



Department
for International
Development



Agriculture and women

Agriculture and growth evidence paper series
June 2014



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Acknowledgements

This production of this paper has been supported by Ben Cattermoul and Maureen McWhirter from the Evidence into Action Team. Technical guidance has been provided by Chris Penrose-Buckley.

This paper has been subjected to a series peer reviews by DFID staff and external experts, see below:

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DFID evidence papers

DFID uses a range of evidence synthesis approaches to address the challenge of providing decision makers with the evidence that they need to make better choices.

The “evidence paper” is an expression of the opinion that DFID has of the existing evidence on a given subject.

This paper, written by staff members of DFID, provides a summary of evidence underpinning a range of debates related to agriculture and women.

The authors do not attempt to prescribe policy conclusions, which, for DFID, will appear elsewhere. This is not a policy document, and is not meant to represent DFID's policy position.

Evidence summary – Agriculture and women¹

Is agricultural growth good for women?

- ❖ **Women make up a significant (and varied) proportion of the agricultural workforce in developing countries**, although the amount of labour provided is widely disputed. And whilst the agricultural workforce as a whole is shrinking, evidence suggests that agriculture remains the most important source of employment for women in South Asia and sub-Saharan Africa.
- ❖ **Agricultural transformation and male-outmigration are creating new wage employment opportunities for women in agriculture**, although trends are not uniform. Studies find that the greatest concentration of opportunities is in traditional food crops and in non-traditional exports including horticulture, floriculture, aquaculture, pigs and poultry across a range of developing countries.
- ❖ **Women's activities within agriculture are very gendered and context-specific**, in relation to specific crops, production cycles, livestock, use of resources and production for household consumption versus commercial purposes. For example, whilst trends vary between countries, a range of studies find that it is common for women to have primary responsibility for harvesting and food processing, to own less livestock, have smaller farms than men, and to produce more for subsistence/own consumption. Women are also responsible for the majority of unpaid productive and 'care' work in rural areas including in the agricultural sector.
- ❖ **Women are typically employed in more precarious agricultural work** (work in which wages, benefits and health and safety are poor, and there is little job security and often a lack of formal contracts), both relative to their male counterparts in agriculture, and their female counterparts in other sectors. Children also contribute significant amounts of labour for unpaid household work, agricultural work and particularly looking after livestock. The data and evidence is, however, limited.

Does investment in women in agriculture bring about better development outcomes?

- ❖ **Unequal access to resources for agricultural production limits women's productive potential**, and the overall growth potential of the agricultural sector. Resultant productivity differentials between men and women are therefore typically driven by a past lack of access to resources rather than lack of future potential.
- ❖ **There is broad consensus that women spend a larger proportion of their income on child health, schooling and nutrition than men** if they have control and decision-

¹ Caveat: Whilst it is possible to draw some conclusions about the relationship between agricultural growth and women and girls', well-being data limitations and weaknesses in the existing evidence-base and the contextual nature of gender relations make it difficult to generalise across countries and to accurately estimate the magnitude of effects.

making power over their income (which does not necessarily have to be earned from agricultural output).

❖ **Women and girls' responsibility for the majority of food purchase and preparation also enables them to enhance the nutritional value of food consumed by the household.** Empirical evidence also shows that women's incomes are particularly important in times of crisis, when they may consume less in order to enable other household members to sustain food consumption, so their own food and nutrition intake can be particularly vulnerable to shocks, and a sub-set of female-headed households are more vulnerable to poverty and malnutrition. It is not, however, possible to generalise that girls and women are more likely than boys and men to be undernourished because the limited evidence available suggests that this may be true in South Asia, but not in Africa.

❖ **Whilst women are not necessarily more likely than men to be poor, a subset of rural female-headed households are more vulnerable to poverty and malnutrition.** Female-headed households where female heads are single, divorced or widowed are more likely to be poor than those with support from adult males.

❖ **The nature of women's activities and often as a result of constrained access, means that they tend to use fewer natural resources** such as land and water, and typically grow a wider diversity of crops, contributing to greater biodiversity.

The agriculture and growth evidence paper series

Agriculture is and will continue to be critical to the futures of many developing countries. This may or may not be because agriculture can contribute directly and/or indirectly to economic growth. But it will certainly be critical because poverty is still predominantly a rural phenomenon and this looks set to remain for the next two decades at least.

The Agriculture and growth evidence paper series has been developed to cover a range of issues that are of most relevance to DFID staff. The first five topics that will be covered by this series are shown below. However, as further issues are identified so further papers will be commissioned.

Agriculture and growth

- *Agricultural growth and the national economy*
- *Agriculture's contribution to economic growth*
- *Agricultural growth and structural transformation*

Food prices and poverty

- *Is there such a thing as an optimum staple food price or food price trend relative to other prices or income?*
- *Food price spikes and poor households*

Agriculture and poverty

- *Agricultural growth and poverty reduction*
- *Agricultural growth vs. growth in other sectors*
- *Value for money of agricultural growth*
- *Contextual influences of agricultural growth and poverty reduction*

Agriculture and the private sector

- *Direct state involvement in agricultural input and output markets.*
- *The role of the public sector in supporting private sector investment*
- *Opportunities for commercialisation of agriculture*

Agriculture and women

- *The impact of agricultural growth on women*
- *The impact of women on agricultural growth*

How to use this paper

The paper is not intended to be a comprehensive overview of all issues relating to women and agriculture. It concentrates on those areas that are of particular focus for DFID policy and strategy.

The search strategy for the evidence is shown in annex 1. The objective of this search strategy was to identify the range of evidence that is indicative of the body of evidence that underpins the statements that are included throughout this section. The evidence includes qualitative and quantitative evidence from both peer reviewed and grey sources.

All papers directly referred to within this evidence paper are described and assessed (where appropriate) in accordance with the DFID How to note Assessing the strength of evidence (see annex 2 for a summary of appraisal criteria). Secondary review papers are described

but not appraised. The only distinction being made where fully systematic methods have been used. The descriptors that are used to articulate this assessment are summarised in the tables below.

Table 1: Descriptors of research type and design

Research type	Research design
Primary and empirical (P&E)	Experimental (EXP)
	Observational (OBS)
Secondary (S)	Systematic review (SR)
	Other review (OR)
Theoretical or conceptual (TC)	N/A

Table 2: Descriptors of research quality

Study quality	Abbreviation	Definition
High	↑	Demonstrates adherence to principles of appropriateness/rigour, validity and reliability; likely to demonstrate principles of conceptual framing, openness/ transparency and cogency
Moderate/High	↗	
Moderate	→	Some deficiencies in appropriateness/rigour, validity and/or reliability, or difficulty in determining these; may or may not demonstrate principles of conceptual framing, openness/transparency and cogency
Moderate/Low	↘	
Low	↓	Major and/or numerous deficiencies in appropriateness/rigour, validity and reliability; may/may not demonstrate principles of conceptual framing, openness/ transparency and cogency

The synthesis of evidence and description of the overall “evidence base” are based on combining this grading of strength of the individual pieces with three other characteristics: the size of the total body of evidence assessed; the context/s in which this evidence is set (local, regional or global); and the consistency of the findings produced by the studies constituting the body of evidence.

