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Women's participation in agricultural decision-making and the adequacy of their households' diets

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Abstract

This study explores the participation of 135 married women in agricultural decision-making in a cross-sectional study in central Uganda. Data was collected from nine randomly selected villages in nine parishes utilising a survey tool combining elements from the Women Empowerment in Agriculture Index and the Household Dietary Diversity Score. Rigorous editing and categorisation preceded SPSS analysis, including binary logistic regression to explore factors influencing participation. Results showed that men owned more crucial agricultural assets especially land and equipment than women, but a shift was observed in livestock ownership, with women favoring pigs and chicken. The study showed generally low participation in decision making levels among women, especially in financial decisions, mirroring traditional gender roles. They also had limited engagement in agricultural extension/advisory services (20%) and community groups (45.2%). Women with low decision-making capacity showed limited dietary diversity, relying heavily on staples, falling below the food security threshold. Membership in community groups and access to credit significantly influenced women's participation in decision-making. Access to credit increased the probability of high participation by 2.212 times, while membership in community groups increased it by 4.015 times. The study recommends that tailored credit services should be instituted to enhance women decision-making power and to foster gender equality. Education and

awareness campaigns encouraging involvement of women in community groups and association for better access to services are also recommended.

Key words: Community groups, credit influence, gender roles, livestock ownership shift, married women

Introduction

In developing countries, women have long been recognised as playing a crucial role in the agricultural sector, contributing significantly to various aspects of production, processing, and household food security (Botreau & Cohen, 2020). In regions such as Africa and Southeast Asia, women's participation in the agricultural labor force has been estimated to reach up to 50% (Doss and SOFA team, 2011). Remarkably, in Uganda, women are responsible for approximately 56% of agricultural labor, while their contributions to total food production reach up to 90%, underscoring their pivotal role in influencing household food security (Palacios-Lopez *et al*., 2017). Despite the substantial contributions made by women in the agricultural domain, they are often confronted with significant constraints when it comes to making decisions related to agriculture.

The root cause of such constraints can be traced back to prevailing gender norms that perpetuate inequalities in gender relations between men and women across various spheres of life, including access to and control over productive resources (Botreau and Cohen, 2020). Consequently, men tend to dominate the decision-making processes in agriculture due to their ownership and control of key agricultural production resources and income (Pelekamoyo and Umar, 2019). The lack of access to and control over productive assets for women has a direct impact on their ability to actively engage in agricultural decision making, perpetuating a cycle of gender disparity within the sector. However, some studies have shown that when women are granted control over assets and decision-making power, they tend to prioritise agricultural products that enhance and ensure household food security (Sraboni *et al*., 2014), thereby improving household diet quality (Sariyev *et al*., 2020), and positively influencing the nutritional status of household members (Sraboni *et al.*, 2014).

Improving food security (zero hunger) is a critical public health issue (WHO, 2015) and effective engagement of women is required since they make major contributions to household food security (Botreau and Cohen, 2020). Connsequently, advancement of gender equality is among the cross-cutting issues of the 2030 sustainable development goals (WHO, 2015). Yet, it has been reported that women control less land compared to men; use less credit; have less education; less access to extension

services and have limited membership in community groups (Kassie, 2014). This makes it more difficult for women to gain access to and use such resources as credit, fertilisers, and nutrition education to sustainably influence household food availability and utilisation.

The limited decision-making is of major concern as agricultural production strategies shift to assuring sustainable food and nutrition security to improve the global population's health. The central argument of this paper is that the conversion of agricultural production resources into outputs involves critical decision-making processes. These decisions may include selection of enterprise, resource investment, marketing, and allocation of profits (Fletschner and Kenney, 2014). Overall, the major decisions are made by one who has control over these resources and this is usually the male head of the household. Women are reported to engage in decisions to assure household food and nutrition security (Kim *et al*., 2017), which are often not quantified and often undervalued; thus their input is considered minor when compared to men's decisions (Jejeebhoy, 2002). Notably, women's decisions often include what food crops to grow, how much of the food crop harvest is used for household consumption, and how to process and preserve food for later household use (Kassie, 2014). These decisions are critical to health and survival of millions of households that subsist on their own production (Sraboni et al. 2014). Hence, there is need to identify strategies to boost women's decision-making processes to improve household diets.

