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Sex-disaggregated data in agriculture and sustainable resource management

New approaches for data collection and analysis

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Contents

Acknowledgements	iv
Executive summary	v
Section 1. Addressing gender data gaps in agriculture	1
1.1 Policy momentum to collect better sex-disaggregated data in agriculture	1
1.2 Existing data, approaches and methods for collecting and analyzing sex-disaggregated data in agriculture	3
1.3 Developing gender indicators and guidelines for data collection	10
Section 2. Measuring women's roles and outcomes in climate-smart agriculture, biodiversity and ecosystem services, and their time use	14
2.1 Climate smart agriculture	14
2.2 Biodiversity and ecosystem services	19
2.3 Efficient use of time resources	25
Section 3. Recommendations and looking ahead	30
References	33

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This guidance document provides an overview on data and methods for collecting and analyzing sex-disaggregated data in agriculture – and presents current approaches and ways forward in climate-smart agriculture, measuring biodiversity and ecosystem services and efficient use of time resources for gender-responsive development interventions and policy-making. The target audience for this guidance document includes researchers, national statistical offices, as well as policy institutions who are involved in monitoring gender-related policy targets in agriculture.¹

¹ A condensed version of this document targeted towards a broader policy audience, including government officials and ministries of agriculture: “The need for improved data in agriculture: a prerequisite for policy and achieving the SDGs,” has also been prepared within Gender Analysis and Policy, ESP. Available at [\(need to add in link\)](#)

Executive summary

The need for improved sex-disaggregated data in agriculture

To increase agricultural productivity while ensuring sustainable natural resources management, advancing gender equality and women's empowerment in agriculture is essential. Gender gaps in agricultural productivity persist across the developing world. In order to support member countries and FAO technical units with the design and implementation of gender-responsive policies and programmes, FAO addresses the gender equality dimensions in country-level interventions and its normative work, including its major statistical databases and surveys.

Amid a growing emphasis on natural resource governance within the Sustainable Development Goals (SDGs), the international agricultural development agenda and more specifically within its own Strategic Framework, FAO aims to further the understanding of gender-specific impacts of interventions on agriculture and the environment such as water and land resources, and ecosystems at large to inform evidence-based and gender-responsive programming and implementation. Increased attention is also being devoted to the analyses of the gender-differentiated impacts of climate change and sharing of benefits between men and women from adaptation and mitigation activities and the uptake of climate-smart agriculture (CSA) practices. However, sex-disaggregated data has only recently begun emerging on some of these topics, and unevenly across regions of the world.

Data is not only a technical issue. What does not get measured remains invisible in policy planning. Efforts to address policy targets to reduce gender inequalities in agriculture, and measure related

indicators, are hampered without adequately understanding the roles of both women and men in agriculture through surveys.

This guidance document examines existing gender data gaps in agriculture, sources of data that have emerged recently to address these gaps, as well as analysis and indicators that can be developed. Specifically, this guidance document emphasizes the need to address gender data gaps in agriculture through nationally-representative household and/or agricultural surveys that rely on individual-level data collection, that can be used to inform regional and/or national policies. This document also discusses recent changes to national individual-level surveys to fill some of these gaps; in particular, much of this progress has been focused in Sub-Saharan African countries, and as a result most of country examples presented in the document come from this region. The target audience for this document includes researchers and policy-makers – across international institutions and within countries – who rely on rigorous data collection and analysis to develop policy prescriptions, and also formulate indicators for monitoring gender-related targets in agriculture within the Sustainable Development Goals.

What factors underlie gender inequalities in agricultural productivity?

Across developing countries, women, who are self-employed in agriculture, tend to have smaller landholdings and lower productivity, stemming from multiple factors – insecure land rights, poorer access to inputs, markets and credit – which can result in their greater vulnerability to external

shocks, changes in climate and natural resource endowments. Some household surveys have made progress in disaggregating these outcomes by sex and linking inequalities with productivity; emerging sex-disaggregated data has come primarily from Sub-Saharan Africa, with data gaps persisting in other countries.

Productivity gaps in agriculture can also be linked to other factors that remain relatively uncovered in household surveys, including climate change. Amid growing concerns among countries about rising food insecurity, depletion of natural resources, and disruptions in weather and seasons, understanding differences in productivity, work burdens, and overall vulnerability of men and women plot managers from climate and resource-related factors is crucial.

New data efforts and ways forward

Until recently, traditional surveys and agricultural censuses have provided very limited information on sex-disaggregated outcomes in agriculture. As detailed in Section II, among household surveys, recent and emerging sources of sex-disaggregated data on agriculture include the World Bank's *Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA)*, focused in Sub-Saharan Africa, and FAO's *Agricultural and Rural Integrated Survey (AGRIS)* which is currently in the pilot phase. These surveys cover individual-level data on agricultural holdings, management, and production, as well as household demographic and socioeconomic characteristics that could be correlated with these outcomes. Additional household survey modules that highlight gender differences in management and decision-making over agricultural input use and production include the *Women's Empowerment in Agriculture Index (WEAI)*, the result of a recent partnership between Feed the Future, IFPRI, USAID, and the Oxford Poverty and Human Development Initiative; the WEAI has also been adopted for surveys conducted by the UN Joint Programme on Rural Women's Economic Empowerment. FAO's *World Census of Agriculture Programme 2020 (WCA 2020)* also

emphasizes the need for agricultural censuses around the world to collect better sex-disaggregated data on ownership and management of plots. Other project-specific household surveys, such as the *Global Environmental Facility's Integrated Approach Pilot*, are exploring how to further incorporate sex-disaggregated data in survey modules on agricultural productivity and climate change.

In addition to highlighting gender differences in agricultural opportunities and productivity, these survey efforts can also shed light on the interactions between gender and CSA, biodiversity and ecosystem services, as well as efficient use of time and natural resources. Global positioning system (GPS) data for individual communities and land parcels has also become increasingly common in household surveys like the LSMS, that can be linked with household or farm outcomes. When combined with other geographic data on soil quality, water resources, and weather patterns, GPS data can therefore help shed light on vulnerabilities that men and women producers face from changes in climate and natural resources. Community-level data on the type of infrastructure accessible to men and women, and the presence of NGOs promoting gender-specific CSA policies is also valuable. Improved survey questions on natural resource collection, activities that are heavily borne by women in developing countries, are being developed by FAO's global water information system AQUASTAT through a household questionnaire on water, as well as the World Bank and FAO (a new forestry module to be incorporated in some LSMS surveys). New approaches to measuring work and time use in agriculture, both at the household (including through the WEAI) and the community levels (through FAO) are also being developed.

An improved understanding, across nationally-representative household surveys, of men's and women's outcomes and constraints in agriculture can greatly inform emerging research and policy interests on the determinants of gender differences in agricultural productivity. Recent work by FAO on mainstreaming gender in agricultural surveys, for which guidelines will be available in mid-

2017, also find that land ownership and actual decisionmaking over plots can be very different concepts, underscoring the need to collect more nuanced data on land rights and use. In addition, to focus on more vulnerable groups that need better policy targeting, outcomes could also be examined across the size of landholdings and other socioeconomic characteristics. Better sex-disaggregated data in household agricultural surveys will also deepen existing FAO resources and databases on gender statistics, including FAOSTAT, the Rural Livelihoods Information System, Gender and Land Rights Database, and AQUASTAT, as well as guide the development of much-needed indicators to monitor outcomes in agriculture, for countries, international agencies and the SDG targets. Greater coordination between countries and international agencies on survey design and implementation is an important step towards this objective.

This guidance document is divided into two main sections. Section 1 examines the main existing gender data gaps in agriculture across nationally-representative household and agricultural surveys, which if addressed could reveal insights on gender differences in agricultural productivity, and important reasons for these inequalities. This section also discusses sources of data that have emerged recently to narrow these data gaps, following international momentum to collect better sex-disaggregated data in agriculture, as well as related analyses and indicators that can be developed across different aspects of agriculture.

Policy is also increasingly concerned with how agricultural productivity can be balanced with sustainable resource management. Section 2 delves further into how management of resources – through climate-smart agriculture, conserving biodiversity and ecosystem resources, and efficient use of working time – has varying implications for men's and women's livelihoods in agriculture, and how surveys can be enhanced further to examine sex-disaggregated outcomes across these areas.



Section 1. Addressing gender data gaps in agriculture

1.1 Policy momentum to collect better sex-disaggregated data in agriculture

Across developing countries, women are heavily engaged in agriculture. Aggregated data show that women comprise around 43 percent of the agricultural labour force globally (FAO, 2011), although these estimates vary widely across regions and communities, and unpaid work in subsistence or smallholder agriculture is more likely to go unmeasured. Despite women's diverse and fundamental roles in agriculture, global gender gaps persist with women having more limited access to productive assets, inputs, services, and rural employment opportunities. Women also face several constraints on their time use, which are often tied to local norms and beliefs that also affect their land rights, work stability and the activities they can engage in. For example, initiatives on agricultural technology adoption are often taken over by male producers because of women's time constraints and norms that limit their ability to manage input and production decisions (World Development Report, 2012). Another example comes from Sub-Saharan Africa; Palacios-Lopez, Christiaensen, and Kilic (2015) find, using individual-disaggregated, plot-level labor input data from nationally representative household survey in Malawi, Tanzania, and Uganda, that the female share of agricultural labor ranges from 50–55 percent. However, a separate study by UN Women, UNDP, UNEP, and World Bank (2015) found that female farm managers in these countries had lower levels of education and a smaller average family size, were often widowed or divorced/separated, and tended to be less wealthy compared to all other plot managers, in addition

to have poorer access to resources and services. These inequalities can foster wide gender gaps in agricultural productivity.

Momentum has increased recently among countries and international organizations for collecting better sex-disaggregated data in agriculture. One primary objective has been to understand how to improve opportunities and productivity among men and women producers, particularly among smaller farmers that comprise a large share of women in the sector. These efforts include the 2010 Global Strategy to Improve Agricultural and Rural Statistics², a joint initiative between the FAO and World Bank, which emphasizes the need for collecting better sex-disaggregated data in agriculture. The Global Strategy has also forged several new survey initiatives to improve data collection.

And notably, in September 2015, countries adopted the 17 Sustainable Development Goals proposed by the UN General Assembly's Open Working Group, including a specific goal on gender equality and specific targets under Goals 1, 2, and 5 to examine women's outcomes in agriculture (Box 1). A set of indicators are being adopted to monitor these targets, but in turn require improved data collection in these areas. To date, for example, only three of the 14 indicators for Goal 5 (on gender equality) are being regularly collected in most countries and have accepted international standards for measurement, calling for increased efforts to address these gaps.

² See <http://www.fao.org/docrep/015/am082e/am082e00.pdf>

Box 1. Sustainable Development Goals (SDG) targets, and IAEG-SDGs proposed indicators, related to gender and agriculture



SDG Goal 1: End poverty in all its forms everywhere

Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

Proposed indicators by the IAEG-SDGs:

Indicator 1.4.2: Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure



SDG Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and sheers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

Proposed indicators by the IAEG-SDGs:

Indicator 2.3.2: Average income of small-scale food producers, by sex and indigenous status



SDG Goal 5: Achieve gender equality and empower all women and girls

Target 5.a: Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws

Proposed indicators by the IAEG-SDGs:

Indicator 5a.1: (a) percentage of people with ownership or secure rights over agricultural land (out of total agricultural population), by sex; and (b) Share of women among owners or rights-bearers of agricultural land, by type of tenure

Indicator 5a.2: percentage of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control

Many recent FAO initiatives emphasize the need for gender-responsive policy and investments in agriculture, as reflected in FAO's 2013 Policy on Gender Equality, which aims at narrowing the gaps between women and men in sustainable agricultural production and rural development for the elimination of hunger and poverty. The five gender equality objectives span decision-making, access to decent employment and productive resources, access to goods/services and markets, reducing women's work burden, and increasing agricultural aid committed to projects on gender equality and women's empowerment.

FAO is also currently in the process of developing the World Census of Agriculture Programme 2020 (WCA 2020), which emphasizes that country agricultural censuses collect sex-disaggregated data on who owns and manages household agricultural plots, as well as individual decision-making roles across other household agricultural activities. WCA 2020 also points out the need for agricultural censuses to sample small holdings, in which women are heavily involved; often these holdings are excluded from censuses' enumeration because of their small contribution to total production.

1.2 Existing data, approaches and methods for collecting and analyzing sex-disaggregated data in agriculture

1.2.1 Collecting individual-level data to shed greater light on gender inequalities

Amid these policy shifts, sex-disaggregated data in agriculture has begun emerging across nationally-representative surveys, albeit unevenly across regions of the world. Further progress on data collection needs to be made in order to address policy targets to reduce gender inequalities in agriculture, and measure related indicators.

