

4. Gains from closing the gender gap

Many studies show that yields on plots managed by women are lower than those managed by men. This is not because women are worse farmers than men. Indeed, extensive evidence shows that women are just as efficient as men. They simply do not have access to the same inputs. If they did, their yields would be the same as men's, they would produce more and overall agricultural production would increase.

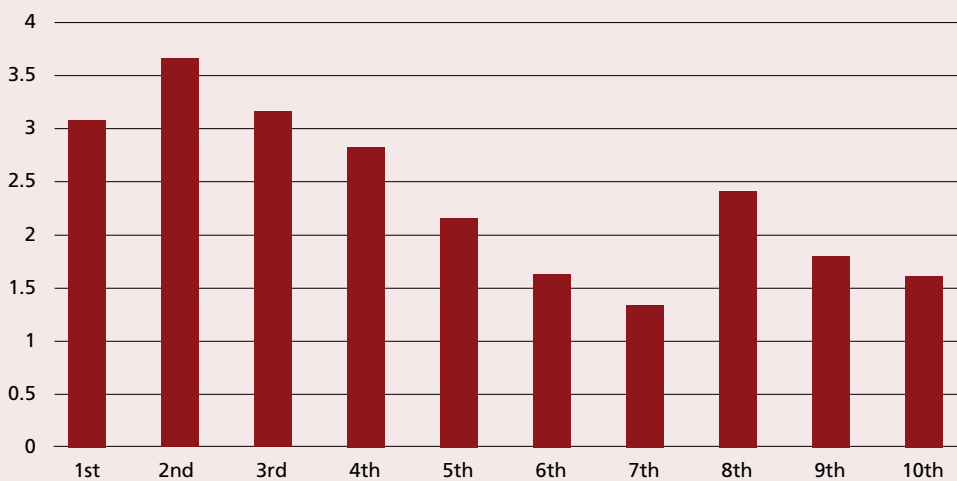
The relationship between gender equality and agricultural productivity can be explored using OECD's index of Social Institutions and Gender Inequality (SIGI) (OECD, 2010). The SIGI index reflects social and legal norms such as property rights, marital practices and civil liberties that affect women's economic development. A lower SIGI indicates lower levels of gender-

based discrimination. Countries with lower levels of gender inequality tend to achieve higher average cereal yields than countries with higher levels of inequality (Figure 16). Of course, the relationship shows only correlation, not causation, and the direction of causality could run in either direction (or in both directions). In other words, more equal societies tend to have more productive agriculture, but more productive agriculture can help reduce gender inequality.

Research surveyed below confirms that closing the gender gap in agriculture can improve agricultural productivity, with important additional benefits through raising the incomes of female farmers, increasing the availability of food and reducing food prices, and raising women's employment and real wages.

FIGURE 16
Cereal yield and gender inequality

Cereal yield (tonnes/ha)



SIGI group: 1st = least gender inequality to 10th = greatest gender inequality

Notes: Gender inequality is a measure used by the Social Institutions and Gender Index (SIGI), a composite measure of gender discrimination based on social institutions, constructed by the OECD Development Centre.

Sources: Cereal yield: FAO, 2010b; SIGI group: OECD, 2010.

Productivity of male and female farmers

Many studies have attempted to assess whether female farmers are as productive as male farmers. These studies measure productivity in a variety of ways, but the most common method is based on output per hectare of land, or yield. Simply comparing yields on men's and women's farms can reveal differences between the two groups – women typically achieve lower yields than men do – but it does not explain why. The most thorough studies also attempt to assess whether these differences are caused by difference in input use, such as improved seeds, fertilizers and tools, or other factors such as access to extension services and education. The vast majority of this literature confirms that women are just as efficient as men and would achieve the same yields if they had equal access to productive resources and services.

A thorough literature search identified 27 studies that compare the productivity of male and female farmers.¹⁰ These studies covered a wide range of countries (primarily, but not only, in Africa), crops, time periods and farming systems, and used various measures of productivity and efficiency. Despite this variety, most found that male farmers achieved higher yields than female farmers. The estimated yield gaps ranged widely but many clustered around 20–30 percent, with an average of 25 percent.¹¹

Most of the studies found that differences in yields were attributable to differences in input levels, suggesting that reallocating inputs from male to female plots can increase overall household output. Several studies showed this explicitly. Because this literature is complex and somewhat contentious, it is summarized below.