The concept of decision-making has different meanings in different contexts (as defined by different researchers). For instance, in the field of psychology, decision-making may refer to the cognitive processes involved in choosing a course of action among multiple alternatives (Vohs *et al*., 2014); in business management, decision-making often pertains to the process of identifying problems, evaluating alternatives, and selecting the best course of action to achieve specific organisational goals (Forman and Selly, 2001); while in public policy and governance, decision-making may be explored in the context of political processes and policy formulation (Almeida and Báscolo, 2006).). Finally in sociology, the concept of decision-making can be studied in the context of family dynamics, social norms, and cultural influences on individual and collective choices. The current study is more skewed towards the sociology context of decision-making. Therefore, as per Simon's (1958) rational decision-making model, the decision-making process was expected to entail an emphasis on enumerating several potential options and subsequently focusing on the one deemed optimal (Galiè *et al*., 2015). Consequently, women are expected to engage in substantial thinking and reasoning to arrive at the most advantageous and efficient choice. Within the agricultural domain, women have access to a myriad of options and technologies that can bolster production, household food preservation, and food

utilisation. Therefore, this study sought to improve comprehensive understanding of how women in Uganda actively participate in decision-making concerning agricultural production for household food security.

Numerous studies have established compelling relationships between women's participation in agricultural decision-making and household dietary adequacy (Sell and Minnot, 2018; Sariyev *et al.*, 2020; Sariyev *et al.*, 2021). Consequently, women's active involvement in decision-making processes within the agricultural sector has been found to significantly influence food choices, household food security, and dietary diversity (Kassie *et al.*, 2020; Wei *et al.*, 2021). When women are empowered to make decisions about agricultural practices and resource allocation, they tend to prioritise interventions that enhance food availability, accessibility, and utilisation within the household (Sraboni *et al.*, 2014). Through their decision-making agency, women often emphasize the cultivation and consumption of diverse and nutritious crops, leading to improved diet quality for all household members (Sariyev *et al.*, 2020). Furthermore, studies have indicated that women's decision-making power positively impacts dietary diversity and nutrition outcomes, ultimately contributing to enhanced household well-being (Sraboni *et al.*, 2014). As such, fostering women's agency in decision-making is not only a matter of gender equality but also holds profound implications for achieving sustainable food security and improved nutrition at the household level. Despite the numerous empirical evidence from diverse contexts that underscores the pivotal role of women in shaping household dietary adequacy through their active engagement in agricultural decision-making processes (Njuki *et al.*, 2021; Visser and Wangu, 2021), such data is lacking in Uganda. Given the diversity of socio-cultural contexts and agricultural production systems in Uganda, this study sough to contribute to the body of knowledge of how women's agricultural decision-making influences household food production and dietary adequacy indicated by dietary diversity.

Furthermore, a plethora of studies has shed light on the multifaceted influence of socio-economic and institutional factors on women's participation in agricultural decision-making (Antman, 2014; Bertocchi *et al.*, 2014). However, these investigations have also revealed that the specific drivers of women's involvement in decision-making vary considerably across different contexts. To address this knowledge gap, our study focused on rural households in central Uganda, seeking to achieve two primary objectives: i) to determine the level of women's engagement in agricultural decision-making within a rural context in Buganda region of Uganda, and ii) to characterise the diverse factors influencing their participation in decision-making in agricultural production processes. By undertaking this comprehensive analysis, our research aimed to provide nuanced insights into the dynamic interplay between women's decision-making agency, household food security, and dietary adequacy.

The overarching research question was: to what extent do individual women's participation in agricultural decision-making shape their households' food security and, consequently, influence the dietary adequacy of their households? Through this investigation, we aimed to contribute substantively to the existing literature on gender, agriculture, and nutrition, providing evidence-based recommendations to support gender-sensitive policies and interventions that foster women's agency and sustainable food security in central Uganda.

Methodology

A cross-sectional study was conducted in Luwero district (Fig. 1) which lies north of Kampala city, between latitude 2^0 north of the equator and east of the longitude between 32^0 and 33^0. Much of Luwero district experiences modified equatorial climate, with rainfall that is well distributed throughout the year and peaking around March-May, and October-November. Economic activity within the district is dominated by agriculture with 81% of the households engaging in some form of agricultural activity. Subsistence farming remains the primary source of livelihood for 66% of households in the district (Namara *et al*., 2013). Luwero Sub-county has nine parishes of Bwaziba, Bweyeyo, Kabakedi, Kagugo, Kasaala, Katuugo, Kigombe, Kikube and Nakikoota. Data was collected from nine villages, each randomly selected from each of the 9 parishes.

