THE COST OF the Gender Gap IN AGRICULTURAL PRODUCTIVITY: FIVE AFRICAN COUNTRIES

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THE COST OF

the Gender Gap

IN AGRICULTURAL PRODUCTIVITY: FIVE AFRICAN COUNTRIES

This report is a joint product of the UN Women Regional Office for Eastern and Southern Africa (ESARO) and the United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative (UNDP–UN Environment PEI) Africa.

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Executive summary

Women represent over half of the agricultural labour force in Sub-Saharan Africa. Their substantive contribution to agriculture and their vital role in ensuring family food security have been widely documented. However, gender-based inequalities in access to and control of productive and financial resources inhibit agricultural productivity and undermine resilience and sustainability efforts.

A growing body of evidence points to a salient feature of the agricultural sector across Sub-Saharan Africa: lower rates of agricultural productivity for female cultivators than for male cultivators. Substantial gender gaps in productivity have arisen not because women are less efficient farmers, but because women experience inequitable access to land and to agricultural inputs. Such unbalanced distribution frequently stems from and is bolstered by deeply entrenched sociocultural norms and traditional expectations of gender roles. This structure of constraints is multifaceted. For example, women are more income- and time-constrained than men, which has repercussions on their ability to access credit, land and appropriate levels of inputs. These constraints thus lead to sizeable gender gaps in the adoption of high-value crops and in the use of agricultural implements, male family labour, pesticides and fertilizer, among other elements.

Within this context, the UN Women Eastern and Southern Africa Regional Office, the United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative Africa, and the World Bank commenced a collaboration to create evidence of the links between women's economic empowerment, sustainable agricultural production and economic growth. The evidence clearly shows that gender gaps in access to inputs have high economic costs and can affect the extent to which farmers adopt new resource management practices and technological innovations.

This report reviews a number of studies to help policymakers diagnose and better understand the nature of these gaps so that agricultural interventions are more effective, scalable and practical. These methods help quantify the structure of constraints which prevent women from having full access to agricultural resources. Dismantling this structure of constraints is crucial for reducing women's unpaid work burdens and raising the returns to their labour. The means towards these ends include policy reforms in five key areas:

- Increasing women's access to labour and time-saving equipment and services
- Facilitating women's shift to high-value crops
- Improving women's access to non-labour agricultural inputs

- Strengthening women's land rights
- Pursuing other interventions to close the gender gap

Examples of such reforms include the development of infrastructure which reduces women's time in unpaid work, initiatives that promote gender-aware agricultural extension services and improved access to information, interventions to provide women with more equitable access to credit, reforms to combat gender-based violence and closing the gender gap in the application of climate-smart agricultural practices.

The bottom line of most of these policies is that more effective targeting can work to reallocate constrained resources in socially optimal ways.

Introduction

Agriculture continues to be an important engine for growth in Africa's local and regional economies; the sector employs a substantial proportion of the population and is the basis for food security.

Women represent over half of the agricultural labour force in Sub-Saharan Africa. Their substantive contribution to agriculture and their vital role in ensuring family food security have been widely documented. However, gender-based inequalities in access to and control of productive and financial resources inhibit agricultural productivity and undermine resilience and sustainability efforts.

Empowering women in agriculture and reducing gender disparities would be consistent not only with the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, but also with a host of regional and international conventions and frameworks related to women in agriculture. Notably, the African Union's declaration of 2015 as the Year of Women's Empowerment and Development towards Africa's Agenda 2063 and the 2003 adoption of the "Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa" (commonly known as the Maputo Protocol) both speak to gender in the context of Africa's long-term development agenda.[1] Further, a number of International Labour Organization (ILO) conventions focus on promoting equality in the workplace and call for governments to ensure decent work conditions for women.[2] These initiatives will help facilitate broader policy and institutional frameworks supporting women farmers and correcting gender imbalances in the agricultural sector.

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A growing body of evidence points to a salient feature of the agricultural sector across Sub-Saharan Africa: lower rates of agricultural productivity for female cultivators relative to male. Substantial gender gaps in productivity have arisen not because women are less efficient farmers, but because women experience inequitable access to land and to agricultural inputs. Such unbalanced distribution frequently stems from and is bolstered by deeply entrenched sociocultural norms and traditional expectations of gender roles. This structure of constraints is multifaceted. For example, women are more income- and time-constrained than men, which has repercussions on their ability to access credit, land and appropriate levels of inputs. These constraints thus lead to sizeable gender gaps in the adoption of high-value crops and in the use of agricultural implements, male family labour, pesticides and fertilizer, among other elements.

Within this context, the UN Women Eastern and Southern Africa Regional Office, the United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative Africa, and the World Bank commenced a collaboration to create evidence of the links between women's economic empowerment, sustainable agricultural production and economic growth. This effort resulted in an initial report in 2015 and two sets of studies by UN Women and PEI in 2017 on the cost of the gender gap in agricultural productivity. This report provides an overview of the key trends identified in these studies and how they compare with patterns documented in other published studies. The UN Women–PEI studies focus on five Eastern and Southern African countries: Ethiopia, Malawi, Rwanda, Tanzania and Uganda.

The present report also summarizes lessons on best practices in eradicating inequities in the agricultural sector emerging from the UN Women and PEI studies. These reforms and best practices can be grouped into five areas, each of which addresses an important driver

of the gender productivity gap for most if not all of the focus countries:

- Increase women's access to labour and time-saving equipment and services
- Facilitate women's shift to high-value crops
- Improve women's access to non-labour agricultural inputs
- Strengthen women's land rights
- Pursue other interventions which close the gender gap, such as initiatives that improve women's access to credit, provide skills training, and help end their isolation from social and market networks facilitating the flow of productivity-enhancing information

Implementing these reforms and best practices will require targeted interventions to address the deeper structural constraints facing women in the agricultural sector. For instance, rectifying the debilitating effect of poor or absent infrastructure on women's unpaid work will have large positive effects on their productivity. Policymakers also need to consider creating an enabling environment for women in agriculture through interventions such as protecting them from gender-based violence. Interventions need to be designed which directly target women farmers, encouraging the use of climate-smart agricultural practices — particularly by enforcing gender-aware agricultural extension services — and correcting gender biases in statutory and customary laws. These policy reforms, whether applied in isolation or in tandem, have the potential to transform women's lives in developing countries such that their labour is valued on an equal basis with that of men.

Methodology and scope

Beginning in 2015, UN Women, PEI and the World Bank undertook a set of studies on how gender differences in access to agricultural inputs affect agricultural production and economic growth. The studies ultimately covered five countries and utilized both quantitative and qualitative methods. The first, "The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda," was a quantitative study conducted in 2015, with similar quantitative studies undertaken in Ethiopia and Rwanda in 2017. These five countries were selected for several reasons, including their potential for valuable policy lessons for the region as well as the availability of high-quality, nationally representative household survey data with information on household characteristics and on agricultural inputs and output.

Policy reforms can potentially make women's labour be valued on an equal basis with that of men.

Another criterion in country selection was the relative importance of the agricultural sectors. As shown in Table 1, the agricultural sector has accounted for at least one-quarter of gross domestic product (GDP) in the five focus countries over the past six years. More dramatically, agricultural sector growth accounts for roughly 60 per cent of total GDP growth on average in Ethiopia, Malawi and Rwanda; and for about 40 per cent of total GDP growth in Tanzania and Uganda. Hence, agriculture remains a major driver of economic growth in these countries.

The quantitative studies provide estimates of the monetary value of the gender gap in agricultural productivity for each country and then calculate the costs associated with gender gaps in access to individual agricultural inputs. These gender gaps in agricultural productivity are calculated as the unconditional values of

TABLE 1

GDP growth and agricultural sector growth in the five countries

Country	2010	2011	2012	2013	2014	2015	2016	Average
Agriculture, value added (% of GDP)								
Ethiopia	44.7	44.7	48.0	44.9	41.9	39.2	37.2	43.0
Malawi	31.9	31.2	30.6	30.8	30.8	29.7	28.1	30.4
Rwanda	30.6	30.4	31.0	30.8	30.9	30.2	31.5	30.8
Tanzania	32.0	31.3	33.2	33.3	31.4	31.5	31.5	32.0
Uganda	28.3	27.0	28.0	27.4	27.1	26.1	25.8	27.1
Agriculture, value added (annual % growth)								
Ethiopia	5.1	9.0	4.9	7.1	5.4	6.4	2.3	5.8
Malawi	6.8	4.3	-0.1	6.6	5.9	-2.0	-2.3	2.7
Rwanda	5.0	4.7	6.5	3.3	6.6	5.0	3.9	5.0
Tanzania	2.7	3.5	3.2	3.2	3.4	2.3	2.1	2.9
Uganda	2.9	3.1	0.6	1.9	2.7	2.3	2.8	2.3
GDP growth (annual %)								
Ethiopia	12.6	11.2	8.6	10.6	10.3	10.4	7.6	10.2
Malawi	6.9	4.9	1.9	5.2	5.7	2.8	2.5	4.3
Rwanda	7.3	7.8	8.8	4.7	7.6	8.9	5.9	7.3
Tanzania	6.4	7.9	5.1	7.3	7.0	7.0	7.0	6.8
Uganda	5.6	9.4	3.8	3.6	5.1	5.2	4.7	5.3

SOURCE: World Bank, World Development Indicators database, 2018, http://databank.worldbank.org/data/home.

the male-female differential in the value of agricultural output per hectare of cultivated land. The reports for Ethiopia, Malawi, Tanzania and Uganda also report conditional gender gaps which take into account gender differences in plot size and regional variations in agro-climatic conditions across each country (the data for Rwanda did not have information on plot size). The conditional gaps tend to be larger than the unconditional gaps because, on average, women work on smaller plots than men and are subject to more variable climate conditions. The costs associated with these gender gaps are calculated by first converting the agricultural output produced by female and male farmers at the plot level into monetary values by multiplying plot output by crop-specific prices, then estimating the proportion of land cultivated by female and male farmers and combining that proportion with the gender productivity gap, and then calculating the size of the gap in relation to agricultural GDP and overall GDP.

This report also summarizes results on how much various factors of production contribute to the overall gender productivity gap. These estimates are based on a decomposition procedure commonly used in the labour economics literature (e.g. Autor, 2015) to explain the drivers of the gender wage gap. The procedure essentially decomposes the male-female agricultural productivity gap into a portion explained by gender differences in **access to various factors of production**, and a portion explained by gender differences

in the **market returns to those factors of production**. This report provides results from this decomposition procedure for the six factors of production that explained most of the gender gap:

- Access to male family labour
- Planting of high-value crops
- Use of agricultural equipment/implements
- Use of pesticides
- Use of inorganic fertilizer
- The wealth index

Of course, there are other challenges beyond these six factors which inhibit women's agricultural productivity. Some of these challenges are not reported here because they are not easily measured and are not captured in the underlying survey data; others are not reported because their contribution in the decomposition procedure was relatively small.[3]

To complete the analysis, this report draws on a set of follow-up qualitative studies — "Factors Driving the Gender Gap in Agricultural Productivity" — conducted by UN Women and PEI in 2017 in Malawi, Tanzania and Uganda. These studies provide field-level analysis of the factors in each country driving the gender gap in agricultural productivity and the adoption of climate-resilient approaches to provide specific policy and programmatic recommendations. The qualitative evidence supplements the quantitative studies, as the latter did not highlight all the factors that could explain the gender gap, nor did they go into much depth as to the socioeconomic, institutional and policy constraints which play a role in determining inequitable access to labour and non-labour agricultural inputs.

