

3. Documenting the gender gap in agriculture⁹

Access to productive resources such as land, modern inputs, technology, education and financial services is a critical determinant of agricultural productivity. Agriculture is important to women, but female farmers (Box 4) have less access to the productive resources and services required by agricultural producers. Women are less likely than men to own land or livestock, adopt new technologies, use credit or other financial services, or receive education or extension advice. In some cases, women do not even control the use of their own time.

While the size of the gender gap differs by resource and location, the underlying causes for the gender asset gap are repeated across regions: social norms systematically limit the options available to women. Regardless of cause or magnitude, however, the gender asset gap reduces the agricultural productivity of women and thus involves broader economic and social costs.



Land

Land is the most important household asset for households that depend on agriculture for their livelihoods. Access to land is a basic requirement for farming and control over land is synonymous with wealth, status and power in many areas. Strengthening women's access to, and control over, land is an important means of raising their status and influence within households and communities. Improving women's access to land and security of tenure has direct impacts on farm productivity, and can also have far-reaching implications for improving household welfare. Strengthening land ownership by women in Nepal, for example, is linked with better health outcomes for children (Allendorf, 2007).

The evidence illustrating gender inequalities in access to land is overwhelming. Women across all developing regions are consistently

less likely to own or operate land; they are less likely to have access to rented land, and the land they do have access to is often of poorer quality and in smaller plots.

The most comprehensive data on women's access to land come from the FAO Gender and Land Rights Database (FAO, 2010f), and were collected from different data sources, including household surveys, agricultural censuses and the academic literature. The database provides information on the shares of "agricultural holders" who are male and female. An agricultural holder is defined as the person or group of persons who exercise management control over an agricultural holding. The holding may be owned, rented or allocated from common property resources and may be operated on a share-cropped basis.

Stark gender disparities in land holdings are apparent in all regions (Figure 8). Women represent fewer than 5 percent of all agricultural holders in the countries in North Africa and West Asia for which data are available. The sub-Saharan African average of 15 percent masks wide variations, from fewer than 5 percent in Mali to over 30 percent in countries such as Botswana, Cape Verde and Malawi. Latin America has the highest regional average share of female agricultural holders, which exceeds 25 percent in Chile, Ecuador and Panama.

In addition to being more likely to hold land, men also typically control larger land holdings than women. Representative and comparable data for 20 countries from the RIGA database of household surveys show that male-headed households operate larger agricultural land holdings, on average, than female-headed households in all countries (Figure 9). Inequality in access to land is more acute in Bangladesh, Ecuador and Pakistan, where average land holdings of male-headed households are more than twice the size of

⁹ The material in this chapter is based on FAO (2010e).

BOX 4

Female farmers, household heads and data limitations

Data on female farmers are limited. Most women engaged in farming do so within a household production unit, and their activities are not usually separable from those of the household as a whole. Most of the data available on female farmers derives from household surveys and pertains to the activities of female-headed households, who comprise a minority of female farmers in most countries. Some data are available for female-operated plots within male-headed households, primarily in Africa where men and women often operate separate plots. The unit of observation used in this chapter (individuals, households, farms or plots) varies depending on the resource being discussed and the availability of data.

The prevalence of female-headed households is generally higher in sub-Saharan Africa than in other regions (Annex table A5), but this hides considerable variation within the region. In fact, the countries having the highest (Swaziland) and the lowest (Burkina Faso) prevalence of female-headed households in developing regions are both found in sub-Saharan Africa.

A distinction should be made between two types of female-headed households: (i) *de facto*, i.e. those in which an adult male partner is working away from the household but remains involved through remittances and other economic and social ties and (ii) *de jure*, i.e. those which have no male partner, such as women who are widowed, divorced or never married. Comprehensive data are not usually available to distinguish between these types of households, but for the few cases for which we have data most female-headed households are *de jure*. In Malawi, Panama and Uganda about 70, 63 and 83 percent, respectively, of all female-headed households are *de jure* (Chipande, 1987; Appleton, 1996; and Fuwa, 2000). Also in Cambodia and the Lao People's Democratic Republic, most are *de jure* (FAO/GSO/MoP, 2010, and FAO/MAF, 2010). Studies that are able to disaggregate by type of female-headed household mostly find that *de jure* households are more likely to suffer from a range of economic and social disadvantages (Seebens, 2010).

those of female-headed households. The RIGA results confirm the findings of studies in Latin America (Deere and León, 2003) and Africa (FAO, 1997) showing that male-controlled land holdings are generally larger than female-controlled holdings.



Livestock

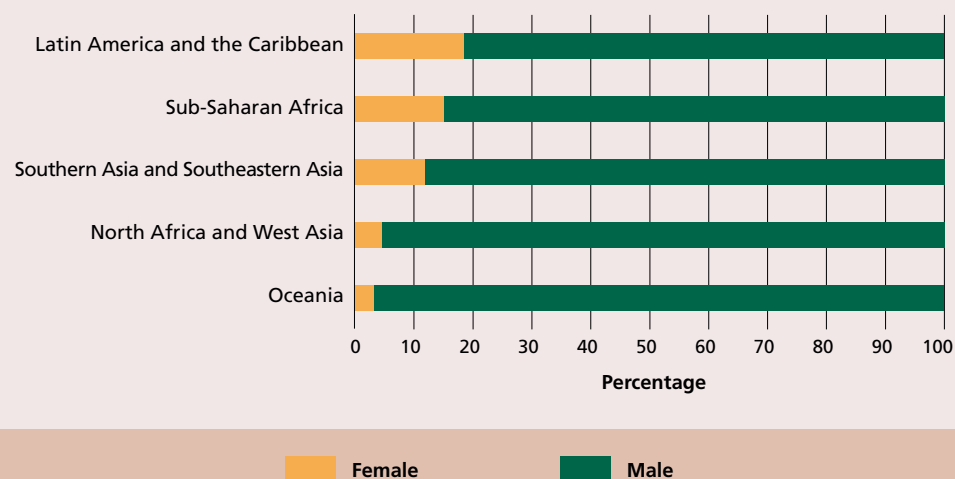
Livestock is another key asset in rural areas (FAO, 2009a). In many countries, livestock is one of the most valuable agricultural assets and represents a source of income and wealth accumulation as well as an important source of resistance to shocks. Draught animals are also the main source of power for ploughing, land clearing and transportation in many regions.

As was the case for access to land, the evidence for livestock holdings points

to systematic gender inequalities. Male-headed households have larger livestock holdings, on average, than female-headed households (Figure 10). Inequality in livestock holdings appears to be particularly acute in Bangladesh, Ghana and Nigeria, where male holdings are more than three times larger than those of female-headed households. In Indonesia and Pakistan, for which the RIGA database contains information on incomes from livestock but not livestock holdings, net incomes from livestock are significantly higher in male-headed households than in female-headed households.

