

Beyond the sex of the holder: understanding agricultural production decisions within household farms in Uganda

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While gender equality is an integral part of the development conversation, there are still data gaps that inhibit the measurement and analysis of gender-related issues. In particular, traditional agricultural surveys are administered to a representative male “holder” and often do not collect information about who else in the household is managing the different agricultural activities. As a result, they risk misrepresenting women’s participation in agricultural decision-making. This paper examines the extent of such misrepresentation using data from Uganda that included an agricultural decision-making module administered to both the holder and the holder’s spouse. We find that within men’s holdings many decisions are made jointly, and a notable number of decisions are made exclusively by women. We also find that male holders often underestimate their spouse’s management of agricultural activities. The traditional approach thus may conceal the complexity of decision-making in agricultural households and may consequently limit the design and implementation of inclusive agricultural programs.

Keywords: Agricultural Production, Decision-Making, Management, Sex-Disaggregated Data, Agricultural Survey Methods.

Introduction

National agricultural surveys, together with agricultural censuses, provide key information about the agricultural sector in many countries and are, therefore, instrumental in informing agricultural policies and programs. Agricultural surveys are traditionally administered to a representative individual or “holder” that is identified as the individual who exercises management control over the agricultural production unit (i.e., the “holding”). This concept of the holder – defined by the Food and Agricultural Organization of the United Nations (FAO) World Programme for the Census of Agriculture (WCA) – is widely used by national statistical offices in their agricultural censuses and surveys and reported in publications (see FAO [2015] for full definitions). Holdings are typically divided into two categories: agricultural households and non-household holdings, where agricultural households are estimated to make up the majority (87 percent) of all holdings globally (Lowder et al. 2016). While national agricultural surveys typically collect a wealth of economic and technical information about the holding, when the holding is an agricultural household, they often lack information about who else in the household is managing the different agri-

cultural activities beyond the holder. Too often the assumption is that the holder exercises management control over the entire agricultural production unit.

Without additional decision-making questions in agricultural surveys, the focus on the holder conceals the complexity of decision-making in agricultural households. Household farms may not necessarily operate as a single business enterprise under the direction of one individual. Even if there is one person that could be identified as managing the overall agricultural production on the farm, there may be other household members who are making important day-to-day decisions on various agricultural activities. Indeed, evidence suggests that households often engage in various agricultural activities, including multiple income-earning activities, which are often overseen by multiple household members, either jointly or separately (e.g. Smith 2015; Twyman et al. 2015). The assumption that the holder exercises management control over all agricultural production in the household thus limits our understanding of agricultural decision-making and may prevent policies and programs from being directed in the right way.

This approach may also significantly underestimate women's participation in decision-making. FAO's Gender and Land Rights Database reports that globally women constitute about 13 percent of agricultural holders, with the highest share of female holders in Europe (27.8 percent) and the lowest in the Middle East and North Africa (4.9 percent) (de la O Campos et al. 2015). Yet, since many agricultural surveys assume that the household head is the holder (see Doss [2014] or Twyman et al. [2015] for discussion), in countries where the agricultural sector is characterized primarily by agricultural households, these statistics likely reflect the household structure (i.e., whether it is female-headed or not) rather than women's overall engagement in operational decision-making in the household's agricultural activities. Even when the household head is not automatically assumed to be the holder, a male household member is typically identified as holder on account of his rights over the agricultural land or because of cultural norms that assume a man would take on the role of primary decision-maker (Doss 2014; Twyman et al. 2015).

As a way to address the possibility of multiple decision-makers in farm households and to ensure women's managerial decision-making is not overlooked, FAO's previous WCA guidelines added the concept of the "sub-holder" (FAO 2005). In the more recent WCA guidelines, this concept was replaced with the recommendation of asking specific questions about who makes different managerial decisions in different agricultural activities to better capture the intrahousehold distribution of decision-making (FAO 2015). The Global Strategy to Improve Agricultural and Rural Statistics (GSARS) guidelines on collecting sex-disaggregated data in agriculture surveys provide detailed guidance on which questions to include and how to include them (GSARS 2018). This guidance is relatively recent, and a quick review of agricultural surveys implemented by national statistical offices suggested that many national statistical offices may be quite far away from collecting information on decision-making within the agricultural household. In fact, some do not even collect information on the sex of the holder (e.g., Armenia and Argentina). Of 37 surveys reviewed, only 12 collected *some* information on decision-making in agriculture or about multiple producers within the holding (e.g., Brazil, Burkina Faso, Ethiopia, Ghana, Malawi, Mali, and Niger).¹ The majority of the surveys that collected some decision-making questions were supported by the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) initiative. In surveys outside this initiative, there is limited data collected on who in the household may take part in decision-making about the holding and which activities may be managed by different members.

A number of studies that examine decision-making in agriculture suggest that intrahousehold decision-making is complex (Katz 1995; Udry 1996; Dercon and Krishnan 2000; Doss 2001; McPeak and Doss 2006; Acosta et al. 2020). However, only a few studies have attempted to rigorously measure the extent to which women's decision-making in agricultural production is overlooked, and these studies suggest that the data may underestimate women's roles (Peterman et al. 2011; Twyman et al. 2015; de la O Campos et al. 2016; Alwang et al. 2017). Of these studies, two focus on survey design and data-collection methods,

and both are set in Ecuador (Twyman et al. 2015; Alwang et al. 2017). One compares differences in men's and women's perceptions in decision-making in cropping and land activities across plot owners (Twyman et al. 2015), and the other is a field experiment that investigates whether the choice of respondent matters using decision-making questions on pesticide use (Alwang et al. 2017). The findings from both studies suggest the survey design affects who is identified in the agricultural household as exercising management control over agricultural production across different activities.

