LEVELLING THE FIELD

IMPROVING OPPORTUNITIES FOR WOMEN FARMERS IN AFRICA

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GRAIN IS BEING HARVESTED IN KOLU, ETHIOPIA.

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ENUMERATOR CARRYING OUT COMPASS-AND-ROPE AREA MEASUREMENT IN NIGERIA.

PHOTO: SYDNEY GOURLAY / WORLD BANK

FOREWORD

Across sub-Saharan Africa agriculture is the backbone of the economy, accounting for 30-40% of nations' gross domestic product, and a leading source of jobs for over two-thirds of the population. Improving the productivity, profitability and sustainability of agriculture on the millions of farms that cover the African continent is essential for ending poverty and boosting shared prosperity in the region.

Even though women make up a large share of Africa's farmers, they are, for the most part, locked out of land ownership, access to credit and productive farm inputs, support from extension services and access to markets, to name just a few factors essential to their productivity. This array of daunting challenges means that, on average, Africa's female farmers produce less per hectare compared with men, which adversely affects their families, communities and – in the long term – entire countries.

Despite the centrality of agriculture in the economies of most African nations, relatively little is known about why farms managed by women are on average less productive. This "knowledge gap" in turn translates into a "policy gap" in the steps that African governments, their development partners, business leaders and civil society can take to equalise opportunities for female and male farmers.

This new report, "Levelling the Field: Improving Opportunities for Women Farmers in Africa", jointly produced by the World Bank in partnership with the ONE Campaign, seeks to focus international attention on the impediments that Africa's women farmers face in feeding their families, increasing farm incomes and lifting the heavy burden of poverty in rural areas.

By combining information and backing it up with new surveys that allow for the disaggregation of results by gender, this report uncovers new evidence that explains some of the factors responsible for the low productivity of female-managed farms in Africa. The report profiles six countries – Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda – that together account for more than 40% of sub-Saharan Africa's population. It presents the clearest evidence to date about both the breadth and the depth of the gender gap in African agriculture.

The report's recommendations offer a menu of actions that governments can consider in their efforts to boost farm productivity for the benefit of women farmers across the continent. It argues that by spearheading proven, effective policies that target the needs of female farmers – for example, strengthening land rights, improving market access, increasing women's access to labour and labour-saving tools, improved seeds and quality fertilisers, and investing in raising human capital, while leveraging social networks for better child-care and spreading agricultural knowledge – governments can help farming families tackle the low-productivity traps that entrench poverty and prevent millions of farmers from leading decent lives.

This joint report from the World Bank Africa Region's Gender Innovation Lab and the ONE Campaign comes at an opportune time, as the African Union Commission has declared 2014 to be the "Year of Agriculture and Food Security" in Africa. We are hopeful that the findings will have broad appeal to policy-makers and the wider development community and will catalyse actions and partnerships for promoting sustainable agricultural development in sub-Saharan Africa.

Empowering Africa's women farmers and supporting them in their efforts to increase food production is an idea whose time has come. By tackling the low productivity that ails African agriculture, we can help unleash the potential of the farm economy to be a major driver of economic growth, providing jobs as well as food, income and nutrition security. Through concerted action, we can make tangible improvements in the lives of African farmers, women and men alike.

Makhtar Diop
Vice President, Africa Region, The World Bank

FOREWORD

2014 – the African Union (AU) Year of Agriculture and Food Security – is a year of great, and potentially historic, opportunity. At the AU summit in Equatorial Guinea this June, African leaders will have the chance to renew their commitments to agricultural growth and development. It is an opportunity I hope leaders will seize with both hands, because a revitalised agriculture sector is essential to ending extreme poverty, growing our economies and thereby transforming the lives of millions of smallholder farmers on the continent.

Ten years ago, at the AU summit in Maputo, Mozambique, African leaders made bold commitments to tackle the underinvestment in agriculture that for so long had been a stumbling block to progress. Recognising the enormous potential locked within the sector, headline pledges were made to allocate at least 10% of national budgets to agriculture, to adopt sound development policies and to achieve at least 6% growth in the sector. But a decade later many countries have not made substantial progress on these commitments, and tellingly their investment plans have not adequately addressed key priority areas, such as the persistent gender gap in African agriculture.

It is clear that we ignore this gender gap at our peril and ultimately at great cost. It is a real injustice to Africa's women farmers and their families that women make up nearly half of the labour force in agriculture but, on average, produce less per hectare than men. This absurd gender gap driven by women's disadvantages in securing their land rights, accessing labour, and other factors, further undermines the sector's potential to drive inclusive economic growth, improve food security and create employment and business opportunities for millions of young Africans entering the job market every year.

ONE has recently launched a new campaign, *Do Agric, It Pays*, calling for African governments to commit to spending at least 10% of national budgets on effective agriculture investments, through transparent and accountable budgets. And, more importantly, to adopt smart, targeted policies that will boost agricultural productivity, increase the incomes of smallholder farmers and help create good jobs and viable business opportunities, lifting millions of Africans out of extreme poverty along the way. Integral to the campaign is a desire to achieve real socio-economic transformation through policies that will narrow the gender gap, seeking to ensure that the benefits of investment in agriculture are equitably shared and that women's increased productivity will reap rewards for the whole sector.

At the launch of the *Do Agric* campaign in Addis Ababa, Ethiopia, I met Elizabeth Nsimadala, a young female farmer from Uganda who left a strong impression on me and confirmed for me that the role of women in agriculture needs to be supported if we are to harness the potential of agriculture to achieve economic transformation. She told the audience, "I am a proud, successful farmer; I am above the salary scale of public sector servants in Uganda. I do agriculture not only because it pays, but because I can do it better." Sadly Elizabeth's story is the exception, not the rule. For too long, Africa's women farmers have been neglected and have faced significant disadvantages, struggling to secure their land, hire farm labour and access inputs such as fertiliser.

This report, developed in partnership with the World Bank, presents the strongest evidence to date of just how deep and entrenched the gender gap in African agriculture really is, and what needs to be done about it. It outlines a number of policy recommendations for governments to consider to better support women farmers. Above all, it should serve as a wake-up call to African leaders and development partners that the time is ripe for action and that progress is possible. If governments and partners invest in agriculture and, in particular, its women farmers today, they can be assured of a legacy of greater equality and boundless opportunity that will benefit Africans for generations to come and just may usher the beginning of the end of aid dependence for our people.

Sipho Moyo
Africa Director, ONE Campaign

INTRODUCTION

There is a growing recognition of agriculture's potential to spur growth and reduce poverty in Africa.[1] Agriculture accounts for one-third of the continent's gross domestic product (GDP), and two-thirds of its citizens rely on the sector for their incomes.[2] Investments in agriculture will hence not only improve productivity and the continent's ability to feed a growing population, but will also lift families out of poverty. Over 90% of sub-Saharan Africa's extreme poor are engaged in agriculture,[3] and growth originating in the sector is 2–4 times more effective at directly reducing poverty than growth originating in other sectors.[4]

Yet agriculture in Africa has not fulfilled its potential, suffering from a lack of investment and insufficient attention from policy-makers. A key hindrance to agricultural development and broader growth is a wide and pervasive gender gap in agricultural productivity. Women comprise nearly half of the labour force in Africa's agriculture sector, and more than half in several countries,[5] but on the whole they produce less per hectare than men.[i] Existing evidence from small-scale studies across the continent documents the numerous disadvantages that women face in accessing the same resources, training, markets and opportunities as men. They also face ingrained norms and institutional barriers that further widen the gap. Tackling the barriers that hold back the productivity of female farmers could both enhance gender equality and usher in broader economic growth.

Investing in women farmers and instituting policies that close this gender gap in African agriculture could yield enormous benefits for women and their families, communities and countries. Closing the gender gap could help increase food security and improve livelihoods for Africa's growing population, which is expected to quadruple within the next 90 years.[6] If women worldwide had the same access to productive resources as men, they could increase yields on their farms by 20–30% and raise total agricultural output by 2.5–4%.[7] The UN Food and Agriculture Organization (FAO) estimates that the gains in agricultural production alone could lift 100 to 150 million people out of hunger.

Closing the gap may also benefit Africa's next generation. When a woman gains more control over her income, she gains more say over important decisions that affect her family, especially her children. Families in which women influence economic decisions allocate more income to food, health, education and children's nutrition.[8] Improving gender equality through agriculture could therefore translate into a generation of Africans who are better fed, better educated and better equipped to make productive contributions to their economies, within agriculture and beyond.

Recognising these opportunities, many African policy-makers, donor governments and development partners have turned their attention to the gender gap in agriculture. Several leaders have championed the importance of supporting Africa's female farmers. Yet despite their words of support, these efforts have not always translated into targeted policies in country agricultural plans. Nor have important regional and international efforts adequately addressed the gender gap.

Recently, development agencies and donors have increasingly incorporated gender analysis into their agricultural programming and their monitoring and evaluation (M&E). FAO aims to allocate 30% of its operational budgets to programmes targeted at women by 2017.[9] Nearly 80% of the Global Agriculture and Food Security Program (GAFSP)'s operations include gender analysis as part of the project design.[10] The US Agency for International Development (USAID) launched the Women's Empowerment in Agriculture Index in 2012 to measure progress towards inclusive growth in all 19 of its "Feed the Future" countries.[11] And while 95% of the World Bank's agriculture and rural development projects have successfully integrated gender issues into their monitoring and design, there is now a greater emphasis on rigorously measuring the impact on both women's and men's lives.

These initiatives are promising, but they could be enhanced by a better understanding of the underlying factors that actually cause the gender gap, including how these factors vary across different countries and regions, and what policies can be effectively employed to bridge the gap. Available data on these fronts has thus far been insufficient; for too long, policy-makers have lacked high-quality, consistent data on agriculture, let alone sex-disaggregated data.[12] National-level surveys often do not even report whether farmers are men or women. Measurements of women's access to land and other resources have not been comparable across or even within

[i] Women's labour contribution to crop production ranges from 24% to 56% across the six countries profiled in this report.

countries, and most evidence of the gender gap is based on small-scale surveys that do not allow for broader generalisation.[13]

This report, "Levelling the Field: Improving Opportunities for Women Farmers in Africa", marshals fresh, new evidence measuring the gender gap in African agriculture and provides detailed analysis of the factors that account for this gap in six African countries. To this end, the report makes three specific contributions.

First, in *Part 1: Country Profiles*, this report provides a more robust assessment of the gender gaps in agricultural productivity across six African countries, using data collected by national statistics offices with assistance from the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) programme. In contrast to prior available data, the LSMS-ISA surveys are nationally representative and contain information at the individual farm manager and plot levels to allow for rich, detailed analyses of gender dynamics in agriculture. The six country datasets that the LSMS-ISA programme has released to date – for Ethiopia, Niger, Nigeria, Malawi, Tanzania and Uganda – cover more than 40% of the population of sub-Saharan Africa. The breadth and depth that this data captures will equip policy-makers with a more accurate, nuanced understanding of the costly inequalities within their agriculture sectors.

Second, within the country profiles and the summary of key drivers, the report identifies the precise factors responsible for the gender gap in each of these six countries through the use of decomposition analysis, a statistical method that is normally used in labour economics. By applying this method to the agriculture sector, it yields new insights on the effects of various factors on women's productivity. Women farmers face a wide array of obstacles, including accessing and benefiting from key inputs (such as fertiliser and agricultural information), hiring farm labourers, mobilising household labour and balancing farm work with child-care and household responsibilities. Previous research into the gender gap has focused on women's access to these inputs, concluding that if women had better access, they would be equally productive. The methodology in this report, however, looks not only at the quantity and levels of resources that women use (whether labour, fertiliser or extension information), but also assesses the returns that women receive from these resources, or how well these resources actually translate into increased agricultural productivity. In doing so, it discovers that in many countries, even when women have access to the same amount of a given input as men, equal access does not achieve the same effect in terms of agricultural productivity. This novel insight points to broader norms, market failures or institutional constraints that influence the effectiveness of these resources for women. These crucial new findings will empower governments and development organisations to develop policies that better address the resource disparities behind the productivity gap and enable women to derive greater benefits from the resources they have.

Finally, *Part 2: Policy Priorities* sets out several concrete policy proposals to address the main constraints that women farmers face, as identified across the country profiles. Drawing upon a nascent evidence base, these policy proposals highlight both promising interventions and emerging new ideas. Agricultural policy, in many African countries, has not distinguished between men and women farmers and their different needs. Yet the persistent gender gap evident in the countries profiled in this report underscores that a shift in thinking is long overdue: African leaders must better attune existing agricultural policies to the issues that undermine the productivity of female farmers, and they must design and implement new policies to address the needs of female farmers in order to boost agricultural productivity. Donors can play a catalytic role in this endeavour by supporting the development and rigorous evaluation of these critical programmes, thereby expanding knowledge of effective measures that support female farmers.

The African Union has declared 2014 to be the "Year of Agriculture and Food Security", bringing much needed attention to the sector's potential to transform the continent. This is an opportunity not only to revitalise the agriculture sector, but to rally African governments and development organisations to commit to concrete policy action to redress the inequalities within the sector, and in so doing to reap greater rewards from future investments.

OFTEN, OLDER WOMEN ARE THE SOLE CARE-GIVERS FOR THEIR GRANDCHILDREN, DUE TO THE EFFECTS OF POVERTY ON COMMUNITIES. ENABLING THESE WOMEN TO RECEIVE MORE BENEFITS OUT OF THEIR FARMS HELPS THEM AS WELL AS THE NEXT GENERATION.

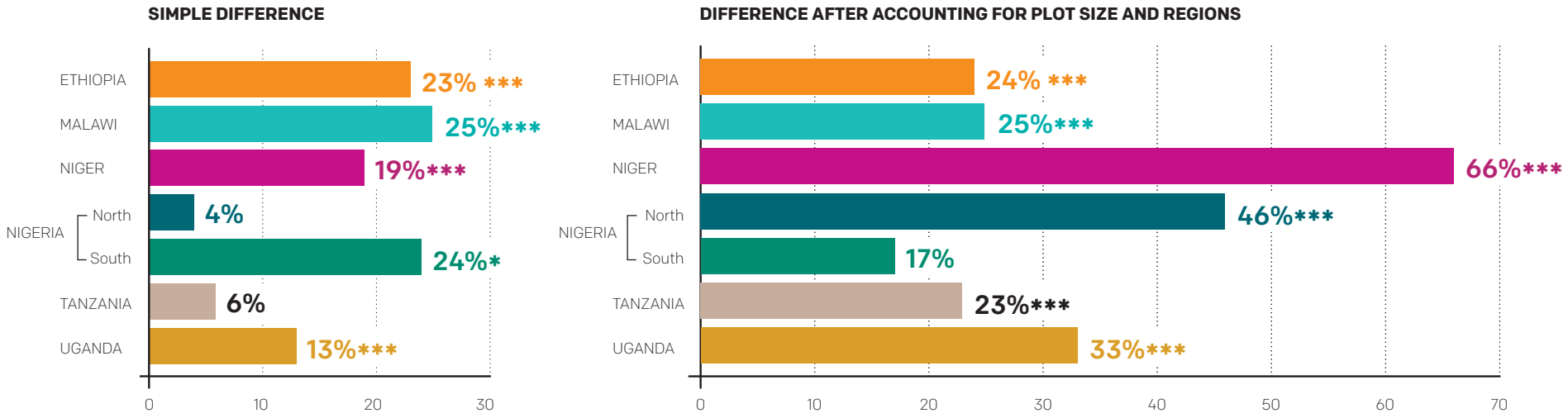
PHOTO: LAURA ELIZABETH POHL / BREAD FOR THE WORLD

KEY FINDINGS

1 Women farmers consistently produce less per hectare than their male counterparts.[i]

This report, profiling six countries that comprise more than 40% of sub-Saharan Africa's population, presents the clearest evidence to date attesting to the breadth and depth of the gender gap in African agriculture. A simple comparison of average male and female productivity shows that the gaps range from a low of 13% in Uganda to a high of 25% in Malawi.[ii] This suggests that in Malawi, for instance, male-managed plots produce on average 25% more per hectare than female-managed plots. A more refined measure of these gaps, accounting for differences in plot size and geographic factors, reveals a starker picture: When comparing women and men with similar-sized plots in a similar context, the gender gaps range from 23% in Tanzania to a strikingly large 66% in Niger.[iii]

FIGURE 1: Gender Gaps in Agricultural Productivity, by Country



Note: The symbols */**/*** denote statistical significance at the 10%, 5% and 1% levels respectively.

[i] The terms "women farmers", "female farmers" and "female plot managers" are used interchangeably throughout this report and indicate women who make important managerial decisions about a given plot of farmland. Box 1 in the Country Profiles Introduction provides more information about this definition.

[ii] The gaps in Tanzania and northern Nigeria are statistically insignificant based on a simple comparison.

[iii] The gap in southern Nigeria is statistically insignificant with this refined measure, probably due to a relatively small sample size.

2 The gender gap is caused by more than unequal access to inputs; women also face unequal returns to the inputs they have.

Previous research highlighting the gender gap in agriculture has focused exclusively on women's *access* to key inputs, such as fertiliser, agricultural information and farm labour, concluding that if women had better access, they would be equally productive. The methodology in this report looks not only at the quantity and levels of resources that women use, but also assesses the *returns* that they receive from these resources, or how well these resources actually translate into increased agricultural productivity. In doing so, the report reveals that in many countries, even when women have access to the same amount of inputs as men, equal access does not achieve the same effect in terms of agricultural productivity. This novel insight points to broader norms, market failures or institutional constraints that alter the effectiveness of these resources for women. For example, women in Ethiopia and Uganda benefit less than men, in terms of increased agricultural productivity,[iv] from extension advice that their households receive, suggesting that current agricultural extension programmes may be better attuned to the needs of male farmers. These crucial new findings will empower governments and development organisations to better tailor policies and programmes to those issues and constraints that are most critical to the livelihoods of women farmers in their countries.

3 Focusing on the key drivers of the gender gap in individual countries can both enhance gender equality and foster economic growth.

Women farmers face numerous disadvantages, such as barriers to accessing credit and lower levels of education, though not all of these disparities contribute equally to the gender gap, if at all. This report provides evidence on the principal factors behind the gender gap, as well as the relative importance of these particular factors. For example, in Malawi women use lower levels of agricultural inputs on their plots, including fertiliser and extension services, than men, and this difference accounts for more than 80% of the gender gap in productivity in that country. The report also shows that not every factor matters in each country. By focusing political attention and marshalling resources to tackle the specific issues identified in their respective countries, policy-makers, practitioners and development partners can begin to address gender equality and help usher in greater productivity and growth. This report reveals the following to be key drivers of the gender gap in the six countries analysed.

Labour poses the main barrier to achieving equality in productivity across all the countries profiled. To address this inequality, African governments and donors must do more to develop effective policies and programmes to help female farmers overcome this barrier.

Agriculture in Africa depends heavily on manual labour, supplied by farmers' households, families and communities. Yet women farmers face many difficulties in mobilising extra help to work on their farms, and these challenges begin in the home. On average, female farmers tend to live in smaller households with fewer men, possibly due to widowhood, migration or divorce. Consequently, women farmers across Ethiopia, Malawi, northern Nigeria, Tanzania and Uganda have fewer household members to provide labour on the farm or support in the home. Even after taking into account household size, female farmers in Malawi, Niger, southern Nigeria and Tanzania deploy fewer household male labourers on their plots. Further, in all these countries except Nigeria, these male labourers generate lower returns for female farmers relative to male farmers. Female farmers also face challenges in hiring effective outside labour. These findings suggest that women may not be able to afford to pay as much as men for effective farm workers; that cultural norms may mean that these labourers work harder for a male supervisor; and/or that women's time constraints (due to their household roles) may affect their ability to supervise their farm labourers. Indeed, women typically assume a larger role in child-care and household responsibilities than men, which is likely to restrict their ability to work on their own farms or manage their labourers. Men, meanwhile, tend to have greater control over how to allocate family labour, including that of younger household members. For these reasons, having a larger proportion of children in the household (relative to adults) reduces women's productivity more than men's in Malawi, Niger, southern Nigeria and Uganda.

Despite the fact that female farmers across all six profiled countries face these types of labour challenges, evidence on policies aiming to help women overcome these barriers is rare. For these reasons, African governments and donors must prioritise attention in this area and develop effective programmes that help women farmers

[iv] Statements explaining the returns findings in this section and the rest of the report assume that all other variables are held constant. Appendix 1 provides more information on the variables controlled for in the individual studies.

hire outside labour, use tools and equipment that reduce the amount of labour they require on the farm and access community-based child-care.

Differences in the use of, and returns to, fertiliser and other non-labour inputs matter for the gender gap.

Women have unequal access to a variety of productive inputs,[1] and this report also demonstrates the importance of unequal returns to those inputs. Indeed, differences in input use and returns contribute to the gender gap across all the countries profiled. In Malawi, Niger, northern Nigeria and Uganda, women use lower overall levels of fertiliser than men, which reduces their relative agricultural productivity. In Ethiopia and Tanzania, gender differences in returns to fertiliser contribute to the gap, suggesting that female farmers in these countries use lower-quality fertiliser, apply the input incorrectly or use it at the wrong time. African governments and donors should support programmes that encourage women to apply higher levels of fertiliser and other non-labour inputs to their plots, and to secure better-quality fertiliser.