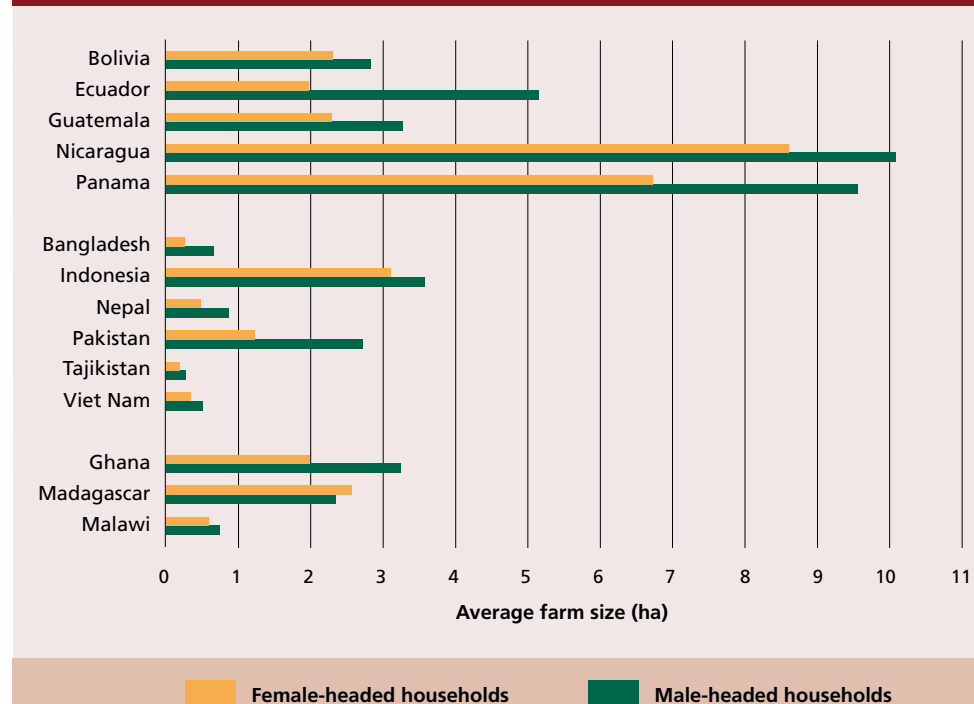
The RIGA database provides information by household according to the sex of the household head, so data do not reflect intra-household differences in control over livestock. These vary by culture and context but, in general, men are responsible for keeping and marketing large animals, such

FIGURE 8
Share of male and female agricultural holders in main developing regions



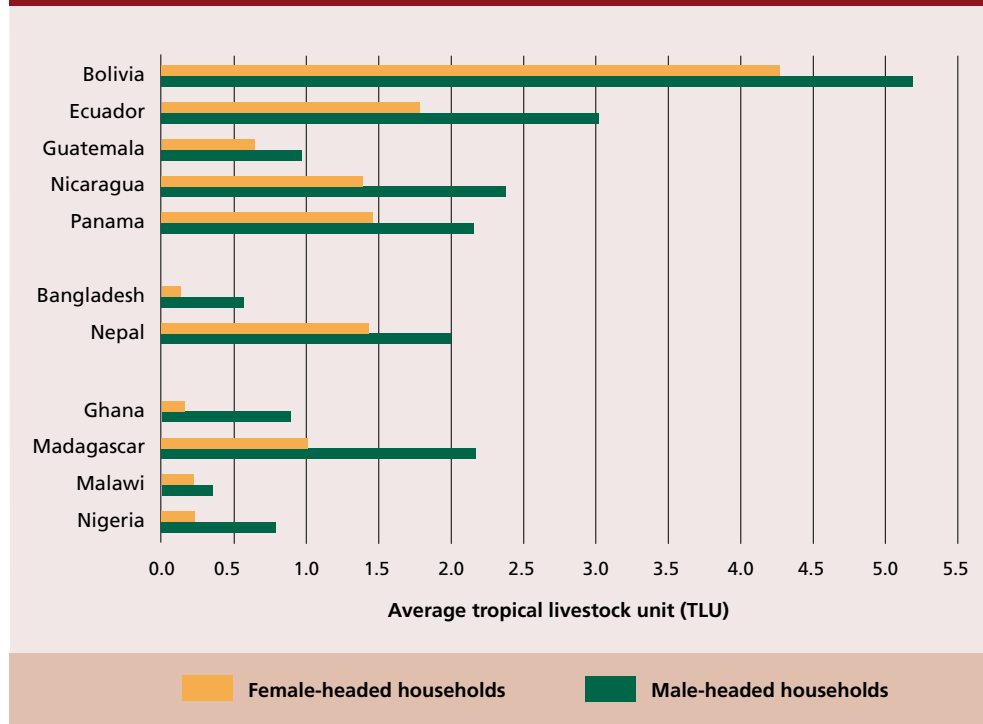
Note: Regional aggregates do not include all countries due to lack of data. Country-level data are provided in Annex table A5.
Source: FAO, 2010f.

FIGURE 9
Rural household assets: farm size



Note: Differences between male and female-headed households are statistically significant at the 95 percent confidence level for all countries, except for Bolivia, Indonesia, Madagascar, Nicaragua and Tajikistan.
Sources: FAO, 2010d, and Anriquez, 2010.

FIGURE 10
Household livestock assets, in male- and female-headed households



Notes: Calculations made using nationally representative household surveys. The number of livestock is computed using the tropical livestock unit (TLU), which is equivalent to a 250 kg animal. The scale varies by region. For example, in South America, the scale is: 1 bovine = 0.7 TLU, 1 pig = 0.2, 1 sheep = 0.1 and 1 chicken = 0.01. Differences between male- and female-headed households are statistically significant at the 95 percent confidence level for all countries except for Guatemala.

Sources: FAO, RIGA team, and Anríquez, 2010.

as cattle, horses and camels, while women tend to control smaller animals, such as goats, sheep, pigs and poultry (FAO, 2009a). In Nicaragua, for example, women own around 10 percent of work animals and cattle but 55–65 percent of pigs and poultry (Deere, Alvarado and Twyman, 2009). Even when women jointly own large animals, they do not necessarily have access to the services they provide, as was found for Indian women and the use of oxen (Chen, 2000).

The RIGA data measure livestock in physical terms – tropical livestock units – but the results are consistent with other studies that evaluate the value of livestock holdings. Data from northern Nigeria, for example, indicate that the value of men's livestock holdings is about twice that of women's (Dillon and Quiñones, 2010). The same study finds that men and women use livestock differently as a store of wealth and as a buffer against shocks. Men are more likely to hold assets in

the form of large animals such as cows and bulls while women are more likely to hold assets in the form of small animals, household durable goods and jewellery. Women tend to draw down assets more quickly than men in response to crises and as they get older (Dillon and Quiñones, 2010).