The qualitative data from the UN Women–PEI studies were collected via a variety of methods, including interviews and stakeholder consultations. Combining quantitative methods with qualitative can be useful for better understanding the dynamics of gender differences in the empirical results, thus helping provide more comprehensive information to policymakers as they consider reforms to close these productivity gaps. Changes in women's agricultural productivity are highly dependent on local contexts, so survey-based data collection techniques may be inadequate in capturing some dimensions of well-being, status, self-esteem, empowerment, social norms and self-perceptions. Bringing together empirical analysis of original survey data with qualitative methods helps yield a richer depiction of gender relations (Box 1).

The gender gap in agricultural productivity in Africa

Numerous Sub-Saharan Africa countries are characterized by substantial gender differences in agricultural productivity. The gaps in the five focus countries are considerable, ranging from about 11 to 12 per cent in Ethiopia and Rwanda to 28 per cent in Malawi (Figure 1a). These yield differences for male and female farmers vary across countries for a number of reasons which differ by country — including gender gaps in the use of fertilizers and improved seed varieties, access to and use of credit, ownership of land and availability of labour.

Gender gaps in agricultural productivity for the five focus countries are within the range of those estimated in other published studies which have used comparable methods (Figure 1b). These gender gaps average around 20–30 per cent across Sub-Saharan African countries for which there are data, with the smallest gap in Kenya (8 per cent) and the largest in northern Nigeria (35 per cent). It would be interesting to explore why the gap appears to be so low in Kenya. This 8 per cent estimate comes from a summary chart published by the World Bank (2012), which in turn drew from an older study by Saito, Mekonnen and Spurling (1994). The only more recent study to examine the gender

BOX 1

The importance of good sex-disaggregated data

The empirical work in the UN Women and PEI reports is largely based on data for male- and female-controlled plots of land. Such data are not widely available, and proxies and extrapolations typically must be made. In particular, the World Bank's Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA), which has been conducted in several Sub-Saharan African countries, collects data on who in the household owns, manages and works each plot of land. While the LSMS and similar large-scale national surveys are conducted at the household level, they include some sex-specific information on individuals within the survey design.[4] Such surveys have the advantage of allowing the researcher to draw conclusions at that scale, and can provide insights into gender differences that can be used as a context for more detailed studies.

In most countries, large-scale surveys are conducted at the household level without including any sex-disaggregated information on agricultural inputs and outputs. In such cases, gender is often proxied by male- and female-headed households, which is not an optimal solution. In male-headed households, both spouses are usually present; in female-headed households, a husband is usually not present. This approach thus conflates measures of household composition with the sex of the household head. Moreover, comparisons between male- and female-headed households do not consider the endogeneity of female headship. Hence the welfare implications of female headship differ with the reasons for female headship. As a practical illustration of this issue, men and women farmers in Ghana make the same maize adoption decisions if they are in male-headed households, but farmers in female-headed households are less likely to adopt improved varieties (Doss and Morris, 2001). This finding suggests that female-headed households face constraints not faced by farmers in male-headed households.

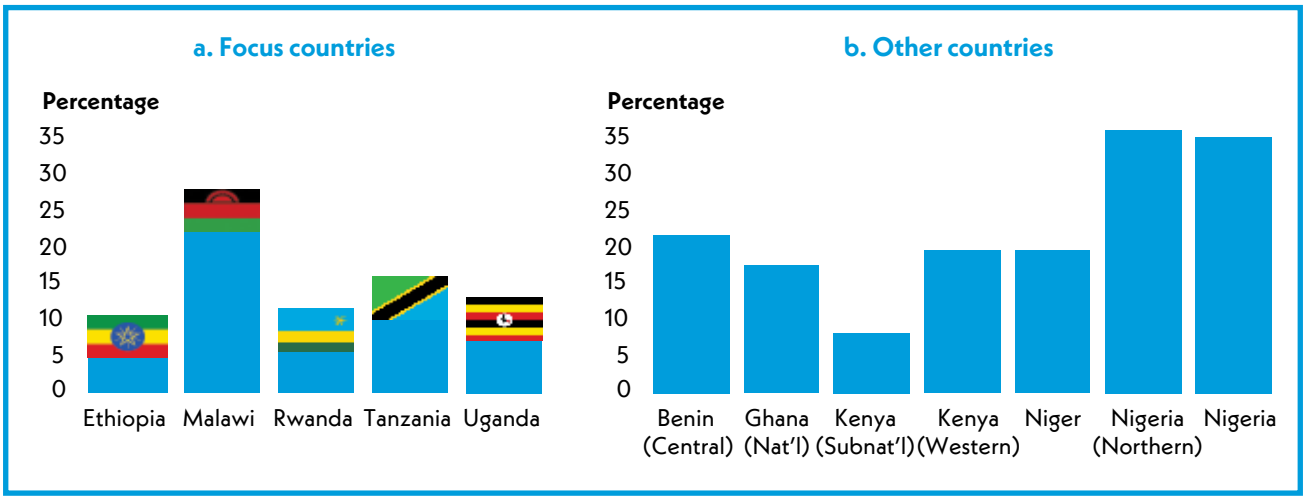
Understanding the significance of gender differences is best addressed by developing research designs based on sex-disaggregated data and by adding an explicit gender dimension to the analysis. Small-scale surveys are more manageable in terms of resource and time costs, but have disadvantages for programmes targeting mega-environments spanning several regions and/or agro-ecological zones. One compromise is to use large-scale data sets to identify the types, levels and range of different gender gaps or indicators of gender gaps (for example, in cell phone ownership or access to credit). Based on this analysis, sub-populations and areas with different types of gender inequality can then be selected within which to collect more detailed agriculturally specific data that are disaggregated by sex. This approach was followed by the UN Women and PEI reports on the cost of the gender gap, with the 2015 quantitative studies based on large-scale nationally representative survey data, and the 2017 follow-up studies in Malawi, Tanzania and Uganda taking a more in-depth approach using qualitative methods.

productivity gap in agriculture in Kenya was conducted by Alene et al. (2008), but this study was limited to maize production in western Kenya. The researchers did find a gender gap of 19 per cent in western Kenya, which is more in line with that of the other countries shown in Figure 1.

The gender gap in agricultural productivity is linked to unbalanced access to agricultural inputs and to women's relatively insecure land rights. Underlying this inequitable distribution in the allocation of inputs are social norms dictating gender roles and the gendered division of labour in households and the

FIGURE 1.

Gender gap in agricultural productivity across selected countries



SOURCES: 1a: Ethiopia Ministry of Agriculture and Natural Resources and UNDP-UNEP PEI Africa, 2017; UN Women and UNDP-UNEP PEI, 2015; UN Women, UNDP-UNEP PEI and World Bank, 2015. 1b: Backiny-Yetna and McGee, 2015 (Niger); Oseni et al., 2015 (Nigeria); World Bank, 2012 (remainder).

NOTE: Data points represent the unconditional values of the male-female gap in agricultural productivity, defined as the value of agricultural output per hectare.

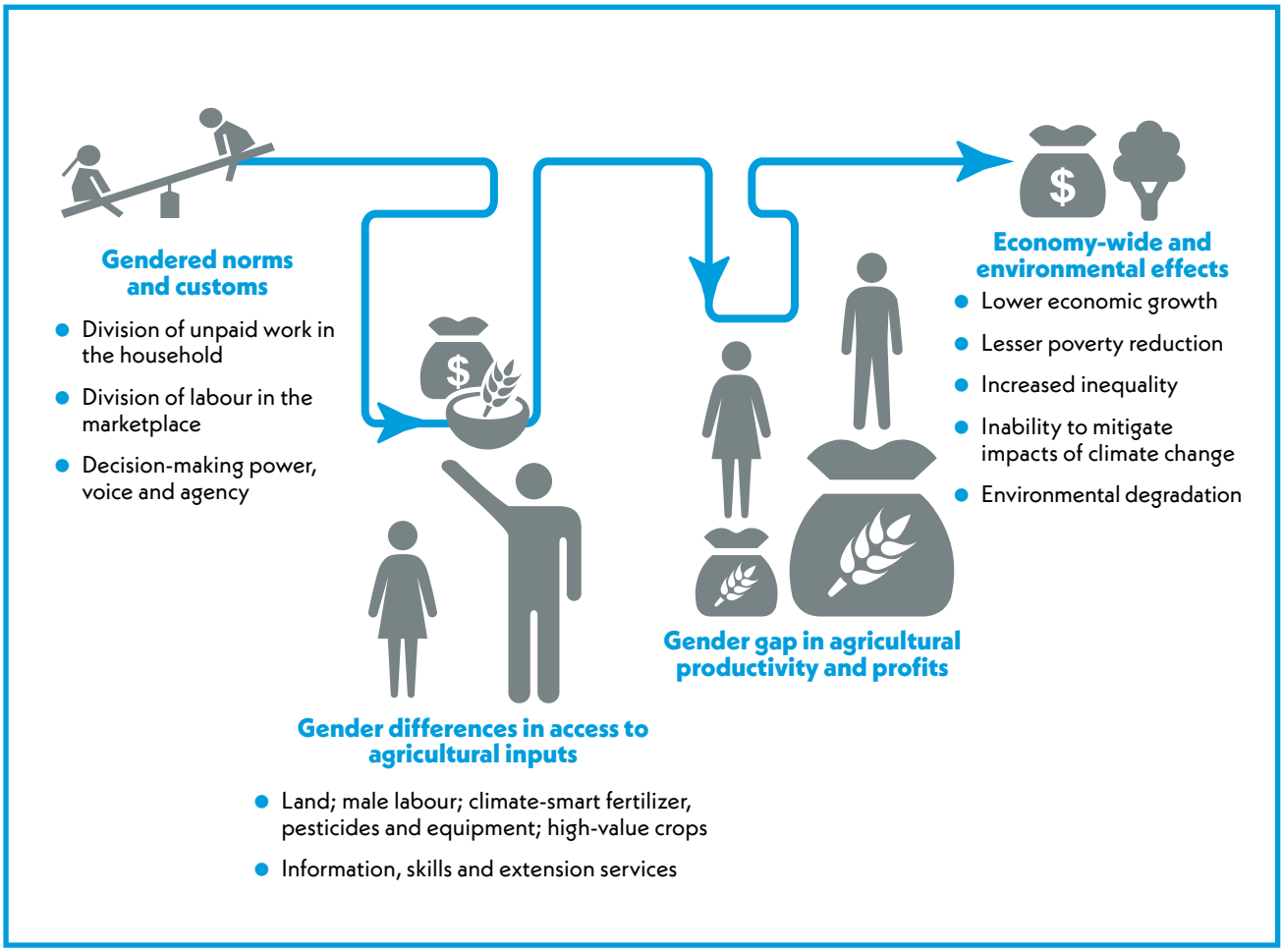
market place (Figure 2). Closely intertwined with these social norms are deeply engrained gender stereotypes, laws and policies that discriminate by sex, and the lack of an enabling environment for women farmers. Gendered norms and customs affect input use, productivity and income generation; they also affect producers' adoption decisions and who benefits from innovations. In other words, the culture around gender norms interacts with the use of key productive inputs such as land, and this interaction affects decisions which will condition farmers' adoption and investment decisions. Even if land, labour and fertilizer were equally allocated between male and female farmers, gender gaps in agricultural productivity would still be observed due to the interaction of gendered norms with many factors of production — some of which are more easily measured and addressed than others.