Even after a woman accesses farm land, other associated challenges can limit her productivity.

Access to, and control of, land are critical for agricultural investment and rural household welfare. Yet statutory and customary land tenure systems often disadvantage rural women, who are less likely to control land than rural men, and women's insecurity of tenure reduces their investments in their land, thus undermining their productivity. The analysis in this report can shed only partial light on complex issues related to land access and control. Nevertheless, it suggests that a number of factors relating to land (beyond access itself) can help explain the gender gap. One of these challenges relates to land size. In Ethiopia and Tanzania, women receive lower returns than men to an extra hectare of land. This could be due to lower quality of the land, but it could also be due to women's relative difficulty in managing farm labour or the application of other inputs across larger tracts of land. African governments must focus on strengthening women's land rights in order to begin to address these issues undermining their productivity.

Agricultural extension and information do not improve female farmers' productivity to the same degree as that of male farmers.

Knowledge and training in farming methods and techniques are critical for both women and men, but women farmers tend to have less access to this information, and particularly information attuned to their needs. Women farmers tend to receive second-hand information from husbands and friends if they are not the head of their household. Furthermore, they may not attend training activities due to household responsibilities or mobility constraints, and they may not be able to interact effectively with male extension agents due to cultural norms.[2] In fact, this report shows that women in Ethiopia and Uganda benefit less than men, in terms of increased agricultural productivity, from some sources of extension advice that their households receive, suggesting that current agricultural extension programmes may be better attuned to the needs of male farmers. Female farmers in Malawi, meanwhile, belong to households that receive less technical guidance on agricultural production and marketing, which contributes to the gender gap. Policy-makers in these countries should consider better tailoring extension services to women's needs and spreading agricultural knowledge through other mechanisms, perhaps including women's social networks.

The gender gap in education, prevalent in previous decades, continues to affect women farmers today.

Although countries across Africa have recently made great strides in achieving gender parity in schooling, the gender inequalities of previous decades continue to have an impact on today's gender productivity gap. Differences in schooling between male and female farmers translate into differences in agricultural productivity in Uganda and, to a lesser degree, Malawi. Policy-makers in these countries should therefore strive to raise the education levels of women farmers to help close the productivity gap.

Improving women's access to markets and enabling female farmers to shift into high-value commercial agriculture both show promise.

In Malawi, women farmers are less likely to cultivate export crops, such as tobacco, than men. This difference contributes substantially to the country's gender gap because these export crops command a higher market value than traditional staple crops. Yet in Malawi, northern Nigeria and Uganda, female farmers enjoy higher returns than male farmers from switching into high-value agriculture. Policies that leverage this advantage can therefore enhance gender equality and boost agricultural growth.

4 2014 offers an historic opportunity for African policy-makers, donor governments and development partners to move the agenda forward and commit to concrete policy action to redress the gender gap in African agriculture.

In many African countries, agricultural policy has not distinguished between men and women farmers and their different needs. The persistent gender gap, documented in this report, underscores the fact that a shift in thinking is long overdue: Existing agricultural policies need to become better attuned to the issues that undermine the productivity of female farmers, and new policies and programmes must be designed and implemented to meet their needs. Without sufficient attention to increasing women's productivity, an opportunity for growth in agriculture will remain unexploited, and broader development efforts will be hampered.

The African Union has declared 2014 to be the "Year of Agriculture and Food Security", bringing much needed attention to the sector's potential to transform the continent. As part of this historic year, African governments should make a new, robust commitment to narrow the gender gap in agriculture, and should unveil this commitment at the African Union Summit in Equatorial Guinea this June.

To make progress in narrowing this gap, African leaders should consider the ten policy priorities and options detailed in this report to address the particular challenges in their countries (see Table 1). These policy priorities are informed by the report's new and comprehensive evidence of the main drivers of the gender gap. Based on the best available research and impact evaluation evidence, they provide both *promising* interventions, for which existing evidence indicates a high potential for success, and *emerging* interventions, which may benefit from further testing.

Meanwhile, given the limited knowledge of effective policies to date, donors and development organisations can play a catalytic role in supporting African governments to close the gender gap in agriculture by taking the following measures:

- Create a "challenge fund" to support the piloting and scaling up of effective policies to support female farmers and close the gender gap.
- Support national agriculture plans with clear attention to the differing needs of male and female farmers.
- Consider this report's findings in relation to donor programmes and continue to use gender analysis to inform the design of programmes, and collect sex-disaggregated data as part of the monitoring and evaluation of programme impacts.

These steps will mark an important turning point for Africa's women farmers, towards the opportunity and equality they rightfully deserve.

TABLE 1: Ten Policy Priorities for Narrowing the Gender Gap in African Agriculture

KEY DRIVER	POLICY PRIORITY	POLICY OPTION
LAND	1. Strengthen women's land rights.	Formalise land rights through registration to increase women's tenure security.
		Expand co-titling and individual titling for women.
		Reform family and inheritance law to protect women's rights.
LABOUR	2. Improve women's access to hired labour.	Offer women farmers financing to hire farm labour.
		Task agents with helping women farmers to find labour.
	3. Enhance women's use of tools and equipment that reduce the amount of labour they require on the farm.	Provide women farmers with financing or discounts for hiring or purchasing machinery.
	4. Provide community-based child-care centres.	Provide community-based child-care centres.
NON-LABOUR INPUTS	5. Encourage women farmers to use more, and higher-quality, fertiliser.	Provide women farmers with financing or price discounts aligned with their cash flow to encourage the purchase of fertiliser.
		Certify small bags of fertiliser for use by women.
	6. Increase women's use of improved seeds.	Provide flexible financing for seeds.
		Help women better identify and obtain good-quality seed.
INFORMATION	7. Tailor extension services to women's needs, and leverage social networks to spread agricultural knowledge.	Train extension agents to target female farmers and be more responsive to their agricultural information needs.
		Bring agricultural training and advice to women's doorsteps through farmer field schools and mobile phone applications.
		Identify female volunteer farm advisors to spread information within women's social networks.
ACCESS TO MARKETS	8. Promote women's cultivation of high-value/cash crops.	Promote women's cultivation of high-value/cash crops.
	9. Facilitate women's access to and effective participation in markets.	Provide market services through information and communications technology (ICT).
		Channel existing groups to access market opportunities.
HUMAN CAPITAL	10. Raise education levels of adult female farmers.	Raise education levels of adult female farmers.

Promising policy option (based on available evidence) Emerging policy option (based on available evidence)

A FEMALE FARMER SELLS HER SURPLUS SWEET POTATOES AT A MARKET IN MWASONGE, TANZANIA.

PHOTO: BILL & MELINDA GATES FOUNDATION

PART 1: COUNTRY PROFILES

While there is broad recognition that gender disparities exist in agricultural productivity, leaders and policy-makers have lacked crucial information regarding the size of the gender gap, its causes and its differences across regions and contexts. The evidence presented in this section, drawn from across a large swathe of the African continent, provides that missing data. This section marshals new evidence on gender productivity gaps in agriculture from six countries – Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda – which together account for more than 40% of sub-Saharan Africa's population. The analysis presented here allows for a comprehensive understanding of the challenges that women farmers face – within their families, within their villages and across countries – so that policy-makers, practitioners and development partners can identify priorities for policy action. Box 1 provides additional background on the use of the terms "female farmer" and "female manager" and how they are used throughout this report.

Prior attempts to understand the gender gap in agriculture across sub-Saharan Africa have almost all relied on data from small-scale surveys that were not nationally representative.[1] When analysis has relied on national data, datasets have lacked detailed information on individual and household activities and resources linked to individual farm plots, which is critical for a rigorous analysis of gender productivity gaps.[2]

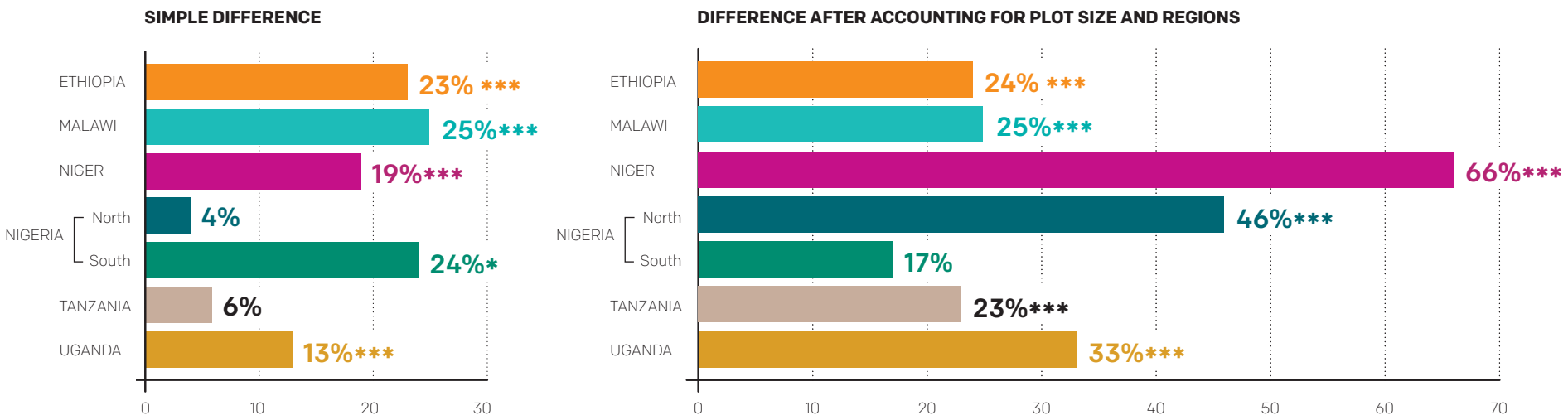
The analysis presented in these six country case studies overcomes many of these shortcomings, thanks to the availability of new data and new methods of analysis. These country profiles explore new data obtained through the World Bank's Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA), which is a multi-country survey programme aimed at improving household and agricultural statistics in sub-Saharan Africa (see Box 2).

In order to pinpoint the factors that drive the gender gap in agricultural productivity, data is analysed through the novel application of a method known as Oaxaca-Blinder decomposition (see Box 3).[3] This method is normally used to examine wage gaps in labour economics, but here it has been used to gain new insights into gender differences in agricultural productivity. The analysis establishes the key issues that contribute to the gap in each country, pointing towards policy solutions to address the relevant issues and reduce the gap. Most importantly, the method separates the factors contributing to the gender gap into two groups of differences between men and women: 1) quantity (or levels) of resources (e.g. hours of farm labour); and 2) returns to those resources (e.g. how much is produced per hectare by one hour of farm labour). Given the diversity of data sources employed in the country profiles and factors that are relevant to the gender gap for each case, the methodology varies somewhat across the six countries. Further details about these differences can be found in Appendix 1.

MEASURING THE GENDER GAP IN PRODUCTIVITY

In this report, agricultural productivity is defined as the average value of agricultural output produced per hectare or acre of land (see Box 4). Productivity differences were measured either at the plot level or added up to the individual farmer level within each country. The results from these surveys show that substantial gender productivity gaps exist within each of the six countries. Figure 1 illustrates the extent of these gaps. A simple comparison of average male and female productivity shows that statistically significant gaps range from a low of 13% in Uganda to a high of 25% in Malawi (the gaps in Tanzania and northern Nigeria are statistically insignificant in this simple comparison). This suggests that in Malawi, for instance, male-managed plots produce on average 25% more per hectare than female-managed plots. A more refined measure of these gaps, which takes into account other key influences on productivity, reveals a starker picture. When plot size and geographic factors are held constant – i.e. when comparing women and men with similar-sized plots in a similar context – substantially larger gender productivity gaps are revealed. After accounting for these differences, the gender gaps range from 23% in Tanzania to a dramatic 66% in Niger.

FIGURE 1: Gender Gaps in Agricultural Productivity, by Country



Note: The symbols */**/*** denote statistical significance at the 10%, 5% and 1% levels respectively.

After accounting for the influence on productivity of farm plot size, the larger gender gaps in the second set of estimates are striking. These estimates show that, in most cases, if women had plots of a similar size to those held by men, the productivity gap would be much larger. Researchers have found that there is a well established inverse relationship between plot size and productivity.[4] In other words, farm yields tend to go down as farm sizes increase. As women in Africa tend to farm smaller tracts of land compared with men, this effect may hide how large the productivity gap would otherwise be. It is important to keep this point in mind when examining male/female comparisons of productivity; this pattern holds across a range of contexts.[5] In particular, the differing results from Niger, northern Nigeria and Tanzania illustrate the influence of plot size on productivity estimates.

The remainder of this section (*Part 1: Country Profiles*) explores the specific drivers of these gaps in each of the six selected countries. The six country profiles reflect a wide range of agricultural practices and agro-climactic contexts, each with its own opportunities and challenges. Each profile introduces the country context and defines the factors contributing to the gender gap (in terms of both levels of resources and returns), and offers policy priorities for that country based on the key factors that substantially account for the gender gap. The summary that closes this section identifies the principal gender productivity constraints that emerge from the data analysis, assesses the relative importance of other factors that fall outside the realm of these analyses and reviews overarching themes to guide policy action. *Part 2: Policy Priorities* offers specific policy guidance to address the priority areas identified in Part 1.

BOX 1: WHO IS A WOMAN FARMER?

In order to maximise crop production, various members of a household contribute time and energy to carry out everyday farming activities. Men, women, boys and girls may all work on the farm. On average, 39% of women in the six profiled countries provide labour (as reported by the farm manager) for household agricultural production.[6]

Most prior research has examined only the household's or head of household's agricultural production, inherently assuming that all household members have similar access to inputs and use them at the same level of effectiveness, with matching levels of productivity.[7] Yet in many African countries, men and women manage their own plots. It is therefore possible and informative to look at specific plot managers and to determine how levels of agricultural productivity differ between women and men.[8]

This report defines women farmers as women who have decision-making power over an arable plot (or plots) of land and/or the resulting harvest. These decisions may include how to prepare land, sow crops, weed, harvest, process produce or sell a surplus. Furthermore, the report uses the terms "women farmers", "female farmers" and "female plot managers" interchangeably. The analysis relies on national-level datasets and the precise definition of these terms varies somewhat across the countries covered. In the country profiles, the definition can indicate an individual within a given household who is responsible for the management of and decision-making about agricultural land; who currently farms a given plot; who makes decisions concerning what crops to plant, which inputs to use and when to conduct farm activities; who decides which crops to plant on the plot; or who is reported to control output from the crops planted on that plot. Each country profile contains a footnote with detailed information on the precise definition employed in that context. Appendix 2 provides further information on the proportion of women farmers as compared with the sex of the household head, across each of the six profiled countries.

BOX 2: LIVING STANDARDS MEASUREMENT STUDY – INTEGRATED SURVEYS ON AGRICULTURE (LSMS-ISA)[9]

Implemented by the Living Standards Measurement Study (LSMS) team within the World Bank, the LSMS-ISA project works with national statistics offices to produce high-quality data in eight countries across Africa, six of which currently have available data that is presented in the following pages.[10] All ISA data is nationally representative and addresses multiple survey topics, allowing for rich, detailed analysis of the linkages between welfare, agriculture and income diversification in sub-Saharan Africa. The ISA data is also disaggregated at the individual and farm plot levels, enabling analysis of a wide variety of issues from a gendered perspective. Furthermore, all ISA surveys have a panel component, which means that in order to understand changes over time, each household is visited at least twice. The LSMS-ISA project also conducts methodological research to improve data quality, disseminating best practices through training, guidebooks, courses and technical assistance.

BOX 3: OAXACA-BLINDER DECOMPOSITION

The Oaxaca-Blinder decomposition method allows for the breakdown of the gender gap into two main components: The endowment effect and the structural effect. The endowment effect refers to the portion of the gender gap that is a result of differences between men and women in terms of factors of production such as age, years of education, amount of fertiliser used, use of farm technologies and so on. Simply put, it refers to the differences in the quantities or levels of resources used in agriculture by men compared with women. Most significantly for policy, the portion of the gender gap attributable to the quantity or levels of resources can be reduced by ensuring that women receive the resources that they lack relative to men. This increased provision could be in the form of more education, more fertiliser or more farm labour, for instance.

Meanwhile, the structural effect captures the returns to resources. This portion of the gender gap results from differences in what is obtained from a given amount of a factor of production – i.e. the difference in agricultural output per hectare or acre that men obtain compared with women who have the same number of years of education, or who use the same amount of fertiliser. Even when men and women have access to the same quantities of resources, they may not achieve the same results. A noticeable difference in returns to resources points towards differences in the treatment of men as compared with women within formal and informal societal institutions, markets, social programmes, etc.[11] As a result, providing women with more resources will not necessarily reduce this structural effect portion of the gender gap. Instead, policies need to address broader issues of disadvantage (including factors such as discrimination and agricultural extension services that focus on male crops) faced by women in the agricultural sector.

Appendix 5 provides further technical details on this methodology.

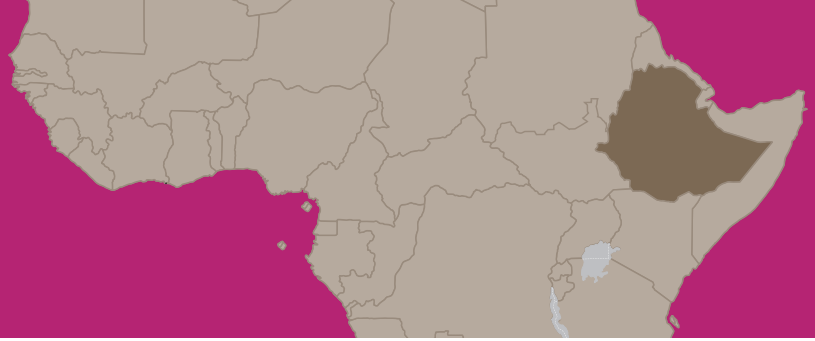
BOX 4: HOW HAVE WE MEASURED AGRICULTURAL PRODUCTIVITY?

Agricultural productivity is defined in this report as the average value of agricultural output produced per unit of land. Individuals within each household are assigned to each plot to allow for a comparison of gender productivity. For example, a man who farms a one-hectare plot in Malawi that produces 50,000 kwacha worth of maize is relatively more productive than a woman who farms a one-hectare plot that produces 40,000 kwacha worth of maize. Specifically, the analysis uses the total value of agricultural output per unit of land, where the quantity of agricultural output is measured by farmers' estimates (whether they consume this output, sell it, etc.). Values are drawn from local and regional sales price information to allow for comparability, and land area is measured either by GPS devices or by farmers' own estimates, depending on the dataset.

WOMEN FETCHING WATER FROM
A WELL IN GOUEZE, NIGER.

PHOTO: ALBERTO ZEZZA / WORLD BANK

ETHIOPIA



SUMMARY

- **Female farm managers[i] in Ethiopia produce 23% less (in terms of gross value of output) per hectare than male managers on average.**
- **Women farmers have a smaller pool of household labour available, spend less time on agricultural activities and are less likely to cultivate a rented plot than men, all of which contribute to the gender gap. Furthermore, women see lower returns to their time spent on agricultural activities, extension services received and use of fertiliser and oxen.**
- **Policy interventions aimed at bridging the gender gap should promote women's use of labour-saving technologies on their farms, provide better tailored advice on input use and take into account household responsibilities.**

INTRODUCTION

Improvements in the agriculture sector hold enormous promise for reducing poverty in Ethiopia, Africa's second most populous country. The sector accounts for nearly half of Ethiopia's GDP.[1] Furthermore, more than three-quarters of the country's population reside in rural areas, where the poverty rate stands at 30%. Smallholder farmers cultivate 96% of Ethiopia's agricultural land, primarily producing subsistence cereal crops. The government plays a central role in seed and fertiliser markets and retains ownership of all the country's land, regulating transfers and rentals. Government policies have striven to expand the provision of agricultural extension and credit services to farmers. Despite this progress, a gap between female and male farmers remains. Enhancing female farmers' contribution to the agricultural sector could yield pay-offs for rural households and the entire Ethiopian economy.

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Aguilar et al., who examine the magnitude of Ethiopia's gender gap in agricultural productivity and the factors that contribute to it.[2] Data from the 2011–12 Ethiopia Rural Socioeconomic Survey (ERSS), conducted by the Ethiopia Central Statistical Agency as part of the LSMS-ISA initiative, form the basis of their study. The analysis sample comprises 1,518 farm managers, of whom approximately 16% are women.

[i] "Farm manager" refers here to an individual within a given household who is responsible for the management of and decision-making about agricultural land. The authors conducted their analysis at the level of the individual farm manager. Nearly all farm managers in the sample (99% of males and 95% of females) also serve as head of their respective households.

ACCOUNTING FOR ETHIOPIA'S GENDER GAP

On average, female farm managers in Ethiopia produce 23% less per hectare than their male counterparts.[ii] This gap grows to 26% among farm managers at median productivity levels (those at the 50th percentile), and narrows to 11.8%[iii] among the least productive farmers (at the 10th percentile). Ethiopia's female farmers face multiple challenges that hinder their productivity: Differences in both the levels of productive factors used and the returns that these factors generate drive the country's gender gap to a substantial degree. Further details on these key differences include the following:

- **Availability of household farm labour:** Ethiopia's female farm managers live in households with 1.7 fewer members on average than male farm managers. This difference widens the gender gap in agricultural productivity considerably, explaining nearly a quarter (23%) of the overall gap. This finding suggests that female farmers would benefit from a deeper reservoir of household farm labour (particularly adult male labour), boosting their production levels.