Box 2 covers some areas where significant gender data gaps in agriculture persist in surveys across countries, although for some countries in Sub-Saharan Africa, many gaps are being addressed by the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) conducted by the World Bank (Box 3).

An important concern is the level at which sex-disaggregated data are collected, which affects cross-country comparability of statistics. With the exception of the LSMS-ISA surveys, until recently, questions on agricultural labor allocation and input use in nationally representative surveys may be asked only of one household member (often the household head). Analyses of gender differences are therefore often only possible at the household level, across male and female heads of household, as opposed to the individual level. Comparisons across male and female heads of household are typically justified by assumptions that the household head is primarily responsible for the economic well-being of the household, and that women tend to have poorer access to resources than men. Based on these assumptions, comparing outcomes by sex of the household head would shed light how men and women heads manage their household economic affairs differently, and allocate resources across different household members.

Box 2. Gender dimensions of agriculture

Agricultural policies could benefit from better sex-disaggregated data on farm outcomes (by sex of the producer – in the case of crops, the person owning and/or managing each plot):

- Types of rights to land (secure title and tenure, lease rights, etc.); concepts of ownership can vary across different regional/country contexts
- Plot size, crops grown, and output (including share of output consumed/marketed)
- Management and decision-making roles
- Access and control of agricultural assets
- Access to input/output markets, credit, extension services and other resources
- How agricultural inputs are used and investments in improved technologies
- Sex/age composition of household members and hired labourers in activities across agri-food value chain
- Agricultural shocks faced in last cropping season or year (drought/flooding/soil erosion/pests), and coping strategies (borrowing, reducing saving, reducing consumption, other help sought), by sex of plot owner or manager
- (Possibly qualitative data): perceptions on institutional and cultural constraints affecting the allocation of farm/plot management and marketing activities

However, the definition of headship can vary substantially across countries and regions, controverting at least one or both of these assumptions. Buvinic and Gupta (1997) provide a useful perspective on some of these issues – the definition of household, particularly in contexts where joint family systems are common, can vary greatly across countries. Surveys often also leave the designation of household head to members of the household, who may use different criteria to make this assignment, making comparisons within countries difficult as well. Headship may also be a temporary concept, for example when spouses migrate for work. Also, decision-making over resources may be a complex process across different household members, so that comparisons by household headship may not be very meaningful – and more than likely mask outcomes for all men and women of interest in the sample.

Similarly, individual-level data on experience with shocks, and ownership/use of agricultural assets and inputs also matters in comparing men's and women's productivity across different contexts. Since collecting detailed data on women's and men's outcomes in agriculture is a relatively recent effort, ensuring that different types of surveys follow similar data collection and survey approaches therefore has important bearing, and in particular disaggregation of outcomes at the individual as opposed to household level. Comparability of questions across different types of surveys, as well as sampling methodology (a particularly relevant issue for small and/or marginalized groups such as women) can also confound policy inference. Coordination and harmonization of survey efforts across country NSOs and international agencies that implement surveys is an important step towards this objective.

1.2.2 New individual-level surveys, and recent research

Nationally-representative survey efforts

Agricultural censuses and surveys are still lacking in their presentation of sex-disaggregated data, an area that several recent initiatives have been trying to address, including the FAO and World Bank Global Strategy; the World Programme for the Census of Agriculture (WCA) 2020; the initiative on Evidence on Data and Gender Equality (EDGE), which has worked with FAO on specific recommendations for agricultural censuses to incorporate sex-disaggregated data on land ownership; and an FAO report and guide (available in mid-2017) on mainstreaming gender in agricultural surveys. Greater progress has been made among household surveys – following the momentum set by the FAO/World Bank Global Strategy and the recent adoption of the SDGs, international agencies have worked

Box 3. New efforts on household survey design among international agencies

Surveys that can shed light on gender differences in agricultural productivity, by socio-economic and demographic characteristics:

- **World Bank Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA):** along with standard modules on individual demographic and socio-economic characteristics, also has detailed agricultural modules on men's and women's plot ownership, management, input use, production, and other agriculture-related activities. The survey also has a community module that covers such topics as institutions and other initiatives serving the community, recent events including shocks, and market prices. Currently, LSMS-ISA covers panel surveys in eight countries across Sub-Saharan Africa (Burkina Faso, Ethiopia, Malawi, Mali, Niger, Nigeria, Tanzania, and Uganda).
Link: <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,,contentMDK:23512006~pagePK:64168445~piPK:64168309~theSitePK:3358997,00.html>
- **Agricultural and Rural Integrated Survey (AGRIS):** New survey designed by FAO that is still in the pilot and development phase, and will begin to be implemented over the next year or two. AGRIS will have detailed individual data on agricultural holdings, management, and production, and household demographic and socio-economic characteristics that could be correlated with these outcomes.

Additional household survey modules that highlight gender differences in management and decision-making over agricultural input use and production:

- **Women's Work and Employment (WWE) partnership:** FAO and the World Bank are also collaborating with ILO and the UN Foundation's Data2X project on a partnership that focuses on how women's and men's work in subsistence agriculture can be better measured across own-production and market-based activities.
Link: <http://data2x.org/partnerships/womens-work-employment/>
- **Women's Empowerment in Agriculture Index (WEAI),** the result of a recent partnership between Feed the Future, IFPRI, USAID, and the Oxford Poverty and Human Development Initiative, measures men and women's relative autonomy and decision-making roles in agricultural production. FAO has also modified a version of the WEAI for the UN Joint Programme survey on Rural Women's Economic Empowerment (UNJP-RWEE), discussed below.
Link: <http://www.ifpri.org/publication/womens-empowerment-agriculture-index>

to bridge gender data gaps in agriculture through household survey improvements targeted at the household and agricultural landholding levels. These improvements can greatly inform policy by providing richer data on agricultural outcomes for men and women that can also be compared against data on demographics, education, other forms of employment and welfare aggregates such as consumption.

The LSMS-ISA surveys have also been used frequently in recent analyses of men's and women's outcomes in agriculture in Sub-Saharan Africa, with broader scope for inference as well given that the surveys are nationally representative. An increasing number of studies, for example, have examined the gender gaps in agricultural productivity in the region and the underlying reasons for these differences, using data collected on the characteristics of plots and outcomes for men and women plot managers (Box 4).

Box 4. Examples of factors affecting gender differences in agricultural productivity: evidence from Sub-Saharan Africa

Recent studies on gender gaps in agricultural productivity, relying on available data from Sub-Saharan Africa (see Goldstein and Udry, 2008; Kilic, Palacios-Lopez and Goldstein, 2015) have identified several factors from which these gaps arise:

- access to and use of agricultural inputs, including labour
- tenure security and related investments in land and improved technologies
- market and credit access
- human (education, training and information) and physical capital
- institutional and cultural constraints (community norms, tenure security) that affect farm/plot management and marketing of agricultural produce

Controlling for the factors above, many studies observe that the gender gap in agricultural productivity narrows:

- Palacios-Lopez and Lopez (2015), for example, use the 2011 Malawi Living Standards and Measurement Study-Integrated Surveys in Agriculture (LSMS-ISA) survey to estimate gender differences in agricultural productivity, and find that agricultural labour productivity is, on average, 44 percent lower on female-headed plots than on those managed by male heads. Their study estimates that 34 percent of this gap is explained by differences in labour market access and 29 percent by differences in credit access.
- A related study by Aguilar et al. (2015), using the 2011–2012 LSMS-ISA Ethiopian Rural Socio-economic Survey, finds a 23.4 percentage point gender gap in agricultural productivity, of which 13.5 percentage remain unexplained after accounting for gender differences in land manager characteristics, land attributes, and access to resources. The magnitude of the unexplained fraction is large relative to other estimates in the literature, and the study suggests that differences in the returns to extension services, land certification, and product diversification may contribute to the unexplained fraction. Moreover, the productivity gap is mostly driven by non-married female managers, particularly divorced women. Overall and unexplained gender differentials are also more pronounced among farmers who fall in the middle of the productivity distribution – and as productivity rises, the share of the gender gap explained by the unequal access to resources declines as productivity increases. The results shed light on specific groups within the distribution of farmers that may need better targeting.
- Slavchevska (2015) uses LSMS-ISA panel data from Tanzania (2008–2009 and 2010–2011) to find gender differences of around 21–29 percent in agricultural productivity, stemming mainly from differences in plot area (women tend to own smaller plots) and family labor (women plot owners tend to be in smaller households with fewer men). Policies aimed at improving women's access to factors of production will also help alleviate the existing gender gap in productivity, but may not be sufficient since other unobservable factors (land quality, for example) can potentially contribute to widening the gender gap. Understanding how plots are assigned to family members is therefore important for understanding these gender differentials. The study also finds some evidence that the unequal access to pesticide and inorganic fertilizer widen the productivity gap, particularly at higher levels of productivity. Women who own plots also tend to live in smaller households with fewer men. Policies that focus on enabling women to hire (male) labor and on relieving women from other time constraints so that they can expand more labor on agricultural production is also a clear way to alleviating the gender gap.

These studies have found that gender gaps are often related to differences in human and physical capital, and also stem from differences in access to inputs, markets, and credit; in property rights that affect investments in land; and community-level constraints on women's management of plots (Box 4). At the same time, however, in some contexts, variables that are typically not collected in surveys (including individual initiative or motivation,

Evidence from smaller surveys across countries

Other country-specific surveys have highlighted interesting factors underlying productivity differences across men and women farmers. In an earlier study of land tenure from Ghana, for example, Goldstein and Udry (2008) implemented a two-year rural survey of four village clusters, with a range of different cropping patterns, in the Akwapim South District of the Eastern Region of Ghana. Within every village cluster, 60 married couples were surveyed, and each head and spouse was interviewed 15 times during the course of the two years. The authors find that women typically lack the local connections to be confident of their land rights, and as a result fallow their plots less than their husbands, and achieve substantially lower yields.

Peterman et al. (2011) also investigate the gender differences in agricultural productivity using plot-level data collected in 2003 from Uganda, with the objective of linking natural resource management to poverty levels and household consumption; and 2005 data from Nigeria collected at the household level with a detailed plot-level agricultural module to evaluate the effects of the second round of Fadama, a national agricultural welfare program. After controlling for a range of socio-economic characteristics of plots, and household fixed-effects, their study found persistent lapses in productivity in female-owned plots and female-headed households in both countries. Productivity differences, however, depend on the type of gender indicator used, agro-ecological region, and inclusion of biophysical characteristics.

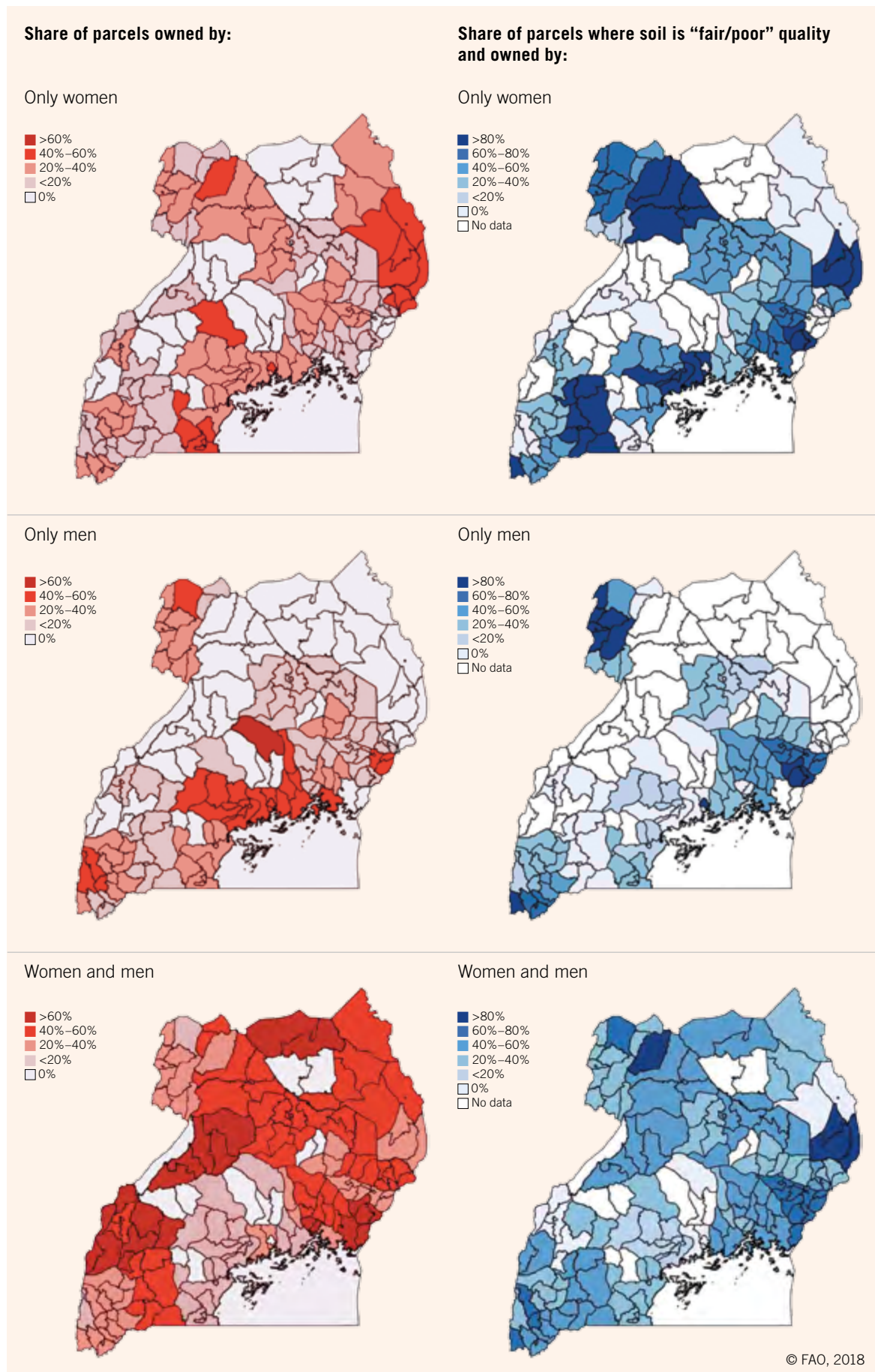
Distributional/regional correlates related to gender and agricultural outcomes, and the role of global positioning system data