1. Introduction - Women in agriculture

There is a growing recognition of women's role in agricultural production – in policy, research and data collection. The context in which this appraisal of evidence takes place is that the case for investing in women and girls in agriculture is generally articulated in terms of:

- i) Human rights – gender equality is a basic human right so we need to improve the equity and distribution of opportunities for men, women, boys and girls
- ii) Smart economics – improving female economic participation can contribute to productivity, efficiency and economic growth through
 - Greater and more productive participation of current women of economically active age
 - Greater and more productive participation of future men and women, through improved food security, nutrition and other investment in children
- iii) Sustainable resource use – requires more equitable engagement of women and men

The main body of this paper summarises key findings that relate to:

- i) The potential of agricultural growth to benefit girls and women
- ii) The potential of investing in girls and women in agriculture to bring about better agriculture, poverty and other outcomes

Framework and definitions

Whilst there are a range of definitions of women's economic empowerment on which we would want to draw to establish the impacts of engagement in agricultural activity for women and others², a notable framework is set out in the Women's Empowerment in Agriculture Index³ which measures the empowerment, agency, and inclusion of women in the agriculture sector. This index defines women's empowerment in terms of:

- (1) decisions about agricultural **production**;
- (2) access to and decision-making power over productive **resources**;
- (3) control over use of **income**;
- (4) **leadership** in the community; and
- (5) **time** use.

The index incorporates data collected through household and community surveys, on both men and women for comparative purposes (within households). It is currently only available

² Such as the International Center for Research on Women (ICRW)'s 'Understanding and Measuring Women's Economic Empowerment: Definition, Framework and Indicators', which suggests defining and measuring economic empowerment according to two categories: access to resources and norms and institutions. [...](#)

³ The Women's Empowerment in Agriculture Index was developed by the Oxford Poverty and Human Development Initiative in collaboration with the United States Agency for International Development and the International Food Policy Research Institute, and was launched in 2012.

for 19 countries.⁴ We also note that this does not directly capture access to knowledge and education, including for example through extension services.

Data quality and availability

Whilst the importance of gender to development outcomes has long been acknowledged, it has yet to be “mainstreamed” in agricultural research and data collection. A limited number of primary data sources disaggregate data by sex on indicators that cover aspects of girls and women’s participation in agriculture, such as employment, self-employment, access to land and other resources, access to markets and time use. More generally, alongside lack of sex disaggregation, data coverage across countries is very variable in terms of coverage/representativeness, frequency of collection, comparability and reliability, with countries such as Somalia and South Sudan, for example, not reporting any rural labour market data in the International Labour Organization (ILO) statistics⁵, and countries such as Namibia⁶ do not report sex disaggregated data. Doss et al (2009 [S;OR]) highlights the need for better sex disaggregated data on the access to and ownership of productive assets.

It is also important to recognise more basic problems in the measurement of employment (and other economic activity) by sector in many developing countries, as most employment in low income countries is informal and household members may engage in multiple sectors and their time spent in an activity may not relate to the value created in that activity.⁷ All aggregate data on economic activity in agriculture therefore needs to be treated with caution.

A selection of useful sources of available data is set out in box 1.

Box 1: Examples of primary data sources on women’s economic empowerment, including in agriculture

- The ILO provides a number of useful links to [labour statistics databases](#)
- The Food and Agriculture Organization of the United Nations (FAO) [Agri-Gender Statistics Toolkit](#), presents examples of gender relevant questions and tables.
- The World Bank’s [Women, Business and the Law](#) database analyses laws that have an impact on women entrepreneurs and employees globally
- The World Bank’s [Global Financial Inclusion Database](#) looks at how individuals in 148 countries save, borrow, make payments and manage risk.
- Time use surveys e.g. [Statistics South Africa](#)
- Living Standards Measurement Surveys (LSMS) and Integrated Surveys on Agriculture (ISA) provide sex disaggregated data on labour, consumption and incomes.
- The FAO’s [Gender and Land Rights Database](#) explores the factors that relate to gender inequalities embedded in land rights

A range of indices and other databases draw on these sources.⁶[is this the right footnote reference?]

⁴ Bangladesh, Cambodia, Ethiopia, Haiti, Honduras, Ghana, Guatemala, Kenya, Liberia, Mali, Malawi, Mozambique, Nepal, Rwanda, Senegal, Tajikistan, Tanzania, Uganda, and Zambia.

⁵ The main repository for ILO labour statistics is the ILOSTAT database, which can be found here : <http://www.ilo.org/ilostat/>

⁶ For example see Ministry of Agriculture, Water and Forestry, Republic of Namibia (2009) or [Republic of Namibia \(1997\)](#)

⁷ Fox and Pimhidzai (2011)

Box 2: Evidence and data for gender equality (EDGE)

A joint UN Women and UN Statistics Division initiative in collaboration with OECD and World Bank, EDGE aims to develop partnerships with countries and development agencies to enhance gender statistics capacity and ultimately to improve the integration of gender issues into the regular production of statistics for policy impact.

It will develop a database of basic health, education and employment indicators, standards and guidelines and pilot data collection in 10 countries. Within the economic empowerment sphere (employment, entrepreneurship and assets) it has proposed 8 indicators.

World Bank et al. (2009 [S;OR]) highlights a range of measurement challenges in collecting sex disaggregated agricultural data:

- (i) The production of most agricultural outputs relies on the combined labour of men and women, which is not always easy to separate
- (ii) Agricultural labour force data does not typically assess the quality of employment i.e. is the work 'decent' in that it provides adequate earnings, decent hours, accommodates family and personal life, is legal, safe, stable, secure, free from discrimination and does not prohibit access to social security, social dialogue and workers' and employers' representation⁸
- (iii) Poverty is generally measured at household level which presents challenges to estimating the incidence of poverty among girls and women in agricultural contexts so it is difficult to establish whether or not women and girls are disproportionately represented among the poorest unless one compares female and male-headed households as a proxy.

FAO (2011b [S;OR]) also notes weaknesses in data collection which may explain some underestimation of women's participation (due, for example, to exclusion of non-income generating activities, underreporting of productive activities, failing to incorporate unpaid work and informal sector activity and changes over time).

This paucity of gender data affects the breadth and quality of the evidence base for this paper. It is, however, important to acknowledge emerging initiatives that aim to address this gap, such as Evidence and Data for Gender Equality (EDGE) which aims to collect employment and assets data among a range of other issues in its first phase (see box 2).

Available evidence, however, highlights the following key constraints to women's gainful participation in agriculture.