- **Competing household responsibilities:** Women often hold primary responsibility for household duties, including caring for children. These obligations mean that female farmers have less flexibility to determine the timing and duration of their farm activities. Indeed, female farm managers in Ethiopia spend almost nine hours fewer per week on their own agricultural work than males, and this disparity accounts for 13% of the overall gender gap. Moreover, an hour spent by a woman on her own farm activities does not yield as large a pay-off – in terms of increased productivity – as an hour spent by a man.

- **Quality and size of land:** Women face challenges in obtaining the right agricultural land to boost their productivity. They are less likely than men to rent their farmland from someone else, a tendency that explains 20% of the overall gender gap. Land rentals may allow farmers to gain access to better quality land than they might own. An alternative explanation for this finding is that the most productive farmers (men in this case) are also more likely to rent land. Differences in returns to the number of fields managed and the distance between plots and the household further reduce women's productivity relative to men's.

- **Returns from the use of farm inputs:** Women see smaller improvements to yields than men even when they apply the same amount of fertiliser and use oxen on their farms. Several reasons could account for this result, such as differences in knowledge of appropriate farming techniques or proper timing of use.

- **Knowledge of improved farming practices:** While receiving agricultural extension services does not contribute to the gender gap, these services generate better relative returns for male farm managers. This result suggests that women may receive less effective extension advice or guidance that is not tailored to their specific needs.

POLICY PRIORITIES

Future agricultural policy interventions should consider the following gender-related issues in order to reduce poverty and achieve inclusive agricultural growth in Ethiopia:

- **Promote labour-saving technologies for women:** Tools, equipment and machinery that reduce the amount of farm labour required could benefit female farmers. Policies that expand the labour pool available to women farmers should also be pursued.

- **Provide relevant information to female farmers:** Extension agents and other sources of agricultural advice should better customise their information to the needs of female farmers. In particular, women could benefit from information on the appropriate use of key agricultural inputs such as fertiliser.

- **Ease the time burden of household responsibilities:** Providing services to reduce the time that female farmers need to perform household duties could enable them to devote more time to productive farm activities.

[ii] This estimate does not account for gender differences in land size. In Ethiopia, as the size of the farm increases, its productivity decreases, a trend observed across many developing contexts (see the Country Profiles introduction for more details). Because women farm smaller plots than men, this difference narrows the gender gap in yields.

[iii] This difference is no longer statistically significant, potentially due to the small sample size of female farm managers at the decile level (which is also the case for Niger and Tanzania).

MALAWI

SUMMARY

- **On average, plots managed by women[i] produce 25% less (in terms of gross value of output) per hectare than plots managed by men.**
- **Women use lower levels of agricultural inputs – including improved seeds, inorganic fertiliser and extension services – on their plots compared with men. This disparity accounts for more than 80% of Malawi's gender gap in agricultural productivity. Differences in the quality of these inputs and the returns they yield drive the remainder of the gap.**
- **Policy interventions aimed at alleviating the gender gap should focus on ensuring equal access to and use of agricultural inputs, and should take into consideration women's child-care responsibilities.**

INTRODUCTION

Malawi, with its predominantly rural population of nearly 16 million, relies heavily on smallholder agriculture to achieve food security and foster economic growth. The agriculture sector accounts for 31% of GDP, although weather variations, declining soil fertility and limited use of improved inputs and farming practices have undermined the sector's productivity over the past two decades.[1] Agriculture also serves as a chief source of livelihoods: 84% of Malawian households own or cultivate land, and virtually all of these households grow maize, the country's main staple crop. Most farming households practise subsistence agriculture, with fewer than half of all farming households selling what they produce. Poverty thus remains a critical issue, and it disproportionately affects female-headed households. As of 2011, 49% of all male-headed households were estimated to be below the national poverty line, compared with 57% of households headed by females.[2]

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Kilic et al., who endeavour to assess Malawi's gender gap in agricultural productivity and to account for any differences observed across female- and male-managed plots.[4] The analysis draws upon data from the Third Integrated Household Survey (IHS3) 2010–11 collected by the Malawi National Statistical Office with support from the LSMS-ISA initiative. The IHS3 data covers 12,271 households. The sample is composed of 16,372 plots, of which 26% are managed by women.

[i] The authors define a plot manager as the individual within a household who makes decisions concerning what crops to plant, which inputs to use and when to conduct farm activities on a given plot.

ACCOUNTING FOR MALAWI'S GENDER GAP

On average, plots managed by women produce 25% less per hectare than plots managed by men. This gap ranges from 22% among less productive farmers (at the 10th percentile) to 37% among highly productive farmers (at the 90th percentile). Several factors contribute to this difference:

- **Quantity of farm inputs:** Women use lower levels of agricultural inputs, including improved seeds,[3] inorganic fertiliser and extension services, on their plots compared with men. Overall, this disparity accounts for more than 80% of the gender gap in agricultural productivity. It fully accounts for the gender gap among Malawi's least efficient farmers, those in the bottom 30% in terms of agricultural productivity. Ensuring that women use similar amounts of complementary inputs to men could therefore narrow the overall gender gap to only 4.5% and entirely eliminate the gap among the least productive farmers.

- **Quality of fertiliser application:** While differences in the quantities of farm inputs account for the majority of the productivity gap, differences in the quality of these inputs and the returns they provide also matter. Men see larger improvements in yield, even when they apply the same amounts of inorganic fertiliser as women, suggesting that women may use inferior quality fertiliser, apply this input incorrectly or use it at the wrong time.

- **Efficiency of farm labour:** Using household adult male labour generates greater returns for male-managed plots compared with female-managed plots. This finding suggests that men may work harder or more efficiently on plots managed by other men.

- **Burden of child-care:** Child-care responsibilities fall primarily to women, and are likely to restrict their ability to supervise farm labour and reduce the productivity of their plots. Indeed, having a larger share of children in the household significantly reduces the productivity of female-managed plots but does not affect male-managed plots.

- **Export crop cultivation:** Men are more likely to cultivate export crops. Among the most productive farmers, this difference in the share of land under export crop cultivation (mainly tobacco and cotton) drives the gender gap, accounting for more than half of the difference in agricultural productivity.

POLICY PRIORITIES

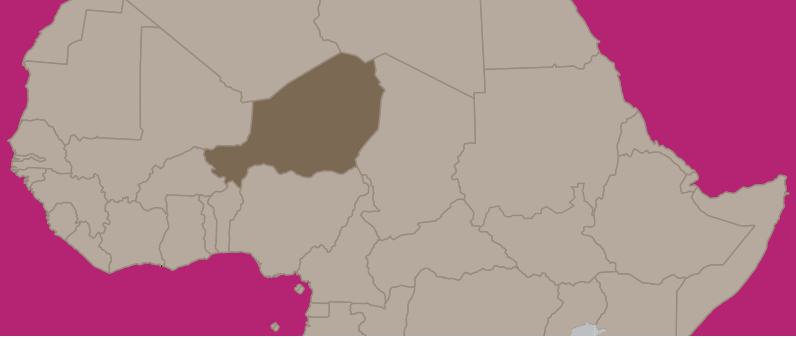
Future agricultural policy interventions should consider the following gender-related issues in order to reduce poverty and achieve inclusive agricultural growth in Malawi:

- **Ensure that female farmers access and use the same amount of key productive inputs as male farmers:** Ensuring that Malawi's female farmers apply similar quantities of agricultural inputs including inorganic fertiliser, pesticides and herbicides, and are growing improved and export crop varieties, could reduce the average gender gap by more than 50%.

- **Take into consideration women's child-care and other household responsibilities:** Policies that enable women to devote a greater proportion of their time to managing their farms could further boost their agricultural productivity.

- **Encourage productive female farmers to engage in export agriculture:** Supporting highly productive female farmers to cultivate export crops could narrow the gender gap.

NIGER



SUMMARY

- **In Niger, plots managed by women[i] produce 19% less (in terms of gross value of output) per hectare than plots managed by men, on average.**
- **Men's greater use of, and returns to, adult male labour explain the largest portion of Niger's gender yield gap. Men also use greater quantities of fertiliser and are more likely to own land, further widening the gap. Differences in returns to organic fertiliser, land and the proportion of children in the household also contribute to the productivity difference, underscoring the importance of structural inequalities in shaping Niger's gender gap.**
- **Policy interventions aimed at redressing the gender gap should focus on increasing women's use of hired farm labour, enhancing their use of fertiliser and improving their access to and control over land.**

INTRODUCTION

Niger, a landlocked country in West Africa with a population of more than 17 million, faces a harsh climate with little water and frequent droughts. Although the Sahara desert envelops most of the country, leaving only 12% of its land arable, it relies heavily on agriculture for its citizens' food security and livelihoods. Crop and livestock production accounted for 40% of Niger's GDP between 2004 and 2011, and more than 60% of rural household income derives from the agricultural sector. Yet the sector is characterised by very low levels of farm input use and low productivity. Nearly half of the country's citizens live below the national poverty line and virtually all (94%) of these impoverished households reside in rural areas. Women account for approximately 24% of Niger's agricultural farm labour, a figure well below that of the other countries covered in this report.[1] Women have sole ownership of only 9% of the total land area controlled or accessed by Niger's households, compared with 62% ownership by men.[2] Increasing women's contributions to Niger's agricultural sector could help rural households lift themselves out of poverty.

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Backiny-Yetna and McGee, and analyses Niger's gender gap in agricultural productivity using data from the 2011 Enquête Nationale sur les Conditions de Vie des Ménages et l'Agriculture (ECVMA), collected by Niger's Institut National de la Statistique with support from the LSMS-ISA initiative.[3] The ECVMA dataset covers 3,968 households. The authors examine data from 4,814 plots managed by men and women in these households. Roughly 40% of the plots in the sample were reported as being collectively managed by the household; in these instances, the authors assign the head of household as the plot manager. Women manage approximately 15% of the plots in the overall sample.

[i] The authors define a plot manager as the individual within a household who makes decisions concerning what crops to plant, which inputs to use and when to conduct farm activities on a given plot.

ACCOUNTING FOR NIGER'S GENDER GAP

On average, plots managed by women produce 19% less per hectare than plots managed by men.[ii] The gender gap, which tends to be highest among Niger's most productive farmers, ranges from 4%[iii] among the least productive farmers (at the 10th percentile) to 34% among highly productive farmers (at the 90th percentile). Several factors contribute to Niger's gender productivity gap:

- **Farm labour:** Women face significant challenges in accessing, using and mobilising male farm labour. Men in Niger use more household adult male labour on their plots than women do, and this imbalance largely drives the country's gender gap. Women also receive less in terms of productivity returns from a day per hectare of a man's labour than men do, and the addition of an extra male or female adult in the household lifts men's productivity more than it does women's. Resorting to hired farm labour only compounds these inequalities, with men enjoying higher relative returns from hiring community labour and using non-family labour more intensively.

- **Quantity and quality of fertiliser use:** Men use more organic and inorganic fertiliser per hectare than women, which widens the gender gap. Men also derive a larger boost in productivity from each unit of organic fertiliser per hectare, and this difference in returns further exacerbates the difference in yields. These findings suggest that, while overall use of farm inputs is low throughout Niger, the gender gap in the use of inputs further constrains productivity.

- **Land ownership and characteristics:** Men are more likely to report owning land and to enjoy higher returns to ownership than women. They also benefit from higher relative returns to an increase in land elevation, a finding that warrants further research. These differences all widen the male/female yield gap and underline important gender disparities in tenure security and land attributes in Niger.

- **Child-care responsibilities:** An increase in the proportion of children in the household is correlated with higher returns for men relative to women. This finding may well be linked to women's larger role in child-care and household responsibilities, which is likely to restrict their ability to supervise farm labour and thus reduces the productivity of their plots.

POLICY PRIORITIES

Future agricultural policy interventions should consider the following gender-related issues to reduce poverty and foster inclusive agricultural growth in Niger:

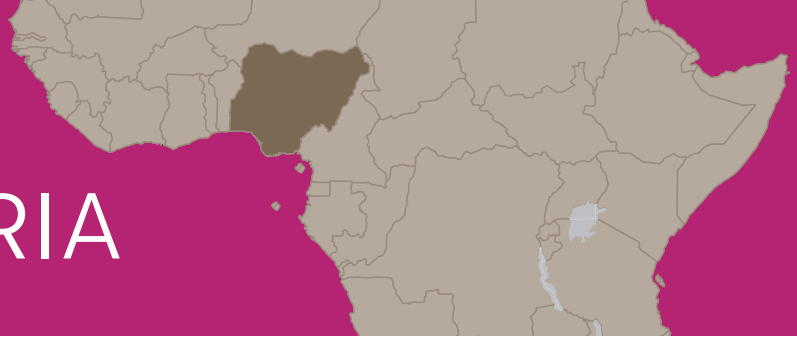
- **Facilitate women's access to and use of hired farm labour:** Policy-makers in Niger should consider policies to address female farmers' labour shortage, as well as options that enable women to devote a larger portion of their time to managing their plots.

- **Increase women's efficient use of fertiliser:** Women apply less fertiliser to their plots than men, and they apply this input less effectively. Policies that increase women's use of fertiliser and improve its application could therefore help to bridge this difference.

- **Support women's access to and control over land:** Women need better access to land, as well as the confidence and security that their land investments will benefit themselves and their families. For these reasons, policies aimed at strengthening women's land rights should be considered.

[ii] The fact that women in Niger cultivate substantially smaller plots than men masks a large underlying productivity gap, as in several other countries included in this report (see the Country Profiles introduction for further details).

[iii] This difference is not statistically significant, perhaps due to the small sample size of farmers for each decile.



NIGERIA

SUMMARY

- **Nigeria's size and broad socio-economic diversity highlight the need for a regional analysis of gender productivity differences.**
- **In northern Nigeria, plots managed by women[i] seem to be just as productive as plots managed by men when simple averages are compared. However, between men and women there are key gender differences in quantities across many important factors of production, such as land size, fertiliser use, labour and household characteristics. After accounting for such differences, plots managed by women produce 27% less (in terms of gross value of output) per hectare than plots managed by men. In addition to differing quantities of productive factors, differences in returns to such factors are also an important component of the gender gap, suggesting that simply providing women with similar quantities of productive inputs to men's will not fully close the gap.**
- **In southern Nigeria, when simple averages are compared, plots managed by women appear to produce substantially less (in terms of gross value of output) per hectare than plots managed by men. However, after accounting for differences in quantities of key productive factors, this gender gap is no longer statistically significant. Unlike in the north, women in the south have similar average returns to productive factors as men. The findings suggest that if women in the south had similar quantities of productive factors to men's, they could produce just as much and the gender gap might disappear.**
- **Future policies aimed at reducing the gender gap in Nigeria should focus on increasing women's use of farm labour, labour-saving technologies and chemical inputs, while expanding female participation in commercial agriculture and tailoring policies to regional differences in agricultural practices and institutional factors.**

INTRODUCTION

Nigeria is set to become the fourth most populous country in the world by 2025.[1] Agriculture plays an important role in its economy, contributing approximately 40% of its GDP and engaging about 60% of the workforce.[2] It plays an even larger role in the north of the country, employing 80% of households compared with approximately 50% in the more urban, oil-producing south. Yet the sector remains mostly small-scale and subsistence-based, with relatively low levels of commercialisation. Nearly half of Nigerians live below the national poverty line, and those in the agricultural sector face even higher poverty levels.[3] Numerous factors constrain women's contribution to agricultural growth. As in much of sub-Saharan Africa, women in Nigeria have relatively limited access to productive agricultural land, inputs and services compared with men. Reducing the gender gap in agricultural productivity thus stands to substantially reduce poverty in the country.

[i] A manager is defined here as the individual(s) within the household who decide(s) which crop(s) to plant on the plot.

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Oseni et al., who assess Nigeria's gender gap in agricultural productivity as well as the key contributing factors to this gap.[4] They employ data from the 2010–11 General Household Survey Panel (GHS-Panel), conducted by the Nigeria National Bureau of Statistics with support from the LSMS-ISA initiative. The GHS-Panel includes 2,431 agricultural households farming 4,240 plots, of which 15% are managed by women. Due to the limited number of female-managed plots in the west of the country and in Niger and Abuja states, the final analysis only looks at approximately 3,000 plots in the remainder of the country. The authors further disaggregate their results by northern (North East and North Central zones) and southern (South East and South South zones) groupings to provide more detailed insights, given Nigeria's varied agro-climatic zones and socio-economic context.

ACCOUNTING FOR NIGERIA'S GENDER GAP

In northern Nigeria, plots managed by women seem to be on average just as productive as plots managed by men when simple averages are compared, due in part to differences in land size. Women in the north manage plots that are nearly half the size of men's. As the size of the farm increases, its productivity decreases (see the Country Profiles introduction for further details). This difference therefore masks the stark gender gaps in agricultural yields in the north of the country. In other words, the female/male gap would be much larger if women in the north had similar-sized plots to men. Indeed, after controlling for manager, land holdings, input use and household characteristics, on average plots managed by women produce 27% less per hectare than plots managed by men, underscoring the importance not just of quantities but also of returns to productive factors for the gender gap in the north.

- **Quantity and efficiency of farm labour:** Men in the north tend to live in households that have more adult labour available and tend to hire more outside labour to meet their agricultural needs. Differences in the number of adult males in the household and the intensity of hired male labour use (measured by days per hectare) account for a large portion of the total gap. Meanwhile, having an extra female adult in the household generates lower returns for female-managed plots relative to male-managed plots. This finding suggests that women may work less efficiently on plots managed by other women.

- **Intensity of fertiliser use:** Female farmers tend to apply less fertiliser per hectare than men, and this difference represents a substantial proportion of the overall gap. Closing this disparity in input use could reduce the north's gender productivity gap.

- **Engagement in commercial agriculture:** Women's cultivation of cash crops and use of purchased seed narrow the gender gap in terms of returns, meaning that female farmers enjoy higher productivity increases from these activities relative to men. Encouraging female farmers to cultivate higher-value crops could help them leverage this advantage to bridge the gender productivity gap.

- **Age:** Older women face lower returns, suggesting that women, including widows, face disadvantages in agricultural production as they age.

In the south of the country, women achieve similar returns from productive factors to those of men on average, implying that differences in female/male productivity would disappear if women could draw on equal quantities of key inputs. Factors influencing the gender gap in the south include:

- **Availability of farm labour:** Male farmers in the south, like their northern counterparts, deploy more labour on their plots. Differences in the amount of male household labour used per hectare explain much of the gap in the south.

- **Herbicide use:** Women use less herbicide per hectare compared with men, and this imbalance further widens the gender productivity gap in the south.

- **Household structure:** Men receive a larger relative boost to productivity from having additional children in their household. This observed difference in returns suggests that men are better able to mobilise younger household members for agricultural work.

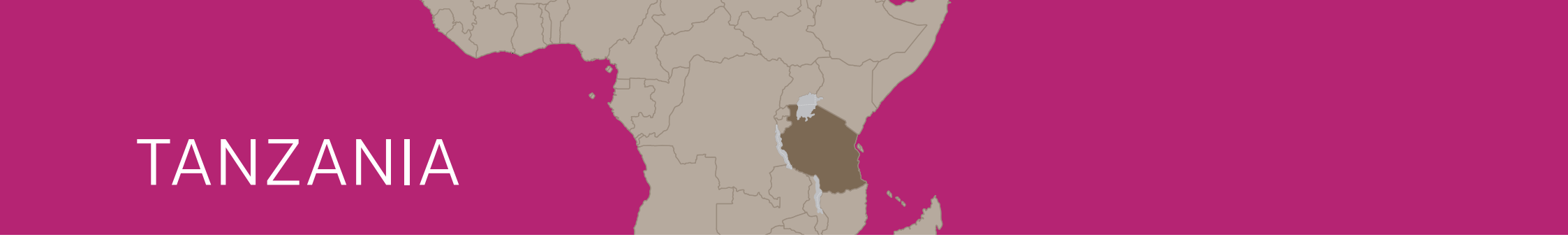
POLICY PRIORITIES

Future agricultural policy interventions should focus on the following gender-related issues in order to reduce poverty and achieve inclusive agricultural growth in Nigeria:

- **Help women overcome their labour disadvantages:** Facilitating women's use of farm labour and labour-saving approaches could narrow the male/female farming gap throughout the country.
- **Improve women's use of fertiliser and herbicides:** Ensuring equal application of key chemical inputs could reduce the gender gap in both the south (herbicides) and the north (fertiliser). Moreover, the increased use of herbicides in the south could yield complementary benefits, as it may reduce the labour that women need for weeding.
- **Expand female participation in commercial agriculture:** Women in the north benefit more than men, in terms of returns, from cultivating cash crops and using purchased seeds. Policies aimed at encouraging and supporting female participation in high-value agriculture could therefore boost women's agricultural production and narrow the productivity gap.
- **Tailor policies to regional differences:** In the south, policies should focus on ensuring that women access and use similar quantities of inputs, including labour and herbicides, to men. Meanwhile, policies targeting female farmers in the north should also take into account the structural disadvantages that prevent women and their households from fully benefiting from agricultural production.