In addition to access to resources, infrastructure and services, disaggregating agricultural outcomes by distributional and regional variables is also important from a policy-making standpoint. This is especially true given the growing role of climate change on the livelihoods of rural areas, and ongoing questions about which areas and groups (including women) are more affected. Comparing farmers' agricultural productivity and constraints by demographic and socioeconomic characteristics is becoming easier, as mentioned above, with more detailed survey data. An increasing number of large-scale surveys are also using GPS data of communities, and land parcels, to visually pinpoint more vulnerable areas within countries; this has useful applications for policies related to gender and climate as well.

Figure 1 below, for example, uses the most recent 2011 LSMS-ISA survey from Uganda³ to visually present how agricultural land ownership and soil quality are distributed by gender across districts. The first column shows, within districts, the share of land owned by only women, only men, and jointly by women and men as reported in the survey. The second column presents the share of landownings for each group where soil quality is reported to be "fair" or "poor" (as opposed to good quality). While defining land ownership is complex, particularly in Sub-Saharan Africa (see Section II), the maps show clear differences in areas where women tend to have a greater role in landownership, and the relative importance of sole versus joint ownership across areas. These maps can also be compared with available global information system (GIS) data on climate and weather patterns, to highlight areas that are more vulnerable. The second column of Figure 1 takes a simple example from the survey itself, showing that women's landownings are much more likely not to have good-quality soil (about 47 percent overall, compared to about 35 percent for male-owned and jointly-owned parcels), and the areas where these gender disparities are more prominent.

³ 2011–12 Uganda National Household Survey (UNHS), which is nationally representative.

Figure 1. Gender distribution of landownings, and land quality: 2011 Uganda LSMS-ISA Survey



In addition to surveyed outcomes, therefore, GPS data can play a valuable role in understanding agricultural outcomes of vulnerable groups, including women, and how these outcomes are correlated with climate-related constraints. Challenges do remain, however, including the capacity of NSOs to collect this data, and working with individual farmers to ensure that locations of parcels are measured accurately (Kilic et al., 2013).

1.2.3 Project-specific household surveys and evaluations

Global Environment Facility (GEF)

Under GEF, the Integrated Approach Pilot (IAP) sets out the management of natural capital – land, soil, water, vegetation and genetic resources – as a priority in the transformation of the agriculture sector for food security. This program targets agro-ecological systems where the need to enhance food security is linked directly to opportunities for generating global environmental benefits. The **Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP)** tool is designed as a survey instrument to assess the resilience of farmer and pastoralist households to climate change. In the context of the IAP, FAO as a GEF executing agency has adapted its SHARP survey questionnaire to incorporate a range of topics related to IAP (land degradation, sustainable land management, agro-biodiversity, resilience, and gender/decision-making) measurable through indexes, scores and scales. This adaptation of the SHARP questionnaire⁴ is currently known as HH-BAT (Box 5). A pilot survey and analysis has been conducted in Uganda, covering 384 households, with another survey planned in Burundi.

Box 5. Topics covered in Global Environment Facility HH-BAT survey questionnaire

- Basic characteristics of the household respondent (gender, age, relationship to the household head, area of residence, main agricultural practice – farmer/agropastoralist)
- Production systems and practices, including labour allocation of household members across different agricultural activities and other income-generating activities
- Within agriculture, several modules detailing input use (labor/seeds/fertilizer/pesticides/ other technology) and related practices, and the extent to which each activity was important to their farming system and sufficient for providing income to the household
- Perceived changes in climate, access to water and land, soil quality and land degradation
- Food consumption and insecurity, and exposure to other shocks
- Household decision-making roles across individual health care, major and daily household purchases, and other financial decisions
- Major productive assets and income sources

The HH-BAT is a rich survey tool for understanding different aspects of households' agricultural activities, their vulnerability to shocks, water and land access issues, and food insecurity, and climate-related factors affecting production. Efforts are also underway to improve the understanding of how gender can be better integrated into this tool.

To better analyze the gender roles in agriculture, for example, the current decision-making module might be replaced with decision-making questions targeted to each specific agricultural activity within each module. This may also improve the accuracy of responses, since the questions would be much more targeted to specific activities. Whether asking about men's and women's land ownership/management earlier in the questionnaire would help frame responses throughout the survey is also being considered. Finally, based on initial findings from the Uganda data, an examination is underway of how men report experience with shocks and other outcomes differently from women, including potential reasons for these differences. Since all

⁴ <http://www.fao.org/documents/card/en/c/a78ba721-9e03-4cfc-b04b-c89d1a332e54/>

members of the household were not interviewed in the survey, gender comparisons are limited to how male heads of household report certain outcomes differently from female spouses of household heads, and also separately from female heads of household. Since the sample is concentrated in a particular regional context, comparability issues on how headship is interpreted or defined may not be as problematic, but the caveats discussed earlier on comparisons of female and male heads of household are still important to consider.

UN Joint Programme on Rural Women's Economic Empowerment (UNJP-RWEE)

The UNJP-RWEE survey is currently being implemented in several countries by FAO, together with UN Women, World Food Programme and IFAD. With FAO as a partner, a survey from Niger covering 560 households was recently conducted, with plans to be replicated soon in Ethiopia as well. Households were targeted areas that received different types of programs, such as capital equipment, livestock transfers and training. The UNJP-RWEE program has four implementation methodologies, of which the survey questionnaire covers the first three (Box 6). Specifically, the UNJP-RWEE has a household questionnaire that asks about which household members (male/female) work on, manage, and/or own each of the household's agricultural plots. The survey includes also an individual questionnaire that adapts the WEAI module by asking men and women about their decision-making roles over different production and income generation activities (how much input over decisions within each activity), group membership and ability to speak up in public, as well as food insecurity.

Box 6. UNJP-RWEE implementation outcomes, and topics covered by survey questionnaire

Outcomes for rural women under UNJP-RWEE

- 1. Improved food and nutrition security** – aims at increasing the productive potential of female smallholder farmers through their access to and control over productive resources and services. It also addresses their social protection, and enhanced control and management of local food security reserves.
- 2. Increased income** – to sustain their livelihoods focuses on creating, supporting and developing rural women's enterprises along the food value chain, enhancing their income opportunities and promoting their participation in high value markets. It will support women-led associations and small scale businesses in overcoming their supply side constraints so that they can take full advantage of market opportunities.
- 3. Enhanced leadership** and participation in rural institutions and in shaping laws, policies and programmes promotes their agency in rural producer organizations, cooperatives and unions and in local governance.
- 4. A more gender responsive policy environment** for the economic empowerment of rural women catalyzes legislative and policy reforms for the effective enforcement of rural women's land rights and their access to decent wage employment, social protection, and infrastructure.

1.2.4 FAO databases that present sex-disaggregated statistics in agriculture

Four main databases within FAO present data that can, for some topics, be disaggregated across men and women – FAOSTAT, the Rural Livelihoods Information System (RuLIS), the Gender and Land Rights Database, and AQUASTAT. Box 7 provides some detail on each of these databases.⁵ A main shortcoming, however, is that greater breadth of data across outcomes, particularly plot-level outcomes, is needed across countries. Going

⁵ FAO also houses the Agri-Gender Database, a toolkit to provide guidance on collecting sex-disaggregated data in agriculture, across nine areas: (1) agricultural population and households, (2) access to productive resources, (3) production and productivity, (4) destination of agricultural produce, (5) labour and time use, (6) income and expenditures, (7) membership of agricultural/farmer organizations, (8) food security, and (9) poverty indicators.

forward, as household and agricultural surveys continue to disaggregate agricultural outcomes by sex, the span of information within these databases will continue to grow.

Box 7. FAO databases with different sex-disaggregated statistics in agriculture

FAOSTAT: shows data for 245 countries and 35 regional areas from 1961 to the present. Statistics on population (men and women in agriculture) are available, and indicators of food security (for example, share of food consumption in total income, or of dietary energy consumption from different food sources) are disaggregated by sex of the household head.

Available at: <http://faostat3.fao.org/home/E>

Rural Livelihoods Information System: platform that will be launched in 2017 by FAO that presents indicators on rural livelihoods and welfare, disaggregating data by sex of the individual on employment, health, education and land ownership (the latter depending on data availability).

Gender and Land Rights Database: launched in 2010 to highlight factors (political, legal, cultural) that affect women's land rights across countries and as of 2016, 84 country profiles are available. The GLRD also contains sex-disaggregated statistics on land ownership from household surveys and on land management (proxied by the agricultural holder) from agricultural censuses.

Available at: <http://www.fao.org/gender-landrights-database/en/>

AQUASTAT: FAO's global water information system, developed by the Land and Water Division. Based on examining data collected through the WCA and other censuses, the AQUASTAT database now has two indicators related to women's use of irrigation (percentage of area equipped for irrigation managed by women, and percentage of agricultural holdings with irrigation managed by women). These data are currently available primarily among European countries, with the intent as well to collect this information in standardized manner in developing countries.

Available at: <http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>

1.3 Developing gender indicators and guidelines for data collection

1.3.1 Gender indicators

In addition to broader research and dissemination, gender indicators can also be developed across different agricultural outcomes. Indicators serve an important diagnostic role and are key for informing policy decisions, and can also be useful for holding institutions accountable for achieving gender-related targets. In the development of gender indicators, concepts and definitions also need to be adapted to different country/local contexts. Regular data collection over time also leads to better monitoring of these indicators among policy-makers.

Some progress is being made on the development of indicators that fall under the SDG targets related to gender and agriculture (Box 1), namely related to equal rights to economic resources and sustainable agriculture. However, the indicators currently developed by the IAEG-SDGs focus primarily on gender-differentiated outcomes related to ownership or secure rights over land, which is crucial but just one dimension of outcomes in agriculture. Understanding other outcomes such as rates of technology adoption among men and women in agriculture, gender differences in access to finance and other services, and differences in production are also important. Developing gender indicators on these topics is needed as well, for monitoring these SDG targets and local policy efforts.

Indicators can be quantitative or qualitative (Box 8), and these two sets of indicators are also complementary and can cross-validate each other. This includes shedding light on the mechanisms underlying individual choices. For example, qualitative indicators on female plot managers' perceived costs and benefits of new technologies can help in understanding quantitative indicators on the share of these women who adopt new technologies, compared to male managers.

Box 9. Examples of gender indicators in agriculture

Quantitative indicators: focus on areas that are easy to quantify, and are usually drawn from censuses, other household surveys and administrative records. When possible, and in particular for production decisions, comparisons across men and women who are plot managers/decision-makers is preferred – although depending on the survey, only the reported or documented owner of the plot may be observable. The indicators below focus on the incidence within the populations of adult male and female plot managers, respectively (for example, the share of female managers using improved technologies/ all adult female managers).