Farm labour

Labour availability depends on the amount of family labour that a household can mobilize and the amount of labour that can be hired in local labour markets. Labour constraints can be more acute for both women and female-headed households than for men and male-headed households for several reasons. Women generally face gender-specific constraints as agricultural labourers and in hiring-in labour. Low levels of human capital – education, health and

nutrition – are a constraint on women's labour productivity in agriculture and other sectors (Behrman, Alderman and Hoddinott, 2004) (Box 5). Some nutrition issues, such as iron deficiency, which directly affects labour productivity and is widespread, are especially relevant to women (Quisumbing and Pandolfelli, 2010). Often there is a pronounced gender division of labour for particular agricultural tasks, with the result that male and female labour cannot be easily substituted. Moreover, women are time-constrained by domestic tasks such as care-giving and collecting firewood and water (McGuire and Popkin, 1970; Quisumbing and Pandolfelli, 2010).

Female-headed households face more severe labour constraints than male-headed households because they typically have fewer members but more dependants. In some areas, male out-migration adds to the constraint already imposed by gender-specific farming tasks (Peters, 1986). Female-headed households may receive help from male relatives, but only after the men have taken care of their own plots. The fact

that female-headed households typically farm smaller plots may not compensate for the lower availability of family labour. For example, among small-scale maize farmers in Malawi, females own less land but still use about 10 percent less total labour per hectare than their male counterparts and much of that labour is supplied by children, who must work to make up the shortfall caused by their mothers' other duties (Takane, 2008).

Household and community responsibilities and gender-specific labour requirements mean that women farmers cannot farm as productively as men and make it more difficult for them to respond when crop prices rise. Depending on cultural norms, some farming activities, such as ploughing and spraying, rely on access to male labour without which women farmers face delays that may lead to losses in output. For example, women maize farmers in Malawi require male labour for ploughing, but female-headed households often lack male family members who can do the work and they may not have the cash needed to hire

BOX 5

Labour productivity and hunger, nutrition and health

Hunger, nutrition and health are strong determining factors on a person's ability to work, their productivity and their cognitive development. With regard to nutrition, only 37 developing countries collect data on chronic energy deficiency (CED) for both men and women (Annex table A6) (WHO, 2010). In 17 countries the difference between the share of men and women with CED is one or less percentage points. Of the remaining 20 countries, 13 show a higher share of women with CED. Based on these few observations, it appears that in sub-Saharan Africa women are less likely than men to suffer CED while in South America and Asia, particularly Southeastern Asia, women are more likely than men to suffer from CED. The reported data for adults are consistent with that available for underweight children (under 5 years of age). For example, in Asia and the Pacific, a larger share of girls than boys are underweight,

whereas the opposite is true in sub-Saharan Africa.

While in some locations women are disadvantaged with regard to hunger and nutrition, this is not generally the case. However, there are certain health and nutritional issues that are sex-specific. For example, women's energy and nutritional needs increase during menstruation, pregnancy and lactation and their nutritional status has an impact on their offspring. There is also evidence that women have higher morbidity than men – not only because they live longer – and that they are less likely to access health services (Buvinic *et al.*, 2006). Thus, gender differences in nutrition and health could have important policy implications for society.

Policy interventions that address the specific health and nutrition issues of women are important, but their nature and scope should always reflect the specific context and location.

male labour. As a result, women cultivate smaller plots and achieve lower yields (Gilbert, Sakala and Benson, 2002). This web of constraints means that women in Malawi have difficulty growing cash crops such as tobacco or improved maize that require purchased inputs, because they cannot generate the income necessary to obtain credit and guarantee repayment. Such labour constraints in some cases may prevent female-headed households from even applying for credit (Chipande, 1987). Female-headed households in Ethiopia, where cultural norms require that ploughing be undertaken by men, also achieve lower yields because they have limited access to male labour (Holden, Shiferaw and Pender, 2001).



Education

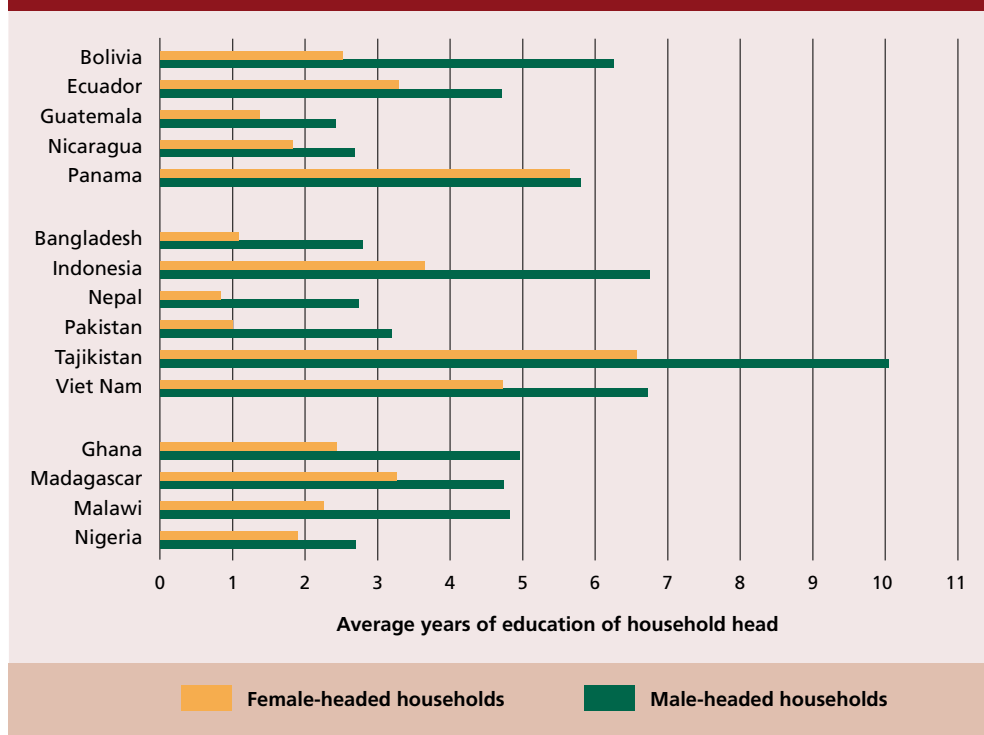
Human capital is a major factor in determining the opportunities available to individuals in society and is closely linked to the productive capacity of households and their economic and social well-being.

The level of human capital available in a household (usually measured as the education of the head of household or the average education of working-age adults in the household) is strongly correlated with measures such as agricultural productivity, household income and nutritional outcomes – all of which ultimately affect household welfare and economic growth at the national level (World Bank, 2007a).