⁸ The ILO provides further resources on 'decent work' here: <http://www.ilo.org/global/topics/decent-work/lang-en/index.htm>

Box 3: Factors inhibiting women's participation in agriculture

- Women often face a range of binding constraints to productive and gainful participation in agriculture. This represents a loss of potential affecting girls and women themselves, as well as their households, communities and wider economies. The key barriers to women's participation in agriculture are summarised as follows:
- Lack of access to resources such as land, finance, irrigation, technologies, inputs like fertilizer, improved seeds
- Lack of education, training, skills and extension services
- Lack of time
- Lack of mobility and access to markets, both for access to agricultural inputs and for the sale of agricultural produce
- Lack of information and networks
- Lack of decision making power and control over household finances

Some key evidence gaps identified at the outset include:

- Have agriculture productivity interventions reduced gender gaps in access to and use of production inputs? What are the pathways?⁹
- Have capacity-building and increased leadership/management opportunities for women led to increased participation of women in leadership roles in the community? Has increased participation of women in leadership roles led to more sustainable resource use and efficient use of community assets?
- Are programs that emphasize gender equality and women's empowerment more effective at reducing poverty and improving food security?
- Have interventions advancing commercialisation in value chains affected access to paid employment or types of employment for men and women? Have they led to increases or decreases in unpaid work for men or women?
- Evidence on participation of girls in agricultural work, and its impacts on their well-being e.g. health and education outcomes
- Gendered differences in access to common property resources.¹⁰
- Potential gender differences in risk attitudes.

It will be important to expand the evidence based on empirical observations including evaluations as well as developing more simulations.

⁹ M&E Harmonization Group of Food Security Partners (2013)

¹⁰ Croppenstedt et al. (2013 [S;OR])

2. Is agricultural growth good for women?

Theoretical and conceptual overview

The agricultural sector has the potential to benefit girls and women as employees, entrepreneurs, producers and consumers. Enabling women to benefit from economic development through gainful participation in agriculture should enable them to achieve greater economic empowerment;¹¹ and potentially contribute to greater gender equality. Some of the key aspects of this debate are described below:

Box 4: Gender equality

Gender equality is defined by the ILO as “women and men [having] equal conditions for realizing their full human rights and for contributing to, and benefiting from, economic, social, cultural and political development. Gender equality is therefore the equal valuing by society of the similarities and the differences of men and women, and the roles they play. It is based on women and men being full partners in their home, their community and their society. Gender equality starts with equal valuing of girls and boys.”

- (i) The agricultural sector employs a significant number of women, and women represent a large proportion of the agricultural workforce, so it can be argued that supporting growth in agriculture has the potential to benefit a large number of women.
- (ii) Although trends are context specific and changing (e.g. both men and women are migrating in increasing numbers), as men migrate out of rural areas, largely in search of better economic opportunities, women increasingly take on new responsibilities and a greater workload in the agricultural sector, which may impact on the likelihood and extent to which they engage in agricultural activities.
- (iii) The growth of modern international value chains and the transformation of the agriculture sector in many developing countries are creating new employment opportunities, including for women. For example, non-traditional opportunities are opening up for women as workers in high value export crops requiring labour intensive production techniques
- (iv) Evidence does not suggest that agricultural work opportunities necessarily offer better conditions than those in other sectors and in urban areas for women.

Empirical evidence

This review draws largely on reviews and syntheses of the existing primary research base. It is not always therefore possible to assess the rigour of every study referenced, and in some cases the quality of the original review and a sample of the primary studies on which it draws have been used as indicative. This section draws on 26 studies, 11 of which are primary and empirical studies, and the remainder of which are non-systematic reviews of evidence. All of the studies are assessed to be of medium or high quality.

It is difficult to separate female and male contributions to agricultural production. It is difficult to accurately and meaningfully disaggregate gendered contributions to agricultural production, due to the lack of investment in data collection and complexity brought about by

¹¹ Defined broadly as process that increases people’s access to and control over economic resources and opportunities.

the combined labour inputs of men and women in most agricultural households (such as instances of joint male-female production in Burkina Faso, Tanzania and Zambia cited in FAO et al. (2010 [S;OR]), differing definitions of food and production and lack of clarity of asset ownership, Doss (2011 [P&E; OBS; ↑]), FAO, (2011b [S;OR])). However, despite these complexities and limitations, it is possible to identify findings that emerge, these are described below:

Women make up a significant proportion of the agricultural workforce in developing countries although the amount of labour provided is widely disputed. It is commonly claimed that women perform 60–80 per cent of the agricultural labour in developing countries, e.g. UNECA (1972) cited in FAO (2011a [S;OR]), World Bank et al. (2009 [S;OR]). However, the evidence from time-use surveys and agricultural labour-force statistics (which is not available on a comprehensive basis) does not support this statement (measured in time rather than yields). Available data suggests women comprise over 60 per cent of the agricultural labour force in some countries although as noted above even such estimates need to be treated with caution. The over-estimation of the former statistic may, however, be explained by inaccurately generalising the division of labour from one context to another, counting some domestic work as agriculture, or using perceived rather than observed data for example.

The ILO suggests that women comprise 43 per cent of the agricultural labour force on average in developing countries (FAO (2011b [S;OR])), and up to 30 per cent in fisheries (FAO (2011a [S;OR]))¹². ILO (2009) cited in FAO (2011a [S;OR]) notes that the highest overall and average female participation rates in agriculture are in sub-Saharan Africa, with the lowest shares in Latin America.

Comprehensive and reliable data on work in fisheries and aquaculture are not available on a sex-disaggregated basis, although data collected by the FAO on 86 countries suggests that women represented 12 per cent of workers in the primary fish sector in 2008 (FAO (2011b [S;OR])).

ILO data (ILO (2006)) cited in World Bank et al. (2009 [S;OR]) suggests that when both self-employment and wage labour are taken into account, across all regions except North Africa, Southeast Asia and the Pacific, more women than men work in agriculture. In sub-Saharan Africa where countries are still mostly agriculture-based¹³ own-account farming is, not surprisingly, the most common form of agricultural employment for both sexes (about 57 per cent and 54 per cent of male and female adults respectively (FAO et al. (2010 [S;OR])).

The agricultural workforce as a whole is shrinking as a proportion of the working population, and to a greater extent for women. The latest Global Employment Trends 2013 report (ILO (2013 [P; OBS; ↑])) finds that the overall share of employment in agriculture declined by 5.5 percentage points, compared to women's employment in agriculture which declined by 9.5 percentage points between 1991 and 2012 in Sub-Saharan Africa.

FAO (2011b [S;OR]) finds that for women "agriculture, relative to manufacturing and services [is] the most important source of employment by a wide margin in South Asia and sub Saharan Africa". The ILO estimates that 37 per cent of all employed women, compared to 33 per cent of all employed men work in agriculture. However, regional data shows significant variation, with almost 70 per cent of employed women in South Asia and more than 60 per cent of employed women in Sub-Saharan Africa working in agriculture.

¹² Which notes that comprehensive data are not available on a sex-disaggregated basis, case studies suggest that women may comprise up to 30 per cent of the total employment in fisheries, including primary and secondary activities

¹³ See World Bank (2007a)

Also, according to World Bank et al. (2009 [S;OR]) rural women are more likely to be unemployed or underemployed and without access to a cash income than urban women.