Study population

The study population included all married women in Luwero sub-county that were living in the same households with their spouses. While most previous studies on household decision-making had targeted both men and women, this study intentionally targeted women because there was no need to compare their decisions with any other person in the household as the study intended to understand their levels of participation in the most common agricultural activities. The number of women included in the study was calculated using the Bartlett *et al*. (2001) formula for surveys based on a 90% estimated proportion of farmers in Luwero (Odogola, 2006) and a margin of error estimated at 5%. All nine parishes in Luwero Sub-county were sampled and one village was randomly selected from each parish. A village register from each local leader (Local Council 1 or LCI chairpersons) in the selected villages was obtained. A total of 1373 households were identified; and these served as the sampling frame from which households that had the target participants (female farmer less than 65 years of age) were selected. In general, this study targeted all female farmers that were not too old to actively engage in agricultural activities. Women that were over 65 years of age were excluded to avoid those with physical limitations that could affect their level of participation in agricultural decision-making.

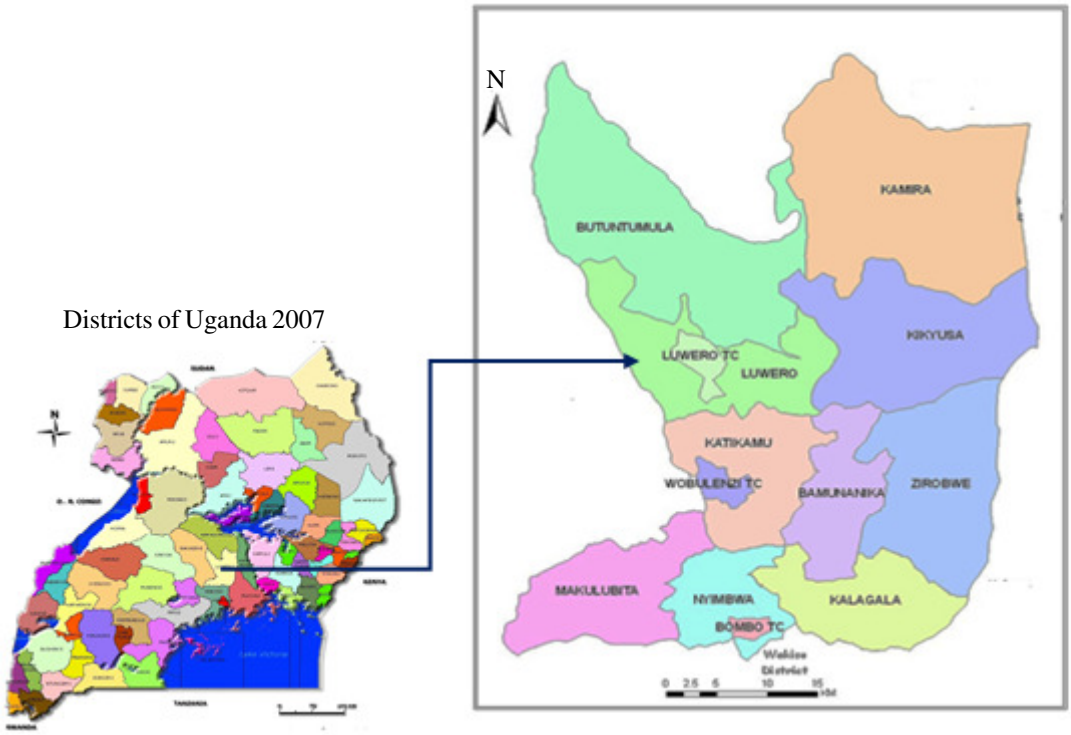

Figure 1. Location of Luwero Sub County and the parishes included in the study.
Source: Luwero District Statistical abstract for 2008/2009.

From all the 9 villages, a total of 923 households were confirmed to have female farmers (aged 16-65) and residing in the same household with their spouses, and both the target woman and her spouse were both engaged in farming. Fifteen (15) households were randomly selected from each of the 9 villages, using random numbers created by Microsoft excel computer program. Thus, a total of 135 women were engaged in the survey. However, data collected from two households was incomplete and was thus excluded from the analyses.

Data collection

A survey tool with open and close-ended questions was used to collect data. To ensure validity of the study tools, the survey questionnaire was constructed with extractions from standardised tools, namely: the Women Empowerment in Agriculture Index (WEAI) tool (Alkire et al., 2013) and the Household Dietary Diversity Score (HDDS) which was developed by FAO (Swindale and Bilinsky, 2005). The WEAI was used to determine how women participated in agricultural decision-making and it also had a section of time use from which the time poverty variable (which in this study is referred to as workload) was computed while the HDDS was used to assess the diversity of household diets. Socio-demographic characteristics, household asset

ownership and control were also captured using questions from the Uganda Demographic Survey (UBOS and ICF 2017). The entire questionnaire was pre-tested in Nangabo sub-county, Wakiso district on a sample of 20 women who were similar to the targeted study participants.