A TANZANIAN FARMER (WOMAN ON THE LEFT) LEARNED ABOUT SOIL IRRIGATION, CROP MULTIPLICATION, AND SELLING CROPS FROM A LOCAL AGRICULTURAL PROGRAM, AND SHE NOW USES HER SKILLS TO LEAD HER COMMUNITY'S FARMING GROUP.

PHOTO: BILL & MELINDA GATES FOUNDATION



TANZANIA

SUMMARY

- **In Tanzania, plots managed by women[i] are on average just as productive as plots managed by men. Yet after accounting for key components such as manager, farm and household characteristics, a clear gender gap emerges: Plots managed solely by women produce on average 14% less (in terms of gross value of output) per acre than plots managed solely by men or jointly by other family members.**
- **An inadequate supply of farm labour, particularly adult male labour, and lower returns from labour inputs constrain the productivity of Tanzania's female plot managers above all other factors. In addition, lower returns to the use of pesticides and organic fertiliser further dampen female productivity and widen Tanzania's gender yield gap.**
- **Policies that expand women's supply of hired labour and others that enable them to devote a greater proportion of their time to farm activities should be considered to bridge the productivity divide. These policies could be accompanied by better information on complementary input use and tailored regional interventions.**

INTRODUCTION

Despite its steady economic growth over the past decade, Tanzania continues to struggle with reducing poverty. The national poverty rate stood at 28% in 2012.[1] Poverty in rural areas, where 80% of the country's poor reside, remains particularly intractable. The government's "Kilimo Kwanza" ("Agriculture First") programme and similar initiatives aim to modernise the country's agricultural sector and help rural households escape poverty. Tanzanian women play a central role in the agricultural sector, contributing 53% of the labour for smallholder crop production.[2] Yet female farmers, who tend to be less educated, less likely to be married and more likely to live in a small household, face multiple barriers that hinder their contributions to rural economic growth. Understanding the extent of the gender gap in agricultural productivity could thus help to improve the lives of the poorest segments of Tanzania's population.

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Slavchevska, and uses data from the first two rounds of the Tanzania National Panel Survey (NPS), conducted in 2008/09 and 2010/11, to explore the impact of gender on agricultural productivity.[3] The analysis of the NPS data, collected by the Tanzania National Bureau of Statistics with support from the LSMS-ISA initiative, includes a total of 6,954 plots farmed by 2,182 agricultural households, 71% of which cultivated plots in both years. Women solely manage 21% of Tanzania's plots and men solely manage 29%, while multiple household members jointly manage the remaining 50%.

[i] A manager is defined here as the individual(s) within the household who decide(s) which crop(s) to plant on the plot. Up to three household members could be identified as plot managers in the survey. The author consequently distinguishes between plots managed by a sole female and those managed by a sole male or jointly by multiple household members.

ACCOUNTING FOR TANZANIA'S GENDER GAP

Across Tanzania, plots managed by women are on the whole just as productive as plots managed by men, though this result is due primarily to differences in land size. As in other countries in Africa, women in Tanzania farm substantially smaller plots than men, and this difference narrows the gender gap in productivity (see the Country Profiles introduction for further details). For this reason, after accounting for differences in farm size as well as manager and household characteristics, inputs and crop choice, a large and significant gender gap in yields emerges: Plots solely managed by women produce on average 14% less per acre than plots managed solely by men or by other family members.[ii] This gap varies from 6.8%[iii] among highly productive farmers (at the 90th percentile) to 8.8% among the least productive (at the 10th percentile).

The following factors contribute to Tanzania's gender gap:

- **Quantity and efficiency of adult male labour:** Households with male- and jointly managed plots have nearly twice as many adult men as those with female managers, and this imbalance drives a large portion of Tanzania's gender productivity gap. The availability, use and intensity (in terms of the number of days worked per acre) of male farm labour all widen the male/female difference in yields. One day of labour from a male family member or a hired labourer also generates a higher increase in yields for male- and jointly managed plots compared with female-managed plots, suggesting that these labourers do not work as efficiently on women's plots.

- **Quality of fertiliser and pesticide application:** Male and joint managers receive higher returns from the use of organic fertiliser and the use of pesticides than female managers. Gender differences in knowledge relating to timing and appropriate use of these productive inputs, or even in the quality of the products themselves, may explain these differences.

- **Regional differences:** The average national gap in productivity masks substantial regional differences. Indeed, Tanzania's more arid and food-insecure regions tend to have the largest gender gaps in yields. Individual female managers in the less fertile central and eastern zones of the country consistently produce less per acre than males or joint managers, with average gaps of 26% in the central zone and 51% in the eastern zone. In the southern "breadbasket" portion of the country, meanwhile, men and women farm at similar levels of productivity.

POLICY PRIORITIES

Future agricultural policy interventions should consider the following gender-related issues to reduce poverty and foster inclusive agricultural growth in Tanzania:

- **Expand women's access to and use of hired labour and labour-saving tools:** Female farmers in Tanzania must overcome their critical shortage of farm labour before their productive potential can be realised. Policies that enable women to hire labour, reduce the amount of labour they require, or allow them to devote a greater share of their own time to productive farm work should be explored to bridge the agricultural productivity divide.

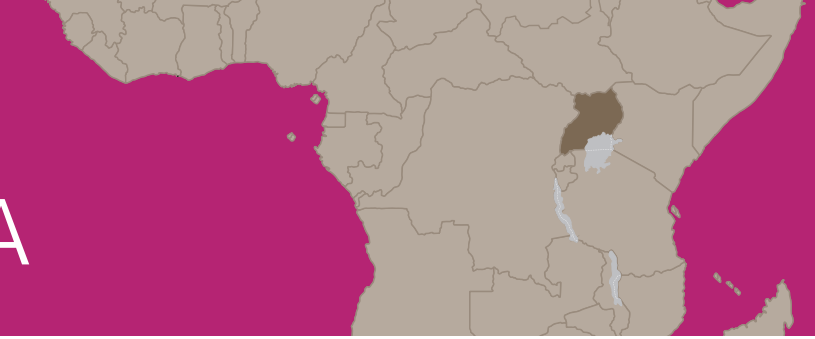
- **Improve women's use of complementary inputs:** Differences in returns to productive inputs, including fertiliser and pesticides, explain most of Tanzania's gender gap. While providing women with complementary inputs will not fully close the gap in yields, equipping them with information on their proper use and application should be a consideration for policy-makers.

- **Develop targeted regional policies:** The central zone of Tanzania has the lowest farm yields and, along with the eastern zone, the largest gender productivity gaps, heightening the need for targeted agricultural interventions that address the constraints particular to those areas.

[ii] When comparing plots solely managed by females and those solely managed by males using the same set of controls, the gender productivity gap stands at 16%.

[iii] This gap is statistically insignificant, perhaps due to the small sample size of farmers for each decile.

UGANDA



SUMMARY

- **Plots managed by women[i] produce 13% less (in terms of gross value of output) per acre on average than plots managed by men or jointly by other family members in Uganda.**
- **Relative to men, women's lower levels of schooling, access to extension services and application of non-labour inputs on their plots, including pesticides and organic fertiliser, widen the gender gap.**
- **Policies aimed at targeting the provision of technical information to women, securing equal access to and use of non-labour inputs, and supporting women's education and training will help to alleviate gender inequality in the sector and enhance productivity.**

INTRODUCTION

Most of Uganda's 36 million inhabitants[1] reside in rural areas and depend on the agricultural sector, which serves as the primary source of livelihoods for 73% of the labour force. The country has made impressive strides in poverty reduction, with 22% of the population living below the national poverty line in 2012–13 compared with 31% in 2005–06.[2] Nevertheless, poverty remains concentrated among rural households that rely on women's and men's farm outputs for sustenance. Indeed, women play a vital role in Uganda's rural agricultural sector and contribute the highest female share of crop labour (56%) of any of the six countries analysed in this report.[3] Increasing the productivity of all rural Ugandans will be central to any efforts to accelerate the country's progress on reducing poverty.

MEASURING THE GENDER GAP IN AGRICULTURE

This profile is based on research by Ali et al., who examine the role of gender in determining Uganda's agricultural productivity.[5] To do this, the authors use panel data from the multi-topic Uganda National Panel Survey (UNPS) rounds for 2009/10 and 2010/11, implemented by the Uganda Bureau of Statistics with support from the LSMS-ISA initiative. The sample includes 14,192 plots,[ii] of which 48% are female-managed.

[i] The authors define a plot manager as the individual within the household who is reported to control output from the crops planted on that plot. In the case of intercropped plots, if all the crop output is controlled by female household members, the plot is defined as female-managed. If all or part of the output is controlled by male managers, the plot is considered to be male- or jointly managed.

[ii] The plot sample is drawn from households in which there is variation in the gender of the plot manager either between or within years, and in which there is at least one plot observation within each year.

ACCOUNTING FOR UGANDA'S GENDER GAP

On average, in Uganda plots managed by women produce 13% less per acre than plots managed by men or jointly by other family members. The gap is driven primarily by differences in the returns that men and women receive from productive factors, more so than the levels of these factors, suggesting that women face disadvantages in multiple socio-economic realms. The following factors drive Uganda's gender gap:

- **Level and quality of education:** Female plot managers complete on average 1.9 fewer years of schooling than male managers, and this difference explains a significant portion of the gender gap. Men also benefit from greater relative returns to education than women; each additional year of schooling boosts male agricultural productivity more than it increases that of women.

- **Effectiveness of extension services and technical information:** Female plot managers are less likely to receive extension advice from Uganda's National Agricultural Advisory Services (NAADS), which contributes to the gender gap. Compounding this effect, the returns to extension services are higher for plots managed by men or jointly with other family members relative to those managed by women. These differences may signify that Uganda's extension services are more attuned to male farmers' demands in terms of crop choices and timing and location of activities, and hence that women could benefit more from information and services that respond to their own needs.

- **Availability and use of farm labour:** Uganda's male plot managers tend to live in households with more adults and thus can draw upon a larger pool of farm labourers, giving them an advantage in terms of resources. Male-managed plots use greater amounts of hired labour, exacerbating the gender gap in agricultural productivity. Household labour, on the other hand, affects the gender gap in a more nuanced way: While women use a higher quantity of household labour than men, helping to close the gender gap, their lower relative returns to this resource widen the gap. This finding indicates that, while women can command household labour, they are not getting as much out of these workers as are men.

- **Access to and use of non-labour inputs:** Overall, the use of many non-labour inputs is low for both men and women in Uganda. Yet plots managed by men or jointly with other family members are still nearly twice as likely to use pesticides and organic fertiliser as plots managed by women. This imbalance increases the gender productivity gap. Ensuring that women apply appropriate quantities of non-labour inputs could both reduce the productivity gap and increase the supply of food available for Ugandan households.

POLICY PRIORITIES

Future agricultural policy interventions in Uganda should consider the following policy priorities in order to decrease poverty further and achieve inclusive agricultural growth:

- **Re-examine the extension services model:** The current extension services model in Uganda could be strengthened to better address women's information needs and skills. Experimenting with different delivery approaches should be encouraged. A farmer field school model, for instance, has already shown some promise in boosting women's productivity.[4] Implementing a targeted capacity-building approach that is better attuned to female farmers' lower education levels may also help.

- **Invest in adult education for women:** While Uganda has already achieved gender parity in national primary and secondary school enrolment, the effects of previous gender gaps in schooling persist. Investments in literacy and adult learning for female farmers may yield tangible benefits for their productivity.

- **Expand women's use of improved inputs:** Women's lower levels of use of pesticide and organic fertiliser limit their productivity relative to men's. Policy-makers should consider improving all farmers' access to these inputs, with a focus on helping women overcome the specific barriers that currently limit their use of inputs.

SUMMING IT UP: KEY DRIVERS OF THE GENDER GAP

The six countries profiled in this report present clear evidence that the disadvantages faced by women farmers in Africa result in a profound gender gap. Female farmers across these diverse African countries, including some of the continent's leading agricultural producers, are consistently less productive on average than their male counterparts, by a range of 13% in Uganda to 25% in Malawi. Although the factors accounting for these gaps vary by country, this report reveals several key drivers of the gender gap that are evident across countries and regions. This section highlights the most important challenges.

Other reports have documented the numerous disadvantages that women face globally, ranging from difficulties in obtaining credit to poor access to modern farming technologies.[1] The country profiles in this report highlight the principal factors and disadvantages that matter for the productivity gap, and also those that do not matter for those particular countries. Table 2 provides a summary of these findings. By focusing political attention and marshalling resources to tackle the specific issues identified here, policy-makers, practitioners and development partners can begin to address gender equality and usher in greater productivity and growth.

In addition to the key drivers identified in the country case studies, there are other important factors that may affect the gender productivity gap. While this analysis allows for a more comprehensive view, limitations in the method, data or surveys mean that it cannot measure everything. Existing empirical literature often cites three additional factors in particular – access to land, social networks and soil quality – that could play a part. After discussing the key drivers of the gender gap identified across the country profiles, this section offers a brief overview of these other factors. Appendix 3 provides a fuller discussion.

KEY DRIVERS OF THE AGRICULTURE GENDER GAP IN AFRICA

Labour

- **Household labour:** Agriculture in Africa depends heavily on manual labour from a farmer's household, family and community. In many ways, labour is a key challenge to achieving equality in productivity across all of the profiled countries – and the farm labour gap begins in the home. On average, female farmers tend to live in smaller households with fewer men, possibly due to widowhood, divorce or migration of husbands. Consequently, women farmers across Ethiopia, Malawi, northern Nigeria, Tanzania and Uganda have fewer household members to provide labour on the farm or support in the home. Female farmers in Malawi, Niger, southern Nigeria and Tanzania also deploy fewer household male labourers on their plots. In all these countries, except Nigeria, these male labourers generate lower returns for female farmers relative to male farmers. And while in Uganda women may be able to mobilise household labour, they still do not receive the same returns to it as men.[i] These lower returns could possibly be due to women's time constraints (relating to their roles as care-givers), which could affect their ability to supervise their household farm labourers, or to cultural norms that result in labourers working harder for male supervisors. Meanwhile, in Niger and northern Nigeria, having an additional household member enhances the productivity of men more than women, possibly indicating men's greater ability to control household farm labour resources.

- **Hired labour:** Female farmers also face challenges in hiring effective outside farm labour, perhaps due to a lack of financial resources, either at the appropriate times in the production cycle or in general. Women in northern Nigeria and Uganda use fewer hired labourers per hectare/acre on their plots and this imbalance widens the gender gap. Meanwhile, hired labour generates lower returns for female farmers compared with male farmers in Niger and Tanzania. This suggests that women, due to other responsibilities, may be less able to adequately manage these labourers and/or that norms constrain women's ability to motivate their labourers to work as efficiently on their plots. Alternatively, women simply may not be able to afford to pay as much as men for effective farm workers.

- **Child-care and household responsibilities:** Women typically assume a larger role in child-care and household responsibilities than men, and this is likely to restrict their ability to work on their own farms or manage their labourers. Moreover, men tend to have greater control over how family labour is allocated, including that of younger household members. For these reasons, having a larger proportion of children in the household (relative to adults) reduces women's productivity more than men's in Malawi, Niger,

[i] The Uganda data does not differentiate between female and male household labour.

southern Nigeria and Uganda. Meanwhile, female farmers in Ethiopia spend less time on farm activities than males and get a lower relative return from the time that they do spend. Addressing women's time burdens could thus have important implications for their farm productivity.[ii]

Non-labour inputs

Differences in the use of and returns to fertilisers, herbicides and pesticides matter for the gender gap. Women have unequal access to a range of productive inputs, including fertiliser and pesticides. The country profiles also demonstrate the importance of unequal returns from those inputs. Indeed, differences in input use and returns contribute to the gender gap across all the countries profiled. In northern Nigeria, women use less fertiliser per hectare than men, while women in southern Nigeria report using pesticides and herbicides less intensively.[iii] These differences reduce the agricultural productivity of Nigerian women, relative to men. In Uganda, women use lower levels of fertiliser, pesticides and herbicides than men, widening the country's gender gap. In Ethiopia and Tanzania, gender differences in returns to fertiliser use contribute to the gap, suggesting that female farmers in these countries use lower-quality fertiliser or apply it incorrectly or at the wrong time. Women in Niger and Malawi, meanwhile, face gender gaps in both domains: They use fertiliser less intensively than men and they achieve smaller productivity gains from the fertiliser they do use (relative to men's). Increasing women's use of improved seeds also offers potential. Female farmers in Malawi and Uganda are less likely to use improved seeds than males, which widens the gap. Meanwhile, in northern Nigeria purchased seeds generate better returns for female farmers compared with their male counterparts. Thus expanding the use of improved and purchased seeds by women in Malawi, Uganda and northern Nigeria could narrow the respective gender gaps.

Agricultural extension and information

The agricultural extension services and information that female farmers access are often less beneficial for their productivity than those obtained by their male counterparts. Women in Ethiopia benefit less than men – in terms of increased agricultural productivity – from the extension advice that their households receive, suggesting that current agricultural extension programmes may be better attuned to the needs of male farmers. Female farmers in Malawi belong to households that receive less technical guidance on agricultural production and marketing, again contributing to the gender gap. Meanwhile, women in Uganda receive less technical guidance from the National Agricultural Advisory Services (NAADS) and also get lower returns from other sources of extension services than men, once again widening the gender gap.

Land

Numerous factors restrict women's access to land, as detailed in the following section. But even after a woman accesses farmland, other associated challenges can hamper her productivity. One of these challenges relates to land size.[iv] In Ethiopia and Tanzania, women receive lower returns than men to an extra hectare of land. This difference could suggest that the marginal land that women obtain may be of poorer quality than men's, among a range of other potential explanations.[v] Gender differences in other land characteristics, including plot elevation and perceived control over land, further reduce women's productivity when compared with men in Ethiopia, Malawi and Niger.

Access to markets

Enabling female farmers to shift into high-value commercial agriculture shows promise. In Malawi, women farmers are less likely to cultivate export crops, such as tobacco, than men, and this difference contributes substantially to the country's gender gap. Similarly, in Uganda the fact that women are less likely to grow cash crops widens the gender gap. Yet on the whole, in Malawi, northern Nigeria and Uganda, female farmers enjoy higher returns than male farmers from switching into high-value agriculture. Policies that leverage this advantage can therefore enhance gender equality and boost agricultural growth.[vi]

[ii] A woman's reproductive role is also likely to influence her overall agricultural productivity, pointing to a possible need for complementary farm worker interventions to help pregnant women.

[iii] Lower levels of pesticide and herbicide use also reduce women's productivity relative to men's in Malawi, while differences in chemical input returns widen the male/female gap in Tanzania.

[iv] While women's smaller plot sizes may narrow the observed gap in productivity (see the Country Profiles introduction), reflecting a gender difference in the quantity of land, differences in returns from land may nevertheless widen the gender gap.

[v] In Niger, men receive lower returns than women from the use of female labour on their plots. These female labourers may be the spouses of the plot managers. Because these women likely lack tenure security over their husbands' plots, they have less incentive to work hard and invest, possibly accounting for the lower observed returns.

[vi] The country profiles for Ethiopia, Niger and Tanzania do not examine the role of cash crop agriculture in contributing to the gender gap.

Human capital

Although countries across Africa have recently made great strides in achieving gender parity in schooling, the gender inequalities of previous decades continue to have an impact on the gender productivity gap. Male/female differences in years of schooling among farmers translate into differences in agricultural productivity in Uganda and, to a lesser degree, Malawi.

Additional measured factors

Other factors play a role but are less relevant than expected in explaining the gender gap across the profiled countries. Women's lower levels of access to non-farm income drives part of Niger's gender gap, but not those of Ethiopia, Malawi or Nigeria. Women farmers tend to be older, on average, than men farmers, but age contributes to the yield gap only in Tanzania, Nigeria and Uganda. Lastly, although credit and irrigation may affect women's access to inputs and shape overall productivity, these factors do not appear to directly determine the gender gap in productivity in any of the profiled countries.[vii]

GOING BEYOND THE SURVEY DATA: OTHER FACTORS THAT MAY MATTER FOR THE GENDER GAP

Evidence from the existing empirical literature points to several other factors (not adequately captured in the country analyses due to limitations in the data, surveys and methodology used) that may also have an effect on the gender gap. Closer analysis of these factors reveals access to land and informal social networks as additional priorities for policy action, with soil quality needing further research. Appendix 3 contains a more detailed discussion of these additional factors.

Access to land and security of tenure

Access to land and security of tenure are critical for agricultural investment and the welfare of rural households, yet women are disadvantaged on both fronts. Studies consistently show that rural women in Africa are less likely to control and own land than rural men, a pattern supported by the household data analysed in this report.[3] Deeply embedded norms and customary institutions govern land in much of rural sub-Saharan Africa, often limiting a woman's rights even to access and cultivate her husband's land.[4] However, the introduction of formal legal systems, in combination with customary institutions, has often resulted in ambiguous and problematic arrangements for women.[5] For example, laws may recognise only a single owner of land, thus failing to account for women's informal secondary access rights under customary systems.[6] At the same time, family and inheritance laws can disadvantage women, making it difficult for them to claim and permanently transfer land following divorce or the death of a father or husband.[7] Inequalities in formal land rights also inhibit women's tenure security, which in turn reduces agricultural productivity. Empirical evidence from settings as diverse as Ethiopia, Rwanda and Ghana has established strong links between security of land tenure and the level of investment in that land, such as tree planting, soil conservation, leaving land fallow and the use of hired labour.[8]

Social networks

Informal social networks play a critical role in the exchange of agricultural information and the adoption of agricultural technologies among farmers.[9] Cultural norms, such as restrictions on women's interactions with men outside the household, as well as time and mobility constraints, may limit avenues for female farmers to access public extension and formal agricultural information services.[10] Women's networks tend to differ from men's (for one thing, they are smaller), and research suggests that women may rely more heavily on them for accessing agricultural information, particularly from other women.[11] Interestingly, one study showed that in communities with male volunteer farm advisors disseminating information about new techniques, farmers did not significantly increase their adoption of these techniques.[12] However, in communities with female volunteer farm advisors, women were more likely to adopt such techniques. Moreover, the same study found that both male and female farmers in communities that had female advisors were also more likely to teach others about these techniques.

