zef
Center for
Development Research
University of Bonn

Working Paper 170

Tina Beuchelt and Sarah Nischalke

Adding a gender lens in quantitative development research on food and non-food biomass production:

A guide for sex-disaggregated data collection

ISSN 1864-6638 Bonn, June 2018

Adding a gender lens in quantitative development research on food and non-food biomass production:

A guide for sex-disaggregated data collection

Tina Beuchelt and Sarah Nischalke

Abstract

A major objective of socio-economic research for agricultural development is to understand, guide and measure technology adoption, support agricultural and rural development policies, and analyse impacts of technological innovations, development projects and policy interventions. Research has clearly shown that gender matters in agricultural development, since women as well as gender issues play a major role in achieving success and impact, especially in family-based production systems. However, there are large data and thus considerable knowledge gaps in this regard.

This guide equips you with plenty of advice to collect sex-disaggregated data and add a gender lens to your socio-economic research in the agricultural sector. It makes you familiar with the need for and advantages of sex-disaggregated data and research, it introduces gender concepts and important definitions and provides practical advice for the planning process of your research and for conducting field work. It identifies six key topics where gender plays a major role in the food and non-food biomass production such as the labour division in farming systems, adoption of technologies and impacts, access to and control over resources and assets, access to information and advisory services, and gendered livelihoods. The guide provides you with a wide choice of quantitative survey questions that can be integrated into your questionnaire based on your research needs. There are 40 minimum questions and many advanced questions to choose from so that you can incorporate a perspective on women's and men's farming activities and agricultural livelihoods into your research. The minimum questions in each section help you to cover the most important gender-related aspects of the specific agricultural topic, while the advanced questions will help you to explore a research area or aspect through the gender lens in more detail. Of course, the questions need to be adapted to the local contexts and circumstances.

Integrating some of these questions in your research will help you to upgrade your research outputs by producing information that draws attention and that meets current standards of international research and development agendas. To meet such expectations, it remains important that not only relevant questions are included in your questionnaire and considerations of sex and gender are applied while conducting your survey, but also that the sex-disaggregated perspective needs to guide your analysis. Having a detailed sex-disaggregated analysis is attractive for high-ranking scientific journals, and supports your project outcomes with regard to adoption and sustainability of project activities and/or technologies.

Table of Contents

List of Tables

Acknowledgements

Many thanks for the sound review comments by Eva Youkhana and Hannah Jaenicke. Further thanks for valuable discussions and comments go to Lone Badstue, Kathy Colverson, Alessandra Galie, Silvia Silvestri, Javier Becerril, Hugo de Groote, Songporne Tongruksawattana, Jena Pradyot, Monica Fisher, Jeetendra Aryal, Surabhi Mittal, and Vongai Kandiwa. The initial ideas of this discussion paper were developed at CIMMYT within the frame of the 'CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)'. This discussion paper was fully drafted within the project "Improving food security in Africa through increased system productivity of biomass-based value webs" (BiomassWeb) funded by the German Federal Ministry of Education and Research (BMBF) based on the decision of the parliament of the Federal Republic of Germany (FKZ 031A258A), and the project NutriHAF "Diversifying agriculture for balanced nutrition through fruits and vegetables in multi-storey cropping systems" funded by the German Federal Ministry of Food and Agriculture (BMEL).

1 Introduction

Food and non-food biomass production is an important activity for all countries, high- and low-income countries alike. The agricultural sector in these countries is still a main job provider with many family farms involved in the production. In most countries and societies, a clear-cut division by sex of who does what on a farm and in the household exists based on societal traditions and norms. In general, women's work in the food and non-food biomass production includes everything from working in fields and caring for livestock to post-harvest processing activities, storage of crops and animal products, seed selection, and marketing. Gendered patterns of cropping exist, for example specific tasks like weeding or ploughing are attributed to be a "female" job or "male" job, respectively or, for example in West Africa, there are specific crops that are typically rather grown by men than by women (Doss, 2002).

Mainly on family farms, key problems are the work load and related drudgery as well as low yields, and research on labour-saving and yield-enhancing technologies is common. New technologies are introduced by agricultural extension or development projects. Usually, new agricultural technologies are considered to be gender neutral or to benefit both women and men, e.g. through decreasing labour input and drudgery. However, whether there is a positive or negative effect of the technology on women depends on the local context with its given cultural and social characteristics (Beuchelt and Badstue, 2013). Several studies have shown that women´s labour burden can increase with new technologies when women either take on additional tasks or their current tasks become more burdensome. For example, fertilizer application may mean that more weeding is necessary or that more output will require processing – both tasks usually done by women (Doss 2001). As shown in a study by Paris and Pingali (1996), the introduction of a mechanical thresher in the Philippines reduced labour for both men and women, since threshing was much faster. Farmers were thus able to grow a second rice crop, which benefitted women as it increased their employment opportunities in transplanting, weeding, and harvesting. The benefits outweighed the reduced labour demand for threshing. In contrast, in Bangladesh the mechanical thresher affected poor and landless women negatively because it replaced their work as threshers. Hence, development processes, economic growth, and modernization affect women in different ways than men, and, though often assumed, they have not been gender neutral (Momsen, 2010).

Gender differences in agriculture relate not only to labour but also to many other issues. For example, male and female household members can have different varietal crop preferences given their different uses. In Latin America, women and men prefer different qualities because of the intended use of the maize and related labour issues (Bellon, 1996; Bellon et al., 2003; Deere, 2005; Hellin et al., 2010). Women's reproductive role usually means that they aim to ensure that varieties are both palatable and nutritious and also meet processing and storing requirements, while men prefer high yielding varieties to fulfil their role as the income earner.

The modernization of agriculture like the introduction of agricultural export-oriented crops for smallholder farmers also changes the traditional division of labour between women and men, often increasing women's dependent status as well as their workload. At the same time, it displaces women from their traditional productive functions, and thus diminishes their income, power, and status (Momsen, 2010; Moser, 1993). Women tend to lose income and control over an agricultural product when it becomes more commercialized and receives better prices. As soon as agricultural production becomes financially lucrative, for example, when being supplied to national and international markets thanks to an intervention, men often take over production and marketing. Thus, women farmers face difficulties in maintaining a profitable market niche and risk losing control over resources such as land (Berti et al., 2004; Doss, 2001; Momsen, 2010; World Bank, 2009).

The examples above clearly show that gender matters in agricultural development, and that agricultural technologies and policies are typically not gender neutral and can affect women in an

unintended way. Hence, a major objective of socio-economic research for agricultural development is to understand, guide and measure technology adoption, support agricultural and rural development policies, and analyse impacts of technological innovations, development projects and policy interventions. As women and gender issues play a major role in achieving success and impact of technological innovations and interventions, especially in family-based production systems, it is important to include a gender lens in socio-economic research for agricultural development (Beuchelt and Badstue, 2013).

1.1 Reasons to address gender in research for food and non-food biomass production

Addressing gender issues in agricultural research, development and extension systems as well as in policies will contribute significantly to meeting the food and nutritional needs of the future population for a number of reasons (FAO, 2011; Meinzen-Dick et al., 2011b). In terms of economics and efficiency, current gender inequalities are large and persisting, and undermine the sustainable development of the agricultural sector. The inequalities relate to many assets and resources, inputs, and services such as land, livestock, labour, education, extension and financial services, and technology. This imposes costs on the agricultural sector, limits its efficiency, and affects the broader economy and society (FAO, 2011). The FAO estimates that if women had the same access to productive resources as men, they could increase yields on their farms up to 30%. This could raise total agricultural output in developing countries by up to 4%, which in turn could reduce the number of hungry people in the world by 12–17% (FAO, 2011).

Food security, nutrition diversity, and household welfare are affected by gender roles and relations. Research has shown that an increase in women's control of resources, especially income, has positive effects on a number of important development outcomes such as food security, education, and child nutrition. Increasing men's income, on the other hand, does not show the same effects (FAO, 2010; Meinzen-Dick et al., 2011b; World Bank, 2009). Development outcomes in the agricultural sector cannot be equitably distributed as long as the socially constructed relationship between men and women continues to promote such disparity of resources. If gender is not taken into account, the same development programs that are meant to help can actually enhance the discrimination and marginalization of women, potentially increase food insecurity, and decrease nutritional diversity of a household and its members. Finally, gender equality is also a development objective in itself as it is a basic human right (Quisumbing et al., 2014). Just as reduction in income poverty or ensuring food and nutrition security is part of development, so too is narrowing the gaps in the well-being between men and women (World Bank, 2011, 2009).

Still little is known about how agricultural research and development programs can most effectively deliver outcomes of well-being and higher incomes in a way that acknowledges the differential access to and control over assets, and that lead to more equitable outcomes (Meinzen-Dick et al., 2011a). Farm technologies and interventions can imply significant trade-offs when applying a household and farming systems perspective. They can both positively and negatively change the access to assets and the role and power status of women in a household. Donors are therefore increasingly interested in gender equity and demand the incorporation of gender issues in projects. Donors also require sex-disaggregated data and numbers and statistics on gender to mobilize more resources, and to improve their projects and policies.

1.2 How can sex-disaggregated data strengthen your research?

Though it is clear nowadays that gender matters for development, the evidence base is still weak (FAO, 2011; World Bank, 2011). There are plenty of data gaps which need to be filled by quantitative and qualitative research. To understand gender relations in agriculture, different sources of

information and different methods of analysis are needed to be brought together (Behrman et al., 2014). Collecting and analysing sex-disaggregated data is one important step. Information is specifically lacking on the role, responsibilities and decision-making of women in male-headed households and in households headed by both a woman and a man (mixed households). As shown below, distinguishing between male- and female-headed households is a first step forward, but this generally says little about gender aspects as such in a society. Contrary to the assumption of economists, family farm households often do not collectively decide and allocate resources to where they are best used (Quisumbing et al., 2014). Therefore, research needs to acknowledge the different roles and responsibilities of men and women in male-headed or mixed households. This increases accuracy and reliability of the data.

Sex-disaggregated data makes your research stronger, as it becomes more relevant for project leaders, policy makers, extension agents and male and female end users of research outputs. Through consideration of gender aspects, the adoption of technologies and research outputs is very likely to increase as shown by several case studies (but even on this issue more research is needed). Since the current evidence base is weak, sex-disaggregated data and its analysis helps to increase the acceptance of your papers in high-impact peer-reviewed journals, and makes it more attractive for donors to fund your research. Summing up, there are several reasons to include gender perspectives in the research: (i) efficiency reasons, (ii) equity reasons, (iii) donor requirements, and (iv) limited research knowledge and thus a great potential for publishing.

1.3 Purpose and objectives of this guide

Talking to many socio-economic researchers and doctoral students, a common question was how to quickly and simply integrate a gender lens into their surveys without having to become a gender expert or to do a gender analysis. The purpose of this guide is to respond to this need and provide suggestions for sex-disaggregated data collection and hence analysis related to food and non-food biomass production. There are plenty of exhaustive gender manuals around, so how is this one different?

In contrast to other guides, we specifically focus on research for agricultural development. In addition, this guide provides an entry point – particularly for doctoral students and non-gender researchers – into the collection and analysis of sex-disaggregated data at household and intra-household level. The main focus is on suggestions of how to engender quantitative survey questions where otherwise differences between men and women in farm activities and in their livelihoods and resource access would be ignored.

We would also like to point out the limits of this guide: Sex-disaggregated data collection and analysis is only a step towards a better understanding of how gender affects agricultural production and outcomes, yet it needs to be followed by approaches and solutions of how gender inequality and disparities that hamper agricultural outcomes and development can be overcome. This guide is not meant to be prescriptive or exhaustive. We refrained from repeating the debates about gender in development studies and gender mainstreaming as we do not want to overburden this guide. We also do not want to reiterate the importance of gender in agriculture as great literature is available for this.[1]

The guide also does not provide enough information in case the research aims to conduct a sound gender analysis or be gender-sensitive from the design onwards. For those who like to enter into gender analysis, more background reading is recommended (for further literature suggestions and

[1] For example see Quisumbing et al. (eds.) (2014) and World Bank (2009).

online sources please see Chapter 6).[2] The users require a good knowledge of quantitative and qualitative research methods and analysis; we do not explain the basics of quantitative research.

1.4 How to use this guide

There are three parts which can be read independently, depending also on the knowledge level of the researcher. Hence, the guide does not need to be read from front to back. The **first part** (Chapter 2) is an introduction to the gender concepts and gender analysis. It introduces definitions and details on relevant aspects such as access, control and ownership over resources, gender roles, empowerment and agency, and gender equality and equity.

The **second part** (Chapter 3) explains in detail how a gender perspective can be integrated into your specific research and adapted to your research needs and objectives. It helps you to identify your relevant research areas, to define your methods and sample size, and to plan your data collection so that you can finally apply a gender lens to your data analysis. It deals with different survey types, i.e. "big" and additional research questions and research units (level of data collection), and provides important hints on gender biases and considerations for sex-disaggregated data collection.

The **third part** (Chapter 4) of the guide provides you with examples of survey questions for potential key topics such as gender roles in farming systems and labour division, including aspects of seasonality, crop production, livestock, non-market activities, reproductive activities, seed development and adaption, access and control over resources, gendered access to information and decision-making processes in households, adoption of technologies, gendered livelihoods including income sources, food security aspects and risks. The survey questions are divided into minimum questions that should definitely be asked if the topic is key for your research, and advanced questions that can provide your research with more in-depth information on the key topic. Here, only the relevant section for your survey needs to be read, or you can read all questions if you wish to get inspired about what could be asked.

[2] The provided literature references are purposely selected to include those where open-access options exist, except in some cases.

2 Useful gender concepts in farming systems research

Gender does not mean the sex of a person, i.e. women do not equal gender. Counting the participation of women in field days or in a project does not automatically mean that the project is gender sensitive. Women are also not a homogenous group and can have very different needs, constraints, and priorities depending on age, marital status, class, ethnicity or religion among others (Doss, 2001). "To understand gender dynamics, it is not sufficient […] to compare male and female farmers or male and female headed households. Instead, we need to understand systems of household behaviour embedded in the agricultural and non-agricultural economies. This is a forbiddingly complex problem, but we must recognize that technology adoption and technology impacts depend on complex interactions that defy simple characterizations" (Doss, 2001, p. 2076). The following brief presentation of concepts around gender helps to gain a common understanding of what gender, sex and different gender terminologies mean.

Sex and gender

Sex refers to the fixed biological differences between women and men. Sexual differences are the same throughout the human race because they are concerned with women´s and men´s bodies (March et al., 1999). The biological differences between women and men can create different needs and capacities, but these differences do not 'naturally' lead to or justify unequal social status or rights (UNICEF, 2011).

Gender refers to the socially constructed roles and status of women and men, and girls and boys. It is a set of culturally specific characteristics defining the social behaviour of female and male members of a society, and the relationship between them. Gender roles, status and relations vary according to place (country, region, village), groups (class, ethnic, religious, and caste), and generations and stages of the lifecycle of individuals. Women and men are thus not a homogenous group. It is necessary to be aware of and account for this heterogeneity though there is a certain global homogeneity of gender roles (Momsen, 2010). The roles and relations between women and men are dynamic and change over time (Doss, 2001). Gender is thus not about women or men but about the relationship between women and men (ILRI, 2012).

"In broad terms, gender defines and differentiates what women and men, and girls and boys, are expected to be and do (their roles, responsibilities, rights and obligations). To differing degrees and depending on the cultural context, gender can condition what these different groups are expected to think and feel (e.g., their preferences, hopes and the nature and extent of their aspirations)" (UNICEF, 2011, p. 8). Gender is the determining factor in defining who does what, who has what, who decides, and who has power. It is important to understand the issue of power in understanding gender relations, because discrimination and subordination of women persist (UNICEF, 2011).

Gender analysis

A **gender analysis** explores and highlights the relationships of men and women in society, their roles, rights and responsibilities, and how these interact and affect outcomes of (agricultural) projects or policies (Doss, 2013). Gender analysis is not only studying women. It is also not comparing male- and female-headed households. Though it is a common practice, it confounds gender and household structure and basically compares structurally very different household types (Doss and Kieran, n.d.). Gender analysis is also more than describing possible differences between women and men. It asks who does what, who has what, who decides and how, who gains and who loses (March et al., 1999). Gender analysis examines power relations within the households and how they interrelate with those at the community, state and international level. It looks at the private sphere involving the personal relationships, and the public sphere dealing with relationships in wider society. Gender analysis helps to explore and highlight the differential opportunities as well as access and control

over resources of women and men, their power relationships in the household and in society, and how this influences development outcomes for women, men, girls and boys (OPM, 2010). In agriculture, gender analysis provides insights into how the roles and responsibilities shape the decisions around agricultural production and processing (Doss, 2013).

The following are classic questions for gender analysis (Hill 2011 in CCAFS & FAO (CCAFS and FAO, 2012)):

- Who does what? How? Where? When? Why? (labour)
- Who uses what? How? Where? When? Why? (access)
- Who controls what/ who decides? How? Where? When? Why? (decision-making and control = power)
- Who knows what? How? Where? When? Why? (information = power)
- Who benefits from what? Who loses? How? Where? When? Why? (benefit sharing)
- Who is included in what? How? Where? When? Why? (participation)

By posing these questions, we also ask which women and which men (OPM, 2010), and thus acknowledge that differences can exist due to the location (country, region, rural or urban area), groups (class, ethnicity, religion, caste), generations, and stages of the lifecycle of individuals. Therefore, gender analysis takes existing social differences into account.

Resource access, control and ownership

When looking at the way resources are allocated between men and women, it is important to distinguish between the access to resources, the control and the ownership of resources. **Access to resources** is defined as the opportunity to make use of a resource (March et al., 1999). **Control over resources** is defined as having the power to decide how a resource is used and who has access to it (March et al., 1999), while **ownership** refers to the legal possession of a resource.

Gender division of labour and roles

Depending on the classification, women in rural areas usually have **reproductive and productive roles** (March et al., 1999), and sometimes a third is added, i.e. the **community role** (Momsen, 2010; Moser, 1993). The reproductive role refers to childcare and housework. The productive role can vary, for example, from subsistence food production to commercial agricultural production, petty trade or involvement in paid, formal employment. The community role refers to women's activities within the community, maintaining the social network and relations as well as to the provision of items for collective consumption such as contributions to religious festivals (Moser, 1993). The community role is often overseen and not recognized even though it is a fundamental part of the household's security and risk-management net (Beuchelt, 2008; Fischer et al., 2010). In general, rural men tend to occupy only the productive and the community role. Generating income, they are the "bread-winner" of the family. Their productive role is socially seen and valued, while the women´s multiple roles, often unpaid, are easily overseen. Labour tasks that are considered to be a female or male task vary cross-culturally, which implies that there is no natural or fixed gender division of labour (Momsen, 2010). To understand gender roles in production, gender roles within the household must also be understood (Momsen, 2010).

Gender indicators and statistics

Gender indicators: Gender-sensitive indicators are needed to point out gender-related changes in society over time, such as who does what in a household, who earns what income and owns which assets. The usefulness of gender indicators lies in their ability to point to changes in the status, responsibilities, roles and activities of women and men over time. They make it possible to measure progress towards more gender equity and determine when it is being achieved. Indicators help to better understand how development results can be achieved, and to identify the effects of policies

and interventions. Therefore, gender-sensitive indicators support and enable a more effective future planning and program delivery based on identified differences in the roles and responsibilities and assets of women and men (CIDA, 1997).

Gender statistics "is a field of statistics which cuts across the traditional fields to identify, produce and disseminate statistics that reflect the realities of the lives of women and men and policy issues relating to gender equality" (UNECE, 2010, p. 1).

Practical and strategic gender needs and interests

The needs and priorities of women versus men can be further broken down into 'practical' needs and 'strategic' gender interests. Practical gender needs or interests refer to interventions that improve the lives of women and girls within their existing roles by meeting basic needs (e.g., water, food, shelter, health care, income) or by helping them fulfil their current responsibilities and roles as defined by prevailing gender norms (UNICEF, 2011). For example, the introduction of water pumps and more efficient stoves that reduce the water-hauling burden and improve indoor air quality are two technologies that provide women with more time to complete other responsibilities. When living conditions are inadequate, it is necessary to meet the practical needs of girls and women, yet it is unlikely that gender inequalities will be reduced, since women's subordinate position in society, expressed for example in the division of labour, is not challenged (Moser, 1993; UNICEF, 2011).

Strategic gender interests challenge traditional gender roles and relations. They relate to the gender division of labour, power and control, and highlight the question of what is required to address unequal relationships or allocation of resources and opportunities between men and women. Strategic interests include issues such as legal rights, domestic violence, equal wages or a change in laws so that women can own or inherit land (Moser, 1993; UNICEF, 2011). These help to increase women's ability to take on new roles and gain empowerment (Momsen, 2010).

Many projects still assume that the inclusion of or focus on women in projects provides an immediate benefit for the women. It has now become clear that simply taking women into account, or counting women, is not sufficient to reach desired development objectives (UNICEF, 2011). "Merely working with girls and women does not necessarily advance gender equality or the empowerment of girls and women. Many think that because their programme caters to girls or women, they are taking a gender perspective and/or promoting equality. In fact, an effort can be gender-blind even when women are the target group if it fails to account for questions related to the gender division of labour (Who does what?), access to and control over resources (Who has what?), and power imbalances between women and men (Who decides?). Depending on its design and implementation, a programme that focuses on women could just as easily support an unequal status quo as it could promote social justice" (UNICEF, 2011, p. 10f). To achieve a faster change, (agricultural) projects need to include boys and men at household level and find male allies in communities.

Empowerment and agency

"One way of thinking about power is in terms of the *ability to make choices*: to be disempowered, therefore, implies to be denied choice" (Kabeer, 1999, p. 436). **Empowerment** is linked to the condition of disempowerment and "refers to the processes by which those who have been denied the ability to make choices acquire such an ability. In other words, empowerment entails a *process of change*" (Kabeer, 1999, p. 437). The ability to exercise choice depends on three dimensions: access and control over resources as a pre-condition to make choices, agency as a process, and achievements which are the outcomes of well-being (Kabeer, 1999).

Agency is the ability to define one´s goals and act upon them. It is often operationalized as "decision-making", however it can take other forms such as bargaining and negotiation, manipulation, subversion and resistance (Kabeer, 1999). To exercise greater control over one's life and have a

wider set of choices, the distribution of resources such as assets and knowledge need to be shifted and institutions and norms changed in favour of women (Sen and Mukherjee, 2014).

Empowerment means that both women and men are enabled to access resources and participate in politics and public life, and can take control over their lives by setting their own agendas. Especially important for women is that empowerment includes having bodily autonomy and integrity, and enjoying freedom from violence. While empowerment is about addressing immediate inequalities faced by women or men, it requires also changes in consciousness and agency that challenge patriarchal structures (Sen and Mukherjee, 2014). Empowerment implies an expansion in women's ability to make strategic life choices in a context where this ability was previously denied to them (Kabeer, 1999).

Gender-neutral, gender-sensitive or responsive and gender-transformative research

For development and research projects alike, there are different levels and approaches of how intensively gender aspects are considered and integrated in the project. **Gender-blind** projects and research fail to recognize that the roles and responsibilities of women/girls and men/boys are assigned to them in specific social, cultural, economic, and political contexts and backgrounds. They ignore the different roles and diverse needs and reinforce gender inequalities to achieve desired development outcomes (UN Women, 2016). **Gender-neutral** approaches and research aim to not reinforce existing gender inequalities but still do not consider gender as relevant to the development outcome. They work within existing gender division of resources and responsibilities and do not address existing gender norms, roles and relations (UN Women, 2016). **Gender-sensitive or -responsive** approaches attempt to address existing gender inequalities and see gender as a means to reach the project goals. They address gender norms, roles and access to resources in so far as needed to reach project goals. These approaches ensure that the needs of both women and men are considered and that they will both benefit. The approach aims to reduce harm, for example, by considering labour peaks and aiming to avoid excessive work burdens (UN Women, 2016). **Gender-transformative** approaches consider gender as central to achieving positive development outcomes and to contributing to more gender equality. They actively attempt to examine, question and change women's and men's gender roles and relations, power imbalances, and the distribution of resources and work responsibilities. The aim is to transform unequal gender relations, and to promote shared power, control of resources, and decision-making, and to support women's empowerment (UN Women, 2016). Agricultural research can be made gender transformative but this requires full gender expertise and hence this approach goes far beyond this guide.

3 Sex-disaggregated data collection in the research process

The integration of sex-disaggregation in quantitative data collection does not as such require the knowledge of new methods or tools, rather it is the use of common scientific procedures of quantitative and qualitative research to which a sex (and gender) lens is added (UNECE, 2010). This, of course, is not equivalent to a proper gender analysis where a good understanding and knowledge regarding gender, norms, power and equity issues is required. This chapter briefly discusses research areas where a gender lens is of interest in the agricultural sector, what to consider regarding the research unit and finally, general considerations for sex-disaggregated data collection. Typical steps of field research related to (sex-disaggregated) quantitative data collection are described in the Annex.

3.1 Typical research areas in agricultural and rural development

A major objective of socio-economic research for agricultural and rural development is to understand, guide and measure constraints in agricultural production, risks in agriculture and livelihoods, technology adoption and preferences, extension and impacts of technological innovations and policy interventions. To all these topics, a sex-disaggregated and a gender perspective can be added and is relevant.

In most family-based farming systems, it is crucial to understand the involvement of women and men and interlinkages between the farming and household system to create more effective projects and policies. Even when women are not performing agricultural tasks, they usually still use the derived agricultural products for home consumption or processing. Thus, they may have vested interests in crop or livestock varieties and diversity, technologies and agricultural management practices, and may well be affected by changes in the food and non-food biomass production systems.

When defining research topics, it can be helpful to first start thinking around overarching research questions which are of interest to research for development. In a next step, these general questions can be broken down to concrete examples and subsets of research questions. For example, overarching research questions can be: How do changes in agricultural production affect women and men, girls and boys? Which technologies/practices/policies can contribute to improving livelihoods while enhancing equity? What effects have suggested or existing agricultural technologies on women and men, girls and boys? Which institutional settings enable women to equally benefit from agricultural value chain development?

3.2 Unit of analysis and household concepts

The choice of the appropriate unit of analysis, the subject or object of study, depends on the research question that is to be answered. The unit of analysis is the 'who or what' that is to be analysed – and important for identifying where to incorporate sex-disaggregated data. It is not necessarily the same as the unit of observation. Common units of analysis in research for rural development are (Doss and Kieran, n.d.; Doss, 2014):

- Individual: The person(s) farming are interviewed to understand decisions, preferences, perceptions and knowledge. Especially in family farms, where women and men are involved in agricultural production, processing or food preparation, they usually need to be interviewed separately to identify potential differences between both.
- Intra-household: Here the farming couple is to be interviewed to understand interactions between people, livelihood activities and how these affect outcomes.