Gender differences in education are significant and widespread (Figure 11). Female heads have less education than their male counterparts in all countries in the sample except Panama, where the difference is not statistically significant. The data suggest that female household heads in rural areas are disadvantaged with respect to human capital accumulation in most developing countries, regardless of region or level of economic development.

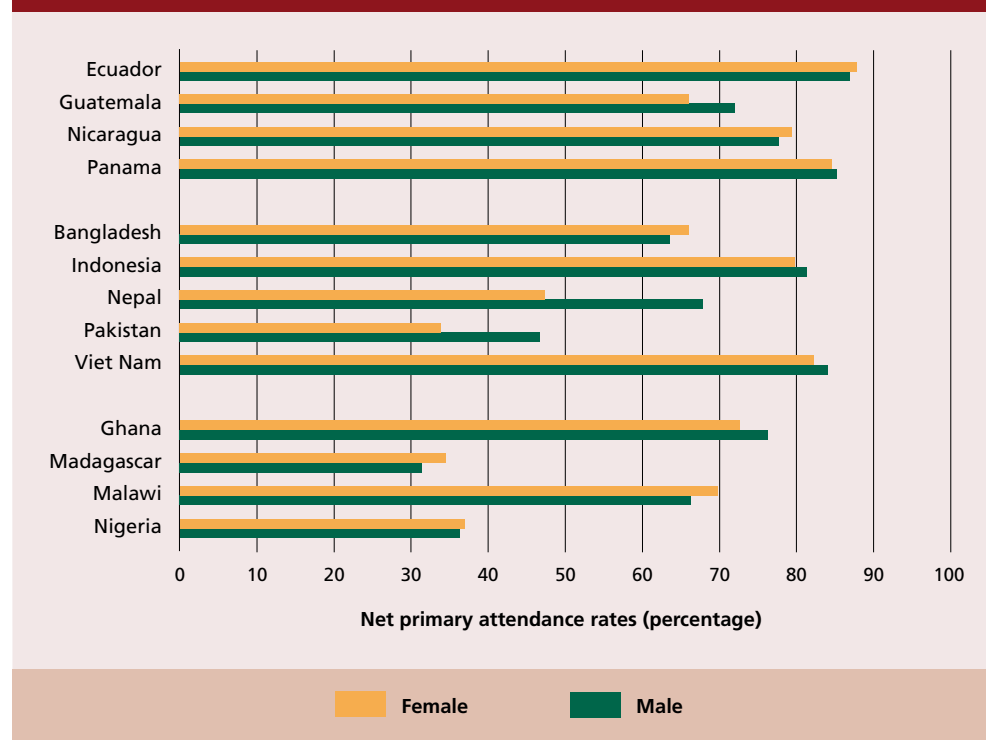
This evidence reflects a history of bias against girls in education. Despite this bias, human capital accumulation is one asset category for which the gender gap has clearly narrowed in recent decades. Although

FIGURE 11
Education of male and female rural household heads



Sources: FAO, 2010d, and Anriquez, 2010.

FIGURE 12
Gender differences in rural primary education attendance rates



Note: Attendance rates are defined as the number of children in primary school age who attend primary school, expressed as a percentage of the total number of children in official primary school age. Only Ghana, Guatemala, Nepal and Pakistan are statistically significantly different from 0 at the 95 percent level.

Source: FAO, RIGA team.

progress has been uneven across regions and important gaps persist, significant gains have been made in primary school enrolment rates for girls, and difference between boys and girls has narrowed. Of the 106 countries committed to MDG 3 on gender parity in access to education, 83 had met the target by 2005 (World Bank, 2007b). Most of the countries in the RIGA database have achieved gender parity in primary school attendance (defined as no statistically significant difference between male and female attendance rates) (Figure 12). One of the most significant advances for women in Latin America has been in the area of primary and secondary education, yet a significant gender gap persists among indigenous groups in many Latin American countries. The education gender gap – both in levels of enrolment and attainment – remains widest in Southern Asia and sub-Saharan Africa.

Beyond general educational attainment, higher education for women in agricultural

science and technology is particularly relevant in regions where women comprise a large part of the agriculture sector. The number of women working in science and technology research in industrialized and developing countries has increased substantially in recent decades, but remains low in most countries. There is an urgent need for a greater representation of women in agricultural research, particularly in sub-Saharan Africa, where women participate heavily in the agricultural workforce. Women scientists, research managers, lecturers and professors can provide different insights and perspectives and help research agencies to address more effectively the unique and pressing challenges that African farmers face. They may also serve as role models to students and other women in agriculture. Significant progress has been made in increasing the share of female professional staff in agricultural higher education and research institutions in Africa (Box 6).

BOX 6

Women in agricultural higher education and research in Africa¹

During 2008, the Agricultural Science and Technology Indicators (ASTI) and the African Woman in Agricultural Research and Development (AWARD) programmes conducted a survey to obtain sex-disaggregated capacity indicators covering 125 agricultural research and higher education agencies in 15 sub-Saharan African countries.² The study found that the pool of female professional staff increased by 50 percent between 2000/01 and 2007/08 and 4 (Botswana, Nigeria, Senegal, and Zambia) of the 15 countries saw their female staff double. In relative terms, the share of women in total professional staff increased from 18 percent to 24 percent over the period. This increase occurred across all three degree levels (BSc, MSc, and PhD), but varied considerably across the 15 countries (Figures A and B). Female participation in agricultural research and higher education was particularly high in South Africa (41 percent), Mozambique (35 percent) and Botswana (32 percent). In contrast, only a small proportion of the agricultural professional staff were women in Ethiopia (6 percent), Togo (9 percent),

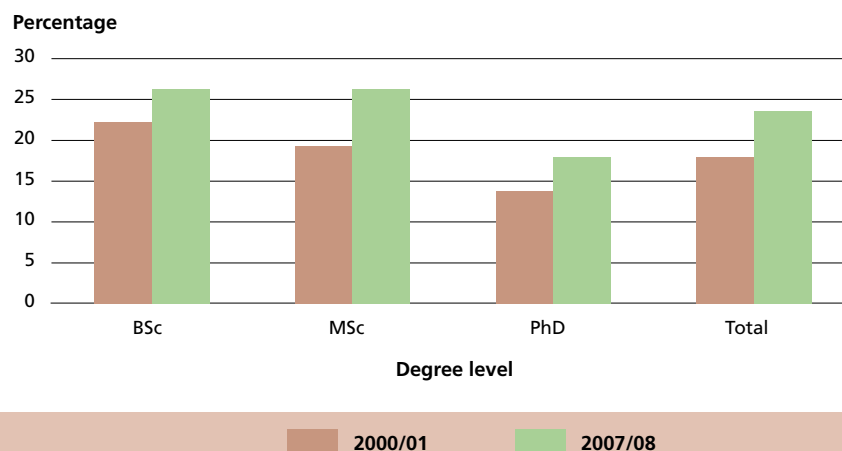
the Niger (10 percent) and Burkina Faso (12 percent). Compared with other countries in the region, female professional staff members were relatively more educated in Kenya, Nigeria, South Africa and Uganda, where more than one-quarter of the total held PhD degrees.