One of the most influential studies in this field comes from Burkina Faso. The authors compared 4 700 agricultural plots in six villages. With the exception of own-

labour, the plots controlled by women used less of all other inputs: men's and children's labour, draught animal labour and organic and chemical fertilizers. Women's yields were lower than men's for a variety of crops – 20 percent lower for vegetables and 40 percent lower for sorghum – but the difference was explained entirely by their lower use of productive inputs, which in turn was a result of gender-specific social norms. The authors estimated that increasing input use on women's plots could increase overall output by 10–20 percent (Udry *et al.*, 1995). Further analysis of the same data found that overall household production could have been almost 6 percent higher if resources were reallocated towards women's plots (Udry, 1996).

Two additional studies from Burkina Faso provide a deeper understanding of these issues. The first found that female farmers produced 15 percent lower value per hectare than male farmers. It also found that female farmers needed advice from female agricultural extension workers – not just more inputs – in order to achieve higher yields, confirming the complementarities among the broad range of assets and services required for agricultural production (Bindlish, Evenson and Gbetibouo, 1993). The second reconsidered the data from Udry (1996) and supplemented them with more recent nationally representative data. It found that households located in less favourable production zones or in areas suffering from drought tended to allocate resources between male- and female-managed plots more efficiently than households in more favourable areas, perhaps because the risk associated with being inefficient was higher for them (Akresh, 2008).

Research in the Ethiopian highlands found that female-headed households produced 35 percent less per hectare, in value terms, than male-headed households but the differences were due to lower levels of input use and less access to extension services by the female farmers (Tiruneh *et al.*, 2001). In the same region, yields for barley and other cereals were found to be 50 percent higher for farms operated by men because farms run by female-headed households had only half the male labour and less than one-third of the amount of draught animal power (Holden, Shiferaw and Pender, 2001).

¹⁰ For more detailed surveys of this literature, see Quisumbing (1996) and Peterman, Quisumbing and Behrman (2010).

¹¹ Not all of the 27 studies quantified the yield gap. Some provided estimates for a single crop while others reported on multiple crops.

Women in Ghana were found to be as efficient as men in maize and cassava production, but they achieved lower yields and earned lower profits because they could not maintain the fertility of their land (Goldstein and Udry, 2008). People who are disadvantaged in the social and political networks of their villages – like many female household heads – are more likely to have their land expropriated if they allow it to remain fallow, so they tend to keep their land under cultivation continuously, eroding soil fertility (Goldstein and Udry, 2008). Several studies from Ghana also confirm that male and female cocoa producers have the same yields when input use is the same (Quisumbing and Otsuka, 2001b; Hill and Vigneri, 2009).

Men producing maize, beans and cowpeas in Kenya achieve higher gross value of output per hectare than women, but the difference is accounted for by differences in input use (Saito, Mekonnen and Spurling, 1994). In western Kenya, female-headed households were found to have 23 percent lower yields than male-headed households, but the difference was caused by less-secure access to land and lower education levels (Alene *et al.*, 2008). An earlier study of smallholder farmers in western Kenya found that women's maize yields were 16 percent lower than men's, largely because they used substantially less fertilizer (Ongaro, 1990).

A nationally representative study in Malawi found that maize yields were 12–19 percent higher on men's plots, but when women were given the same level of fertilizer for use on experimental plots, they achieved the same yields (Gilbert, Sakala and Benson, 2002).

Considerable evidence is available from Nigeria from several states and for a wide variety of crops. In Oyo State, male and female farmers growing maize, yam, cassava, vegetables and legumes were found to be equally productive (Adeleke *et al.*, 2008). In Osun State, female rice producers achieved 66 percent lower yields than male farmers but the difference was attributable to differences in input use (Oladeebo and Fajuyigbe, 2007). Similarly, in Ondo and Ogun States, female small-scale cassava farmers achieved lower yields and lower returns than their male counterparts because they used fewer inputs and purchased inputs

of lower quality or higher price (Timothy and Adeoti, 2006).