Using original survey data from Uganda, we provide evidence on the extent to which women's participation in agricultural decision-making is underestimated. The survey consisted of two questionnaires. One questionnaire adhered to the traditional method of collecting data on the sex of the holder, representing the approach commonly used by the Uganda Bureau of Statistics in agricultural censuses and surveys. The second questionnaire was administered to both the holder and another adult (mostly the holder's spouse or partner) and focused on decision-making questions in multiple areas of agricultural production. The decision-making module allows us to compare the distribution of male and female holders based on the traditional approach to the gender distribution of principal decision-makers from the individual questionnaire. Further, as the two respondents were interviewed privately, the information allows us to also investigate whether responses by male holders on women's participation in decision-making are similar to what women self-report.

We find that for the majority of agricultural households in the sample, both men and women make decisions about agricultural production. Within men's holdings, decisions across many activities are made jointly, although, there are also a notable number of decisions made exclusively by women. Our results thus suggest that focusing only on the sex of the holder underestimates women's participation as farm managers. We also find that for some activities the responses of male holders and their spouses differ significantly on women's role in agricultural decision-making. In particular, we find that men have much lower estimates of their spouse's decision-making role across some cropping activities (e.g., decisions regarding financing). Assuming that self-response data is the gold standard for decision-making in agriculture, our results imply that more accurately representing women's decision-making in agriculture may require reconsidering holder or household head questionnaires and reorienting parts of the survey instruments to individual respondents.

While we are not the first to collect and analyze agricultural decision-making data in a sex-disaggregated manner, this is the first study to compare the traditional approach used by statistical offices to an approach that collects more detailed decision-making data. Importantly, our study uses a unique dataset that is high-resolution in the sense that it permits us to analyze decision-making by parcel, plot, crop, and even livestock type. In contrast, many previous studies examine decision-making at a more aggregate level (Ambler et al. 2017; Anderson et al. 2017; Seymour and Peterman 2018), which can make it difficult to examine why there would be conflicting responses over who is making the decisions. Previous studies that investigate data collection

methods have also focused on land and cropping activities at the plot level (Twyman et al. 2015) and on decisions over pest management and cropping activities (Alwang et al. 2017). Our data, however, includes information on a rich variety of decisions (e.g., regarding crop and input choices, finance and marketing decisions, land-related investments, and livestock).

Literature review

The literature on measuring decision-making in agriculture draws on models of intra-household bargaining. One of the earliest models of the household is the unitary model, which posits that households pool all resources and behave as a single production or consumption unit with a common set of preferences (see Alderman et al. [1995], Quisumbing and Maluccio [2003], or Doss [2013] for detailed discussion). The unitary model implies that the distribution of household income or assets does not affect household decisions, but there is a substantial body of empirical evidence demonstrating otherwise (Alderman et al. 1995; Strauss and Thomas 1995; Doss 1996; Udry 1996; Duflo 2003; Quisumbing and Maluccio 2003; Fiala and He 2017). In light of such evidence, more recent work has focused on alternative models of household behavior.

Like the unitary model, cooperative models assume that household decisions are Pareto-efficient, but unlike the unitary model an explicit bargaining process between spouses determines household outcomes (Manser and Brown 1980; McElroy and Horney 1981). Importantly, the resulting allocation of resources is a function of each individual's threat point or fallback position, which is defined as the utility they would receive if the household does not reach an agreement (e.g., their utility in divorce) (Chiappori 1988, 1992; Alderman et al. 1995; Quisumbing and Maluccio 2003; Doss 2013). In contrast to cooperative models, non-cooperative models do not assume that agreements are binding and costlessly enforceable but rather emphasize self-enforcing arrangements where each person's strategy is conditional on the other. A key element of non-cooperative models is that households do not necessarily achieve Pareto-efficient allocations, which is a testable implication (Lundberg and Pollack 1994; Doss 1996; Carter and Katz 1997; Chen and Woolley 2001; Fiala and He 2017).

Consistent with non-cooperative models, empirical studies from a variety of contexts have found inefficiencies associated with intra-household bargaining outcomes. For example, using data on agricultural households from Burkina Faso, Udry (1996) found that plots controlled by women were farmed less intensively than male-controlled plots in the same household. Other instances of non-cooperative outcomes have been found in Ethiopia (Dercon and Krishnan 2000), Ghana (Doss 2001), Guatemala (Katz 1995), and Kenya (McPeak and Doss 2006). To be sure, the cooperative model has found support in some cases. For example, Quisumbing and Maluccio (2003) used data from multiple countries to test the unitary versus collective models of the household. The authors rejected the unitary model in all countries but failed to reject the Pareto-efficient cooperative model in any of the cases.

Given that households cannot be accurately portrayed by a unitary household model, numerous issues arise regarding the measurement and analysis of intra-household gender relations, particularly in agriculture. A common concern is that many studies examining gender issues in agriculture focus their analysis on differences between "female-headed" and "male-headed" households. Such studies implicitly assume a unitary model of the household and ignore the role of women within male-headed households and vice versa (Quisumbing et al. 2014). In particular, agricultural households may have multiple plots, each of which may be held by different household members, either separately or jointly. Moreover, all decisions regarding a particular plot may not be made exclusively by the plot holder, so analyses based on the gender of the plot holder may also misrepresent the role of women in the household (Twyman et al. 2015).