Soil quality

Soil quality[viii] is a major determinant of crop productivity in Africa, and it is often claimed that land managed by women is of lower soil quality than that managed by

[vii] Some factors, such as irrigation, are hardly used by either women or men and thus at present they do not contribute to the gap.

[viii] A wide range of indicators can provide information on soil quality, but the level of soil fertility (the amount and composition of nutrients available in the soil) is perhaps the most critical for agricultural productivity.

men.[13] However, the high cost and the logistics of large-scale soil testing in Africa limit the availability of quality data at the farm level. Due to these challenges, empirical evidence of a gender gap in soil quality is scarce and inconclusive. In one study of southern Ghana, researchers found that women do farm plots with slightly lower levels of organic matter, but that this difference does not tend to impact yields.[14] Small sample results from Burkina Faso and Uganda find no appreciable difference in soil quality between women's and men's plots.[15] The lack of robust empirical studies highlights the need for further research to strengthen the evidence base in this area.

POLICY LESSONS

In addition to identifying the main drivers of the agricultural productivity gap between men and women, the country profiles reveal three overarching lessons that should guide policy action on narrowing this gap.

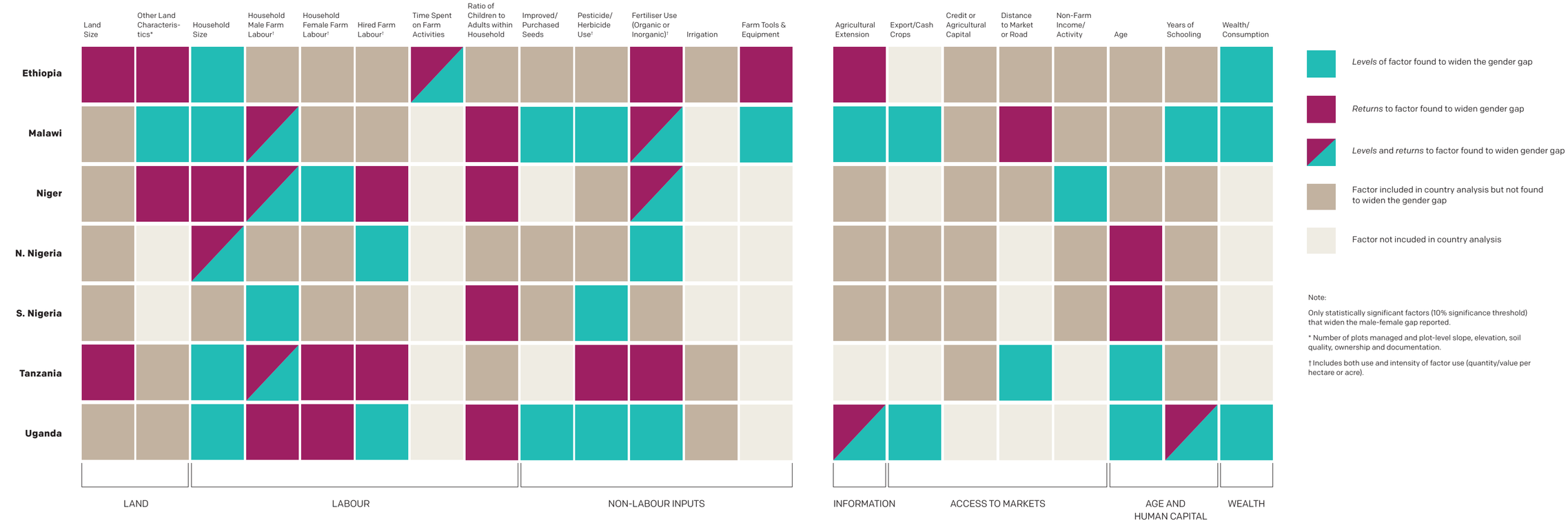
- **First, closing Africa's gender gap is about more than just ensuring that women farmers have equal access to key productive resources. While differences in access to land, fertiliser and other inputs remain important, differences in how a female farmer benefits from these resources (i.e. her returns to those inputs) often have a larger effect. This finding has important implications for policy-makers who seek growth dividends from greater equality.**
- **Second, farmers with different levels of productivity face distinct challenges of their own, and policy-makers should take this into account. The same policy response may not necessarily benefit both female subsistence farmers and highly productive female farmers, for instance.**
- **Third, regional differences matter. Even within the same country, the factors accounting for the gender gap may vary by region. In countries such as Nigeria or Tanzania, for example, policy-makers need to tailor their policy responses to the state or regional level.**

The final section of this report presents specific policy recommendations to address the key drivers of the gender gap.

WOMAN WATERING HER FIELD NEAR LIWONDE NATIONAL PARK, MALAWI.

PHOTO: MEIKE VAN DE SANDE / WORLD BANK

TABLE 2: Factors that Widen the Gender Gap in Agricultural Productivity



Note:

Only statistically significant factors (10% significance threshold) that widen the male-female gap reported.

* Number of plots managed and plot-level slope, elevation, soil quality, ownership and documentation.

† Includes both use and intensity of factor use (quantity/value per hectare or acre).

A SMALLHOLDER FARMER IN UGANDA.

PHOTO: USAID

PART 2: POLICY PRIORITIES FOR NARROWING THE GENDER GAP IN AFRICAN AGRICULTURE

Despite growing recognition of the disadvantages that women face in agriculture, evidence from the six countries profiled in this report suggests that a significant gender gap in agricultural productivity remains. Maintaining the status quo has real costs, in terms of missed opportunities to enhance equality, improve overall agricultural productivity and accelerate economic growth. The persistent gap evident in the profiled countries underscores that a shift in thinking is long overdue. Existing agricultural policies need to become better attuned to the issues that undermine the productivity of female farmers, and new policies and programmes must be designed and implemented to address their particular needs.

This section presents ten policy priorities that are informed by the main drivers of the gender gap identified in the country profiles. Each priority sets out policy options, which have been identified from an interrogation of rigorous impact evaluation evidence and credible inferential research, where it exists. These options include both *promising* interventions, for which existing evidence indicates a high potential for success, and *emerging* interventions, which may benefit from further testing. Ultimately, which policy options individual countries adopt will depend upon the main constraints that women farmers face in those countries and the relevance of that option to each country context. The ten policy priorities are listed on the following pages, grouped according to the key drivers of the gender agricultural productivity gap that they address.

It is important to note that evidence identifying effective policies to support women farmers and bridge the gender gap is scarce. To the extent possible, these policy options are tailored to evidence from African countries. Furthermore, these options are classified as *promising* or *emerging* depending on the rigour and quantity of evidence available. Interventions are classified as *emerging* if the current state of evidence available is thin and/or indirect, and *promising* if rigorous impact evaluation evidence exists for positive productivity impacts on women farmers.[i] While some of these policy options, such as interventions aiming to provide better-quality non-labour inputs, may benefit both women and men to varying degrees, other proposed interventions, such as better targeting of extension services, focus on improving the agricultural productivity of women farmers only. Appendix 4 offers a full assessment of the policy evidence presented here.

This section concludes by offering specific guidance to African leaders wishing to reduce the gender gap within their agriculture sectors and by outlining the catalytic role that donors and other development organisations can play in assisting African governments in this important endeavour, including through the funding of pilot programmes that have the potential to close the gender gap and by employing sex-disaggregated data in the monitoring and evaluation of their programmes to better track impacts on women farmers.

[i] Specifically, a policy is classified as *promising* if it has at least one impact evaluation with a plausible counterfactual that demonstrates results in the anticipated direction. A policy option is *emerging* if it lacks direct, rigorous evidence of impact on gender agricultural productivity outcomes.

TABLE 1: Ten Policy Priorities for Narrowing the Gender Gap in African Agriculture

Promising policy option (based on available evidence)
Emerging policy option (based on available evidence)

Key Driver	Policy Priority	Policy Option
LAND 	1. Strengthen women's land rights.	Formalise land rights through registration to increase women's tenure security.
		Expand co-titling and individual titling for women.
		Reform family and inheritance law to protect women's rights.
LABOUR 	2. Improve women's access to hired labour.	Offer women farmers financing to hire farm labour.
		Task agents with helping women farmers to find labour.
	3. Enhance women's use of tools and equipment that reduce the amount of labour they require on the farm.	Provide women farmers with financing or discounts for hiring or purchasing machinery.
	4. Provide community-based child-care centres.	Provide community-based child-care centres.
NON-LABOUR INPUTS 	5. Encourage women farmers to use more, and higher-quality, fertiliser.	Provide women farmers with financing or price discounts aligned with their cash flow to encourage the purchase of fertiliser.
		Certify small bags of fertiliser for use by women.
	6. Increase women's use of improved seeds.	Provide flexible financing for seeds.
		Help women better identify and obtain good-quality seed.

Key Driver	Policy Priority	Policy Option
INFORMATION 	7. Tailor extension services to women's needs, and leverage social networks to spread agricultural knowledge.	Train extension agents to target female farmers and be more responsive to their agricultural information needs.
		Bring agricultural training and advice to women's doorsteps through farmer field schools and mobile phone applications.
		Identify female volunteer farm advisors to spread information within women's social networks.
ACCESS TO MARKETS 	8. Promote women's cultivation of high-value/cash crops.	Promote women's cultivation of high-value/cash crops.
	9. Facilitate women's access to and effective participation in markets.	Provide market services through information and communications technology (ICT).
		Channel existing groups to access market opportunities.
HUMAN CAPITAL 	10. Raise education levels of adult female farmers.	Raise education levels of adult female farmers.

Promising policy option (based on available evidence)
Emerging policy option (based on available evidence)

PRIORITY 1. STRENGTHEN WOMEN'S LAND RIGHTS

Secure land rights enhance a woman's incentives to invest in her farm. Indeed, evidence has shown that increasing women's formal land rights boosts agricultural investments, particularly in soil and water conservation.[1] Strengthening land rights may also mean that women will have to spend less time and fewer resources trying to secure their land, freeing up resources for investment elsewhere.[2] Having such rights thus holds great potential for improving women's productivity, and policy-makers should consider implementing the following measures.

Formalise land rights through registration to increase women's tenure security

Policy-makers should consider regularising land tenure through community land registration, land title registration or land certification. As an illustration, an innovative, low-cost and gender-sensitive land tenure registration programme in Rwanda (see Box 5) has increased agricultural investments for both women and men, with women increasing their investments almost twice as much as men. These impressive results show how improved tenure security can lead to concrete investment pay-offs.[3] The reforms also helped to clarify the distribution of rights within the household – boosting the chances that a married woman would receive recognition as a co-owner of the land and that children would inherit their parents' land.

Having formal property rights also affects women's decisions to rent land from other community members or to community members, with implications for their own productivity. Formalising rights to land for both women and men may help overcome this challenge and increase women's access to rented land. Men with formal titles may be more willing to lease land to women because of the certainty that women cannot claim rights on it.[4] Furthermore, when a woman rents out a plot and does not cultivate it directly, she risks losing it. For this reason, women are reluctant to rent land out or leave it fallow if their rights are not well documented or their communities do not recognise these rights. Formalising land rights facilitates and increases women's participation in the rental market.[5] Therefore, for both women and men, it may help narrow the productivity gap, while increasing tenure security and overall welfare.[6]

State of evidence: PROMISING

Direct evidence is available of positive impacts on agricultural investment and productivity.

Expand co-titling and individual titling for women

In addition to formalising land rights, policy-makers may focus on land registration for women, either jointly with their spouses or as individuals, to enhance their productivity. Co-titling of landholdings between husbands and wives offers a cost-effective way to ensure that women benefit from accompanying legal reforms.[7] In Tanzania, researchers encouraged co-titling by offering price discounts to land-owners who wished to acquire formal land titles and agreed to accept their wives as owners or co-owners of the land.[8] They assessed this initiative through a randomised experiment and found that these small financial incentives achieved almost complete gender parity without affecting demand for land titles, exemplifying a low-cost yet effective way to achieve gender equality in land ownership. Policy-makers may also consider financial incentives to encourage individual titles in women's names, especially for single, unmarried women or female heads of households, as they may not directly benefit from legal reforms on co-titling.[9]

Past experiences of land titling reforms in Africa and other regions have shown that these efforts may actually harm some women if not designed carefully.[10] Land registration programmes need to account for all the factors that determine women's access to land and their control over it: The underlying legal framework; the interaction between formal and customary laws; women's understanding of their own rights; and the effective enforcement of these rights. Village-level legal aid or paralegals may provide assistance in enforcing these co-titling reforms.[ii]

State of evidence: PROMISING

The policy has evidence of positive gendered impacts on access to and control over land.

[ii] While the evidence for land registration is promising, no rigorous evidence exists on the efficacy of local-level legal assistance.

BOX 5: SECURING LAND TENURE FOR WOMEN AND MEN IN RWANDA

One of the most densely populated countries in Africa, Rwanda has long faced the challenge of developing a land governance system that is efficient, fair and non-discriminatory. It has been argued that the failure to meet this challenge played an important role in the 1994 genocide. The government has since made a concerted effort to clarify land rights and overcome inequalities, setting out rules and guiding principles in its National Land Policy (2004) and Organic Land Law (2005). This process culminated in the Land Tenure Regularisation (LTR) programme, one of the first initiatives in Africa to address tenure insecurity on a national level, with the ambitious goal of registering every landholder in the country. The LTR is innovative in its treatment of gender issues, mandating that legally married wives be recognised as co-owners in the registration process. Piloted in 2007–08 and rolled out nationally in 2010, the programme has demarcated and digitised 10 million plots, and has issued 6.1 million land titles. International donors have supported these efforts, notably the UK's Department for International Development (DFID) and the World Bank. A recent study revealed some interesting and positive gender impacts:

- Households that register their land through the LTR were more likely to invest in it (for example, building terraces and dams), and this effect was twice as strong for female-headed households, suggesting that tenure insecurity had acted as a barrier to investment, especially for women.
- After participating in the LTR programme, the 76% of women in the study who had a marriage certificate were more likely to be regarded as joint land owners with their husbands.
- The property rights of women who are not officially married are not protected under Rwandan law. The LTR pilot actually reduced the likelihood of these women becoming documented owners of land. However, based on these initial results, the Rwandan government has developed a new policy aimed at strengthening the rights of women who do not have official marriage certificates, and preliminary results indicate that this has greatly improved the programme's impact.

Recognising and supporting women's land rights has been at the heart of Rwanda's remarkable reform agenda. The LTR programme serves as an inspiring model for other countries grappling with issues of land insecurity and gender inequality.

Sources: D.A. Ali, K. Deininger and M. Goldstein. 2014. "Environmental and Gender Impacts of Land Tenure Regularization in Africa: Pilot evidence from Rwanda". *Journal of Development Economics*; DFID. 2013. "Annual Review: Support for Land Tenure Regularisation Programme in Rwanda". http://devtracker.dfid.gov.uk/projects/GB-1-200284/documents/

Reform family and inheritance laws to protect women's rights

Policy-makers should consider reforms to family and inheritance laws which ensure that women have equal rights to access, use, control and transfer productive resources such as land. These laws may be designed particularly to protect women's rights to land in the case of divorce. Offering a prime example of this, Malawi's constitution stipulates that, upon the dissolution of a marriage, a woman has the right to a fair disposition of property held jointly with her husband.[11] A study in Ethiopia demonstrated that the country's change in family law has increased women's participation in the workforce and other productive sectors (although impacts on agriculture are not separately identified).[12] Similarly, using non-experimental evidence from a dataset of women's property rights spanning 100 countries over a period of 50 years, researchers found that legal reforms correlated with greater labour force participation among women, higher rates of women in waged employment, lower adolescent fertility, reduced maternal and infant mortality and improved female educational enrolment.[13] After India changed its succession law to grant daughters and sons equal rights to inherit ancestral land, daughters gained more access to land through inheritance, thereby increasing their educational achievements and delaying marriage.[14] These reforms in family and inheritance laws can increase women's access to land, thus enhancing their agricultural investments and productivity. However, as in the previous titling example, access to justice and enforcement are critical to the success of such reforms.

State of evidence: EMERGING

No rigorous evidence is available for agriculture in any African country, but there are positive gender impact results to draw from other developing countries.

PRIORITY 2. IMPROVE WOMEN'S ACCESS TO HIRED LABOUR

Due to household and child-care responsibilities, female farmers have limited time to devote to their own farm work, which undermines their productivity. Making matters worse, they have fewer household members on average than men to help them on their farms, and they face difficulties in hiring additional farm labour, either because they lack the necessary cash to pay for it or because social norms restrict them from hiring men to work for them. When women do hire labour, their workers generate lower returns for them compared with male farmers – perhaps because women's cash constraints can lead them to hire cheaper, less productive labour. In addition, these constraints may vary for female heads of household depending on whether they are unmarried, divorced or widowed. Women farmers across all six countries profiled face these types of challenges, and in every instance these obstacles have widened the gender gap in agricultural productivity. However, evidence on policies aiming to help women overcome these barriers is rare. It is therefore vital that policy-makers consider piloting and evaluating policy options, such as the following, to identify how to enable women farmers across sub-Saharan Africa to overcome such obstacles.

Offer women farmers financing to hire farm labour

Policy-makers should consider piloting and assessing interventions that provide female farmers with financing to hire outside labour for specific farm tasks, such as planting, ploughing, weeding and harvesting. These measures may include vouchers specific to hiring labour, cash transfers and credit. Many agricultural tasks must be conducted within specific time periods, and labour shortages often occur during these periods. If women farmers cannot afford to hire additional labourers or cannot hire labourers to complete tasks at the appropriate time, the delay may result in lower productivity on their farms. Providing finance for these tasks may permit women to access labour in a timely manner, boosting both the number of labourers they can hire and their effectiveness. For example, a preliminary evaluation of cash transfers given to households with children under the age of five in Zambia found that they increased spending on hired labour in addition to other agricultural inputs, such as seeds and fertiliser. Spending on hired labour increased to four times its value before the cash transfers were made.[15] Policy-makers' choice of financing mechanism (be it vouchers, cash transfers or credit) may vary based on their country's particular labour market and institutional context.

State of evidence: EMERGING

Indirect evidence is available on the impact of cash transfers on hired labour, but no direct evidence is available on providing women with financing to hire labour.

Task agents with helping women farmers to find labour

Policy-makers could also pilot and evaluate community programmes whereby agents, both women and men, help connect women farmers to potential hired labour. This policy option may prove particularly effective for women farmers who face difficulties in hiring labour because they are not easily able to leave their homes or because cultural norms limit their ability to hire male labour. Women have already proved to be effective community-based providers of extension information – for example, in Mozambique's extension programme, where female agents were tasked with spreading knowledge of sustainable land management practices within their respective communities.[16] A natural extension of this type of programme may entail these agents providing support to women to hire outside labour. Policy-makers may pilot this type of programme on its own, or combine it with other extension interventions.

State of evidence: EMERGING

This policy lacks any direct, rigorous, empirical evidence.

PRIORITY 3. ENHANCE WOMEN'S USE OF TOOLS AND EQUIPMENT THAT REDUCE THE AMOUNT OF LABOUR THEY REQUIRE ON THE FARM

Improving women's access to tools and machinery that reduce the amount of on-farm labour required has the potential to reduce the productivity gap. Tools and machinery may also help improve women's returns from using available labour on the farm. Use of better tools and equipment may appeal to women who have limited time due to household responsibilities. Women who work on their own farms but face challenges in hiring outside labour may also benefit.

Provide women farmers with financing or discounts for hiring or purchasing machinery

Policy-makers should consider piloting the provision of vouchers, cash transfers, loans or discounts to women farmers so that they can hire or purchase machinery and equipment, and evaluate the impact of these programmes on women's agricultural productivity. Policy-makers may learn from previous experience when designing these pilots. For example, a programme in Kenya and Tanzania targeted women to purchase pumps for irrigation but, despite the emphasis on women, a qualitative assessment of the programme noted that they constituted only 10% of total pump buyers.[17] This example shows that market-based approaches to increase technology use also need to address the information and financial constraints that women face, such as information on how to use machinery. It also shows that the design of technologies should be better attuned to women's situations, cultural appropriateness and ergonomic comfort wherever possible. In this case, the most effective irrigation pumps needed two people to operate them and required women to use their legs for pedalling, which is considered culturally inappropriate. Financing or discounts for hiring or purchasing machinery and equipment may not need to be given to women directly, and could instead incentivise service providers to offer services on female farms. In situations where individuals or groups of female farmers want to purchase machinery, financing layaway purchases[iii] may also prove useful, especially in easing the high upfront cost of buying agricultural equipment.

State of evidence: EMERGING

Only indirect evidence is available on the impact of using machinery.