Additional studies in sub-Saharan Africa from Cameroon (Kumase, Bisseleua and Klasen, 2008), Benin (Kinkinginhoun-Médagbé *et al.*, 2010), Côte d'Ivoire (Adesina and Djato, 1997) and Zimbabwe (Horrell and Krishnan, 2009) also overwhelmingly support the conclusion that differences in farm yields between men and women are caused primarily by differences in access to resources and extension services.¹²

Evidence from other regions is relatively rare because farming operations are less likely to be segregated by gender than is the case in Africa, but the available studies generally support the finding that female farmers are at least as efficient as their male counterparts. For example, female-managed farms in Nepal produce less value per hectare than male-managed farms, but the differences are nearly all accounted for by lower input use (Thapa, 2008). Female-managed farms in China are at least as profitable as those run by men, according to data from the China National Rural Survey (Zhang, De Brauw and Rozelle, 2004).

Some studies compare labour productivity rather than yields, but the results are consistent with the finding that yield differences are caused by differences in input use. The labour productivity of female farm workers in Bangladesh is at least as high as that of male workers when input use is the same (Rahman, 2010). Labour productivity studies for oil palm in Indonesia (Hasnah, Fleming and Coelli, 2004), for rice in Nepal (Aly and Shields, 2010) and for vegetables in Turkey (Bozoglu and Ceyhan, 2007) all show that female labour is at least as productive as male labour when differences in irrigation and seed type are considered.

Production gains from closing the gender gap

If gender-specific differences in input use could be overcome and female farmers could achieve the same yields as male farmers, the

¹² Some studies could not fully account for yield differences between male and female farmers because they did not consider all the resource gaps women face (Zavale, Mabaye and Christy [2006], Uaiene and Channing [2009], and Lilja, Randolph and Diallo [1998]).

evidence suggests that the production gains could be substantial. The potential gains cannot be calculated precisely because the necessary data are not available; however, a reasonable range can be estimated based on the yield gaps identified in the studies discussed above and the amount of farm land that women manage.

As noted above, studies of the yield gap between male and female farmers provide estimates averaging 20–30 percent, and most attribute the difference to lower levels of input use. Although most of these studies pertain to sub-Saharan Africa, similar input gaps have been documented for all regions in Chapter 3. Therefore, it is reasonable to assume that a similar range of yield gaps exists in other regions. Closing the input gap on the agricultural land held by women could increase yields on their land to the levels achieved by men. This would imply an increase in production of 20–30 percent on their land, and increases at the national level proportionate to the amount of land controlled by women. This would increase agricultural output in the developing countries for which data are available by an average of 2.5–4 percent.¹³ Assuming that the input and yield gaps are representative of other developing countries, this would imply global gains of a similar magnitude.

Of course, the potential production gains calculated by this method are based on the existing distribution of land and a stylized yield gap of 20–30 percent. This implies that countries where women control proportionately more land could achieve the greatest potential gains. It may be the case, however, that the overall gender gap in access to agricultural resources is, in fact, wider where women control less land. The actual gains from closing the gender gap in access to resources would be greater in

countries where the gender gap is wider. Increasing women's access to land as well as complementary inputs in that case would generate broader socio-economic benefits than those captured by this analysis.

This approach provides admittedly very rough estimates, but they suggest that closing the gender productivity gap could increase agricultural output in the developing world by a significant amount. Increased production would also imply increased food availability and reductions in undernourishment. The standard methodology used by FAO to estimate the number of people who are undernourished calculates the average daily dietary energy supply available for consumption in each country and applies country-specific criteria for its distribution and thresholds for minimum per capita energy requirements (see FAO, 2002 for details). People who fall below this minimum threshold are considered chronically undernourished. Domestic food production is a key component of the dietary energy supply, so – assuming that the additional output from closing the gender gap is consumed domestically – closing the gender yield gap could have a direct impact on reducing the number of people who are undernourished.

Inserting the potential output gains calculated above into the formula for estimating the number of undernourished provides a rough quantitative estimate of how closing the gender gap in agriculture could contribute to reducing hunger. If yield gaps of 20–30 percent were closed and domestic production increased by 2.5–4 percent, the number of undernourished people in the countries for which data are available could decline by 12–17 percent.¹⁴ An estimated 925 million people in the world were undernourished in 2010, of which 906 million were in developing countries (FAO, 2010g). Gains of this magnitude could therefore equate to 100–150 million fewer people living in hunger. For countries where hunger is more widespread and women play a major role in the agriculture sector, the proportional declines could be even greater.