An inaccurate measure of the distribution of decision-making within agricultural households may have significant implications for assessing gender gaps in agriculture and for designing interventions to close those gaps. Using plot-level data from Uganda, de la O Campos et al. (2016) estimated that the productivity differential between men and women is approximately 10 percent when using a gender indicator based on the plot manager, but they found no gender differential at higher levels of aggregation of decision-making. Peterman et al. (2011) similarly found that the use of household-level gender indicators tends to underestimate productivity differences between men and women. In related work, Kazianga and Wahhaj (2013) used data from Burkina Faso to show that yields on plots owned by men who are not the household head are similar to yields on plots owned by women in the same household. The authors thus argued that the observed gender productivity gap might not actually be due to innate gender differences, but rather the fact that men tend to occupy the authoritative role of household head.

An emerging literature on the disagreement in reported decision-making within agricultural households further highlights the importance of the selection of the survey respondent. As mentioned, agricultural surveys usually collect responses from the holder or the household head. The decision-making literature, however, consistently shows that household members often disagree about the process of decision-making or who owns various asset types. Anderson et al. (2017) used data from Tanzania to examine whether husbands and wives agreed on who holds authority over key farming, family, and livelihood decisions. While both parties agreed that the husband exhibited the majority of control over most decisions, the authors found evidence of disagreement over the extent of control in nine of the 13 decisions considered. Using data from Ecuador, Twyman et al. (2015) find that men tend to report that their wives participate less in agricultural decision-making than their wives report. Similarly, Alwang et al. (2017) find that men tend to underreport women's decision-making in pest management and cropping activities in agricultural households in a field experiment in Ecuador. Similar results have been documented by Jacobs and Kes (2015) with regards to asset ownership and Ambler et al. (2017), to name a few.

In light of the above, there have been several initiatives to improve data collection related to agricultural decision-making.

For example, the Gender Asset Gap Project collected individual-level asset and wealth data in Ghana, Ecuador, and Karnataka, India, in 2010 and included a module on agricultural decision-making of plots owned. The data is unique in that it was administered to two individuals per household, typically the male and female who were most knowledgeable about the assets and wealth of the household. Similarly, the LSMS-ISA is beginning to routinely include questions to obtain decision-making information on multiple household members. A representative household member who is considered the most knowledgeable in agricultural production in the household, however, typically completes the agricultural modules of the questionnaire and, as such, the data may not represent the perceived contributions of other members. Another important example of gender-sensitive data collection is the Women's Empowerment in Agriculture Index (WEAI). Unlike the LSMS-ISA, the WEAI asks each member of the primary couple in the household to report on their own experiences, activities, and level of decision-making within agriculture and in other household activities. Because its aim is to measure aspects of empowerment beyond decision-making in agriculture, the WEAI decision-making questions around agricultural production are aggregated by types of activities (e.g., staple-crop production, high-value crop production, livestock rearing, etc.), and information at the parcel, plot, or crop level is not collected. It is worth noting that all of these initiatives remain limited in scale: the Gender Asset Gap Project was piloted in three countries, LSMS-ISA covers eight countries in sub-Saharan Africa, and the WEAI has been mostly used at the sub-national level.

These initiatives have nevertheless yielded some important insights. Deere and Twyman (2012) argued that egalitarian decision-making – where both spouses agree that decisions are made jointly – is a more appropriate measure of agency than decision-making autonomy. Using the Gender Asset Gap data from Ecuador, the authors found that the share of household wealth controlled by women is associated with an increased likelihood of egalitarian decision-making. Ambler et al. (2017) examined the case of Bangladesh using WEAI data and found that spousal agreement on joint decision-making or asset ownership is associated with improved welfare outcomes for women relative to male-dominated decision-making or ownership. Finally, Seymour and Peterman (2018) echoed these findings with similar WEAI data from Bangladesh, though no analogous relationship was found when using data from Ghana.

Overall, the above suggests that agricultural households are often characterized by non-cooperative outcomes and, as such, promoting efficiency in resource allocation requires understanding complex family formations and diverse farming systems. Not only are various assets and decisions overseen by different (and potentially multiple) household members, but often members disagree about asset ownership and the process of decision-making. Perhaps most importantly, recent work suggests that ignoring decision-making complexity risks misrepresenting the role of women in agriculture and underestimating gender-related disparities. These issues have implications for the design of interventions to promote not only gender equality but also the adoption and scaling of technologies in the agricultural sector.

Description of study and data

Following the approach used by the Uganda Bureau of Statistics, we defined an agricultural holding as an economic unit of agricultural production under single management, comprising of all livestock kept and all land used for agricultural production purposes. Because the agricultural sector in Uganda consists primarily of agricultural households that hold small plots of land of one to two hectares on average, agricultural holdings are by and large agricultural households. The Ugandan Annual Agricultural Surveys (AAS) and agricultural census reflect this in that the unit is an agricultural household. When an agricultural survey is administered, the household head is typically identified as the holder and is assumed to make the operational decisions over the holding. The gender distribution of holders is then assumed to represent the gender distribution of decision-making. Our survey was designed to examine (1) the extent to which this overlooks other decision-makers on the holding and (2) whether the holder underestimates decision-making by others in the household.

Our survey is cross-sectional in nature and was administered in September 2016 as part of the GSARS.² The survey was administered to agricultural holdings in three districts in the Eastern Region of Uganda: Bukedea, Kamuli, and Buikwe. As mentioned, the survey consisted of two questionnaires. One was a brief holding questionnaire, which was administered to the holder. It included a household roster, a household parcel roster, and questions to capture socioeconomic aspects of the household and holding. The second was an individual questionnaire. This questionnaire included detailed questions on land and livestock owned; a series of questions on land, cropping, and livestock activities on the holding; and a number of decision-making questions related to each activity.