Gender gaps in access to inputs and agricultural productivity often stem from the perpetuation of cultural norms which dictate that child care and housework are primarily a woman's domain. The expectation that women are responsible for unpaid housework places a large time burden on them and — together with high rates of economic activity in the poorest countries — results in a double work burden for women. This extra burden can translate into gender-inequitable distributions of inputs and resources within households and on farms.

Primary endowments such as men's and women's labour can have very different productive roles in agricultural settings which are subject to strong gender norms. Social norms around gender are not simply constructs which individuals sense: they are tangible structures and impediments rooted in organizations, economic transactions and group characteristics; and vary by region and along social and demographic dimensions. The existence of these norms and constraints means that development policies and projects in agriculture (such as training programmes and farmers associations), as well as technological innovations, may vary in their levels of success across local settings. Dismantling a structure of constraints is crucial for closing the gender gap in agricultural productivity.

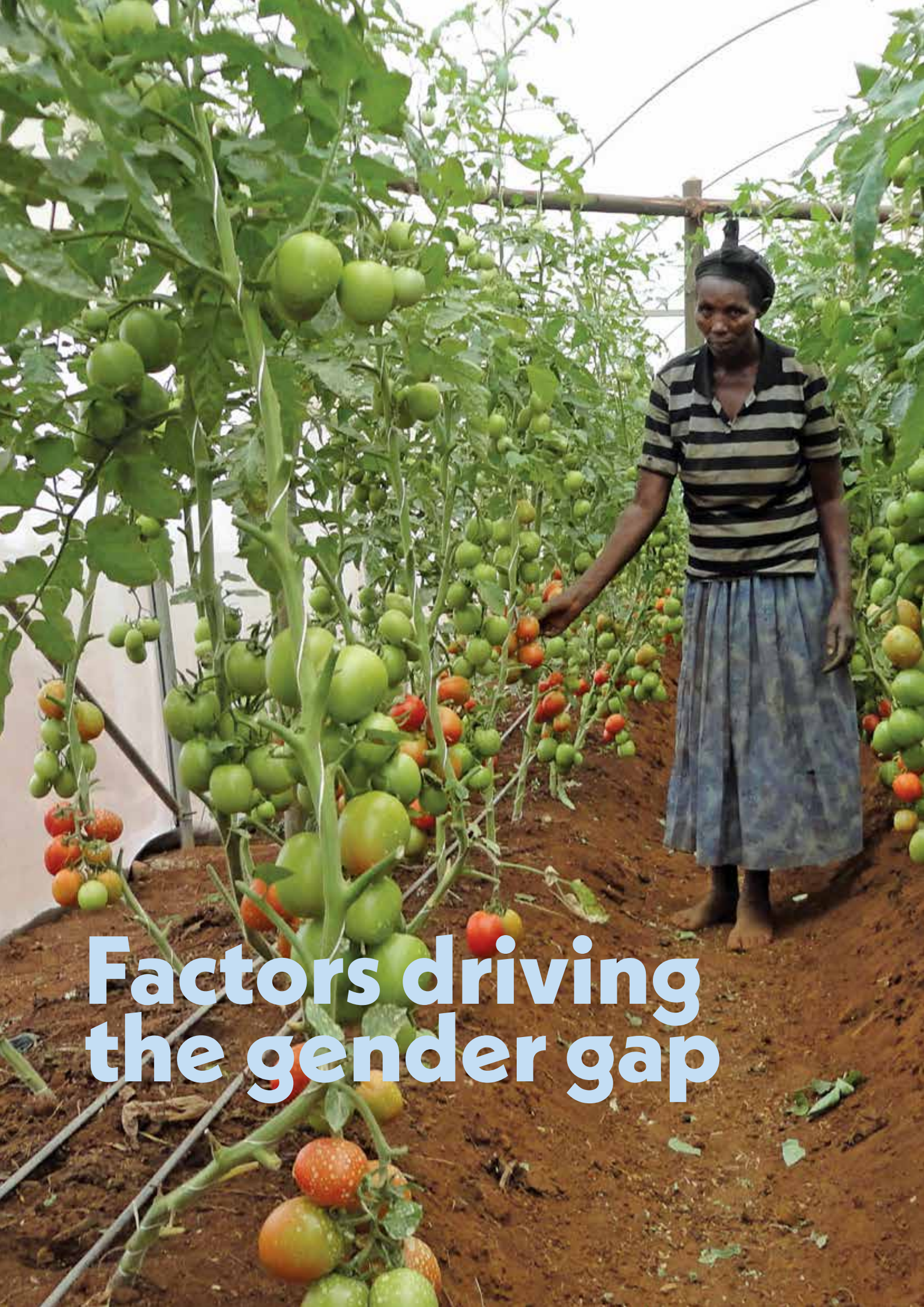
FIGURE 2

Path model of the gender gap in agricultural productivity



Low agricultural productivity is also an environmental sustainability issue, and is further exacerbated by climate change. Low productivity levels lead to more intensive land use, perpetuating a vicious cycle of environmental and natural resource degradation and reduced productivity. In many African countries, the productivity of major crops is significantly below potential due to reduced soil fertility and soil erosion driven by unsustainable and changing land use practices, including inefficient use of chemical fertilizers and pesticides (FAO, 2013). Additionally, increasing mean temperatures and changes in rain patterns will have profound impacts on agriculture (FAO, 2016). Food systems contribute up to a third of greenhouse gas emissions and must therefore be part of the solution to reducing global warming (Vermeulen et al., 2012).

Ongoing processes of climate change are likely to have different impacts on men and women farmers, who then may adopt differential coping and adaptation strategies in response. But gender gaps in agriculture affect how women and men are able to access, participate in, adopt and benefit from climate-smart agriculture. Taken together, climate change and gender-differentiated adaptation to climate change have significant implications for poverty reduction. The agriculture sector can play an important role in gender-responsive climate mitigation and adaptation, but environmentally sustainable and climate-smart approaches to agriculture are not yet mainstream (FAO, 2013).



Factors driving the gender gap

In the five focus countries, women's limited access to agricultural inputs and factors of production is the main culprit behind the gender gap in agricultural productivity. Analysis of the costs associated with unbalanced access to agricultural inputs can help policymakers set priorities among alternative interventions. To ensure the biggest "bang for the buck" in policy interventions, this section aims to identify and focus on the most costly constraints to women's productivity by examining which factors of production account for the largest portion of the gender gap in agricultural productivity. The discussion draws on estimates in the quantitative UN Women and PEI reports.

Key factors for the five focus countries

Table 2 reports results from this decomposition procedure for the six factors of production which explain most of the gender gap in Ethiopia, Malawi, Tanzania and Uganda. The decomposition procedure for Rwanda yielded substantially different results, partly because the structure of the underlying survey data differed from that used for the other countries. Therefore, the factors of production differ accordingly and are reported separately, as described below.

Limited access to male family labour

As shown in Table 2, one of the largest contributors to the gender gap in agricultural productivity is **access to male family labour**, especially in Ethiopia, Malawi and Tanzania. Typically, women have less access to male family labour in cases of divorce, separation and widowhood. Women are also subjected to social norms around gender that make it very difficult to hire male wage labour. Moreover, women's relatively high burdens of unpaid care work and domestic work leave them time poor, with less ability than men to invest their own labour in agricultural work. In Tanzania, women's relatively lower access to male family labour explains virtually the entire gap in agricultural productivity, costing the economy about $102 million. In Malawi and Ethiopia, inequitable access to male family labour accounts for about 45 per cent of the agricultural productivity gap, with an accompanying cost to the overall economy of $45.1 million in Malawi and $89.0 million in Ethiopia. These results are consistent with findings in the qualitative reports that the quantity and quality of labour to which women have access is poor compared to men's access. Moreover, the time women spend on unpaid care work limits the time and quality of labour they can devote to their farms. It is not clear why access to male labour appears to play little to no role in explaining the gender gap in Rwanda and Uganda. One possible explanation is that Rwanda and Uganda are among the few countries in Africa which have implemented gender-responsive budgeting. Such budgeting efforts often target agriculture and poverty reduction, which might have provided some cushion for women in these countries (Budlender, 2000).

Women's limited use of agricultural implements and machinery

Among the other imbalances, the gender differential in the **use of implements and machinery** explains 18 per cent of the gender gap in Malawi, 9 per cent in Uganda and 8 per cent in Tanzania. This gender imbalance in access to equipment costs as much as $17.7 million in lost GDP in Malawi. (For Ethiopia and Rwanda, it appears that the underlying data sets did not contain variables which directly measure women's and men's access to implements and machinery.) As discussed in the qualitative reports, one of the main reasons for this gender imbalance in

TABLE 2

Decomposing the gender productivity gap in agriculture in five countries

Driver	Ethiopia		Malawi		Rwanda		Tanzania		Uganda	
	Gap (%)	Gap in GDP (mil. $)	Gap (%)	Gap in GDP (mil. $)	Gap (%)	Gap in GDP (mil. $)	Gap (%)	Gap in GDP (mil. $)	Gap (%)	Gap in GDP (mil. $)
Access to male family labour	43.7	89.0	45.2	45.1			97.3	102.1	—	—
Planting of high-value crops	—	—	28.4	28.4			3.0	3.2	13.3	8.9
Use of equipment/implements	—	—	17.8	17.7			8.2	8.6	9.0	6.0
Use of pesticides	45.3	92.2	1.0	1.0			12.0	12.6	4.5	3.0
Use of inorganic fertilizer	25.1	51.0	5.3	5.3			6.4	6.7	3.0	2.0
Wealth index	—	—	5.3	3.3			−0.1	−0.1	—	—
Sales of household farm production					67.0	280.5				
Household size					22.5	94.1				
Spending on insecticides					12.8	53.7				
Years of education					11.5	48.3				

SOURCES: Ethiopia Ministry of Agriculture and Natural Resources and UNDP-UNEP PEI Africa, 2017; UN Women and UNDP-UNEP PEI, 2015; UN Women, UNDP-UNEP PEI and World Bank, 2015.

NOTE: Decomposition categories differ for Rwanda because of differences in underlying survey data. Percentages do not sum to 100 because the decompositions include other categories with negative values. Percentages do not sum to 100 because a number of drivers can be negative. Only a selection of those that reduce the gender gap are shown here, and together, they may overcompensate.

access to equipment is women's lack of cash income given their responsibility for meeting household maintenance needs.