Women's participation in agricultural decision-making was computed by combining scores of ratings on the following decision areas: land allocation to crops; crop enterprise selection; agricultural technology adoption; purchase of inputs/equipment; marketing of produce as well as allocation of income from crop sales. Each decision area was rated as 0 for "*Never participated*", 1 for "*Rarely participated*", 2 for "*Participated sometimes*", 3 for "*Often participated*", and 4 for "*Very much participated*". The individual scores on each decision area were summed up to derive the individual total score on decision making; and each individual could score a total of 0 to 30 points. These scores were then used to categorise women's level of participation in agricultural decision making. An average score per respondent was obtained from the scores under each agricultural decision-making area. From here, respondents with average scores of 1-2 were placed under the low decision-making category while those with scores of 3-4 were placed under the high decision-making category.

Household dietary diversity was measured by summing the food groups consumed by participants during the 24 hours preceding the interview using the household dietary diversity score (Swindale and Bilinsky, 2005). Consumption of a particular food group was assigned 1 or 0 for non-consumption; and the 12 food groups in HDDS were used to create the dietary diversity scores. Therefore, the maximum possible score for each household was 12 in case the household had included foods from all the groups in their diet during the day preceding the survey. Three dietary diversity scores (DDS) categories were created, notably: households that used 1-3 food groups were classified as "*low dietary diversity"*, 4-5 food groups were categorised in the "*medium diversity score"* while those with scores above 6 food groups documented to have "*high dietary diversity*".

Data analysis

The collected questionnaire data underwent rigorous editing and categorisation before being entered into the Statistical Package for Social Sciences (SPSS, Version 16) for analysis, which involved the generation of summary frequency tables and graphs. The analysis comprised both univariate and multivariate levels. At the univariate level, frequencies and percentages were computed for selected key variables, including education level, dietary diversity, and engagement in agricultural decision-making. This approach facilitated a focused examination of essential factors among the study

participants. For a more in-depth exploration of the factors influencing women's participation in agricultural decision-making, multivariate analysis, specifically logistic regression, was employed. In developing the regression model, we carefully selected a subset of crucial socio-demographic variables deemed to have a substantial impact on women's participation. Specifically, age, education level, and workload were identified as key factors. Additionally, institutional variables such as access to credit, agriculture extension services, and membership in community groups and networks were included in the model.

Given that the dependent variable was binary, categorised into 'low participation' and 'high participation,' a binary logistic regression model was chosen. This model was designed to test the hypothesis that a concise set of socio-demographic and institutional factors significantly influences women's participation in agricultural decision-making. By focusing on a more specific set of variables, a clearer and more targeted analysis of the factors driving women's roles in decision-making within the agricultural sector would be shown.

The functional form of the Logistic regression model was specified as follows (Gujarati and Porter, 2009):

(1) $$\prod(X) = E\left(Y = \frac{1}{x}\right) = \frac{1}{1+e^{-(\beta o+\beta iXi)}}$$

Equation (1) could be written as follows,

(2) $$\prod(X) = \frac{1}{1+e^{-Zi}}$$

Where: "(x) is a probability of '*high participation'* in agricultural decision-making ranging from 0 to 1; and Zi = is a function of *n* explanatory variables (Xi) which is also expressed as:

(3) $$Zi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + Ui$$

Contrarily, the probability that a woman will have '*low participation'* in agricultural decision can be expressed as,

Thus,

(4) $$1 - \prod(X) = \frac{1}{1+e^{-Zi}}$$

(5). $\prod(X)/1 - \prod(X) = (1 + e^{zi} / 1+e^{-zi}) = e^{zi}$

For this case, the expression $\prod(X)/1 - \prod(X)$ meant the ratio of the probability that a woman will have '*high participation'* to the probability that she will have '*low participation'*.

The specific independent variables entered in the model (Table 1) were:

X_1 Age of the woman in years
X_2 Education level in number of years the woman spent at school
X_3 Women's workload i.e., whether the woman has a normal workload (1) or otherwise (0). Households with women who confessed working for more than 10.5 hours a day were placed under abnormal workload while those below 10.5 hours were placed under normal workload.
X_4 Access to credit i.e., whether a woman has access to credit (1) or otherwise (0)
X_5 Access to agricultural extension and advisory services, where (1) was access and (0) otherwise.
X_6 Membership in community groups, where (1) was for membership and (0) otherwise.