- Household: Agricultural households are usually both producers and consumers. To consider all activities, the household may be the adequate unit of analysis. A gender perspective can be added by aiming to understand who does what, who owns which resources, etc.
- Crop or plot or a value chain: For example, this includes the person (woman/man/couple) who is deciding what happens on the plot or with the crop, who does the work and who receives the income/output. Along the whole value chain or within a certain stage, again a gender perspective can be added regarding who does what, who earns how much, etc.
- Formal and informal organizations: For example, comparing the role of women and men in cooperatives and who benefits.

Depending on the objective of the research, different survey types are used. In agricultural research, most common are crop/plot/farm surveys focusing more on agricultural production (and maybe marketing) and household surveys, which include other livelihood activities. Each survey type has advantages and disadvantages when aiming to include a gender perspective (Doss, 2014).

A common concept of a household used in (quantitative) surveys is that a household consists of a group of persons, related or unrelated, who share the necessities of living, e.g. those who live under one roof and eat from the same pot for most of the year (OPM, 2010). This is in line with many economists, who perceive a household as one entity with one set of preferences and pooling their income (Doss, 1996). Perceiving households as homogenous in terms of family structure in many contexts hides complex family structures, e.g. in the case of polygamous marriages or migration patterns (OPM, 2010) and actually can lead to different outcomes of research (Doss, 2014).

Moser (1993) raises the question of whether we can generally work at household level for the needs of low-income households or whether we need to embark on an intra-household perspective considering the different needs of household members, specifically of women and children. The same question of course also applies to the research. Until now, most research projects and development programs on sustainable agriculture, seed system development, or innovation networks have largely been built on the assumption that by targeting the household, all household members will benefit from the intervention. The typical **household concept** assumes that individuals share the same preferences and equitably pool their resources (UNECE, 2010); this is a **unitary household model** (Quisumbing, 2003). Thus, in household surveys, the household head is identified assuming that this is the most senior decision-maker in the household. The relationships of other household members are then defined with respect to their relationship to the household head (OPM, 2010). This is in line with the assumption that the household head, usually the man, represents the household and thus that all attitudes and motivations of the household members are identical to his (Moser, 1993). However, it is not clear on which theoretical and empirical evidence these assumptions are based. The concept of the household head does not only make "a presumption about intra-household power relations but also supposes the household as a joint welfare unit. Both assumptions can conceal important gender-based differences in access to and control over resources and decision making" (OPM, 2010, p. 2).

The existing evidence shows that households are complex and heterogeneous, and thus do not act in a unitary manner when making decisions or allocating resources (Doss, 2001; Momsen, 2010; UNECE, 2010). As described by UNECE, the "concept of a household 'head' is no longer considered appropriate in many countries […]. The concept is difficult to define, particularly when gender issues are considered, and has little relevance in many current household situations" (UNECE, 2010, p. 16). The concept of the household as a unified economic entity fails to recognize intra-household resource and labour exchanges or allocations (Alderman et al., 1995). Empirical evidence shows that unequal exchange and inequality exists within households; therefore, a household is usually not a joint decision-maker and does not have a joint utility function (Moser, 1993). By using models other than the unitary household model, such as collective/cooperative, strategic/bargaining (non-cooperative), or independent individual models, the complex realities of family decision-making can

be better reflected (Quisumbing et al., 2014). Research using alternative models has shown that the redistribution of inputs and control over resources between men and women in the household has the potential for increasing productivity, food and nutrition security, and education (Alderman et al., 1995; Meinzen-Dick et al., 2011b; Quisumbing and Maluccio, 2000).

Small farms with their female and male household members have multiple objectives, and also often have multiple income sources while resources are typically limited. Interactions and potential conflicts regarding resource allocation arise between the farmer's objectives and his/her attitude towards risk as well as with regard to different crops, between crops and livestock, farm and household as well as on-farm and off-farm activities, since they all compete for the same resources. These interactions are very critical in decision-making and imply trade-offs and compromises, i.e. resources are allocated according to the priority of the household or of the most powerful household member. This does not necessarily include a shared priority setting between women and men, as priority setting is usually dominated by power relationships that are in favour of men (Ponniah et al., 2008).

The often cited feminization of agriculture also leads to different household types. Women´s access to resource access, intra-household power relations, and constraints can be very different depending on the marital status of the women. Many household surveys which try in some way to address "gender aspects" do so by comparing female-headed households with male-headed households. It is recommended to avoid such simple analysis for the reasons outlined above. They further specify that women find themselves as household heads for a variety of reasons, including migration of their spouse, divorce, and widowhood. The poverty and living circumstances of each situation can be very different. Therefore, they recommend analysing female-headed households taking into account the marital status to differentiate between never-married women, widows, or women whose husbands have migrated. In addition, questions are suggested on polygamous marriages, non-legal marriages, and that the absence of the spouse is more insightful than the usual status categories of single, married, separated or divorced (OPM, 2010).

3.3 Who should be interviewed?

In general, who should be interviewed depends on the research question, the unit of analysis and the unit of observation. There are conceptual and data limitations to standard household surveys when gender perspectives are to be integrated. In many household surveys, usually only one person is interviewed, and that is usually the household head, in most cases a man, irrespective of the question who is the most appropriate person to be interviewed. Instead of relying on general assumptions that the household head knows all the relevant answers and maximises the total household welfare, a reflection on what the household head may know and represent is necessary. It is important to identify the respondent who knows best the answer to the research questions, who is the owner of the knowledge; this is typically based on roles and responsibilities (Doss and Kieran, n.d.). It may be the wife, the husband, the grandmother or son, or both. While the household head may be the person representing the household to non-family members, he or she may not be the person who is cropping or selecting the seeds that are grown. He or she may be the main income earner but not the person managing the agricultural plot or taking care of the livestock.

Different people can be interviewed depending on the research question, i.e. both spouses, a man and a woman, randomly chosen people, or everyone that is relevant for a specific research question or set of survey questions. Depending on who is interviewed, you may get very different answers. Depending on the survey question, it can be further important to stratify or classify your data according to age, place (country, region, and village), group (class, ethnic, religious, and caste), wealth, etc., as these variables influence women's participation in farming, their decision-making, and their gender roles and livelihoods. Intra-household surveys are an important tool to ensure that both perspectives of a couple or men and women in the household are equally represented, and

such surveys are key when aiming to understand relations between individuals in the household. For gender analysis, it is necessary to interview women and men (Doss and Kieran, n.d.). By doing the same survey or parts of it separately, a secure space is created in which women and men can talk freely and express their perceptions and ideas (UNECE, 2010). Interviewing women and men in a household separately provides much more detail on intra-household resource allocation, income, time use and labour division, etc. One person does not have all the information, which is also due to gender differences in roles and responsibilities, and more sensitive issues such as additional incomes can be hidden from the spouses. An option is to introduce two units of enumerations in household surveys: a household-level unit and a person-level unit (UNECE, 2010). Data can thus be collected at household level and at individual level by interviewing women in addition to men (UNECE, 2010). It is not necessary to interview both women and men in the same household for all survey types or units of analysis. For labour surveys (e.g. regarding working conditions of plantation day laborers) or value chain analysis, it is sufficient to interview similar numbers of men and women, depending of course also on the distribution at the work place.

3.4 Considerations for sex-disaggregated data collection

During the data collection process, several issues may arise and gender biases be created. Not everything can be anticipated, but there are typical problems and issues when aiming to integrate disaggregation by sex and a gender perspective in the research. These should already be considered at the planning stage of the research. It is necessary to **respect the respondent**'s willingness and time. To introduce sex-disaggregated and gender-related questions in a household is not as easy as it might look, because traditional gender norms can present barriers. It can be challenging to explain to the husband why perceptions from both husband and wife are needed and why researchers want to interview his wife. Not in all cases do husbands give permission, and sometimes invent reasons to avoid an interview. The participation of a selected interviewee cannot be forced upon the person, as this is against good scientific practice and ethical considerations. Surveys should last at the most one hour (including translation). Especially if both spouses are interviewed, survey duration should be minimized in order not to take up too much of the household's time. It is important to be aware of and respect the general responsibilities of each respondent, e.g. women having to start food preparation to avoid household conflicts once the interview is over. A statement of consent from the interviewee should be included in the questionnaire and agreed upon by each interviewee, not only by the household head.

Data collection errors and causes of bias when collecting sex-disaggregated data

- **Concepts, terms and definitions are inadequate:** Common definitions and concepts (e.g. what constitutes a male- / female-headed household) may fail to reflect the gender differentiations in the target population. This is often followed by **erroneous wording of questions or communication problems.** The enumerators, translators and respondents may fail to understand the content or language of the questionnaire when the question wording is too technical or the terminology too complex or the correct terms are not used in their language/society (UNECE, 2010). This may happen more often in interviews with women than with men, as educational background and previous exposure to the survey topics may be lower. Local enumerators and people who know the culture well can help to find the right introduction or concepts to introduce the survey, e.g. not talking about gender roles but about family roles. This is ideally done before the interview round starts, e.g. through focus groups or key informant interviews.
- The respondent has to be in a position to answer the questions correctly. Depending on the research question, a woman or a man – or maybe both - might be the adequate person to be interviewed. **Selecting the wrong respondent** can be hence a major error (UNECE, 2010).

- **Spouse being present during interview:** The presence of the spouse during the interview is generally not recommended, as respondents usually do not speak freely but rather adjust their answers to the opinion of the spouse and thus try to avoid disagreement with the other spouse. Also, the respondent may be interrupted by the spouse who might try to direct the interview according to his/her views (UNECE, 2010). Therefore, it is recommended to interview husband and wife separately, especially when it comes to questions around access and control, income, decision-making, power, etc. In the latter case, research has shown that more accurate estimates are obtained when the persons are interviewed separately. General questions not related to individuals can be asked when both are present. Some questions such as on yields or crop storage are better asked in the presence of the couple, who can then discuss and exchange opinions. However, if plots are managed separately by household members, these questions should be asked separately. It is important to guarantee and maintain the confidentiality and privacy of responses, especially when more sensitive issues such as asset ownership are discussed.
- **Choosing the wrong enumerator:** In many contexts, when interviewing women, a female enumerator is needed to increase trust and confidence among the interviewed women but also to make sure not to offend local norms. This is part of the ethical considerations when planning the research, and one of the important issues where ethical clearance by an ethic board can be necessary. Usually, male enumerators cannot just enter a household and ask to talk to the women. In some cultures, this is a complete no-go and would lead to serious consequences for those participating in the research process. Thus, it is recommended in general that men are interviewed by male enumerators and women by female enumerators. However, experiences here differ among different countries and contexts as pointed out by Behrman et al. (2012). During the interviews, enumerators can also introduce personal values or a bias in the way they ask the questions because of prejudices, insufficient training or simple carelessness (UNECE, 2010). Especially for intra-household surveys, it is essential to count on very well-trained enumerators, who need to have a basic gender knowledge. A special training day during the general enumerator training is often required. Finding female enumerators to interview women can often be difficult, especially in countries where women cannot move around freely or strict gender norms exist, their security in the field is not ensured or where simply not enough interested women exist to do this kind of work. This needs to be evaluated when planning the research and can limit survey size or type of questions to be asked.
- **Obscuring the truth:** Respondents may "deliberately give a wrong answer, either to meet some socially acceptable norm or because they are fearful or suspicious about why the question is being asked" (UNECE, 2010, p. 18). For example, a woman may deny any domestic violence issues in the household.

3.5 Mixed-method approaches

"Why" questions like "why are things the way they are" are difficult to answer in quantitative surveys. Also many outcomes of projects and policies in regard to gender relations are not amenable to measurement using standard quantitative surveys, for example well-being, status, self-esteem, empowerment, vulnerability, social differentiation, social norms, and self-perceptions by individuals and communities of what it means to be "male" or "female" in a given society (Behrman et al., 2014). Ways to overcome these and other limitations in many (household) surveys in regard to the integration of a sex-disaggregated perspective can be through the use of qualitative assessments or mixed-method approaches.

Qualitative research can help us to understand gender norms which may affect the access and control of women over resources, their role in decision-making, etc. This type of research goes beyond pure sex-disaggregation and the description that women and men do things differently (or

not). They help us understand why these are gendered. “Understanding the underlying causes (rather than only the symptoms) of gender differences and inequalities leads to a better understanding of gender-based constraints […] This can be done by asking why things are as they are, what norms structure the ways men and women relate to each other (power relations) and to the resources we study, who enforces these norms and how, and what challenges exist to overcome the norms that cause inequalities and hinder effective and equitable resource management” (Bioversity International, n.d., p. 2).

A mixed-method approach uses both qualitative and quantitative research techniques. The quantitative methods provide data that can be aggregated and analysed to describe and predict relationships, and provide a broad, statistically valid overview. The qualitative methods can help to explain and probe those relationships and to explain contextual differences in the quality of these relationships, thus gaining insights into the “why” questions (Baker, 2000; Garbarino and Holland, 2009). Qualitative research can use social analytical frameworks to interpret observed patterns and trends, e.g. of the analysis of socially differentiated outcomes, and to analyse poverty as a dynamic process rather than a static outcome (Garbarino and Holland, 2009). Mixed-method approaches can be used for more than simply triangulating data from more than one data source or method to cross-check findings. As mentioned by Behrman et al. (2014), there are several purposes for mixing methods, ranging from (i) triangulating data to see convergence of results; to (ii) identifying complementarities, i.e. examining overlapping and different facets of a phenomenon; to (iii) discovering paradoxes, contradictions, fresh perspectives; to (iv) using the methods sequentially, such that results from the first method inform the use of the second method; and finally (v) to add breadth and scope to a project.

There are advantages and disadvantages in the use of these approaches which we will not further discuss here; a good overview is given by Bryman (2012) and Behrman et al. (2014). Concluding, it can be said that “[m]ixed methods work allows the qualitative to inform the quantitative and vice versa, thus expanding the depth and breadth of research and providing a more complete picture of gender relationships” (Behrman et al., 2014, p. 49).

4 Key topics and survey questions related to women and men in farming systems research

In farming systems, women and men have different roles and responsibilities, and thus often attach different weight to technologies and practices. While the men's activities are often more visible and understood in the farming system, the often less visible activities of women need also to be identified to ensure that women are not losing out and ideally also benefit. The adoption of new farming practices or technologies will have different implications for women´s and men´s income, labour requirements, livelihoods and well-being (CCAFS and FAO, 2012). To account for this perspective, the quantitative survey requires additional or different sets of questions than the usual household survey.

The following provides suggestions of survey questions that include a sex-disaggregated and, subsequently, a gender perspective in farming systems research. Gender relations are complex and context specific (Quisumbing et al., 2014), so we are aware that it is difficult to provide survey questions which are applicable everywhere. However, we still do it since we found the need for it among researchers who are not gender experts. In all cases, it is important to adjust the questions to the local social context, and not to apply them as a "one-size-fits-all" tool.

Questions are differentiated for each topic between suggested "minimum" questions, which are easy to be collected and contain basic gender perspectives, and "advanced" questions aiming to gain more insights. Not all topics and questions are needed for a survey, as this would otherwise become far too long. Whether the minimum questions or the advanced questions are asked depends on the objectives of the research, the available time and budget, the skills and knowledge of the researcher, and the skills and sex of the enumerators. The minimum questions are designed in such a way that they can be easily integrated in any survey, even when only one spouse is interviewed, and do not need much time or add to the costs. The advanced questions allow deeper insights into gender aspects but may require more targeted selection of the respondent. The advanced questions are listed to provide the researcher with an idea of questions where gender issues are relevant and how they could be phrased. Again, even for one topic not all advanced questions may be of interest to the research question. For some advanced questions, women and men might have to be interviewed separately.

For example, when a survey briefly addresses crop storage, it is suggested to include the "minimum" questions. If a survey focuses on crop storage, then the advanced questions are suggested. When the minimum questions are consistently integrated in surveys, results can be compared across studies, and a comprehensive database can be developed increasing the benefits of the research. However, there is no blueprint of questions that a survey should always include and how they should be exactly phrased. This needs to be adjusted according to the local context. All questions are general suggestions, i.e. the exact wording needs to be adapted to the local context and the questions need to be piloted to find out whether they are correctly understood by the respondents. A different phrasing may be necessary in some cases, and the researcher has to identify this before starting the survey through, for example, focus groups, key informant interviews and pilot tests.

The following topics and questions draw on own research experience and on other literature, mainly the "Tips for asking gender-responsive questions" from Bioversity International (Bioversity International, n.d.), the CCAFS "Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development" (CCAFS and FAO, 2012) and Doss (2014). Doss (2014) also provides more explanations and reasoning for most of the topics listed below.

4.1 Coding

The "who" questions (who does what, who decides) are the starting point for adding a sex-disaggregated and subsequently a gender perspective. Coding, i.e. clearly identifying the respondent in a simplified form, becomes important, especially if more than one person is involved. There are different ways to code. The researcher can decide to list the ID from the household roster (if available), or create a code for woman, man, female child, and male child, and allow several categories to be listed at the same time, or the combinations woman alone, man alone, female child, male child, both (spouse), woman with another female / male decision-maker, man with another male / female decision-maker, etc. (Doss and Kieran, n.d.). The consequences of each method of data capturing, data entering and subsequent analysis should be considered when designing the questionnaire. One way is to pose each question to each of the following groups:

1. Self
2. Partner/spouse
3. Self and partner/spouse jointly
4. Other household member
5. Self and other household member(s)
6. Partner/spouse and other household member(s)
7. Someone (or group of people) outside the household
8. Self and other outside people
9. Partner/spouse and other outside people
10. Self, partner/spouse and other outside people

When it comes to assets or activities, also simply the "ID number" from the household roster can be used. If there is joint ownership or several people are involved in the activity, several IDs can be listed.

4.2 Sex of the interviewee and knowledgeable respondent

It is extremely important in all surveys to include a column indicating whether the interviewee is female or male. It is often skipped in surveys that do not have a household roster, however it provides important information. This should be followed by the question whether the respondent is the right person to answer the questionnaire as defined by our research design and his/her role and responsibilities we are interested in, for example, whether she/he is the person managing the plot or the crop of interest and selecting the seeds, or is the owner of the land or the household head.

4.3 Gender roles and labour division in farming systems

4.3.1 Main crop production

Men and women often assume different tasks in the cultivation of the same crop or may cultivate different crops. For example, men do the land preparation, while women sow and weed. This can also vary between crops or plots, depending on who manages and controls them. Women may contribute a significant amount of labour in male-headed households or in the cultivation of crops controlled by men, but this contribution often lacks recognition. In addition, women tend to grow many crops in small quantities that are nonetheless important for feeding their family, be it in own fields or on the borders of family/men's fields and in home gardens (see also subsection "Multiple activities in the farming system"). The questions related to the crop production can be for all crops in general, for groups of crops or for individual crops, depending of the objective of the research.

Minimum questions

- Who (mainly) worked physically on the plot(s)/land during the last growing season?
- Who generally made the decisions about which [crop/s] to plant on the plot/land during the last growing season?
- If any produce was sold from [crop/s] planted on the plot/land in the last growing season, who was responsible for taking the crop to the market and negotiating the sale?
- If any revenue was generated from [crop/s] planted on the plot/land in the last growing season, who decided how to spend the revenues?

Advanced questions (choose relevant ones)

- Who prepares the land (main work/helpers)? Which plots?
- Who sows on which plots (main work/helpers)?
- Who fertilizes which plots (main work/helpers)?
- Who controls weeds and pests on which plots (main work/helpers)?
- Who harvests which crops and on which plots (main work/helpers)?
- Who uses crop residues? For what?
- Who does the (post-harvest) crop storage?
- Who does the seed selection for [crop]?
- Who decides to test a new variety for [crop]?
- Who does the processing of crops/food for home consumption?
- Who decides how to prepare the land? Which plots?
- Who decides which crop / which variety to grow?
- Who decided which crops, how and where to plant during the last growing season?
- Who generally made the decisions about what inputs to use on [LAND] during the last growing season?
- Who decides what, how and where to apply fertilizers?
- Who decides how, when and where to control weeds and pests?
- Who decides when, where and how to harvest, for which crops?
- Who decides how crop residues are used and for which purpose? Who will be affected when no /less crop residues are available and how?
- Did the wife/spouse grow any specific crops by herself outside the main plots? Which? How? Where – on field borders, home garden, own plot,…?
- Who stores the [crop]?
- Who can decide whether to use [crop] for food?
- Which parts of a crop are used? By whom and for what purposes?
- Who can decide whether to use [crop] for food?
- Who decides whether to sell [crop]?
- Who decides which crops/varieties are planted on a specific plot? (Consider different practices between plots)
- What are the key features of existing and new / improved crops, fruit trees, vegetables or livestock preferred by men and women?
- How good are the crops to store, process, cook and how is the taste?
- What are desired key features with regard to processing?
- When new/improved species were introduced: what were positive and negative key crop characteristics affected through a breeding intervention perceived by women and men?
- Are crops separately or jointly stored, i.e. among couple/together with parents/among the household members? How is this handled among different generations living in the same household? If jointly, who then has the right to sell the crop?

4.3.2 Multiple and seasonal activities in the farming system

There is a tendency to prioritize questions regarding field activities related to staple and marketable crops while obscuring the other activities women and/or men carry out in addition. These can be having a home garden, using forests, seed selection and conservation, post-harvest storage, marketing or food processing. Interventions in main crops can lead to positive or negative side effects for the other activities, e.g. conservation agriculture reduces available straw for livestock or a tractor reduces labour input, thus freeing time for other activities. The activities can also be relevant at different periods in the season, leading possibly to unexpected labour peaks if they are not considered before an intervention.

The following table serves as a very rough overview of the different activities in the farming system, i.e. who does most of the work (very generally) and who sells the products. It should be adjusted to each research region, for example, in a coffee region there may be no need to ask about fish production.

Table 1:Overview of farming activities and who is mainly involved

	Produced/ harvested/on your farm?	Who does most of the work?	Any sold for cash?	Who sells?
Food crops				
Cash crops like tea, coffee, cotton, etc.				
Fruits and vegetables (mainly for sale)				
Home garden (mainly for home consumption)				
Large livestock (cattle, buffalo, camels)				
Small livestock (sheep, goats, pigs)				
Poultry				
Fish				
Production of livestock products (e.g. milk, eggs, meat)				
Further processing of livestock products (e.g. cheese)				
Processing of crops/food/livestock products for sale like snacks, tortillas, cheese, etc.				
Collection of non-timber forest products (medicinal herbs, spices, honey, etc.)				
Timber				
Fodder				

Fuelwood				
Charcoal				
Other (specify)				

Men's and women's activities vary throughout the year, and no snapshot captures the whole range of activities pursued in a year. It is important to be aware of and explore these seasonal variations to understand the labour constraints women and men experience at specific times of the year. Engendered seasonal calendars are an effective way of making these visible. Table 2 below is ideally applied separately for men and women to better understand who is occupied and when. For practical reasons, both tables could be merged into one, but this requires more attention when filling the table. One could also distinguish between low labour input and middle to high labour input of women and men. This helps to identify possible labour peaks and trade-offs of current activities or new interventions.

In which month do men/women do each activity listed in Table 1 (multiple activities in farming system)?

Table 2: Engendered seasonal calendar

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Food crops																								
Cash crops																								
Fruits																								
Vegetables																								
Fodder																								
Large livestock																								
Small livestock																								
...																								

4.3.3 Livestock

Depending on the regional context and animal type, men as well as women are livestock owners, managers or perform certain tasks. Women typically own and raise fewer large livestock than men but rather take care of small stock like pigs, sheep and poultry. Gender norms often influence who handles and owns which type of animal. Although they do not own the livestock, women may assume most of the responsibilities for animals kept at the homestead, which can include the procurement of fodder for animals, the processing and marketing of livestock products. Their contribution to livestock keeping is often ignored or underestimated, as the owner of the livestock is typically the one interviewed.

Minimum questions

- Who in the household owns [LIVESTOCK]?
- Who in the household takes mostly care of the [LIVESTOCK]?

- Who markets the [LIVESTOCK] / sells the [LIVESTOCK] product?

Advanced questions (choose relevant ones):

- Who in the household collects fodder for the [LIVESTOCK]?
- Who in the household feeds and waters the [LIVESTOCK]?
- Who in the household herds the [LIVESTOCK]?
- Who in the household is responsible for [LIVESTOCK] health?
- Who in the household receives extension / advice on [LIVESTOCK]?
- Who in the household decides to sell [LIVESTOCK]?
- Who in the household decides when to slaughter [LIVESTOCK]?
- Who in the household controls the money from the sale of the [LIVESTOCK] and livestock products?
- Who in the household decided to buy the [LIVESTOCK]?
- Do you practice specific livestock breeding and, if you do, who decides about it?
- Did you recently acquire new livestock species? Who took the decision?

1.1.1 Non-market biomass-based activities

Rural women are often involved in the production of crops or collection of wild foods for household consumption, in home gardens or in the collection of non-timber forest products (NTFPs), with surpluses often being sold. This important contribution to household food security and potential income sources for women is overlooked when studies focus on income-generating activities or main crops.

Minimum questions

- Who in the household is responsible for production of crops/vegetables or collection of wild vegetables/herbs/insects that are only/mostly used for household consumption?
- Who in the household is responsible for the collection of wild vegetables and herbs and insects that are only/mostly used for household consumption?
- Who in the household is responsible for collecting NTFP that are only/mostly used for household consumption?

Advanced questions (choose relevant ones):

- Who decides which of the household crops/how much of the surplus are kept for household consumption and which/how much is sold?
- Who decides which of the NTFP/how much of it is kept for household consumption and which/how much is sold?
- Who decides which [NTFP] is collected from the wild?
- Who in the household is responsible for processing the [CROP] / [collected food] / [NTFP]?
- How many hours per day are spent on subsistence activities in the household by whom [caring for subsistence crops, collecting NTFPs for household consumption, processing crops and NTFPs]?
- Do you collect fuelwood for sale? Who does it? Who sells it? Who receives the income from the sale?
- Do you dry dung for sale /home use? Who collects it? Who sells it? Who receives the income from the sale?

4.4 Adoption of technologies/new agricultural practices and impacts (ex-ante and ex-post assessments)

In agricultural research, it is important to identify who benefits (or will benefit) from an old or new agricultural practice, technology or research output, who does not benefit, and whether somebody will lose out. Is this person female/male, young/old, rich/poor, and what does it mean in terms of livelihood opportunity for this person and the whole household? Agricultural interventions can change women's access to paid employment or other income-earning activities especially when technologies/machinery are introduced that reduce labour. Finding this out requires a whole set of advanced questions: Who will participate in the change in agricultural practices, whose labour will be used or saved with the promoted technology or intervention? What are/could be the dynamics of change due to the intervention? Does it require so much labour that the household or individual members will have to neglect other crops or activities? Whose labour will be used and what are the consequences of this, e.g. on leisure time, health, food security, etc. Will the project/programme positively or negatively affect women's access to labour of other household members? What are the effects on the female and male wage workers?