Examples related to farm, landscape and policy-making issues include:

Farm issues

- Share of men and women using improved technologies and infrastructure (ranging from irrigation, seeds or other inputs) in the last cropping season or year
- Average size of irrigated farms, by men and women
- Share of men and women who own productive assets for agriculture

Landscape issues

- Characteristics, aggregated from men's and women's plot-level data, within a given locality (for example, average soil salinity and other measures of soil fertility, elevation, distance to the nearest road)

Policy-making issues

- Budget allocations for training women and men plot owners/managers on improved technologies (seed use, improved water infrastructure, etc.)
- Whether measures exist to guarantee women's equal rights to landownership and control (could be collected from household surveys on knowledge/awareness of these measures, or more aggregated administrative data)

Qualitative indicators: describe individual perceptions, and other traditional practices and institutional factors at the community level, affecting outcomes. Generating data for qualitative indicators calls for participatory methodologies such as focus group discussions, individual interviews, and surveys measuring perceptions and opinions of both men and women. Examples include:

Farm issues

- Men's and women's perceptions of the importance of extension knowledge and their effects on productive outcomes
- Men's and women's perceptions of the importance of climate change on how they manage their plots, as well as productivity

Landscape issues

- Community norms that affect men's and women's landownership and rights over land, as well as access to input and output markets

Policy-making issues

- Regional policy priorities for improving irrigation use (and other potential productivity-enhancing interventions) for women plot owners/managers

Since sex-disaggregated indicators for agriculture are often likely to be compared on the basis of control over land (for example, measuring outcomes by male/female plot owners), how control is defined needs to be examined more carefully. Control over land could mean **documented ownership**, for example (with the presence of a title, certificate, or deed), simply **reported ownership** if documents are not available or if a formal registration system does not exist, or **rights/decision-making capacity over land** (who makes decisions on the use of land,

or how to sell/transfer, for example). Section II of this report discusses difficulties in measuring land ownership across men and women in more detail. As seen with the SDG targets related to gender and agriculture in Box 1, the adopted indicators incorporate a host of aspects of ownership, land rights, and tenure, disaggregated by sex. In general, data on who is responsible for managing resource and input use on plots would be very useful in understanding gender differences in production decisions.

As mentioned earlier, several initiatives have highlighted the need to develop core gender indicators in agriculture that national statistical agencies should focus on. The IAEG-SDG indicators are one example. The initiative on Evidence on Data and Gender Equality (EDGE) was also launched in 2012 to develop international guidelines on difficult-to-measure indicators such as women's asset ownership and entrepreneurship.⁶

The selection of relevant gender indicators will evolve with the availability of data, making this an important issue in the near term, but policy objectives can also guide the development of indicators and in turn data collection. Coordination with countries will also aid in the comparability of gender indicators across different contexts.

1.3.2 Need for coherent guidelines for the collection and use of sex-disaggregated data in agriculture

The increased emphasis on sex-disaggregated data in agriculture is also spearheading efforts to create guidelines on how this data should be collected and analyzed across countries.⁷ As part of the Global Strategy, FAO released a document in 2016, "Sex-Disaggregated Data and Gender Indicators in Agriculture – A Review of Data Gaps and Good Practices,"⁸ which provides a literature review of gender gaps in agriculture spanning different forms of capital (human, physical, financial, and social), as well as inequalities in time use and decisionmaking in agriculture. The document discusses how these variables have been/not been incorporated into current agricultural censuses and surveys, good practices for including variables on these topics in surveys going forward, as well as methodological issues in data collection and analysis.

FAO will also be releasing guidelines in mid-2017 targeted towards NSOs and ministries of agriculture on how to mainstream gender in agricultural surveys, with a focus on large-scale agricultural surveys and agricultural modules in household and other surveys. The guidelines will cover several thematic areas, including decisionmaking (going beyond the holder and looking at who manages/controls decisions on plots), assets, financial resources, time use and work of household members, external labor, and training/extension services/participation in groups. For each thematic area, these guidelines will identify key gender indicators for the agricultural sector, and providing guidance on sources, data collection, calculation of the related indicators, and analysis. The guidelines will also draw on results from two field tests that were conducted in late 2016 (in Uganda, between September-October, and in Indonesia, between October-November). Findings on decisionmaking from the Uganda field test (covering 471 households in the districts of Bukedea, Kamelia, Buikwe in the Eastern Region), for example, show that the standard approach of only asking the gender of the holder ignores complex negotiations between household members and can underestimate women's participation in major decisions; 29 percent of women reported being holders, but women had decisionmaking roles (either sole or joint with their husband) in 86 percent of crop and livestock holdings. These decisions spanned several areas, including major permanent investments; land use; which crops to plant and inputs to use; financing cropping activities; destination of output, and control of revenue.

As mentioned in Box 4 above, the Women's Work and Employment (WWE) partnership – comprised of the ILO, World Bank, FAO and Data2X – is also working to develop guidelines specifically on measuring men's and women's participation in subsistence agriculture. The partnership was formed in 2014, following new changes to the definition of work and employment by the 19th International Conference of Labour Statisticians (ICLS), which guides all country Labour Force Surveys (LFS) conducted by the International

6 EDGE was created as part of a collaboration between the US Government, the United Nations Statistics Division and UN Women, along with key regional and international agencies including the OECD and the World Bank.

7 The 2013 UN Gender Statistics Manual, available at <http://unstats.un.org/unsd/genderstatmanual/>, provides a comprehensive synthesis of how sex-disaggregated data as well as other topics on gender should be collected across different policy areas discussed above, including poverty, environment, food security, power and decision-making, and migration/displacement.

8 Available at http://gsars.org/wp-content/uploads/2016/05/TR_Sex-Disaggregated-Data-and-Gender-Indicators-in-Agriculture_120516.pdf

Labour Organization. The new definitions, adopted in 2013, for the first time recognize all productive activities, paid and unpaid, as work. Under the new standards, however, surveys should define employment to cover only paid activities. A key consequence is that unpaid activities be moved out of employment, and surveyed in a separate module on other types of work that countries can decide whether to implement. This has significant bearing on women working in subsistence agriculture, which is largely unpaid and for households' own consumption, depending on the season and year. A main concern, therefore, is that women's economic activities are not underestimated with these definitional changes. Under the WWE partnership, the ILO, World Bank and FAO have designed and implemented pilot studies to test the effectiveness of different survey questions in distinguishing between paid and unpaid work in agriculture. The next phase of the partnership plans to develop guidelines on measuring men's and women's work and employment in subsistence agriculture, based on these pilot studies.

In general, consistent and regular production of sex-disaggregated statistics in agriculture deepen the data resources that inform policy-making. Another issue is harmonization of statistics across different types of surveys (such as household surveys, community-level surveys, and censuses). For a given point in time and local context, for example, different types of surveys can be ongoing – including smaller-scale field tests and/or surveys implemented as part of a program or policy intervention, and nationally-representative household surveys or censuses that are typically conducted every few years. Comparability of questions and sampling methodology (a particularly relevant issue for small and/or marginalized groups such as women) are therefore important issues, particularly since methods for data collection need to be tailored to different communities as well as different activities within agriculture.

Since collecting detailed sex-disaggregated data in agriculture is a relatively recent effort, ensuring that different types of surveys follow similar data collection and survey approaches has important

bearing now, particularly in light of the SDG targets and associated indicators, which will take time and significant resources to produce. Coordination between countries different international agencies, including the FAO and World Bank, as well as country NSOs is a big step towards this objective. UNDP is already providing support to governments, based on national requests, to reflect the new global agenda in national development plans and policies. To push SDG baseline data collection immediately across countries, indicators that are “ready to measure” should be emphasized. For example, given the SDG targets on secure rights/land tenure, and that the LSMS-ISA and AGRIS surveys are already/will be collecting data on this issue, guidelines for land tenure and land use rights should be a priority area as well. Partnerships between countries and international agencies, as with the WWE partnership, is an important way to work towards guidelines that apply to different types of surveys as well.

Section 2. Measuring women's roles and outcomes in climate-smart agriculture, biodiversity and ecosystem services, and their time use

Growing uncertainties in agriculture stemming from climate change, including variations in the availability and quality of land and water, are central policy concerns across countries. Rural households are faced with increasing risks from natural shocks (drought, temperature and rainfall variability, for example) and longer-run changes over time such as groundwater depletion, soil degradation, unexpected changes in growing seasons, and declining access to other natural resources. Because of its effect on household income and consumption, climate change also has a magnified impact on the earnings of small-scale and subsistence agriculture, which is making up a greater share of family farms across countries (FAO, 2015a).

Investing in agriculture, however, requires a better understanding of the constraints agricultural producers face, including their access to natural resources, such as land and water, and productive resources such as credit, technologies and infrastructure. These constraints affect producer choices and can vary widely by individual landholdings, agroclimatic endowments, and policy environments. These have significant implications for women as well. In developing countries, women are often responsible for the collection of water and firewood in rural areas, and are also heavily involved in smallholder or small-scale agriculture – often in a temporary and/or unpaid activities, with poorer access to productive capital, technology, and other resources. As discussed in Section 1, however, significant gender data gaps persist at the

individual level that hamper policy-making to help men and women adapt to short-term and long-term changes in temperature, rainfall, soil quality, and other climate-related factors. These gaps include, among others, data on land tenure (the definition of which can vary substantially across contexts), vulnerability and coping with climate-related shocks, and improved practices related to management of land and water resources, soil, crops, livestock, and fisheries. At the same time, unpacking the division of responsibilities between men and women within agricultural households is also crucial, to understand women's relative roles in natural resource management, adoption of new inputs and technologies, and other aspects of their ability to adapt to changes in agroclimatic conditions.

2.1 Climate smart agriculture

In the face of these uncertainties, policy-makers are increasingly focused on climate-smart agriculture (CSA). Broadly, FAO defines CSA as an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA covers three main areas: (a) sustainably increasing agricultural productivity and food security; (b) adapting and building resilience to climate change; and (c) reducing and/or removing greenhouse gas emissions, where possible (World Bank, FAO and IFAD, 2015).

The IPCC in its 5th assessment (2013) also underscores that climate change hazards increase or heighten existing gender inequalities, thereby contributing to the greater climate change vulnerability of many women. The nexus of gender, climate change and agriculture is particularly complex. Adaptation and mitigation interventions in these three domains are not always well aligned because of a failure to recognize and manage the trade-offs that may result in policy contradictions. Climate change action can thus reinforce or exacerbate inequalities – or intentionally aim to overcome and transform them, for the resilience of all people. As countries and communities take a closer look at their physical and socio-cultural

structures in response to climate change, long standing gender inequalities can be identified and addressed. However, it is important to recognise that resolving gender inequalities is not only a matter of ‘righting a wrong’ but also an important opportunity to make use of previously underused (and under-recognized) abilities, knowledge and talents of both men and women. For example, as global temperatures continue to rise, a re-evaluation of agricultural practices will be required. Because women represent a little over 40 of the world’s agricultural labour force (FAO, 2011), and in some regions even a much higher percentage, they hold a vast amount of important knowledge that will inform these needed re-evaluations of agricultural practices – and be a major part of that labour force to implement solutions.

2.1.1 The role of landownership, and vulnerability to shocks

As discussed in Section I, the collection and analysis of data on women’s and men’s roles and productivity in agriculture, and food security, is still evolving. The Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA) in Sub-Saharan Africa have made the greatest headway on sex-disaggregated data on land ownership and management, and are revealing important insights into how women’s land ownership and productivity in agriculture differs from men. The LSMS and other national household consumption and expenditure surveys

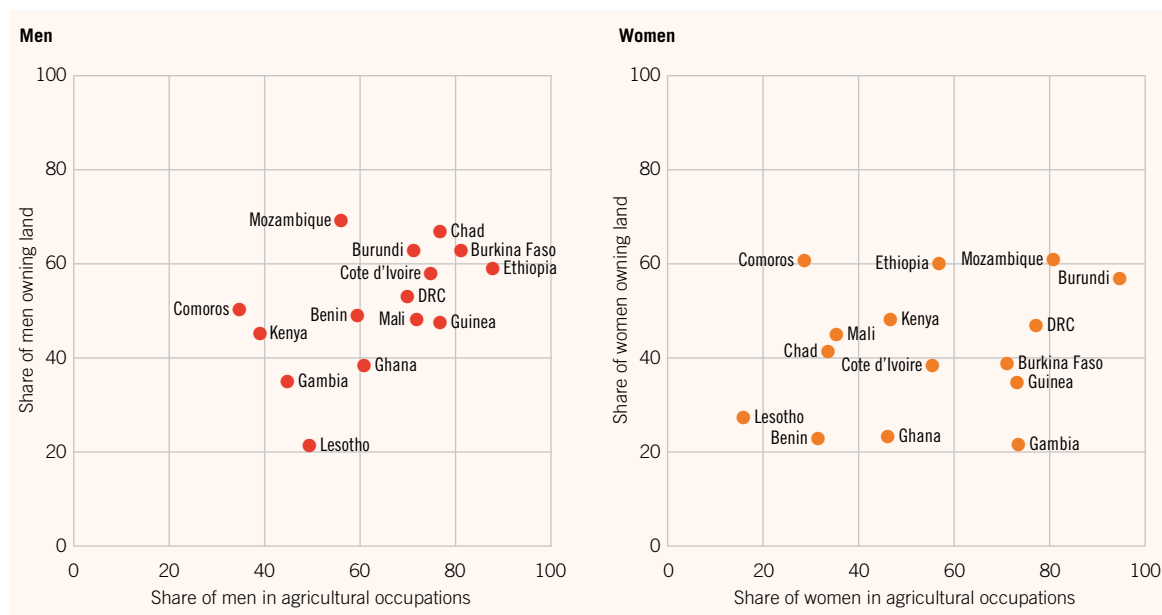
are also increasingly including detailed modules on health, vulnerability and perceptions of food security, as well as shocks encountered (natural, social, household) and coping strategies.

