the least productive ones (Backiny-Yetna and McGee 2015). Aguilar et al. (2015) show that productivity gaps in Ethiopia are experienced by single divorced women, while married women are not disadvantaged. Younger women research farmers of tilapia fish in Northern Zambia had higher productivity than male fish farmers (Lundeba et al. 2022).

Smale et al. (2019), building on earlier studies, highlight 'generation' as a key intersecting dimension in the Sudanese savanna of Mali explaining the productivity differential between younger and older men, wherein seniority of the older generation males gives them authority and better access to household resources. They suggest targeting both women and youth in agricultural policy in view of the gender and generation gaps in productivity. However, such generational advantage is absent for older women when they are heads of the family or plot managers. Old age is identified as an additional constraint for women because of their

lower physical capacity and difficulty accessing male labor (de la O Campos, Covarrubias and Patron 2016). Marital status of women (married, divorced or widowed) when they are heads of the household, and whether they are first wife or younger wife in polygamous relationships figure in the intragender heterogeneity among women's experiences in agriculture. An important dimension here is the degree of difficulty in accessing male labor, and wives' unpaid labor on men's farms without such reciprocation from men (UN Women et al. 2015; UN Women and UNDP-UNEP PEI 2016).

4. What works in reducing gender productivity gaps?

Eliminating the gendered constraints and bridging the gaps in resources to contribute to increased productivity and profits is considered an essential way forward for agricultural growth, food security and gender equality (FAO 2011). This understanding has influenced and guided agricultural development interventions (Mukasa and Salami 2015; Djurfeldt et al. 2019) to transform the agricultural sector by bridging the gender productivity gaps. As noted above, the drivers of gender gaps consist of endowment and structural factors and, therefore, understanding the causes helps in designing appropriate intervention strategies.

This section highlights the available evidence on (a) interventions and programs that are effective or ineffective in increasing women's productivity, thereby reducing the gaps; and (b) factors that influence women's and men's productivity. It also highlights interventions that did not work because of social and gender issues.

4.1 Effectiveness of interventions to reduce productivity gaps or increase women's productivity in agriculture

Njobe (2015) argues that closing the gender gap in access to extension services, finance and financial services, seeds, fertilizers and irrigation (among others) increases women's productivity. If women had access to technology such as crop-protection practices, improved varieties, and culturally appropriate machinery it would likely reduce the gender productivity gaps between women- and men-managed plots by almost 18 percent in Malawi, 8 percent in Tanzania, and 9 percent in Uganda (UN Women et al. 2015; Bello et al. 2021). Kosec et al. (2023) emphasize the importance of increasing women's access to complementary services to improve productivity. However, the differences in access to and control over resources and the returns on resource use are rooted in gender inequalities perpetuated through social norms, which are exacerbated by institutional barriers. Deeply entrenched social norms across societies manifest in women's inability to access material and nonmaterial resources, economic organizations and institutions (van der Meulen 2018). This also involves socially ingrained perceptions and beliefs about what women can and cannot do; and roles that disproportionately burden women with reproductive functions, limiting their productive capacities and producing inferior outcomes including lower yields from crops and livestock.

Rigorous impact evaluations of interventions aimed at reducing gender productivity gaps are very few. The predominantly used econometric and, to a lesser extent, mixed evaluation

methodologies often fall short of the required robust gender analysis that can unearth root causes of gender inequality and gender productivity gaps. Table 4 summarizes the studies reviewed which looked at the effects of interventions/programs or decomposed the effects.

Table 4. Summary of evidence on effectiveness of interventions to reduce gender productivity gaps