What are/will be the benefits generated by adopting the technology and who determines the use? Is or will household **and** individual food security be increased? How will poorer households benefit in comparison to not so poor households? What happens to day labourers (differentiated between female and male workers)? Does the possibility exist for a crop/livestock to become marketable when it is heavily promoted in rural areas? Will these changes affect women positively or negatively? And could men take over control in the long run and women possibly lose an income source?

Minimum questions before adoption (as part of ex-ante impact assessment)

- Who in your household will carry out/use [ACTIVITY], [TECHNOLOGY]?
- What effect, do you expect, will the new [ACTIVITY], [TECHNOLOGY] have on the labour input of [women/men/boys/ girls/male farm worker/female farm worker]?
- Do you expect that the intervention will (i) increase household food security and/or (ii) household income?
- Who do you expect will benefit most by carrying out/using a new [ACTIVITY], [TECHNOLOGY]?
- Who do you expect will be negatively affected by the introduction of a new [ACTIVITY], [TECHNOLOGY]?

Advanced questions before adoption (as part of ex-ante impact assessment) (choose relevant ones):

- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged food security for all household members?
- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged increased nutrition diversity for all household members?
- If you employ [female/male] wage workers, how much more/less labour input do you need after adopting the innovation?
- Which positive impacts will the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?
- Which negative impacts will the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?

Minimum questions after adoption (as part of ex-post impact assessment)

- Who would you say benefitted most by carrying out/using a new [ACTIVITY], [TECHNOLOGY]?

- Was anybody negatively affected by the introduction of a new [ACTIVITY], [TECHNOLOGY] and if yes, who?
- Who in your household carries out/uses the new [ACTIVITY], [TECHNOLOGY]?
- What effect did the new [ACTIVITY], [TECHNOLOGY] have on the labour input of [women/men/boys/ girls/male farm worker/ female farm worker]?

Advanced questions after adoption (as part of ex-ante impact assessment) (choose relevant ones):

- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged food security for all household members?
- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged increased nutrition diversity for all household members?
- Which positive impacts did the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?
- Which unexpected impacts did the [ACTIVITY], [TECHNOLOGY] have on men/women in your household? In what way does the new [ACTIVITY], [TECHNOLOGY] impact men's/women's ability to fulfil their responsibilities on your farm and in your household?
- If the [ACTIVITY], [TECHNOLOGY] mainly supports women, did it encourage men/other household members to help more with the task than before?
- How are positive gains (free time, increased income) used in your household? Who decides how free time or additional income is used?
- In case the marketability of a female-controlled [CROP], [LIVESTOCK], etc. has developed well due to the intervention / adoption of new practice /technology, have the men in the household expressed interest in starting to use it as well? Has decision-making shifted from women to men? If you employ [female/male] wage workers, how did their labour input change after adopting the innovation? Whose [female/male] wage worker labour input was changed and to what extent?

4.5 Gendered access to and control over resources and assets

Data on ownership of household assets is often collected, however, it is usually not distinguished between who owns the assets. The presence of resources and assets does not necessarily mean that all individuals in the household have the same right to use or to sell these assets. This section focuses specifically on physical and natural assets relevant to agriculture. Access to labour, farm inputs, and farm machinery often varies between women and men. Gender norms can also prevent women from using certain resources or technologies, e.g. women do not drive tractors in Bangladesh. Thus, despite the asset being available, women do not have the right to use it. Other important forms of access to resources may also be important, such as access rights to crops/trees and their products, which may differ from rights to the land on which the crops/trees grow.

While women may have access to certain resources such as labour, land, seeds or livestock, they may not have the ability to decide on the use of these resources. Thus, it is important to distinguish between access (right to use an asset), control (who actually makes the decision), and who owns the asset. Ownership can deviate from controlling resources, and distinguishing both can help to better understand crop and resource management processes. For example, a woman may formally own a piece of land but informal institutions and gender norms may inhibit her deciding on how to use the land or to sell it. Of course, assets can be jointly owned, such as by husband and wife. "However, households are often inclined to report that all assets in the household are jointly held for the sake of politeness or political correctness, even when this differs from the reality of associated rights. Further probing on specific rights often helps to uncover whether an asset can be considered jointly owned, individually owned or collectively owned" (Behrman et al., 2012, p. 10). The understanding of use, control and ownership tends to differ significantly by country context and culture. For

interpreting the data correctly, it is thus very helpful to complement the quantitative work with qualitative research. If both spouses of the same household are asked separately, it is likely that differences between both answers will exist.

For research on new technologies or practices, or research accompanying interventions and projects, it can be very useful to keep the following three key issues in mind: (i) When new agricultural practices/projects are to be introduced, do women and men have (the same) access to the necessary agricultural inputs which are part of the suggested agricultural technology? (ii) Will the intervention positively or negatively affect the access, control and ownership of women to resources (and assets), particularly to land, credit, firewood, and water compared to men? And (iii) Are there any policies that counteract the inclusion of gender, e.g. women are not allowed to have land titles or have been discriminated in the past? To which extent do women have formal or customary rights over land independent of their husbands and can decide on their own?

Minimum questions:

- Who would you say owns the [ITEM e.g. land / plot / machinery / tool/ livestock]?
- Who would you say is permitted to sell [ITEM e.g. land / plot / machinery / tool/ livestock]?
- Who actually uses the asset (e.g. land / plot / machinery / tool/ livestock)?

Table 3:Simple way to engender an asset module

Asset	Number owned	ID of owner (from household roster)	ID of user	ID of decision-maker who decides whether to sell the asset
Animals				
Cattle				
Horses				
Sheep/goats				
Poultry				
Pigs				
Productive assets				
Land				
Spades/shovels				
Ploughs				
Carts/carriage				
Grain storage silos				
Tractor				

Source: Adjusted from Johnson and Quisumbing (2009)

Advanced questions (choose relevant ones):

- Who is permitted to use the asset (e.g. land / plot / machinery / tool / livestock)?
- Whose name is on the land title/ownership document?

- Who makes decisions on how to spend income generated from its use, sale, or rental
- Who contributes most to decisions regarding a new purchase of [ITEM]?
- Who makes decisions regarding who else is allowed to use it and who is not?
- Who tends to the asset in terms of time spent taking care of it, repairing it, maintaining it?
- Whose resources were used to purchase a certain asset?
- Who is allowed to keep the asset if a partnership dissolves or a household splits up?
- In case of credit: Who makes the decision about what to do with the money/ item borrowed from [SOURCE]?
- Who makes decisions regarding its sale, lending or rental
  - Who would you say can decide whether to sell [ITEM] most of the time?
  - Who would you say can decide whether to give away [ITEM] most of the time?
  - Who would you say can decide to mortgage or rent out [ITEM] most of the time?
- Who collects any income generated from its sale or rental?

4.6 Gendered access to information and advisory services

As discussed before, women, though active in farming, are often not addressed by extension and advisory services, since the male household head is targeted irrespective of who does or participates in the actual work. The assumption that by training men, this information reaches their spouses or other family members is often wrong. Several additional reasons exist why extension services do not reach out to women. In some regions, gender norms also mean that male extension agents cannot talk directly to women. Even when invited, timing of advisory meetings can be in conflict with the women´s other activities, they might have to sit in the back, their questions might be ignored or treated in a derogative way. Thus, the availability of a service or women´s attendance does not say enough about whether women actually benefit. The type of information provided can be of different interest to women or men, or to both. For example, in countries with ´male´ and ´female´ crops or strong labour divisions, talks around the ´male ´crop/activities are of less interest to women, so the content has to be adjusted to the roles and activities the person performs. Again, both research on projects and interventions should consider whether an intervention will positively or negatively affect women's access to trainings, extension and information. Is the research and extension system gender aware and sensitive when designing and spreading an agricultural innovation? What tools and reforms does the extension system need to be more gender sensitive?

While in general smallholders and poor farmers have little access to this information, women tend to have even less access, especially when it is provided via mobile phones/individually owned media and not broadcasted via radio or other mass media accessible by all family members.

Minimum questions

- Where do you usually get your information regarding agriculture/home garden from? Is this the same for women and men in the household?
- Who in your household was invited to trainings in the last 12 months?
- Who in your household participated in a training on [CROP] [LIVESTOCK] [OTHER CONTENT] in the last 12 months?
- Why did you [other invited household member] not participate in a training though you were invited in the last 12 months? For example, answer codes could be no time, topic of no interest, not permitted, no female extension agent available, low quality of service (waste of time).

Advanced questions (choose relevant ones):

- Where do you [women/men] usually get your information from regarding agriculture /home garden?

- For all who participated in trainings, ask each one separately: Rank how well the training covered your needs, problems, interests, if you participated (10=very well, 0= not at all). Please explain the ranking. This is an open question but could be supported by a coding system, e.g. low quality, not encouraged to ask questions, possible to ask questions, good explanations, extension agent very knowledgeable.
- Would you have gone to a training on [CROP] [LIVESTOCK] [OTHER CONTENT] if at least one female extension agent had been present?
- Through which (media) channels are training invitations communicated? To which media sources do [men/women] in your household have access?
- Do you [women/men] in the household feel that you have time capacities to participate in trainings?
- Which topics would [men/women] in your household like extension agents to address?
- Which topics would you [men/women] in your household like to be addressed by other communication channels (and which), e.g. radio, television, mobile phone, books/brochures?

At community level, the following questions could be asked:

- How are male/female participants in the village selected for trainings?
- Was there any training for female farmers or on "female" [CROP] [LIVESTOCK] [CONTENT] offered in the last 12 months?
- Were trainings for women or on women's topics conducted by male extension agents? Was it ok for you to be trained by a male extension agent or would you have preferred a female extension agent?
- How many men/women participated in such a training?
- In case of mixed trainings, were women able to express their position and interests?
- How many male/female extension officers exist in your [UNIT]? Are there female extension agents available as contact persons for women in the community?
- Who spreads information on [CONTENT], e.g. agriculture/health/nutrition/climate change] in the community?

4.7 Gendered livelihoods

4.7.1 Reproductive activities

Reproductive activities are those required to maintain the household and its members, such as cooking, raising children, cleaning. The particularly heavy responsibilities of women in the reproductive sphere limit their opportunity to pursue other (income) activities or attend extension meetings, since they perform this role in addition to contributing to agricultural production and natural resource management. Reproductive activities are usually not in the focus of agricultural research. However, they can be of interest regarding labour availability and constraints when planning to introduce or evaluate interventions.

General questions can relate to how much time is spent per day on fetching water, collecting firewood, cooking, cleaning, and raising children, and how much leisure time is available.

Minimum questions

- Who in the household is responsible for cooking, childcare, washing and cleaning the home?
- How much time per day do [women/men] in your household spend on childcare, cooking, and maintenance?
- Who collects water [women/men/girls/boys]?
- Who collects fuelwood [women/men/girls/boys]?

Advanced questions (choose relevant ones):

- How much time per week does it take women/men/girls/boys in your household to fetch water for your needs on a normal day?
- How much time does it take women/men/girls/boys to collect firewood for your needs per week? [you could use the list below]

Table 4: Examples of who does reproductive activities

Household members	Fetching fuelwood, duration in hours per day	Frequency per week	Fetching water for household use, duration in hours per day	Frequency per week	Etc. ….	Frequency per week
Boys age 6-14						
Girls age 6-14						
Men age 15-64						
Women age 15-64						
Men age 65+						
Women age 65+						

- What percentage of time do women/men spend on household chores compared to time in agriculture in low and high season?
- In which household/subsistence activities would women want more support from their husbands/families?
- In which reproductive/subsistence activities could men/husbands imagine to provide women with more support?
- Do women/men/children perceive their labour share as fair?
- How has the division of labour/household tasks changed over the last ten years? Answer codes can be (several answers are possible): (i) women do more agricultural work, (ii) women have more leisure time, (iii) men do more household tasks, (iv) men have more leisure time, (v) girls/boys do less/more household tasks, (vi) girls/boys do more agricultural work, (vii) no change, (viii) women spend more time in off-farm employment, and (xi) men spend more time in off-farm employment.
- Which household tasks are culturally best accepted if they are done by men?

4.7.2 Participation in organizations

Women generally have less access than men to formal associations, groups and organizations but more frequently participate in informal ones. Participation in community groups may be mixed or limited to women or men. Community groups that control key resources are often dominated by men. Although women may be represented in mixed-gender associations and committees, their actual ability to influence decisions made within these organizations can be limited. Women´s voices tend not to be considered, and women take on leadership roles less frequently. The question regarding existing groups and women's participation is interesting, as groups can work towards more social inclusion, also of women, or rather enhance inequalities. Women, though maybe not explicitly excluded, in reality are often excluded from such support and activities.

Groups can support the adoption process of new agricultural practices and technologies, facilitate the access to credit, seeds and other inputs or information, and are thus interesting to researchers, extension agents and NGOs.

Minimum questions

- Is there a [GROUP] in your community? For example, agricultural / livestock/ fisheries producer's group (including marketing groups); water users' group; forest users' group; credit, saving or microfinance group; mutual help or insurance group (including burial societies); trade and business association; civic group / charitable group / religious group;
- Is this [GROUP] a men´s group, women´s group, mixed group?
- Who in the household is an (active) member of this [GROUP]?

Advanced questions (choose relevant ones):

- How much input do you have in making decisions in this [GROUP]? Answer codes can be: (i) No input; (ii) input into very few decisions; (iii) input into some decisions; (iv) input into most decisions; (v) input into all decisions (vi) no decision made.
- Why are you not a member of this [GROUP]?
- Which benefits/assistance/services did you get out of this group in the last 24 months? How do they compare to benefits other people [men] received? Or which benefits/assistance/services do women get out of this group? How do they compare to benefits other people [men] received?
- Which of the groups is most important for men/women in your household – rank 1 to 3?
- How much commitment does the group require from men/women in your household (in hours per week/month, money, food, etc.)?
- Who initiated this group? It might be interesting to explore the level of social organization in the community and to see how proactive especially women are.

4.7.3 Income sources (formal and informal) and access to credit

Households often have multiple income sources in addition to their agricultural production, which may be small but nonetheless significant for men and women, especially in the "hungry season". This can be through selling own labour or processed agricultural products, like maize tortillas or wild herbs. Women generally have less access than men to formal forms of employment, but are likely to participate more in the informal economy. It is good to include such income sources and whether women and men have access to labour markets in livelihood analyses. Agricultural interventions can change women's access to paid employment or to other income-earning activities especially when technologies/machinery is introduced which reduces labour. Will the intervention lead to a shift in income sources? Will the shift affect the power status of men and women and if yes, in which direction?

Minimum questions

- Who in your household participated in any non-farm economic activity or ran a business in the last 12 months, and which one?
- Who was involved in any formal employment?

Advanced questions (choose relevant ones):

- Who in the household made the decision to start the business / to take up non-farm economic activity or employment/ to migrate for work?
- Who in the household is/was the principal manager/administrator of the business (responsible for day-to-day operations)? Who in the household would you consider the owner(s) of the

business? Who in the household works/worked in the business? How much revenue (which share of household budget) was generated from the business/formal employment/non-farm economic activity in the last 12 months?

- Who in the household controls/controlled the money from the business/employment/ remittances?
- Which alternative livelihood opportunities exist for women/men in your household in your area? Answer codes can be: (i) trading, (ii) civil/public servant, (iii) remittances, (iv) daily labour (agriculture, construction, domestic worker, etc.), (v) rent, (vi) sale of processed agricultural products, i.e. home-made alcohol, processed foods, NTFPs, (vii) transport services, (viii) fishing, (ix) timber harvesting, (x) craft work, and (xi) leasing out land.
- Which factors limit women's engagement in off-farm employment in your household? Answer codes could be, for example (i) distance, (ii) time, (iii) education, (iv) skills, (v) no networks, (vi) no job opportunities, etc.
- How much income do men/women earn for daily labour jobs in your area?
- Which interventions has the government undertaken to create employment for women/men in your community? Has your household benefitted from such interventions? Has the government undertaken any agricultural interventions that reduced labour in your area and eliminated your employment opportunities? If yes, specify.
- If in need, where does your household borrow money from? Answer codes can include (i) bank, (ii) financial institutions, (iii) aid organizations, (iv) private money lenders, and (v) saving groups.
- Who in your household is eligible to borrow money from formal institutions?
- Who in your household decides to take out credit for which purposes? For which purpose did your household (specify who) take out credit (specify amount) within the last 12 months? How much interest did the household member have to pay?

4.7.4 Risks

Women and men can perceive risks and what is at risk, e.g. such as extreme weather events, differently due to their gender roles, tasks and responsibilities. Women and men can apply common but also different strategies to deal with risks. Who decides which adaptation strategy to implement and who then implements it can be different among a couple. The implications of a given adaptation strategy on women´s and men´s use of time and labour and on their health is likely to vary between women and men.

Minimum questions

- Which climate/agricultural risks are perceived as the biggest threat by men/women in your household? Answer codes can be: (i) crop failure, (ii) crop pest, (iii) wildlife attacks, (iv) livestock disease, (v) insect attack, (vi) floods, (vii) droughts, (viii) delayed rains, (ix) human disease, etc.
- What were the most important problems/shocks, natural, economic or social, your household faced as far as negative impacts to your household, household members' livelihoods and/or the household's agriculture/livestock during the last 12 months were concerned?
- Which environmental changes (e.g. extreme weather events, frosts, dry spells, late rain), which had not occurred in the past, affected your farm/household in the last five years (perceptions by men/women in the household)?
- What effects did the environmental change have on men and women in your household?

Advanced questions (choose relevant ones):

- Who decided on which adaptation strategies were applied?
- Who applied the adaptation strategy?

- Because of these changes, did women/men in your household apply any of the following (adaptations)? Answer codes can be (examples): (i) Delayed planting of [CROP], replaced [CROP] with […], (iii) introduced new variety, (iv) sold livestock, and (v) sold assets, etc.
- Who of the following assisted the women/men in your household to deal with the effects of the events/changes/problems? Answer codes can be: (i) relatives, (ii) friends, (iii) neighbours, (iv) community members, (v) insurance, (vi) local/provincial/national government, (vii) local NGO, (viii) international organizations, (ix) community groups, and (x) foreign government.
- Which are the adaptation strategies favoured/applied by men/women in your household?
- How much additional time and resources (hours, inputs, etc.) did the adaptation require from men/women in your household?
- Which effects did the adaptation have on men and women in your household?

4.8 Gendered decision-making processes within the household

Even when men are recognized in public or within the household as the decision-makers, women often contribute valuable knowledge and input into this process. Spouses can directly or indirectly influence decisions without clearly voicing their opinion or making the decision. Who will decide about the purchase/implementation of machinery/other technology? Who in the household decides that a new crop or variety is grown, how much livestock is kept or which inputs are used? What are the decision-making procedures and rules among women and men? What could change due to the intervention and in which direction? What are the social norms, power relations, and decision-making processes? Quantitative household surveys can usually concentrate only on "who makes the decision" and identify, to a certain degree, whether women and men participate equally. Identifying how decisions are made and negotiated is key to understanding gender relations and household crop and resource management strategies. However, this is already difficult to identify in qualitative research and unsuitable for quantitative surveys.

The following questions are of a general nature and subsumed as advanced. The set of minimum questions that you would need for your specific research area is already covered under the specific questions above, e.g. around agronomic practices. Each section contains questions on gendered decision-making processes. You could also check the survey to construct the "Women Empowerment in Agriculture Index" by IFPRI (see Chapter 6).

Advanced questions (choose relevant ones):

- Did you (singular) participate in [ACTIVITY] in the past 12 months (i.e. during the last [one/two] cropping seasons)? Activities can be grouped as (i) food-crop farming: crops that are grown primarily for household food consumption, (ii) cash-crop farming: crops that are grown primarily for sale on the market, (iii) livestock raising, (iv) non-farm economic activities: small business, self-employment, buy-and-sell, (v) wage and salary employment: in-kind or monetary work both agriculture and other wage work, and (vi) fishing or fishpond culture.
- How much input did you have in making decisions about [ACTIVITY]? Answer codes can be: (i) no input, (ii) input into very few decisions, (iii) input into some decisions, (iv) input into most decisions, (v) input into all decisions, and (vi) no decision made.
- How much input did you have in decisions on the use of income generated from [ACTIVITY]? Answer codes can be as above.
- How much input did you have in decisions on major household expenditures such as [ITEM, e.g. fridge]?
- How much input did you have in decisions on minor household expenditures for daily consumption and household needs?
- To what extent do you feel you can make your own personal decisions regarding [crop production/livestock raising/purchasing agricultural inputs?

4.9 Household roster

A household roster containing detailed information about all household members and their characteristics such as sex, age, education or occupation of household members is needed mainly for household and intra-household surveys. If the focus is exclusively for plot-level information, it depends on the research question whether this level of detail is needed. However, also for plot-level data, it can be necessary to identify who works on the plot, who decides, and which trade-offs does this imply, e.g. a child helping out on the plot and therefore not going to school. Questions related to the household structure can be included at the beginning, e.g. whether the household is a male-headed, female-headed, couple-headed household or other system. We can compare these different household structures if they are of interest to the research.

Minimum questions:

- Relationship to respondent (or household head)
- Household structure: male-headed, female-headed, couple-headed household. The focus could also be on classifying the household according to who is the main decision-maker as done by the CCAFS gender survey (see Chapter 6): 1) dual (male and female spouses), (2) female-headed with another adult male decision-maker (3) male-headed but with another adult female decision-maker, (4) female-headed, without an adult male decision-maker in the household, (5) male-headed, without a female adult decision-maker in the household.
- Number, sex and age of all household members.
- Migration status of present/absent household members (e.g. of spouse).

Advanced questions (choose relevant ones):

- Schooling status for the household members at schooling age (often starting at 5 years)
- Marital status for all adults who are at the local marriage age (can be as early as 10 or 11 years), including whether it is a polygamous marriage or not legal marriage
- Education and literacy status of household members
- Language skills – especially of interest in countries where local/ethnic languages are still commonly used and differ from the national language
- Ethnicity
- Religion
- Health status
- (Paid) income source
- Occupation (primary, secondary)
- Does the household head have any additional wives who were not mentioned in the household roster?
    - How many other wives does the household head have?
    - If the household head has one or more wives who are not considered to be a member of his household, ask the following questions:
        - What is the name of the wife?
        - How many children does she have?
        - Where does she live? (different household, same compound, same village, different village, city/urban area)
        - Does each wife maintain any agricultural plots or livestock on her own?

5 Conclusions

As an agricultural researcher, empowering women farmers might not be your objective, yet this guide can be useful to include a gender lens into your research through the collection and analysis of sex-disaggregated data. The answer to the question why bother about gender and sex-disaggregated data in agricultural research is easy. Gender intersects with many different aspects of agricultural research and development such as land- and water-use patterns, value chains, productivity and sustainability, access to knowledge and resources, and biodiversity. Integrating gender is crucial for better and more sustainable project outcomes and research results, but a complete gender research and gender analysis may not be the first objective of many socio-economic researchers in the food and non-food biomass production sector. However, this guide helps to add a more differentiated perspective related to women and men in agriculture with only little effort through the collection and analysis of sex-disaggregated data. The inclusion of just a handful of questions provides the researcher with information and insights into social relations and dynamics of farming systems that, if not considered, might hamper the effectiveness of projects, initiatives or policy activities. The guide was developed based on experiences gathered in the field in Latin America, Asia and Africa. However, the responsibility remains with the researcher to choose the "right" questions for the research topic and adapt them to the local circumstances. The guide also has its limitations. Some questions remain sensitive terrain, and you will struggle to get genuine responses through quantitative methods. In some cases, you might work in areas where first gender sensitization activities have already taken place so that female and male farmers are likely to say what they think is expected from them or what they were taught: "we distribute our work equally", "we decide everything mutually", etc. Reality is often different. Hence, it is important to cross-check such information, ideally through different methods, especially qualitative ones, and keep your eyes open, observe and analyse what you see and experience in the field. Informal conversations with locals or field assistants can often reveal interesting cultural information, and they might help you in your cultural interpretation. Additional qualitative research is often indispensable to gain a better understanding of the gender context or certain aspects in order to set up properly the survey tool and better explain the findings from the survey.

It remains important to highlight that not only relevant questions are included in your questionnaire and considerations of sex and gender are applied while conducting your survey, but also that the sex-disaggregated perspective needs to guide your analysis. After the field work is over, many researchers tend to forget to differentiate male and female perspectives in their analysis and do not make proper use of the valuable data that they have collected. Instead they step back to subsume findings under "the farmer", "the interviewee", "the participant", which again weakens the research and does not justify the claim of having done gender-disaggregated work. This means a loss of relevant information for your project outcome and science, and it is a waste of your work time and that of your enumerators. Having a detailed sex-disaggregated analysis is attractive for high-ranking scientific journals, and supports your project outcomes with regard to adoption and sustainability of project activities and/or technologies.

This guide was developed for doctoral researchers and socio-economists who like to add a gender lens to their research without fully engaging in gender research and analysis. It is meant as a starting point to enable everyone, including people with little expertise or only limited interest in gender, to make their research more relevant to the livelihoods of women and men and hence projects more successful and attractive for donor institutions and results more interesting to scientific journals.

The guide as such, of course, does not exhaust the topics or provide researchers with solutions to gender issues that might emerge during the research process. Sex-disaggregated data collection and analysis is only a step towards a better understanding of how gender affects agricultural production and outcomes, yet it needs to be followed by approaches and solutions of how inequality and

disparities between women and men that hamper agricultural outcomes and development can be overcome. Lessons must be learned and shared from projects on the ground, so that effects of well-intended activities can be better understood and negative effects reduced.

6 Further reading suggestions

6.1 Examples of surveys in regard to gender in agriculture

CCAFS gender survey: https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl:1902.1/22584

Survey for the 'Women Empowerment in Agriculture Index' (WEAI): http://www.ifpri.org/publication/ womens-empowerment-agriculture-index

6.2 Books regarding gender research in agriculture and rural development

FAO, 2011. The state of food and agriculture, 2010-2011. Women in agriculture: Closing the gender gap for development. FAO, Rome, IT.

Feldstein, H.S., Jiggins, J., 1994. Tools for the field: Methodologies handbook for gender analysis in agriculture. Kumarian Press, West Hartford, US.

March, C., Smyth, I., Mukhopadhyay, M., 1999. A Guide to Gender-Analysis Frameworks. Oxfam GB, Oxford, UK.