Enumerators were instructed to select two respondents from the household for the individual questionnaire. When possible, the holder was designated as the first respondent, while the second respondent was the spouse (or partner) of the holder if he or she lived in the household and engaged in agricultural activities on the holding. When the holder had more than one spouse in the household who engaged in agricultural activities on the holding, enumerators were instructed to select the oldest spouse. If a spouse was not available, enumerators were instructed to select a household member 15 years or older of a different gender than the holder and who engaged in agricultural activities on the holding.

The two enumerators interviewed the two respondents in each household at the same time. The holding questionnaire and the first part of the individual questionnaire were administered with both enumerators and both respondents in the same room. One enumerator interviewed the respondents and both enumerators recorded the information as a way to ensure that the household and parcel rosters contained similar information for both respondents. The second part of the individual questionnaire was administered privately and in separate locations to limit the influence the other had on the responses. Additionally, to minimize unobserved respondent bias created by household members trying to coordinate responses once households become aware of

the survey from the community, the teams were instructed to implement the survey quickly within each neighborhood area.

Two decision-making questions were asked with regard to land investment on each parcel of the holding:

- Have any permanent investments been made to [the parcel] in the last two years, such as irrigation systems, fences, or trees? Who made the decision to make these permanent investments?
- During the last rainy season, was [the parcel] cultivated, rented out, given out for free, left fallow, a forest or woodlot, a pasture, or other? Who made this decision (either to cultivate, rent out, give out for free, or leave follow)?

When a given parcel was cultivated, two decision-making questions were asked for each plot on the parcel:

- Who made the decisions concerning which crops to plant, which inputs – such as purchased or home-produced fertilizers, pesticides, herbicides – to use, and the timing of cropping activities on [the plot] since the beginning of the agricultural season?
- Who made the decisions on how to pay for or finance the cropping activities on [the plot], such as whether to use savings or to take out credit and where to borrow, since the beginning of the agricultural season?

The individual questionnaire then asked two questions for each crop on each plot:

- Who made the decision about what do to with the harvest from [the crop] (whether to sell, store, give away, or consume at home)?
- Was any amount of the harvest or a product made from the harvest from [the crop] sold? Who decided how to use the earnings from the sales of this crop?

Finally, a series of decision-making questions were asked with regard to the management of each type of livestock on the holding:

- Who manages [livestock type]?
- Who made the decisions about what preventative or curative health treatments to use on [livestock type]?
- Since the beginning of the last rainy season, were any products produced from [livestock type] consumed in the household or used on the holding? (Examples include milk from dairy cows, eggs from poultry, wool from sheep, and using manure as fertilizer.) Who made the decisions regarding which products from [livestock type] to consume at home or to use on the holding?
- Since the beginning of the last rainy season, were any products produced from [livestock type] sold for cash or bartered? Who made the decisions on which products produced from [livestock type] to sell or trade?

- Who decided how to use the earnings from selling the products produced from [livestock type]?
- Since the beginning of the last rainy season, were any [livestock type] slaughtered for home consumption? Who made the decision to slaughter [livestock type] for home consumption?
- Since the beginning of the last rainy season, were any [livestock type] sold? Who made the decision to sell [livestock type]?
- Who decided how to use the earnings from selling the [livestock type]?

The initial sample consisted of 510 agricultural households from 30 randomly selected enumeration areas (EAs) with 17 households per EA. A complete listing was done prior to sampling and survey implementation. In 19 households, the interviews were not completed. The final sample consists of 809 individuals from 491 households with 169 households from Bukedea, 161 from Kamuli, and 161 from Buikwe. For 471 households at least one of the respondents is identified as the holder. For 318 of these households, the enumerators were able to interview two respondents at the same time. In men's holdings, when two respondents were interviewed, in 98 percent of the holdings the second respondent was a spouse. Of these 318 households, 99.7 percent of the first respondents and 97.8 percent of the second respondents report being interviewed privately.

Results

This section consists of two subsections. First, we present our results related to who makes agricultural decisions in the household. Then we discuss whether survey respondents agreed on their respective roles in agricultural decision-making.

Who makes the agricultural decisions in the household?

We begin by comparing the gender distribution of the holder in line with the standard approach to the gender distribution of principal decision-makers based on the decision-making questions. There are 336 male holders and 135 female holders in our sample (Table 1). Because the household head is considered the holder, whether the holding is female- or male-headed is determined primarily by the structure of the household. About 80 percent of the female holders are widowed, divorced, or separated. Another 12 percent are in polygamous relationships, and eight percent are in a monogamous relationship. In contrast, all but 12 percent of the male holders are currently married or in a free union. Female holders are, on average, 10 years older than male holders. In addition, female holders are generally less educated – 40 percent of female holders have never been to school compared to only seven percent of male holders. Overall, 92 percent of women's holdings and 99 percent of men's holdings engaged in cropping activities since the beginning of the last agricultural season, and 76 percent of women's holdings and 85 percent of men's holdings have livestock.