The production of specific crops has traditionally been very gendered. Whilst it is not possible to accurately disaggregate male and female contributions to agricultural production, primary responsibilities for producing different agricultural outputs are very gendered, and women have traditionally been responsible for producing locally important staple crops, including those consumed within the household (World Bank et al. (2009 [S;OR])). FAO et al. (2010 [S;OR]) finds that women are the main producers of food crops including staples like maize, rice, and wheat (including for household consumption¹⁴) and provide most of the labour in the production of non-traditional agricultural exports (e.g. horticulture), while men dominate own-account commercial farming in sub-Saharan Africa, Asia and Latin America. The activities undertaken throughout the production cycle of any specific agricultural commodity are also very gendered (although with variation across contexts and over time).

The gendered nature of agricultural activities is very context-specific, but universally combined with a significant unpaid female work burden. The impacts of women's time poverty outlined above, are closely related to women's time use. Female time-use in agriculture and women's contributions to specific agricultural activities vary widely across contexts, depending on the crop, the phase of the production cycle, the age and ethnic group of the women in question, the type of activity and a number of other factors (FAO (2011a [S;OR])). Some common findings across contexts do, however, emerge on female time use in rural contexts. A range of studies such as Hanao and Baanante (1999) for Ghana and Togo, Government of India (2006) for India and Joshi (2000) for Nepal and World Bank et al. (2009 [S;OR]) suggest that alongside providing much of the labour for sowing, weeding, applying fertilizer and pesticides, and harvesting, "rural women provide most postharvest labour, arrange storage, and take care of handling, stocking, processing, and marketing of the produce".

Studies (e.g. Duggan (1998) cited in Ibnouf (2009 [P; OBS; →])) also show that women are principally responsible for storing, preparing and processing food, and for complementary tasks such as gathering wood fuel, fetching water, grinding and pounding grains (Horrell et al., (2008 [P; OBS; ↗])). Women bear a significant unpaid work burden including both productive work e.g. contributing to family enterprises, where at the extreme in Yemen for example, women unpaid workers represented 79 per cent of women agricultural workers (IFAD (n.d.) cited in World Bank et al. (2009 [S;OR])) and 'reproductive' work caring for household members, although this does vary across countries. For example, Horrell et al., (2008 [P; OBS; ↗]) shows that women do 40 per cent of total productive work in male-headed households in Zimbabwe compared to less than 10 per cent in Ethiopia (where women do almost 100 per cent of domestic and care work).

Time-use surveys (e.g. Fontana and Natali (2008 [P; OBS; ↗])) across a range of countries estimate that women spend 85 to 90 per cent of their time on household food processing and preparation, calculating that the time savings from unpaid work and the lack of investment in critical infrastructure services is equal to 466,000 and 4,590,000 jobs respectively. They are also usually responsible for child care and other household chores (Ilahi (2000 [S;OR])).

It is also important to note that women have higher overall work time burdens but fewer hours of paid work: in Benin, Madagascar and Tanzania, women spend 5 to 10 hours less per week than men in 'productive work' (UN et al. (2008)), compared to at least 10 hours more for non-productive work (which includes food preparation, household maintenance, shopping, care of household and community members and other community services, Horrell et al., (2008 [P; OBS; ↗])). Similarly, time burdens may constrain women from seeking the

¹⁴ Which is supported by evidence in World Bank (2012)

best prices for their output (Quisumbing and Pandolfelli, (2010 [S;OR])). Their involvement in unpaid agricultural work may therefore be damaging to women, if it is not accompanied by a reduction in other paid or unpaid work.

Women's time burdens are often increased by household shocks. In addition to the impacts of migration, HIV and AIDS presents significant labour challenges for households, where productive labour is lost to illness and care work. This is particularly relevant for girls in AIDS-affected households who are found to be withdrawn from school to care for sick family members (Kipp et al., (2007) for rural Uganda and Grant and Palmiere (2003) for rural Zimbabwe cited in FAO et al. (2010 [S;OR])). The ILO (2008) estimates that 34.5 per cent of women (and 24.9 per cent of men) are "contributing family workers" globally, compared to 59 per cent of the total female labour force in South Asia and 35 per cent of the total female labour force in Sub-Saharan Africa. There is also anecdotal and isolated evidence e.g. Eaton and Shepherd (2001 [P; OBS; →]) that whilst men control contract farming arrangements, women conduct much of the farm work.

Rural electrification, which can reduce women's time burdens e.g. collecting fuel for cooking and heating, extending the working day by providing artificial light after dark, has been found to significantly improve women's productivity and earnings in agriculture and entrepreneurship, increasing female employment in South Africa for example, by 9.5 percentage points over 5 years (Dinkelman (2011) cited in Buvinić et al. (2013 [S;OR])).

Women's limited ownership of agricultural assets and constrained access to markets, for inputs and for the sale of outputs, inhibits their ability to benefit from agricultural growth For example, female-headed households generally have poorer access to credit, agricultural inputs including labour, seeds, fertilisers and extension services. See next section for further evidence.

Women are more likely to own smaller farms and produce food for subsistence. Men are more likely than women to own medium to large commercial farms, making them more able to benefit from the expansion of tradable agricultural goods (FAO (2006) cited in World Bank et al. (2009 [S;OR])).

Studies suggest that men are more likely to own relatively more livestock and livestock of greater value than women. The Rural Gender Asset and Wealth Gaps study covering Ghana, Ecuador, Uganda and Karnataka, India (Doss et al. (2012 [P; OBS; ↑])) finds that in all countries except Ecuador, male exceeds female ownership of livestock, but that there is a smaller differential in ownership of small stock and poultry specifically. Other available data indicates that inequality in livestock holdings is particularly acute in Bangladesh, Ghana and Nigeria, for example, where male holdings are more than three times larger than those of female-headed households (FAO (2011a [S;OR]))

Across regions, women and girls often have a prominent role in managing small livestock. International Livestock Research Institute (ILRI) (2002 [P; OBS; →]) estimates that two thirds of poor livestock keepers (totalling approximately 400 million people) are women, including poultry, pigs (Tung (2005) cited in FAO (2011b [S;OR])) and dairy animals (Tangka et al. (2000) cited in FAO (2011a [S;OR])). Studies in Pakistan and Afghanistan (Tibbo et al. (2009 [P; OBS; →]) and Ashrafi (2009) cited in FAO et al. (2010 [S;OR]) for Pakistan and Afghanistan respectively) highlight that most livestock-related activities are undertaken by women, and their degree of control over related income was higher.

Some studies including Bravo-Baumann (2000 [P; OBS; →]) indicate that livestock ownership is attractive to women in societies where access to land is restricted to men (and they have access to communal land) and when tasks are divided, men are more likely to be

involved in herding grazing animals and marketing produce if women's mobility is constrained.