Meinzen-Dick, R., Quisumbing, A.R., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., Beintema, N., 2011. Engendering Agricultural Research, Development, and Extension. International Food Policy Research Institute (IFPRI), Washington D.C., US.

Momsen, J.H., 2010. Gender and Development, 2nd ed. Routledge, London and New York.

Moser, C.O.N., 1993. Gender Planning and Development: Theory, Practice & Training. Routledge, London and New York.

Poats, S., Schmink, M., Spring, A., 1988. Gender issues in farming systems research and extension. Westview Press, Boulder, US.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), 2014. Gender in Agriculture: Closing the Knowledge Gap, Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Rao, A., Anderson, M.B., Overholt, C.A., 1991. Gender analysis in development planning. Kumarian Press, West Hartford, US.

UNECE (2010). Developing gender statistics: A practical tool. Geneva, CH: United Nations & United Nations Economic Commission for Europe.

World Bank, 2009. Gender in Agriculture Sourcebook. World Bank, Washington, D.C., US.

6.3 Online sources

BRIDGE: a specialised gender and development research and information service based at the Institute of Development Studies (IDS) in the UK with over 3,000 specially selected gender documents and resources. http://www.bridge.ids.ac.uk/

Free online course on "***Integrating gender into scientific research***" by SCiDevNet: http://scidevnet.teachable.com/

The International Food Policy Research Institute (IFPRI) in the USA has done lots of gender research and tool developments, all to be found under http://www.ifpri.org/topic/gender. Some examples are:

- **Toolkit** from IFPRI: Materials are provided to assist researchers with applying a gender analysis to their work. http://www.ifpri.org/book-20/ourwork/researcharea/gender/gender-tool-box
- **Gender Mapper:** Together with the International Water Management Institute (IWMI), IFPRI is developing a "gender map" of agriculture in Sub-Saharan Africa in order to better understand how to target agricultural interventions to women and men farmers. http://gender.mappr.info/explore.php

Un Women and its training center: http://www.unwomen.org/en and https://trainingcentre.unwomen.org/

References

Alderman, H., Chiappori, P.-A., Haddad, L., Hoddinott, J., Kanbur, R., 1995. Unitary versus collective models of the household: Is it time to shift the burden of proof? World Bank Research Observer 10, 1–19.

Baker, J.L., 2000. Evaluating the Impact of Development Projects on Poverty A Handbook for Practitioners. World Bank, Washington D.C., US.

Behrman, J.A., Meinzen-Dick, R., Quisumbing, A.R., 2014. Understanding Gender and Culture in Agriculture: The Role of Qualitative and Quantitative Approachesw, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Ed.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Behrman, J., Karelina, Z., Peterman, A., Roy, S., Goh, A., 2012. A Toolkit on Collecting Gender & Assets Data in Qualitative & Quantitative Program Evaluations.

Bellon, M., 1996. The dynamics of crop infraspecific diversity: A conceptual framework at the farmer level. Economic Botany 50, 26–39.

Bellon, M.R., Berthaud, J., Smale, M., Aguirre, A., Taba, S., Aragon, F., Dıaz, J., Castro, H., 2003. Participatory landrace selection for on-farm conservation: An example from the Central Valleys of Oaxaca, Mexico. Genetic Resources and Crop Evolution 50, 401–416.

Berti, P.R., Krasevec, J., FitzGerald, S., 2004. A review of the effectiveness of agriculture interventions in improving nutrition outcomes. Public health nutrition 7, 599–609. doi:10.1079/PHN2003595

Beuchelt, T.D., 2008. Support Networks of Rural Households. A Case Study of Risk-Management in Northern Vietnam. Margraf Publishers, Kommunikation und Beratung - Sozialwissenschaftliche Schriften zur Landnutzung und ländlichen Entwicklung No. 86. Weikersheim, Germany.

Beuchelt, T.D., Badstue, L., 2013. Gender, nutrition- and climate-smart food production: Opportunities and trade-offs. Food Security 5. doi:10.1007/s12571-013-0290-8

Bioversity International, n.d. Tips for asking gender-responsive questions [WWW Document]. URL http://www.bioversityinternational.org/e-library/publications/detail/tips-for-asking-gender-responsive-questions/

Bryman, A., 2012. Social Research Methods, 4th ed. Oxford University Press, Oxford, GB.

CCAFS, FAO, 2012. Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development. Rome, IT.

CIDA, 1997. Guide to gender-sensitive indicators. Canadian International Development Agency (CIDA), Quebec, CA.

Deere, C.D., 2005. The Feminization of Agriculture? Economic Restructuring in Rural Latin America (No. 1), Occasional Paper. Geneva, CH.

Doss, C., 2001. Designing Agricultural Technology for African Women Farmers: Lessons from 25 Years of Experience. World Development 29, 2075–2092. doi:10.1016/S0305-750X(01)00088-2

Doss, C., 2013. Data Needs for Gender Analysis in Agriculture, IFPRI Discussion Paper No. 01261. Washington D.C., US: IFPRI.

Doss, C., Kieran, C., n.d. Standards for collecting sex-disaggregated data for gender analysis [WWW Document]. URL http://pim.cgiar.org/2014/07/31/standards-for-collecting-sex-disaggregated-data-for-gender-analysis/ (accessed 2.20.17).

Doss, C.R., 1996. Testing among models of intrahousehold resource allocation. World Development 24, 1597–1609. doi:http://dx.doi.org/10.1016/0305-750X(96)00063-0

Doss, C.R., 2002. Men's Crops? Women's Crops? The Gender Patterns of Cropping in Ghana. World Development 30, 1987–2000.

Doss, C.R., 2014. Data Needs for Gender Analysis in Agriculture, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springe, Rome, IT and Dordrecht, NL.

FAO, 2010. Gender and Nutrition [WWW Document]. URL http://www.fao.org/docrep/012/al184e/al184e00.pdf

FAO, 2011. The state of food and agriculture, 2010-2011. Women in agriculture: Closing the gender gap for development. FAO, Rome, IT.

Fischer, I., Beuchelt, T.D., Dufhues, T., Buchenrieder, G., 2010. Risk-Management networks of ethnic minorities in Vietnam. Asia-Pacific Development Journal 17, 93–118.

Garbarino, S., Holland, J., 2009. Quantitative and qualitative methods in impact evaluation and measuring results. Governance and Social Development Resource Centre (GSDRC); Social Development Direct.

Hellin, J., Keleman, A., Bellon, M., 2010. Maize diversity and gender: research from Mexico. Gender & Development 18, 427–437. doi:10.1080/13552074.2010.521989

ILRI, 2012. Strategy and plan of action to mainstream gender in ILRI. Nairobi, Kenya.

Johnson, N.L., Quisumbing, A.R., 2009. Data needs for measuring impacts on women's assets and asset disparities [WWW Document]. presentation from the Inception workshop of the Gender, Agriculture and Assets Project. November 2009, Narobi Kenya. URL http://de.slideshare.net/genderassets/data-needs-presentation-nov-5-final

Kabeer, N., 1999. Resources, Agency, Achievements: Reflections on the Measurement of Women' s Empowerment. Development and Change 30, 435–464.

March, C., Smyth, I., Mukhopadhyay, M., 1999. A Guide to Gender-Analysis Frameworks. Oxfam GB, Oxford, UK.

Meinzen-Dick, R., Johnson, N., Quisumbing, A.R., Njuki, J., Behrman, J., Rubin, D., Peterman, A., Waithanji, E., 2011a. Gender, Assets, and Agricultural Development Programs, CAPRi Working Paper. CAPRi Working Paper No. 99, Washington D.C., US: IFPRI.

Meinzen-Dick, R., Quisumbing, A.R., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., Beintema, N., 2011b. Engendering Agricultural Research, Development, and Extension. International Food Policy Research Institute (IFPRI), Washington D.C., US.

Momsen, J.H., 2010. Gender and Development, 2nd ed. Routledge, London and New York.

Moser, C.O.N., 1993. Gender Planning and Development: Theory, Practice & Training. Routledge, London and New York.

OPM, 2010. Using Household Surveys for Gender Analysis in Developing Countries, OPM briefing notes 2010-08. Oxford Policy Management (OPM). Oxford, UK.

Paris, T.R., Pingali, P.L., 1996. Do agricultural technologies help or hurt poor women? Competition and conflict in Asian agricultural resource management: Issues, Options, and Analytical

Paradigms: IRRI Discussion Paper Series No. 11, pp. 237-245. Edited by P.L. Pingali and T.R. Paris. International Rice Research Institute, Los Banos, Lagun 237–245.

Ponniah, A., Puskur, R., Workneh, S., Hoekstra, D., 2008. Concepts and practices in agricultural extension in developing countries: A source book. IFPRI (International Food Policy Research Institute), Washington, DC, USA, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 275 pp.

Quisumbing, A.R., 2003. Household Decisions, Gender, and Development. International Food Policy Research Institute (IFPRI), Washington D.C.

Quisumbing, A.R., Maluccio, J.A., 2000. Intrahousehold allocation and gender relations : new empirical evidence from four developing countries, FCND Discussion Paper No. 84. FCND Discussion Paper No. 84. Washington D.C., US: IFPRI.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A., 2014. Closing the Knowledge Gap on Gender in Agriculture, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Ed.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), 2014. Gender in Agriculture: Closing the Knowledge Gap, Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL. doi:10.1007/978-94-017-8616-4

Sen, G., Mukherjee, A., 2014. No Empowerment without Rights, No Rights without Politics: Gender-equality, MDGs and the post-2015 Development Agenda. Journal of Human Development and Capabilities 15, 188–202. doi:10.1080/19452829.2014.884057

UN Women, 2016. Gender equality glossary [WWW Document]. UN Women Training Centre. URL https://trainingcentre.unwomen.org/mod/glossary/view.php?id=36 (accessed 3.31.17).

UNECE, 2010. Developing gender statistics: A practicaltool. United Nations & United Nations Economic Commission for Europe, Geneva, CH.

UNICEF, 2011. Promoting Gender Equality: An Equity-Focused Approach to Programming. New York, US: United Nations Children's Fund (UNICEF).

World Bank, 2009. Gender in Agriculture Sourcebook. World Bank, Washington, D.C., US.

World Bank, 2011. Gender equality and development. World Development Report 2012. Washington D.C., US.

Annex: Typical steps in quantitative field research

The research process can be simplified in a stepwise process, though it is often iterative. The following briefly describes the different steps of the research process and highlights where specifically gender aspects should be considered. It is based in part on UNECE (2010), where also more detailed information on how to produce gender statistics can be found.

1. Start with identifying the relevant research objectives, issues and questions. Ideally, a gender perspective is already explicitly mentioned in the research question, e.g., which maize varieties and crop characteristics are preferred by women, which by men? What is the impact of irrigation on yield, household food security and work load of women and men? Doing a survey without properly defined research questions is not a good scientific practice. This step includes a sound revision of existing literature as well as of existing concepts, definitions, and methods to produce unbiased gender-relevant information (UNECE, 2010).
2. Define the appropriate unit of analysis which is needed to answer the research question. The answer to the research unit helps also to identify whom to interview. For example, if we are interested in plots, we need to identify who is managing the plot – in many African countries there are female and male plot or crop managers. If that is the case, the plot manager or worker on the plot, i.e. probably women and men, needs to be interviewed.
3. Use qualitative research tools to quickly identify key issues around gender which need to be addressed in-depth in the quantitative research if sufficient information from literature, previous research or sound knowledge of the research region is not available. Focus group discussions help to better design the research. To identify pertinent gender issues, you can use a common gender analysis tool, i.e. the Harvard Framework[3], to find out which key gender issues are relevant, where further research is needed, and which questions should be in a baseline for impact measurement (e.g. labour division, resource access, individual health and food security, inclusion of youth or marginalized groups). Focus groups can also help to identify how men and women understand particular concepts and questions and to determine the language / wording of the questionnaire to minimize gender bias (UNECE, 2010).
4. Rethink the relevant research questions and identified research unit after the qualitative research period and adjust according to the field findings.
5. Choose the appropriate research methods to answer the research questions. Do we need quantitative or qualitative methods, or is a mixed method approach best? Do we need household or intra-household surveys, focus group discussions, key informant interviews, experimental games on risk, modelling approaches,…? Some questions related to gender issues are more easily identified with qualitative methods, especially when it comes to power issues, norms and values or domestic violence.
6. Determine the type of data analysis which you like to do. For quantitative data, this can range from, for example, descriptive, inferential, predictive or impact analysis. For qualitative data, different methods exist for example content analysis, grounded theory, case study or narratives.
7. Determine the variables which are needed to answer the research question and consider possible gender differentials and women's and men's roles and contributions in agriculture and (family) farming systems. Establish the relevant survey question around these variables. Do not choose too many variables, as a good survey should not take more than 1 hour per interview, since the concentration of the interviewer and interviewee strongly decreases after this time and data quality diminishes, and you need to show respect to the other pressures on the interviewee's time.

[3] For more information on the Harvard Framework see (March et al., 1999) and http:// www. ilo. org/public/english/region/asro/mdtmanila/training/unit1/harvrdfw.htm.

8. Determine the appropriate sample size. Sample size estimations can vary when we like to add a gender perspective to our research – not only in quantitative but also in qualitative research. In case the sex of a person is also estimated to influence the outcome variable, e.g. adoption rates of a new crop variety, the sample size needs to take this into account and be higher to detect differences. Therefore, this should be carefully considered in the sample size calculations.
9. Plan data collection methods and procedures. Depending on the research unit and the sex of the person to be interviewed, special measures need to be taken. For example, in many cultures it is not appropriate that a male enumerator interviews a female farmer. In this case, female enumerators need to be found.
10. Train the enumerators properly so that all understand the questions in the same way and that the enumerators do not show personal values in the interviews. Pay special attention to the gender issues and questions so that all enumerators understand the underlying concepts and ideas. A pre-test is recommended especially for the quantitative survey to identify errors in the questionnaire, and unclear questions and codes. Questions should be adjusted according to the feedback from the field. In some cases, a second pre-test is recommended.
11. Start the data collection: Consider timing and available resource (transport, money, etc.) when both spouses are to be interviewed. Often both spouses are not in the same place at the same time making it necessary for the interviewer to return at a later date. Finding a time of day when both spouses are at home for the interview is a challenge, e.g. a spouse is not present due to farm or off-farm work, is selling or buying at a market or participating in meetings. It might not always be possible to interview both spouses, and this affects data analysis. Migration patterns can make the situation even more complex, especially when it is planned to establish panel data4. In order to have a sufficient number of couples for a good panel dataset, the number of interviewed households might need to be higher than first calculated to account for the losses due to unavailability of spouses.
12. After data capturing and data cleaning, add a sex-disaggregated perspective and if possible, a gender lens, to your data analysis. This can go far beyond differentiating between men and women in descriptive statistics. For example, use non-unitary household models instead of assuming a unitary household.
13. The final step is writing up the results into reports, exciting publications and presentations which will close the existing gender data gaps.

[4] Panel data, also called longitudinal data, is data that is collected in several survey rounds over a longer time span with the same questions asked to the same individuals or households.

Adding a gender lens in quantitative development research on food and non-food biomass production:

A guide for sex-disaggregated data collection

Tina Beuchelt and Sarah Nischalke

Abstract

A major objective of socio-economic research for agricultural development is to understand, guide and measure technology adoption, support agricultural and rural development policies, and analyse impacts of technological innovations, development projects and policy interventions. Research has clearly shown that gender matters in agricultural development, since women as well as gender issues play a major role in achieving success and impact, especially in family-based production systems. However, there are large data and thus considerable knowledge gaps in this regard.

This guide equips you with plenty of advice to collect sex-disaggregated data and add a gender lens to your socio-economic research in the agricultural sector. It makes you familiar with the need for and advantages of sex-disaggregated data and research, it introduces gender concepts and important definitions and provides practical advice for the planning process of your research and for conducting field work. It identifies six key topics where gender plays a major role in the food and non-food biomass production such as the labour division in farming systems, adoption of technologies and impacts, access to and control over resources and assets, access to information and advisory services, and gendered livelihoods. The guide provides you with a wide choice of quantitative survey questions that can be integrated into your questionnaire based on your research needs. There are 40 minimum questions and many advanced questions to choose from so that you can incorporate a perspective on women's and men's farming activities and agricultural livelihoods into your research. The minimum questions in each section help you to cover the most important gender-related aspects of the specific agricultural topic, while the advanced questions will help you to explore a research area or aspect through the gender lens in more detail. Of course, the questions need to be adapted to the local contexts and circumstances.

Integrating some of these questions in your research will help you to upgrade your research outputs by producing information that draws attention and that meets current standards of international research and development agendas. To meet such expectations, it remains important that not only relevant questions are included in your questionnaire and considerations of sex and gender are applied while conducting your survey, but also that the sex-disaggregated perspective needs to guide your analysis. Having a detailed sex-disaggregated analysis is attractive for high-ranking scientific journals, and supports your project outcomes with regard to adoption and sustainability of project activities and/or technologies.

Table of Contents

List of Tables

Acknowledgements

Many thanks for the sound review comments by Eva Youkhana and Hannah Jaenicke. Further thanks for valuable discussions and comments go to Lone Badstue, Kathy Colverson, Alessandra Galie, Silvia Silvestri, Javier Becerril, Hugo de Groote, Songporne Tongruksawattana, Jena Pradyot, Monica Fisher, Jeetendra Aryal, Surabhi Mittal, and Vongai Kandiwa. The initial ideas of this discussion paper were developed at CIMMYT within the frame of the 'CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)'. This discussion paper was fully drafted within the project "Improving food security in Africa through increased system productivity of biomass-based value webs" (BiomassWeb) funded by the German Federal Ministry of Education and Research (BMBF) based on the decision of the parliament of the Federal Republic of Germany (FKZ 031A258A), and the project NutriHAF "Diversifying agriculture for balanced nutrition through fruits and vegetables in multi-storey cropping systems" funded by the German Federal Ministry of Food and Agriculture (BMEL).

1 Introduction

Food and non-food biomass production is an important activity for all countries, high- and low-income countries alike. The agricultural sector in these countries is still a main job provider with many family farms involved in the production. In most countries and societies, a clear-cut division by sex of who does what on a farm and in the household exists based on societal traditions and norms. In general, women's work in the food and non-food biomass production includes everything from working in fields and caring for livestock to post-harvest processing activities, storage of crops and animal products, seed selection, and marketing. Gendered patterns of cropping exist, for example specific tasks like weeding or ploughing are attributed to be a "female" job or "male" job, respectively or, for example in West Africa, there are specific crops that are typically rather grown by men than by women (Doss, 2002).

Mainly on family farms, key problems are the work load and related drudgery as well as low yields, and research on labour-saving and yield-enhancing technologies is common. New technologies are introduced by agricultural extension or development projects. Usually, new agricultural technologies are considered to be gender neutral or to benefit both women and men, e.g. through decreasing labour input and drudgery. However, whether there is a positive or negative effect of the technology on women depends on the local context with its given cultural and social characteristics (Beuchelt and Badstue, 2013). Several studies have shown that women´s labour burden can increase with new technologies when women either take on additional tasks or their current tasks become more burdensome. For example, fertilizer application may mean that more weeding is necessary or that more output will require processing – both tasks usually done by women (Doss 2001). As shown in a study by Paris and Pingali (1996), the introduction of a mechanical thresher in the Philippines reduced labour for both men and women, since threshing was much faster. Farmers were thus able to grow a second rice crop, which benefitted women as it increased their employment opportunities in transplanting, weeding, and harvesting. The benefits outweighed the reduced labour demand for threshing. In contrast, in Bangladesh the mechanical thresher affected poor and landless women negatively because it replaced their work as threshers. Hence, development processes, economic growth, and modernization affect women in different ways than men, and, though often assumed, they have not been gender neutral (Momsen, 2010).

Gender differences in agriculture relate not only to labour but also to many other issues. For example, male and female household members can have different varietal crop preferences given their different uses. In Latin America, women and men prefer different qualities because of the intended use of the maize and related labour issues (Bellon, 1996; Bellon et al., 2003; Deere, 2005; Hellin et al., 2010). Women's reproductive role usually means that they aim to ensure that varieties are both palatable and nutritious and also meet processing and storing requirements, while men prefer high yielding varieties to fulfil their role as the income earner.

The modernization of agriculture like the introduction of agricultural export-oriented crops for smallholder farmers also changes the traditional division of labour between women and men, often increasing women's dependent status as well as their workload. At the same time, it displaces women from their traditional productive functions, and thus diminishes their income, power, and status (Momsen, 2010; Moser, 1993). Women tend to lose income and control over an agricultural product when it becomes more commercialized and receives better prices. As soon as agricultural production becomes financially lucrative, for example, when being supplied to national and international markets thanks to an intervention, men often take over production and marketing. Thus, women farmers face difficulties in maintaining a profitable market niche and risk losing control over resources such as land (Berti et al., 2004; Doss, 2001; Momsen, 2010; World Bank, 2009).

The examples above clearly show that gender matters in agricultural development, and that agricultural technologies and policies are typically not gender neutral and can affect women in an

unintended way. Hence, a major objective of socio-economic research for agricultural development is to understand, guide and measure technology adoption, support agricultural and rural development policies, and analyse impacts of technological innovations, development projects and policy interventions. As women and gender issues play a major role in achieving success and impact of technological innovations and interventions, especially in family-based production systems, it is important to include a gender lens in socio-economic research for agricultural development (Beuchelt and Badstue, 2013).

1.1 Reasons to address gender in research for food and non-food biomass production

Addressing gender issues in agricultural research, development and extension systems as well as in policies will contribute significantly to meeting the food and nutritional needs of the future population for a number of reasons (FAO, 2011; Meinzen-Dick et al., 2011b). In terms of economics and efficiency, current gender inequalities are large and persisting, and undermine the sustainable development of the agricultural sector. The inequalities relate to many assets and resources, inputs, and services such as land, livestock, labour, education, extension and financial services, and technology. This imposes costs on the agricultural sector, limits its efficiency, and affects the broader economy and society (FAO, 2011). The FAO estimates that if women had the same access to productive resources as men, they could increase yields on their farms up to 30%. This could raise total agricultural output in developing countries by up to 4%, which in turn could reduce the number of hungry people in the world by 12–17% (FAO, 2011).

Food security, nutrition diversity, and household welfare are affected by gender roles and relations. Research has shown that an increase in women's control of resources, especially income, has positive effects on a number of important development outcomes such as food security, education, and child nutrition. Increasing men's income, on the other hand, does not show the same effects (FAO, 2010; Meinzen-Dick et al., 2011b; World Bank, 2009). Development outcomes in the agricultural sector cannot be equitably distributed as long as the socially constructed relationship between men and women continues to promote such disparity of resources. If gender is not taken into account, the same development programs that are meant to help can actually enhance the discrimination and marginalization of women, potentially increase food insecurity, and decrease nutritional diversity of a household and its members. Finally, gender equality is also a development objective in itself as it is a basic human right (Quisumbing et al., 2014). Just as reduction in income poverty or ensuring food and nutrition security is part of development, so too is narrowing the gaps in the well-being between men and women (World Bank, 2011, 2009).

Still little is known about how agricultural research and development programs can most effectively deliver outcomes of well-being and higher incomes in a way that acknowledges the differential access to and control over assets, and that lead to more equitable outcomes (Meinzen-Dick et al., 2011a). Farm technologies and interventions can imply significant trade-offs when applying a household and farming systems perspective. They can both positively and negatively change the access to assets and the role and power status of women in a household. Donors are therefore increasingly interested in gender equity and demand the incorporation of gender issues in projects. Donors also require sex-disaggregated data and numbers and statistics on gender to mobilize more resources, and to improve their projects and policies.

1.2 How can sex-disaggregated data strengthen your research?

Though it is clear nowadays that gender matters for development, the evidence base is still weak (FAO, 2011; World Bank, 2011). There are plenty of data gaps which need to be filled by quantitative and qualitative research. To understand gender relations in agriculture, different sources of

information and different methods of analysis are needed to be brought together (Behrman et al., 2014). Collecting and analysing sex-disaggregated data is one important step. Information is specifically lacking on the role, responsibilities and decision-making of women in male-headed households and in households headed by both a woman and a man (mixed households). As shown below, distinguishing between male- and female-headed households is a first step forward, but this generally says little about gender aspects as such in a society. Contrary to the assumption of economists, family farm households often do not collectively decide and allocate resources to where they are best used (Quisumbing et al., 2014). Therefore, research needs to acknowledge the different roles and responsibilities of men and women in male-headed or mixed households. This increases accuracy and reliability of the data.

Sex-disaggregated data makes your research stronger, as it becomes more relevant for project leaders, policy makers, extension agents and male and female end users of research outputs. Through consideration of gender aspects, the adoption of technologies and research outputs is very likely to increase as shown by several case studies (but even on this issue more research is needed). Since the current evidence base is weak, sex-disaggregated data and its analysis helps to increase the acceptance of your papers in high-impact peer-reviewed journals, and makes it more attractive for donors to fund your research. Summing up, there are several reasons to include gender perspectives in the research: (i) efficiency reasons, (ii) equity reasons, (iii) donor requirements, and (iv) limited research knowledge and thus a great potential for publishing.

1.3 Purpose and objectives of this guide

Talking to many socio-economic researchers and doctoral students, a common question was how to quickly and simply integrate a gender lens into their surveys without having to become a gender expert or to do a gender analysis. The purpose of this guide is to respond to this need and provide suggestions for sex-disaggregated data collection and hence analysis related to food and non-food biomass production. There are plenty of exhaustive gender manuals around, so how is this one different?

In contrast to other guides, we specifically focus on research for agricultural development. In addition, this guide provides an entry point – particularly for doctoral students and non-gender researchers – into the collection and analysis of sex-disaggregated data at household and intra-household level. The main focus is on suggestions of how to engender quantitative survey questions where otherwise differences between men and women in farm activities and in their livelihoods and resource access would be ignored.

We would also like to point out the limits of this guide: Sex-disaggregated data collection and analysis is only a step towards a better understanding of how gender affects agricultural production and outcomes, yet it needs to be followed by approaches and solutions of how gender inequality and disparities that hamper agricultural outcomes and development can be overcome. This guide is not meant to be prescriptive or exhaustive. We refrained from repeating the debates about gender in development studies and gender mainstreaming as we do not want to overburden this guide. We also do not want to reiterate the importance of gender in agriculture as great literature is available for this.[1]

The guide also does not provide enough information in case the research aims to conduct a sound gender analysis or be gender-sensitive from the design onwards. For those who like to enter into gender analysis, more background reading is recommended (for further literature suggestions and

[1] For example see Quisumbing et al. (eds.) (2014) and World Bank (2009).

online sources please see Chapter 6).[2] The users require a good knowledge of quantitative and qualitative research methods and analysis; we do not explain the basics of quantitative research.