Future trends in female participation in agricultural research will be influenced by current student enrolment and graduation levels. An increasing number of women have been enrolling in higher education, not only in sub-Saharan Africa, but also in other regions in the world (UIS, 2006; UNESCO, 2004). This also appears to be the case in agricultural sciences, but unfortunately no sex-disaggregated trend data are available. Most female students in agricultural sciences, however, are enrolled in BSc programmes. This is also true for male students and reflects the reality that many agricultural faculties and schools in sub-Saharan Africa have only small MSc and PhD programmes.

The growing shares of professional women employed in agriculture and female students enrolled in agricultural

FIGURE A

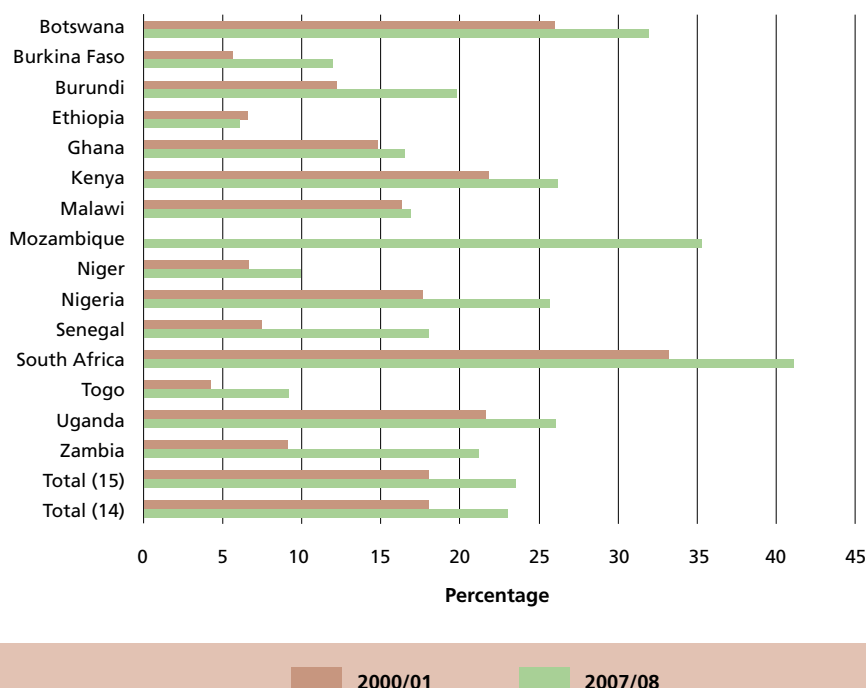
Change in average female shares in professional staff of agricultural and higher education institutions in 14 African countries, by degree level, 2000/01 to 2007/08



Note: Excludes Mozambique owing to lack of available data for 2000/01.

Source: Beintema and Di Marcantonio, 2009, based on ASTI datasets.

FIGURE B
Change in female shares in professional staff, by headcount, 2000/01 to 2007/08



Note: Excludes Mozambique owing to lack of available data for 2000/01.

Source: Beintema and Di Marcantonio, 2009, based on ASTI datasets.

sciences indicate that the gender gap in African agricultural sciences may be narrowing, especially in southern Africa. But the increase in the number of women, as well as men, that enter African agricultural research and higher education are mostly young staff with lower level of degrees and at the beginning of the career ladder. On average, more than half of the female professional staff in the 15-country sample were younger than 41 years compared with 42 percent of the total male professional staff. On average, 31 percent of total female staff and 27 percent of total male staff held BSc degrees. These 15-country averages, again, mask a wide variation across countries (see Beintema and Di Marcantonio, 2009).

The share of women disproportionately declines on the higher rungs of the career

ladder. Only 14 percent of management positions were held by women, which is considerably lower than the overall share of female professional staff employed in agriculture. Women are, therefore, less represented in high-level research, management and decision-making positions compared with their male colleagues.

¹ This section was prepared by Nienke Beintema and is based on Agricultural Science and Technology Indicators (ASTI) datasets (www.asti.cgiar.org), Beintema (2006), and Beintema and Di Marcantonio (2009). ASTI is managed by the International Food Policy Research Institute (IFPRI); AWARD is managed by the Consultative Group on International Agricultural Research (CGIAR) Gender and Diversity (G&D) Program.

² Botswana, Burkina Faso, Burundi, Ethiopia, Ghana, Kenya, Malawi, Mozambique, the Niger, Nigeria, Senegal, South Africa, Togo, Uganda and Zambia.

Information and extension

Good and timely information on new technologies and techniques is essential for farmers when deciding whether or not to adopt an innovation. Although private extension services are playing an increasing role in some countries, such as Brazil, China and India, public extension services remain the key source of information on new technologies for farmers in most developing countries. Extension services encompass the wide range of services provided by experts in the areas of agriculture, agribusiness, health and others and are designed to improve productivity and the overall well-being of rural populations. The provision of agricultural extension can lead to significant yield increases. Yet, extension provision in developing economies remains low for both women and men, and women tend to make less use than men of extension services (Meinzen-Dick *et al.*, 2010). According to a 1988–89 FAO survey of extension organizations covering 97 countries with sex-disaggregated data (the most comprehensive study available) only 5 percent of all extension resources were directed at women. Moreover, only 15 percent of the extension personnel were female (FAO, 1993).

In social contexts where meetings between women and men from outside the family nucleus are restricted, a lack of female extension agents effectively bars women from participating. The preference for female extension agents varies by country and marital status. In Ghana, for example, male and female farmers in male-headed households have equal contact with extension agents but female farmers in female-headed households have much less contact, although they are willing to speak to agents of either sex (Doss and Morris, 2001). In the United Republic of Tanzania, on the other hand, many female farmers prefer to talk to a female extension officer and, by 1997, one-third of extension officers were women, up from almost none 15 years prior (Due, Magayane and Temu, 1997).

However, even when women have access to extension services, the benefits may not be obvious. In Kenya, contact with the extension agent contributed significantly and positively to output on male-managed plots, but not necessarily on female-managed plots (Saito,

Mekonnen and Spurling, 1994). Extension service agents tend to approach male farmers more often than female farmers because of the general misperception that women do not farm and that extension advice will eventually “trickle down” from the male household head to all other household members. Extension services are often directed towards farmers who are more likely to adopt modern innovations, for example farmers with sufficient resources in well-established areas. As discussed above, women are less likely to access resources and may therefore be bypassed by extension service providers (Meinzen-Dick *et al.*, 2010).