¹³ Data on the share of women agricultural holders are available for 52 countries. The methodology for calculating potential gains starts with the definition of output (Q) as yield (Y) times area (A), $Q = Y * A$. Next, for the 20 percent productivity gap scenario, assume that women farmer's yields are only 80 percent those of men, i.e. $Y_f = 0.8 * Y_m$. (The subscripts f and m denote female and male, respectively.) Now write $Q = Y * A$ as $Q = Y_f * P * A + Y_m * (1 - P) * A$, where P is the share of land cultivated by women farmers. Solve this problem for Y_m and then use $Y_f = 0.8 * Y_m$ to obtain Y_f . Assuming the gender gap in productive assets is closed, set Y_f equal to Y_m and find the new output level, Q^* .

¹⁴ Data for both the share of women agricultural holders and the number of people undernourished are available for 34 countries.

These potential output gains would only be the first, direct, effect. Over time, higher productivity would have additional impacts such as increased demand by farmers for labour and locally produced goods and services (Hayami *et al.*, 1978; FAO, 2004). Additional output could result in lower commodity prices, depending on the responsiveness of demand and the degree of trade openness. Most households in developing countries, including in rural areas, are net food buyers and would gain from a fall in staple food prices. Farm incomes could suffer, on the other hand, unless markets are sufficiently developed so as to handle the additional supply.

Other social and economic benefits of closing the gender gap

In addition to increases in production and income, closing the gender gap in agriculture would generate broader social and economic benefits by strengthening women's direct access to, and control over, resources and incomes. Evidence from Africa, Asia and Latin America consistently shows that families benefit when women have greater status and power within the household. Increased control over income gives women a stronger bargaining position over economic decisions regarding consumption, investment and production. When women have more influence over economic decisions, their families allocate more income to food, health, education, children's clothing and children's nutrition.¹⁵ Social safety-net programmes in many countries now target women specifically for these reasons (Box 8).

A large number of studies have linked women's income and greater bargaining power within the family to improved child nutritional status, which in turn influences health outcomes and educational attainment (Smith *et al.*, 2003). Evidence from the Philippines provided some of the earliest data showing that increasing the share of household income earned by mothers

contributes positively and significantly to household food consumption (Garcia, 1991). This was reinforced by evidence from Brazil, which showed that maternal income exerts a larger effect on children's nutritional outcome indicators than paternal income and that women spend considerably more than men on education, health, and household services (Thomas, 1997). In extended family households in Mexico, the impact of increasing family income on the nutritional status of children depends on who earns the income; higher earnings by any female household member – not only mothers – has substantial positive impacts on child nutrition, while this is not the case for male income earners (Djebbari, 2005). More recent evidence from Malawi confirms that increasing women's – but not men's – access to credit increases total household expenditures on food and improves the long-term food security of young female children (Hazarika and Guha-Khasnobis, 2008).

The fact that gender inequality is particularly severe in Southern Asia helps explain, at least partly, why rates of child malnutrition there are twice those found in sub-Saharan Africa (Smith *et al.*, 2003). Indeed, despite surpassing sub-Saharan Africa in terms of national income, democracy, food supplies, health services and education, Southern Asia still trails in child malnutrition. This has been labelled the "Asian enigma", which finds women's status, sanitation and urbanization to be the key factors in narrowing the gap in children's nutritional status. Recent evidence from Bangladesh confirms that children's long-term nutritional status is higher in households where women are more empowered (Bhagowalia *et al.*, 2010).

Improved gender equality in access to opportunities and returns to assets not only improve nutrition, health and education outcomes, but can also have a long-lasting impact on economic growth by raising the level of human capital in society.¹⁶ Closing the gender gap spurs economic development, largely through the impact of female education on fertility, child

¹⁵ Important studies in this field include Behrman and Deolalikar (1988), Behrman and Wolfe (1989), Kennedy and Peters (1992), Kennedy and Haddad (1994), Hoddinott and Haddad (1995), Thomas (1997), Haddad (1999), Katz (2000), Quisumbing and Maluccio (2000), Smith *et al.* (2003) and Doss (2005).