Intervention	Location and crop or commodity	Outcome	Methodology	Study
Enhancing access to inputs—fertilizer and seeds				
Maize intensification programs providing seed and fertilizer subsidy Malawi Farm Input Subsidy Program (FISP) in 2005/06 and 2010/11 maize-growing seasons Zambia FISP during the 2009/10 maize-growing season Tanzania Agricultural Input Voucher Scheme (NAIVS) from 2011 to 2015	Malawi Tanzania Zambia Maize	Malawi— yields over 2006–18 largely stagnant with no significant gender gaps. Tanzania—No significant gender gaps, with low yields and low use of external inputs in general. Zambia—gender productivity gaps between plot managers were persistent. Yield increase in men-managed plots was much higher at 45% compared to 22% increase in women-managed plots.	A simple comparison based on yields per ha	Djurfeldt et al. 2019
National Agricultural Input Voucher Scheme	Tanzania All crops	16% gender productivity gap. Despite this intervention, only 13% and 15% of all plots applied organic and inorganic fertilizers, respectively, with no significant gender differences.	Blinder–Oaxaca decomposition	Torkelsson and Onditi 2018
FISP	Malawi All crops	28% gender productivity gap. 62% of women and 64% of men-managed plots applied fertilizer. This higher share of fertilizer use and small gap between women and men are likely associated with the FISP program, yet the productivity gaps are high.	Blinder–Oaxaca decomposition	Torkelsson and Onditi 2018
Large-scale voucher-based FISP providing inorganic fertilizer	Malawi Maize	Both male and female plot managers improved maize productivity, but achieved no reduction in gender gap.	Ordinary Least Squares, probit regression analysis and descriptive statistics	Karamba and Winters 2015
Enhancing access to new varieties and other management technology and practices				
Provision of improved bean varieties and training women in good agricultural practices	Tanzania	34% increase in productivity on women's plots and a reduction in the gender productivity gap.	Blinder–Oaxaca decomposition	Nchanji et al. 2021
Provision of New Rice for Africa (NERICA) upland rice varieties	Uganda	Introduction of NERICA rice varieties in Uganda reduced the difference in land size under rice production, but plots owned and managed by male-headed households were more productive than those of female-headed households.	Mixed-methods study (descriptive statistics)—surveys, questionnaires, interviews, focus groups	Lodin, Paulson and Jirströmet 2014

Cont.

Intervention	Location and crop or commodity	Outcome	Methodology	Study
Provision of low-cost pedal threshers and weeders to reduce women's time and work burdens	Nepal Finger millet	Reduced women's drudgery and time spent in intercultural operations, and increased their overall production and productivity at the household level (qualitative data, not quantified).	Mixed-methods study—surveys, focus group discussions, interviews	Devkota et al. 2016
Improving access to new knowledge and skills				
Training women on soil conservation practices (organic fertilizers and retaining crop residues) as climate change coping strategies	Malawi Maize	Reduction in cost of production and improved crop productivity on women-managed plots.	Regression analysis and descriptive statistics	Burke and Jayne 2021
Rural capacity building interventions which targeted both women and men to enhance access to extension services	Ethiopia General crops	Increase in agricultural productivity for crops in general, with yield on women-managed plots increasing more (0.7% increment) compared to plots managed by men (0.4%).	Descriptive statistics and ordinary least squares (OLS) regression	Buehren et al. 2019
Women extension officers disseminating knowledge on sustainable soil management practices	Mozambique Sorghum	Helped women adopt the practices, increasing their sorghum yields.	Randomized control trials Multivariate linear regressions	Kondylis et al. 2014
Video-enabled extension messaging targeting women	Uganda Maize	Improved women's decision-making skills, technical know-how about maize cultivation, and their productivity.	Randomized control trial	Lecoutere, Spielman and Van Campenhout 2019
Agricultural extension training for couples	Côte d'Ivoire Rubber	The adoption of new rubber seedlings usually results in a drop in production on old trees in the initial years of plantation as labor and care is diverted to new seedlings. The group which received training along with wives did not suffer any drop in productivity compared to the 18% productivity drop for farmers who received training alone. The couple group was also able to plant 20% more new seedlings.	Randomized control trial Two groups of male farmers receiving improved rubber seedling subsidy. One group trained along with their spouses and one without them.	Donald et al. 2022
Increasing access to and control of land				
Land-certification schemes targeting women	Zambia Maize	Insignificant impact on redressing gender productivity gaps. Women reported to own poor-quality lands compared to men, mainly due to gender norms which consider women to have low capability and not deserving of good-quality land.	A simple comparison based on yields per ha	Djurfeldt et al. 2019
Land certification or ownership rights for women	Ethiopia All crops	Positive correlation with productivity on women-owned plots. Attributed to the fact that certification gave a sense of security against land redistribution and land grabbing.	Difference-in-difference and switching regression econometric approach	Bezabih, Holden and Mannberg 2016