Limited access to high-value crops enterprise

Gender differences in the **planting of high-value crops** account for another 28 per cent, 3 per cent and 13 per cent of the gender gaps in Malawi, Tanzania and Uganda, respectively; with a cost to GDP of over $28 million in Malawi, $3.2 million in Tanzania and almost $9 million in Uganda. High-value crops include cash crops and exported crops, which are typically farmed by men; women are more likely to plant subsistence crops. The qualitative reports attribute these disparities to social norms which dictate that women have primary responsibility for household food production. Moreover, women may be unable to scale up to the level required for high-value crops if they are constrained by plot size and/or ownership. Women's lower likelihood of planting high-value crops may also be an outcome of limited access to climate change adaptation tools and extension services; this lack of access is related not only to cash income constraints but also to women's relative time poverty given their need to perform domestic work and care labour.

The gender differential in high-value crops comprises the highest proportion of the overall gender gap in agricultural productivity in Uganda. Women in Uganda appear to be particularly burdened by the cash and time constraints of their unpaid care and domestic work — which results in their not growing higher-value crops or having the requisite cash to access better agrarian technologies. Uganda is distinct among the five countries in farm production practices in that women are relatively less available to work on

Women are more likely to plant subsistence crops.

their own plots of land due to social norms that create the expectation that women work on plots jointly controlled by their husbands. In fact, women are expected to work on their husbands' plots before working their own land. These norms reduce women's likelihood of investing in higher-value crops on their own plots of land.

Women's limited access to agricultural inputs

Female-controlled plots have relatively lower yields because important **inputs such as inorganic fertilizer and pesticides** are used mostly on male-controlled plots. Organic fertilizers are usually produced by livestock owned by a household, while inorganic fertilizers are purchased in the marketplace. In most countries, women tend to have less access to both types of fertilizer. One of the primary explanations for women's relative lack of access to fertilizers and pesticides is their relatively lower cash income, which is related to heavy demands on their time in performing unpaid work at home. As shown in Table 2, gender differentials in the use of pesticides and fertilizer are particularly large in Ethiopia, explaining 45 per cent and 25 per cent of the total agricultural productivity gap, respectively. The cost in terms of lost GDP in Ethiopia is enormous: $92.2 million lost due to inefficient allocations of pesticides and $51 million lost due to inefficient allocations of fertilizer. The report for Ethiopia points to particularly large income and wealth constraints for women which prevent them from being able to purchase as many modern plant protection technologies as men, including pesticides, herbicides and fungicides. In an apparent attempt to compensate for these deficiencies, Ethiopian women are more likely to rely on self-provided non-land and non-labour farm inputs, especially organic fertilizer. While organic fertilizer has beneficial effects for soil quality, women's over-reliance on this input reduces the productivity of their plots compared to those of men using chemical fertilizers. Gender differentials in the allocation of pesticides and fertilizers also play a relatively large role in Tanzania, collectively explaining almost one-fifth of the overall agricultural productivity gap.

Inputs such as inorganic fertilizer and pesticides are used mostly on male-controlled plots.

The results in Table 2 are not directly comparable for Rwanda, because the underlying data set did not contain information for the same categories and because different agricultural input categories were economically meaningful and statistically significant. That said, the results for Rwanda indicate that women's **inequitable access to cash crops** explains about two-thirds of the gender gap (with a resounding $280.5 million cost to the country's GDP), while access to pesticides accounts for another 13 per cent. The remaining two categories relate to gender differences in household size (which is largely picking up a higher dependency ratio for women) and in average years of education.

Factor findings of comparable studies

The decomposition results for the five focus countries are consistent with those published for other countries using the same methodology. In particular, Backiny-Yetna and McGee (2015) find that in **Niger**, the most important gender differentials explaining the total productivity gap occur in access to male labour, the use of inorganic fertilizer and land ownership.

These factors also matter in **Nigeria**, albeit with different emphases. In northern Nigeria, gender differences in the market returns to factors of production (the explained part of the gap) matter more than gender differences

in access to these factors of production. The opposite holds in southern Nigeria, where virtually the entire gender gap in agricultural productivity is explained by gender differences in access to inputs, especially land holdings (Oseni et al., 2015). The authors point to cultural differences between the north and south that could explain these differences. Notably, the north is predominantly Muslim, so women may be more constrained in hiring male labour and accessing markets.

World Bank (2012) decomposition results for **Benin, Ghana and Kenya** indicate that gender differences in access to inputs account for most if not all of the total gender gap in agricultural productivity.

Numerous published studies across developing regions have documented that once access to inputs such as land, fertilizer, labour and credit is taken into account, women are as productive and technically efficient as men. That is, the main explanation for the gender gap in agricultural productivity is not that women are less efficient cultivators. Rather, there is an inefficient allocation of land, labour and other agricultural inputs among household members. Much of the evidence to support this claim comes from Sub-Saharan Africa. For example, in **Burkina Faso**, plots controlled by women have lower yields than similar plots simultaneously planted with the same crop but controlled by men within the household. The main explanation is that inefficient allocations of land, labour and inputs such as fertilizers contribute to lower yields for plots controlled by women.

Results indicate that reallocating factors of production in a more efficient manner could increase output by 6 per cent (Udry 1996). Duflo and Udry (2004) find an inefficient allocation of resources in **Côte d'Ivoire**, where strong gender norms dictate that men and women farm their own plots without trying to maximize joint household production. The authors find that rainfall shocks which increase the output of crops predominantly cultivated by women shift expenditures towards food, while rainfall shocks affecting cash crops cultivated by men have no effect on food expenditures. Hence, the potential economic gains from reducing the gender gap translate into poverty reduction and improved nutritional outcomes.

In **Kenya**, female farmers are found to be as responsive to price incentives in terms of output supply and input demand as male farmers, and as economically efficient when agricultural inputs and human capital factors of production are taken into account (Alene et al., 2008).

Inefficient allocation of agricultural inputs, not inefficiency of women farmers, is the main explanation for the gender gap in agricultural productivity

In **Malawi**, although men use more fertilizer, enjoy greater access to extension services and devote relatively more land to cash crops, experimental results indicate that female farmers are no less efficient than male in terms of crop yields when they are provided with equal access to inputs (Gilbert, Sakala and Benson, 2002).

As a final example of the large number of studies on the gender gap in agricultural productivity in Sub-Saharan Africa, in the Osun state of **Nigeria**, female rice farmers are actually more technically efficient than male, particularly when age and years of education are controlled for (Oladeebo and Fajuyigbe, 2007).

Other significant factors of production

Although the decomposition results summarized in Table 2 do not include access to

credit and land rights as the primary drivers of the gender gap in the focus countries, these factors of production do play a role in influencing crop choice and access to key agricultural inputs.

Women have faced difficulties in **accessing formal credit** through commercial banks due to their lack of collateral; this problem is exacerbated by weak or non-existent property rights for women. Credit market imperfections in turn can have greater adverse effects on women's ability to engage in income-generating activities and purchase farm inputs (Palacios-López and López, 2015).

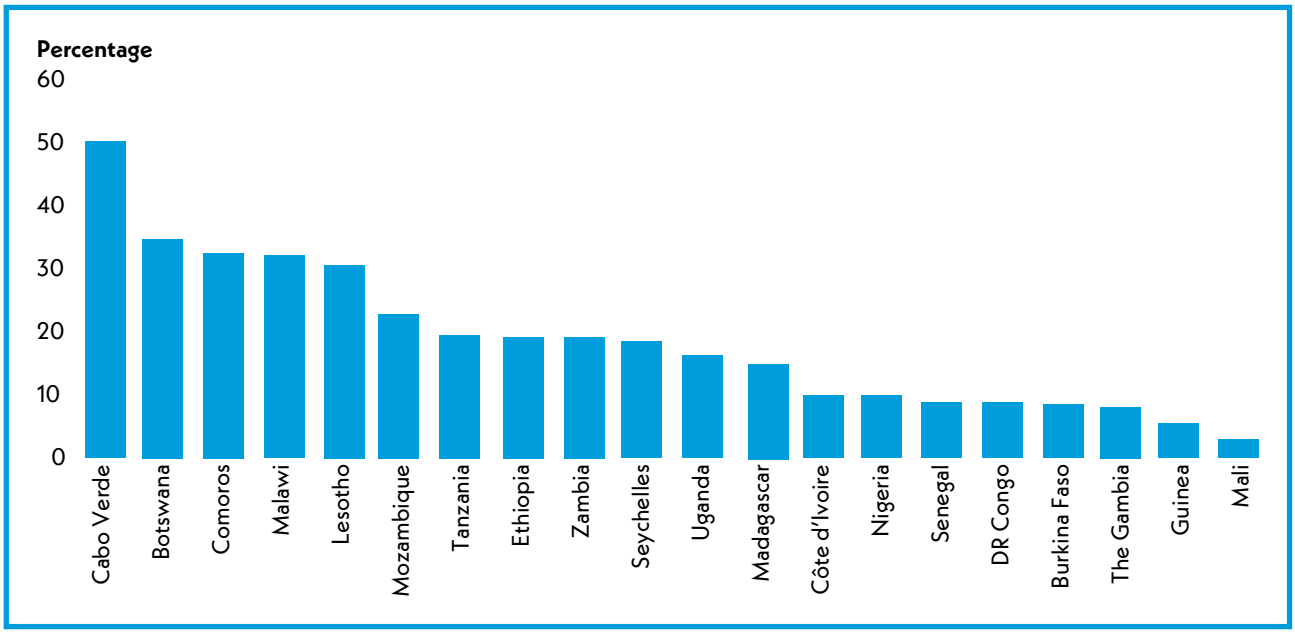
Although **access to land** may not always be a binding constraint, it has implications for the scale of farming women can engage in and how productive they can be. This, in turn, affects their ability to generate a marketable surplus. Hence, greater gender equality in access to credit and in land ownership could increase women's engagement in agricultural markets.

Across developing regions, women own and control substantially less land than men.[5] In most African countries, where women's control over land depends on customary tenure systems, the variation in women's control over land is more substantial than in other regions. This circumstance partially reflects variations across countries in the importance of community-held land and in the extent to which countries have patrilineal versus matrilineal communities. In all Sub-Saharan African countries for which there are data on land holdings and ownership, about 19 per cent of agricultural land holders are women. As shown in Figure 3, this average hides considerable variation. At one extreme is Cabo Verde, where about 50 per cent of all agricultural holders are women; at the other extreme, the share of land held by women is no more than 6 per cent in Guinea and Mali.

Looking more closely at some of the reasons for women's lack of land rights, Goldstein and Udry (2008) find that in rural Ghana, women have relatively less social and political power

FIGURE 3

Percentage of individual landholders in various African countries who are women



SOURCE: Food and Agriculture Organization of the United Nations, Gender and Land Rights Database, 2018, www.fao.org/gender-landrights-database/en/.

in villages, are less likely to have secure land rights, and consequently, are less likely to invest in improving land fertility. The authors attribute women's substantially lower profits per hectare compared to men primarily to women's insecure land tenure and the heightened risk women face of having their land expropriated. The implications of these gender inequities in land holdings for agricultural investments and output are enormous: insecure land tenure reduces the incentive of farmers to invest either in their land or in high-value crops.

Gains from closing the gap

Gender gaps in agricultural productivity in Sub-Saharan Africa are sizeable. The potential economic gains from eliminating them would translate into meaningful reductions in poverty and improvements in nutritional outcomes — and in the overall macroeconomy. A growing body of literature shows that the marginalization of women's labour impedes poverty reduction efforts, dampens productivity and reduces economic growth (DFID et al., 2013). In agricultural economies, the effect of gender on growth prospects is linked to the gender division of labour and to gender inequality in land ownership and loan access.