In a recent study from Malawi for example, Asfaw and Maggio (2016a) establish that weather shocks significantly reduce consumption and nutritional outcomes, with more pronounced effects where the share of land area owned by women is higher. On data, the study uses the Malawi LSMS-ISA, which includes two panel rounds (2010 and 2013), as well as a community module on local institutions; and climatic data on historical rainfall and temperature which could be linked to the household GPS coordinates in the LSMS-ISA. The results point towards the hypothesis of a gender-differentiated impact of drought shocks, which leads to a negative and consistent deviation on household’s welfare when the gender indicator rises, suggesting that, in the case of high climate variability, women involved in agriculture are much less able to cope with shocks. These results highlight the need for policy to examine more closely how different vulnerable groups cope with changes in climate.

In low- and middle-income contexts, land is also an important input for agricultural productivity, and are also often used as collateral for other investments. As an imperfect but telling example, Figure 1 presents summary data across recent nationally representative Demographic and Health Surveys (DHS) from Sub-Saharan Africa between 2010-2015, and shows that in rural areas, while men and women are heavily concentrated in agriculture across countries, women are less likely to report owning land (an average of 40 percent compared to 48 percent of men). Furthermore, Figure 1 shows that there is a strong positive relationship between men’s concentration in agricultural occupations and their ownership of land, but the same does not hold for women. FAO’s Gender and Land Rights database also highlights women’s lower rights and security over land tenure across countries, even when they are very active in agriculture.

While the DHS provide a useful cross-country overview, they do not give a complete picture

Figure 2. Share of men/women owning land, against economic participation in agriculture: countries from Sub-Saharan Africa



Source: Demographic and Health Surveys from rural areas, 2010-2015

of men's and women's land ownership and responsibilities in agriculture. An added complication is that interpretations of land ownership and control vary significantly across countries, and communities. In many developing countries, inheritance is the main channel by which women acquire property (Kenny and de la o Campos, 2016), and in Sub-Saharan Africa and elsewhere, partial ownership rights are common – for example, a woman may have the right to farm a parcel and give it to her children, but not sell it without permission from her immediate or joint family (Doss et al., 2015; de la o Campos et al., 2015). Whether ownership is simply reported, or documented with a certificate or title is important to understand tenure security, but also nuances over how parcels can be managed and sold. Slavchevska, de la o Campos, Brunelli and Doss (2016) examine land tenure laws and regulations across six countries in Sub-Saharan Africa (Ethiopia, Tanzania, Uganda, Malawi, Niger, and Nigeria), as well as statutory and customary laws governing land ownership and control. They find substantial gender gaps in a number of rights, not only in land ownership, but also land management and the rights to sell or use land. Furthermore, land rights are often not all vested in the same person, and so in survey data collection, collecting

data on who holds different rights is important, both within and outside the household.

As a result, significant gaps persist in understanding gender differences in land ownership and tenure, including how these questions should be administered in surveys across countries. As discussed in Section I, agricultural censuses and other surveys with agricultural modules have thus far not collected this information regularly. Currently, the main source for sex-disaggregated data on agriculture landownership and management is the LSMS-ISA, which currently covers eight countries in Sub-Saharan Africa spanning 2008–2014. Limited landownership and tenure security can constrain access to credit and other services that ease investments in improved technology, natural resource management in the face of climate change, and other cropping and livestock practices that can help in adapting to declining land quality (World Bank, 2009). How land ownership and security of tenure interacts with climate change, and for more vulnerable groups including women, is therefore a pressing research issue with important policy implications.⁹

⁹ FAO's Gender and Land Rights database also highlights women's lower rights and security over land tenure across countries.

2.1.2 Ways to address resilience and adaptive capacity of agricultural producers to cope with climate-related shocks

In addition to inequalities in land ownership and use, gender differences in access to improved inputs and technology, markets, credit and extension services can affect women's ability to cope with external shocks, including changes in climate. Reduced mobility for women can also affect their ability to seek help from broader social networks or institutions, and migration for additional work. These inequalities can also reduce women's roles in community decisions over natural resources (World Bank, 2009; FAO/AQUASTAT, 2016).

Currently, however, exposure to climate-related shocks, and coping strategies, are typically only asked at the household level. This means that differences between men's and women's experiences cannot be distinguished within households, and comparisons can only be made by sex of the household head. As discussed in Section 1, this has problems as the definition of headship can vary substantially across contexts. Going forward, household and agricultural surveys should strongly consider adding questions on coping strategies across all adult men and women in the household, so as to better understand their resilience to natural shocks. Men's and women's awareness perceptions

Table 1. Coping from climate-related shocks among rural agricultural households in Uganda (2010–2011), by sex of household head and landownings

Coping strategy	Quantile of agricultural landowning distribution					
	Bottom third		Middle third		Top third	
	Male head	Female head	Male head	Female head	Male head	Female head
Sought help from family/friends	0.09**	0.14**	0.07***	0.16***	0.07***	0.15***
	[0.28]	[0.35]	[0.26]	[0.37]	[0.26]	[0.35]
Reduced consumption	0.18	0.23	0.20	0.18	0.27	0.21
	[0.38]	[0.42]	[0.40]	[0.38]	[0.45]	[0.41]
Changed cropping practices (crop choice/technology)	0.03	0.02	0.06	0.07	0.07	0.09
	[0.16]	[0.14]	[0.25]	[0.25]	[0.26]	[0.28]
Relied on savings	0.18	0.18	0.20**	0.13**	0.28***	0.15***
	[0.38]	[0.38]	[0.40]	[0.34]	[0.45]	[0.35]
Sought more non-agricultural employment	0.15	0.14	0.14	0.09	0.17	0.17
	[0.36]	[0.34]	[0.35]	[0.29]	[0.38]	[0.37]
Obtained credit	0.01	0.01	0.02	0.01	0.04	0.03
	[0.11]	[0.12]	[0.15]	[0.10]	[0.21]	[0.16]
Migrated for work	0.02	0.02	0.02	0.02	0.02	0.05
	[0.13]	[0.14]	[0.13]	[0.14]	[0.14]	[0.22]
Other coping strategy	0.10	0.13	0.13	0.10	0.15	0.17
	[0.30]	[0.34]	[0.34]	[0.10]	[0.36]	[0.37]
Number of households	413	207	433	199	426	151

Notes: Standard deviations in brackets. Tests of equality of means were conducted across female- and male-headed households within each of the three quantiles. *** = significant at 0.01, ** = significant at 0.05.

Source: Uganda National Panel Survey 2010-11 (LSMS-ISA survey). Summary statistics above are subset to rural, agricultural landowning households. Shocks and coping strategies were only asked at the household level. Natural shocks included those from drought, flooding, and loss of crop/livestock from pests or disease.

of the threat of climate change to their production activities and allocation of time, as well as specific strategies they have taken to address these risks, are also important topics that should be incorporated in agricultural survey modules going forward, including the LSMS-ISA. The GEF, discussed in Section 1, does cover many of these topics but again only at the household level.

A rough look at coping strategies by sex of the household head does reveal some important differences that need further investigation. Table 1 presents data from 2010–2011 Uganda National Panel Survey, which is also an LSMS-ISA survey. Across rural agricultural households in the sample,

about 62 percent had experienced a climate-related shock (drought, flooding, and loss of crop/livestock from pests or disease) in the last 12 months in 2009–2010; in 2010–2011 this had fallen to 36 percent, owing likely to year-on-year fluctuations in these events. While information related to shocks was only asked at the household level, some gender differences can be highlighted across female- and male-headed landowning households. Female-headed households, for example, were significantly more likely to seek help from family and friends, and overall significantly less likely to rely on savings, indicating a potential gap in finances (and perhaps financial access) across the two groups of households.

Box 10. Examples of gender indicators for CSA

Land ownership/management:¹⁰ (could be disaggregated to look at joint or partial ownership as well; also see Doss et al, 2015 for additional discussion):

- Share of female plot owners and male plot owners that have a formal certificate of title issued by and registered with government authorities, by sex
- Share of female and male plot owners that have the right to sell land and/or use land as collateral
- Share of plots owned by women and men (and jointly owned), relative to total number of plots
- Land area owned by women and men (and jointly owned), relative to total land area

Input use/access:

- Share of male and female producers that purchased improved seeds/fertilizer/fodder
- Share of male and female producers that received agricultural extension services
- Share of male and female producers that have access to credit for agriculture (by source of credit: formal/semiformal/informal)
- Share of male and female producers that own productive assets for agriculture (can be specified depending on the type of agricultural activity)

Natural resources/endowments:

- Average plot soil quality, by sex of plot manager
- Main source of water access to plot (irrigated/rain-fed, for example), by sex of plot owner
- Agricultural shocks faced in the last cropping season or year (drought/flooding/soil erosion/pests, for example), and coping strategies (borrowing, reducing saving, reducing consumption, other help sought, for example), by sex of plot manager
- Share of producers who use weather/climate information services, by sex
- Share of producers actively involved in community associations for natural resources management, by sex

10 For land ownership/management, the shares of female and male plot owners could be interpreted relative to different reference groups. As examples, these shares could be calculated by dividing the number of female and male plot owners by (a) total number of adult men and women, or (b) the total number of reported plot owners, which would not reflect how widely land ownership is distributed across all men and women (See Doss et al., 2015).

2.1.3 Using community-level data on technology adoption

Community-level data are often employed to capture CSA adoption within a locality, especially when it is not possible to rely on data at household level. By using these data, researchers often compare the adoption patterns of all the households residing in the community. However, by ignoring the gender dimension, this type of data collection could lead to a biased estimate of the proportion of females adopting a certain CSA strategy inside a community, and thus the policy indications deriving from an eventual analysis would misrepresent the gender conditions. Individuals' roles within the household, in addition to their gender, may also influence their decisions to adopt new CSA approaches (Asafaw and Maggio, 2016b).

By gathering responses to sex-disaggregated questions at community level it would be possible to overcome this barrier. Other sex-disaggregated data could consist of tracking adoption of CSA by neighbours, the type of infrastructure that women could access, and the presence in the community of NGOs promoting gender-specific CSA policies. Additionally, several dimensions could play an important role in influencing both producers' skills and the capability of having a forward-looking perspective on the possible effects of climate change, and thus indirectly on the decision of adoption of CSA techniques.

2.2 Biodiversity and ecosystem services

Rural areas are highly dependent on natural resources, including water and firewood, for their consumption and economic activities in agriculture. Women, who often bear a large share of the burden for collection of these resources and who in some contexts are able to sell a share of collected firewood for an income, therefore face substantial vulnerability, in the absence of adequate natural resource management and more efficient alternatives.

The values placed on biodiversity and ecosystem services (actual or perceived benefits) also typically differ by gender, with differentiated economic participation, share of benefits and opportunities (men often responsible for extractive uses while women often for non-market purposes of these natural resources). For example, women in many poorer agricultural contexts are often involved in small-scale livestock management, relying on common property resources for their care (Köhler-Rollefson, 2012). These factors result in different attitudes and outcomes that have important policy implications and should also inform development interventions and conservation efforts.

Increased scarcity in resources, including land, forests, and water, also have strong implications for women. Across developing countries, women face several constraints on their time use, tied to local norms and beliefs, which also affect their land rights, work stability, and the type of activities they can participate in. For example, women in rural and low-income contexts often spend several hours a day collecting water and firewood for household consumption and economic activities.

A recent study from 24 countries in Sub-Saharan Africa by Graham et al. (2016) find that among households spending more than 30 minutes collecting water, adult females were the primary collectors of water across all countries, ranging from 46 percent in Liberia to 90 percent in Cote d'Ivoire. The study also found on average that 62 percent of female children were responsible for water collection across countries, compared to 38 percent of male children. Women also bear the brunt of water collection in Asia, Latin America and the Caribbean, and Eastern Europe (UNDESA, 2015). Growing water shortages and uneven supply compound this effort. Worsening water quality also increases the risk of water-borne diseases – particularly for pregnant women and children, and increases time spent on water treatment.