1.4 How to use this guide

There are three parts which can be read independently, depending also on the knowledge level of the researcher. Hence, the guide does not need to be read from front to back. The **first part** (Chapter 2) is an introduction to the gender concepts and gender analysis. It introduces definitions and details on relevant aspects such as access, control and ownership over resources, gender roles, empowerment and agency, and gender equality and equity.

The **second part** (Chapter 3) explains in detail how a gender perspective can be integrated into your specific research and adapted to your research needs and objectives. It helps you to identify your relevant research areas, to define your methods and sample size, and to plan your data collection so that you can finally apply a gender lens to your data analysis. It deals with different survey types, i.e. "big" and additional research questions and research units (level of data collection), and provides important hints on gender biases and considerations for sex-disaggregated data collection.

The **third part** (Chapter 4) of the guide provides you with examples of survey questions for potential key topics such as gender roles in farming systems and labour division, including aspects of seasonality, crop production, livestock, non-market activities, reproductive activities, seed development and adaption, access and control over resources, gendered access to information and decision-making processes in households, adoption of technologies, gendered livelihoods including income sources, food security aspects and risks. The survey questions are divided into minimum questions that should definitely be asked if the topic is key for your research, and advanced questions that can provide your research with more in-depth information on the key topic. Here, only the relevant section for your survey needs to be read, or you can read all questions if you wish to get inspired about what could be asked.

[2] The provided literature references are purposely selected to include those where open-access options exist, except in some cases.

2 Useful gender concepts in farming systems research

Gender does not mean the sex of a person, i.e. women do not equal gender. Counting the participation of women in field days or in a project does not automatically mean that the project is gender sensitive. Women are also not a homogenous group and can have very different needs, constraints, and priorities depending on age, marital status, class, ethnicity or religion among others (Doss, 2001). "To understand gender dynamics, it is not sufficient […] to compare male and female farmers or male and female headed households. Instead, we need to understand systems of household behaviour embedded in the agricultural and non-agricultural economies. This is a forbiddingly complex problem, but we must recognize that technology adoption and technology impacts depend on complex interactions that defy simple characterizations" (Doss, 2001, p. 2076). The following brief presentation of concepts around gender helps to gain a common understanding of what gender, sex and different gender terminologies mean.

Sex and gender

Sex refers to the fixed biological differences between women and men. Sexual differences are the same throughout the human race because they are concerned with women´s and men´s bodies (March et al., 1999). The biological differences between women and men can create different needs and capacities, but these differences do not 'naturally' lead to or justify unequal social status or rights (UNICEF, 2011).

Gender refers to the socially constructed roles and status of women and men, and girls and boys. It is a set of culturally specific characteristics defining the social behaviour of female and male members of a society, and the relationship between them. Gender roles, status and relations vary according to place (country, region, village), groups (class, ethnic, religious, and caste), and generations and stages of the lifecycle of individuals. Women and men are thus not a homogenous group. It is necessary to be aware of and account for this heterogeneity though there is a certain global homogeneity of gender roles (Momsen, 2010). The roles and relations between women and men are dynamic and change over time (Doss, 2001). Gender is thus not about women or men but about the relationship between women and men (ILRI, 2012).

"In broad terms, gender defines and differentiates what women and men, and girls and boys, are expected to be and do (their roles, responsibilities, rights and obligations). To differing degrees and depending on the cultural context, gender can condition what these different groups are expected to think and feel (e.g., their preferences, hopes and the nature and extent of their aspirations)" (UNICEF, 2011, p. 8). Gender is the determining factor in defining who does what, who has what, who decides, and who has power. It is important to understand the issue of power in understanding gender relations, because discrimination and subordination of women persist (UNICEF, 2011).

Gender analysis

A **gender analysis** explores and highlights the relationships of men and women in society, their roles, rights and responsibilities, and how these interact and affect outcomes of (agricultural) projects or policies (Doss, 2013). Gender analysis is not only studying women. It is also not comparing male- and female-headed households. Though it is a common practice, it confounds gender and household structure and basically compares structurally very different household types (Doss and Kieran, n.d.). Gender analysis is also more than describing possible differences between women and men. It asks who does what, who has what, who decides and how, who gains and who loses (March et al., 1999). Gender analysis examines power relations within the households and how they interrelate with those at the community, state and international level. It looks at the private sphere involving the personal relationships, and the public sphere dealing with relationships in wider society. Gender analysis helps to explore and highlight the differential opportunities as well as access and control

over resources of women and men, their power relationships in the household and in society, and how this influences development outcomes for women, men, girls and boys (OPM, 2010). In agriculture, gender analysis provides insights into how the roles and responsibilities shape the decisions around agricultural production and processing (Doss, 2013).

The following are classic questions for gender analysis (Hill 2011 in CCAFS & FAO (CCAFS and FAO, 2012)):

- Who does what? How? Where? When? Why? (labour)
- Who uses what? How? Where? When? Why? (access)
- Who controls what/ who decides? How? Where? When? Why? (decision-making and control = power)
- Who knows what? How? Where? When? Why? (information = power)
- Who benefits from what? Who loses? How? Where? When? Why? (benefit sharing)
- Who is included in what? How? Where? When? Why? (participation)

By posing these questions, we also ask which women and which men (OPM, 2010), and thus acknowledge that differences can exist due to the location (country, region, rural or urban area), groups (class, ethnicity, religion, caste), generations, and stages of the lifecycle of individuals. Therefore, gender analysis takes existing social differences into account.

Resource access, control and ownership

When looking at the way resources are allocated between men and women, it is important to distinguish between the access to resources, the control and the ownership of resources. **Access to resources** is defined as the opportunity to make use of a resource (March et al., 1999). **Control over resources** is defined as having the power to decide how a resource is used and who has access to it (March et al., 1999), while **ownership** refers to the legal possession of a resource.

Gender division of labour and roles

Depending on the classification, women in rural areas usually have **reproductive and productive roles** (March et al., 1999), and sometimes a third is added, i.e. the **community role** (Momsen, 2010; Moser, 1993). The reproductive role refers to childcare and housework. The productive role can vary, for example, from subsistence food production to commercial agricultural production, petty trade or involvement in paid, formal employment. The community role refers to women's activities within the community, maintaining the social network and relations as well as to the provision of items for collective consumption such as contributions to religious festivals (Moser, 1993). The community role is often overseen and not recognized even though it is a fundamental part of the household's security and risk-management net (Beuchelt, 2008; Fischer et al., 2010). In general, rural men tend to occupy only the productive and the community role. Generating income, they are the "bread-winner" of the family. Their productive role is socially seen and valued, while the women´s multiple roles, often unpaid, are easily overseen. Labour tasks that are considered to be a female or male task vary cross-culturally, which implies that there is no natural or fixed gender division of labour (Momsen, 2010). To understand gender roles in production, gender roles within the household must also be understood (Momsen, 2010).

Gender indicators and statistics

Gender indicators: Gender-sensitive indicators are needed to point out gender-related changes in society over time, such as who does what in a household, who earns what income and owns which assets. The usefulness of gender indicators lies in their ability to point to changes in the status, responsibilities, roles and activities of women and men over time. They make it possible to measure progress towards more gender equity and determine when it is being achieved. Indicators help to better understand how development results can be achieved, and to identify the effects of policies

and interventions. Therefore, gender-sensitive indicators support and enable a more effective future planning and program delivery based on identified differences in the roles and responsibilities and assets of women and men (CIDA, 1997).

Gender statistics "is a field of statistics which cuts across the traditional fields to identify, produce and disseminate statistics that reflect the realities of the lives of women and men and policy issues relating to gender equality" (UNECE, 2010, p. 1).

Practical and strategic gender needs and interests

The needs and priorities of women versus men can be further broken down into 'practical' needs and 'strategic' gender interests. Practical gender needs or interests refer to interventions that improve the lives of women and girls within their existing roles by meeting basic needs (e.g., water, food, shelter, health care, income) or by helping them fulfil their current responsibilities and roles as defined by prevailing gender norms (UNICEF, 2011). For example, the introduction of water pumps and more efficient stoves that reduce the water-hauling burden and improve indoor air quality are two technologies that provide women with more time to complete other responsibilities. When living conditions are inadequate, it is necessary to meet the practical needs of girls and women, yet it is unlikely that gender inequalities will be reduced, since women's subordinate position in society, expressed for example in the division of labour, is not challenged (Moser, 1993; UNICEF, 2011).

Strategic gender interests challenge traditional gender roles and relations. They relate to the gender division of labour, power and control, and highlight the question of what is required to address unequal relationships or allocation of resources and opportunities between men and women. Strategic interests include issues such as legal rights, domestic violence, equal wages or a change in laws so that women can own or inherit land (Moser, 1993; UNICEF, 2011). These help to increase women's ability to take on new roles and gain empowerment (Momsen, 2010).

Many projects still assume that the inclusion of or focus on women in projects provides an immediate benefit for the women. It has now become clear that simply taking women into account, or counting women, is not sufficient to reach desired development objectives (UNICEF, 2011). "Merely working with girls and women does not necessarily advance gender equality or the empowerment of girls and women. Many think that because their programme caters to girls or women, they are taking a gender perspective and/or promoting equality. In fact, an effort can be gender-blind even when women are the target group if it fails to account for questions related to the gender division of labour (Who does what?), access to and control over resources (Who has what?), and power imbalances between women and men (Who decides?). Depending on its design and implementation, a programme that focuses on women could just as easily support an unequal status quo as it could promote social justice" (UNICEF, 2011, p. 10f). To achieve a faster change, (agricultural) projects need to include boys and men at household level and find male allies in communities.

Empowerment and agency

"One way of thinking about power is in terms of the *ability to make choices*: to be disempowered, therefore, implies to be denied choice" (Kabeer, 1999, p. 436). **Empowerment** is linked to the condition of disempowerment and "refers to the processes by which those who have been denied the ability to make choices acquire such an ability. In other words, empowerment entails a *process of change*" (Kabeer, 1999, p. 437). The ability to exercise choice depends on three dimensions: access and control over resources as a pre-condition to make choices, agency as a process, and achievements which are the outcomes of well-being (Kabeer, 1999).

Agency is the ability to define one´s goals and act upon them. It is often operationalized as "decision-making", however it can take other forms such as bargaining and negotiation, manipulation, subversion and resistance (Kabeer, 1999). To exercise greater control over one's life and have a

wider set of choices, the distribution of resources such as assets and knowledge need to be shifted and institutions and norms changed in favour of women (Sen and Mukherjee, 2014).

Empowerment means that both women and men are enabled to access resources and participate in politics and public life, and can take control over their lives by setting their own agendas. Especially important for women is that empowerment includes having bodily autonomy and integrity, and enjoying freedom from violence. While empowerment is about addressing immediate inequalities faced by women or men, it requires also changes in consciousness and agency that challenge patriarchal structures (Sen and Mukherjee, 2014). Empowerment implies an expansion in women's ability to make strategic life choices in a context where this ability was previously denied to them (Kabeer, 1999).

Gender-neutral, gender-sensitive or responsive and gender-transformative research

For development and research projects alike, there are different levels and approaches of how intensively gender aspects are considered and integrated in the project. **Gender-blind** projects and research fail to recognize that the roles and responsibilities of women/girls and men/boys are assigned to them in specific social, cultural, economic, and political contexts and backgrounds. They ignore the different roles and diverse needs and reinforce gender inequalities to achieve desired development outcomes (UN Women, 2016). **Gender-neutral** approaches and research aim to not reinforce existing gender inequalities but still do not consider gender as relevant to the development outcome. They work within existing gender division of resources and responsibilities and do not address existing gender norms, roles and relations (UN Women, 2016). **Gender-sensitive or -responsive** approaches attempt to address existing gender inequalities and see gender as a means to reach the project goals. They address gender norms, roles and access to resources in so far as needed to reach project goals. These approaches ensure that the needs of both women and men are considered and that they will both benefit. The approach aims to reduce harm, for example, by considering labour peaks and aiming to avoid excessive work burdens (UN Women, 2016). **Gender-transformative** approaches consider gender as central to achieving positive development outcomes and to contributing to more gender equality. They actively attempt to examine, question and change women's and men's gender roles and relations, power imbalances, and the distribution of resources and work responsibilities. The aim is to transform unequal gender relations, and to promote shared power, control of resources, and decision-making, and to support women's empowerment (UN Women, 2016). Agricultural research can be made gender transformative but this requires full gender expertise and hence this approach goes far beyond this guide.

3 Sex-disaggregated data collection in the research process

The integration of sex-disaggregation in quantitative data collection does not as such require the knowledge of new methods or tools, rather it is the use of common scientific procedures of quantitative and qualitative research to which a sex (and gender) lens is added (UNECE, 2010). This, of course, is not equivalent to a proper gender analysis where a good understanding and knowledge regarding gender, norms, power and equity issues is required. This chapter briefly discusses research areas where a gender lens is of interest in the agricultural sector, what to consider regarding the research unit and finally, general considerations for sex-disaggregated data collection. Typical steps of field research related to (sex-disaggregated) quantitative data collection are described in the Annex.

3.1 Typical research areas in agricultural and rural development

A major objective of socio-economic research for agricultural and rural development is to understand, guide and measure constraints in agricultural production, risks in agriculture and livelihoods, technology adoption and preferences, extension and impacts of technological innovations and policy interventions. To all these topics, a sex-disaggregated and a gender perspective can be added and is relevant.

In most family-based farming systems, it is crucial to understand the involvement of women and men and interlinkages between the farming and household system to create more effective projects and policies. Even when women are not performing agricultural tasks, they usually still use the derived agricultural products for home consumption or processing. Thus, they may have vested interests in crop or livestock varieties and diversity, technologies and agricultural management practices, and may well be affected by changes in the food and non-food biomass production systems.

When defining research topics, it can be helpful to first start thinking around overarching research questions which are of interest to research for development. In a next step, these general questions can be broken down to concrete examples and subsets of research questions. For example, overarching research questions can be: How do changes in agricultural production affect women and men, girls and boys? Which technologies/practices/policies can contribute to improving livelihoods while enhancing equity? What effects have suggested or existing agricultural technologies on women and men, girls and boys? Which institutional settings enable women to equally benefit from agricultural value chain development?

3.2 Unit of analysis and household concepts

The choice of the appropriate unit of analysis, the subject or object of study, depends on the research question that is to be answered. The unit of analysis is the 'who or what' that is to be analysed – and important for identifying where to incorporate sex-disaggregated data. It is not necessarily the same as the unit of observation. Common units of analysis in research for rural development are (Doss and Kieran, n.d.; Doss, 2014):

- Individual: The person(s) farming are interviewed to understand decisions, preferences, perceptions and knowledge. Especially in family farms, where women and men are involved in agricultural production, processing or food preparation, they usually need to be interviewed separately to identify potential differences between both.
- Intra-household: Here the farming couple is to be interviewed to understand interactions between people, livelihood activities and how these affect outcomes.

- Household: Agricultural households are usually both producers and consumers. To consider all activities, the household may be the adequate unit of analysis. A gender perspective can be added by aiming to understand who does what, who owns which resources, etc.
- Crop or plot or a value chain: For example, this includes the person (woman/man/couple) who is deciding what happens on the plot or with the crop, who does the work and who receives the income/output. Along the whole value chain or within a certain stage, again a gender perspective can be added regarding who does what, who earns how much, etc.
- Formal and informal organizations: For example, comparing the role of women and men in cooperatives and who benefits.

Depending on the objective of the research, different survey types are used. In agricultural research, most common are crop/plot/farm surveys focusing more on agricultural production (and maybe marketing) and household surveys, which include other livelihood activities. Each survey type has advantages and disadvantages when aiming to include a gender perspective (Doss, 2014).

A common concept of a household used in (quantitative) surveys is that a household consists of a group of persons, related or unrelated, who share the necessities of living, e.g. those who live under one roof and eat from the same pot for most of the year (OPM, 2010). This is in line with many economists, who perceive a household as one entity with one set of preferences and pooling their income (Doss, 1996). Perceiving households as homogenous in terms of family structure in many contexts hides complex family structures, e.g. in the case of polygamous marriages or migration patterns (OPM, 2010) and actually can lead to different outcomes of research (Doss, 2014).

Moser (1993) raises the question of whether we can generally work at household level for the needs of low-income households or whether we need to embark on an intra-household perspective considering the different needs of household members, specifically of women and children. The same question of course also applies to the research. Until now, most research projects and development programs on sustainable agriculture, seed system development, or innovation networks have largely been built on the assumption that by targeting the household, all household members will benefit from the intervention. The typical **household concept** assumes that individuals share the same preferences and equitably pool their resources (UNECE, 2010); this is a **unitary household model** (Quisumbing, 2003). Thus, in household surveys, the household head is identified assuming that this is the most senior decision-maker in the household. The relationships of other household members are then defined with respect to their relationship to the household head (OPM, 2010). This is in line with the assumption that the household head, usually the man, represents the household and thus that all attitudes and motivations of the household members are identical to his (Moser, 1993). However, it is not clear on which theoretical and empirical evidence these assumptions are based. The concept of the household head does not only make "a presumption about intra-household power relations but also supposes the household as a joint welfare unit. Both assumptions can conceal important gender-based differences in access to and control over resources and decision making" (OPM, 2010, p. 2).

The existing evidence shows that households are complex and heterogeneous, and thus do not act in a unitary manner when making decisions or allocating resources (Doss, 2001; Momsen, 2010; UNECE, 2010). As described by UNECE, the "concept of a household 'head' is no longer considered appropriate in many countries […]. The concept is difficult to define, particularly when gender issues are considered, and has little relevance in many current household situations" (UNECE, 2010, p. 16). The concept of the household as a unified economic entity fails to recognize intra-household resource and labour exchanges or allocations (Alderman et al., 1995). Empirical evidence shows that unequal exchange and inequality exists within households; therefore, a household is usually not a joint decision-maker and does not have a joint utility function (Moser, 1993). By using models other than the unitary household model, such as collective/cooperative, strategic/bargaining (non-cooperative), or independent individual models, the complex realities of family decision-making can

be better reflected (Quisumbing et al., 2014). Research using alternative models has shown that the redistribution of inputs and control over resources between men and women in the household has the potential for increasing productivity, food and nutrition security, and education (Alderman et al., 1995; Meinzen-Dick et al., 2011b; Quisumbing and Maluccio, 2000).

Small farms with their female and male household members have multiple objectives, and also often have multiple income sources while resources are typically limited. Interactions and potential conflicts regarding resource allocation arise between the farmer's objectives and his/her attitude towards risk as well as with regard to different crops, between crops and livestock, farm and household as well as on-farm and off-farm activities, since they all compete for the same resources. These interactions are very critical in decision-making and imply trade-offs and compromises, i.e. resources are allocated according to the priority of the household or of the most powerful household member. This does not necessarily include a shared priority setting between women and men, as priority setting is usually dominated by power relationships that are in favour of men (Ponniah et al., 2008).

The often cited feminization of agriculture also leads to different household types. Women´s access to resource access, intra-household power relations, and constraints can be very different depending on the marital status of the women. Many household surveys which try in some way to address "gender aspects" do so by comparing female-headed households with male-headed households. It is recommended to avoid such simple analysis for the reasons outlined above. They further specify that women find themselves as household heads for a variety of reasons, including migration of their spouse, divorce, and widowhood. The poverty and living circumstances of each situation can be very different. Therefore, they recommend analysing female-headed households taking into account the marital status to differentiate between never-married women, widows, or women whose husbands have migrated. In addition, questions are suggested on polygamous marriages, non-legal marriages, and that the absence of the spouse is more insightful than the usual status categories of single, married, separated or divorced (OPM, 2010).

3.3 Who should be interviewed?

In general, who should be interviewed depends on the research question, the unit of analysis and the unit of observation. There are conceptual and data limitations to standard household surveys when gender perspectives are to be integrated. In many household surveys, usually only one person is interviewed, and that is usually the household head, in most cases a man, irrespective of the question who is the most appropriate person to be interviewed. Instead of relying on general assumptions that the household head knows all the relevant answers and maximises the total household welfare, a reflection on what the household head may know and represent is necessary. It is important to identify the respondent who knows best the answer to the research questions, who is the owner of the knowledge; this is typically based on roles and responsibilities (Doss and Kieran, n.d.). It may be the wife, the husband, the grandmother or son, or both. While the household head may be the person representing the household to non-family members, he or she may not be the person who is cropping or selecting the seeds that are grown. He or she may be the main income earner but not the person managing the agricultural plot or taking care of the livestock.

Different people can be interviewed depending on the research question, i.e. both spouses, a man and a woman, randomly chosen people, or everyone that is relevant for a specific research question or set of survey questions. Depending on who is interviewed, you may get very different answers. Depending on the survey question, it can be further important to stratify or classify your data according to age, place (country, region, and village), group (class, ethnic, religious, and caste), wealth, etc., as these variables influence women's participation in farming, their decision-making, and their gender roles and livelihoods. Intra-household surveys are an important tool to ensure that both perspectives of a couple or men and women in the household are equally represented, and

such surveys are key when aiming to understand relations between individuals in the household. For gender analysis, it is necessary to interview women and men (Doss and Kieran, n.d.). By doing the same survey or parts of it separately, a secure space is created in which women and men can talk freely and express their perceptions and ideas (UNECE, 2010). Interviewing women and men in a household separately provides much more detail on intra-household resource allocation, income, time use and labour division, etc. One person does not have all the information, which is also due to gender differences in roles and responsibilities, and more sensitive issues such as additional incomes can be hidden from the spouses. An option is to introduce two units of enumerations in household surveys: a household-level unit and a person-level unit (UNECE, 2010). Data can thus be collected at household level and at individual level by interviewing women in addition to men (UNECE, 2010). It is not necessary to interview both women and men in the same household for all survey types or units of analysis. For labour surveys (e.g. regarding working conditions of plantation day laborers) or value chain analysis, it is sufficient to interview similar numbers of men and women, depending of course also on the distribution at the work place.

3.4 Considerations for sex-disaggregated data collection

During the data collection process, several issues may arise and gender biases be created. Not everything can be anticipated, but there are typical problems and issues when aiming to integrate disaggregation by sex and a gender perspective in the research. These should already be considered at the planning stage of the research. It is necessary to **respect the respondent**'s willingness and time. To introduce sex-disaggregated and gender-related questions in a household is not as easy as it might look, because traditional gender norms can present barriers. It can be challenging to explain to the husband why perceptions from both husband and wife are needed and why researchers want to interview his wife. Not in all cases do husbands give permission, and sometimes invent reasons to avoid an interview. The participation of a selected interviewee cannot be forced upon the person, as this is against good scientific practice and ethical considerations. Surveys should last at the most one hour (including translation). Especially if both spouses are interviewed, survey duration should be minimized in order not to take up too much of the household's time. It is important to be aware of and respect the general responsibilities of each respondent, e.g. women having to start food preparation to avoid household conflicts once the interview is over. A statement of consent from the interviewee should be included in the questionnaire and agreed upon by each interviewee, not only by the household head.

Data collection errors and causes of bias when collecting sex-disaggregated data

- **Concepts, terms and definitions are inadequate:** Common definitions and concepts (e.g. what constitutes a male- / female-headed household) may fail to reflect the gender differentiations in the target population. This is often followed by **erroneous wording of questions or communication problems.** The enumerators, translators and respondents may fail to understand the content or language of the questionnaire when the question wording is too technical or the terminology too complex or the correct terms are not used in their language/society (UNECE, 2010). This may happen more often in interviews with women than with men, as educational background and previous exposure to the survey topics may be lower. Local enumerators and people who know the culture well can help to find the right introduction or concepts to introduce the survey, e.g. not talking about gender roles but about family roles. This is ideally done before the interview round starts, e.g. through focus groups or key informant interviews.
- The respondent has to be in a position to answer the questions correctly. Depending on the research question, a woman or a man – or maybe both - might be the adequate person to be interviewed. **Selecting the wrong respondent** can be hence a major error (UNECE, 2010).

- **Spouse being present during interview:** The presence of the spouse during the interview is generally not recommended, as respondents usually do not speak freely but rather adjust their answers to the opinion of the spouse and thus try to avoid disagreement with the other spouse. Also, the respondent may be interrupted by the spouse who might try to direct the interview according to his/her views (UNECE, 2010). Therefore, it is recommended to interview husband and wife separately, especially when it comes to questions around access and control, income, decision-making, power, etc. In the latter case, research has shown that more accurate estimates are obtained when the persons are interviewed separately. General questions not related to individuals can be asked when both are present. Some questions such as on yields or crop storage are better asked in the presence of the couple, who can then discuss and exchange opinions. However, if plots are managed separately by household members, these questions should be asked separately. It is important to guarantee and maintain the confidentiality and privacy of responses, especially when more sensitive issues such as asset ownership are discussed.
- **Choosing the wrong enumerator:** In many contexts, when interviewing women, a female enumerator is needed to increase trust and confidence among the interviewed women but also to make sure not to offend local norms. This is part of the ethical considerations when planning the research, and one of the important issues where ethical clearance by an ethic board can be necessary. Usually, male enumerators cannot just enter a household and ask to talk to the women. In some cultures, this is a complete no-go and would lead to serious consequences for those participating in the research process. Thus, it is recommended in general that men are interviewed by male enumerators and women by female enumerators. However, experiences here differ among different countries and contexts as pointed out by Behrman et al. (2012). During the interviews, enumerators can also introduce personal values or a bias in the way they ask the questions because of prejudices, insufficient training or simple carelessness (UNECE, 2010). Especially for intra-household surveys, it is essential to count on very well-trained enumerators, who need to have a basic gender knowledge. A special training day during the general enumerator training is often required. Finding female enumerators to interview women can often be difficult, especially in countries where women cannot move around freely or strict gender norms exist, their security in the field is not ensured or where simply not enough interested women exist to do this kind of work. This needs to be evaluated when planning the research and can limit survey size or type of questions to be asked.
- **Obscuring the truth:** Respondents may "deliberately give a wrong answer, either to meet some socially acceptable norm or because they are fearful or suspicious about why the question is being asked" (UNECE, 2010, p. 18). For example, a woman may deny any domestic violence issues in the household.

3.5 Mixed-method approaches

"Why" questions like "why are things the way they are" are difficult to answer in quantitative surveys. Also many outcomes of projects and policies in regard to gender relations are not amenable to measurement using standard quantitative surveys, for example well-being, status, self-esteem, empowerment, vulnerability, social differentiation, social norms, and self-perceptions by individuals and communities of what it means to be "male" or "female" in a given society (Behrman et al., 2014). Ways to overcome these and other limitations in many (household) surveys in regard to the integration of a sex-disaggregated perspective can be through the use of qualitative assessments or mixed-method approaches.