In Tables 2 and 3, we look at decision-making across all activities on the holdings (Table 2 for land and cropping activities and

	Men's holdings n = 336	Women's holdings n = 135
Age of holder	45.6 (16.3)	55.5 (17.14)
Household size	5.97 (3.12)	4.68 (2.68)
Marital status of holder		
Polygamous marriage/union (%)	19.4	11.9
Monogamous marriage/union (%)	68.7	8.1
Widow/Widower (%)	1.5	54.1
Divorced or separated (%)	8.4	25.2
Never married (%)	2.1	0.7
Education		
Never been to school / No formal education (%)	6.9	40.0
Did not complete primary school (%)	45.7	38.5
Completed primary school or higher (%)	47.4	21.5
Household dwelling floor		
Earth, dirt, or sand (%)	71.4	58.5
Cement or concrete (%)	28.0	40.0
Brick or tiles (%)	1.0	1.5
Household lighting source		
Electricity (%)	24.7	26.7
Paraffin lamp (<i>tadooba</i>) (%)	58.0	60.7
Other (%)	11.3	12.6
Crops were planted since the beginning of the agricultural season (% of holdings)	98.8	91.8
Crops were harvested (% of holdings)	97.3	91.1
The holding has cattle, goats, sheep, pigs, chicken or other poultry, horses, donkeys and mules, rabbits, or other livestock (% of holdings)	84.5	76.3

Standard deviations in parentheses.

Table 1 Characteristics of men's and women's holdings.

Table 3 for livestock activities). In women's holdings, we see that women are most likely to be responsible for decision-making. This is likely the result of the demographic structure of the household, in that the household includes fewer men. In contrast, looking across activities in men's holdings, we find that it is often more likely that both men and women are responsible for determining the outcomes or operations of different agricultural and livestock activities. This means that within the holding, either both women and men make decisions jointly about an activity, or women and men make decisions about the same activity separately on different parcels, plots, or by livestock type. In more than half of men's holdings, both men and women make decisions on (1) how to use the land; (2) which crops to plant, which inputs to use, and the timing of cropping activities; (3) how to pay for or finance cropping activities; and (4) what to do with the harvest. Similarly, in about half of men's holdings both men and women manage livestock, and in roughly 40 percent, both men and women make decisions on the preventative or curative health treatments of

livestock (Table 3). We do not find corresponding evidence for both men and women making decisions in terms of permanent agricultural investments or the marketing of livestock products. In men's holdings, these are more likely to be male-only decisions in our sample.

We are also particularly interested in examining how women perceive their role in decision-making on men's holdings across activities, where the unit is the parcel, plot, or crop as opposed to the household as a whole. For this, we restrict our sample to the female respondents in men's holdings (272 observations). These women report that they are engaged in decision-making either exclusively or jointly with others for a large share of nearly all activities (Table 4). For example, there are 897 cultivated plots in this sub-sample, and for nearly 74 percent of these plots, these women reported making decisions concerning which crops to plant, which inputs to use, and the timing of the cropping activities. Similarly, for 87 percent of the 804 crops harvested across different plots, they reported making the decision about

	Men's holdings n = 336	Women's holdings n = 135
Permanent investments		
Who made the decision about permanent investments on the parcel in the last two years?		
Men only (% of holdings)	13.7	0.7
Women only (% of holdings)	0.3	8.2
Men and women (% of holdings)	6.9	0.7
No decision made (% of holdings)	79.1	90.4
Use of parcels		
Who made the decision on the use of the parcel (whether to cultivate, rent out, give out for free, or leave fallow) during the last agricultural season?		
Men only (% of holdings)	38.7	3.0
Women only (% of holdings)	8.0	66.7
Men and women (% of holdings)	51.8	22.2
No decision made (% of holdings)	1.5	8.1
Management of cropping activities		
Who made the decisions concerning which crops to plant, which inputs to use, and the timing of cropping activities since the beginning of the agricultural season?		
Men only (% of holdings)	30.7	1.5
Women only (% of holdings)	6.9	69.7
Men and women (% of holdings)	60.7	20.7
No decision made (% of holdings)	1.7	8.1
Who made the decisions on how to pay for or finance cropping activities, such as whether to use savings or to take out credit and where to borrow, since the beginning of the agricultural season?		
Men only (% of holdings)	39.9	0.7
Women only (% of holdings)	4.8	71.1
Men and women (% of holdings)	53.6	8.2
No decision made (% of holdings)	1.7	20.0
Use of harvest		
Who made the decision about what to do with the harvest (whether to sell, store, give away, or consume at home) since the beginning of the agricultural season?		
Men only (% of holdings)	25.6	0.7
Women only (% of holdings)	8.0	71.9
Men and women (% of holdings)	63.7	18.5
No decision made (% of holdings)	2.7	8.9
Use of earnings from harvest sold		
Who decided how to use the earnings from the sales of this crop?		
Men only (% of holdings)	27.4	0.7
Women only (% of holdings)	9.8	43.0
Men and women (% of holdings)	28.3	6.7
No decision made (% of holdings)	34.5	49.6

Table 2 Who makes the decisions about land and cropping activities within women's and men's holdings as reported by the holder?

	Men's holdings n = 336	Women's holdings n = 135
Livestock management		
Who manages the livestock?		
Men (% of holdings)	17.0	3.0
Women (% of holdings)	17.9	50.0
Men and women (% of holdings)	49.7	23.7
No decision made (% of holdings)	15.4	23.3
Who made the decision on preventative or curative health treatments of the livestock?		
Men (% of holdings)	33.0	3.0
Women (% of holdings)	11.9	57.8
Men and women (% of holdings)	39.6	15.6
No decision made (% of holdings)	15.5	23.6
Home consumption		
Who made the decisions regarding which livestock products to consume at home or to use on the holding?		
Men (% of holdings)	14.2	1.5
Women (% of holdings)	17.6	41.5
Men and women (% of holdings)	26.2	6.7
No decision made (% of holdings)	42.0	50.3
Sold in market		
Who made the decisions regarding which livestock products to sell?		
Men (% of holdings)	10.1	0.0
Women (% of holdings)	2.1	17.8
Men and women (% of holdings)	4.2	3.0
No decision made (% of holdings)	83.6	79.20
Who made the decisions regarding what to do with earnings from the livestock products sold?		
Men (% of holdings)	10.7	0.0
Women (% of holdings)	1.8	17.0
Men and women (% of holdings)	3.9	3.7
No decision made (% of holdings)	83.6	79.3

Note: Livestock includes cattle, goats, sheep, pigs, chicken or other poultry, and rabbits.