¹⁶ Important studies in this field include Dollar and Gatti (1999), Klasen (2002), Knowles, Lorgelly and Owen (2002), Kalaitzidakis *et al.* (2002), Lagerlöf (2003) and Klasen and Lamanna (2009).

BOX 8

Targeting transfer payments to women for social benefits

Conditional transfer programmes are a type of safety net programme in which cash or benefits in kind are transferred to generally poor households on condition that the household undertake certain types of human capital investment for the benefit of their children. Women are often targeted as the recipients of such payments because evidence shows they are more likely than men to prioritize child nutrition. The types of investments generally considered are in health – i.e. pre- and post-natal health care, health check-ups or attendance at health clinics – and in education – generally measured by enrolment and attendance rates. Conditional transfer programmes have rapidly gained popularity in the developing world. Starting from the *Oportunidades* (formerly known as *PROGRESA* – Education, Health and Nutrition Programme) programme in Mexico in 1997, they have expanded worldwide, with all developing regions having some active conditional transfer programme, although with the largest prevalence in Latin America.

Conditional transfer programmes can be used directly and indirectly to address gender inequities. With the exception of a few secondary school programmes, in the great majority of them the beneficiaries are the mothers. This choice is founded on the overwhelming evidence that, when women and mothers control a higher proportion of household income, families tend to spend a higher share of their budgets on

the education, nutrition, and /or well-being of their children. *Post-factum* evaluations of conditional transfer programmes have confirmed this to be the case: the impact on spending patterns goes beyond the simple income effect of the transfer, with recipient households spending a larger proportion of their incomes on food (Schady and Rosero, 2008) and a relatively larger proportion on more nutritious food (Macours, Schady and Vakis, 2008).

An implicit, yet important, idea underlying these programmes is that by directing the transfers to mothers, they strengthen the bargaining position of women in the intra-household decision-making process. Some conditional transfer programmes successfully also target gender inequality directly. In Bangladesh and Pakistan, programmes exist to promote girls' enrolment in public education. In Bangladesh, the Female Secondary School Assistance Project (FSSAP) provides a stipend to girls aged 11–18 years for attending secondary school, while in Pakistan, the Punjab Education Sector Reform Programme (PESRP) provides "scholarships" for girls aged 10–14 to attend school. Both programmes have been very successful in increasing enrolment: Khandker, Pitt and Fuwa (2003) estimate that the FSSAP increased the enrolment of girls by 12 percentage points, while the PESRP increased it by 11 percentage points, according to an evaluation by Chaudhury and Parajuli (2010).

mortality and the creation of human capital in the next generation. Falling fertility rates will, after some years, lead to what Bloom and Williamson (1998) have termed the "demographic gift". The working-age population will grow faster than the rest of the population, reducing dependency rates and thus benefiting per capita growth.

It is also true that removing the gender gap in access to opportunities widens the pool of talent available, which, assuming that the talent is distributed equally among

men and women, will again work to raise the level of human capital available in the working population. These growth studies suffer from the usual limitations: it is impossible to assign the direction of causality, and it could also be the case that higher growth causes countries to reduce gender inequality by economically empowering women. Nonetheless, the point remains that closing the gender gap in educational and employment opportunities would boost long-term growth.

Key messages

- Female farmers are just as efficient as male farmers but they produce less because they control less land, use fewer inputs and have less access to important services such as extension advice.
- Closing the gender gap in access and use of productive resources and services would unlock the productivity potential of women and could increase output substantially. Closing the gap could increase agricultural output in the developing world by 2.5–4 percent, on average, with higher gains in countries where women are more involved in agriculture and the gender gap is wider.
- Increasing agricultural production by this magnitude could reduce the number of undernourished people by 12–17 percent, and would imply significant progress towards achieving MDG 1C. This highlights the synergies that exist between promoting gender equality and reducing extreme poverty and hunger.
- When women control additional income, they spend more of it than men do on food, health, clothing and education for their children. This has positive implications for immediate well-being as well as long-run human capital formation and economic growth through improved health, nutrition and education outcomes.