[iii] In a layaway purchase, unlike a hire purchase or instalment agreement, the customer does not receive the item until it is fully paid for. The seller may charge a small fee for reserving the item, but no interest is charged.

PRIORITY 4. PROVIDE COMMUNITY-BASED CHILD-CARE CENTRES

Typically women care for children, and this responsibility may limit the time they can devote to their own farm work and their ability to supervise farm labour. In several of the contexts profiled, including Malawi, Niger and southern Nigeria, the lack of time that women spend on the farm contributes to the gender gap in productivity.

Policy-makers should consider piloting community-based child-care centres to alleviate the responsibilities that women shoulder at home, and assessing the impact of such centres on women's farm work. Child-care centres have already improved labour participation for women working in other sectors. For example, a pre-school enrolment programme in rural Mozambique helped care-givers, mostly mothers, save 15 hours per week on their child-care responsibilities, as evidenced by a recent experimental evaluation. The programme also increased the likelihood that care-givers would work in the labour market by six percentage points.[18] Similarly, a study in Togo found that women are more likely to work when they have fewer children to care for, and that young women are more likely to participate in the labour market if their children are enrolled in pre-school.[19]

State of evidence: EMERGING

Indirect but strong evidence is available for this policy; however, it pertains to care-givers and not specifically to women farmers.

PRIORITY 5. ENCOURAGE WOMEN FARMERS TO USE MORE, AND HIGHER-QUALITY, FERTILISER

Despite its potential to boost production and increase profits, levels of fertiliser use remain very low in Africa,[20] particularly among women.[iv] In 2002, farmers in sub-Saharan Africa used 8kg of fertiliser on average for every hectare of land they cultivated, which is extremely low compared with averages of over 100kg in South Asia and 78kg in Latin America.[21] The evidence presented in the country profiles underscores the fact that, in many African countries, women apply even less fertiliser than men to their plots. Increasing the use of fertiliser, both in terms of quantity and quality, has emerged as a critical priority for narrowing the gender gap in agricultural productivity, particularly in Ethiopia, Malawi, Niger, northern Nigeria, and Uganda. Yet several distinct barriers may prevent female farmers from using fertiliser, including its price,[22] their inability to obtain credit for its purchase[23] or lack of access to a market.

Policy-makers therefore need to better understand the specific barriers that prevent women farmers from using higher levels of fertiliser and earning higher returns from its application in their particular contexts, and should consider the following policy options.

Provide women farmers with financing or price discounts aligned with their cash flow to encourage the purchase of fertiliser

Policy-makers should consider providing women farmers with financing or should leverage other price incentives, such as time-limited discounts, to encourage them to increase their use of fertiliser. Women farmers may be less likely to use fertiliser if they

[iv] While over-reliance on fertiliser is an important sustainability issue for soil and environmental degradation, use of fertiliser in African countries is far below the smallest possible quantity recommended for improving soil fertility, with farmers applying inorganic fertiliser far less intensively than in the rest of the world.

lack information on its benefits or how to use it, cannot afford to purchase it or face difficulties in conserving cash between agricultural seasons. Price incentives may provide an effective tool to overcome these problems. A randomised control trial in Mali found that when women received free fertiliser, it increased their use of that input as well as of other complementary inputs, including herbicides and hired labour.[24] The intervention led to an overall increase in agricultural output, but because spending on hired labour and herbicides increased as well, it did not lead to higher farm profits. In other fertiliser subsidy programmes where women farmers have not been specifically targeted, evidence of impact has not been as encouraging. A recent preliminary evaluation of Malawi's Farm Input Subsidy Programme showed that when cash vouchers for the use of inputs were given to poor households who owned and cultivated land, there were no clear productivity gains on female-managed plots, although the programme had positive impacts on male-managed plots.[25] This type of intervention would increase women's use of fertiliser, but would not necessarily help them to receive optimal returns from its use. For this reason, complementary interventions to improve information and knowledge on how to use fertiliser (through extension services, for example) will be needed to help women reap the full benefits.

Farmers may also face difficulties in conserving cash between the harvest season and the planting season. A randomised evaluation in Kenya showed that small, time-limited fertiliser discounts, in the form of free delivery, induced bigger increases in fertiliser use than those resulting from much larger price subsidies later in the agricultural season.[26] This evaluation did not distinguish impact by gender, but if women face such fluctuations in their cash flow more than men through the agricultural season, then a similar programme might offer them higher rewards. However, the implementation costs of such an intervention could be significant in Africa, since vouchers and inputs need to be delivered within a short time period. Policy-makers should ensure that they have sufficient resources to execute such an intervention, and should consider designing a smart delivery mechanism to decrease the cost of delivery to farmers.

State of evidence: PROMISING

Evidence is available that vouchers can increase the use of fertiliser by women, but the impact of time-limited discounts is not differentiated by gender.

Certify small fertiliser bags for use by women

Policy-makers and private sector actors could pilot interventions to certify smaller bags of fertiliser for women farmers, and assess whether these measures improve fertiliser use and returns. Fertiliser is typically certified and sold in large, bulk quantities. For example, fertilisers such as urea and diammonium phosphate (DAP) are currently sold in many West African countries in sealed and certified 50kg bags, which is a large quantity considering the low average levels of fertiliser use. Because women cultivate smaller plots of land than men on average,[27] they need even smaller quantities of fertiliser for their plots. However, small bags of certified fertiliser are not readily available. Women therefore often have to resort to purchasing fertiliser of uncertain or adulterated quality, which perhaps helps explain their limited use of the input and their poorer returns from its application.

Admittedly, this intervention may be costly since it would require packaging and certification of smaller bags, thereby raising the unit cost.[28] But many products such as soap and shampoo are available in small sachets in rural areas, and therefore supplying fertiliser in small bags is not unrealistic if the private sector is also brought in as a partner. Moreover, fertiliser certification and regulatory systems across Africa may lack capacity to roll out this policy alone. In Mali, for example, there are no laboratories to check for product quality prior to fertiliser being sold.[29] Nevertheless, the initiative may offer promise in reducing the gender gap in contexts with strong administrative and quality enforcement capabilities. Building this capacity is a precondition for effective certification of fertiliser and one that will have a pay-off for both women and men, with potentially higher benefits for women.

State of evidence: EMERGING

No direct, rigorous evidence is available on the impact of providing certified smaller bags of fertiliser on agricultural productivity.

PRIORITY 6. INCREASE WOMEN'S USE OF IMPROVED SEEDS[30]

Improved seeds can boost farmers' yields. Yet female farmers may not be able to afford to purchase improved seeds or may have limited knowledge or confidence in their quality. A study of soybean adoption in Nigeria examined simple cross-sectional data and found that women tend to use improved soybean seeds less often than men. This difference correlates with lower access to hired labour and fewer market opportunities.[31] Women's limited use of improved seeds, and returns from these inputs, have played a role in increasing the gender gap in Malawi, while in northern Nigeria the use of these seeds is a factor that has helped to close the gender gap.[v] Few rigorous studies have empirically examined increased use or the returns from improved seed varieties. For this reason, this section offers policy guidance based upon lessons from comparable sectors, including the market for pharmaceuticals. Based on these lessons, policy-makers should consider piloting and evaluating the following policy options. They should also carefully consider the limitations that women farmers face in accessing other inputs that may be required for successfully cultivating higher-quality seed, such as fertiliser and labour at certain points in the production cycle.

Provide flexible financing for seeds

Policy-makers could pilot and assess time-sensitive financing options, such as vouchers, loans or transfers for the purchase of improved seed and other inputs that may be needed for cultivating improved seed varieties. The same barriers that hamper fertiliser use may also limit seed purchases. Time-sensitive financing options may provide potential policy remedies when aligned with women's cash flow. An ongoing experiment with seed vouchers in the Democratic Republic of Congo offers an innovative application of this approach (see Box 6). Policy-makers may also consider combining vouchers for a range of inputs within the same intervention, as is the case in the Fertiliser Input Subsidy Programme in Malawi, where farmers were given coupon packages for purchasing fertiliser, hybrid or open-pollinated varieties of maize seed and legumes.[32] However, as the evidence from Mali's free fertiliser experiment shows, subsidising one input may affect farmers' use of other inputs, so the aspect of complementarities between different farm inputs needs to be taken into account.[33]

State of evidence: EMERGING

Evidence is indirect and is related to other non-labour inputs and not directly to the use of improved seeds.

Help women better identify and obtain good-quality seed

Policy-makers could pilot and evaluate programmes that encourage extension agents to teach farmers how to identify quality seeds, and provide incentives to seed retailers to label and brand good-quality seeds and certify smaller bags of improved seeds. As in the cases of fertiliser and medicines, farmers often do not trust the quality of seeds purchased from the market, particularly if they need to buy seeds in uncertified bags. Female farmers may face greater difficulties in accessing market information and therefore, if they doubt the quality of seeds available, will be even less likely than men to purchase them. The example of pharmaceutical drugs markets, where fake drug sellers complicate quality concerns, may offer lessons to improve access to quality seeds. In Uganda, when an external NGO entered the local market to sell authentic quality drugs, the availability of fake drugs decreased and the reputation of their providers diminished, as evidenced by a randomised experiment.[34]

[v] The survey data from Nigeria measures the difference in purchased seed use, which is likely to include improved seeds.

Another field experiment examined anti-malarial drugs in Tanzania and showed that adoption and learning about drugs were higher where misdiagnosis of malaria was higher, and that individuals learned from the bad experiences of previous adopters.[35] Policies encouraging extension organisations to teach farmers about identifying quality seeds or helping seed retailers to label and brand quality seeds might offer effective ways of solving misconceptions about quality.[36] Since female farmers cultivate smaller plots on average, and therefore may need smaller quantities of purchased inputs, pilot programmes that provide smaller bags of certified improved seeds may offer another effective policy option.[37]

State of evidence: EMERGING

No rigorous evidence of positive agricultural productivity impacts is available for improving access to good-quality seed.

BOX 6: BOOSTING WOMEN'S ACCESS TO EXTENSION AND SEED INPUTS IN THE DEMOCRATIC REPUBLIC OF CONGO

The World Bank-funded Agricultural Rehabilitation and Recovery Support Project (PARRSA) in the DRC is an example of an agricultural development initiative that takes an innovative, gender-sensitive approach. The project aims to improve agricultural productivity among smallholder farmers by stimulating the market for seeds of high-yield varieties in the northern part of Equateur Province. The project is developing seed markets both by increasing supply (supporting seed multipliers at the local level to produce and sell their own seeds) and demand (providing agricultural extension services and seed vouchers).

The provision of information and training – through agricultural extension and other means – is an important element of enhancing productivity and overcoming the gender gap among Africa's smallholder farmers. Extension services are especially important when introducing new types of seed to farmers, who may not be willing to take risks and may prefer to plant seeds with which they are familiar. Although extension can encourage the adoption of improved seeds and other practices to increase agricultural productivity, female attendance at extension activities in the DRC is very low. To address this imbalance, half of the PARRSA demonstration plots are reserved for women, and the programme also ensures that some of the local trainers are female.

Observations in the field indicate that extension services have limited impact only if not complemented by other interventions to increase the demand for improved seeds. To address this challenge, the project distributes seed vouchers to offer price discounts to women and men in 60 villages. Additionally, a truck delivers seeds directly to half of the villages in order to evaluate how lack of transportation might hinder future uptake of high-yielding seed varieties. The World Bank's Gender Innovation Lab and the Paris School of Economics are collaborating with PARRSA to conduct a rigorous evaluation of the impact of this approach on both women and men.

Source: World Bank. 2014. DRC PARRSA Implementation, unpublished mimeo.

PRIORITY 7. TAILOR EXTENSION SERVICES TO WOMEN'S NEEDS, AND LEVERAGE SOCIAL NETWORKS TO SPREAD AGRICULTURAL KNOWLEDGE

Knowledge and training on farming methods and techniques are critical for all farmers, but it is particularly important to target female farmers. Women farmers tend to receive second-hand information from husbands and friends if they are not the head of their household, may not attend field training activities due to household responsibilities or mobility constraints, and may not be able to interact with male extension agents due to cultural norms.[38] Female farmers in Malawi receive fewer extension services than men, and this difference contributes to the country's gender gap. Similarly, extension services do not lead to the same returns for female farmers in Ethiopia and Uganda as for their male counterparts, suggesting that these services are less effective for them or are poorly attuned to their needs. The following policy options may help address these challenges and thus reduce the gender gaps in these contexts.

Train extension agents to target female farmers and be more responsive to their agricultural information needs

Policy-makers should consider revisiting their extension services models, encouraging agents to specifically target women farmers, and providing the type of information that these farmers need. Ethiopia's Rural Capacity Building Project (RCBP) offers a good example of such an intervention. The programme, which focuses on improving the delivery of extension service systems throughout the country, explicitly seeks to improve women's participation and to promote gender equality within the extension system by training agents to specifically target women farmers.[39] A recent evaluation of the programme has found mixed but generally encouraging evidence of impact on female-headed households, which were more likely to be in contact with local agricultural offices in the programme intervention areas than in comparison areas. Both female- and male-headed households have experienced positive impacts from the programme and, while the magnitude of impact is lower for women, it is not a significant difference. The programme has also benefited females and males equally in terms of high-value crop cultivation. While there are benefits from the intervention in cultivating crops, the programme has had a significantly lower impact on livestock holdings by female-headed households.

State of evidence: PROMISING

Rigorous empirical evidence is available within African contexts of positive impacts on women's agricultural productivity when extension is targeted specifically to women farmers.

Bring agricultural training and advice to women's doorsteps through farmer field schools and mobile phone applications

Policy-makers should consider expanding farmer field schools and leveraging mobile phone applications to provide women farmers with agricultural training and advice. Women tend not to participate in extension trainings or similar initiatives because they are unable to travel long distances to sessions or they do not have enough time to devote to them.[40] Farmer field schools and mobile phone applications may enable women to receive agricultural information despite these challenges.

Farmer field schools involve regular sessions, from planting to harvest, where groups of neighbouring farmers learn new agricultural techniques and discuss farm management issues. The farmer field school extension agenda can better incorporate specific topics that benefit women farmers, such as training modules on crops that may be more beneficial for them to cultivate. The flexible training schedules of field schools can also better accommodate women farmers, who must already balance farm work, child-care and household responsibilities. A study of farmer field schools in Kenya, Tanzania and Uganda found that the programme helped improve the per capita agricultural income of female-headed households by a large margin compared with male-headed households. Crop productivity also increased in participating female-headed

households in Kenya and Tanzania. Overall, the study found that female-headed households benefited much more than male-headed households from participating in these farmer field schools.

Lastly, pilot interventions, such as the Community Knowledge Worker Initiative in Uganda, where a community contact farmer provides mobile phone agricultural services to farmers, are now being scaled up.[41] Community contact farmers help provide their peers with weather forecasts, crop price information and advice on crop diseases by virtually linking them with extension offices that may be far away. Such interventions underscore the ease and speed with which information and communication technologies (ICT) can make better and more tailored advice available for women farmers.

State of evidence: PROMISING

Positive gendered impacts on agricultural productivity of farmer field schools have been recorded in African countries, but no direct evidence of productivity impacts by gender is available for providing agricultural services using mobile phones.

Identify female volunteer farm advisors to spread information within women's social networks

Policy-makers may also identify female volunteer farm advisors within farming communities, provide agricultural training to these volunteers and encourage them to promote this knowledge within their social circles. Social networks offer a powerful asset that policy-makers can leverage to bridge the gender gap in agricultural productivity. In order to better provide agricultural advice to women, policy-makers can identify female volunteer advisors within communities, who agree to regularly meet with extension agents for agricultural training and demonstrations. They would then encourage these volunteers to promote agricultural information within their social circles. This approach has shown promising results in Mozambique, where extension agents identified female volunteer farm advisors within communities and brought extension demonstrations closer to women's homes. The results showed that in communities that had female farm advisors, both female and male farmers were more likely to adopt sustainable land management practices.[42] Similarly, promising evidence from Malawi suggests that women can be just as effective in delivering agricultural information to their peers (see Box 7). Policy-makers could also complement the use of farm advisors by tapping into the social networks that already exist within women's or mixed-sex farmer organisations.

State of evidence: PROMISING

Available empirical evidence shows that female volunteer farm advisors successfully help in providing agricultural information to both women and men farmers.

BOX 7: LEVERAGING SOCIAL NETWORKS TO SPREAD AGRICULTURAL KNOWLEDGE IN MALAWI

Poor farmers may benefit from many simple and inexpensive technologies, such as using compost, yet they are often reluctant to take them up. One explanation is that a farmer may not know enough about a technology to believe in its benefits or to try it on her own plot, especially when her own and her family's livelihoods depend on a successful harvest. Recognising this obstacle, many governments have looked to agricultural extension programmes to transfer knowledge to farmers, but rates of adoption remain low.

Research from the World Bank's Development Impact Evaluation Initiative in Malawi suggests that social networks may provide more effective channels for spreading agricultural knowledge. Women and men, moreover, are equally successful in imparting this new information. Under a programme carried out by Malawi's Ministry of Agriculture, lead farmers in rural areas received training on innovative methods for growing maize, including pit planting for water retention in dry areas and using compost. A randomised control trial found that, thanks to lead farmers:

- Twice as many farmers displayed greater knowledge of the technique;
- Three times as many farmers actually used the technique;
- Male and female lead farmers performed equally well in transferring knowledge;
- Female lead farmers far outperformed men when both were provided with a cash incentive.

Nevertheless, female lead farmers were not perceived as favourably as their male counterparts, in spite of their equal performance levels. They received lower assessments than their male peers in terms of their knowledge, ability and the quality of their teaching. Thus, while norms around gender may limit the efficacy of using social networks to spread technical knowledge, targeted interventions can partially overcome these cultural and social barriers.

Source: A. Benyishay, M. Jones, F. Kondylis and M. Mobarak. 2014. "Farmers Teaching Farmers: Gender and Lead Farming". Mimeo.

PRIORITY 8. PROMOTE WOMEN'S CULTIVATION OF HIGH-VALUE/CASH CROPS

Women and men often cultivate different types of crop, and women are less likely than men to cultivate cash crops.[43] A majority share of these cash crops may be sold in the market or exported, may command a higher market value and may be used as a food or non-food crop. While this difference in crops cultivated by women and men contributes to widening the gender gap in several contexts, in Malawi and northern Nigeria women farmers who participate in commercial agriculture receive higher returns than men from this choice (holding all else equal).

In order to improve women's overall productivity and welfare, policy-makers should pilot and evaluate programmes that introduce high-value/cash crops into women's cropping systems. They must take into account the following considerations when designing these measures:

- To reap the full benefits, cash crops often need to be complemented with other inputs, such as improved seed varieties, fertiliser and hired labour, to which women may lack access.
- Access to markets is critical to the success of these crops. This spans a range of potential issues from securing transport to being able to get the necessary documents for export, to getting timely and accurate pricing information.
- Women may prefer particular crops because of these crops' maturation periods, yields, taste or colour. These preferences could affect their decision to take up high-value and cash crops.[44] Furthermore, women tend to favour crops that require less upfront investment and less use of complementary inputs.[45] Programmes should encourage women to adopt crops that possess their preferred traits. For example, research on cultivation of Nerica rice varieties in Ghana, Togo and Guinea showed that men favoured short growing cycles and plant height characteristics, while women preferred traits such as good emergence and seedling vigour, probably because they are more involved in sowing and weeding operations.
- As with encouraging the adoption of high-value/cash crops among men, measures are critical to mitigate the riskiness of these new crop varieties and to provide adequate and timely growing information to farmers.
- Men often play a critical role in the choice of crops. For example, in a recent initiative to improve Vitamin A intake in Uganda, biofortified orange fleshed sweet potatoes (OSP) vines were distributed to farmers. Evaluation of the programme found that on about 60% of the plots, women and men jointly made the decision to grow OSP, even though men had a greater say in the decision-making process. On another 17% of the plots both women and men decided jointly, but women had a higher degree of control in making the decision. On 20% of the plots, women alone made the decision to cultivate OSP, and men alone made the decision on only 5% of the plots.[46] The fact that men have an important role in the decision-making process should also be considered when designing interventions that encourage women to cultivate high-value and cash crops. Because traditional roles reserve cash crops for men and confine women to growing food crops, attempts to increase production of high-value/cash crops by women could lead to capture of the benefits by their husbands. Policy-makers should consider branding high-value/cash crops as female crops in extension programmes and encouraging women to cultivate them.

State of evidence: EMERGING

Limited, indirect evidence is available of positive impacts of high-value or cash crop cultivation by women.

PRIORITY 9. FACILITATE WOMEN'S ACCESS TO AND EFFECTIVE PARTICIPATION IN MARKETS

Simply boosting a woman's farm production will not automatically improve her income. In situations where women do not have access to markets to sell their crops, improvements in productivity may not directly yield profitable returns. Male/female differences in a plot's distance from the nearest road contribute to the gender productivity gap in Tanzania. In Malawi, even though both women and men access agricultural marketing offices, women derive lower levels of benefit from this access compared with male farmers. Governments and development organisations should therefore prioritise improving market access and participation for female farmers. Utilisation of ICT and leveraging of existing social groups offer potential tools to improve access to market services and information. Because the evidence of many ICT-based pilot interventions in Africa is patchy, policy-makers should understand in particular the use of ICT in the context of the market challenges that women and men face, such as the high cost of travelling to market or the inability of those living in remote areas to access information.[47]

Provide market services through ICT

Policy-makers may consider piloting ICT innovations and expanding the evidence base around the impact of these pilots on female farmers' access to markets and information. Several projects in Africa have sought to better connect farmers to markets and to provide agricultural information via mobile phones. For instance, a mobile phone intervention in Uganda led to increased market participation by farmers, particularly by those who cultivated perishable crops.[48] Mobile phone applications have also helped farmers receive more consistent prices for their crops. In Niger, the agricultural grain output prices that farmers received were much less variable due to the spread of mobile phone use.[49]

State of evidence: PROMISING

Direct evidence is available of the efficacy of mobile phones in providing market information, but the results are not specific to women.