This limited evidence shows that support schemes and technological interventions had varied impacts on women's agricultural productivity and the gender gaps. For example, the maize intensification programs in Zambia, Malawi and Tanzania that provided seed and fertilizer subsidy resulted in different outcomes both in yields and gender gaps (Djurfeldt et al. 2019). The yield increases varied based on the level of technology adoption, and the uptake was significant in Zambia. But the gender productivity gap in women's farms in Zambia was due to lack of women's control over land preparation—both mechanization and male labor. Few women compared to men owned oxen or ox-drawn implements, and the seasonality in demand for both machinery and labor put women at a disadvantage. Men prioritize plowing their plots before allowing women to hire their oxen for land preparation (Djurfeldt et al. 2019).

The emphasis of most programs has been on providing subsidies, without necessarily targeting women, for enhancing use of external inputs such as fertilizers and seeds—and the evidence on their outcomes is mixed. It is obvious that this alone does not help in increasing productivity or reducing gaps unless other constraints are also addressed. Providing women's access to new varieties also seems to work when they are specifically targeted to be reached with traits they prefer and need (Nchanji et al. 2021). Mechanization helps in alleviating women's time poverty and drudgery, and increases their productivity (Devkota et al. 2016). Enhancing women's knowledge and skills and providing them access to new technology by increasing their access to extension services or other means appears to be an effective mechanism to increase productivity and reduce the gaps. Women appear to respond more to such interventions than men. The evidence on outcomes of increasing women's access to land is also mixed, and we need more rigorous evidence in this regard. While land titling or certification does provide them a sense of security, the quality of land they have access to also matters.

4.2 Factors influencing women's productivity

It is imperative to understand the diversity of factors that impede efforts to increase women's productivity to reduce the gender gaps, so intervention strategies can be designed based on this evidence. It is important to note that addressing one constraint alone might not give the desired results—women need bundles of interventions to overcome productivity gaps. For instance, the gender productivity gaps in groundnut farming in Uganda were influenced by labor-use differences, constraints in women's access to and control of land to cultivate groundnuts due to cultural biases, and differences in characteristics such as education and access to credit (Mugisha et al. 2019). Higher productivity of women is possible due to a variety of factors such as technical training and support, availability of credit, and the choice of growing commercial crops instead of foodgrains (Agarwal 2018).

4.2.1 Access to labor

Palacios-López and López (2015) show that correcting credit and labor-market failures is likely to have a bigger impact on female-headed households than on male-headed households. The importance of productive resources other than access to land may be key—for instance, the need to tackle constraints related to women's access to household male labor, and policies that help women farmers to access laborsaving technology (Torkelsson and Onditi 2018). World Bank and ONE Campaign (2014) highlight that on average, female farmers tend to live in smaller households with fewer men—possibly due to widowhood, divorce or migration of husbands—and in countries such as Malawi, Niger and Tanzania, women farmers deploy fewer men laborers on their plots, who generate lower returns for women farmers relative to men farmers.

4.2.2 Climate change

Climate change poses challenges for women smallholder farmers in maintaining and improving their agricultural productivity (Bryan et al. 2023), which is constrained by lack of access to labor, cost-saving and climate-resilient technologies, credit, information, markets

and most basic farming tools (Murray et al. 2016; Chanana-Nag and Aggarwal 2020). A study in Malawi noted how a change in the timing of rains as well as frequency of rainfall has negatively affected especially the women farmers, because it is closely linked to division of tasks and duties in the households (Murray et al. 2016). Another cross-country study in Africa covering nine9 East (Ethiopia, Kenya, Uganda and Tanzania) and West (Senegal, Mali, Niger, Burkina Faso and Ghana) African countries, notes that female farmers were more constrained than male farmers in accessing and using quality seeds; or planting drought-tolerant, pest-resistant or disease-resistant varieties; or using commercial inputs (fertilizers, pesticides and herbicides) that are critical for maintaining productivity (Perez and Barahona 2015). Access to and use of climate-smart agricultural technology in Nepal such as direct-seeded rice, green manuring, and so on were found to potentially reduce women's drudgery and improve their productivity (Khatri-Chhetri et al. 2020). Larson et al. (2015)—using a model that is consistent with the notion that the gender of the farmer per se does not directly affect productivity outcomes, but does influence fertilizer purchases, which affect eventual productivity outcomes—found that what does matter for productivity outcomes is weather, choices about input use, and *ex ante* risk-mitigation strategies.