Qualitative research can help us to understand gender norms which may affect the access and control of women over resources, their role in decision-making, etc. This type of research goes beyond pure sex-disaggregation and the description that women and men do things differently (or

not). They help us understand why these are gendered. “Understanding the underlying causes (rather than only the symptoms) of gender differences and inequalities leads to a better understanding of gender-based constraints […] This can be done by asking why things are as they are, what norms structure the ways men and women relate to each other (power relations) and to the resources we study, who enforces these norms and how, and what challenges exist to overcome the norms that cause inequalities and hinder effective and equitable resource management” (Bioversity International, n.d., p. 2).

A mixed-method approach uses both qualitative and quantitative research techniques. The quantitative methods provide data that can be aggregated and analysed to describe and predict relationships, and provide a broad, statistically valid overview. The qualitative methods can help to explain and probe those relationships and to explain contextual differences in the quality of these relationships, thus gaining insights into the “why” questions (Baker, 2000; Garbarino and Holland, 2009). Qualitative research can use social analytical frameworks to interpret observed patterns and trends, e.g. of the analysis of socially differentiated outcomes, and to analyse poverty as a dynamic process rather than a static outcome (Garbarino and Holland, 2009). Mixed-method approaches can be used for more than simply triangulating data from more than one data source or method to cross-check findings. As mentioned by Behrman et al. (2014), there are several purposes for mixing methods, ranging from (i) triangulating data to see convergence of results; to (ii) identifying complementarities, i.e. examining overlapping and different facets of a phenomenon; to (iii) discovering paradoxes, contradictions, fresh perspectives; to (iv) using the methods sequentially, such that results from the first method inform the use of the second method; and finally (v) to add breadth and scope to a project.

There are advantages and disadvantages in the use of these approaches which we will not further discuss here; a good overview is given by Bryman (2012) and Behrman et al. (2014). Concluding, it can be said that “[m]ixed methods work allows the qualitative to inform the quantitative and vice versa, thus expanding the depth and breadth of research and providing a more complete picture of gender relationships” (Behrman et al., 2014, p. 49).

4 Key topics and survey questions related to women and men in farming systems research

In farming systems, women and men have different roles and responsibilities, and thus often attach different weight to technologies and practices. While the men's activities are often more visible and understood in the farming system, the often less visible activities of women need also to be identified to ensure that women are not losing out and ideally also benefit. The adoption of new farming practices or technologies will have different implications for women´s and men´s income, labour requirements, livelihoods and well-being (CCAFS and FAO, 2012). To account for this perspective, the quantitative survey requires additional or different sets of questions than the usual household survey.

The following provides suggestions of survey questions that include a sex-disaggregated and, subsequently, a gender perspective in farming systems research. Gender relations are complex and context specific (Quisumbing et al., 2014), so we are aware that it is difficult to provide survey questions which are applicable everywhere. However, we still do it since we found the need for it among researchers who are not gender experts. In all cases, it is important to adjust the questions to the local social context, and not to apply them as a "one-size-fits-all" tool.

Questions are differentiated for each topic between suggested "minimum" questions, which are easy to be collected and contain basic gender perspectives, and "advanced" questions aiming to gain more insights. Not all topics and questions are needed for a survey, as this would otherwise become far too long. Whether the minimum questions or the advanced questions are asked depends on the objectives of the research, the available time and budget, the skills and knowledge of the researcher, and the skills and sex of the enumerators. The minimum questions are designed in such a way that they can be easily integrated in any survey, even when only one spouse is interviewed, and do not need much time or add to the costs. The advanced questions allow deeper insights into gender aspects but may require more targeted selection of the respondent. The advanced questions are listed to provide the researcher with an idea of questions where gender issues are relevant and how they could be phrased. Again, even for one topic not all advanced questions may be of interest to the research question. For some advanced questions, women and men might have to be interviewed separately.

For example, when a survey briefly addresses crop storage, it is suggested to include the "minimum" questions. If a survey focuses on crop storage, then the advanced questions are suggested. When the minimum questions are consistently integrated in surveys, results can be compared across studies, and a comprehensive database can be developed increasing the benefits of the research. However, there is no blueprint of questions that a survey should always include and how they should be exactly phrased. This needs to be adjusted according to the local context. All questions are general suggestions, i.e. the exact wording needs to be adapted to the local context and the questions need to be piloted to find out whether they are correctly understood by the respondents. A different phrasing may be necessary in some cases, and the researcher has to identify this before starting the survey through, for example, focus groups, key informant interviews and pilot tests.

The following topics and questions draw on own research experience and on other literature, mainly the "Tips for asking gender-responsive questions" from Bioversity International (Bioversity International, n.d.), the CCAFS "Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development" (CCAFS and FAO, 2012) and Doss (2014). Doss (2014) also provides more explanations and reasoning for most of the topics listed below.

4.1 Coding

The "who" questions (who does what, who decides) are the starting point for adding a sex-disaggregated and subsequently a gender perspective. Coding, i.e. clearly identifying the respondent in a simplified form, becomes important, especially if more than one person is involved. There are different ways to code. The researcher can decide to list the ID from the household roster (if available), or create a code for woman, man, female child, and male child, and allow several categories to be listed at the same time, or the combinations woman alone, man alone, female child, male child, both (spouse), woman with another female / male decision-maker, man with another male / female decision-maker, etc. (Doss and Kieran, n.d.). The consequences of each method of data capturing, data entering and subsequent analysis should be considered when designing the questionnaire. One way is to pose each question to each of the following groups:

1. Self
2. Partner/spouse
3. Self and partner/spouse jointly
4. Other household member
5. Self and other household member(s)
6. Partner/spouse and other household member(s)
7. Someone (or group of people) outside the household
8. Self and other outside people
9. Partner/spouse and other outside people
10. Self, partner/spouse and other outside people

When it comes to assets or activities, also simply the "ID number" from the household roster can be used. If there is joint ownership or several people are involved in the activity, several IDs can be listed.

4.2 Sex of the interviewee and knowledgeable respondent

It is extremely important in all surveys to include a column indicating whether the interviewee is female or male. It is often skipped in surveys that do not have a household roster, however it provides important information. This should be followed by the question whether the respondent is the right person to answer the questionnaire as defined by our research design and his/her role and responsibilities we are interested in, for example, whether she/he is the person managing the plot or the crop of interest and selecting the seeds, or is the owner of the land or the household head.

4.3 Gender roles and labour division in farming systems

4.3.1 Main crop production

Men and women often assume different tasks in the cultivation of the same crop or may cultivate different crops. For example, men do the land preparation, while women sow and weed. This can also vary between crops or plots, depending on who manages and controls them. Women may contribute a significant amount of labour in male-headed households or in the cultivation of crops controlled by men, but this contribution often lacks recognition. In addition, women tend to grow many crops in small quantities that are nonetheless important for feeding their family, be it in own fields or on the borders of family/men's fields and in home gardens (see also subsection "Multiple activities in the farming system"). The questions related to the crop production can be for all crops in general, for groups of crops or for individual crops, depending of the objective of the research.

Minimum questions

- Who (mainly) worked physically on the plot(s)/land during the last growing season?
- Who generally made the decisions about which [crop/s] to plant on the plot/land during the last growing season?
- If any produce was sold from [crop/s] planted on the plot/land in the last growing season, who was responsible for taking the crop to the market and negotiating the sale?
- If any revenue was generated from [crop/s] planted on the plot/land in the last growing season, who decided how to spend the revenues?

Advanced questions (choose relevant ones)

- Who prepares the land (main work/helpers)? Which plots?
- Who sows on which plots (main work/helpers)?
- Who fertilizes which plots (main work/helpers)?
- Who controls weeds and pests on which plots (main work/helpers)?
- Who harvests which crops and on which plots (main work/helpers)?
- Who uses crop residues? For what?
- Who does the (post-harvest) crop storage?
- Who does the seed selection for [crop]?
- Who decides to test a new variety for [crop]?
- Who does the processing of crops/food for home consumption?
- Who decides how to prepare the land? Which plots?
- Who decides which crop / which variety to grow?
- Who decided which crops, how and where to plant during the last growing season?
- Who generally made the decisions about what inputs to use on [LAND] during the last growing season?
- Who decides what, how and where to apply fertilizers?
- Who decides how, when and where to control weeds and pests?
- Who decides when, where and how to harvest, for which crops?
- Who decides how crop residues are used and for which purpose? Who will be affected when no /less crop residues are available and how?
- Did the wife/spouse grow any specific crops by herself outside the main plots? Which? How? Where – on field borders, home garden, own plot,…?
- Who stores the [crop]?
- Who can decide whether to use [crop] for food?
- Which parts of a crop are used? By whom and for what purposes?
- Who can decide whether to use [crop] for food?
- Who decides whether to sell [crop]?
- Who decides which crops/varieties are planted on a specific plot? (Consider different practices between plots)
- What are the key features of existing and new / improved crops, fruit trees, vegetables or livestock preferred by men and women?
- How good are the crops to store, process, cook and how is the taste?
- What are desired key features with regard to processing?
- When new/improved species were introduced: what were positive and negative key crop characteristics affected through a breeding intervention perceived by women and men?
- Are crops separately or jointly stored, i.e. among couple/together with parents/among the household members? How is this handled among different generations living in the same household? If jointly, who then has the right to sell the crop?

4.3.2 Multiple and seasonal activities in the farming system

There is a tendency to prioritize questions regarding field activities related to staple and marketable crops while obscuring the other activities women and/or men carry out in addition. These can be having a home garden, using forests, seed selection and conservation, post-harvest storage, marketing or food processing. Interventions in main crops can lead to positive or negative side effects for the other activities, e.g. conservation agriculture reduces available straw for livestock or a tractor reduces labour input, thus freeing time for other activities. The activities can also be relevant at different periods in the season, leading possibly to unexpected labour peaks if they are not considered before an intervention.

The following table serves as a very rough overview of the different activities in the farming system, i.e. who does most of the work (very generally) and who sells the products. It should be adjusted to each research region, for example, in a coffee region there may be no need to ask about fish production.

Table 1:Overview of farming activities and who is mainly involved

	Produced/ harvested/on your farm?	Who does most of the work?	Any sold for cash?	Who sells?
Food crops				
Cash crops like tea, coffee, cotton, etc.				
Fruits and vegetables (mainly for sale)				
Home garden (mainly for home consumption)				
Large livestock (cattle, buffalo, camels)				
Small livestock (sheep, goats, pigs)				
Poultry				
Fish				
Production of livestock products (e.g. milk, eggs, meat)				
Further processing of livestock products (e.g. cheese)				
Processing of crops/food/livestock products for sale like snacks, tortillas, cheese, etc.				
Collection of non-timber forest products (medicinal herbs, spices, honey, etc.)				
Timber				
Fodder				

Fuelwood				
Charcoal				
Other (specify)				

Men's and women's activities vary throughout the year, and no snapshot captures the whole range of activities pursued in a year. It is important to be aware of and explore these seasonal variations to understand the labour constraints women and men experience at specific times of the year. Engendered seasonal calendars are an effective way of making these visible. Table 2 below is ideally applied separately for men and women to better understand who is occupied and when. For practical reasons, both tables could be merged into one, but this requires more attention when filling the table. One could also distinguish between low labour input and middle to high labour input of women and men. This helps to identify possible labour peaks and trade-offs of current activities or new interventions.

In which month do men/women do each activity listed in Table 1 (multiple activities in farming system)?

Table 2: Engendered seasonal calendar

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Food crops																								
Cash crops																								
Fruits																								
Vegetables																								
Fodder																								
Large livestock																								
Small livestock																								
...																								

4.3.3 Livestock

Depending on the regional context and animal type, men as well as women are livestock owners, managers or perform certain tasks. Women typically own and raise fewer large livestock than men but rather take care of small stock like pigs, sheep and poultry. Gender norms often influence who handles and owns which type of animal. Although they do not own the livestock, women may assume most of the responsibilities for animals kept at the homestead, which can include the procurement of fodder for animals, the processing and marketing of livestock products. Their contribution to livestock keeping is often ignored or underestimated, as the owner of the livestock is typically the one interviewed.

Minimum questions

- Who in the household owns [LIVESTOCK]?
- Who in the household takes mostly care of the [LIVESTOCK]?

- Who markets the [LIVESTOCK] / sells the [LIVESTOCK] product?

Advanced questions (choose relevant ones):

- Who in the household collects fodder for the [LIVESTOCK]?
- Who in the household feeds and waters the [LIVESTOCK]?
- Who in the household herds the [LIVESTOCK]?
- Who in the household is responsible for [LIVESTOCK] health?
- Who in the household receives extension / advice on [LIVESTOCK]?
- Who in the household decides to sell [LIVESTOCK]?
- Who in the household decides when to slaughter [LIVESTOCK]?
- Who in the household controls the money from the sale of the [LIVESTOCK] and livestock products?
- Who in the household decided to buy the [LIVESTOCK]?
- Do you practice specific livestock breeding and, if you do, who decides about it?
- Did you recently acquire new livestock species? Who took the decision?

1.1.1 Non-market biomass-based activities

Rural women are often involved in the production of crops or collection of wild foods for household consumption, in home gardens or in the collection of non-timber forest products (NTFPs), with surpluses often being sold. This important contribution to household food security and potential income sources for women is overlooked when studies focus on income-generating activities or main crops.

Minimum questions

- Who in the household is responsible for production of crops/vegetables or collection of wild vegetables/herbs/insects that are only/mostly used for household consumption?
- Who in the household is responsible for the collection of wild vegetables and herbs and insects that are only/mostly used for household consumption?
- Who in the household is responsible for collecting NTFP that are only/mostly used for household consumption?

Advanced questions (choose relevant ones):

- Who decides which of the household crops/how much of the surplus are kept for household consumption and which/how much is sold?
- Who decides which of the NTFP/how much of it is kept for household consumption and which/how much is sold?
- Who decides which [NTFP] is collected from the wild?
- Who in the household is responsible for processing the [CROP] / [collected food] / [NTFP]?
- How many hours per day are spent on subsistence activities in the household by whom [caring for subsistence crops, collecting NTFPs for household consumption, processing crops and NTFPs]?
- Do you collect fuelwood for sale? Who does it? Who sells it? Who receives the income from the sale?
- Do you dry dung for sale /home use? Who collects it? Who sells it? Who receives the income from the sale?

4.4 Adoption of technologies/new agricultural practices and impacts (ex-ante and ex-post assessments)

In agricultural research, it is important to identify who benefits (or will benefit) from an old or new agricultural practice, technology or research output, who does not benefit, and whether somebody will lose out. Is this person female/male, young/old, rich/poor, and what does it mean in terms of livelihood opportunity for this person and the whole household? Agricultural interventions can change women's access to paid employment or other income-earning activities especially when technologies/machinery are introduced that reduce labour. Finding this out requires a whole set of advanced questions: Who will participate in the change in agricultural practices, whose labour will be used or saved with the promoted technology or intervention? What are/could be the dynamics of change due to the intervention? Does it require so much labour that the household or individual members will have to neglect other crops or activities? Whose labour will be used and what are the consequences of this, e.g. on leisure time, health, food security, etc. Will the project/programme positively or negatively affect women's access to labour of other household members? What are the effects on the female and male wage workers?

What are/will be the benefits generated by adopting the technology and who determines the use? Is or will household **and** individual food security be increased? How will poorer households benefit in comparison to not so poor households? What happens to day labourers (differentiated between female and male workers)? Does the possibility exist for a crop/livestock to become marketable when it is heavily promoted in rural areas? Will these changes affect women positively or negatively? And could men take over control in the long run and women possibly lose an income source?

Minimum questions before adoption (as part of ex-ante impact assessment)

- Who in your household will carry out/use [ACTIVITY], [TECHNOLOGY]?
- What effect, do you expect, will the new [ACTIVITY], [TECHNOLOGY] have on the labour input of [women/men/boys/ girls/male farm worker/female farm worker]?
- Do you expect that the intervention will (i) increase household food security and/or (ii) household income?
- Who do you expect will benefit most by carrying out/using a new [ACTIVITY], [TECHNOLOGY]?
- Who do you expect will be negatively affected by the introduction of a new [ACTIVITY], [TECHNOLOGY]?

Advanced questions before adoption (as part of ex-ante impact assessment) (choose relevant ones):

- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged food security for all household members?
- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged increased nutrition diversity for all household members?
- If you employ [female/male] wage workers, how much more/less labour input do you need after adopting the innovation?
- Which positive impacts will the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?
- Which negative impacts will the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?

Minimum questions after adoption (as part of ex-post impact assessment)

- Who would you say benefitted most by carrying out/using a new [ACTIVITY], [TECHNOLOGY]?

- Was anybody negatively affected by the introduction of a new [ACTIVITY], [TECHNOLOGY] and if yes, who?
- Who in your household carries out/uses the new [ACTIVITY], [TECHNOLOGY]?
- What effect did the new [ACTIVITY], [TECHNOLOGY] have on the labour input of [women/men/boys/ girls/male farm worker/ female farm worker]?

Advanced questions after adoption (as part of ex-ante impact assessment) (choose relevant ones):

- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged food security for all household members?
- Did the [ACTIVITY], [TECHNOLOGY] lead to an (1) increased, (2) decreased or (3) unchanged increased nutrition diversity for all household members?
- Which positive impacts did the [ACTIVITY], [TECHNOLOGY] have on men/women in your household?
- Which unexpected impacts did the [ACTIVITY], [TECHNOLOGY] have on men/women in your household? In what way does the new [ACTIVITY], [TECHNOLOGY] impact men's/women's ability to fulfil their responsibilities on your farm and in your household?
- If the [ACTIVITY], [TECHNOLOGY] mainly supports women, did it encourage men/other household members to help more with the task than before?
- How are positive gains (free time, increased income) used in your household? Who decides how free time or additional income is used?
- In case the marketability of a female-controlled [CROP], [LIVESTOCK], etc. has developed well due to the intervention / adoption of new practice /technology, have the men in the household expressed interest in starting to use it as well? Has decision-making shifted from women to men? If you employ [female/male] wage workers, how did their labour input change after adopting the innovation? Whose [female/male] wage worker labour input was changed and to what extent?

4.5 Gendered access to and control over resources and assets

Data on ownership of household assets is often collected, however, it is usually not distinguished between who owns the assets. The presence of resources and assets does not necessarily mean that all individuals in the household have the same right to use or to sell these assets. This section focuses specifically on physical and natural assets relevant to agriculture. Access to labour, farm inputs, and farm machinery often varies between women and men. Gender norms can also prevent women from using certain resources or technologies, e.g. women do not drive tractors in Bangladesh. Thus, despite the asset being available, women do not have the right to use it. Other important forms of access to resources may also be important, such as access rights to crops/trees and their products, which may differ from rights to the land on which the crops/trees grow.

While women may have access to certain resources such as labour, land, seeds or livestock, they may not have the ability to decide on the use of these resources. Thus, it is important to distinguish between access (right to use an asset), control (who actually makes the decision), and who owns the asset. Ownership can deviate from controlling resources, and distinguishing both can help to better understand crop and resource management processes. For example, a woman may formally own a piece of land but informal institutions and gender norms may inhibit her deciding on how to use the land or to sell it. Of course, assets can be jointly owned, such as by husband and wife. "However, households are often inclined to report that all assets in the household are jointly held for the sake of politeness or political correctness, even when this differs from the reality of associated rights. Further probing on specific rights often helps to uncover whether an asset can be considered jointly owned, individually owned or collectively owned" (Behrman et al., 2012, p. 10). The understanding of use, control and ownership tends to differ significantly by country context and culture. For

interpreting the data correctly, it is thus very helpful to complement the quantitative work with qualitative research. If both spouses of the same household are asked separately, it is likely that differences between both answers will exist.

For research on new technologies or practices, or research accompanying interventions and projects, it can be very useful to keep the following three key issues in mind: (i) When new agricultural practices/projects are to be introduced, do women and men have (the same) access to the necessary agricultural inputs which are part of the suggested agricultural technology? (ii) Will the intervention positively or negatively affect the access, control and ownership of women to resources (and assets), particularly to land, credit, firewood, and water compared to men? And (iii) Are there any policies that counteract the inclusion of gender, e.g. women are not allowed to have land titles or have been discriminated in the past? To which extent do women have formal or customary rights over land independent of their husbands and can decide on their own?

Minimum questions:

- Who would you say owns the [ITEM e.g. land / plot / machinery / tool/ livestock]?
- Who would you say is permitted to sell [ITEM e.g. land / plot / machinery / tool/ livestock]?
- Who actually uses the asset (e.g. land / plot / machinery / tool/ livestock)?

Table 3:Simple way to engender an asset module

Asset	Number owned	ID of owner (from household roster)	ID of user	ID of decision-maker who decides whether to sell the asset
Animals				
Cattle				
Horses				
Sheep/goats				
Poultry				
Pigs				
Productive assets				
Land				
Spades/shovels				
Ploughs				
Carts/carriage				
Grain storage silos				
Tractor				

Source: Adjusted from Johnson and Quisumbing (2009)

Advanced questions (choose relevant ones):

- Who is permitted to use the asset (e.g. land / plot / machinery / tool / livestock)?
- Whose name is on the land title/ownership document?

- Who makes decisions on how to spend income generated from its use, sale, or rental
- Who contributes most to decisions regarding a new purchase of [ITEM]?
- Who makes decisions regarding who else is allowed to use it and who is not?
- Who tends to the asset in terms of time spent taking care of it, repairing it, maintaining it?
- Whose resources were used to purchase a certain asset?
- Who is allowed to keep the asset if a partnership dissolves or a household splits up?
- In case of credit: Who makes the decision about what to do with the money/ item borrowed from [SOURCE]?
- Who makes decisions regarding its sale, lending or rental
  - Who would you say can decide whether to sell [ITEM] most of the time?
  - Who would you say can decide whether to give away [ITEM] most of the time?
  - Who would you say can decide to mortgage or rent out [ITEM] most of the time?
- Who collects any income generated from its sale or rental?

4.6 Gendered access to information and advisory services

As discussed before, women, though active in farming, are often not addressed by extension and advisory services, since the male household head is targeted irrespective of who does or participates in the actual work. The assumption that by training men, this information reaches their spouses or other family members is often wrong. Several additional reasons exist why extension services do not reach out to women. In some regions, gender norms also mean that male extension agents cannot talk directly to women. Even when invited, timing of advisory meetings can be in conflict with the women´s other activities, they might have to sit in the back, their questions might be ignored or treated in a derogative way. Thus, the availability of a service or women´s attendance does not say enough about whether women actually benefit. The type of information provided can be of different interest to women or men, or to both. For example, in countries with ´male´ and ´female´ crops or strong labour divisions, talks around the ´male ´crop/activities are of less interest to women, so the content has to be adjusted to the roles and activities the person performs. Again, both research on projects and interventions should consider whether an intervention will positively or negatively affect women's access to trainings, extension and information. Is the research and extension system gender aware and sensitive when designing and spreading an agricultural innovation? What tools and reforms does the extension system need to be more gender sensitive?

While in general smallholders and poor farmers have little access to this information, women tend to have even less access, especially when it is provided via mobile phones/individually owned media and not broadcasted via radio or other mass media accessible by all family members.

Minimum questions

- Where do you usually get your information regarding agriculture/home garden from? Is this the same for women and men in the household?
- Who in your household was invited to trainings in the last 12 months?
- Who in your household participated in a training on [CROP] [LIVESTOCK] [OTHER CONTENT] in the last 12 months?
- Why did you [other invited household member] not participate in a training though you were invited in the last 12 months? For example, answer codes could be no time, topic of no interest, not permitted, no female extension agent available, low quality of service (waste of time).

Advanced questions (choose relevant ones):

- Where do you [women/men] usually get your information from regarding agriculture /home garden?

- For all who participated in trainings, ask each one separately: Rank how well the training covered your needs, problems, interests, if you participated (10=very well, 0= not at all). Please explain the ranking. This is an open question but could be supported by a coding system, e.g. low quality, not encouraged to ask questions, possible to ask questions, good explanations, extension agent very knowledgeable.
- Would you have gone to a training on [CROP] [LIVESTOCK] [OTHER CONTENT] if at least one female extension agent had been present?
- Through which (media) channels are training invitations communicated? To which media sources do [men/women] in your household have access?
- Do you [women/men] in the household feel that you have time capacities to participate in trainings?
- Which topics would [men/women] in your household like extension agents to address?
- Which topics would you [men/women] in your household like to be addressed by other communication channels (and which), e.g. radio, television, mobile phone, books/brochures?

At community level, the following questions could be asked:

- How are male/female participants in the village selected for trainings?
- Was there any training for female farmers or on "female" [CROP] [LIVESTOCK] [CONTENT] offered in the last 12 months?
- Were trainings for women or on women's topics conducted by male extension agents? Was it ok for you to be trained by a male extension agent or would you have preferred a female extension agent?
- How many men/women participated in such a training?
- In case of mixed trainings, were women able to express their position and interests?
- How many male/female extension officers exist in your [UNIT]? Are there female extension agents available as contact persons for women in the community?
- Who spreads information on [CONTENT], e.g. agriculture/health/nutrition/climate change] in the community?

4.7 Gendered livelihoods

4.7.1 Reproductive activities

Reproductive activities are those required to maintain the household and its members, such as cooking, raising children, cleaning. The particularly heavy responsibilities of women in the reproductive sphere limit their opportunity to pursue other (income) activities or attend extension meetings, since they perform this role in addition to contributing to agricultural production and natural resource management. Reproductive activities are usually not in the focus of agricultural research. However, they can be of interest regarding labour availability and constraints when planning to introduce or evaluate interventions.

General questions can relate to how much time is spent per day on fetching water, collecting firewood, cooking, cleaning, and raising children, and how much leisure time is available.

Minimum questions

- Who in the household is responsible for cooking, childcare, washing and cleaning the home?
- How much time per day do [women/men] in your household spend on childcare, cooking, and maintenance?
- Who collects water [women/men/girls/boys]?
- Who collects fuelwood [women/men/girls/boys]?

Advanced questions (choose relevant ones):

- How much time per week does it take women/men/girls/boys in your household to fetch water for your needs on a normal day?
- How much time does it take women/men/girls/boys to collect firewood for your needs per week? [you could use the list below]

Table 4:Examples of who does reproductive activities

Household members	Fetching fuelwood, duration in hours per day	Frequency per week	Fetching water for household use, duration in hours per day	Frequency per week	Etc. ….	Frequency per week
Boys age 6-14						
Girls age 6-14						
Men age 15-64						
Women age 15-64						
Men age 65+						
Women age 65+						

- What percentage of time do women/men spend on household chores compared to time in agriculture in low and high season?
- In which household/subsistence activities would women want more support from their husbands/families?
- In which reproductive/subsistence activities could men/husbands imagine to provide women with more support?
- Do women/men/children perceive their labour share as fair?
- How has the division of labour/household tasks changed over the last ten years? Answer codes can be (several answers are possible): (i) women do more agricultural work, (ii) women have more leisure time, (iii) men do more household tasks, (iv) men have more leisure time, (v) girls/boys do less/more household tasks, (vi) girls/boys do more agricultural work, (vii) no change, (viii) women spend more time in off-farm employment, and (xi) men spend more time in off-farm employment.
- Which household tasks are culturally best accepted if they are done by men?