The items in the model were tested for multi-collinearity (Morgan *et al*., 2004) using the variable inflation factor (VIF) and the tolerance values (TV).

Results and discussion

Characteristics of the study participants

Table 2 shows the study participants' socio-demographic characteristics. Most participants (84.2%) were between 16-45 years of age indicating that most were in the economically productive age groups and were also within the reproductive age. Almost two thirds (65.4%) of the respondents were between 26-55 years which is an age group composed of women who could make independent decisions; however, most of these women had very limited education. The participants had limited formal education. Almost 16% had not attained any formal education, the majority (70%) had attained only primary education, and only14% had acquired post primary education. The average number of years in school was 4.09 implying that many women did not attain upper primary education and thus had limited capacity to seek and interpret new knowledge on their own. Since the study targeted farming households, majority (82%) of the respondents were engaged in farming as their primary livelihood activity.

Table 1. Explanatory variables and a priori expectations

Variable	Description of the explanatory variables¥	Expected sign
X_1	***Age*** -for number of years a woman has	+
X_2	***School years*** -completed education level of by the woman	+
X_3	***Workload*** -whether a woman has an abnormal workload (1) or otherwise (0)	-
X_4	***Credit***-woman's access to credit, 1=yes, 0=no	+
X_5	***Got extension*** -dummy variable for access to extension by the woman; 1 = yes, 0 = otherwise	+
X_6	***Community-groups*** -whether a woman is a member in community groups, 1=yes, 0=no	+

¥These variables were determined from review of literature and preliminary analyses. Each variable is explained below:

Age [AGE]-increase in age was expected to increase women's participation in agricultural decision-making. With each additional year, a woman is expected to make more informed decisions in agricultural production.

Education level of woman [SCHOOL YEARS]: increase in the education level of the woman is associated with increase in the level of decision-making. It is easier for an educated women farmer to interpret information and independently adopt innovations easily than one who is not educated.

Work load [WORKLOAD]: a dummy variable for abnormal workload i.e., above 10.5hrs of work a day (1) and (0) otherwise. Heavy workload reduces time for women to fully engage in agricultural decision-making and vice versa.

Access to credit [CREDIT]: Credit helps women to purchase agricultural inputs and pay off workers and thus was expected to increase women's participation in agricultural decision-making.

Access to extension services [GOT EXTENSION]: Access to extension offers information to women and insights on new innovations and agronomic practices which enable women to make informed decisions.

Membership in community groups and networks [COMMUNITY-GROUPS]: When a woman is in community groups, she is expected to benefit from the increased information flow, exchange of ideas and technologies, social support, and other outcomes of interacting with others. These help women in making decisions based on the kind of advice or new information they receive through groups and networks.

Table 2. Socio-demographic characteristics of the respondents

Characteristic	Proportion (%)
Participants' age (years)	
16-25	28.6
26-35	30.0
36-45	25.6
46-55	9.8
56-65	4.5
>65	1.5
Education Level attained	
No formal education	15.8
Primary	70.0
Post primary	14.2
Primary occupation	
Agricultural, self employed	82.0
Non-agricultural, self employed	7.4
Unemployed	7.0
Others	3.5

Decision making and women's ownership of assets at household level

The study showed that a substantial 76% of agricultural land is primarily owned by men, despite the prevalence of land in 84% of households, which raises pertinent questions about gendered power dynamics (Table 3). This echoes established patterns found in prior research (Meinzen-dick *et al*., 2010; FAO, 2011), indicating a consistent trend in the male-centric ownership of crucial agricultural assets.The dominance in ownership extends beyond land to encompass essential assets such as agricultural equipment (75%) and bicycles (70%), reinforcing a traditional distribution of resources favoring men. This implies a significant gender gap in decision-making power related to key agricultural resources, setting the stage for an exploration of how such disparities may influence broader household dynamics.