4.2.3 Access to land

Although there is limited evidence on the impacts of land ownership on productivity, it does determine people's access to credit which, in turn, is critical for women to access good-quality inputs at the right time to ensure high productivity. While there are not many studies that establish the relationship between land rights and productivity for women empirically, some infer "If observed labor and input constraints are considered in conjunction with the significantly lower returns to land, we can infer that if women plots were as large as men's plots, the gender productivity gap would be probably larger, all things being equal" (de la Campos, Covarrubias and Patron 2016). The FAO (2011) assessments were critiqued for considering resources, particularly land, as unlimited and for simulating the gains from reducing gender productivity gaps with no costs for men. The fact is that the majority of the farms are jointly owned, and having joint ownership will enhance women's decision-making and access, and enhance productivity leading to overall gains. In Ethiopia, acquiring land rights motivated women to engage in cash-crop production and invest in better technology (Bezabih, Holden and Mannberg 2016).

A literature review focused on impacts of women's land rights on productivity highlights the observation from Ethiopia that for productivity increases in households with land certificates relative to those without, the impact is stronger for female-headed households. Another study using panel data from Vietnam found that plots with joint titles are positively associated with rice productivity (Meinzen-Dick et al. 2019).

4.2.4 Access to credit

Empirical assessment of the impact of access to credit on women's agricultural productivity is scant. Backiny-Yetna and McGee (2015) show that return on agricultural capital was higher on plots managed by women compared to those managed by men, implying that if women had more access to agricultural capital, they would produce more yields compared to men. In Nigeria, male-headed households (on average) obtained up to about 32 percent larger loan amounts for purchase of planting material and fertilizer, crop operations and land acquisition than female-headed households—and this was positively correlated with higher cassava productivity (Awotide et al. 2015).

4.2.5 Access to extension and advisory services

Gender inequity in access to extension services and agricultural training persists, and it has been highlighted as one of the contributors to gender productivity gaps in agriculture (Bello et al. 2021; Onyalo 2019; Palacios-López and López 2015; Larson et al. 2015; Ragasa et al. 2013). Men-managed plots in Nigeria achieved a higher mean farm-level technical efficiency in cassava production, and they had better access to extension service providers than women

(Ironkwe, Ewuziem and Ezebuiro et al. 2012). Women in many sub-Saharan African countries find it hard to access extension services due to gender norms that impede their mobility or participation in agricultural training. Even though smallholder maize farmers generally received few extension visits in Uganda, women maize plot managers received fewer visits compared to their male counterparts (Larson et al. 2016), attributed to biases of male extension officers who tend to target men viewed as the head of the household and main decision-makers. Increasing use of digital extension services is proving to be favorable to women in certain contexts (Lecouture, Spielman and Van Campenhout 2019). Indian women farmers who had access to at least a single ICT[4] tool had more participation in decision-making and better productivity (Jain, Ahuja and Kumar 2012). Use of the internet to obtain agricultural information and credit has proven effective in increasing fish farm productivity in Ghana—and the positive impact is higher for women-managed fish farms than men-managed fish farms (Twumasi et al. 2021).

4.2.6 Collective action and social networks

Having access to networks and social capital enables women to access information, promote egalitarian gender attitudes and increase their productivity (Kosec et al. 2023). Social groups such as cooperatives and farmer-based organizations are proving effective in disseminating agricultural information to women smallholder farmers, which helps them improve productivity. The higher productivity of women rice farmers in Ghana was attributed to their membership in farmer-based organizations that facilitated their access to agricultural information and adoption of technology such as high-yielding and disease-resistant rice varieties, and inorganic fertilizer (Addai, Lu and Temoso 2021). Membership in farmer-based organizations also allowed women to access extension services (Bello et al. 2021). Aryal and Kattel (2019) posit that when women in agriculture organize themselves in farmer cooperatives, such institutions boost their level of confidence in gainfully participating in agriculture. They are able to save, and access credit to purchase inputs to enhance their yields.