Forest degradation, particularly in tropical areas around the world, has also threatened the availability of fuelwood, as well as other natural materials that can be used for livestock fodder

and composting. This also heavily affects women in rural and low-income contexts, who often bear much of the responsibility for fuelwood collection, and are also heavily involved in raising livestock, and providing labour in planting and agro-forestry farming (Baland et al., 2010, Kiptot and Franzel, 2012). Locally available resources also help counter food insecurity in communities.

Maintaining ecosystems and biodiversity is therefore crucial for the livelihood of low-income households, particularly in areas with poor infrastructure. The costs of complementary inputs can also rise as the supply of locally available resources declines, depressing incomes further. Conservation of local biodiversity can also have several other benefits affecting women and children, including improved diets and health (UNEP, 2016), and freeing up time spent on collection that could be redirected towards other productive activities (Koolwal and van de Walle, 2010).

In light of declining natural resources, therefore, policies targeted towards improving agriculture need to be environmentally sustainable. Take-up of new technologies and inputs that are less taxing on local resources needs to be encouraged for both men and women involved in agriculture. A main issue in policy design, however, is the near-absence of data on men's and women's use of resources, and their decision-making and responsibilities in agriculture, that directly relate to the effective conservation and management of biodiversity and ecosystem services. Because of available data, the discussion and analysis in this section focuses on water and forestry resources, which as highlighted above have significant implications for women.

2.2.1 Water

On water collection, several large cross-country surveys (including the DHS and LSMS) collect data on the main source of water used by the household, and walking time or distance to the nearest water source for households without a connection. Recent rounds of the DHS also collect data on what methods the household uses to treat water, and whether in the last two weeks the water from the source was not available for at least one day. The

LSMS-ISA surveys also collect individual-level data on the amount of time spent each day in water collection, to better understand the time burdens faced by different members of the household.¹¹ Based on this data, several studies across countries, discussed earlier, have documented women's and girls' time burdens in collecting water.

Nationally-representative surveys, however, have far less data on how water resources are used across different household activities, and what actions have been taken to conserve water in the wake of shortages. Cross-country surveys with agricultural modules (such as LSMS-ISA, as well as the upcoming AGRIS survey), for example, include information on types of irrigation across different crops, but an understanding of how water resources are distributed across different household and economically productive activities is absent. Individual perceptions of access to water, water quality, vulnerability to water-related shocks, and how this resource should be used are also important in understanding men's and women's priorities in this area, and thus for policy design.

Within FAO, AQUASTAT has conducted pilot surveys in Algeria, Morocco and Tunisia that included questions on access (and perceptions of access/quality) of water (see Box 11 below); understanding these perceptions is important in linking water shortages to use. The SHARP questionnaire developed under the Global Environmental Facility (GEF) also includes questions on water conservation, respondents' perceived changes in climate, and perceptions of water and land access and quality. Both the AQUASTAT and GEF questionnaires, however, only survey one respondent per household on these questions, making it challenging to construct gender differences in these outcomes. Given improved technologies in the field that reduce the time and costs of survey administration (for example, tablets, GPS tracking of households/plots), surveying all adult household members would provide an immense policy benefit in terms

¹¹ While not as refined as individual-level data, some DHS surveys also collect who is mainly responsible for collecting water (adult men/women, boys/girls).

of understanding within-household vulnerabilities and constraints across men and women, and should be emphasized going forward. As discussed earlier in Section I, the AQUASTAT database also now has two indicators, based on data primarily available from European countries at the moment, related to women's use of irrigation (percentage of area equipped for irrigation managed by women, and percentage of agricultural holdings with irrigation managed by women). Collecting this data in a standardized manner across developing countries is a priority going forward.

2.2.2 Forestry

As with water, data on time spent collecting firewood is analyzed regularly (most often by the LSMS and LSMS-ISA surveys). However, data on problems with access, quality, risk/vulnerability to shocks, and how men and women adapt their collection and use of forestry resources in times of scarcity need to be better understood.

Insecure land rights often also translate into differences in what women and men are able to collect and use from forests. For example, in some countries, only men have the right to harvest trees or engage in other higher-return commercial activities in forests, whereas women in many contexts are only able to collect lower-return non-timber products like branches and tree limbs for household use and food security, and are also often restricted from entering certain forest areas (Kiptot and Franzel, 2012; Suna et al., 2011). When women are able to sell forest products, however, this often ends up (proportionally) being a greater source of cash income for them as compared to men, who are more likely to be engaged in a diverse range of forestry and other economic activities (Sunderland et al., 2014). As with inequalities in land ownership, this greater dependence on forestry products also augments vulnerabilities for women as well, particularly amid changes in climate and deforestation.

Box 11. Women's role in irrigation: Findings from AQUASTAT pilots in North Africa

Based on pilot studies of women in Algeria, Morocco and Tunisia, AQUASTAT collected quantitative and qualitative data on access to water and other agricultural outcomes. Among other results, the studies found that women play a crucial role in the functioning of irrigated agriculture and participate in a range of activities related to irrigation. However, they typically do not manage resources, and there is a pronounced absence of women at the community level in associations and organizations managing water access. The underlying questionnaire for the data, which spans multiple topics (household farm activities, labour allocation, irrigation system, access to (and perceptions of access/quality) water and other resources, as well as participation in organizations related to water management) is available at <http://www.fao.org/nr/water/aquastat/catalogues/index.stm>

The pilot studies were intended to develop methodological tools for gender indicators in the water management sector for the North Africa region, and integrate them into FAO's global databases on water. Recommendations on key irrigation-related indicators to be developed included the following list below, reflecting multiple dimensions of the management and use of irrigation.

Male / female ratio of:

- Heads of farms in the irrigation sector
- Employed family labour in the irrigation sector
- Permanent salaried work occupied in the irrigation sector
- Busy seasonal employee workforce in the irrigation sector
- Workdays devoted to irrigated agriculture
- Irrigated areas among landowners
- Average size of managed holdings that are irrigated
- Employed population in the irrigation sector by level of education
- Body of technical advisers (particularly in the irrigation sector)
- Access to training and extension programs in the area of irrigated crops (number of days)

More detailed data on household dependence and different members' contributions to forestry income would therefore be useful from a policy standpoint. To this end, a set of new specialized survey modules on forestry are being designed through a collaborative effort between FAO, the LSMS-ISA team of the World Bank, the Center for International Forestry Research (CIFOR), International Forestry Resources and Institutions, and the World Bank Program on Forests, to fill current information gaps concerning the relationship of forest and wild products¹² with household well-being. Some questions from these modules are also being planned for future LSMS surveys, and in general these modules are intended to inform other household welfare surveys being conducted in the field. A main contribution of these new modules is to help work towards a **standardized data-collection process for contribution of forests and natural environments in rural poverty alleviation, that would better inform policymaking.**

The household and community questionnaires (both core and optional) in these specialized forestry modules are specifically designed to measure how forest and wild products contribute to household welfare through their provision of goods and services. The new forestry modules are intended to fill existing data gaps in this area. In existing LSMS surveys, for example, household forestry-related questions tend to be limited to fuel for cooking, fuelwood expenditure, household construction (such as material for outer walls and flooring), source of lighting and heat, fuelwood collection, and forestry income. Community level questions tend to be limited to forest areas, number of trees, and available forest products (FAO, 2013). Other surveys typically conducted across countries, including agricultural censuses, often collect information on forest and local area endowments, but typically lack data on socioeconomic variables related to forestry use. Understanding further different household members' contributions to forestry income, various constraints in accessing these resources, and how

disruptions in weather and climate affect their livelihoods, are less well understood in surveys.

The main areas to be examined in the new forestry modules are the economic benefits generated from forest-related activities and schemes, possession of forest assets, consumption of forest resources for energy, construction and health, forest management and environmental services, as well as the use of forests as coping mechanisms in times of food shortage and crises, and adaptation to climate change and variability. The household questionnaires involve traditional face-to-face household-level interviews, and the community modules include key informant interviews to collect data on units, pricing and ongoing programs and services available in the community, as well as focus group discussions on seasonal collection of forest products and the most important forest and wild products.

On gender, although the household questionnaires are directed at one (or in some cases two) respondents, the survey modules do ask about everyone in the household involved in collecting and processing different forest and wild products, so one could compare forestry-related labour allocations and contributions to household income by gender. The optional household modules on climate change and environmental services (including perceptions of the effects of climate change) do cover important topics related to how household dependence on forestry fluctuates seasonally and affects their income and consumption, as well as shortages, shocks and coping strategies. Again, however, these questions are asked at the household level, potentially masking differences in perceptions across men and women in the household, but allowing for comparisons in climate-related outcomes across male and female heads of household. A community module on governance also covers forest institutions that affect the harvesting and use of forestry products, although specific restrictions on women's use are not explicitly laid out in the questionnaire. Thus, careful consideration of the gender of respondents, relative to concentration of men and women in particular forestry-related activities, would be needed in household and community-level analyses. Box 12 presents topics covered by the survey modules.

¹² These can include products from non-forest or non-cultivated environments which may not fall under classic forest definitions (for example, trees outside forests, grasslands, shrublands, rangelands or fallows).

Box 12. Areas covered by new FAO-World Bank forestry survey modules, and level of questions

Theme	Level of questions
Cash and subsistence income from forest and wild products	Household (core)
Other forest-related income sources	Household (core)
Food and nutrition: income	Household (core)
Food and nutrition: most important forest and wild products	Community (core)
Food and nutrition: seasonal calendar	Community (core)
Employment/business benefits (forest-related)	Household (core)
Forest-related assets	Household (core)
Energy	Household (core)
Health (quantities and use of medicinal plants for cash and subsistence)	Household (core)
Structural and fibre products	Household (core)
Other products from forests/trees	Household (core)
Climate change and environmental services	Household (optional)
Climate change and community environmental services	Community (optional)
Extension services	Household (core)
Forest clearance	Household (core)
Food shortage, insurance, shocks and coping strategies	Household (core)
Governance	Community (core)

2.2.3 Community decision-making patterns over resources: understanding the role of forest user groups and water associations

Common to both water and forestry resource management is the policy interest in engaging women in the management of these resources, at the community level. This includes participation in community associations, or user groups, that make decisions on how these resources are managed, conserved, and used. In addition to social norms restricting women's mobility and public participation across different contexts, participation in these groups is often restricted by landowning status, access to assets, infrastructure, and technology, curtailing women's roles.

By encouraging women's participation in community decisions related to water and forestry, the hope would be to have women take a greater role in managing these resources, widen their

access to inputs and markets, and reduce their vulnerabilities to external socioeconomic and climate-related factors (UNESCO, 2015). Greater conservation of forestry and water resources may also be tied to women's improved participation in user groups (see Agrawal, 2009 for an example from forestry user groups in India and Nepal), and some evidence exists that a greater share of women in user groups reduced the incidence improved conflict resolution within the group (Coleman and Mwangi, 2013; Westermann et al., 2005). Potentially diverging public interests between men and women was also documented in an earlier study from India by Chattopadhyay and Duflo (2004), who found in a study of local panchayats or village councils that in areas with limited piped water access, both men and women wanted improved roads, drinking water, and schooling for their communities, but men tended to rank roads first, while women prioritized water. The AQUASTAT study in North Africa also

found that while women play a crucial role in the functioning of irrigated agriculture and participate in a range of activities related to irrigation, they typically they do not manage resources, and there is a pronounced absence of women at the community level in associations and organizations managing water access.

However, on a broader scale, little remains clear on how greater participation at the community level affects outcomes by gender, since data is often not collected on men's and women's participation in user groups in cross-country surveys, and the existence of such groups is also typically limited across countries. Decisions may be made through other associations or networks (for example, local governing bodies addressing a range of different issues); distinguishing between which groups are advisory and those that bear responsibility for management of local resources is therefore

important. Community surveys also typically collect data only on whether local water and forestry groups are present, without eliciting the gender composition as well as the extent of participation of different members; recent activities, including constraints on resource management, of these groups would also be useful to understand.