Channel existing groups to access market opportunities

Policy-makers could also pilot and evaluate interventions that channel women's social groups to improve their market access and information. For instance, in the past many programmes in Africa and Asia have channelled social groups of women, such as religious, vocational and financial groups, to impart business training and link them to agricultural value chains. Accessing these opportunities through groups makes the process easier for women and enhances their bargaining power. Moreover, women demand access to more entrepreneurial capital due to positive influences from their peers, as suggested by non-experimental evidence from Paraguay.[50] In Senegal and Burkina Faso, a study classified village organisations into market-based or community-based organisations based on their primary role and found that market-based organisations were more effective in providing services such as information and training, which require fewer resources.[51] Female groups can also collectively transport their agricultural produce to markets. In Uganda, for example, female-headed households sold smaller amounts of coffee in the market because of a lack of transportation and lower wealth levels.[52] Groups can help female farmers to pool transportation costs and reduce unit costs.

State of evidence: EMERGING

No direct evidence is available relating to agricultural productivity or channelling market information through social networks, but this policy may be easily implemented.

PRIORITY 10. RAISE EDUCATION LEVELS OF ADULT FEMALE FARMERS

Across the countries profiled in this report, women's lower levels of education have hampered both their access and returns to agricultural resources. The gender gap in human capital observed today is partly due to women's lack of access to education in previous decades. Although girls' school enrolment rates have increased markedly, offering the promise that future generations of women farmers will not face the same obstacles to productivity, today's adult female farmers continue to have lower education levels.

Policy-makers should consequently consider piloting, evaluating and further developing programmes that will improve women's education levels, including literacy and numeracy. A rural adult education programme in Niger offers interesting ideas for improving the basic literacy skills of adults (see Box 8). Courses for improving literacy and numeracy were offered over a period of two years. Class schedules were closely aligned to the agricultural seasons and classes were not offered during peak planting and harvesting seasons. Mobile phones were offered in about 58 of 140 programme villages to further assist in learning. An evaluation of the programme found positive results of learning for both women and men, suggesting that innovative methods of teaching adults can successfully improve women's education levels in rural contexts. An even more exciting impact of the programme is that it has resulted in more women cultivating cash crops compared with non-programme villages, suggesting that non-traditional adult education may help women boost their productivity.[53]

State of evidence: **PROMISING**

Rigorous empirical evidence is available of changing female production decisions through improving their education levels.

BOX 8: ADULT EDUCATION AND MOBILE PHONES IN NIGER

Niger has one of the most pronounced gender literacy gaps in the world: 43% of men have basic reading and writing skills, compared with just 15% of women. Food insecurity is chronic in rural areas, and lack of access to market information – reinforced by illiteracy – is a key contributing factor. To help address this challenge, Catholic Relief Services (CRS) established a two-year adult education programme across 140 villages.

As part of a randomised experiment in collaboration with Tufts and Oxford Universities, an extra module was added in 58 of the villages: Projet Alphabetisation de Base par Cellulaire or "Project ABC", which provided cheap shared mobile phones and taught students how to use them. Interventions that use simple mobile phone technology in rural Africa have proliferated in recent years, in recognition of the devices' enormous potential to increase the flow of information and thereby transform farmers' lives. Armed with a mobile phone (and the skills to use it), a farmer can more easily obtain useful information on markets, pricing, agronomy and weather, enhancing her productivity and boosting her livelihood. In Project ABC, participants were enabled to access market information using mobile phones, and also practised reading and writing, reinforcing learning from traditional literacy and numeracy classes.

The results of Project ABC are extremely promising, especially for women. In the wider education programme, both female and male participants considerably improved their literacy and maths skills, with no significant difference between them in their performance. Those in ABC villages, who additionally received mobile phone training, improved even more, scoring 20% higher than their non-ABC counterparts. One interesting finding from the programme was that students learned more effectively with teachers of their own gender, which has valuable implications for future programme design. Furthermore, gains in basic literacy, numeracy and mobile phone skills translated into a real boost in agricultural diversification. ABC households increased the number of crops they produced by 8% compared with non-ABC households. Moreover, ABC women farmers, who were more likely to grow cash crops such as peanuts and okra after taking part in the programme, largely drove this increase in diversification.

Sources: J.C. Aker, C. Ksoll and T.J. Lybbert. 2012. "Can Mobile Phones Improve Learning? Evidence from a Field Experiment in Niger". *American Economic Journal: Applied Economics*, 4(4): 94-120; J.C. Aker and C. Ksoll. 2013. "Can Mobile Phones Improve Agricultural Outcomes? Evidence from a Randomized Experiment in Niger". Mimeo; UNESCO, International Literacy Data. http://www.uis.unesco.org/literacy/Pages/data-release-map-2013.aspx?SPSLanguage=EN

BROADER LESSONS FOR POLICY DESIGN AND IMPLEMENTATION

A number of general considerations should guide policy-makers' design and implementation of the policy options proposed in this report.

- **Take advantage of complementarities:** Female farmers across all the countries profiled face multiple constraints. The proposed policy actions may have a greater impact in reducing the gender gap if policy-makers take advantage of the potential synergies between productive factors, including seeds, fertiliser and labour. Getting the combination right will require paying attention not only to the type of inputs (e.g. a high-yielding crop variety that requires fertiliser) but also to the particular constraints in a given context.
- **Look to the private sector as a potential partner:** Policy-makers should consider looking to the private sector as a partner for solutions, including for the sale of fertiliser and high-quality seeds in small packages and the provision of technical guidance.
- **Leverage women's groups to enhance impact:** Policy-makers can help women's farming groups take advantage of group dynamics to access seeds, bags of fertiliser, land and hired labour or machinery. Supporting the creation of these groups in the form of farmer associations (where they do not already exist) may also help women share agricultural knowledge and overcome cultural barriers to accessing land and labour.
- **Consider cash without any strings attached:** While a clear consensus on the impact of unconditional cash transfers on productivity has not yet emerged, such an approach may help women and men in cash-constrained rural households. For example, Malawi's Social Cash Transfer Scheme, a safety net programme that did not primarily target agriculture, provided cash without conditions to extremely poor households. In addition to its impacts on poverty, an impact evaluation of the programme found strong increases in ownership of productive agricultural assets and time devoted to household farms.[54] Productive impacts of cash transfers, including higher use of inputs such as fertiliser and hired labour by women farmers, have also been observed in Zambia, where cash was given to households with children under the age of five.[55]
- **Account for constraints faced by different kinds of female-headed households:** Women farmers may cultivate their farms along with their male counterparts in a household, or serve as the head of their own household. Decision-making powers and constraints may vary for these female heads of household depending on whether they are unmarried, divorced, widowed or have a male head of household who has migrated out.
- **Understand the broader spectrum of economic activities that women and men farmers engage in:** These activities may provide scope for complementary interventions – for example, improving not only access to labour and equipment for harvesting, but also strengthening post-harvest processing and packaging.
- **Recognise when to end the intervention:** Many of the challenges discussed in this section stem from problems in markets and institutions. In some cases, the policy remedy does not need to be a permanent programme. For example, a farmer may be reluctant to shift to growing a high-value crop because she does not know how best to cultivate it. A short-term voucher programme may enable her to try to grow the crop and develop this knowledge on her own while minimising her costs because she will not have paid for key inputs. However, once she learns how to cultivate the high-value crop correctly and adopts it, the market failure will no longer exist, and the voucher programme will not need to be continued.

NARROWING THE GENDER GAP IN AFRICAN AGRICULTURE: MOVING THE AGENDA FORWARD

This report presents clear evidence of the wide and pervasive gender gap in African agriculture. While it is possible to identify country priorities to close this gap, the evidence base to inform effective policy-making is still limited. Nevertheless, this section broadly marks out a roadmap to jumpstart policy action on this important issue. It also highlights the roles and responsibilities of African governments, donors and development organisations in moving the agenda forward.

RECOMMENDATIONS FOR AFRICAN POLICY-MAKERS

In addition to clearly integrating gender into their national agriculture plans, African policy-makers can take a number of concrete actions to reduce the gender gap in the agriculture sector.

- **Make a robust commitment to narrowing the gender gap:** As part of the African Union's Year of Agriculture and Food Security, African governments should make a new, robust commitment to narrowing the gender gap in agriculture and should unveil this commitment at the AU Summit in Equatorial Guinea in June 2014. Such a commitment should reflect this report's comprehensive understanding of the gender gap in the agriculture sector and the policy priorities set out in this section, which address the main barriers that undermine the productivity of more than 40% of sub-Saharan Africa's women farmers. Without sufficient attention to increasing women's productivity, growth in agriculture may remain stalled, and broader development efforts may be hampered.
- **Implement and scale up promising programmes and policies to support women farmers:** This report empowers African policy-makers across six countries – Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda – with a detailed understanding of the specific constraints faced by women farmers in their countries. It further highlights promising interventions, i.e. those with some evidence of impact, to address these challenges. Policy-makers in the profiled countries and across the continent should implement and further refine the promising programmes relevant to their particular country contexts.
- **Pilot, develop and evaluate emerging ideas to identify new, effective policies and programmes for women farmers:** For too long, a limited understanding of the key constraints facing female farmers in Africa (and in other developing regions) has hindered efforts to reduce the gender gap in agriculture. Now that policy-makers have this knowledge, they must prioritise the development of effective policies and programmes to address these key constraints, including labour. Policy-makers can start this process by piloting the emerging ideas that this report puts forward (such as community-based child-care), evaluating their effectiveness and sharing this knowledge. These efforts will both enable policy-makers to identify effective programmes to support women farmers in their contexts and offer insight, guidance and options to policy-makers in other countries, where women farmers face similar constraints.
- **Strengthen data collection and analysis efforts to pinpoint the specific constraints that women farmers face in non-profiled countries:** This report focuses on just six countries in sub-Saharan Africa. These countries encompass more than 40% of the region's population, cover a broad range of contexts and suggest some key challenges faced by female farmers throughout the region, such as using crop inputs. However, as the profiles also suggest, the factors accounting for the gender gap in agricultural productivity may vary by country. Policy-makers in countries not directly profiled in this report start from a lower level of data availability. They should consider strengthening their capacity to execute comparable data collection and analysis efforts so that they can begin to reduce any costly gender gaps in their agriculture sectors. In addition, the country profiles suggest that, in order to further enhance understanding of the gender gap in African agriculture overall, more data and empirical studies are needed on the time and labour allocation of women farming within male-headed, female-headed and multi-generational households, as well as on soil fertility, access to water and irrigation sources, and constraints faced by different kinds of female-headed households.

RECOMMENDATIONS FOR DONORS AND DEVELOPMENT ORGANISATIONS

Meanwhile, donors and development organisations should play a catalytic role in supporting African governments to close the gender gap. This report empowers African governments with a new and rich understanding of the key challenges that female farmers in their countries face. Donors and development organisations can play an important role in assisting governments to transform this information into tangible improvements in the welfare of their women farmers, by taking the following actions.

- **Create a "challenge fund" to support the piloting and scaling up of effective policies to support female farmers and close the gender gap:** As described here, knowledge of effective policies to close the gender gap in African agriculture is limited. For example, women farmers across all the profiled countries face significant challenges in mobilising and supervising farm labourers to work on their plots. Yet there are no proven policies or programmes to help women farmers overcome these obstacles. For this reason, donors should partner with African governments and fund efforts to develop effective policies to help women farmers overcome the key constraints identified in this report. One way donors can do this is through the creation of a "challenge fund". This independent fund would provide African policy-makers with technical assistance to help them pilot, develop and evaluate programmes, such as the emerging policy options identified in this report, to better support women farmers. The fund's activities would generate widespread benefits: It would enable policy-makers to identify effective programmes to support women farmers in their specific contexts and it would also offer insight, guidance and options to policy-makers in other countries, where women farmers face similar key constraints.
- **Support national agriculture plans with robust gender components:** This report should equip African policy-makers, particularly in the profiled countries, with the tools to address the gender gap, and these policies and programmes should be reflected in their national agriculture plans. Donors should work to support the funding of national agriculture plans directly, and at the very least ensure that complementary efforts are in line with the gender components contained in national plans.
- **Consider the report's findings in relation to donor programmes:** Many donor organisations and development partners operate programmes focusing on women farmers in Africa. This report's findings should therefore help inform their programming in the six profiled countries, while the policy options may also help guide their work with female farmers facing similar constraints in other contexts. Donors and development organisations should also continue to draw on gender analysis in their programme design to better understand the underlying constraints that women face, and should collect sex-disaggregated data as part of the M&E of agricultural programmes to better track impacts on women farmers.

Taking these steps will mark an important turning point for Africa's women farmers towards the opportunity and equality they rightfully deserve.

FARMERS HARVEST A CROP OF BEANS IN MELKASSA, ETHIOPIA.

PHOTO: BILL & MELINDA GATES FOUNDATION

APPENDICES

APPENDIX 1: COMPARABILITY OF COUNTRY PROFILES

Although every effort has been made to standardise the country profiles in this report, readers should keep in mind certain differences relating to survey data and methodology when making comparisons.

First, the surveys that inform the country profiles were implemented by national statistics bureaux in different contexts, and therefore they may vary in the following ways. For one thing, the precise wording of questions and the measurement of different aspects of farming may differ.[i] For example, the surveys in some countries, such as Uganda and Malawi, distinguish contact with extension services at the plot manager level while others, such as Ethiopia, Niger and Nigeria, measure extension contact at the household level. In addition, some country surveys, such as Uganda's, ask about specific sources of agricultural extension, while others have a single question to cover multiple sources of extension.

Second, the authors of the studies that underlie the country profiles may have approached the analysis somewhat differently. The structure of the data itself (e.g. the definition of "farm manager" in the Ethiopia profile) may account for some of these differences. In addition, at the outset of their analyses, the authors made informed judgments regarding the factors that may matter for the analysis based on existing literature, and then focused their analyses on these factors.

Third, structural differences in the country context may be responsible for the different approaches. For this reason, some country studies do not cover particular factors, as Table 2 on page 38 shows.

These three types of difference affected the choice of control variables in the underlying decomposition analyses.[ii] All the analyses employ controls for the geographical area in which a particular household lies, but these can range from small (e.g. enumeration areas in Uganda) to much larger (e.g. states in Nigeria). All of the analyses control for the crop choice of farmers or households, but the individual crops and their groupings differ across the studies.

Despite these differences, it is important to note that the content of each of the country surveys is largely similar and that the core methodology is consistent across the studies. Moreover, as these studies were conducted, there was communication between the authors, which facilitated the comparability of the country analyses. Readers who are interested in more detail on a given country are encouraged to consult the longer studies that informed the country profiles.

[i] The cross-country differences in questionnaire design that were put in perspective during the research programme prompted the LSMS team to increase the comparability of questionnaire instruments in subsequent rounds of supported surveys.

[ii] Control variables are variables that are used in the regression analysis to deal with factors such as regional differences, but the results for this are not discussed here.

APPENDIX 2: WOMEN FARMERS AND HOUSEHOLD HEADSHIP

Sex of the Manager and Sex of the Household Head

The following table illustrates the distribution of male and female farmers by sex of the household head, based on the LSMS-ISA survey samples from each of the six country profiles. For example, in Ethiopia, the large majority of male farmers (1,268 out of 1,277) in the survey sample reside in male-headed households, while most female farmers (231 out of 241) reside in female-headed households. The analyses from Tanzania and Uganda include plots managed jointly by more than one household member. For instance, of the 2,224 plots managed by more than one household member in the Uganda sample, most of these plots (1,711 out of 2,224) are found in male-headed households.

SEX OF HOUSEHOLD HEAD

SEX OF PLOT MANAGER	ETHIOPIA		MALAWI		NIGER		NIGERIA (NORTH)		NIGERIA (SOUTH)		TANZANIA		UGANDA	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
MALE	1,268	9	11,894	134	4,051	17	1,851	4	539	10	1,919	115	4,832	156
FEMALE	10	231	814	3,530	501	245	98	97	186	210	237	1199	4,481	2,491
JOINT											3,028	456	1,711	513

APPENDIX 3: GOING BEYOND THE SURVEY DATA – OTHER FACTORS THAT MAY MATTER FOR THE GENDER GAP

The country profiles contained in this report identify several key factors as the main contributors to the gender gap in agricultural productivity. However, there are other often discussed factors to consider that have not been adequately captured in the analysis due to limitations in the data, surveys and methodology used. This section draws on existing empirical literature to explore how three other key factors – access to land, social networks and soil quality – may also affect the gender productivity gap in Africa.

Access to land

Access to and control of land are critical for agricultural investment and the welfare of rural households. The LSMS-ISA datasets, despite their rich level of detail, can shed only partial light on complex issues related to land access and control. Furthermore, the decomposition analysis was (by design) carried out only for those *already* farming land, thereby limiting its scope. Nevertheless, this analysis does suggest that a number of factors relating to land (beyond access itself) can help explain the gender gap, including ownership, land rentals and formal land rights. These findings are complemented by a considerable body of existing literature exploring the importance of gender inequalities in access, security of control, tenure and rights over land.

Women are disadvantaged in both access to and security of control over land. Deeply embedded norms and customary institutions govern women's access to land in much of rural sub-Saharan Africa, and women are often disadvantaged under both statutory and customary land tenure systems.[1] Traditionally, women had land use rights mainly through their husbands and were limited to accessing land that they cultivated and occupied, thereby compromising their rights to own or inherit land. The introduction of formal legal systems has often resulted in ambiguous legal arrangements which, when combined with existing customary institutions, have tended to disadvantage women.[2] Despite efforts to take women's interests into account under recent land rights reforms, large gender inequalities in access to formal land rights persist in many African countries.[3] For example, laws may recognise only a single owner of land (disregarding secondary users), thus failing to account for women's informal access rights under customary systems.[4] At the same time, family and inheritance laws can also disadvantage women, making it difficult for them to claim and permanently transfer land following divorce or the death of a father or husband.[5]

Studies have found a very consistent trend in land ownership in Africa: Rural women are less likely to control and own land than rural men.[6] This pattern is supported by analyses of the LSMS-ISA data. For example, in Tanzania, of the total agricultural land area that households own or access, 91% is owned by farmers (whether formally documented or not), 44% is owned solely by men, 16% by women only and 39% is owned jointly.[7] In the six countries analysed in this report, men report consistently higher levels of sole ownership of land than women, except in Malawi. In Nigeria, they own 99 times as much land area as women, although 13% of land is managed by women.[i] These ratios are lower in other countries: 7:1 in Niger, 3:1 in Tanzania and 2:1 in Uganda.[ii] These inequalities in formal land rights also inhibit women's security of tenure on the land that they farm, as well as their ability to claim their rights in the case of disputes over land (e.g. competing ownership claims). These challenges make the transfer of land much more problematic for women; they rely less on the market for temporary land rentals, face formal and informal restrictions on land sales and risk losing their land access if their husband dies.[8]

Insecure tenure reduces investment and agricultural productivity. Empirical literature has established strong links between the security of land tenure and the level of investment in that land.[9] For example, research in Ethiopia found that the threat of expropriation tends to reduce investment in soil conservation measures, whereas land certification (which increases security of tenure) boosts investment and rental market activity.[10] Similarly, in Rwanda research has shown that women experience lower levels of tenure security than men, which constrains their willingness to make or maintain investment in structures such as bunds, terraces and dams.[11] A study of nine West African countries concluded that secure tenure tends to significantly increase tree planting and long-term investments, such as leaving land fallow.[12]

[i] In this context, "managed" means purchased, accessed or distributed by clan or family.

[ii] In Malawi, sole ownership of land is similar between women and men.

Weak land security can also dampen agricultural productivity in other ways. One study in Ghana found that women produce lower yields because they leave land fallow for shorter periods.[13] Women's weaker tenure security means that they are more likely to have their land taken away from them when they leave it fallow.

Social networks

Informal social networks play a critical role in the exchange of agricultural information and the adoption of agricultural technologies among farmers.[14] Detailed data on the role of social networks is beyond the scope of the LSMS-ISA surveys, but existing literature has suggested that women's social networks tend to differ from men's, and that women and men tend to use their social networks differently, with implications for their agricultural productivity.[15] Women and men tend to rely on sex-segregated social networks for their farming information and these networks tend to be smaller in size for women. Researchers in Mozambique, for example, found that adding new connections within small social networks increased participants' chances of growing sunflowers for the first time, with this effect being more pronounced among female-headed households.[16] Information networks of pineapple farmers in Ghana, meanwhile, tend to be based on same-gender, clan and age groups.[17] In a study in Ethiopia, a majority of farmers who had adopted inputs such as fertiliser attributed their decision to having an individual of the same sex within their social network.[18]

Women may also rely more than men on social networks for accessing agricultural information.[19] Cultural norms, such as restrictions on interacting with men outside the household and time and mobility constraints, may restrict avenues for women farmers to access public extension and formal agricultural information services.[20] In such situations, women rely heavily on their female social networks to learn about new agricultural technologies. In Mozambique, researchers examined the impact of providing training to female and male volunteer farm advisors, who were identified to disseminate information in communities about these techniques.[21] In communities with male volunteer farm advisors, the programme had no significant impact on adoption. In communities with female advisors, women were more likely to adopt the technology – suggesting that female farm advisors influence other females within their networks to learn about and adopt agricultural techniques. Moreover, both male and female farmers in communities that had female advisors were also more likely to teach others about these techniques.