In Ethiopia, shared kinship or membership of women in certain groups, informal forms of mutual insurance and frequent network member meetings are associated with improved access to information, a statistically significant and positive relationship with adoption of row-planting, and yields for both female and male networks. Given the U-shaped relationship between network size and innovation, the authors caution that the benefits from social networks depend on identifying the "right" networks (Mekonnen, Gerber and Matz. 2018).

4.2.7 Time poverty

Some studies highlight women's unpaid labor on husbands' farms, time poverty, lack of access to male labor, and gender-based violence as other factors that contribute to productivity gaps (Djurfeldt et al. 2019; van der Meulen 2018). Women's lower technical efficiency was associated with time constraints due to their involvement in household chores, the household size (bigger the house, more the chores) and limited access to quality inputs. Women farmers in Ghana are both time-burdened and time-poor, and experience low productivity compared to men (Atakli and Agbenyo 2020).

4.2.8 Market access

There is very limited evidence on whether access to markets catalyzes changes in crop management that would result in higher productivity. Although access to output markets did not affect productivity for women-managed plots, access to input markets (shorter distance to the markets) positively affected productivity for men-managed plots (Backiny-Yetna and McGee 2015). Further, qualitative insights from studies also show that some of the gender differentials in productivity are also a result of 'distinctive objectives and modes of production' associated customarily with families, women and men (i.e., men aiming more to improve productivity because of a focus on cash crops) (Smale et al. 2019).

4. ICT tools included in the study are radios, TVs, computers, mobile phones and telephones.

4.2.9 Women's agency and empowerment

A growing body of evidence postulates that empowering women may lead to socioeconomic benefits for not just the empowered women, but also for their households and their communities (Duflo 2012; Kabeer and Natali 2013; Klasen 2018). Women's empowerment and consequent bargaining power and decision-making positively affects household outcomes—including better food security and improved health of the household members—which could, in turn, result in a more productive workforce leading to higher productivity. However, very few studies focus on the links between women's empowerment and production outcomes (Quisimbing et al. 2023). The limited evidence does suggest that higher empowerment is positively linked to agricultural output, adoption of cash crops, and crop diversification (Wouterse 2019; Mobarok, Skevas and Thompson 2021; Avila-Santamaria 2017). A systematic review of 12 studies reports that women use higher levels of inputs and technology when empowered, and that increasing women's access to and use of productive resources leads to economic benefits from increased agricultural productivity (Anderson et al. 2020). Women in Myanmar that participated in decision-making were more technically efficient and optimally used inputs—and that positively impacted on-farm aquaculture performance (Aung et al. 2021).

It s estimated that a one-unit increase in women's production decision-making is associated with a 32 percent increase in maize productivity in Western Kenya. Adoption of yield-enhancing practices—in this case, push–pull technology that repels stemborers and suppresses Striga species—contributed to higher maize yields. The probability of adoption of push–pull technology is higher for households with empowered women (52 percent) compared with households with disempowered women (50 percent) (Diiro et al. 2018). Evidence from Bangladesh on jointly managed family farms cultivating rice suggests that improvement in women's economic empowerment is positively correlated with productivity change (Mobarok, Skevas and Thompson 2021). Similarly, in Niger, women's empowerment levels are positively related to farm output, and an increase in empowerment is likely to increase output in the same proportion (Wouterse 2019).

Farm input subsidy programs in Zambia (table 4) did not generate a disproportionate gain in agricultural productivity for female plot managers, because men were reported to channel subsidized inputs given to women to their own plots or sold some of them, and women were unable to hire or found it difficult to manage male labor (Ngoma, Machina and Kuteya 2019).

5. Costs and benefits of closing the gender productivity gaps

The extent of gender productivity gaps across low- and middle-income countries is well documented. The productivity gains from closing the gender gap in agriculture is also adequately substantiated. While it is particularly important from a policy perspective, there is scant evidence on the estimated benefits that can be expected if there was a decrease or outright elimination of the gender productivity gap in agriculture.