As demonstrated by the UN Women and PEI country case studies and as supported by cross-country evidence in numerous other published studies, gender equality in access to land, technology and agricultural inputs holds the key to increasing productivity in food production. Not only is gender inequality economically inefficient, the sizeable macroeconomic repercussions of its presence provide a rationale for better understanding and eliminating the barriers which prevent women from having full access to agricultural resources and inputs. The predicted benefits from removing the barriers women face in terms of increased productivity of land and overall agricultural output are substantial (Croppenstedt, Goldstein and Rosas 2013).

Increasing access to labour, land, equipment such as ploughs and other implements at appropriate times in the crop cycle would greatly improve productivity, crop production and income. As shown in Figure 4, the increases in crop production, agricultural GDP and overall GDP are substantial. Closing the gender gap in agricultural productivity corresponds to an estimated increase of almost 19 per cent in crop production in Rwanda and a 7 per cent increase in Malawi. It is interesting that closing the gender gap in Malawi — which has the highest gender productivity gap among the five focus countries (28 per cent) — leads to a relatively smaller increase in crop production than for Rwanda, whose productivity gap is about 11 per cent. Thus, the gains in closing the gender gap in agricultural productivity in Rwanda appear to be greater. These results could be pointing to already favourable conditions for gender equality and for the agricultural sector in Rwanda, such that making women more productive has relatively high returns at the macroeconomic level.

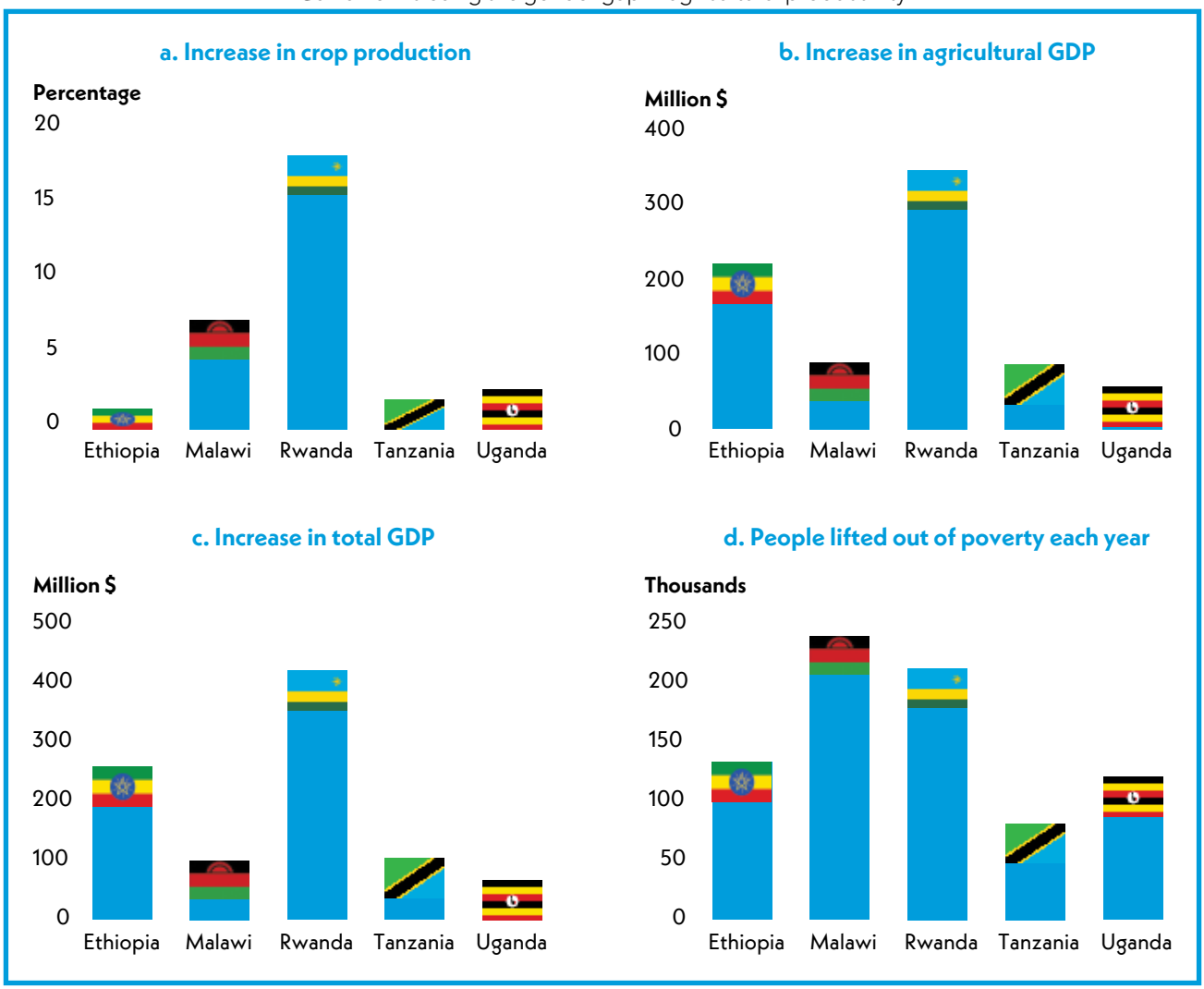
Although the percentage increases in crop production in the other three focus countries are smaller, the boosts to both agricultural GDP and overall GDP are still large. For example, in Ethiopia, the 1.4 per cent increase in crop production translates into a whopping $221 million increase in agricultural GDP. Much of the reason for this large increase is that crop output accounts for 71 per cent of agricultural GDP in Ethiopia, which serves as a strong rationale for promoting gender equality in agricultural productivity. Rwanda has the largest increase in agricultural GDP among the five countries at over $345 million. Even Uganda's increase in agricultural GDP of $58 million — the lowest among the countries — is still substantial. With multiplier effects factored in arising from the contribution of agriculture to GDP, the increases in overall GDP across countries are even higher, ranging from $67 million in Uganda to $419 million in Rwanda.

Gender equality in access to land, technology and agricultural inputs holds the key to increasing productivity in food production.

Closing the gender gap in agricultural productivity corresponds with a substantial reduction in poverty. At least 80,000 people in Tanzania and as many as 238,000 people in Rwanda could be lifted out of poverty per year over

FIGURE 4

Gains from closing the gender gap in agricultural productivity



SOURCES: Ethiopia Ministry of Agriculture and Natural Resources and UNDP-UNEP PEI Africa, 2017; UN Women and UNDP-UNEP PEI, 2015; UN Women, UNDP-UNEP PEI and World Bank, 2015.

a 10-year period if the total gender gap in agricultural productivity in each country were closed. The benefits in Rwanda are again large, with over 200,000 people lifted out of poverty annually. These absolute shifts in the number of people living in poverty represent meaningful changes in the poverty headcount ratio (the proportion of the population living below the poverty line). These ratios ranged from 20 per cent in Uganda to 51 per cent in Malawi at approximately the time the UN Women–PEI surveys were conducted.[6]

Overall, the results in Figure 4 suggest that Rwanda would gain the most from closing the gender gap in agricultural productivity in terms of the greatest increases in food production and GDP and a substantial reduction in poverty, with Ethiopia and Malawi not far behind. Although the gains in Tanzania and Uganda appear to be relatively smaller within this sample, in absolute terms the benefits are extensive.

Closing the gap: remedies and recommendations

The results reported provide an objective framework within which to evaluate alternative policy options to close the agricultural productivity gap between men and women. As shown in Table 3, these policy reforms can be classified into five broad areas:

- Increasing women's access to labour and time-saving equipment and services
- Facilitating women's shift to high-value crops
- Improving women's access to non-labour agricultural inputs
- Strengthening women's land rights
- Pursuing other interventions which close the gender gap

These reforms will have a bigger impact in some countries than others depending on the importance of the underlying factors of production in explaining the gender gap as measured by the decomposition analysis. Table 3 provides an intuitive representation of the "bang for the buck" afforded by various policy reforms and programme interventions according to whether each country is likely to experience high, medium or low economic gains. Governments can choose among these policy reforms and priorities according to those that would yield the most benefit for their country.

Increase women's access to labour and time-saving equipment and services

One of the key results from the decomposition analysis and the follow-up qualitative studies is that women lack access to male family labour and are time-poor themselves due to their disproportionately large workloads caring for children and engaging in domestic work. Inequitable access to agricultural inputs is often reinforced by deeply entrenched social norms which devalue women's work. Transformative interventions are needed to change gender norms so other proposed innovations in agricultural production can have optimal outcomes.

One avenue towards rectifying this situation is to consider policies which help women to access hired labour. A large hurdle is that strong social norms may prevent women from hiring male labour — especially when these norms dictate that men and women engage in different agricultural tasks. These norms would need to be challenged with educational campaigns to help ensure the success of subsequent policies aimed at strengthening women's ability to hire wage labourers, male and female.

A somewhat innovative, but potentially effective, approach could be to launch edutainment programmes on national television with the objective of educating the general public about the benefits of relaxing rigid cultural norms in farming work. This would be supported by evidence-based advocacy to policymakers and community leaders on the importance of women's economic empowerment in households — and specifically, the importance of engaging women in sustainable agriculture. As discussed in the UN Women–PEI reports, policies to assist women in gaining access to hired labour include cash vouchers for hiring labour, as well as doorstep delivery of equipment and training.

Reforms which provide women with greater access to time-saving household and farming equipment will help reduce their time poverty and free up their own labour to engage in productive agricultural work. Household equipment would include energy-efficient and environmentally friendly improved cooking

TABLE 3

Policy reform options and potential gains across the five countries

	Ethiopia	Malawi	Rwanda	Tanzania	Uganda
Increase women's access to labour and time-saving equipment and services					
▪ Support women's access to hired labour ▪ Confront gender norms around labour ▪ Introduce labour-saving devices ▪ Invest more in public infrastructure	High	High	Medium	High	Low
Facilitate women's shift to high-value crops					
▪ Improve access to info & markets ▪ Promote gender-awareness in R&D ▪ Confront gender norms	Low	Medium	High	Low	Medium
Improve women's access to non-labour agricultural inputs					
▪ Improve access to fertilizers & pesticides ▪ Encourage wider range of machinery use ▪ Increase women's access to credit	High	Medium	Medium	Medium	Medium
Strengthen women's land rights					
▪ Consider large-scale land titling reforms ▪ Correct gender biases in laws	Medium	High	Medium	High	High
Pursue other interventions which close the gender gap					
▪ Reduce gender-based violence ▪ Promote climate-smart agricultural practices ▪ Gender-responsive extension services ▪ Provide agricultural skills training ▪ Representation in cooperatives ▪ Encourage knowledge dissemination	High	High	High	High	High

SOURCE: Adapted and updated from Ethiopia Ministry of Agriculture and Natural Resources and UNDP-UNEP PEI Africa, 2017; UN Women and UNDP-UNEP PEI, 2015; UN Women, UNDP-UNEP PEI and World Bank, 2015.

stoves to reduce the amount of time women spend fetching firewood, thus freeing up their time for productive work. Digging wells has also helped reduce women's domestic work burdens. In Burkina Faso, various organizations undertook initiatives to construct wells, supply carts to villages for hauling wood, build fuel-efficient ovens, and introduce hullers and grain mills to convert grain into flour. Kompaoré, McSweeney and Frisanco (2007) present evidence which suggests the introduction of these new technologies reduced women's workloads and helped them use their freed-up time to engage in more economically productive activities. Time-saving farm equipment would include replacing traditional sowing, storage and land preparation tools with modern machinery and equipment, which would contribute to sustainable agricultural production in a changing climate. This equipment would include modern irrigation facilities, solar driers for grains and tractors for large-scale land preparation.