Girls' contributions to agricultural production are significant. Globally, an estimated 60 per cent of the world's 218 million child labourers (aged 5 to 17 years) are working in agriculture. Sex disaggregated data estimates that girls represent 40.7 per cent of child labourers and that girls conduct 37.2 per cent of child labour in agriculture.¹⁵ Horrell et al., (2008 [P; OBS; ↗]) find that "livestock keeping is almost exclusively a children's activity in all the African countries". This is likely to have an adverse impact on children's, educational attainment.

Male out-migration may be creating new opportunities for women in agriculture, though trends are not uniform. It is estimated that men still migrate more frequently than women, particularly internationally, although sex-disaggregated migration data is limited and trends are not uniform nor constant over time, with for example, some countries seeing growing numbers of both women and men migrating. Data referenced in Song et al. (2009 [P; OBS; →]) suggests that the effects of male out-migration are greatest in sub-Saharan Africa where 52.5 per cent of the adult population in rural areas is female.

Evidence suggests a range of effects of male out-migration. Women often encounter greater labour constraints than male-headed households because they typically have fewer adult household members and more dependants (FAO (2011a [S;OR])). Menjivar and Agadjanian (2007)¹⁶ highlight instances where women take up traditionally male activities as a result of labour constraints in female-headed households, particularly as remittances may not be large enough to hire replacement labour in the latter two countries. In areas with more rigid sociocultural gender norms, such as rural Armenia and Guatemala, women are likely to have to withdraw from agricultural work.

Agricultural growth presents new opportunities for women although the quality of the opportunities may be poorer for women than men. World Bank et al. (2009 [S;OR]) finds that waged labour opportunities are increasing, including for women, particularly in horticulture, floriculture, aquaculture, pigs and poultry across much of the developing world. For example, in Senegal, the growth of modern horticulture supply chains has been associated with direct beneficial effects for rural women and reduced gender inequalities in rural areas (Maertens and Swinnen (2009 [P; OBS; →])). This study also finds that women typically earn minimum wages in non-traditional agricultural export packing. It is important to note, however, that women tend to be concentrated in unskilled jobs, with limited opportunities for advancement, but that the increased demand for their labour may increase their bargaining power (Croppenstedt, Goldstein and Rosas (2013 [S;OR])).

Whilst producing high value agricultural products does not typically employ a large proportion of the rural labour force (as in the case of Senegal for example), women are found to benefit more from employment in large-scale estate production and agro-industrial processing than from high-value smallholder contract-farming in which they often provide unpaid family labour. Men and women are not, however, necessarily employed on equal terms (FAO et al. (2010 [S;OR])), Maertens and Swinnen (2009 [P; OBS; →])).

Evidence shows that female farmers are largely excluded from modern contract-farming arrangements. For example, in Kenya and Senegal women are excluded from contract farming in high-value products because they lack statutory rights over land, have

¹⁵ ILO (2010) 2

¹⁶ See also Kennedy (1989)

limited access to irrigation and infrastructure and have weaker claims over family labour (Maertens and Swinnen (2009 [P; OBS; →])). This may be due to social norms or because they are unable to meet requirements such as minimum business size, land ownership, ability to meet management time and cost of registering a business and securing trade licenses, or access to resources required to guarantee delivery of a reliable flow of produce (World Bank (2007b) cited in World Bank et al. (2009 [S;OR])).

Gladwin et al. (2001 [S;OR]) find that cash cropping and non-farm microenterprises may not be particularly beneficial for married women whose husbands make decisions; and younger women may have more demands on their time and less money than older women who have younger female relatives to carry out activities on their behalf.

When productivity, profits and exports of traditionally ‘female’ crops rise, men often take over land and inputs where women lack control over them. Croppenstedt, Goldstein and Rosas (2013 [OR; ↑]) cite a number of studies that demonstrate a loss of control of crops as their export markets develop such as spices in Zanzibar (Ellis et al. (2007 [S;OR])). Fontana (2003 [S;OR]) identifies that rising demand for traditionally female crops can lead to men taking over their cultivation given higher earnings potential, particularly of crops for the export sector e.g. leafy vegetables in Kampala markets in Uganda (Shiundu and Oniang’o (2007 [S;OR])) and in Gambia, Uganda, Tanzania and Zambia (FAO et al. (2010 [S;OR])).

Women are typically employed in more precarious agricultural work (work in which conditions including wages, benefits and health and safety are poor, and there is little job security and often a lack of formal contracts). Whilst statistics on gendered employment segmentation and working conditions are very limited (e.g. see International Labour Conference, 2008 cited in FAO et al. (2010 [S;OR])), a range of studies demonstrate trends across a range of contexts, summarised below.

Women are disproportionately represented in low value agricultural activity with low skills requirements (see Song et al. (2009 [P; OBS; →]) for China and Jütting and Morrisson (2009 [P; OBS; →]) for 28 developing countries in African, Asia and Latin America) and earning lower wages for the same work as men (e.g. see Ahmed and Maitra (2010) which finds that even controlling for age, industry and education, women typically earn lower wages than men for the same work; Fontana (2009) cited in FAO (2011a [S;OR])). A review of rural gender wage gaps cited in FAO et al. (2010 [S;OR]), found the largest disparities in Afghanistan and Pakistan where women’s wages are around half those of men (in 2003 and 2001 for respective countries)

Other studies note trends toward the ‘casualisation’ of agricultural labour, particularly among women, where women’s jobs are increasingly flexible, temporary/seasonal, part-time and informal. For example, in India between 1972 and 2002, male casual workers increased from 65 per cent to 80 per cent, whilst female casual workers increased from 89 per cent to 92 per cent (World Bank (2007a) cited in World Bank et al. (2009 [S;OR])). For example, in Tanzania women comprise 85 per cent of casual workers planting, harvesting and grading on flower farms, while men typically occupy managerial positions (ILO (2003) cited in FAO et al. (2010 [S;OR])). This lack of security means that women are particularly vulnerable to significant losses of or reductions in income at short notice, with implications for their entire households.

An Indian study by Sinha and Sangeeta, 2000 cited in World Bank et al. (2009 [S;OR]), using household member level data found that women are overrepresented in poor households with earnings from the informal sector, suggesting that the kinds of informal work arrangements outlined above, have implications for poverty outcomes.

There are also climate change implications for women, such as risk of declining farm yields, dictated by the crops they produce, although Brody et al. (2008 [S;OR]) cite some evidence of women's adaptation to flood and drought resistance crops.

Rural non-agricultural work may have higher returns than agricultural work for women. Whilst earnings are not systematically higher within these sectors, rural non-agricultural work for women is most likely to be in domestic work (especially in Latin America), home-based work such as artisan handicrafts (particularly in South Asia), small-scale manufacturing (such as processing of food and other agricultural products), commerce and various forms of services.