Over the past few years, some attempts have been made to identify the socioeconomic benefits from gradually reducing or closing gender productivity gaps at individual, local and national levels. A collaborative study by UN Women et al. (2015)—conducted in Malawi,

Tanzania and Uganda—and a follow-up paper by the same authors in 2018 using plot-level data highlight the cost of gender productivity gaps on crop production, agricultural GDP and national GDPs. It observed that closing gender productivity gaps (defined as the productivity difference between female- and male-managed plots) can increase annual crop output by 2.1 percent in Tanzania, 2.8 percent in Uganda and 7.3 percent in Malawi.

The spillover effect of higher agriculture output can lead to a potential gross gain of US$100 million to GDP or 1.85 percent of GDP in Malawi, US$105 million or 0.46 percent of GDP in Tanzania, and US$67 million or 0.42 percent of GDP in Uganda. Malawi can lift one-quarter of a million people out of poverty, reducing it by 2.2 percent; Uganda can bring down poverty by 0.90 percent; and Tanzania can reduce it by 0.41 percent; all in the same year through such a rise in GDP (UN Women et al. 2015). The same study which also studied Rwanda and Ethiopia separately observed that closing the gender productivity gap between women and men-managed farms in Rwanda could have resulted in a one-off increase of US$419 million in GDP for the year 2013–14 and one-third of the population of the poor could have been lifted out of poverty in the same year (UN Women and UNDP-UNEP PEI 2016). For Ethiopia, an increase of 1.4 percent of crop production due to closing the gender productivity gap could have resulted in a US$221 million increase in agricultural GDP (UN Women et al. 2015).

An approximation exercise conducted by Mukasa and Salami (2015) for Nigeria, Tanzania and Uganda revealed that closing the gender productivity gap will result in yield increases of 2.8 percent in Nigeria, 8.1 percent in Tanzania and 10.3 percent in Uganda. This rise will also lead to an increase in monthly consumption expenditure per adult equivalent (compared to current levels) by 2.9 percent, 1.4 percent, and 10.7 percent respectively. Shrinking the gap also has the potential to pull households with women-managed plots out of poverty in all three countries.

These simulations and modeling, however, have several limitations and challenges, and results should be interpreted with caution. In the countries studied, the comparison is made between female- and male-managed plots, and it is not clear how jointly managed plots (which are common among farming households in these study countries) were accounted for. Households that have jointly managed plots may likely be systematically different from households with a female- and male-managed plot dichotomy, and using the same parameters and simplistic assumptions for different types of farms and households in the modeling can be misleading.

6. Summary and recommendations

As explained in the overarching working paper (Lecoutere, Kosec, et al. 2023), the current thinking around gender equality and women's empowerment in agriculture and food systems has evolved from focusing on bridging gender gaps to promoting gender-transformative change. Gender gaps in access to resources and services, agricultural productivity, benefits derived from engaging with food systems, and food and nutrition security are visible manifestations or symptoms of structural constraints to equality. Gender-transformative change hinges on challenging those structural constraints to equality and power relations that maintain and exacerbate inequalities.

The emerging research on gender gaps reveals the complex relation between gender dynamics and farming systems, with some studies attempting to standardize data and estimates on gender productivity gaps on the one hand, and on the other some studies are

focusing on local contexts and regional and crop heterogeneity, highlighting the need for a nuanced approach. Such diverse findings make simple comparisons across time and space difficult, but they offer rich insights for a more comprehensive assessment of gender gaps.

Based on the review of the literature as described in this paper, we propose recommendations to improve the methods and approaches being used for gender productivity gaps estimation (to generate credible evidence) and recommendations on effective approaches to bridge productivity gaps (to inform policies, investments and development practice):