Finally, the way in which extension services are delivered can constrain women farmers in receiving information on innovations. Women tend to have lower levels of education than men, which may limit their active participation in training that uses a lot of written material. Time constraints and cultural reservations may hinder women from participating in extension activities, such as field days, outside their village or within mixed groups (Meinzen-Dick *et al.* 2010).

Several new and participatory extension approaches have been developed and tested in the past decade in an effort to move away from a top-down model of extension service provision to more farmer-driven services. These approaches can target women effectively and increase their uptake of innovations (Davis *et al.*, 2009) and will be discussed in Chapter 5. Participatory approaches that encourage communication between farmers and researchers can also lead to positive feedback loops that allow researchers to adjust innovations to local needs.

Modern information and communication technologies (ICTs) such as radio, mobile phones, computers and Internet services can also play an important role in transferring information. ICTs offer opportunities for accessing and sharing information faster, networking, the mobilization of resources and educational purposes. Mobile phone subscriptions in developing countries have doubled since 2005. To date, 57 out of 100 inhabitants (up from 23 in 2005) in developing countries have a mobile phone subscription (ITU, 2010). These technologies may be beneficial for rural women whose ability to travel to distant markets is restricted.

Rural women may face barriers in accessing ICTs because of their limited education and financial and time constraints. Locations that are convenient and appropriate for women to visit can help improve women's access (Best and Maier, 2007).

Financial services

Financial services such as savings, credit and insurance provide opportunities for improving agricultural output, food security and economic vitality at the household, community and national levels. Many studies have shown that improving women's direct access to financial resources leads to higher investments in human capital in the form of children's health, nutrition and education.

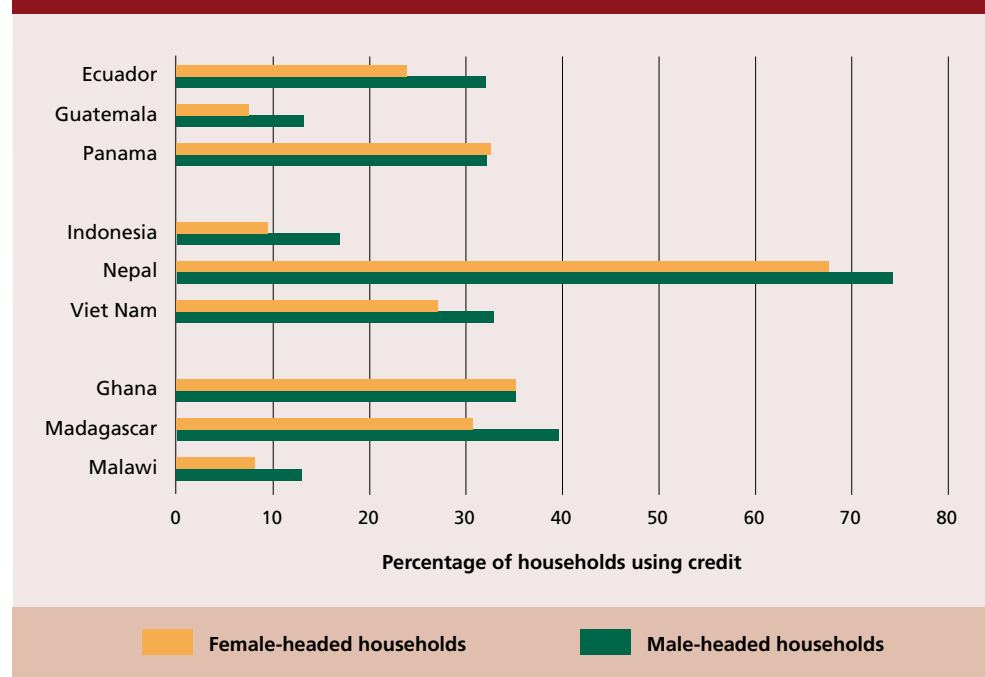
Producers who are unable to cover their short-term expenses or who want to purchase more productive but more expensive technologies must rely on either credit markets or other credit sources. Without access to credit, producers may be unable to bear the risks and up-front

costs associated with the innovations and investment necessary to enhance their productivity, income and well-being.

Evidence shows that credit markets are not gender-neutral. Legal barriers and cultural norms sometimes bar women from holding bank accounts or entering into financial contracts in their own right. Women generally have less control over the types of fixed assets that are usually necessary as collateral for loans. Institutional discrimination by private and public lending institutions often either ration women out of the market or grant women loans that are smaller than those granted to men for similar activities (Fletschner, 2009; World Bank, FAO and IFAD, 2009).

In seven out of nine countries in the RIGA dataset, rural female-headed households are less likely than male-headed households to use credit (Figure 13). In Madagascar, for example, the share of female-headed households that use credit is 9 percentage points smaller than the share of male-headed households who do so. The cases of Ghana and Panama are noteworthy in that no gender gap is apparent in the use of credit.

FIGURE 13
Credit use by female- and male-headed households in rural areas



Note: Calculations made using nationally representative household surveys. The gender gap is calculated as the difference between the percentages of male- and female-headed households that use credit.

Sources: FAO, RIGA team, and Anríquez, 2010.

The gender gap in access to credit is also confirmed by other evidence. In Nigeria, for example, 14 percent of males but only 5 percent of females obtain formal credit, while in Kenya the percentages are 14 and 4 for males and females, respectively (Saito, Mekonnen and Spurling, 1994). In Uganda, women entrepreneurs receive just 1 percent of available credit in rural areas (Dolan, 2004). Also in Uganda, nearly all female-headed households reported a desire to expand agricultural activities but lacked the money to purchase land and inputs such as seeds, fertilizer and pesticides, and/or to hire-in labour. They cited the lack of access to credit as one of the most prominent barriers to livelihood diversification (Ellis, Manuel and Blackden, 2006).

In Bangladesh, women received about 5 percent of loans disbursed by financial institutions to rural areas in 1980 and only slightly more than 5 percent in 1990, despite the emergence of special credit programmes for women in Bangladesh during the research period (Goetz and Gupta 1996). Further evidence from Bangladesh suggests that even when programmes succeed in improving the access of women to credit, they may not retain control over the assets: White (1991) found that about 50 percent of loans taken by women were used for men's productive activities; Goetz and Gupta (1996) reported that, on average, women retained full or significant control over loan use in only 37 percent of all cases; while Chowdhury (2009) reported that credit to women from the Grameen Bank was positively and significantly correlated with the performance of male-managed micro-enterprises but not those managed by females.