Table 3 Who makes the decisions about livestock activities within women's and men's holdings as reported by the holder?

what do to with the harvest (whether to sell, store, give away, or consume at home). The female respondents also reported making the decision about how to use the parcel for the majority of the parcels and how to finance the cropping activities for a large share of cultivated plots. Most of these decisions were made jointly with others, but there are also a notable number of decisions made exclusively across these activities.

There are two activities in which the female respondents report less involvement in the decisions made. The first is that on 63 percent of the parcels where permanent investments were made, female respondents report not taking part in the decision. This may be because permanent investments are more likely to be made by the individuals who have rights over the land. Based on sex-disaggregated data collected in the 2019 AAS, 49 percent of men but only 31 percent of women hold secure rights over

agricultural land.³ This gender land gap thus may help explain why men are more likely than women to make these investment decisions. The second exception is that for 83 percent of the 373 crops sold, female respondents report not taking part in decisions regarding the use of the earnings from the harvest. This corresponds with findings from FAO (2018) that suggest that men often claim a large majority of farm income. Here too it is argued that because men are more likely to hold rights to the land, they have a greater claim to the income earned from the land. Interestingly, unlike the other activities, when the decision was made, this was more likely to be an exclusive decision, than a joint decision made with others.

Overall, our data shows that while only 29 percent of the holders in the sample are women, women are decision-makers on 86 percent of the holdings, either exclusively or jointly with

Activity	Unit	Exclusively (%)	Jointly (%)	Did not make the decision (%)	Total (%)
Decision on permanent investments on the parcel	73 parcels with investments	5.5	31.5	63.0	100.0
Decision on how use the parcel	500 parcels cultivated, rented out, given out for free, or left fallow	10.8	53.4	35.8	100.0
Decisions concerning which crops to plant, which inputs to use, and the timing of cropping activities	897 cultivated plots	13.8	59.5	26.6	100.0
Decision on how to pay for or finance cropping activities, such as whether to use savings or to take out credit and where to borrow	897 cultivated plots	11.7	49.1	39.2	100.0
Decision about what to do with the harvest (whether to sell, store, give away, or consume at home)	804 crops harvested across different plots	18.8	64.4	16.8	100.0
Decision how to use the earnings from the sales of the harvest	373 crops sold across different plots	16.1	0.5	83.4	100.0

Table 4 Distribution of women's decision-making in men's holdings across land and cropping activities, self-reported by female respondents.

men (Figure 1). In comparison, men are decision-makers either jointly with women on the same activities or exclusively on different activities on 77 percent of the holdings. Part of the explanation behind the lower rate of male decision-making is that women's holdings often correspond to households where the (female) household head is single or unmarried. Taking our results together, we then find that women in men's holdings make many managerial decisions about the operation of the farm, often jointly with the male holder, but also exclusively for a notable number of activities. Focusing only on the distribution of the gender of the holder thus understates women's participation as decision-makers in agricultural production.

Do male holders' views of women's roles in agricultural decision-making differ from women's own view of their roles in agricultural decision-making?

For this part of the analysis, we examine whether men and women disagree about women's role in agricultural decision-making. To this end, we restrict the sample to men's holdings where there

are two respondents (272 holdings).⁴ We compare the woman's self-reported decision-making in land, cropping, and livestock activities to the male holder's report of her decision-making in those same activities (Table 5 and 6). When we control for the district fixed effects, we find that male holders' reports of women's involvement in the management of cropping activities are consistently three to six percentage points lower than the women's own estimates (Table 5).⁵ For livestock, we find that male holders' reports of women's involvement in how to use the earnings from livestock products are more than 13 percent lower than the women's reports when we control for district fixed effects. The differences related to most other activities are not statistically significant.

The above findings are consistent with previous studies suggesting that men and women do not always agree on the nature of the women's participation (Jejeebhoy 2002; Ghuman et al. 2006; Becker et al. 2006; Twyman et al. 2015; Alwang et al. 2017). In our study the disagreement is relatively small across agricultural activities, with a few exceptions. This may be attributed to the communities in the sample. What we find here may be

different in other contexts. This also may be attributed to the fact that in our survey the decision-making questions were asked in a highly disaggregated manner (i.e., at the parcel, plot, crop, and livestock level), which reduced misreporting across different activities. Disagreements in perceptions related to how involved women or other members are in different decisions on the holding are likely to be higher when questions about decisions made in agricultural production are at the household level, like in the WEAI survey. That is, conflicting responses may occur because men and women answer with respect to different components of household decisions (e.g., they may be thinking of different crops or plots when asked about agricultural decisions in the household) (Seymour and Peterman 2018). It may also be that conflicts in responses arise because each individual thinks about a different decision-making occasion within the specified time period (*ibid.*). Gender norms may also influence responses and result in bias due to respondents providing socially acceptable answers, which, depending on context, may influence the responses of one gender more than the other.