- **Use better study designs and sampling strategies when measuring and analyzing gender productivity gaps:**
    - Many studies continue to focus on a female- and male-headed household dichotomy. However, there is still very little evidence looking at farms that are jointly managed, or at differences between men's and women's plots in the same household. This continues to be a huge drawback, because jointly managed farms are the majority across continents. We need more and better data and methods to address this limitation. Analyses could categorize households along a gender (in)equality continuum linked to their productivity levels to inform programmatic investments and policy reform.
    - Studies continue to focus on land productivity, with a few beginning to look at labor productivity, which is also not without methodological challenges. There is a need to reflect on, and develop methods and tools for, appropriate measures of productivity that would be relevant.
    - We should be moving toward analyzing intrahousehold relations/decision-making/empowerment and how they affect household productivity, especially to understand the productivity dynamics in jointly managed plots.
    - To eliminate the challenges of biases in self-reported yield and market prices, we should use complementary data such as soil-quality parameters based on lab tests, and geospatial data for yield estimations.
    - Most productivity gap analyses continue to be monodisciplinary, and use standard models and decomposition methods which do not capture the social and intangible dimensions (such as social norms) which underlie productivity gaps. The move toward using mixed-methods research using qualitative tools and data needs to be strengthened further by engaging other disciplines such as anthropology, sociology, institutional economics, and political economy analyses.
- **Use an intersectional lens**: While differences between women and men are important, it is equally (or more) important to recognize and understand the intragender differences based on intersectional factors. Evidently, productivity and resulting gaps are mostly determined by access to resources. Such access is influenced by the identity of an individual—which is determined by a range of intersectional factors such as age, class, caste/ethnicity, location and others. This analysis is not necessarily onerous. Regression analysis should include interaction terms between gender and other social markers, and be presented in results. For qualitative research, diversity of women and men should be a criterion in sampling, and data and analysis should capture the differences.
- **Carefully select respondents**: Most studies do not reveal details on who and how many respondents per household were interviewed during surveys. Kilic, Moylan and Koolwal (2021) show how the selection of respondents influences the survey results in 'land ownership by women and men' in Malawi. This also holds true for information on plot size and quality, inputs and yields, etc. Surveys should first identify and target those who make decisions on different aspects of farm production. For plot-level data, it would be useful to have two respondents who are knowledgeable. This has the additional benefit of being able to obtain better recall data validated by two members of the household.

- **Create a more diverse portfolio of productivity gap analyses**: There are very limited studies on livestock and fisheries/aquaculture, which happen to be very important for the livelihoods of many women. Even among crops, the emphasis is on staple crops, but little on crops such as vegetables or other crops that are grown in smaller quantities, but that are critical for income, food and nutrition security for women.
- **Take a food-systems approach**: There are hardly any studies that look at whole farm productivity taking a systems view, including farm and nonfarm sectors. There are not many studies which focus on gender gaps in other nodes such as processing or value-addition where women play an important role. There is no evidence on whether market pull for a certain product or commodity motivates women farmers to invest in improving productivity.
- **Generate wider regional data coverage**: Most gender productivity gap studies continue to focus on Africa, leaving a huge vacuum in the evidence base for other regions, becoming a bottleneck in designing effective, context-specific policies and interventions. Large-scale, nationally representative datasets are not widely available for Asia. This data and evidence gap is critical and urgently needs to be filled.
- **Conduct impact evaluations**: Research on gender productivity gaps needs to move from diagnostics to impact evaluations (both quantitative and qualitative) on whether and how gendered targeting can have impacts on productivity, and what works for whom in which contexts and why. For policy and programming and along the lines suggested by Doss (2017), the focus can also shift to testing whether women-targeting or other gender-responsive or gender-transformative approaches (and to test design features of these approaches) can improve productivity and development outcomes. Increasing evidence points to the important role of women's empowerment in increasing productivity, but there is no systematic evidence on whether productivity changes have a transformative potential. Not much evidence is available on how policies and governance impact gender productivity gaps. Similarly, not much data is available to establish the impact of productivity on dietary, economic, livelihood and environmental outcomes.
- **Use multidimensional interventions and target them effectively**: To be effective, interventions need to be targeted, and aim to benefit and empower women. It requires moving beyond stand-alone interventions targeting single constraints (such as enhancing access to inputs) toward designing and implementing solutions that could change the system in a lasting manner by removing structural constraints and promoting positive and equal gender norms. Policy priorities and specific options vary depending on the regional contexts and specific farming systems (see van der Meulen 2018; World Bank and ONE Campaign 2014), and should be evidence-based.

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ANNEX AND GLOSSARY

Available at: https://hdl.handle.net/10568/129710.

GENDER Impact Platform

Generating Evidence and New Directions for Equitable Results (GENDER) is CGIAR's impact platform designed to put equality and inclusion at the forefront of global agricultural research for development. The Platform is transforming the way gender research is done, both within and beyond CGIAR, to kick-start a process of genuine change toward greater gender equality and better lives for smallholder farmers everywhere.

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