4.7.2 Participation in organizations

Women generally have less access than men to formal associations, groups and organizations but more frequently participate in informal ones. Participation in community groups may be mixed or limited to women or men. Community groups that control key resources are often dominated by men. Although women may be represented in mixed-gender associations and committees, their actual ability to influence decisions made within these organizations can be limited. Women´s voices tend not to be considered, and women take on leadership roles less frequently. The question regarding existing groups and women's participation is interesting, as groups can work towards more social inclusion, also of women, or rather enhance inequalities. Women, though maybe not explicitly excluded, in reality are often excluded from such support and activities.

Groups can support the adoption process of new agricultural practices and technologies, facilitate the access to credit, seeds and other inputs or information, and are thus interesting to researchers, extension agents and NGOs.

Minimum questions

- Is there a [GROUP] in your community? For example, agricultural / livestock/ fisheries producer's group (including marketing groups); water users' group; forest users' group; credit, saving or microfinance group; mutual help or insurance group (including burial societies); trade and business association; civic group / charitable group / religious group;
- Is this [GROUP] a men´s group, women´s group, mixed group?
- Who in the household is an (active) member of this [GROUP]?

Advanced questions (choose relevant ones):

- How much input do you have in making decisions in this [GROUP]? Answer codes can be: (i) No input; (ii) input into very few decisions; (iii) input into some decisions; (iv) input into most decisions; (v) input into all decisions (vi) no decision made.
- Why are you not a member of this [GROUP]?
- Which benefits/assistance/services did you get out of this group in the last 24 months? How do they compare to benefits other people [men] received? Or which benefits/assistance/services do women get out of this group? How do they compare to benefits other people [men] received?
- Which of the groups is most important for men/women in your household – rank 1 to 3?
- How much commitment does the group require from men/women in your household (in hours per week/month, money, food, etc.)?
- Who initiated this group? It might be interesting to explore the level of social organization in the community and to see how proactive especially women are.

4.7.3 Income sources (formal and informal) and access to credit

Households often have multiple income sources in addition to their agricultural production, which may be small but nonetheless significant for men and women, especially in the "hungry season". This can be through selling own labour or processed agricultural products, like maize tortillas or wild herbs. Women generally have less access than men to formal forms of employment, but are likely to participate more in the informal economy. It is good to include such income sources and whether women and men have access to labour markets in livelihood analyses. Agricultural interventions can change women's access to paid employment or to other income-earning activities especially when technologies/machinery is introduced which reduces labour. Will the intervention lead to a shift in income sources? Will the shift affect the power status of men and women and if yes, in which direction?

Minimum questions

- Who in your household participated in any non-farm economic activity or ran a business in the last 12 months, and which one?
- Who was involved in any formal employment?

Advanced questions (choose relevant ones):

- Who in the household made the decision to start the business / to take up non-farm economic activity or employment/ to migrate for work?
- Who in the household is/was the principal manager/administrator of the business (responsible for day-to-day operations)? Who in the household would you consider the owner(s) of the

business? Who in the household works/worked in the business? How much revenue (which share of household budget) was generated from the business/formal employment/non-farm economic activity in the last 12 months?

- Who in the household controls/controlled the money from the business/employment/ remittances?
- Which alternative livelihood opportunities exist for women/men in your household in your area? Answer codes can be: (i) trading, (ii) civil/public servant, (iii) remittances, (iv) daily labour (agriculture, construction, domestic worker, etc.), (v) rent, (vi) sale of processed agricultural products, i.e. home-made alcohol, processed foods, NTFPs, (vii) transport services, (viii) fishing, (ix) timber harvesting, (x) craft work, and (xi) leasing out land.
- Which factors limit women's engagement in off-farm employment in your household? Answer codes could be, for example (i) distance, (ii) time, (iii) education, (iv) skills, (v) no networks, (vi) no job opportunities, etc.
- How much income do men/women earn for daily labour jobs in your area?
- Which interventions has the government undertaken to create employment for women/men in your community? Has your household benefitted from such interventions? Has the government undertaken any agricultural interventions that reduced labour in your area and eliminated your employment opportunities? If yes, specify.
- If in need, where does your household borrow money from? Answer codes can include (i) bank, (ii) financial institutions, (iii) aid organizations, (iv) private money lenders, and (v) saving groups.
- Who in your household is eligible to borrow money from formal institutions?
- Who in your household decides to take out credit for which purposes? For which purpose did your household (specify who) take out credit (specify amount) within the last 12 months? How much interest did the household member have to pay?

4.7.4 Risks

Women and men can perceive risks and what is at risk, e.g. such as extreme weather events, differently due to their gender roles, tasks and responsibilities. Women and men can apply common but also different strategies to deal with risks. Who decides which adaptation strategy to implement and who then implements it can be different among a couple. The implications of a given adaptation strategy on women´s and men´s use of time and labour and on their health is likely to vary between women and men.

Minimum questions

- Which climate/agricultural risks are perceived as the biggest threat by men/women in your household? Answer codes can be: (i) crop failure, (ii) crop pest, (iii) wildlife attacks, (iv) livestock disease, (v) insect attack, (vi) floods, (vii) droughts, (viii) delayed rains, (ix) human disease, etc.
- What were the most important problems/shocks, natural, economic or social, your household faced as far as negative impacts to your household, household members' livelihoods and/or the household's agriculture/livestock during the last 12 months were concerned?
- Which environmental changes (e.g. extreme weather events, frosts, dry spells, late rain), which had not occurred in the past, affected your farm/household in the last five years (perceptions by men/women in the household)?
- What effects did the environmental change have on men and women in your household?

Advanced questions (choose relevant ones):

- Who decided on which adaptation strategies were applied?
- Who applied the adaptation strategy?

- Because of these changes, did women/men in your household apply any of the following (adaptations)? Answer codes can be (examples): (i) Delayed planting of [CROP], replaced [CROP] with […], (iii) introduced new variety, (iv) sold livestock, and (v) sold assets, etc.
- Who of the following assisted the women/men in your household to deal with the effects of the events/changes/problems? Answer codes can be: (i) relatives, (ii) friends, (iii) neighbours, (iv) community members, (v) insurance, (vi) local/provincial/national government, (vii) local NGO, (viii) international organizations, (ix) community groups, and (x) foreign government.
- Which are the adaptation strategies favoured/applied by men/women in your household?
- How much additional time and resources (hours, inputs, etc.) did the adaptation require from men/women in your household?
- Which effects did the adaptation have on men and women in your household?

4.8 Gendered decision-making processes within the household

Even when men are recognized in public or within the household as the decision-makers, women often contribute valuable knowledge and input into this process. Spouses can directly or indirectly influence decisions without clearly voicing their opinion or making the decision. Who will decide about the purchase/implementation of machinery/other technology? Who in the household decides that a new crop or variety is grown, how much livestock is kept or which inputs are used? What are the decision-making procedures and rules among women and men? What could change due to the intervention and in which direction? What are the social norms, power relations, and decision-making processes? Quantitative household surveys can usually concentrate only on "who makes the decision" and identify, to a certain degree, whether women and men participate equally. Identifying how decisions are made and negotiated is key to understanding gender relations and household crop and resource management strategies. However, this is already difficult to identify in qualitative research and unsuitable for quantitative surveys.

The following questions are of a general nature and subsumed as advanced. The set of minimum questions that you would need for your specific research area is already covered under the specific questions above, e.g. around agronomic practices. Each section contains questions on gendered decision-making processes. You could also check the survey to construct the "Women Empowerment in Agriculture Index" by IFPRI (see Chapter 6).

Advanced questions (choose relevant ones):

- Did you (singular) participate in [ACTIVITY] in the past 12 months (i.e. during the last [one/two] cropping seasons)? Activities can be grouped as (i) food-crop farming: crops that are grown primarily for household food consumption, (ii) cash-crop farming: crops that are grown primarily for sale on the market, (iii) livestock raising, (iv) non-farm economic activities: small business, self-employment, buy-and-sell, (v) wage and salary employment: in-kind or monetary work both agriculture and other wage work, and (vi) fishing or fishpond culture.
- How much input did you have in making decisions about [ACTIVITY]? Answer codes can be: (i) no input, (ii) input into very few decisions, (iii) input into some decisions, (iv) input into most decisions, (v) input into all decisions, and (vi) no decision made.
- How much input did you have in decisions on the use of income generated from [ACTIVITY]? Answer codes can be as above.
- How much input did you have in decisions on major household expenditures such as [ITEM, e.g. fridge]?
- How much input did you have in decisions on minor household expenditures for daily consumption and household needs?
- To what extent do you feel you can make your own personal decisions regarding [crop production/livestock raising/purchasing agricultural inputs?

4.9 Household roster

A household roster containing detailed information about all household members and their characteristics such as sex, age, education or occupation of household members is needed mainly for household and intra-household surveys. If the focus is exclusively for plot-level information, it depends on the research question whether this level of detail is needed. However, also for plot-level data, it can be necessary to identify who works on the plot, who decides, and which trade-offs does this imply, e.g. a child helping out on the plot and therefore not going to school. Questions related to the household structure can be included at the beginning, e.g. whether the household is a male-headed, female-headed, couple-headed household or other system. We can compare these different household structures if they are of interest to the research.

Minimum questions:

- Relationship to respondent (or household head)
- Household structure: male-headed, female-headed, couple-headed household. The focus could also be on classifying the household according to who is the main decision-maker as done by the CCAFS gender survey (see Chapter 6): 1) dual (male and female spouses), (2) female-headed with another adult male decision-maker (3) male-headed but with another adult female decision-maker, (4) female-headed, without an adult male decision-maker in the household, (5) male-headed, without a female adult decision-maker in the household.
- Number, sex and age of all household members.
- Migration status of present/absent household members (e.g. of spouse).

Advanced questions (choose relevant ones):

- Schooling status for the household members at schooling age (often starting at 5 years)
- Marital status for all adults who are at the local marriage age (can be as early as 10 or 11 years), including whether it is a polygamous marriage or not legal marriage
- Education and literacy status of household members
- Language skills – especially of interest in countries where local/ethnic languages are still commonly used and differ from the national language
- Ethnicity
- Religion
- Health status
- (Paid) income source
- Occupation (primary, secondary)
- Does the household head have any additional wives who were not mentioned in the household roster?
    - How many other wives does the household head have?
    - If the household head has one or more wives who are not considered to be a member of his household, ask the following questions:
        - What is the name of the wife?
        - How many children does she have?
        - Where does she live? (different household, same compound, same village, different village, city/urban area)
        - Does each wife maintain any agricultural plots or livestock on her own?

5 Conclusions

As an agricultural researcher, empowering women farmers might not be your objective, yet this guide can be useful to include a gender lens into your research through the collection and analysis of sex-disaggregated data. The answer to the question why bother about gender and sex-disaggregated data in agricultural research is easy. Gender intersects with many different aspects of agricultural research and development such as land- and water-use patterns, value chains, productivity and sustainability, access to knowledge and resources, and biodiversity. Integrating gender is crucial for better and more sustainable project outcomes and research results, but a complete gender research and gender analysis may not be the first objective of many socio-economic researchers in the food and non-food biomass production sector. However, this guide helps to add a more differentiated perspective related to women and men in agriculture with only little effort through the collection and analysis of sex-disaggregated data. The inclusion of just a handful of questions provides the researcher with information and insights into social relations and dynamics of farming systems that, if not considered, might hamper the effectiveness of projects, initiatives or policy activities. The guide was developed based on experiences gathered in the field in Latin America, Asia and Africa. However, the responsibility remains with the researcher to choose the "right" questions for the research topic and adapt them to the local circumstances. The guide also has its limitations. Some questions remain sensitive terrain, and you will struggle to get genuine responses through quantitative methods. In some cases, you might work in areas where first gender sensitization activities have already taken place so that female and male farmers are likely to say what they think is expected from them or what they were taught: "we distribute our work equally", "we decide everything mutually", etc. Reality is often different. Hence, it is important to cross-check such information, ideally through different methods, especially qualitative ones, and keep your eyes open, observe and analyse what you see and experience in the field. Informal conversations with locals or field assistants can often reveal interesting cultural information, and they might help you in your cultural interpretation. Additional qualitative research is often indispensable to gain a better understanding of the gender context or certain aspects in order to set up properly the survey tool and better explain the findings from the survey.

It remains important to highlight that not only relevant questions are included in your questionnaire and considerations of sex and gender are applied while conducting your survey, but also that the sex-disaggregated perspective needs to guide your analysis. After the field work is over, many researchers tend to forget to differentiate male and female perspectives in their analysis and do not make proper use of the valuable data that they have collected. Instead they step back to subsume findings under "the farmer", "the interviewee", "the participant", which again weakens the research and does not justify the claim of having done gender-disaggregated work. This means a loss of relevant information for your project outcome and science, and it is a waste of your work time and that of your enumerators. Having a detailed sex-disaggregated analysis is attractive for high-ranking scientific journals, and supports your project outcomes with regard to adoption and sustainability of project activities and/or technologies.

This guide was developed for doctoral researchers and socio-economists who like to add a gender lens to their research without fully engaging in gender research and analysis. It is meant as a starting point to enable everyone, including people with little expertise or only limited interest in gender, to make their research more relevant to the livelihoods of women and men and hence projects more successful and attractive for donor institutions and results more interesting to scientific journals.

The guide as such, of course, does not exhaust the topics or provide researchers with solutions to gender issues that might emerge during the research process. Sex-disaggregated data collection and analysis is only a step towards a better understanding of how gender affects agricultural production and outcomes, yet it needs to be followed by approaches and solutions of how inequality and

disparities between women and men that hamper agricultural outcomes and development can be overcome. Lessons must be learned and shared from projects on the ground, so that effects of well-intended activities can be better understood and negative effects reduced.

6 Further reading suggestions

6.1 Examples of surveys in regard to gender in agriculture

CCAFS gender survey: https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl:1902.1/22584

Survey for the 'Women Empowerment in Agriculture Index' (WEAI): http://www.ifpri.org/publication/ womens-empowerment-agriculture-index

6.2 Books regarding gender research in agriculture and rural development

FAO, 2011. The state of food and agriculture, 2010-2011. Women in agriculture: Closing the gender gap for development. FAO, Rome, IT.

Feldstein, H.S., Jiggins, J., 1994. Tools for the field: Methodologies handbook for gender analysis in agriculture. Kumarian Press, West Hartford, US.

March, C., Smyth, I., Mukhopadhyay, M., 1999. A Guide to Gender-Analysis Frameworks. Oxfam GB, Oxford, UK.

Meinzen-Dick, R., Quisumbing, A.R., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., Beintema, N., 2011. Engendering Agricultural Research, Development, and Extension. International Food Policy Research Institute (IFPRI), Washington D.C., US.

Momsen, J.H., 2010. Gender and Development, 2nd ed. Routledge, London and New York.

Moser, C.O.N., 1993. Gender Planning and Development: Theory, Practice & Training. Routledge, London and New York.

Poats, S., Schmink, M., Spring, A., 1988. Gender issues in farming systems research and extension. Westview Press, Boulder, US.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), 2014. Gender in Agriculture: Closing the Knowledge Gap, Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Rao, A., Anderson, M.B., Overholt, C.A., 1991. Gender analysis in development planning. Kumarian Press, West Hartford, US.

UNECE (2010). Developing gender statistics: A practical tool. Geneva, CH: United Nations & United Nations Economic Commission for Europe.

World Bank, 2009. Gender in Agriculture Sourcebook. World Bank, Washington, D.C., US.

6.3 Online sources

BRIDGE: a specialised gender and development research and information service based at the Institute of Development Studies (IDS) in the UK with over 3,000 specially selected gender documents and resources. http://www.bridge.ids.ac.uk/

Free online course on "***Integrating gender into scientific research***" by SCiDevNet: http://scidevnet.teachable.com/

The International Food Policy Research Institute (IFPRI) in the USA has done lots of gender research and tool developments, all to be found under http://www.ifpri.org/topic/gender. Some examples are:

- **Toolkit** from IFPRI: Materials are provided to assist researchers with applying a gender analysis to their work. http://www.ifpri.org/book-20/ourwork/researcharea/gender/gender-tool-box
- **Gender Mapper:** Together with the International Water Management Institute (IWMI), IFPRI is developing a "gender map" of agriculture in Sub-Saharan Africa in order to better understand how to target agricultural interventions to women and men farmers. http://gender.mappr.info/explore.php

Un Women and its training center: http://www.unwomen.org/en and https://trainingcentre.unwomen.org/

References

Alderman, H., Chiappori, P.-A., Haddad, L., Hoddinott, J., Kanbur, R., 1995. Unitary versus collective models of the household: Is it time to shift the burden of proof? World Bank Research Observer 10, 1–19.

Baker, J.L., 2000. Evaluating the Impact of Development Projects on Poverty A Handbook for Practitioners. World Bank, Washington D.C., US.

Behrman, J.A., Meinzen-Dick, R., Quisumbing, A.R., 2014. Understanding Gender and Culture in Agriculture: The Role of Qualitative and Quantitative Approachesw, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Ed.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Behrman, J., Karelina, Z., Peterman, A., Roy, S., Goh, A., 2012. A Toolkit on Collecting Gender & Assets Data in Qualitative & Quantitative Program Evaluations.

Bellon, M., 1996. The dynamics of crop infraspecific diversity: A conceptual framework at the farmer level. Economic Botany 50, 26–39.

Bellon, M.R., Berthaud, J., Smale, M., Aguirre, A., Taba, S., Aragon, F., Dıaz, J., Castro, H., 2003. Participatory landrace selection for on-farm conservation: An example from the Central Valleys of Oaxaca, Mexico. Genetic Resources and Crop Evolution 50, 401–416.

Berti, P.R., Krasevec, J., FitzGerald, S., 2004. A review of the effectiveness of agriculture interventions in improving nutrition outcomes. Public health nutrition 7, 599–609. doi:10.1079/PHN2003595

Beuchelt, T.D., 2008. Support Networks of Rural Households. A Case Study of Risk-Management in Northern Vietnam. Margraf Publishers, Kommunikation und Beratung - Sozialwissenschaftliche Schriften zur Landnutzung und ländlichen Entwicklung No. 86. Weikersheim, Germany.

Beuchelt, T.D., Badstue, L., 2013. Gender, nutrition- and climate-smart food production: Opportunities and trade-offs. Food Security 5. doi:10.1007/s12571-013-0290-8

Bioversity International, n.d. Tips for asking gender-responsive questions [WWW Document]. URL http://www.bioversityinternational.org/e-library/publications/detail/tips-for-asking-gender-responsive-questions/

Bryman, A., 2012. Social Research Methods, 4th ed. Oxford University Press, Oxford, GB.

CCAFS, FAO, 2012. Training Guide: Gender and Climate Change Research in Agriculture and Food Security for Rural Development. Rome, IT.

CIDA, 1997. Guide to gender-sensitive indicators. Canadian International Development Agency (CIDA), Quebec, CA.

Deere, C.D., 2005. The Feminization of Agriculture? Economic Restructuring in Rural Latin America (No. 1), Occasional Paper. Geneva, CH.

Doss, C., 2001. Designing Agricultural Technology for African Women Farmers: Lessons from 25 Years of Experience. World Development 29, 2075–2092. doi:10.1016/S0305-750X(01)00088-2

Doss, C., 2013. Data Needs for Gender Analysis in Agriculture, IFPRI Discussion Paper No. 01261. Washington D.C., US: IFPRI.

Doss, C., Kieran, C., n.d. Standards for collecting sex-disaggregated data for gender analysis [WWW Document]. URL http://pim.cgiar.org/2014/07/31/standards-for-collecting-sex-disaggregated-data-for-gender-analysis/ (accessed 2.20.17).

Doss, C.R., 1996. Testing among models of intrahousehold resource allocation. World Development 24, 1597–1609. doi:http://dx.doi.org/10.1016/0305-750X(96)00063-0

Doss, C.R., 2002. Men's Crops? Women's Crops? The Gender Patterns of Cropping in Ghana. World Development 30, 1987–2000.

Doss, C.R., 2014. Data Needs for Gender Analysis in Agriculture, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springe, Rome, IT and Dordrecht, NL.

FAO, 2010. Gender and Nutrition [WWW Document]. URL http://www.fao.org/docrep/012/al184e/al184e00.pdf

FAO, 2011. The state of food and agriculture, 2010-2011. Women in agriculture: Closing the gender gap for development. FAO, Rome, IT.

Fischer, I., Beuchelt, T.D., Dufhues, T., Buchenrieder, G., 2010. Risk-Management networks of ethnic minorities in Vietnam. Asia-Pacific Development Journal 17, 93–118.

Garbarino, S., Holland, J., 2009. Quantitative and qualitative methods in impact evaluation and measuring results. Governance and Social Development Resource Centre (GSDRC); Social Development Direct.

Hellin, J., Keleman, A., Bellon, M., 2010. Maize diversity and gender: research from Mexico. Gender & Development 18, 427–437. doi:10.1080/13552074.2010.521989

ILRI, 2012. Strategy and plan of action to mainstream gender in ILRI. Nairobi, Kenya.

Johnson, N.L., Quisumbing, A.R., 2009. Data needs for measuring impacts on women's assets and asset disparities [WWW Document]. presentation from the Inception workshop of the Gender, Agriculture and Assets Project. November 2009, Narobi Kenya. URL http://de.slideshare.net/genderassets/data-needs-presentation-nov-5-final

Kabeer, N., 1999. Resources, Agency, Achievements: Reflections on the Measurement of Women' s Empowerment. Development and Change 30, 435–464.

March, C., Smyth, I., Mukhopadhyay, M., 1999. A Guide to Gender-Analysis Frameworks. Oxfam GB, Oxford, UK.

Meinzen-Dick, R., Johnson, N., Quisumbing, A.R., Njuki, J., Behrman, J., Rubin, D., Peterman, A., Waithanji, E., 2011a. Gender, Assets, and Agricultural Development Programs, CAPRi Working Paper. CAPRi Working Paper No. 99, Washington D.C., US: IFPRI.

Meinzen-Dick, R., Quisumbing, A.R., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., Beintema, N., 2011b. Engendering Agricultural Research, Development, and Extension. International Food Policy Research Institute (IFPRI), Washington D.C., US.

Momsen, J.H., 2010. Gender and Development, 2nd ed. Routledge, London and New York.

Moser, C.O.N., 1993. Gender Planning and Development: Theory, Practice & Training. Routledge, London and New York.

OPM, 2010. Using Household Surveys for Gender Analysis in Developing Countries, OPM briefing notes 2010-08. Oxford Policy Management (OPM). Oxford, UK.

Paris, T.R., Pingali, P.L., 1996. Do agricultural technologies help or hurt poor women? Competition and conflict in Asian agricultural resource management: Issues, Options, and Analytical

Paradigms: IRRI Discussion Paper Series No. 11, pp. 237-245. Edited by P.L. Pingali and T.R. Paris. International Rice Research Institute, Los Banos, Lagun 237–245.

Ponniah, A., Puskur, R., Workneh, S., Hoekstra, D., 2008. Concepts and practices in agricultural extension in developing countries: A source book. IFPRI (International Food Policy Research Institute), Washington, DC, USA, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 275 pp.

Quisumbing, A.R., 2003. Household Decisions, Gender, and Development. International Food Policy Research Institute (IFPRI), Washington D.C.

Quisumbing, A.R., Maluccio, J.A., 2000. Intrahousehold allocation and gender relations : new empirical evidence from four developing countries, FCND Discussion Paper No. 84. FCND Discussion Paper No. 84. Washington D.C., US: IFPRI.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A., 2014. Closing the Knowledge Gap on Gender in Agriculture, in: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Ed.), Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL.

Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, A., Behrman, J.A., Peterman, A. (Eds.), 2014. Gender in Agriculture: Closing the Knowledge Gap, Gender in Agriculture: Closing the Knowledge Gap. FAO and Springer, Rome, IT and Dordrecht, NL. doi:10.1007/978-94-017-8616-4

Sen, G., Mukherjee, A., 2014. No Empowerment without Rights, No Rights without Politics: Gender-equality, MDGs and the post-2015 Development Agenda. Journal of Human Development and Capabilities 15, 188–202. doi:10.1080/19452829.2014.884057

UN Women, 2016. Gender equality glossary [WWW Document]. UN Women Training Centre. URL https://trainingcentre.unwomen.org/mod/glossary/view.php?id=36 (accessed 3.31.17).

UNECE, 2010. Developing gender statistics: A practicaltool. United Nations & United Nations Economic Commission for Europe, Geneva, CH.

UNICEF, 2011. Promoting Gender Equality: An Equity-Focused Approach to Programming. New York, US: United Nations Children's Fund (UNICEF).

World Bank, 2009. Gender in Agriculture Sourcebook. World Bank, Washington, D.C., US.

World Bank, 2011. Gender equality and development. World Development Report 2012. Washington D.C., US.

Annex: Typical steps in quantitative field research

The research process can be simplified in a stepwise process, though it is often iterative. The following briefly describes the different steps of the research process and highlights where specifically gender aspects should be considered. It is based in part on UNECE (2010), where also more detailed information on how to produce gender statistics can be found.

1. Start with identifying the relevant research objectives, issues and questions. Ideally, a gender perspective is already explicitly mentioned in the research question, e.g., which maize varieties and crop characteristics are preferred by women, which by men? What is the impact of irrigation on yield, household food security and work load of women and men? Doing a survey without properly defined research questions is not a good scientific practice. This step includes a sound revision of existing literature as well as of existing concepts, definitions, and methods to produce unbiased gender-relevant information (UNECE, 2010).
2. Define the appropriate unit of analysis which is needed to answer the research question. The answer to the research unit helps also to identify whom to interview. For example, if we are interested in plots, we need to identify who is managing the plot – in many African countries there are female and male plot or crop managers. If that is the case, the plot manager or worker on the plot, i.e. probably women and men, needs to be interviewed.
3. Use qualitative research tools to quickly identify key issues around gender which need to be addressed in-depth in the quantitative research if sufficient information from literature, previous research or sound knowledge of the research region is not available. Focus group discussions help to better design the research. To identify pertinent gender issues, you can use a common gender analysis tool, i.e. the Harvard Framework[3], to find out which key gender issues are relevant, where further research is needed, and which questions should be in a baseline for impact measurement (e.g. labour division, resource access, individual health and food security, inclusion of youth or marginalized groups). Focus groups can also help to identify how men and women understand particular concepts and questions and to determine the language / wording of the questionnaire to minimize gender bias (UNECE, 2010).
4. Rethink the relevant research questions and identified research unit after the qualitative research period and adjust according to the field findings.
5. Choose the appropriate research methods to answer the research questions. Do we need quantitative or qualitative methods, or is a mixed method approach best? Do we need household or intra-household surveys, focus group discussions, key informant interviews, experimental games on risk, modelling approaches,…? Some questions related to gender issues are more easily identified with qualitative methods, especially when it comes to power issues, norms and values or domestic violence.
6. Determine the type of data analysis which you like to do. For quantitative data, this can range from, for example, descriptive, inferential, predictive or impact analysis. For qualitative data, different methods exist for example content analysis, grounded theory, case study or narratives.
7. Determine the variables which are needed to answer the research question and consider possible gender differentials and women's and men's roles and contributions in agriculture and (family) farming systems. Establish the relevant survey question around these variables. Do not choose too many variables, as a good survey should not take more than 1 hour per interview, since the concentration of the interviewer and interviewee strongly decreases after this time and data quality diminishes, and you need to show respect to the other pressures on the interviewee's time.