Finally, where these groups receive external development assistance, quotas may also be in place to ensure women's participation, which may skew an understanding of their roles since they may be "selected" by men in the community to participate without creating much conflict, or may not participate in the way intended by the program. Gerard (2014), for example, finds in a study from Northern India that quotas for women in irrigation management groups increased women's likelihood to attend formal meetings where decisions are made, but they did not speak up during these

Box 13. Examples of gender indicators for water and forestry

Water

- Main source of water, separately for household and agricultural use, by sex
- Share of adults and children engaged in collecting water, separately for household and agricultural use, by sex
- Among women and girls who collect water: walking time to the nearest water source (minutes, one way)
- Share of producers who use water conservation methods, separately for traditional and improved methods, by sex
- Number of water shortages experienced in the last two weeks, separately for household and agricultural use, by sex
- Perceptions of water access and quality for household use, by sex
- Perceptions of water access and quality for agricultural use, by sex
- Share of adults involved in community associations on the management of water resources, by sex

Forestry

- Share of adults and children engaged in collecting forestry products, separately for household and agricultural use, by sex
- Among women and girls who collect forestry products: walking time to the nearest forestry source (minutes, one way)
- Share of adults who earn income from agroforestry, by sex
- Share of adults who use forestry products just for own consumption, by sex
- Share of adults who face constraints in accessing forestry resources, both physical/natural (also related to climate) and social constraints, by sex
- Share of adults involved in community associations on the management of forestry resources, by sex

meetings since they were more comfortable using informal channels of communication. Dewan et al. (2014) also found in the case of women's quotas for participatory water management groups in Bangladesh that women and other marginalized groups who joined were ultimately excluded through informal means (undermining their ability to voice their opinions, and holding meetings in places they were not able to go, for example).

Addressing these different questions and channels within surveys would greatly help in understanding the role of user groups, and in particular women's participation, on actual resource use, efficiency, and conservation. Meaningful approaches to integrating women in community-level decisions could also be explored with more detailed data on their activities. A recent forestry-related study by Sunderland et al. (2014) uses data from 24 countries across Africa, Asia, and Latin America collected through CIFOR's Poverty Environment Network (PEN) project¹³, and finds that forest user groups only exist in 25 percent of the study villages. Within that group, women's representation in user groups is indeed well below that of men, and below their input share of forest collections across the different regions. However, the study did not find that women's participation in these user groups had a statistically significant impact on their share of forest income in any region. Other factors such as proximity to forests and the extent of local market integration (which reduces the share of forestry income) played a greater role for women.

2.3 Efficient use of time resources

Women spend substantial amounts of time in both paid and unpaid work across countries, and this balance directly affects household livelihoods. In developing-country contexts, this work can span multiple productive areas – including domestic work, care for children and the elderly, contributing family work in the household farm or business, and collecting resources such as water

for the household. Particularly in low-income areas, women are engaged in many of these tasks simultaneously, and often with paid work as well (such as care for children and self-employed work). As mentioned earlier, changes in climate can further affect men's and women's time allocation, particularly in agriculture.

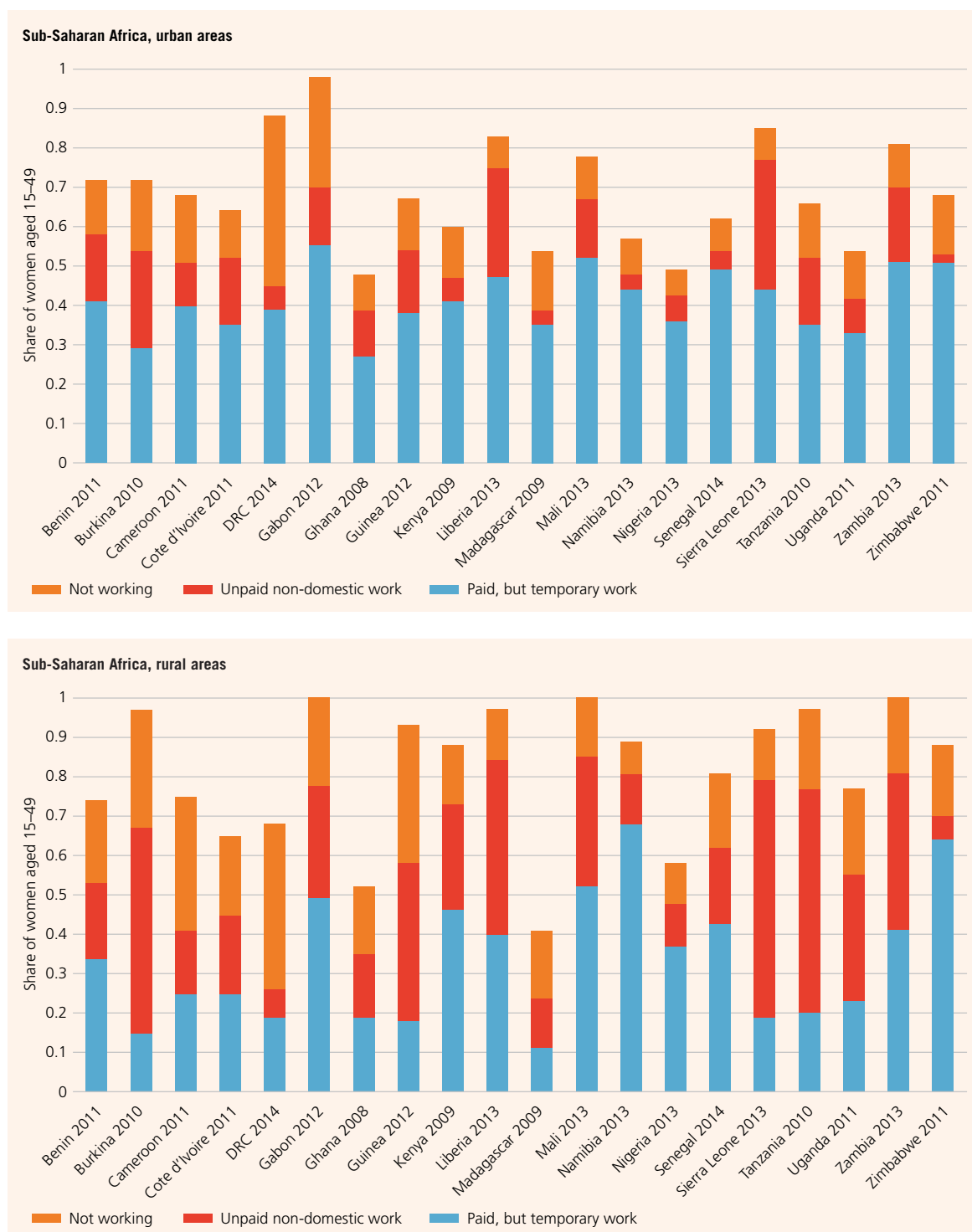
Policies targeting women's choices in economically productive activities (for example, their use of new agricultural inputs and services) therefore need a careful understanding of their time constraints and priorities. In low-income contexts in particular, however, measurement of women's work burdens can be very complicated. Seasonality in work patterns, and simultaneity of paid and unpaid work make an accurate assessment of women's time use difficult, and time use surveys are continually grappling with these complexities.

2.3.1 Women's time burdens

To motivate this issues, available data from recent nationally-representative Demographic and Health Surveys (DHS) raises important questions. Spanning 24 countries in Sub-Saharan Africa between 2008–2014, the figures below show that at least half, and in many countries nearly all, of women aged 15–49 are either (a) not working (which could include domestic work, inability to work, or schooling); (b) in unpaid non-domestic work, such as work on the family farm or business; or (c) in temporary paid work, and so either not working or in other unpaid activities for much of the year. Women in rural areas, in particular, are much more likely to be working than women in urban areas (some of this due to higher school attendance among younger urban women), and also more likely to be in unpaid non-domestic work, as well as temporary work. Much of this work is likely to be carried out in agriculture.

¹³ <http://www.cifor.org/pen>

Figure 3. Women's distribution of unpaid and temporary work in Sub-Saharan Africa



Source: Demographic and Health Survey data from Sub-Saharan Africa, waves 5 and 6.

Across other countries, the 2012 World Development Report, based on ILO estimates, calculates that an average of 60 percent of economically active women in South Asia report being unpaid family workers; these shares are 40 percent for Middle East and North Africa, 20 percent for East Asia and

the Pacific, and about 10 percent for Latin America and the Caribbean. A study by Fontana and Paciello (2010) also found that rural women's work status is often not measured well or goes unrecorded across country surveys.

Box 14. Women's time poverty: examples from Eastern Europe and Central Asia

Recent studies from Eastern Europe and Central Asia (FAO, 2016b, 2016c, 2016d, 2016e) show, across different socioeconomic contexts, how women face substantial constraints on their time, stemming from greater responsibilities at home as well as contributing family work:

- The Moldovan time use survey, conducted between 2011 and 2012, found that women spend 4.9 hours per day taking care of the family and household, as well as voluntary work and meetings in the community, compared to 2.8 hours per day for men. Based on additional results showing women's disproportionate burdens in child care in 2016, Moldova also passed legislation that included a measure for paid paternity leave.
- Women in rural areas also tend to face greater time burdens, not only because they lack the labor-saving appliances and services that are typically available in urban areas, but also because markets and facilities tend to be further away, including (in low-income contexts) access to water and energy sources. Albania's 2010-11 time use survey, for example, shows that women in rural areas spend on average 1.5 more hours in domestic work and child care than women in urban areas (nearly 6 hours per day, compared to 4.5 hours among women in urban areas). Time use surveys conducted in 2015 in the Kyrgyz Republic and Turkey also highlighted rural women's roles helping on the family farm, as well as the fact that women tend to combine agricultural work with domestic tasks.
- In Tajikistan, women's time burdens also stem from droughts and scarcity of water, taking on more agricultural activities when men have migrated to urban areas, and the need to supplement the family budget through the sale of home-produced foods. Water scarcities also directly affect cooking, cleaning, and time spent in water collection, and as a result have magnified effects on the time burdens as well as health of women and children.

Despite the clear burden of unpaid work in women's day-to-day lives, even in urban areas, several questions remain. What types of unpaid non-domestic activities are women involved in across urban and rural areas? Are they doing this simultaneously with domestic and/or other temporary work? And if women are involved only in domestic work, is it because they feel there are no opportunities for them in the labour market, that they couldn't even if they wanted to, or that they don't have the time? Understanding these constraints is also important for policy, and global standards for data collection in these areas remain uncharted territory. Measurement is also an important issue – a study by Fontana and Paciello (2010) also found that rural women's work status is often not measured well or goes unrecorded across country surveys.

2.3.2 Challenges in collecting data on time use

Collecting data on both paid and unpaid work requires a careful approach, which takes into consideration the productive, household and community-related tasks of all household members. Data analysis can support researchers and policy makers in identifying women and men's specific labour and time constraints, and envisage the

design and implementation of policies and activities that can be put in place (labour-saving technologies, introduction of alternative agricultural practices, community/household dialogue to foster a better sharing of tasks). Time use surveys, which usually present seasonal perspectives, have been carried out in many countries but they are relatively complex to administer because they also need to take into account the fact that individuals are often simultaneously involved in different types of activities. IFPRI has recently been working on survey approaches to measure time use, which will help in better understanding how to collect data on the unpaid work. To complement available data on labour and time use, particularly within agriculture, it is important to also collect information on men and women's views over new and potentially time-saving technologies. For example, the Women's Empowerment and Agriculture Index, discussed in Section I, includes a 24-hour time use diary for men and women, with detailed questions on their relative decision-making ability over agricultural production and other household decisions (this is a rapid rural assessment methodology which also provides insight into labour and time use). Without proper understanding of women's constraints on time, and their specific technology and resource

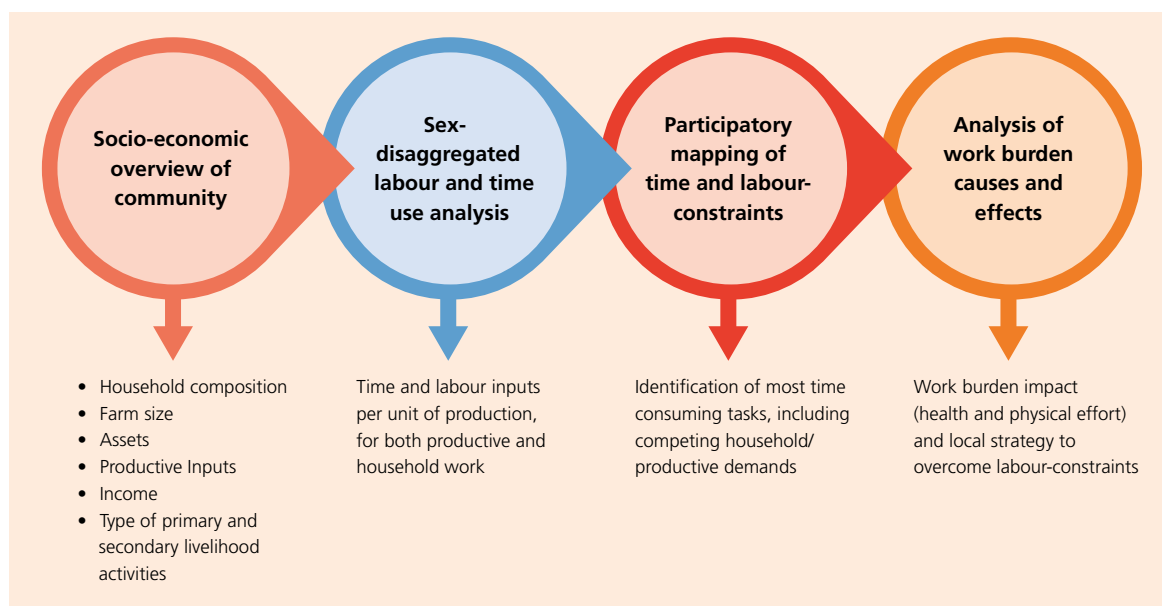
requirements, gender-targeted policies will have limited information on how to best target productivity-enhancing measures in agriculture.