Another set of interventions to save (unremunerated) time for women includes infrastructure improvement in the water sector, electrification, road construction, better transportation options and sanitation services. The absence of infrastructure, especially in rural

areas, is an important driver of the relatively high burden of unpaid domestic work borne by women. Infrastructure improvement is considered an important gender-smart policy contributing to both economic growth and gender equality. These investments work at the macroeconomic level by improving several important outcomes, including health, access to markets, labour productivity and investment. They also help narrow the gender gap in agricultural productivity by increasing women's access to time-saving services; this reduces their unpaid work burdens and increases their ability to expend their own labour on agricultural work.

Planners and policymakers do not always recognize how improving infrastructure can transform the market economy.

In a study of time use by men and women in Tanzania, Fontana and Natali (2008) find that planners and policymakers do not adequately recognize the role of improving infrastructure in transforming the market economy to work more effectively. The authors calculate that provision of better infrastructure in Tanzania would, on average, result in a 24 per cent increase in total annual cash earnings from reducing food preparation times, and in increases of 4 per cent and 2 per cent in total annual cash earnings, respectively, from reductions in water and fuel collection times. Since most of these gains would accrue to women, there may be additional beneficial spillover effects in terms of poverty reduction, investments in children and increased economic well-being within the home.

Another infrastructure-focused development scheme yielding significant benefits for women is South Africa's rural electrification programme. Dinkelman (2011) finds that the introduction of rural electrification increased female employment within five years, primarily by allowing for micro-enterprises and by liberating women from home production. With electrification, households used less wood within the home and increasingly adopted electric lighting and cooking. Electrification thus served as a labour-saving device in the rural landscape allowing women to move from home production to market work.

India provides another example of a successful intervention which both improved infrastructure to reduce women's unpaid work and contributed to environmental conservation. The country's 2005 National Rural Employment Guarantee Act (NREGA) provides each rural household a minimum of 100 days of work per year. Although there are few eligibility requirements, it was believed that the nature of the work and the level of wages were such that only the poor would self-target access to the programme. According to the government, the main aim of NREGA is to increase wage employment and wage security in rural India. Secondary objectives included addressing underlying reasons for poverty such as deforestation, soil erosion and drought. As part of these secondary services, sponsored projects involved road construction, improved irrigation and water conservation.

Women were particularly attracted to NREGA work for several reasons. First, NREGA wages do not differentiate by sex — which means that the offered wage differential between rates for alternative options and NREGA work is especially attractive for women. Second, much of the work can be undertaken locally, a stipulation that reduces travel times to work sites and reduces the burden for women who bear most of the responsibility for housework. NREGA worksites also have mandated child care facilities. While this provision was not fully enforced at all sites, it eased the burden of child care in areas where this functioned relatively well (Narayanan, 2008).

Programme evaluation results suggest that NREGA has had positive impacts on employment and wages — especially for women (Azam, 2012). The wage increases for women may have resulted in important feedback effects such as stronger bargaining power within the household, just as the programme itself led to the construction of much-needed rural infrastructure.

Facilitate women's shift to high-value crops

The decomposition results indicate that women are less likely than men to grow high-value crops, and this explains a substantial portion of the agricultural productivity gap, especially in Malawi, Rwanda and Uganda. A number of issues underlie what appears to be a choice to not grow high-value crops:

- Gender norms in most countries in the region dictate that women are largely responsible for food crop production, so they are constrained by these norms to focus on subsistence farming in order to ensure the food security of their households. Switching to cash crops could involve changes in the nutritional content of household food consumption.

- Women may avoid planting higher-value crops if their cultivation entails heavy demands on time, and the women are time-poor or have relatively less access to hired labour. Policy options described in the previous section to increase women's access to labour will help address this problem.

- Women may also be constrained in terms of cash, meaning that greater access to credit (discussed in the next section) or to some sort of funding programmes would help.

- Inequitable access to land also helps to explain why women plant relatively fewer high-value crops. Women may be unable to scale up if they own or manage just small plots of land, or they may be unwilling to invest in cash crop cultivation if their land tenure is insecure or they do not own the land at all. Reforms to land ownership laws (discussed below) will help in this regard.

There are many reasons why women decide not to grow high-value crops.

- Women may also avoid investing in cash crops for market sale if they have trouble accessing markets due to restrictions in their mobility arising from social norms — and, in many countries, relatively less access to motorized forms of transportation. Challenging social norms around women's mobility and improving public infrastructure and means of transportation will help relieve some of these constraints.

Another constraint is women's relatively lower access to new farming techniques and seed technologies. Specific policy reforms to address this constraint include improving women's access to information, promoting gender awareness in research and development on new technologies, and confronting social norms around crop choice and marketing. The diffusion of new seed technologies that match women's preferences will help. In planning agricultural innovations, it is important to differentiate between male and female preferences affecting technology choice and adoption decisions, rather than assume uniform household preferences. A large number of studies have disproven the unitary household model with evidence that households do not pool resources nor share the same preferences. In many countries, individual men and women in a household manage different resources with different criteria for making decisions about farming.

In other words, households do not plough, plant, fertilize, weed or irrigate crops — individuals do. Even when individual men and women in farm households jointly own some of the productive resources used for farming and make decisions together, they may differ in how they share the costs and distribute the benefits of production decisions.

Improve women's access to non-labour agricultural inputs

More widespread adoption of improved technologies and climate-smart agricultural approaches may not require changes in the innovation process, but rather better access for women to complementary inputs. One of the overriding constraints women face in accessing such inputs is their spending power. In particular, women's responsibilities for meeting cash household needs constrains their spending on agricultural inputs. Policy-based instruments to increase their cash holdings and reduce input prices will help alleviate this constraint. In some cases, agricultural input subsidies can help reduce the gender gap in the adoption of new seed technologies.

An overriding constraint for women in accessing needed agricultural inputs is their spending power.

Malawi provides a useful case study because it has had a long-term commitment to agricultural input subsidies. Notably, Malawi's Farm Input Subsidy Programme (FISP) has helped close the gender gap in modern maize adoption (Fisher and Kandiwa, 2014). Receipt of subsidized input coupons had no discernible effect on modern maize adoption for male farmers, but adoption by female household heads was positively influenced by receipt of a FISP package consisting of both maize seed and fertilizer coupons. Receiving a subsidy for both seed and fertilizer through the FISP has reduced the gender gap in adoption of modern maize in Malawi.[7]

Women may also face gender-based constraints in their access to natural resources. Common resources such as water may not be shared equally in patriarchal societies. A case in point is southern Tanzania, where farmers depend on irrigation to grow their crops, and an informal set of codes governs how much water farmers divert to their own fields and how much they leave for farmers downstream. A field experiment conducted by Lecoutere, d'Exelle and Van Campenhout (2015) shows that high-status men keep more than half of the available water for themselves — regardless of whether the water is scarce or in abundance — while high-status women share altruistically, no matter what. Gender and social status thus influence how users of self-governed common watersheds distribute their water. Policies assuming fair and equitable use of common pooled resources can be misguided if gender and social standing are not taken into account.

Another important institutional reform is increasing women's access to credit. The security of land ownership is associated with higher agricultural productivity; however, women may face more obstacles than men in obtaining credit. These obstacles can weaken the potential of land titling in benefiting women. One of the consequences of remaining isolated from networks is restricted access to credit markets. This restricted access also results from women's relatively meagre control over assets that can be used as collateral. Further, formal lending institutions often view women as risky clients because of their lower levels of education and skills, which increases the perception that they cannot be "banked."

These restrictions handicap women in their ability to purchase agricultural inputs.

Research suggests that the targeted provision of small-scale loans through microfinance initiatives can support and incentivize women's agricultural activities and promote economic welfare. The success of initiatives such as the Grameen Bank model in rural Bangladesh has contributed to the proliferation of microfinance initiatives across countries and regions throughout the world. This movement has demonstrated the extent of the unmet need for credit among poor women and the potential for commercial banks to play a larger role in providing access to formal credit to marginalized women.

On the other hand, several studies have found that microloans may bring only modest advantages to women (Banerjee, Karlan and Zinman, 2015). An alternative to microfinance with demonstrated success in reaching women in agriculture is rural banking policy reforms which incentivize the opening of commercial bank branches in remote areas that were previously unbanked. A good example is India's rural banking reform in which commercial banks were required to open branches in four previously unbanked locations (often in rural areas) in order to obtain a license for opening a branch in an already banked location. The government also set deposit and lending policies to provide incentives for people to use the new banks. The savings rates were higher and lending rates lower than in urban areas, and there were targets set for lending in priority areas that included agriculture and small-scale entrepreneurship. Results in Menon and Rodgers (2011) indicate that the increased availability of credit afforded by this programme was of particular significance to women.

Finally, another approach to help low-income women emerge from subsistence-level production is capital bundled together with training and financial services (Buvinić and Furst-Nichols, 2016). Such services will help build women's capacities in financial management and help ensure that capital is spent on productivity-enhancing agricultural inputs.

Strengthen women's land rights

Another critical intervention in the agricultural sector is formalization of women's land ownership. When female farmers have more formal control over land, their productivity increases. Land rights need to be guaranteed in such a way that women can exchange, lease, bequeath, sell or mortgage land in an enforceable manner. Recommendations for policy reforms supported by findings in the UN Women–PEI reports center on changing the legal structures governing women's land rights. This objective can be achieved through improved documentation, stronger communal rights, constitutional revisions to inheritance rights and land titling programmes.

When female farmers have more formal control over land, their productivity increases.

A growing number of governments have implemented large-scale land titling programmes, whose results indicate that joint titling of land for married couples serves as an effective way for more women to gain legal land rights. Mandatory joint titling in particular raises the likelihood of women gaining secure land rights; voluntary joint titling is somewhat less effective in providing large proportions of women with secure rights, especially in countries with strong patriarchal social norms.

A common problem across developing regions is that land titles are often distributed to heads of household only. Since the majority of household heads in most developing countries are male, this practice has led to an overwhelmingly disproportionate number of land titles allocated to men. A

number of countries have revised their land inheritance rights in recent years to guarantee equal inheritance of land to sons and daughters and to ensure joint land ownership between husband and wives.

Policy recommendations center on improvements in implementation of land law reforms, especially when uneven implementation results in gender disparities in the issuance of land titles. For example, Ethiopia had a successful first-time process for land registration which was rapid, participatory and effective in achieving the objective of increasing household investments in land (Deininger et al., 2008). However, there was substantial variation across regions in whether land was registered in the name of the husband only, wife only, or jointly — largely due to regional variation in programme requirements for joint certification and photographs of landowners. Also needing improvement was women's representation on village-level land-use committees, with distant overnight meetings serving as a substantial disincentive for women's participation in these political bodies.