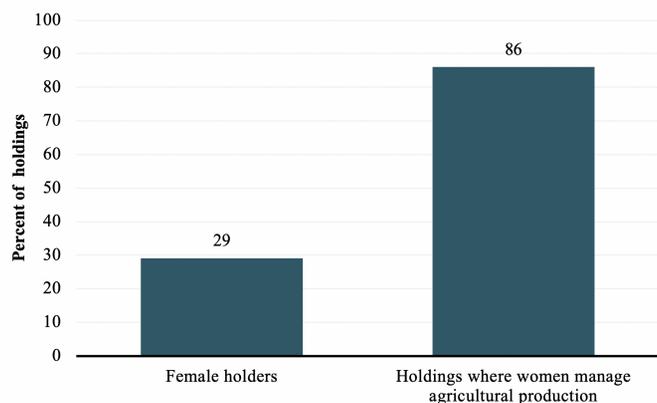


Figure 1 Proportion of female holders compared to proportion of holdings where women manage agricultural production.

Discussion and conclusion

While gender equality has become an integral part of the development conversation, there are still important data-related limitations that inhibit the measurement and analysis of gender-related issues. In particular, agricultural surveys are often administered to the holder, who is assumed to exercise management control over agricultural production of the entire holding. Agricultural households in developing countries are, however, characterized by diverse farming systems where multiple family members are engaged in different activities. Assuming the household and all its agricultural activities are managed from the top down is problematic as it implicitly assumes a unitary model of the household and ignores the complexity of decision-making within the household. Without more detailed decision-making data, there is a risk of misrepresenting the role of women in agriculture and underestimating gender-related disparities.

Using data from Uganda, we investigate the extent to which women's participation in agricultural decision-making is misrepresented by traditional agricultural surveys. We find that women in men's holdings in our sample engage in many decisions regarding agricultural production, although they are unlikely to contribute to decisions related to the use of earnings from the sale of agricultural output. Our results also show that men's and women's perceptions of who is making the decision often differ. For example, we find that male holders' reports of a female household members' involvement in the management of cropping activities are lower than the female household members' own estimates of their decision-making by three to six percentage points. Knowing which family members are managing which crops and livestock activities is essential for improving agricultural productivity (e.g., through better targeted extension advice) and for designing inclusive value chain interventions (e.g., by identifying the value chains of importance to women). The traditional approach to data collection obscures this information and may thus limit the development of sustainable and inclusive agricultural programs.

Data that takes into account women's responses in men's holdings and male-headed households gives women farmers a voice and increases the visibility of their contributions, regardless of how the man responds. Accordingly, we recommend collecting decision-making information from multiple household members rather than solely through the holder or household head. Some existing initiatives are already making progress in this regard. The LSMS+ project will collect data from multiple individuals in the household and is expected to significantly improve the availability of individually disaggregated data in the countries in which they will be implemented. However, a critical issue is that the project will be implemented in only a few countries and thus remains limited. A larger initiative, the 50x2030 initiative, aims to strengthen national data systems for the agricultural sector in 50 developing countries by 2030. The program provides survey tools that include core and rotating modules over a 10-year period. For inclusion as an optional survey tool in the 50x2030 surveys, a Women's Empowerment Metric (WEMNS) for national statistical systems is under development by a team of experts from the International Food Policy Research Institute, Emory University, Cultural Practice, the University of Oxford, and the WEMNS Study Team. The WEMNS builds on the same theoretical underpinnings as the WEAI but aims to be streamlined in a way that enables easier adoption into national surveys by national statistical systems. Widespread adoption of this tool would represent a major step forward in progress toward filling gender data gaps in agricultural surveys. WEMNS is still under development but will likely result in more data on individual-level decision-making within agricultural households and will likely be collected with minimal reliance on proxy respondents.

While wider use of multi-respondent surveys would represent an important step toward improving agricultural survey instruments, there remains scope for further improvements on the measurement and interpretation of decision-making in different contexts. One key avenue for future research relates to unpacking the meaning of making "joint" decisions with the spouse or other family members. When surveys allow for multiple decision-

Men's holdings where there are two respondents						
	Self- reported estimates of women	Number of observations	Estimates of women's participation as reported by male holder	Number of observations	Difference	Difference controlling for district
	(1)	(2)	(3)	(4)	(5)	(6)
Permanent investments						
Wife made the decision on permanent investments on the parcel (% of parcels with investments)	37.0	73	32.1	78	4.9 (0.078)	1.6 (0.070)
Use of parcels						
Wife made the decision on how use the parcel (% of parcels cultivated, rented out, given out for free, or left fallow)	64.2	500	59.3	501	4.9 (0.03)	4.9* (0.020)
Management of cropping activities (crops by plot)						
Wife made the decisions concerning which crops to be planted, which inputs to use, and the timing of cropping activities (% of crops by plot)	73.3	897	70.1	904	3.2 (0.021)	3.4* (0.020)
Wife made the decision on how to pay for or finance cropping activities, such as whether to use savings or to take out credit and where to borrow (% of crops by plot)	60.8	897	55.0	904	5.8** (0.023)	6.0*** (0.026)
Use of harvest (crops by plot)						
Wife made the decision about what do to with the harvest (whether to sell, store, give away, or consume at home) (% of crops harvested)	83.2	804	79.6	799	3.6* (0.019)	3.5* (0.019)
Use of earnings from harvest sold (crops by plot)						
Wife made the decision on how to use the earnings from the sales of this crop (% of crops sold)	65.1	373	64.0	346	1.1 (0.036)	3.2 (0.033)

Notes: Standard deviations in columns (5) and (6) are heteroskedastic-consistent. *** p < 0.01, ** p < 0.05, and * p < 0.10

Table 5 Differences in self-reported estimates of land and cropping activities as reported by women and the male holder in men's holdings.