To this end, FAO follows a two-pronged approach: i) it encourages member countries to collect labour and time use data to guide policy makers and project formulators (tools are available and have been tested); and ii) in line with FAO's Policy on Gender Equality, it suggests that national project implementation partners (eg: extension services, and Farmer Field Schools) – when introducing agricultural practices and technologies – assess how they affect women and men's labour and time use (see Box 15). The approach includes a review of household assets and technologies and an analysis of the access to services for different wealth, sex and age groups within the community. The use of a community level approach offers the advantage of better understanding the social norms that affect men's and women's division of labour and time use. For example, questions can be asked on whether women from different socio-economic groups are encouraged to work, or if there is any restriction on their mobility. A better understanding of how new technologies and practices should be targeted differently towards men and women can also be achieved through community-level surveys. FAO's new guidelines for mainstreaming gender in

agriculture surveys, to be soon available, provide a series of recommendations for countries that want to include a time use module in their agricultural surveys.

Modifying survey methodologies will require time, resources and training for country statistical offices. Greater communication with countries and advocacy are crucial for advancing progress in this area. The need for revised approaches for collecting time use data has received greater attention among countries and international agencies in light of recent changes in international standards for measuring work and employment, as discussed earlier in Section I. The new standards of the International Council of Labour Statisticians (ICLS), which also assess unpaid activities, including subsistence agriculture for own consumption, have significant bearing on women, who tend to be disproportionately represented in subsistence agriculture and other unpaid but potentially income-generating work. The risk with the new definition, particularly in poor agricultural households, is that men and women will have problems in distinguishing what share of their output is for market work or for household consumption. The result will be that many individuals, especially women, who would have been considered employed under the previous

Box 15. FAO approach to identifying labour and time constraints



definition will no longer be considered employed, with important implications in the national labour force statistics. And if many countries are unwilling to spend time collecting additional data on unpaid work, more questions will remain on women's activities on a day-to-day basis.

This is where a more focused conceptual approach linked to data on paid and unpaid work can be extremely helpful, so as to not skew sex-disaggregated statistics on labour force participation in developing countries. Currently, very little quantitative and comparable survey data exists on which unpaid activities dominate women's time in different contexts, to guide member states on where to focus their policy efforts.

Target 5.4 of the Sustainable Development Goals

(SDGs) also highlights the need to “recognize and value unpaid care and domestic work” to promote shared responsibilities at the household level and better target women with resources, services and social protection measures. Time use surveys have been conducted in many countries, but their usage by policy makers is still far too limited, due to the difficulty in aggregating data in a simple and convincing manner. Household work needs to be systematically incorporated to appear in national labour statistics. Understanding ways that countries can feasibly and more precisely collect data on women's unpaid work is therefore critical for national government and communities.

Box 16. Examples of gender indicators for efficient use of time resources

Average hours spent on unpaid domestic work (housework and childcare), by sex (IAEG-GS minimum set indicator)

- Average hours spent on paid and unpaid work combined (total work burden), by sex (IAEG-GS minimum set indicator)
- Share of adults in temporary or seasonal paid work, by sex
- Share of adults in subsistence agriculture, by sex
- Share of adults who feel their unpaid work burdens are too high to engage in paid work, by sex

Section 3. Recommendations and looking ahead

The Sustainable Development Goals on ending poverty (Goal 1), ending hunger and achieving food security, improved nutrition and sustainable agriculture (Goal 2), and gender equality (Goal 5) all have targets on improving outcomes for women in agriculture. These targets cover secure and equal access to land for men and women, as well as equal access to other productive assets and inputs, extension services, finance, markets, and opportunities to capitalize on farm-nonfarm linkages in the economy.

Momentum for collecting sex-disaggregated data in agriculture, that can address some of these targets as well as related policy interests, has increased considerably in recent years across international agencies. Data gaps remain, however, and one important area that has not been addressed in nationally-representative surveys is the role of climate change on the productivity of men and women producers. This guidance document has examined these gender data gaps within climate-smart agriculture, biodiversity and ecosystems use, and efficient use of time resources, which includes the adoption of time- and resource-saving technologies. Growing uncertainties in agriculture stemming from climate change, and related input/output price fluctuations, have become central policy concerns across countries. These uncertainties also tend to have the hardest impact on earnings opportunities for poor men and women. Understanding how to target more vulnerable segments of the population, including women, is therefore extremely important – and requires specific sex-disaggregated data on these groups.

However, surveys tend to collect data on households' experiences with climate change and resource use at the household level, as opposed to across individuals within the household, making it difficult to compare outcomes across men and women. This includes the adoption of technologies that raise productivity, conserve natural and time resources, and in many cases allow individual agricultural producers to cope with disruptions in weather and climate. A few new survey efforts, including within FAO, are aiming to shed light on men's and women's outcomes in this area, but greater efforts are needed to harmonize these efforts and also engage countries on the need to collect this data.

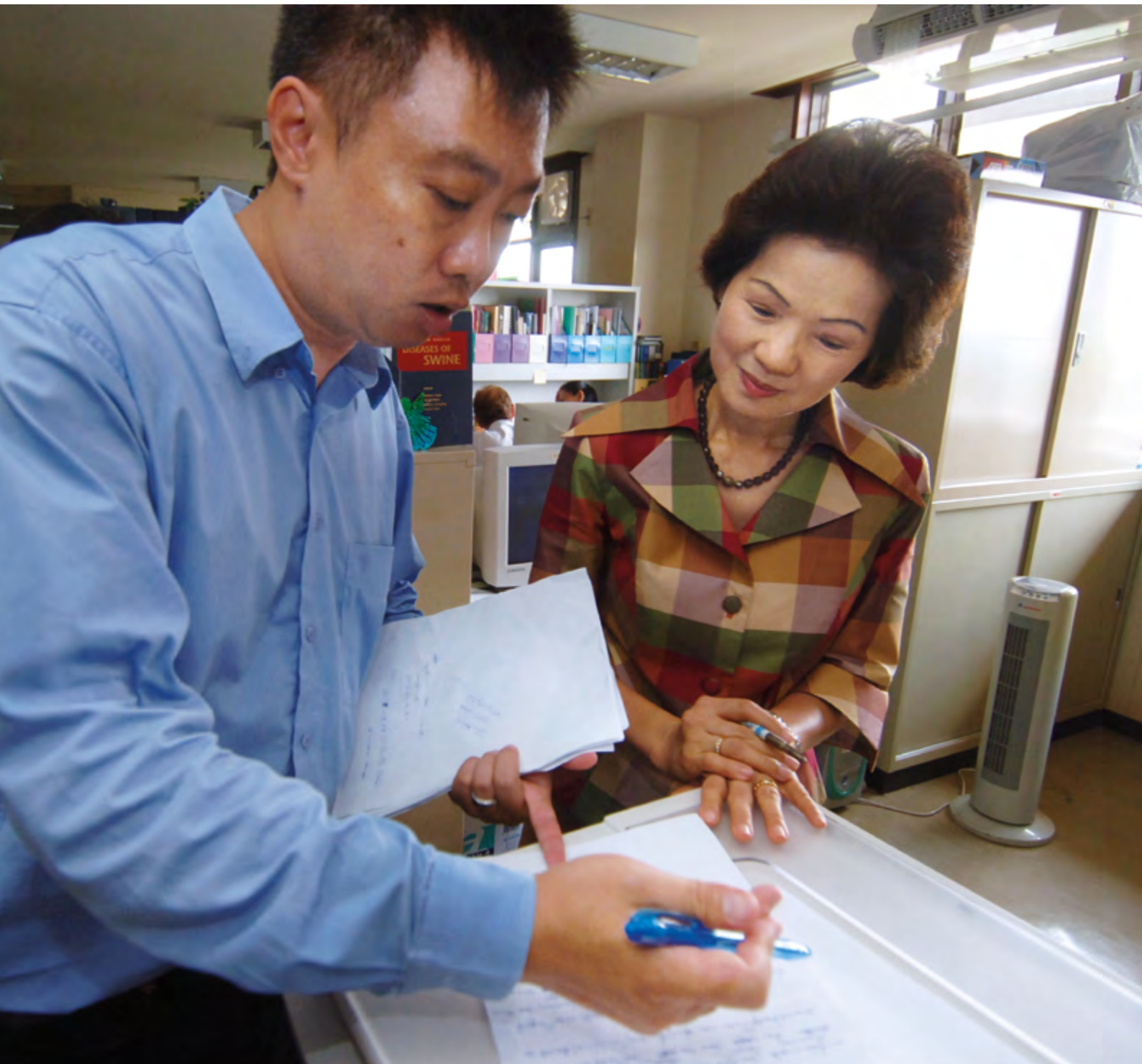
Following the discussion in this report, a few major recommendations on survey design, data collection, and advocacy to address gender data gaps in agriculture include:

- 1) **Augmenting household surveys:** On data, many questions in household surveys need to shift towards individual-level outcomes, as compared to only asking at the household level. This has happened to a large extent with landownership (in the case of LSMS-ISA surveys, and FAO's upcoming AGRIS survey). Individual-level data on coping with climate-related shocks, and adoption of new technologies, would also be very beneficial from a policy standpoint to understand vulnerabilities in the population. At the same time, community-level, sex-disaggregated data on access to infrastructure and services; men and women producers' views on climate change and how to adapt to increased variability in weather and natural resource endowments, and participation in community associations to manage resources; and norms

that affect their allocation of time and resources, can also highlight broader-level constraints and opportunities in agriculture by gender.

- 2) Highlighting producers' efforts to adapt to changes in climate: On climate, surveys traditionally have included modules on natural shocks faced by the household, but have not delved into adaptive strategies that producers have taken (conservation, different technologies, and perceptions of how climate change affects them that would affect these decisions). The different risks and vulnerabilities that men and women face with respect to climate change are often assumed, given their diverse roles in agriculture, but not well understood.
- 3) Partnerships to harmonize and strengthen data and analysis: With respect to gender and agriculture, recent improvements in household survey data have been based on several partnerships between international agencies – to share knowledge and pinpoint data gaps, conduct pilot surveys to test new survey questions that address these gaps, and to form recommendations on how surveys should be designed. The Women's Work and Employment Partnership (WWE) is one example, which ultimately aims to measure how paid and unpaid activities in subsistence agriculture can be distinguished in survey questionnaires. Other collaborations have led to the creation of the Women's Empowerment in Agriculture Index and survey module, as well as a new Forestry Module that could complement LSMS-ISA surveys and other household welfare surveys. These partnerships can help work towards standardization of survey modules as well, to allow better comparability of statistics across country surveys.
- 4) Research and country engagement: Augmenting surveys is time consuming and expensive. Continuing research is needed to deepen country dialogue and highlight the value of collecting better sex-disaggregated data in agriculture, and monitoring related indicators, including those related to the SDGs – particularly amid growing scarcity in natural resources across

countries. Improvements in data are shedding light on women's contributions to agriculture and gender productivity gaps, although much remains to be understood (and hence the need for data) on what policies are most effective in narrowing these gaps.



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To achieve the 2030 Agenda for Sustainable Development, it is crucial to understand the gender-specific impacts of interventions on agriculture and the environment such as water and land resources, and ecosystems at large to inform evidence-based and gender-responsive programming and implementation. Increased attention is also being devoted to analyze the gender impacts of climate change and how men and women benefit from adaptation and mitigation activities and the uptake of climate-smart agriculture practices. However, sex-disaggregated data has only recently begun emerging on some of these topics, and unevenly across the world.

This guidance examines the existing gender data gaps in agriculture and the available sources of data to address these gaps, and describes the types of analysis and indicators that can be developed, with a focus on progress made in Sub-Saharan African countries. It is targeted at national and international researchers and policy-makers, who rely on rigorous data collection and analysis to develop policy prescriptions and formulate indicators for monitoring gender-related targets in agriculture within the Sustainable Development Goals.

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