Many Sub-Saharan countries still have somewhat arbitrary inheritance and property rights for women.

Rwanda's large-scale Land Tenure Regularization programme resulted in greater land tenure security and large positive effects on agricultural investment, especially in female-headed households (Ali, Deininger and Goldstein, 2014). The programme clarified land rights, reduced tribal conflicts and reduced gender discrimination in land access. These accomplishments contributed to increased land access for married women, improved documentation of inheritance rights and large increases in soil conservation efforts.

Recommendations for policy reforms supported by the literature centre on ensuring that statutory and customary laws are in accordance with legal guarantees — especially in Africa, where both customary land redistribution schemes and official land law reforms have led to reallocations frequently biased against women. Government agencies have typically distributed land to household heads. This process favours men in general, and specifically the more senior men who already have power through customary land holdings. Even though government efforts to reform land laws may give female household heads the right to receive land, in practice they may not receive plots in the reallocation process when local officials redefine them as dependants of male relatives. If customary laws in Sub-Saharan countries have placed restrictions on women's access to land or prevented women from pursuing title, these laws need to be revised so they are in accordance with constitutional provisions governing equality (Joireman, 2008).

Many Sub-Saharan African countries still have somewhat arbitrary inheritance and property rights for women, due to competing provisions in laws and legal statutes. Greater attention needs to be paid to gender relations and power structures in rural areas which disadvantage women in their attempts to own land. State-sponsored efforts to formalize property rights need to address not only customary laws and women's right to property, but also enforcement, especially in under-resourced areas.

Examples of relevant policy lessons are found in Kenya, Senegal, Tanzania and Zambia. In Senegal, land redistribution policies did not correct gender inequality in access to land, as only a small proportion of women could obtain land rights as household heads. Following extensive droughts in the 1970s, the government distributed equal-sized plots to all heads of household. Yet by 1990, women

— all household heads — held only 6 per cent of irrigated plots. Moreover, married women in Senegal did not have customary land-use rights, and many widows and divorcees who were entitled to plots were denied this right because they were classified as dependants of male relatives (Koopman, 2009). Consequently, tiny plots and tenuous land rights for women in the Senegal River Valley have constrained food output and marketable surpluses.

In the River Njoro Watershed area of Kenya, policy reforms have led to a shift away from communal land ownership towards private individual ownership, with indigenous Maasai pastoralist communities having to adjust to further changes introduced by agricultural settlements. Interview data in Willya and Chiuri (2010) indicate that property rights reforms have caused substantial changes in gendered tasks and workloads, with women seeing increased domestic workloads and fewer user rights to resources such as cows, small farm animals and firewood. Local men, however, have gained from cash payments they have earned from migratory livestock herders. The authors conclude that communities as a whole have gained from finding ways to blend indigenous and modern institutions, but women are bearing the burden of the transition.

Tanzania and Zambia offer further examples of the need to address customary laws and local practices in Sub-Saharan Africa. In Tanzania, the "double-safeguarding of land rights" — which involves legitimizing customary land inheritance practices and contemporary land rights — may lead to the exclusion of marginal groups, including women. As discussed in the qualitative UN Women and PEI report for Tanzania, women's groups in Tanzania have successfully challenged the exclusionary effect of certificates of customary occupation.

In Zambia, the HIV/AIDS epidemic has caused enormous suffering and loss of life. Chapoto, Jayne and Mason (2011) found that more than two-thirds of the households which experienced the death of the male head after 2001 had less land within a three-year span, and about one third of the widow-led households controlled less than half the land they had controlled before the male head had died. The authors note that government decrees to protect the security of land access by female widows have had little to no impact when local authorities were not included in the decree arrangements. This situation highlights the importance of working with local community authorities in developing programmes to property rights for widows.

Government decrees to protect widows' security in land access have had little to no impact when local authorities were not included in the decree arrangements.

While the evidence from empirical studies provides a clear rationale for procedures to increase women's land ownership, the literature also suggests that such procedures would have more potent impacts if they were embedded in a framework which sought to widen the scope of institutional structures so they assist women living on the margin.

Other interventions for closing the gender gap

Several additional interventions can directly target women's engagement in the agricultural sector and contribute towards narrowing the gap in accessing multiple key inputs. One of the most important such interventions is legislative reform around gender-based violence, stronger enforcement of such laws, and other programmes to change attitudes towards and raise awareness about gender-based violence.

The Malawi, Tanzania and Uganda reports clearly show that gender-based violence and traditional attitudes towards masculinity serve as an important contributing factor to the gender gap in agricultural productivity (UN Women and UNDP-UNEP PEI, 2019a, 2019b and 2019c). Gender-based violence is a violation of civil and political rights as well as social and economic rights, leading to numerous adverse outcomes for women's health, well-being and productivity — and for overall agricultural output. As noted in the country reports, policymakers need to consider not only stronger laws and enforcement to prevent gender-based violence, but should also develop programmes to educate men and women on the economic benefits of cooperation within the household, so agricultural productivity improvements at the farm level can be leveraged. Such programmes would help women gain access to more male household labour, one of the key drivers of the agricultural productivity gap in several of the focus countries.

Closing gender gaps in access to factors of production, along with the adoption of climate-smart agricultural practices, will help close gender gaps in farm crop productivity and improve household livelihoods.

The country reports also highlight the importance of closing gender gaps in climate-smart agricultural practices. As the reports note, agricultural productivity hinges on the effective application of various factors of production, which are in turn linked to the agronomic practices being followed. These practices affect soil fertility and serve as the foundation of successful adoption of climate-smart agricultural practices. The reports were not able to quantify the extent to which these practices explain the total gender gap in agricultural productivity because the underlying survey data did not include this information. The qualitative research, however, clearly shows that closing gender gaps in access to factors of production, along with the adoption of climate-smart agricultural practices, will help close gender gaps in farm crop productivity and improve household livelihoods. Such climate-smart agricultural practices include selecting crop varieties which are planted earlier, mature earlier, and are high-yielding and drought resistant; using cover crops to improve crop husbandry; preserving natural grass and tree coverage on uncultivated land; promoting the use of organic fertilizers; conserving water through rainwater harvesting and precision irrigation; rotating crops; introducing agroforestry methods which integrate trees with crops (or livestock) on plots of land; using contour ridging and markers; and introducing soil management techniques which limit disruptions to soil composition and structure.

Extension services are one of the most common vehicles for disseminating knowledge and training in climate-smart agricultural techniques. However, women in agriculture often have limited access to agricultural support services. For one thing, extension services are often dominated by men, resulting in the potential for gender bias in the diffusion of knowledge of new seed technologies and training in new farming techniques.

Female extension agents may be more likely to reach women farmers with new training techniques and information, especially in societies that are highly segregated by gender (Quisumbing et al., 2012). This argument is supported by evidence in Kondylis et al. (2016). That study used a randomized control trial conducted in Mozambique to estimate the impact of training female messengers in sustainable land management (SLM) techniques on the awareness, knowledge and adoption of SLM practices by female farmers. In this experiment, communities were randomly selected to have a female messenger trained in SLM who

was encouraged to teach other women the techniques. The authors found that women's awareness of pit planting farming techniques increased by 9 percentage points and their adoption of the technology increased by 5 percentage points one year later in communities with female messengers compared to communities in the experimental areas which did not have female messengers. The results imply that placing women in extension positions can help women farmers overcome barriers to adoption posed by inequitable access to agricultural extension services and information on sustainable farming techniques.

Policy interventions which empower women through the provision of agricultural skills training opportunities are vital. A training programme which has successfully improved farmer skills and training — especially of women farmers — is Junior Farmer Field and Life Schools. In an effort to reach some of the most vulnerable individuals, this programme has targeted orphaned children in countries with a high prevalence of HIV/AIDS (Cameroon, Kenya, Malawi, Mozambique, Namibia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe). Both boys and girls are taught agricultural concepts including sowing, weeding, conservation, processing of crops and marketing. This training is bundled with basic education and learning, and other concepts of equality, health and nutrition. Programme evaluations have been positive, especially in terms of their impact on the empowerment of women and girls who have benefited from the new methods and innovative means of skills delivery (FAO, IFAD and ILO, 2010).

Similarly, measures to connect small women farmers to marketing networks and local agricultural value chains improve their overall viability and help build their confidence. Women are not typically represented in agricultural cooperatives to a large degree. Yet collective approaches have the potential to increase women's access to resources. Such approaches include group investments in capital inputs, individual ownership combined with group cultivation and the distribution of group rights by governments to poor rural women (ICRW, 2005). Although collective action groups can be helpful in mobilizing communities to engage in development, they need to be monitored carefully to ensure existing inequities are not exacerbated (Kinkingninhoun-Medagbe et al., 2010).

Collective approaches have the potential to increase women's access to resources.

Women also tend to be absent from professional and service networks which allow for the quick diffusion of information. Much of this is because sociocultural norms limit their mobility and social circles. Improving access to information for women so as to improve their productivity and success in the market place is of special importance. India's Gyandoot network is a good example of how women's access to information has been fostered (DFID, FAO and ODI, 2002). This network is a system of village "kiosks," linked through an intranet system, where people may access public information such as land records, technical advice, marketing information for agricultural commodities and prices, and details on government projects. It also serves as a communication outlet, as individuals may submit complaints directly to the local government; and as a means of e-marketing. Gyandoot's innovations — especially the ability to post questions to agricultural extension staff and to gain information on market prices of grains and other commodities — are invaluable to India's female farmers. The technology has the power to bring measurable benefits to a segment of farmers who are often not recognized in their own right, and who are often curtailed in their everyday dealings with the market.

Mobile phone technology is another excellent means by which women's access to information and services has been fostered. The introduction of this technology has had a widespread impact on economic development across Africa (Aker and Mbiti, 2010). But there is evidence that mobile phones have had disproportionately positive effects for women. For example, Klonner and Nolen (2008) find that with the advent of a mobile phone network in South Africa, employment increased by 15 percentage points in rural areas. Much of this effect is accounted for by women who do not have extensive child care responsibilities within the home. Most women found work in wage employment, which translated into increases in household income and measurable declines in extreme poverty in South Africa. Hence, improving access to services and information can bring substantial targeted benefits to women.

Notes

1. See https://au.int/sites/default/files/documents/31358-doc-au_echo_january_2015.pdf for the African Union Commission's report on the Year of Women's Empowerment and Development towards Africa's Agenda 2063. The devotion of a chapter on "Women in Agriculture: Addressing the Gender Gap through Relevant Agricultural Frameworks" highlights the importance of reforms to reduce gender inequality in the agricultural sector. The African Commission's protocol on the rights of women can be found here: http://www.achpr.org/instruments/women-protocol/.