Rural workers typically remain poor due to the following factors, to which women can be particularly vulnerable (although individual level poverty data is very limited) (evidence summarised in FAO et al. (2010 [S;OR]), and above):

- Low earnings
- Precarious living and working conditions
- Vulnerability to health and other shocks
- Limited access to risk-coping mechanisms such as insurance or social assistance

Some evidence suggests that non-agricultural employment can tackle some of these negative factors. Evidence, from Haggblade et al. (2007) cited in FAO et al. (2010 [S;OR]) and Hertz et al. (2009 [P; OBS; →]), suggests that women's earnings are typically higher from non-agricultural work than agricultural work. An Ethiopia study (Kimhi (2009 [P; OBS; →])), for example, shows that female non-farm labour income is the only income source that significantly reduces per capita income inequality. It is, however, worth noting that this may also be the case for men, particularly those without secure land tenure.

3. Does investment in women in agriculture bring about better development outcomes?

Theoretical and conceptual overview

A number of studies find that once women have access to the same inputs and extension services as men, there is no productivity differential between women and men in agriculture.¹⁷ Increasing women's productive employment in agriculture and tackling gender specific barriers will therefore improve agricultural productivity.¹⁸

It is commonly claimed that female-headed households are disproportionately represented among the poor, so increasing their incomes could also act as an effective method of poverty targeting.

While women tend to earn less and own and control fewer resources than their male counterparts, resources and incomes controlled by women are more likely to be used to improve household food, nutritional security and education. For example, Ibnouf's review (2009 [P; OBS; →]) finds that there is a significant difference between men and women's expenditure patterns (money allocated for food and non-food items). Compared to men, women earn lower incomes, but tend to allocate more of their earnings to buy food items for their household (also see FAO (2006) cited in World Bank et al. (2009 [S;OR])).

It is often claimed that women are responsible for the majority of food production for the household¹⁹, which suggests another route to greater food and nutritional security associated with investing in women in (subsistence) agriculture.

Women's participation in agriculture could improve natural resource management which could benefit future growth and poverty reduction.²⁰

Empirical evidence

Much like the previous section, the majority of studies informing this review are reviews and syntheses of existing evidence. A total of 31 studies were reviewed, of which 19 can be described as primary research, whilst the remaining studies are (not systematic) reviews of existing evidence. Again, all studies reviewed are assessed to be of medium or high quality.

¹⁷ Croppenstedt et al. (2013 [S;OR])

¹⁸ FAO et al. (2010 [S;OR])

¹⁹ For example, Kurz and Johnson-Welch, (2001 [S;OR]) find that women are largely responsible for food processing and preparation for household consumption.

²⁰ World Bank et al. (2009 [S;OR])

Agricultural productivity and growth

Women consistently have unequal access to resources, limiting their productive potential in agriculture. World Bank (2012), Gilbert et al. (2002), Moock (1976) and Peterman et al. (2010) all cited in FAO (2011a [S;OR]) find that female farmers in all regions own and control less resources including land, water, livestock, purchased inputs like fertilisers, improved seed varieties, pesticides, credit, insurance and technology. Representative and comparable data for 20 countries from the Rural Income Generating Activities (RIGA) database²¹ of household surveys show that male-headed households operate larger agricultural land holdings, on average, than female-headed households in all countries.

Even where women have formal land tenure, lack of access to other assets often impedes their ability to maximise the gains from it and constrains their productive potential e.g. lack of availability of credit; marketing and processing facilities; limited control over price; gender inequities in local and national decision-making; unsuitability of produce for export; lack of education and productive know-how; poor quality and unavailability of productive inputs; and other difficulties such as the migration of young labourers (Pellizzoli, (2009 [P; OBS; →])).

Whilst restricted in agriculture in general, access to finance is particularly restricted for women. Fletschner (2009) cited in FAO, (2011a [S;OR]) and World Bank et al. (2009 [S;OR]) find that 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. In Zimbabwe, for example, men were more likely than women to take up high yielding maize varieties, as a result of better access to financial assets and formal marketing institutions (Bourdillon et al. (2007) cited in Quisumbing and Pandolfelli (2010, [S;OR])).

Similarly, a study of rural service provision in Ghana, Ethiopia and India found that women in all three countries were less likely than men to join farmer-based organisations, which is likely to further reduce their access to agricultural inputs (cited in Quisumbing and Pandolfelli (2010, [S;OR])).

Girls and women also typically have weaker access to education, training, skills and extension services. Meinzen-Dick et al. (2010 [S;OR]) find that extension provision in developing economies remains low for both women and men, and women tend to make less use than men of extension services. Only 15 per cent of extension agents globally are women, and in Africa, a mere 7 per cent (Williams (2003) cited in World Bank (2012)), making extension services inaccessible for women in some contexts. An older study, FAO (1993 [P, OBS; ↗]) found that only five per cent of extension resources were devoted to women. Women's participation in farmer groups, associations or collectives has been found, in Uganda for example, to improve access to extension services and information about new varieties and farm management practices (Buvinić et al. (2013 [S;OR])).

Productivity differentials between men and women are typically driven by a past lack of access to resources rather than lack of future potential. Drawing on FAO, (2011b [S;OR]), comparing the agricultural output of female versus male-headed households highlights the gendered differential in farm size and input use, which explains the relatively smaller contributions of female-headed households (where across 4 countries female-headed households represent 3-38 per cent of total, and produce 2-17 per cent of total food produced).

²¹ RIGA database, cited in FAO, 2011a [OR; →]), available at <http://www.fao.org/economic/riga/en/>

A number of studies such as Goldstein and Udry (2008 [S;OR]) and de Brauw et al. (2008 [P; OBS; ↑]) confirm that differences in yields and profit per hectare between male and female farmers are typically driven by lack of tenure security, lack of access to inputs, extension services and other factors. Based on data for 52 countries which estimates an average yield gap between male and female farmers of 20 to 30 per cent (attributed largely to gendered differences in input use), reducing the gender gap in the control of agricultural resources (i.e. land, labour, inputs, finance) could increase agricultural productivity by 15-20 per cent, increasing agricultural output by 2.5 to 4 per cent and reducing the number of undernourished people by 12 to 17 per cent (FAO (2011a [S;OR])).

Chen et al.'s (2011 [P; EX; ↑]) study on the impact of family gender composition on agricultural input use in India suggests that households with more male children invest more in agricultural inputs due to the perceived additionality of adding physical capital to male human capital versus female human capital, suggesting that more male children in a household is likely to enhance agricultural productivity.

Women's productive participation in agriculture (and other sectors) has implications for economic growth prospects. A range of rigorous studies have identified positive impacts of female education, labour participation and earnings across the wider economy on economic growth (for example, see Klasen and Lamanna (2009 [P; OBS; →])). A recent review of the literature summarised the key (direct and indirect) channels through which greater gender equality contribute to growth as (i) enhanced current and future labour productivity, and (ii) increased rates of savings brought about by declines in fertility in among educated women, and therefore lower dependency ratios (Klasen (1999) cited in Kabeer and Natali (2013 [S;OR])).