Soil quality

Soil quality[i] is a major determinant of crop productivity in Africa, and it is often claimed that land managed by women has lower soil quality than that managed by men.[22] However, the high cost and the logistics of large-scale soil testing limit the availability of quality data at the farm level. The LSMS-ISA surveys do not include objective data (based on soil chemistry measurements), and thus soil quality was not addressed in the country analyses in this report.[ii] Due to these same challenges, empirical evidence in the existing literature of a gender gap in soil quality is scarce and inconclusive.[23] For example, a study from Burkina Faso did not find any evidence that women's plots were of a lower quality; similarly, in Uganda, no difference was found between plots owned by husbands and wives (although this was based on a very small sample).[24] In southern Ghana, researchers found that women did farm plots with slightly lower levels of organic matter, but that this difference did not tend to impact yields.[25]

It may be true that women manage and farm land of lower soil quality than men. However, a lack of strong empirical studies highlights the need for further research to strengthen the evidence base in this area.

[i] While a wide range of indicators can provide information on soil quality, the level of soil fertility – i.e. the amount and composition of nutrients available in the soil – is perhaps the most critical for agricultural productivity.

[ii] LSMS-ISA surveys in some countries include self-reported measures of soil quality.

APPENDIX 4: EVIDENCE AND IMPLEMENTATION GUIDE FOR POLICY PRIORITIES TO NARROW THE GENDER GAP

LAND

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 1: STRENGTHEN WOMEN'S LAND RIGHTS					
Formalise land rights through registration to increase women's tenure security.	Promising	Rwanda	Titling registration had positive effects on agricultural investment for both women and men, with significantly higher benefits accruing to female-headed households (Ali et al., 2014).	Yes	Evaluate the impact of large-scale land registration programmes on tenure security for women and men.
		Ethiopia	Land titling resulted in a significant reduction of tenure insecurity and an increase in land-related investment (Deininger et al., 2011).	No	
Expand co-titling and individual titling for women.	Promising	Tanzania	Small financial incentives help achieve high gender parity in titling at low cost and with no loss of demand for land titles (Ali et al., 2013).	Yes	Assess the effect of co-titling on women's access to land, agricultural productivity, empowerment, bargaining power and allocation of resources within the household.
Reform family and inheritance law to protect women's rights.	Emerging	World	Eliminating discrimination in land rights between women and men is associated with positive development outcomes for women (Hasan et al., 2013).	Yes	Analyse the impact of reforms in family and inheritance laws on agricultural investments and productivity using experimental or quasi-experimental data.
	Emerging	India	Equal inheritance rights for girls have the potential to increase their likelihood of inheriting land and improving education levels (Deininger and Goyal, 2013).	Yes	

* A policy is classified as *promising* if it has at least one impact evaluation with a plausible counterfactual that demonstrates results in the anticipated direction. A policy option is *emerging* if it lacks direct, rigorous evidence of impact on gender agricultural productivity outcomes.

** The policy studies are described in Part 2: Policy Priorities, and link to the full citations in the endnotes.

LABOUR

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 2: IMPROVE WOMEN'S ACCESS TO HIRED LABOUR					
Offer women farmers financing to hire farm labour.	Emerging	Zambia	Unconditional cash transfers can increase the amount of money spent on hiring labour (Seidenfeld et al., 2013).	No	Test if financing the hire of labour by women helps increase their use of labour and narrows the gender gap. Compare different mechanisms for doing this, including cash transfers, credit and/or vouchers.
Task agents with helping women farmers to find labour.	Emerging	–	–	–	Examine the effect of training community agents to help women find labour on women's access to and use of hired farm labour.
POLICY PRIORITY 3: ENHANCE WOMEN'S USE OF TOOLS AND EQUIPMENT THAT REDUCE THE AMOUNT OF LABOUR THEY REQUIRE ON THE FARM					
Provide women farmers with financing or discounts for hiring or purchasing machinery.	Emerging	Kenya and Tanzania	Promote technologies that consider women's labour and financial constraints and that are culturally appropriate for women to use (Njuki et al., 2013).	Yes	Examine which financing mechanisms work best to increase the use of machinery and tools and its consequent impact on labour and farm productivity.
POLICY PRIORITY 4: PROVIDE COMMUNITY-BASED CHILD-CARE CENTRES					
Provide community-based child-care centres.	Emerging	Mozambique	Enrolling children in pre-school increases the likelihood of female labour force participation (Martinez et al., 2012).	No	Evaluate the direct impact of enrolling children in community-based child-care centres on female labour supply on farms.

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** The policy studies are described in Part 2: Policy Priorities, and link to the full citations in the endnotes.

NON-LABOUR INPUTS

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 5: ENCOURAGE WOMEN FARMERS TO USE MORE, AND HIGHER-QUALITY, FERTILISER					
Provide women farmers with financing or price discounts aligned with their cash flow to encourage the purchase of fertiliser.	Promising	Mali	Vouchers for free fertiliser not only increase the use of fertiliser, but also enhance use of other complementary inputs (Beaman et al., 2013).	Yes	Analyse the impact of different financing mechanisms and time-limited discounts on the use of fertiliser, other complementary inputs and farm productivity.
		Kenya	Timely and affordable availability of fertiliser is key: Small price incentives aligned with farmers' cash flow cycles can increase the use of fertiliser substantially (Duflo et al., 2011).	No	
Certify small bags of fertiliser for use by women.	Emerging	–	–	–	Test if providing smaller certified bags of fertiliser has an impact on fertiliser use and productivity for women and men that is worth the cost.
POLICY PRIORITY 6: INCREASE WOMEN'S USE OF IMPROVED SEEDS					
Provide flexible financing for seeds.	Emerging	Mali	Vouchers for free fertiliser increase not only use of fertiliser but also use of other complementary inputs (Beaman et al., 2013).	Yes	Assess the influence of different financing mechanisms, varying levels of discounts and timing of offering discounts for various inputs on the use and returns from these inputs on female-managed plots.
		Kenya	Timely and affordable availability of fertiliser is key: Small price incentives aligned with farmers' cash flow cycle can increase the use of fertiliser substantially (Duflo et al., 2011).	No	
Help women better identify and obtain good-quality seeds.	Emerging	–	–	–	Evaluate the impact of providing women with small certified bags of seeds on the use of good-quality seeds and female agricultural productivity.

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INFORMATION

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 7: TAILOR EXTENSION SERVICES TO WOMEN'S NEEDS, AND LEVERAGE SOCIAL NETWORKS TO SPREAD AGRICULTURAL KNOWLEDGE					
Train extension agents to target female farmers and be more responsive to their agricultural information needs.	Promising	Ethiopia	Female-headed households benefit from extension efforts that specifically seek to improve women's participation (Buehren et al., 2013).	Yes	Compare the impact of different agents (e.g. extension service staff, lead farmers, volunteer advisors) and different modalities of delivery (e.g. face-to-face, via mobile phones, through farmer groups) on the use of farm inputs, agricultural techniques and farm productivity of female-managed plots.
Bring agricultural training and advice to women's doorsteps through farmer field schools and mobile phone applications.	Promising	Kenya, Uganda and Tanzania	Female-headed households may benefit more than male-headed households from participation in farmer field schools (Davis et al., 2010).	Yes	
Identify female volunteer farm advisors to spread information within women's social networks.	Promising	Mozambique	Selecting female volunteer farm advisors directly within communities enhances the use of agricultural techniques by both female and male farmers within those communities (Kondylis and Mueller, 2013).	Yes	

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** The policy studies are described in Part 2: Policy Priorities, and link to the full citations in the endnotes.

ACCESS TO MARKETS

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 8: PROMOTE WOMEN'S CULTIVATION OF HIGH-VALUE/CASH CROPS					
Promote women's cultivation of high-value/cash crops.	Emerging	–	–	–	Test various mechanisms for increasing the adoption of high-value/cash crops including increased information and/or subsidies (for seeds, but also for complementary inputs) and evaluate the impact.
POLICY PRIORITY 9: FACILITATE WOMEN'S ACCESS TO AND EFFECTIVE PARTICIPATION IN MARKETS					
Provide market services through ICT.	Promising	Niger	Price volatility of grains decreased significantly after roll-out of mobile phones in Niger because of increased access to market information (Aker, 2010).	No	Examine if female farmers benefit more than, and differently from, male farmers in using mobile phones to access agricultural market information.
Channel existing groups to access market opportunities.	Emerging	–	–	–	Assess the effect of providing marketing training and information to female farmers (alone or through groups) on market access, crop sales and agricultural productivity.

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** The policy studies are described in Part 2: Policy Priorities, and link to the full citations in the endnotes.

HUMAN CAPITAL

POLICY OPTION	STATE OF EVIDENCE*	COUNTRY	KEY FINDINGS FOR POLICY**	STUDY REPORTS GENDER DIFFERENCES	POSSIBLE PILOT INTERVENTION
POLICY PRIORITY 10: RAISE EDUCATION LEVELS OF ADULT FEMALE FARMERS					
Raise education levels of adult female farmers.	Promising	Niger	Adult literacy programmes along with training on mobile phone use improve literacy and numeracy skills of women and men almost equally and increase cultivation of cash crops by women (Aker et al., 2012; Aker and Ksoll, 2013).	Yes	Assess the impact on agricultural outcomes of different mechanisms to increase women's literacy and numeracy skills.

* A policy is classified as *promising* if it has at least one impact evaluation with a plausible counterfactual that demonstrates results in the anticipated direction. A policy option is *emerging* if it lacks direct, rigorous evidence of impact on gender agricultural productivity outcomes.

** The policy studies are described in Part 2: Policy Priorities, and link to the full citations in the endnotes.

APPENDIX 5: TECHNICAL ANNEX ON DECOMPOSITION METHODS

This annex provides a technical overview of the quantitative methods used for the country profiles presented in this report.[1]

Regression-based decomposition methods have been widely utilised in labour economics following the seminal papers of Oaxaca (1973)[2] and Blinder (1973),[3] notably in analyses of the gender wage gap, union wage gap and growing wage inequality.[4] [5] Despite the extensive use of Oaxaca-Blinder regression-based mean decomposition by applied economists over the past three decades and the advances that have been made to extend its application to the decomposition of distributional statistics besides the mean, the questions that the method attempts to address require a strong set of assumptions.[6]

In particular, these methods follow a partial equilibrium approach, where observed outcomes for one group can be used to construct various counterfactual scenarios for the other group.[7] Another limitation is that while decompositions are useful for quantifying, purely in an accounting sense, the contribution of various factors to a difference in an outcome across groups or a change in an outcome for a particular group over time, they are based on correlations, and hence cannot be interpreted as estimates of underlying causal parameters, as noted by Fortin et al. (2011). The use of phrases in this report such as "drivers of the gender gap" should therefore be viewed in this light. Nevertheless, decomposition methods do document the relative quantitative importance of factors in explaining an observed gap, thus suggesting priorities for further analysis and, ultimately, policy interventions.[8]

To document the extent and drivers of the gender difference in agricultural productivity, the background papers that underlie this report rely on an Oaxaca-Blinder regression-based mean decomposition. Typically, they assume the log of an agricultural productivity measure (Y), namely gross value of agricultural output per hectare, for male- (M) and female- (F) managed plots, estimated as:

$$(1) \qquad Y_G = \beta_{G0} + \sum_{k=1}^{K} X_{Gk}\,'\beta_{Gk} + \varepsilon_G$$

where G indicates the gender of the plot manager (one exception is Ethiopia, where the analysis is conducted at the individual plot-holder level); X is a vector of k observable, plot-/holder-, household- and/or community-level explanatory variables; β is the associated vector of intercept and slope coefficients; and $\boldsymbol{\varepsilon}$ is the error term under the assumption that $E(\boldsymbol{\varepsilon}_M) = E(\boldsymbol{\varepsilon}_F) = 0$.

The gender gap *"D"* is expressed as the mean outcome difference:

$$(2) \qquad D = E(Y_M) - E(Y_F).$$

Equations (1) and (2) imply that:

$$(3) \qquad E(Y_M) = E(\beta_{M0} + \sum_{k=1}^{K} X_{Mk}\beta_{Mk} + \varepsilon_M) = \beta_{M0} + \sum_{k=1}^{K} E(X_{Mk})\beta_{Mk}$$

$$(4) \qquad E(Y_F) = E(\beta_{F0} + \sum_{k=1}^{K} X_{Fk}\beta_{Fk} + \varepsilon_F) = \beta_{F0} + \sum_{k=1}^{K} E(X_{Fk})\beta_{Fk}$$

and Equation (2) could be rewritten as:

$$(5) \qquad D = E(Y_M) - E(Y_F) = \beta_{M0} + \sum_{k=1}^{K} E(X_{Mk})\beta_{Mk} - \beta_{F0} - \sum_{k=1}^{K} E(X_{Fk})\beta$$

Subsequently, β^* could be defined as the vector of coefficients that is obtained from a regression of Y that is based on the pooled plot sample and includes the group membership identifier, i.e. a dummy variable identifying female-managed plots. The inclusion of the group membership indicator in the pooled regression for the estimation of β^* takes into account the possibility that the mean difference in plot-level productivity measure is explained by the gender of the plot manager, avoiding a possible distortion of the decomposition results due to the residual group difference reflected in β^*.[9] Rearranging Equation (5) by adding and subtracting (i) the slope coefficient of the pooled regression (β_0^*) and (ii) the return to the observable covariates of each group valued at $\beta^*(X_{Mk}\beta_k^* \text{ and } X_{Fk}\beta_k^*)$, the following is obtained:

(6)

$$D = \underbrace{\sum_{k=1}^{K}[E(X_{Mk}) - E(X_{Fk})]\beta_k^*}_{Component\ 1:\ Endowment\ Effect} +$$

$$\underbrace{\underbrace{(\beta_{0M} - \beta_0^*) + \sum_{k=1}^{K}[E(X_{Mk})(\beta_{Mk} - \beta_k^*]}_{Male\ Structural\ Advantage} + \underbrace{(\beta_0^* - \beta_{0F}) + \sum_{k=1}^{K}[E(X_{Fk})(\beta_{Fk} - \beta_k^*]}_{Female\ Structural\ Disadvantage}}_{Component\ 2:\ Structure\ Effect}$$

Where $\beta_{M0}, \beta_{F0}, \beta_0^*, \beta_{Mk}, \beta_{Fk}, \beta_k^*$ $(k=1\ldots K)$ are the estimated intercept and slope coefficients of each covariate included in the regressions for the male-managed, female-managed and pooled plot samples.

Equation (6) is known as the *aggregate decomposition*. The first component is the *endowment effect*, i.e. the portion of the gender gap that is explained by differences in the levels of observable covariates between both groups. This effect corresponds to the report's references to "levels". It is equal to the sum across all covariates of the differences between male and female means, valued at the corresponding "average" return. The second component is the *structure effect*, i.e. the portion of the gender gap driven by deviations of each group's return from the corresponding "average" return. The combined structure effect corresponds to the report's references to "returns". The first term of the structure effect $(\beta_{0M} - \beta_0^*) + \sum_{k=1}^{K}[E(X_{Mk})(\beta_{Mk} - \beta_k^*]$ represents the *male structural advantage*, which is equal to the portion of the gender gap accounted for by deviations of male regression coefficients from pooled counterparts. The second term of the structure effect $(\beta_0^* - \beta_{0F}) + \sum_{k=1}^{K}[E(X_{Fk})(\beta_{Fk} - \beta_k^*]$ represents the *female structural disadvantage*, which is equal to the portion of the gender gap driven by deviations of pooled regression coefficients from female counterparts.[i]

In practice, Equation (1) is estimated for (i) male-managed plots, (ii) female-managed plots and (iii) the pooled plot sample (with a dummy variable identifying female-managed plots), and uses the resulting vector of coefficients β_M, β_F and β^*, together with the mean values for each covariate for each group X_M and X_F, to compute the components of Equation (6). Moving beyond the aggregate decomposition, the detailed decomposition involves sub-dividing the endowment and structure effects into the respective contributions of each observable covariate, which correspond to the variable-specific sub-components of the summations included in Equation (6).

Fortin et al. (2011) present a detailed account of the assumptions required to identify the population parameters of interest. Two crucial assumptions for the validity of aggregate decomposition are (i) overlapping support and (ii) ignorability. *Overlapping support* implies that no single value of $X = x$ or $\boldsymbol{\varepsilon} = e$ exists to identify female plot management. *Ignorability* refers to the random assignment of female plot management conditional on observable attributes. The additional essential assumptions required by detailed decomposition to identify the individual contribution of each covariate include *additive linearity* and *zero conditional mean*. The latter implies that $\boldsymbol{\varepsilon}$ is independent of X In other words, we assume that there is no unobservable heterogeneity that jointly determines the outcome and observable attributes. It should be noted that even if the additional assumptions required by detailed decomposition may not hold true, aggregate decomposition would remain valid as long as overlapping support and ignorability assumptions are tenable.

While it is important to conduct Oaxaca-Blinder decomposition at the mean with nationally representative data, the background papers underlying this report recognise that going beyond the "average" farmer and understanding the *heterogeneity* of constraints faced by farmers with different gender and productivity profiles is crucial for the design and implementation of better-targeted interventions aimed at bridging the gap. An important question is whether the findings, based on the sample means, are robust to the decomposition of alternative distributional statistics beyond the mean.

A method that is similar in spirit to the mean decomposition relies on the recentred influence function (RIF) regressions proposed by Firpo et al. (2009)[10] and provides a straightforward framework within which cross-group differences in any distributional statistic could be decomposed. The RIF decomposition approach is subsequently used to provide estimates of the aggregate and detailed decomposition of the gender gap at different percentiles of the agricultural productivity distribution.

[i] The use of the term "disadvantage" is tied to the subsequent section's discussion of the regression co-efficients estimated from the pooled, male-managed and female-managed plot samples. With respect to their counterparts estimated from the pooled plot sample, the regression co-efficients from the female-managed plot sample that are expected to be positive and that are associated with key factors of production are consistently positive but lower in absolute terms. Conversely, the use of the term "advantage" is linked to the same set of regression co-efficients being higher in the male-managed plot sample than those from the pooled plot sample.

An RIF regression is similar to a standard OLS regression, except that the dependent variable, Y, is replaced by the RIF of the distributional statistic of interest. The approach assumes that the conditional expectation of the $RIF(Y;v)$ can be modelled as a linear function of observable attributes, X, such that $E[RIF(Y;v)|X] = X\gamma$, as in the mean decomposition. Assuming that $IF(y;v)$ is the influence function corresponding to an observed productivity outcome y, for the distributional statistic $v(F_Y)$, the RIF is defined as:

$$RIF(y;v) = v(F_Y) + IF(y;v). \quad (7)$$

In the case of quantiles, the influence function is equal to:

$$IF(Y;Q_T) = \frac{(T - \mathbf{1}\{Y \leq Q_T\})}{f_Y(Q_T)}, \quad (8)$$

where $1\{Y \leq Q_T\}$ is an indicator function equal to 1 if the value of the outcome variable is smaller than or equal to the quantile Q_T and 0 otherwise, $f_Y(Q_T)$ is the density of the marginal distribution of Y, and Q_T is the population T-quantile of the unconditional distribution of Y. Consequently,

$$RIF(Y;Q_T) = Q_T + IF(Y;Q_T). \quad (9)$$

In practice, the RIF is first estimated as a function of the sample quantile Q_T (e.g. the 10th percentile), the dummy variable identifying whether the observed outcome, Y, is smaller than or equal to the sample quantile, and the density estimated using kernel methods at the point of the sample quantile. In the second stage, the estimated RIF is used as a dependent variable in an OLS regression that is run separately for the male-managed, female-managed and pooled plot samples. The resulting parameters γ_M, γ_F and γ^* replace the β counterparts in Equation (6) and are used together with the group-specific mean values for each covariate, X_M and X_F, to perform aggregate and detailed decompositions of any distributional statistic beyond the mean with the same framework that underlies the Oaxaca-Blinder mean decomposition.

A WOMAN MAKES HER LIVING AS A CHICKPEA FARMER IN TULU BOLO, ETHIOPIA. TRAINING FROM A FARMER'S COOPERATIVE ON IMPROVED SEEDS AND FARMING TECHNIQUES HAS INCREASED HER CROP PRODUCTION AND TRANSFORMED HER AND HER FAMILY'S LIVES.

PHOTO: MIKE TURNER

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PART 1: COUNTRY PROFILES

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APPENDICES

Appendix 3

1. A.R. Quisumbing and L. Pandolfelli. 2010. "Promising Approaches to Address the Needs of Poor Female Farmers: Resources, Constraints, and Interventions". *World Development* 38, 581-592.

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Appendix 5

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