2. See in particular ILO Convention No. 100 on Equal Remuneration (1951), Convention No. 111 on Discrimination in Employment and Occupation (1958), Convention No. 156 on Workers with Family Responsibilities (1981) and Convention No. 183 on Maternity Protection (2000). Conventions 100 and 111 are among the eight fundamental conventions of the ILO Declaration on Fundamental Principles and Rights at Work. Other relevant ILO instruments include Convention No. 175 on Part-time Work (1994), Convention No. 177 on Home Work (1996), Convention No. 182 on the Worst Forms of Child Labour (1999), the Declaration on Equality of Opportunity and Treatment for Women Workers (1975) and the Declaration on Fundamental Principles and Rights at Work (1998).

3. The quantitative studies upon which this report is based only reported results for those factors of production which, for at least one of the countries, (i) had a substantially large impact on the gender gap in agricultural productivity, and (ii) had a statistically significant coefficient in the regression analysis used to derive the decomposition results.

4. In addition to the World Bank's LSMS (http://surveys.worldbank.org/lsms), sex-disaggregated information is captured in the databases of the Global Findex Study (https://globalfindex.worldbank.org/), the World Bank's World Development Indicators (http://datatopics.worldbank.org/world-development-indicators/) and the International Food Policy Research Institute's Women's Empowerment in Agriculture Index (WEIA; http://www.ifpri.org/project/weai).

5. The data in this paragraph are from Food and Agriculture Organization of the United Nations, Gender and Land Rights Database, 2018, www.fao.org/gender-landrights-database/en/. The database defines an agricultural holder as "the civil or juridical person who makes the major decisions regarding resource use and exercises management control over the agricultural holding"; this definition includes land owners, producers and managers. Additionally, most country time use surveys and demographic and health surveys collect at least some sex-disaggregated information.

6. Source: World Bank, World Development Indicators database, 2018, http://databank.worldbank.org/data/home.

7. Note that the Fisher and Kandiwa (2014) study uses the same data set as that on which the UN Women–PEI productivity gap study for Malawi is based — the 2010–2011 Integrated Household Survey. This implies that the gender gap in agricultural productivity in Malawi would have been even higher than the reported 28 per cent if the FISP were not in effect.

Bibliography

Aker, Jenny, and Isaac Mbiti (2010). Mobile phones and economic development in Africa. *Journal of Economic Perspectives* 24 (3): 207–232.

Alene, Arega, Victor Manyong, Gospel Omanya, Hodeba Mignouna, Mpoko Bokanga and George Odhiambo (2008). Economic efficiency and supply response of women as farm managers: comparative evidence from Western Kenya. *World Development* 36 (7): 1247–1260.

Ali, Daniel Ayalew, Klaus Deininger and Markus Goldstein (2014). Environmental and gender impacts of land tenure regularization in Africa: pilot evidence from Rwanda. *Journal of Development Economics* 110: 262–275.

Autor, David (2015). Lecture Note 1: Wage density decompositions. MIT Graduate Labor Economics 14.662.

Azam, Mehtabul (2012). The impact of Indian job guarantee scheme on labor market outcomes: evidence from a natural experiment. IZA Working Paper No. 6548.

Backiny-Yetna, Prospere, and Kevin McGee (2015). Gender differentials in agricultural productivity in Niger. Policy Research Working Paper No. 7199. Washington, D.C.: World Bank.

Banerjee, Abhijit, Dean Karlan and Jonathan Zinman (2015). Six randomized evaluations of microcredit: introduction and further steps. *American Economic Journal: Applied Economics* 7(1): 1–21.

Budlender, Debbie (2000). A global assessment of gender responsive budget initiatives.

Buvinić, Mayra, and Rebecca Furst-Nichols (2016). Promoting women's economic empowerment: what works? *World Bank Research Observer* 31 (1): 59–101.

Chapoto, Antony, T. S. Jayne and Nicole Mason (2011). Widows' land security in the era of HIV/AIDS: panel survey evidence from Zambia," *Economic Development and Cultural Change* 59 (3): 511–547.

Croppenstedt, Andre, Markus Goldstein and Nina Rosas (2013). Gender and agriculture: inefficiencies, segregation, and low productivity traps. *World Bank Research Observer* 28 (1): 79–109.

Deininger, Klaus, Daniel Ayalew Ali, Stein Holde and Jaap Zevenbergen (2008). Rural land certification in Ethiopia: process, initial impact, and implications for other African countries. *World Development* 36 (10): 1786–1812.

DFID, FAO and ODI (Department for International Development, Food and Agriculture Organization of the United Nations and Overseas Development Institute) (2002). Program for Information on Sustainable Livelihoods: India case study. DFID, London.

DFID (Department for International Development), William and Flora Hewlett Foundation and IDRC (International Development Research Centre Canada) (2013). Growth and economic opportunities for women: literature review to Inform the DFID-IDRC-Hewlett Foundation research program on women's economic empowerment, gender equality and growth in low income countries.

Dinkelman, Taryn (2011). The effects of rural electrification on employment: new evidence from South Africa. *American Economic Review* 101(7): 3078–3108.

Doss, Cheryl, and Michael Morris (2001). How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. *Agricultural Economics* 25 (1): 27–39.

Duflo, Esther, and Christopher Udry (2004). Intra-household resource allocation in Côte d'Ivoire: social norms, separate accounts and consumption choices. National Bureau of Economic Research Working Paper No. 10498, Cambridge, MA: NBER.

Ethiopia Ministry of Agriculture and Natural Resources and UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) Africa (2017). *The Cost of the Gender Gap in Agricultural Productivity in Ethiopia*.

FAO (Food and Agriculture Organization of the United Nations) (2013). *Climate-Smart Agriculture Sourcebook*. Rome: FAO.

FAO (Food and Agriculture Organization of the United Nations) (2016). *The State of Food and Agriculture Climate Change, Agriculture and Food Security*. Rome: FAO.

FAO, IFAD and ILO (Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, and International Labour Organization) (2010). *Gender Dimensions of Agricultural and Rural Employment: Differentiated Pathways Out of Poverty: Status, Trends and Gaps*. Rome: FAO.

Fisher, Monica, and Vongai Kandiwa (2014). Can agricultural input subsidies reduce the gender gap in modern maize adoption? Evidence from Malawi. *Food Policy* 45: 101–111.

Fontana, Marzia, and Luisa Natali (2008). Gendered patterns of time use in Tanzania: public investment in infrastructure can help. Paper prepared for the IFPRI Project on Evaluating the Long-Term Impact of Gender-focused Policy Interventions. University of Sussex, Brighton, UK.

Gilbert, Robert, Webster Sakala and Todd Benson (2002). Gender analysis of a nationwide cropping system trial survey in Malawi. *African Studies Quarterly* 6 (1): 1–21.

Goldstein, Markus, and Christopher Udry (2008). The profits of power: land rights and agricultural investment in Ghana. *Journal of Political Economy* 116 (6): 981–1022.

ICRW (International Center for Research on Women) (2005). Property ownership for women enriches, empowers and protects. ICRW, Washington, D.C.

Joireman, Sandra Fullerton (2008). The mystery of capital formation in Sub-Saharan Africa: women, property rights and customary law. *World Development* 36 (7): 1233–1246.

Kinkingninhoun-Medagbe, Florent, Aliou Diagne, Franklin Simtowe, Afiavi Abgoh-Noameshie and Patrice Adegbola (2010). Gender discrimination and its impact on income, productivity, and technical efficiency: evidence from Benin. *Agricultural and Human Values* 27 (1): 57–69.

Klonner, Stefan, and Patrick Nolan (2008). Does ICT benefit the poor? Evidence from South Africa. University of Essex.

Kompaoré, Scholastique, Brenda Gael McSweeney and Jennifer Hilda Frisanco (2007). The quest for gender equality in Burkina Faso: female workloads, education and empowerment. UNESCO, Geneva.

Kondylis, Florence, Valerie Mueller, Glenn Sheriff and Siyao Zhu (2016). Do female instructors reduce gender bias in diffusion of sustainable land management techniques? Experimental evidence from Mozambique. *World Development* 78: 436–449.

Koopman, Jeanne (2009). Globalization, gender, and poverty in the Senegal River Valley. *Feminist Economics* 15 (3): 253–285.

Lecoutere, Els, Ben d'Exelle, and Bjorn Van Campenhout (2015). Sharing common resources in patriarchal and status-based societies: evidence from Tanzania. *Feminist Economics* 21 (3): 142–167.

Menon, Nidhiya, and Yana Rodgers (2011). How access to credit affects self-employment: differences by gender during India's rural banking reform. *Journal of Development Studies* 47 (1): 48–69.

Narayanan, Sudha (2008). Employment guarantee, women's work and childcare. *Economic and Political Weekly* 43 (9): 10–13.

Oladeebo, Job O., and A. A. Fajuyigbe (2007). Technical efficiency of men and women upland rice farmers in Osun State, Nigeria. *Journal of Human Ecology* 22 (2): 93–100.

Oseni, Gbemisola, Paul Corral, Markus Goldstein and Paul Winters (2015). Explaining gender differentials in agricultural production in Nigeria. *Agricultural Economics* 46 (3): 285–310.

Palacios-López, Amparo, and Ramon López (2015). The gender gap in agricultural productivity: the role of market imperfections. *Journal of Development Studies* 51 (9): 1175–1192.

Quisumbing, Agnes, Ruth Meinzen-Dick, Terri Raney, André Croppenstedt, Jere Behrman and Amber Peterman, eds. (2014). *Gender in Agriculture: Closing the Knowledge Gap*. Washington, D.C.: Food and Agriculture Organization of the United Nations.

Saito, Katrine, Hailu Mekonnen and Daphne Spurling (1994). Raising the productivity of women farmers in Sub-Saharan Africa. Africa Technical Department Discussion Paper Series 230, World Bank, Washington, D.C.

Singhal, Arvind, and Everett M. Rogers (1999). *Entertainment-Education: A Communication Strategy for Social Change*. Mahwah, New Jersey: L. Erlbaum Associates.

Udry, Christopher (1996). Gender, agricultural production, and the theory of the household. *Journal of Political Economy* 104 (5): 1010–1046.

UN Women and UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) (2017). Equally productive? Assessing the gender gap in agricultural productivity in Rwanda. Policy Brief.

UN Women and UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) (2019a, forthcoming). Factors driving the gender gap in agricultural productivity: Malawi.

UN Women and UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) (2019b, forthcoming). Factors driving the gender gap in agricultural productivity: Tanzania.

UN Women and UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) (2019c, forthcoming). Factors driving the gender gap in agricultural productivity: Uganda.

UN Women, UNDP-UNEP PEI (United Nations Development Programme–United Nations Environment Programme Poverty-Environment Initiative) and World Bank (2015). *The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda*.

Vermeulen, S., R. Zougmore, E. Wollenberg, P. Thornton, G. Nelson, P. Kristjanson, J. Kinyangi, A. Jarvis, J. Hansen, A. Challinor, B. Campbell and P. Aggarwal (2012). Climate change, agriculture and food security: a global partnership to link research and action for low-income agricultural producers and consumers. *Current Opinion in Environmental Sustainability* 4: 128–133.

Willya, Daniel, and Wanjiku Chiuri. 2010. New common ground in pastoral and settled agricultural communities in Kenya: renegotiated institutions and the gender implications." *European Journal of Development Research* 22 (5): 733–750.

World Bank (2012). *World Development Report 2012: Gender Equality and Development*. Washington, D.C.: World Bank.

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