[3] For more information on the Harvard Framework see (March et al., 1999) and http:// www. ilo. org/public/english/region/asro/mdtmanila/training/unit1/harvrdfw.htm.

8. Determine the appropriate sample size. Sample size estimations can vary when we like to add a gender perspective to our research – not only in quantitative but also in qualitative research. In case the sex of a person is also estimated to influence the outcome variable, e.g. adoption rates of a new crop variety, the sample size needs to take this into account and be higher to detect differences. Therefore, this should be carefully considered in the sample size calculations.
9. Plan data collection methods and procedures. Depending on the research unit and the sex of the person to be interviewed, special measures need to be taken. For example, in many cultures it is not appropriate that a male enumerator interviews a female farmer. In this case, female enumerators need to be found.
10. Train the enumerators properly so that all understand the questions in the same way and that the enumerators do not show personal values in the interviews. Pay special attention to the gender issues and questions so that all enumerators understand the underlying concepts and ideas. A pre-test is recommended especially for the quantitative survey to identify errors in the questionnaire, and unclear questions and codes. Questions should be adjusted according to the feedback from the field. In some cases, a second pre-test is recommended.
11. Start the data collection: Consider timing and available resource (transport, money, etc.) when both spouses are to be interviewed. Often both spouses are not in the same place at the same time making it necessary for the interviewer to return at a later date. Finding a time of day when both spouses are at home for the interview is a challenge, e.g. a spouse is not present due to farm or off-farm work, is selling or buying at a market or participating in meetings. It might not always be possible to interview both spouses, and this affects data analysis. Migration patterns can make the situation even more complex, especially when it is planned to establish panel data4. In order to have a sufficient number of couples for a good panel dataset, the number of interviewed households might need to be higher than first calculated to account for the losses due to unavailability of spouses.
12. After data capturing and data cleaning, add a sex-disaggregated perspective and if possible, a gender lens, to your data analysis. This can go far beyond differentiating between men and women in descriptive statistics. For example, use non-unitary household models instead of assuming a unitary household.
13. The final step is writing up the results into reports, exciting publications and presentations which will close the existing gender data gaps.

[4] Panel data, also called longitudinal data, is data that is collected in several survey rounds over a longer time span with the same questions asked to the same individuals or households.

ZEF Working Paper Series, ISSN 1864-6638
Center for Development Research, University of Bonn
Editors: Christian Borgemeister, Joachim von Braun, Manfred Denich, Till Stellmacher and Eva Youkhana

26. Eguavoen, Irit; E. Youkhana (2008). Small Towns Face Big Challenge. The Management of Piped Systems after the Water Sector Reform in Ghana.
27. Evers, Hans-Dieter (2008). Knowledge Hubs and Knowledge Clusters: Designing a Knowledge Architecture for Development
28. Ampomah, Ben Y.; Adjei, B. and E. Youkhana (2008). The Transboundary Water Resources Management Regime of the Volta Basin.
29. Saravanan.V.S.; McDonald, Geoffrey T. and Peter P. Mollinga (2008). Critical Review of Integrated Water Resources Management: Moving Beyond Polarised Discourse.
30. Laube, Wolfram; Awo, Martha and Benjamin Schraven (2008). Erratic Rains and Erratic Markets: Environmental change, economic globalisation and the expansion of shallow groundwater irrigation in West Africa.
31. Mollinga, Peter P. (2008). For a Political Sociology of Water Resources Management.
32. Hauck, Jennifer; Youkhana, Eva (2008). Histories of water and fisheries management in Northern Ghana.
33. Mollinga, Peter P. (2008). The Rational Organisation of Dissent. Boundary concepts, boundary objects and boundary settings in the interdisciplinary study of natural resources management.
34. Evers, Hans-Dieter; Gerke, Solvay (2009). Strategic Group Analysis.
35. Evers, Hans-Dieter; Benedikter, Simon (2009). Strategic Group Formation in the Mekong Delta - The Development of a Modern Hydraulic Society.
36. Obeng, George Yaw; Evers, Hans-Dieter (2009). Solar PV Rural Electrification and Energy-Poverty: A Review and Conceptual Framework With Reference to Ghana.
37. Scholtes, Fabian (2009). Analysing and explaining power in a capability perspective.
38. Eguavoen, Irit (2009). The Acquisition of Water Storage Facilities in the Abay River Basin, Ethiopia.
39. Hornidge, Anna-Katharina; Mehmood Ul Hassan; Mollinga, Peter P. (2009). 'Follow the Innovation' – A joint experimentation and learning approach to transdisciplinary innovation research.
40. Scholtes, Fabian (2009). How does moral knowledge matter in development practice, and how can it be researched?
41. Laube, Wolfram (2009). Creative Bureaucracy: Balancing power in irrigation administration in northern Ghana.
42. Laube, Wolfram (2009). Changing the Course of History? Implementing water reforms in Ghana and South Africa.
43. Scholtes, Fabian (2009). Status quo and prospects of smallholders in the Brazilian sugarcane and ethanol sector: Lessons for development and poverty reduction.
44. Evers, Hans-Dieter; Genschick, Sven; Schraven, Benjamin (2009). Constructing Epistemic Landscapes: Methods of GIS-Based Mapping.
45. Saravanan V.S. (2009). Integration of Policies in Framing Water Management Problem: Analysing Policy Processes using a Bayesian Network.
46. Saravanan V.S. (2009). Dancing to the Tune of Democracy: Agents Negotiating Power to Decentralise Water Management.
47. Huu, Pham Cong; Rhlers, Eckart; Saravanan, V. Subramanian (2009). Dyke System Planing: Theory and Practice in Can Tho City, Vietnam.
48. Evers, Hans-Dieter; Bauer, Tatjana (2009). Emerging Epistemic Landscapes: Knowledge Clusters in Ho Chi Minh City and the Mekong Delta.
49. Reis, Nadine; Mollinga, Peter P. (2009). Microcredit for Rural Water Supply and Sanitation in the Mekong Delta. Policy implementation between the needs for clean water and 'beautiful latrines'.
50. Gerke, Solvay; Ehlert, Judith (2009). Local Knowledge as Strategic Resource: Fishery in the Seasonal Floodplains of the Mekong Delta, Vietnam

51. Schraven, Benjamin; Eguavoen, Irit; Manske, Günther (2009). Doctoral degrees for capacity development: Results from a survey among African BiGS-DR alumni.

52. Nguyen, Loan (2010). Legal Framework of the Water Sector in Vietnam.

53. Nguyen, Loan (2010). Problems of Law Enforcement in Vietnam. The Case of Wastewater Management in Can Tho City.

54. Oberkircher, Lisa et al. (2010). Rethinking Water Management in Khorezm, Uzbekistan. Concepts and Recommendations.

55. Waibel, Gabi (2010). State Management in Transition: Understanding Water Resources Management in Vietnam.

56. Saravanan V.S.; Mollinga, Peter P. (2010). Water Pollution and Human Health. Transdisciplinary Research on Risk Governance in a Complex Society.

57. Vormoor, Klaus (2010). Water Engineering, Agricultural Development and Socio-Economic Trends in the Mekong Delta, Vietnam.

58. Hornidge, Anna-Katharina; Kurfürst, Sandra (2010). Envisioning the Future, Conceptualising Public Space. Hanoi and Singapore Negotiating Spaces for Negotiation.

59. Mollinga, Peter P. (2010). Transdisciplinary Method for Water Pollution and Human Health Research.

60. Youkhana, Eva (2010). Gender and the development of handicraft production in rural Yucatán/Mexico.

61. Naz, Farhat; Saravanan V. Subramanian (2010). Water Management across Space and Time in India.

62. Evers, Hans-Dieter; Nordin, Ramli, Nienkemoer, Pamela (2010). Knowledge Cluster Formation in Peninsular Malaysia: The Emergence of an Epistemic Landscape.

63. Mehmood Ul Hassan; Hornidge, Anna-Katharina (2010). 'Follow the Innovation' – The second year of a joint experimentation and learning approach to transdisciplinary research in Uzbekistan.

64. Mollinga, Peter P. (2010). Boundary concepts for interdisciplinary analysis of irrigation water management in South Asia.

65. Noelle-Karimi, Christine (2006). Village Institutions in the Perception of National and International Actors in Afghanistan. (**Amu Darya Project Working Paper No. 1**)

66. Kuzmits, Bernd (2006). Cross-bordering Water Management in Central Asia. (**Amu Darya Project Working Paper No. 2**)

67. Schetter, Conrad; Glassner, Rainer; Karokhail, Masood (2006). Understanding Local Violence. Security Arrangements in Kandahar, Kunduz and Paktia. (**Amu Darya Project Working Paper No. 3**)

68. Shah, Usman (2007). Livelihoods in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (**Amu Darya Project Working Paper No. 4**)

69. ter Steege, Bernie (2007). Infrastructure and Water Distribution in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (**Amu Darya Project Working Paper No. 5**)

70. Mielke, Katja (2007). On The Concept of 'Village' in Northeastern Afghanistan. Explorations from Kunduz Province. (**Amu Darya Project Working Paper No. 6**)

71. Mielke, Katja; Glassner, Rainer; Schetter, Conrad; Yarash, Nasratullah (2007). Local Governance in Warsaj and Farkhar Districts. (**Amu Darya Project Working Paper No. 7**)

72. Meininghaus, Esther (2007). Legal Pluralism in Afghanistan. (**Amu Darya Project Working Paper No. 8**)

73. Yarash, Nasratullah; Smith, Paul; Mielke, Katja (2010). The fuel economy of mountain villages in Ishkamish and Burka (Northeast Afghanistan). Rural subsistence and urban marketing patterns. (**Amu Darya Project Working Paper No. 9**)

74. Oberkircher, Lisa (2011). 'Stay – We Will Serve You Plov!'. Puzzles and pitfalls of water research in rural Uzbekistan.

75. Shtaltovna, Anastasiya; Hornidge, Anna-Katharina; Mollinga, Peter P. (2011). The Reinvention of Agricultural Service Organisations in Uzbekistan – a Machine-Tractor Park in the Khorezm Region.

76. Stellmacher, Till; Grote, Ulrike (2011). Forest Coffee Certification in Ethiopia: Economic Boon or Ecological Bane?

77. Gatzweiler, Franz W.; Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Marginality. Addressing the roots causes of extreme poverty.

78. Mielke, Katja; Schetter, Conrad; Wilde, Andreas (2011). Dimensions of Social Order: Empirical Fact, Analytical Framework and Boundary Concept.

79. Yarash, Nasratullah; Mielke, Katja (2011). The Social Order of the Bazaar: Socio-economic embedding of Retail and Trade in Kunduz and Imam Sahib

80. Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Innovative business approaches for the reduction of extreme poverty and marginality?

81. Ziai, Aram (2011). Some reflections on the concept of 'development'.

82. Saravanan V.S., Mollinga, Peter P. (2011). The Environment and Human Health - An Agenda for Research.

83. Eguavoen, Irit; Tesfai, Weyni (2011). Rebuilding livelihoods after dam-induced relocation in Koga, Blue Nile basin, Ethiopia.

84. Eguavoen, I., Sisay Demeku Derib et al. (2011). Digging, damming or diverting? Small-scale irrigation in the Blue Nile basin, Ethiopia.

85. Genschick, Sven (2011). Pangasius at risk - Governance in farming and processing, and the role of different capital.

86. Quy-Hanh Nguyen, Hans-Dieter Evers (2011). Farmers as knowledge brokers: Analysing three cases from Vietnam's Mekong Delta.

87. Poos, Wolf Henrik (2011). The local governance of social security in rural Surkhondarya, Uzbekistan. Post-Soviet community, state and social order.

88. Graw, Valerie; Ladenburger, Christine (2012). Mapping Marginality Hotspots. Geographical Targeting for Poverty Reduction.

89. Gerke, Solvay; Evers, Hans-Dieter (2012). Looking East, looking West: Penang as a Knowledge Hub.

90. Turaeva, Rano (2012). Innovation policies in Uzbekistan: Path taken by ZEFa project on innovations in the sphere of agriculture.

91. Gleisberg-Gerber, Katrin (2012). Livelihoods and land management in the Ioba Province in south-western Burkina Faso.

92. Hiemenz, Ulrich (2012). The Politics of the Fight Against Food Price Volatility – Where do we stand and where are we heading?

93. Baumüller, Heike (2012). Facilitating agricultural technology adoption among the poor: The role of service delivery through mobile phones.

94. Akpabio, Emmanuel M.; Saravanan V.S. (2012). Water Supply and Sanitation Practices in Nigeria: Applying Local Ecological Knowledge to Understand Complexity.

95. Evers, Hans-Dieter; Nordin, Ramli (2012). The Symbolic Universe of Cyberjaya, Malaysia.

96. Akpabio, Emmanuel M. (2012). Water Supply and Sanitation Services Sector in Nigeria: The Policy Trend and Practice Constraints.

97. Boboyorov, Hafiz (2012). Masters and Networks of Knowledge Production and Transfer in the Cotton Sector of Southern Tajikistan.

98. Van Assche, Kristof; Hornidge, Anna-Katharina (2012). Knowledge in rural transitions - formal and informal underpinnings of land governance in Khorezm.

99. Eguavoen, Irit (2012). Blessing and destruction. Climate change and trajectories of blame in Northern Ghana.

100. Callo-Concha, Daniel; Gaiser, Thomas and Ewert, Frank (2012). Farming and cropping systems in the West African Sudanian Savanna. WASCAL research area: Northern Ghana, Southwest Burkina Faso and Northern Benin.

101. Sow, Papa (2012). Uncertainties and conflicting environmental adaptation strategies in the region of the Pink Lake, Senegal.

102. Tan, Siwei (2012). Reconsidering the Vietnamese development vision of “industrialisation and modernisation by 2020”.

103. Ziai, Aram (2012). Postcolonial perspectives on ‘development’.

104. Kelboro, Girma; Stellmacher, Till (2012). Contesting the National Park theorem? Governance and land use in Nech Sar National Park, Ethiopia.

105. Kotsila, Panagiota (2012). “Health is gold”: Institutional structures and the realities of health access in the Mekong Delta, Vietnam.

106. Mandler, Andreas (2013). Knowledge and Governance Arrangements in Agricultural Production: Negotiating Access to Arable Land in Zarafshan Valley, Tajikistan.

107. Tsegai, Daniel; McBain, Florence; Tischbein, Bernhard (2013). Water, sanitation and hygiene: the missing link with agriculture.

108. Pangaribowo, Evita Hanie; Gerber, Nicolas; Torero, Maximo (2013). Food and Nutrition Security Indicators: A Review.

109. von Braun, Joachim; Gerber, Nicolas; Mirzabaev, Alisher; Nkonya Ephraim (2013). The Economics of Land Degradation.

110. Stellmacher, Till (2013). Local forest governance in Ethiopia: Between legal pluralism and livelihood realities.

111. Evers, Hans-Dieter; Purwaningrum, Farah (2013). Japanese Automobile Conglomerates in Indonesia: Knowledge Transfer within an Industrial Cluster in the Jakarta Metropolitan Area.

112. Waibel, Gabi; Benedikter, Simon (2013). The formation water user groups in a nexus of central directives and local administration in the Mekong Delta, Vietnam.

113. Ayaribilla Akudugu, Jonas; Laube, Wolfram (2013). Implementing Local Economic Development in Ghana: Multiple Actors and Rationalities.

114. Malek, Mohammad Abdul; Hossain, Md. Amzad; Saha, Ratnajit; Gatzweiler, Franz W. (2013). Mapping marginality hotspots and agricultural potentials in Bangladesh.

115. Siriwardane, Rapti; Winands, Sarah (2013). Between hope and hype: Traditional knowledge(s) held by marginal communities.

116. Nguyen, Thi Phuong Loan (2013). The Legal Framework of Vietnam’s Water Sector: Update 2013.

117. Shtaltovna, Anastasiya (2013). Knowledge gaps and rural development in Tajikistan. Agricultural advisory services as a panacea?

118. Van Assche, Kristof; Hornidge, Anna-Katharina; Shtaltovna, Anastasiya; Boboyorov, Hafiz (2013). Epistemic cultures, knowledge cultures and the transition of agricultural expertise. Rural development in Tajikistan, Uzbekistan and Georgia.

119. Schädler, Manuel; Gatzweiler, Franz W. (2013). Institutional Environments for Enabling Agricultural Technology Innovations: The role of Land Rights in Ethiopia, Ghana, India and Bangladesh.

120. Eguavoen, Irit; Schulz, Karsten; de Wit, Sara; Weisser, Florian; Müller-Mahn, Detlef (2013). Political dimensions of climate change adaptation. Conceptual reflections and African examples.

121. Feuer, Hart Nadav; Hornidge, Anna-Katharina; Schetter, Conrad (2013). Rebuilding Knowledge. Opportunities and risks for higher education in post-conflict regions.

122. Dörendahl, Esther I. (2013). Boundary work and water resources. Towards improved management and research practice?

123. Baumüller, Heike (2013). Mobile Technology Trends and their Potential for Agricultural Development

124. Saravanan, V.S. (2013). “Blame it on the community, immunize the state and the international agencies.” An assessment of water supply and sanitation programs in India.

125. Ariff, Syamimi; Evers, Hans-Dieter; Ndah, Anthony Banyouko; Purwaningrum, Farah (2014). Governing Knowledge for Development: Knowledge Clusters in Brunei Darussalam and Malaysia.

126. Bao, Chao; Jia, Lili (2014). Residential fresh water demand in China. A panel data analysis.

127. Siriwardane, Rapti (2014). War, Migration and Modernity: The Micro-politics of the Hijab in Northeastern Sri Lanka.

128. Kirui, Oliver Kiptoo; Mirzabaev, Alisher (2014). Economics of Land Degradation in Eastern Africa.

129. Evers, Hans-Dieter (2014). Governing Maritime Space: The South China Sea as a Mediterranean Cultural Area.

130. Saravanan, V. S.; Mavalankar, D.; Kulkarni, S.; Nussbaum, S.; Weigelt, M. (2014). Metabolized-water breeding diseases in urban India: Socio-spatiality of water problems and health burden in Ahmedabad.

131. Zulfiqar, Ali; Mujeri, Mustafa K.; Badrun Nessa, Ahmed (2014). Extreme Poverty and Marginality in Bangladesh: Review of Extreme Poverty Focused Innovative Programmes.

132. Schwachula, Anna; Vila Seoane, Maximiliano; Hornidge, Anna-Katharina (2014). Science, technology and innovation in the context of development. An overview of concepts and corresponding policies recommended by international organizations.

133. Callo-Concha, Daniel (2014). Approaches to managing disturbance and change: Resilience, vulnerability and adaptability.

134. Mc Bain, Florence (2014). Health insurance and health environment: India's subsidized health insurance in a context of limited water and sanitation services.

135. Mirzabaev, Alisher; Guta, Dawit; Goedecke, Jann; Gaur, Varun; Börner, Jan; Virchow, Detlef; Denich, Manfred; von Braun, Joachim (2014). Bioenergy, Food Security and Poverty Reduction: Mitigating tradeoffs and promoting synergies along the Water-Energy-Food Security Nexus.

136. Iskandar, Deden Dinar; Gatzweiler, Franz (2014). An optimization model for technology adoption of marginalized smallholders: Theoretical support for matching technological and institutional innovations.

137. Bühler, Dorothee; Grote, Ulrike; Hartje, Rebecca; Ker, Bopha; Lam, Do Truong; Nguyen, Loc Duc; Nguyen, Trung Thanh; Tong, Kimsun (2015). Rural Livelihood Strategies in Cambodia: Evidence from a household survey in Stung Treng.

138. Amankwah, Kwadwo; Shtaltovna, Anastasiya; Kelboro, Girma; Hornidge, Anna-Katharina (2015). A Critical Review of the Follow-the-Innovation Approach: Stakeholder collaboration and agricultural innovation development.

139. Wiesmann, Doris; Biesalski, Hans Konrad; von Grebmer, Klaus; Bernstein, Jill (2015). Methodological review and revision of the Global Hunger Index.

140. Eguavoen, Irit; Wahren, Julia (2015). Climate change adaptation in Burkina Faso: aid dependency and obstacles to political participation. Adaptation au changement climatique au Burkina Faso: la dépendance à l'aide et les obstacles à la participation politique.

141. Youkhana, Eva. Postponed to 2016 (147).

142. Von Braun, Joachim; Kalkuhl, Matthias (2015). International Science and Policy Interaction for Improved Food and Nutrition Security: toward an International Panel on Food and Nutrition (IPFN).

143. Mohr, Anna; Beuchelt, Tina; Schneider, Rafaël; Virchow, Detlef (2015). A rights-based food security principle for biomass sustainability standards and certification systems.

144. Husmann, Christine; von Braun, Joachim; Badiane, Ousmane; Akinbamijo, Yemi; Fatunbi, Oluwole Abiodun; Virchow, Detlef (2015). Tapping Potentials of Innovation for Food Security and Sustainable Agricultural Growth: An Africa-Wide Perspective.

145. Laube, Wolfram (2015). Changing Aspirations, Cultural Models of Success, and Social Mobility in Northern Ghana.

146. Narayanan, Sudha; Gerber, Nicolas (2016). Social Safety Nets for Food and Nutritional Security in India.

147. Youkhana, Eva (2016). Migrants' religious spaces and the power of Christian Saints – the Latin American Virgin of Cisne in Spain.

148. Grote, Ulrike; Neubacher, Frank (2016). Rural Crime in Developing Countries: Theoretical Framework, Empirical Findings, Research Needs.

149. Sharma, Rasadhika; Nguyen, Thanh Tung; Grote, Ulrike; Nguyen, Trung Thanh. Changing Livelihoods in Rural Cambodia: Evidence from panel household data in Stung Treng.

150. Kavegue, Afi; Eguavoen, Irit (2016). The experience and impact of urban floods and pollution in Ebo Town, Greater Banjul Area, in The Gambia.

151. Mbaye, Linguère Mously; Zimmermann, Klaus F. (2016). Natural Disasters and Human Mobility.

152. Gulati, Ashok; Manchanda, Stuti; Kacker, Rakesh (2016). Harvesting Solar Power in India.

153. Laube, Wolfram; Awo, Martha; Derbile, Emmanuel (2017). Smallholder Integration into the Global Shea Nut Commodity Chain in Northern Ghana. Promoting poverty reduction or continuing exploitation?

154. Attemene, Pauline; Eguavoen, Irit (2017). Effects of sustainability communication on environments and rural livelihoods.

155. Von Braun, Joachim; Kofol, Chiara (2017). Expanding Youth Employment in the Arab Region and Africa.

156. Beuchelt, Tina 2017. Buying green and social from abroad: Are biomass-focused voluntary sustainability standards useful for European public procurement?

157. Bekchanov, Maksud (2017). Potentials of Waste and Wastewater Resources Recovery and Re-use (RRR) Options for Improving Water, Energy and Nutrition Security.

158. Leta, Gerba; Kelboro, Girma; Stellmacher, Till; Hornidge, Anna-Katharina (2017). The agricultural extension system in Ethiopia: operational setup, challenges and opportunities.

159. Ganguly, Kavery; Gulati, Ashok; von Braun, Joachim (2017). Innovations spearheading the next transformations in India's agriculture.

160. Gebreselassie, Samuel; Haile Mekbib G.; Kalkuhl, Matthias (2017). The Wheat Sector in Ethiopia: Current Status and Key Challenges for Future Value Chain Development

161. Jemal, Omarsherif Mohammed, Callo-Concha, Daniel (2017). Potential of Agroforestry for Food and Nutrition Security of Small-scale Farming Households.

162. Berga, Helen; Ringler, Claudia; Bryan, Elizabeth; El Didi, Hagar; Elnasikh Sara (2017). Addressing Transboundary Cooperation in the Eastern Nile through the Water-Energy-Food Nexus. Insights from an E-survey and Key Informant Interviews.

163. Bekchanov, Maksud (2017). Enabling Environment for Waste and Wastewater Recycling and Reuse Options in South Asia: the case of Sri Lanka.

164. Kirui, Oliver Kiptoo; Kozicka, Martha (2018). Vocational Education and Training for Farmers and Other Actors in the Agri-Food Value Chain in Africa.

165. Christinck, Anja; Rattunde, Fred; Kergna, Alpha; Mulinge, Wellington; Weltzien, Eva (2018). Identifying Options for the Development of Sustainable Seed Systems -Insights from Kenya and Mali.

166. Tambo, Justice A. (2018). Recognizing and rewarding farmers' creativity through contests: experiences and insights from four African countries.

167. Von Braun, Joachim (2018). Innovations to Overcome the Increasingly Complex Problems of Hunger.

168. Maksud, Bekchanov; Evia, Pablo (2018). Sanitation system and investment climate for Resources Recovery and Reuse (RRR) options in South and Southeast Asia: The cases of India, Bangladesh, Nepal, Sri Lanka, Laos and Myanmar.

169. Kirui, Oliver K.; von Braun, Joachim (2018). Mechanization in African Agriculture. A Continental Overview on Patterns and Dynamics.

170. Beuchelt, Tina; Nischalke, Sarah (2018). Adding a gender lens in quantitative development research on food and non-food biomass production: A guide for sex-disaggregated data collection

zef
Center for
Development Research
University of Bonn

Working Paper Series

Authors: Tina Beuchelt and Sarah Nischalke

Contacts: beuchelt@uni-bonn.de; snischal@uni-bonn.de

Photo: Daniel Ayalew Mekonnen

Published by:
Zentrum für Entwicklungsforschung (ZEF)
Center for Development Research
Genscherallee 3
D – 53113 Bonn
Germany

Phone: +49-228-73-1861
Fax: +49-228-73-1869
E-Mail: presse.zef@uni-bonn.de

www.zef.de