Men's holdings where there are two respondents						
	Self- reported estimates of women	Number of observations	Estimates of women's participation as reported by male holder	Number of observations	Difference	Difference controlling for district
	(1)	(2)	(3)	(4)	(5)	(6)
Wife manages the livestock (% of holdings with livestock)	88.1	244	84.8	243	3.3 (0.031)	3.4 (0.031)
Wife made decisions on the preventative or curative health treatments of livestock (% of holdings with livestock)	69.7	244	65.4	243	4.2 (0.042)	4.3 (0.042)
Wife made the decisions regarding which livestock products to consume at home or to use on the holding (% of holdings where livestock products were consumed in the household or used on the holding)	83.8	160	80.0	175	3.8 (0.042)	3.9 (0.042)
Wife made the decisions regarding selling of livestock products (% holding where livestock products were sold)	77.6	85	75.9	87	1.8 (0.065)	7.5 (0.059)
Wife made the decisions regarding how to use the earnings from livestock products sold (% holding where livestock products were sold)	81.6	87	73.3	86	8.4 (0.064)	13.6** (0.057)

Notes: Standard deviations in columns (5) and (6) are heteroskedastic-consistent. Livestock includes cattle, goats, sheep, pigs, chicken or other poultry, and rabbits. Similar analyses were done separately by livestock type. With the exception of making decisions on the preventative or curative health treatments of small livestock, none of the differences between the self-reported estimates and estimates reported by the holder were statistically significant.
*** p < 0.01, ** p < 0.05, and * p < 0.10

Table 6 Differences in self-reported estimates of livestock activities as reported by women and the male holder in men's holdings.

makers to be listed, joint decision-making is frequently reported. However, there can be large variations in what decisions are classified as “joint”. Acosta et al. (2020) use qualitative methods to study what joint decision-making means to women and men in one community in Uganda. The study finds no evidence that joint decision-making implies decisions in which both spouses have an equal say in the discussion and an opportunity to negotiate the final decision.

Another important avenue for future research relates to understanding and capturing the role of gender norms in decision-making. The Acosta et al. (2020) study also observes that joint decision-making in their study community does not always involve a discussion between spouses, indicating that the decision-making process is not always explicit but may instead be a decision that is already agreed upon. In our data, there is no distinction in the decisions that are made passively, in that they are based on what the individual has internalized is culturally appropriate due to norms, from those decisions made purposefully. The data also does not capture what happens when disagreements arise, how gender norms may shape the ability to disagree, and who in the end has the final say in the decision. Additionally, gender norms likely shape how men and women respond to the survey questions in different contexts. Strong gender norms within communities regarding decisions-making on particular activities can mean that respondents provide socially desirable responses that may not reflect how decisions are actually made in the household. For example, a female respondent may feel she must show respect to the authority of her spouse or another male family member and thus include him as a decision-maker even when he is not a primary decision-maker on the activity.

Rigorous qualitative research could provide valuable insights into how to better ask questions in quantitative survey instruments, particularly by furthering our understanding of community-specific norms related to agricultural decision-making. While quantitative data measures the distribution of decision-making within the household and across activities, it does not provide insights on *how* decisions are negotiated within households and *why* respondents provide the particular answers. Using vignettes to classify how similar households are to a set of five hypothetical household types, Bernard et al. (2020) try to understand respondents’ perceptions of why a particular family member made certain decisions (e.g., because they are most informed, because of social norms, etc.). Vignettes blend qualitative and quantitative approaches in data collection and could be a useful tool for integrating questions on social norms around decision-making into agricultural surveys. However, more research is needed around these and other tools for capturing social norms through agricultural surveys. Qualitative work on agricultural decision-making thus represents an important avenue for future research.

Availability of data and material

The data for this study is owned by Uganda Bureau of Statistics (UBOS) and Food and Agriculture Organization of the United Nations (FAO) and restrictions apply. Data is available from the authors upon reasonable request and with permission of the owners.

Code availability

The STATA code used for this study is available from the authors upon reasonable request.

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4. For the other 19 percent of men's holdings, in eight percent, the spouse was unavailable or away and in 11 percent, the respondent was a widower or separated. In these households, there was not another adult female household member who engaged in agricultural production on the holding available for the interview.
 5. We use a least squares regression to control for district fixed effects.

Notes

1. We reviewed agricultural surveys conducted by the respective national statistical offices of the following countries and for the years listed (unless otherwise stated): Albania (2005); Argentina (2001); Armenia (2007/2008); Bangladesh (2003); Bolivia (2008); Brazil (2013); Bulgaria (2009/2010); Burkina Faso (2007/2008); Burundi (2011/2012); Canada (2015); Colombia (2010); Czech Republic (2009/2010); Ecuador (2012); Estonia (2009/2010); Ethiopia (2011/12); Estonia(2009/10); Finland (2009/10); France (2013); the Gambia (2006/07); Georgia (template); Germany (2009/10); Ghana (template); Hungary (2010); Kosovo (2005); Latvia (2010); Malawi (2010/11); Mali (2014); Mexico (2012); Niger (2010/11); Nigeria (2010/11); Palestine (2010/11); Rwanda 92012/13); Sierra Leone (2011); Tanzania (2010/11); Tunisia (2004/05); Uganda (2011/12); Zambia (2009/10).
2. The Global Strategy to Improve Agricultural and Rural Statistics (GSARS) is housed in the Statistics Division at FAO. One of its roles is to provide new cost-effective statistical methodologies, guidelines, and training material to support the implementation of the program at regional and country level. The Uganda data was collected to support guidelines for collecting sex-disaggregated and gender-relevant data in national agricultural surveys. The guidelines are available at <http://gsars.org/wp-content/uploads/2018/12/GS-GENDER-GUIDELINES-SECOND-EDITION-2018-05.pdf>.
3. FAO is the custodian of SDG indicator 5.a.1. The statistics come from the statistics division and were verified by the country.