In Eastern Asia, the evidence regarding bias in credit access is mixed. In China, de Brauw *et al.* (2008) found that households in which women manage their own farms appear to have almost identical access to land and credit relative to male-headed households. On the other hand, a joint study by FAO and the United Nations Development Programme (FAO/UNDP, 2002) carried out in Viet Nam indicates that female-headed households borrow less, have less access to formal credit and pay higher interest on loans than dual-headed households.

For Latin America, Fletschner (2009) reports that in Paraguay women in farm

households typically receive loans only from credit cooperatives as opposed to the state banks or wholesalers. Her findings show that women are less likely to use credit than men under equivalent socio-economic conditions and that they are not always able to rely on their husbands to help them overcome credit constraints. These constraints on women's access to capital have a measurable negative impact on their production capabilities. For example, in addition to the efficiency loss associated with the husband's credit constraints, when women are unable to meet their credit needs their households experience an additional 11 percent drop in efficiency (Fletschner, 2008).

Technology

Access to new technology is crucial in maintaining and improving agricultural productivity. Gender gaps exist for a wide range of agricultural technologies, including machines and tools, improved plant varieties and animal breeds, fertilizers, pest control measures and management techniques. A number of constraints, including the gender gaps described above, lead to gender inequalities in access to and adoption of new technologies, as well as in the use of purchased inputs and existing technologies.

The use of purchased inputs depends on the availability of complementary assets such as land, credit, education and labour, all of which tend to be more constrained for female-headed households than for male-headed households. The adoption of improved technologies is positively correlated with education but is also dependent on time constraints (Blackden *et al.*, 2006). In an activity with long turnaround periods, such as agriculture, working capital is required for purchasing inputs such as fertilizers and improved seeds; however, as discussed above, women face more obstacles relative to men in their access to credit. Adoption of improved technologies and inputs may also be constrained by women's lower ability to absorb risk.

The evidence points to significant gender differences in the adoption of improved technologies and the use of purchased inputs across regions (see Peterman, Quisumbing and Behrman, 2010, for a comprehensive literature review). For example, male-headed households show much wider use of

fertilizers than their female counterparts in all countries covered (Figure 14). While the direction of the difference is unambiguous across technologies and regions, the degree of inequality shows notable variations, appearing much more pronounced in Southern Asia (Bangladesh and Pakistan) and in West Africa (Ghana and Nigeria).

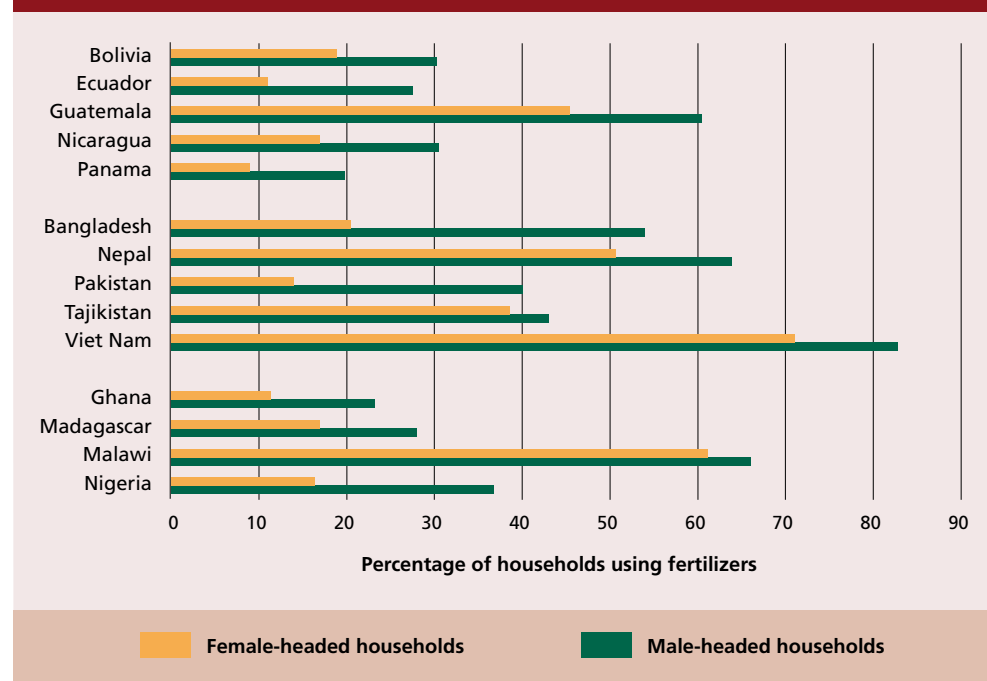
Detailed country studies provide deeper insights. In Ghana, for example, Doss and Morris (2001) found that only 39 percent of female farmers adopted improved crop varieties (compared with 59 percent of male farmers) because they had less access to land, family labour and extension services. Several studies from Kenya show that female-headed households have much lower adoption rates for improved seeds and fertilizers. These differences are explained by reduced access to land and labour, lower education levels and limited access to credit markets (Kumar, 1994; Saito, Mekonnen and Spurling, 1994; Ouma, De Groote and Owur, 2006). Credit constraints also limit the access of female-headed households to fertilizers in Benin and Malawi (Minot, Kherallah and Berry, 2000).

In Burkina Faso, women use less fertilizer per hectare than men (Udry *et al.*, 1995).

Studies that disaggregate mechanization – tools and other farming equipment – by gender are rare. This may, in part, be because modern farming equipment such as tractors and tillers are not commonly available to any farmer, especially in sub-Saharan Africa. The share of farmers using mechanical equipment and tools is quite low in all countries, but it is significantly lower for farmers in female-headed households, sometimes by very wide margins (Figure 15).

A few studies from the late 1980s and early 1990s point to gender differences in ownership of, or access to, tools. In a Gambian irrigated rice scheme, none of the women owned a plough and fewer than 1 percent owned a weeder, seeder or multipurpose cultivation implement; the proportions of men owning these tools were 8, 12, 27 and 18 percent, respectively (von Braun, Hotchkiss and Immink, 1989). According to data from a household survey across three Kenyan districts, the value of farm tools owned by women amounted to