Evidence is, however, mixed. Bussman (2009) found that at higher levels of GDP per capita and openness to trade, women's share in agriculture tends to decline, in both OECD and non-OECD countries. Whereas, Balamoune-Lutz and McGillivray (2007) present regression analysis that suggests some growth benefits of increased openness to trade may have been driven by the high proportion of uneducated women employed in export agriculture in sub-Saharan Africa, that represent a source of cheap labour. And another study in India (Esteve-Volart (2004)), found that lower female-male ratios of workers in both agricultural and non-agricultural sectors reduced total output. Gaddis and Klasen (2011) found that growth in agricultural value added tended to have positive and significant impacts on female labour force participation. All of the above were cited in Kabeer and Natali (2013 [S;OR]).

Poverty reduction

There is mixed evidence that women are more likely than men to be poor. Empirical studies (such as Anriquez, 2010 cited in FAO, (2011a [S;OR]) on the relationship between gender and poverty have found no statistically significant difference between men and women, although much of the analysis draws on more readily available data on poverty in female-versus male-headed households as a proxy. Quisumbing et al. (2001, [P; OBS; ↑]) tests whether poverty rates are higher in female-headed households across ten countries, but this is supported only by a few of the data sets considered. It highlights the additional problem of headship endogeneity, whereby the varied process by which households become female-headed are important.

There are however country specific examples of gendered poverty trends. For example: data for Cameroon, Laos, Madagascar, Mauritania and Tanzania in Gürkan and Sanogo (2009) referenced in FAO et al. (2010 [S;OR]) suggests a higher incidence of poverty among female-headed than male-headed households.

Evidence indicates that a sub-set of female-headed households may be more vulnerable to poverty and malnutrition. Anriquez (2010) cited in FAO (2011b [S;OR]), finds that rural female-headed households are more likely to be poor than urban female-headed households, and that households with single, divorced or widowed female-heads are more likely to be poor than those with an adult male supporting the household through remittances or social networks. On this basis one could argue that enhancing the incomes of rural female-headed households is likely to represent an effective means of poverty targeting.

Evidence suggests that there is no consistent difference between the nutrition outcomes of poor female-headed households and poor male-headed households. Of 18 studies that examined the nutritional effect of female-household headship on children, results were divided almost equally between positive and negative outcomes, but more likely to be positive for poorer households suggesting disproportionate benefits from economically empowering poor female household heads (Buvinić and Gupta (1997 [S;OR])).

It is not possible to generalise that girls and women are more likely than boys and men to be undernourished. Although the limited evidence available suggests that this may be true in much of Asia and Africa. In households vulnerable to food insecurity, women are at greater risk of malnutrition than men (Bain, L.E. et al, (2013 [S;OR])). In India, for example, there is some evidence of son preference in nutrient investment in children (Borooah, 2004 [P; OBS; →]). More sex disaggregated data of better quality on anthropometric and other indicators of malnutrition are needed to arrive at clear conclusions.

Household welfare

There is broad consensus that women spend disproportionately more of their income on investments in the welfare of their households, including through education, health and nutrition (see Quisumbing and Maluccio (2000 [P; OBS; →]) and Doss 2005 [P, OBS; ↗]), suggesting that increasing their earnings from agriculture should deliver greater household welfare.

Ibnouf (2009 [P; OBS; →]) also finds that women's involvement in income generating activities has greater impact than simply increasing their own or other household income, with benefits for household welfare, child nutrition and education. 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 (Guha-Khasnobis and Hazarika (2007 [P; OBS; →])).

In certain environments household welfare is especially likely to improve as a result of women's greater economic empowerment. For example, strengthening women's land ownership in Nepal is linked with better health outcomes for children (Allendorf (2007 [P; OBS; →])). In a number of contexts women tend to draw down assets more quickly than men in response to crises and as they get older (e.g. see Dillon and Quiñones (2010) cited in FAO (2011a [S;OR])), offering greater protection of household welfare.

Increasing women's incomes needs to be accompanied by improved female decision-making power (which is found to be weak in a number of studies) to maximise household benefits. The above assertions about the impact of increasing women's incomes on household welfare assume that women have control and decision-making power over the income they earn (i.e. they can protect it and decide when and how to spend it), but a number of studies (in India, Kenya and Senegal) show that women often have limited or no control over income earned, particularly from their work on family crops (for example, see Maertens and Swinnen (2009 [P; OBS; →])). IDS (2012) argues that "Women have far less

access to higher value markets, and their crops and food products may be sold on their behalf by men – who then keep and control the income.”

Women’s status (defined as power relative to men) tends to dictate their control over resources, time and broader household decision making, which has direct implications for their own nutritional status and health, and that of their children (Haddad et al. (1997), Engle et al. (1999) and Kishor (2000) cited in Smith et al. (2003 [P; OBS; ↑])). Women’s status and decision making power is typically lowest in South Asia, where children’s rates of malnutrition (being underweight, stunted and wasted) are highest. Smith et al. (2003 [P; OBS; ↑]) estimate that if male and female status was equalized in south Asia, the underweight rate among children under three years would drop by approximately 13 per cent, which represents a reduction of 13.4 million malnourished children (compared to equalizing the status of genders in Sub-Saharan Africa which is estimated to reduce child malnutrition by 3 per cent or 1.7 million children under age three). But the study also finds that in sub-Saharan Africa, women’s status increases women’s BMI only among those women with very low decision-making power relative to their husbands, and it has no influence on the treatment of child illness.

A participatory research approach to enhance rural women’s capacity to analyse and access market opportunities found that the increase in women’s incomes led to an increase in joint household decision-making between men and women (CIAT implemented *Enabling Rural Innovations* case study in Kaaria et al. (2008) cited in Quisumbing and Pandolfelli (2010 [S;OR])).

Similarly, Buvinić et al. (2013 [S;OR]) finds that improved property and inheritance rights in rural Tanzania enhanced employment outside the home, self-employment and earnings. The same review cites evidence from Bangladesh and South Africa that there is a positive correlation between the assets (including land) brought to marriage by women and the household budget share spent on education.

Buvinić et al. (2013 [S;OR]) also suggest that ‘autonomy or its absence seems to be much less of a concern for women in wage employment’, although they acknowledge that this may be due to the correlation between women’s status and employment in wage labour in countries with greater gender equality.

Where women’s work commitments displace time previously devoted to care giving, families can be adversely affected, particularly where women have been the primary care-givers. Whilst a larger proportion of the additional household income is likely to be spent on household welfare, there may be a reduction in time available for care and domestic work for the household (Salazar and Quisumbing (2008 [P; OBS; →])). Also see Cutler et al. (2002 [P; OBS; →]) which shows that during the Mexico crisis in 1995, infant mortality rates increased most in the areas where women’s work participation increased, with girls worst affected. In Kenya, Uganda and Zambia, a significant number of older children, especially older siblings, look after younger siblings whilst their mothers work (Smith et al. (2004 [P; OBS; →])).