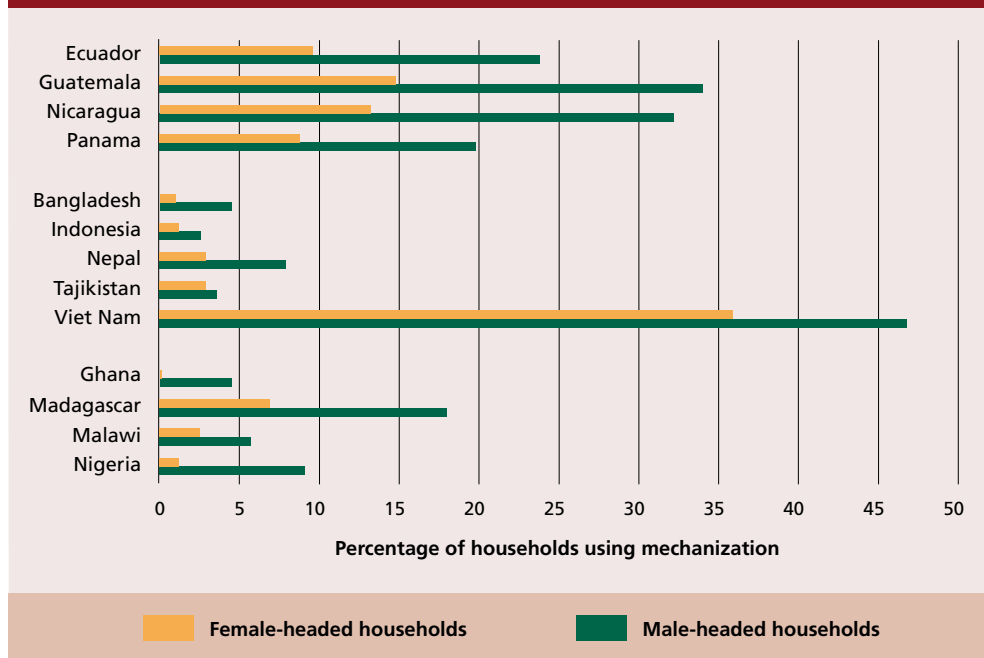
FIGURE 14
Fertilizer use by female- and male-headed households



Note: Calculations made using nationally representative household surveys. Differences between female- and male-headed households are significant at the 95 percent confidence level for all countries.

Sources: FAO, RIGA team, and Anríquez, 2010.

FIGURE 15
Mechanical equipment use by female- and male-headed households



Note: Calculations made using nationally representative household surveys. Differences between female- and male-headed households are significant at the 95 percent confidence level for all countries.

Sources: FAO, RIGA team, and Anríquez, 2010.

only 18 percent of the tools and equipment owned by male farmers (Saito, Mekonnen and Spurling, 1994).

In a more recent study of productivity differences by gender in a rice irrigation scheme in Central Benin, researchers noted that equipment such as motor cultivators used for ploughing and transport were managed by groups, but women's groups were unable to start ploughing until the drivers had completed work on men's fields. As a consequence of the delays in ploughing and planting, women faced yield losses and could not participate in a second cropping season (Kinkingninhoun-Médagbé *et al.* 2010). Gender differences in the use of farm equipment may have further implications. Quisumbing (1995), for example, concludes that farmers with more land and tools are more likely to adopt other technologies, thus highlighting the complementarities among agricultural inputs.

Furthermore, lack of access to transportation technology often limits the mobility of women and their capacity to transport crops to market centres (Box 7).

It is important to note that not all types of female-headed households are equally constrained in their access to technology. On small farms in Kenya, households headed by single, divorced or widowed women are the least likely to use animal traction. In contrast, female-headed households in which the husband lives elsewhere are more likely to use animal traction and hired labour, because they still benefit from their husband's name and social network and often receive remittances from him (Wanjiku *et al.*, 2007).

Key messages

- Across diverse regions and contexts, women engaged in agriculture face gender-specific constraints that limit their access to productive inputs, assets and services. Gender gaps are observed for land, livestock, farm labour, education, extension services, financial services and technology.
- For those developing countries for which data are available, between 10 percent

BOX 7

Smallholder coffee production and marketing in Uganda

Coffee is Uganda's largest export, providing employment (directly and indirectly) to an estimated 5 million people (Bank of Uganda, 2001; Kempaka, 2001). Smallholders' coffee is usually intercropped with staples such as banana, plantain, beans, sweet potatoes and maize. Simple farming methods are normally used to produce coffee; purchased inputs such as fertilizer or pesticides are used minimally and irrigation is rare.

A study by Hill and Vigneri (2009) draws on a sample of 300 coffee-farming households that were surveyed in 1999 and 2003. Twenty-three percent of the households were headed by females (mainly widows, but also unmarried, separated and divorced women). Female-headed households had less labour, land and coffee trees than male-headed households; they also had lower levels of wealth and education. Women household heads tended to be older; many were wives who had taken over when their husband had died. As a result of these basic differences in scale, liquidity and human capital, we may expect crop choice, production methods and access to markets to be quite different for male- and female-headed households.

The share of labour allocated to coffee production and the proportion of trees harvested were comparable between male- and female-headed households, as was the yield per producing tree. However, because female-headed households farmed on a

much smaller scale, women sold smaller amounts than men (only 47 kg, on average, compared with 151 kg for men).

Most smallholders sold their coffee in the form of dry cherries locally known as *kiboko*, which would then be milled by the traders who bought the coffee. Some farmers transported their coffee to market, which allowed them to sell it at a higher price. Members of male-headed households were more likely than those of female-headed households to travel to market to sell their coffee. Fifteen percent of the transactions made by male-headed households took place in the nearby coffee market, compared with only 7 percent of transactions by women. This may be because men were more likely to own a bicycle and could therefore travel to the market more easily than women. Farmers received a higher price for their coffee if they chose to mill it at the market before selling it. Only 3 percent of transactions were for milled coffee, all of which were made by male-headed households.

The study concludes that gender differences in marketing are largely explained by the fact that women market smaller quantities of coffee and do not own bicycles. It also finds that a major constraint facing women is their relative difficulty in accessing marketing channels that allow added value. By engaging in marketing channels in which they add value, male-headed households received 7 percent more per kilogram of coffee.

and 20 percent of all land holders are women, although this masks significant differences among countries even within the same region. The developing countries having both the lowest and highest shares of female land holders are in Africa.

- Among smallholders, farms operated by female-headed households are smaller in almost all countries for which data are available. The gap is negligible in some countries, but in others farms operated by female-headed households are only

half to two-thirds the size of farms operated by male-headed households.

- The livestock holdings of female farmers are much smaller than those of men in all countries for which data are available, and women earn less than men from their livestock holdings. Women are much less likely to own large animals, such as cattle and oxen, that are useful as draught animals.
- Farms run by female-headed households have less labour available for farm work because these households are typically

smaller and have fewer working-age adult members and because women have heavy and unpaid household duties that take them away from more productive activities.

- Education has seen improvements in gender parity at the national level, with females even exceeding male attainment levels in some countries, but in most regions women and girls still lag behind. The gender gap in education is particularly acute in rural areas, where female household heads sometimes have less than half the years of education of their male counterparts.
- Smallholders everywhere face constraints in accessing credit and other financial services, but in most countries the share of female smallholders who can access credit is 5–10 percentage points lower than for male smallholders. Access to credit and insurance are important for accumulating and retaining other assets.
- Women are much less likely to use purchased inputs such as fertilizers and improved seeds or to make use of mechanical tools and equipment. In many countries women are only half as likely as men to use fertilizers.