Women’s role in food preparation can contribute to better nutritional outcomes within the household. According to Duggan (1998) cited in Ibnouf (2009 [P; OBS; →]) women’s significant role in food preparation across countries in sub-Saharan Africa and elsewhere, contributes to food security, and can maintain better nutritional value of food and increase dietary diversification. For example, women’s greater use of locally available raw materials (Ibnouf (2009 [P; OBS; →]) notes that women collect local wild plant and tree foods which help maintain household nutrition and sustain food levels during shortages) which are processed into food products at relatively low cost provides food for the household with a higher nutritive value compared to the raw material (Van de Sande (1997) cited in Ibnouf

(2009 [P; OBS; →])). It is, however, important to note that dietary diversification could be achieved through other means, such as more diverse food production and/or increased earnings with which to purchase more diverse food.

There is mixed evidence on the impact of women growing high value crops (particularly for export) on the production of food for household consumption. In Kenya, for example, Dolan (2001) finds that land and labour traditionally used for household food production are diverted to export production, whereas in Madagascar Minten et al. (2009) find productivity spillovers from vegetable growing that improve food security for the producing households (both cited in FAO (2011b [S;OR])).

Women's food and nutritional security is particularly vulnerable to shocks. Quisumbing et al. (2008 [S;OR]) find that during food crises, women often reduce their own consumption to leave more food for other household members. In India, data suggests that women face greater food insecurity and malnutrition than men in times of crisis, suggesting an asymmetric treatment of genders directly affecting hunger and nutrition outcomes (Behrman and Deolalikar (1991) cited in Chen et al. (2011 [P; EX; ↑])). There is evidence for example, from Baird et al. (2011 [P; OBS; ↑]) that girls are much more vulnerable to transitory income shocks than boys, and pregnant and lactating mothers are among the groups considered most at risk of food insecurity and poor nutrition induced by crisis, with implications for their health and nutritional status and the future health and productivity of their children. Zezza et al. (2008 [P; OBS; →]), found that in some countries female-headed households were worse affected by the food price shocks of 2008 because they spent a larger proportion of household income on food than their male-headed counterparts. This suggests that bolstering women's incomes could make household food and nutritional security more resilient to shocks.

Food price rises will mean that staples account for an increasing proportion of household food expenditures (assuming that incomes do not rise proportionately and that households are net food consumers), potentially forcing households to cut back on both food quantity (caloric intake) and quality (dietary diversity). On the other hand, net food producers and/or exporters may be better off. Given that women spend relatively larger proportions of their incomes on food, such food price shocks are likely to affect women disproportionately. Quisumbing et al. (2008 [S;OR]) highlight that loss in dietary diversity and associated micronutrients can also have specific implications for girls and women.

Natural resource management

Evidence suggests that the gendered nature of agricultural work and unpaid household care work give women scope to improve the management of natural resources such as food, fuel and water. Typically men use more resources in agriculture, logging, and fishing for commercial purposes, than women. For example, it is estimated by FAO (2007) cited in World Bank et al. (2009 [S;OR]) that men use more water for irrigation systems in crop production whilst women have less access for vegetable gardens and subsistence crops.

Women, however, play an important role in water management as collectors, users and managers of water for household use. Similarly, women tend to grow a wider diversity of crops, with greater potential to maintain biodiversity relative to male-dominated monoculture cash crops (Pandolfelli et al. (2008 [S;OR])). Whilst some of their traditional techniques are being applied in commercial agriculture, much of this tradition is within subsistence agriculture.

Rocheleau (1996) cited in World Bank et al. (2009 [S;OR]) finds that in many contexts women typically have fewer ownership rights than men so their use rights are often mediated

through their relationships with men potentially limiting their resource use, and they often rely heavily on common property resources. It is also important to note that women may be less likely to invest in soil management where they have limited security of tenure, alongside the extent to which they invest in off-farm livelihood strategies (Verma, 2011 cited in Quisumbing and Pandolfelli (2010 [S;OR])). Ali et al. (2011 [P; OBS; ↑]) find that when land rights are strengthened for both women and men, female-headed households increase their investments disproportionately more than male households in Rwanda.

Engaging women in wider decision-making may prove beneficial. Pandolfelli et al. (2008 [S;OR]) found that mixed-sex self-help groups can be more effective where joint action is required, such as in natural resource management.

Similarly, the gendered division of labour and gendered knowledge around crop cultivation and the wider production-consumption chain influences the use of production spaces, with direct impacts on biodiversity. For example in Yucatan, Mexico, home gardens which are typically managed by women, tend to have far greater interspecific variety, with an average of 156 species compared to male-dominated 'milpas' (traditional small native agricultural fields), with a maximum of 25 species e.g. crop staples, fruit trees and legumes.

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Annex 1: Literature search methodology

The interrogation of the evidence base for this paper was built on an iterative process designed to ensure that the paper covers a range of evidence that was indicative of the scope of the evidence base for each of the sections (that is, the full range of arguments and empirical research was represented). This included:

A structured literature search of the following databases and repositories:

- SviVerse Scopus
- Web of Knowledge
- Google Scholar
- DFID's research repository R4D
- International Initiative for Impact Evaluation (3ie) systematic review and impact evaluation databases.

The search was designed around search strings created for each of the sections. Further inclusion criteria for this rapid search were:

- Date: after 2000 – present - unless considered seminal.
- Languages - English
- Population - developing countries
- Region - no regional limitations.

Focused searches by authors - The results of this search were used by authors to construct their theoretical and conceptual arguments. Once constructed the theoretical and conceptual sections of the paper formed a framework for a further literature search to identify further sources of the empirical evidence that underpins the arguments presented.

Peer review – The development of the paper is supported by a steering group and each section has both DFID peer reviewers and external peer reviewers. At each stage of the process – from the identification of the focus areas to the drafting of the final documents the peer reviewers have contributed their assessments and suggestions relating to the representativeness and strength of the evidence base that we are drawing from.

Annex 2: Critical appraisal

For a full description of the methods used for critical appraisal in this paper please refer to the ***DFID How to note on Assessing the strength of evidence***.

The basic criteria for assessing the quality of the studies cited in this paper are summarised in the table below:

Principles of quality	Associated principles	YES/NO
Conceptual framing	Does the study acknowledge existing research?	
	Does the study construct a conceptual framework?	
	Does the study pose a research question?	
	Does the study outline a hypothesis?	
Openness and transparency	Does the study present the raw data it analyses?	
	Does the author recognise limitations/weaknesses in their work?	
Appropriateness and rigour	Does the study identify a research design?	
	Does the study identify a research method?	
	Does the study demonstrate why the chosen design and method are good ways to explore the research question?	
Validity	Has the study demonstrated measurement validity?	
	Is the study internally valid?	
	Is the study externally valid?	
Reliability	Has the study demonstrated measurement reliability?	
	Has the study demonstrated that its selected analytical technique is reliable?	
Cogency	Does the author 'signpost' the reader throughout?	
	Are the conclusions clearly based on the study's results?	

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