With regard to livestock ownership, while men hold the majority of livestock, our findings illustrate a distinct preference among women for pig and chicken ownership, at significant 61% and 43%, respectively. This departure from conventional livestock ownership patterns is noteworthy, underlining a nuanced decision-making process within households. The choice of pig ownership by women is not merely a statistical observation but holds substantial implications. Women's inclination towards pig ownership is associated with lower investment costs and a seamless integration of

Table 3. Ownership of productive assets among household members (n=133)

Asset	Proportion of households owning asset (%)	Who owns asset within household (%)			
		Man	Woman	Both	Others
Agricultural land	84.2	76.1	8	9.7	6.2
Non-agricultural land	17.8	66.7	11.1	14.8	7.4
Residential houses	71.4	84.4	6.2	8.3	1.1
Knapsack sprayer	36.1	75.1	16.7	8.2	0
Motorcycle	31.6	88.1	4.8	7.1	0
Bicycle	63.9	69.8	19	9.5	2.3
Cattle	26.3	57.1	22.9	17.1	2.9
Chicken	64.1	23.9	43.2	19.3	13.6
Pigs	33.1	13.6	61.4	22.7	2.3

these animals into household responsibilities. Unlike the conventional pursuit of large livestock for social status, women's choices are grounded in practical considerations that align with their responsibilities and preferences within the household. Understanding these ownership dynamics within the agricultural realm is crucial in the context of our overarching study, which explores the correlation between women's participation in agricultural decision-making and household dietary diversity.

The evident gender disparities in the ownership of agricultural resources highlight a potential asymmetry in decision-making power, which can profoundly influence the allocation of resources within households. In the realm of livestock ownership, the observed preference of women for pigs, known for their lower investment requirements, suggests a potential avenue for women to exercise agency within resource constraints. The practical considerations influencing women's choices may extend to decisions related to household dietary diversity, providing insights into how women navigate these dynamics to ensure the well-being of their households.

Women's participation in agricultural decision-making

Results indicated a trend of generally low participation levels among women, particularly in decisions entailing financial considerations (Table 4). Analysing mean participation levels unveils intriguing patterns. Notably, women exhibit the highest mean participation level (2.59) in the crucial domain of crop enterprise selection. This aligns with broader societal norms, emphasizing women's central role in ensuring household food security and nutrition (Quisumbing *et al*., 2015). The emphasis on crops directly contributing to family consumption and dietary diversity, characterised by essential nutrients and shorter cultivation-to-harvest cycles, resonates with women's prioritisation. Conversely, the data portrays a stark contrast in women's

Table 4. Extent of women's participation in agricultural decision-making (n=133)

Agricultural Decision-making domain	Mean participation level (scale 0-4)	% women that participate				
		Very much	Often	Sometimes	Rarely	Never participate
Crop enterprise selection	2.59	27.4	37.8	25.9	6.7	2.2
Purchase of inputs/equipment	1.78	21.5	8.2	25.2	17.04	28.1
Agricultural technology adoption	2.02	27.41	8.2	25.2	17.8	5.21
Acreage of land to grow crops	2.30	30.40	11.0	29	17.04	12.6
Marketing of crop produce	2.13	33.33	6	23.7	14.07	5.23
Income allocation from crops sales	2.01	30.4	6.7	24.44	11.1	27.40

participation, with the lowest mean level (1.78) observed in decisions related to the purchase of agricultural inputs or equipment. This crucial aspect, entailing financial investment, reflects a significant gap in women's involvement, echoing traditional structures where male household heads tend to take the lead in financial decisions.

These findings encapsulate the divergent roles played by women and men in agricultural pursuits. Women, often bearing the primary responsibility for household food security, gravitate towards selecting crops vital for immediate family consumption. The preference for quick-maturing crops, such as vegetables, sweet potatoes, and beans, aligns with the imperative of ensuring swift food availability, particularly during periods of scarcity. Women's involvement in growing cassava (root crop) (Fig. 2), a food security crop for times of shortage, further underscores their strategic decision-making for the welfare of the household. On the flip side, men predominantly engage in decisions pertaining to cash crop production, emphasizing crops with higher market value and extended cultivation cycles. This delineation reflects the broader economic roles assumed by men, contributing to household income and overall economic stability. The nuanced dynamics highlight the complementary roles of men and women in sustaining the agricultural ecosystem within the household.

Despite the multifaceted contributions of women in crop selection for food security, a substantial proportion (more than a quarter) reports non-participation in critical financial decisions. Decisions regarding the purchase of inputs, utilisation of income from crop sales, marketing of crop produce, and the adoption of agricultural technologies remain domains where women, to varying extents, are sidelined. This asymmetry in financial decision-making can be attributed to entrenched gender norms, with financial decisions traditionally falling under the purview of male household heads. The observed reluctance or exclusion of women in these realms highlights a crucial area for intervention and empowerment, acknowledging the pivotal role women play

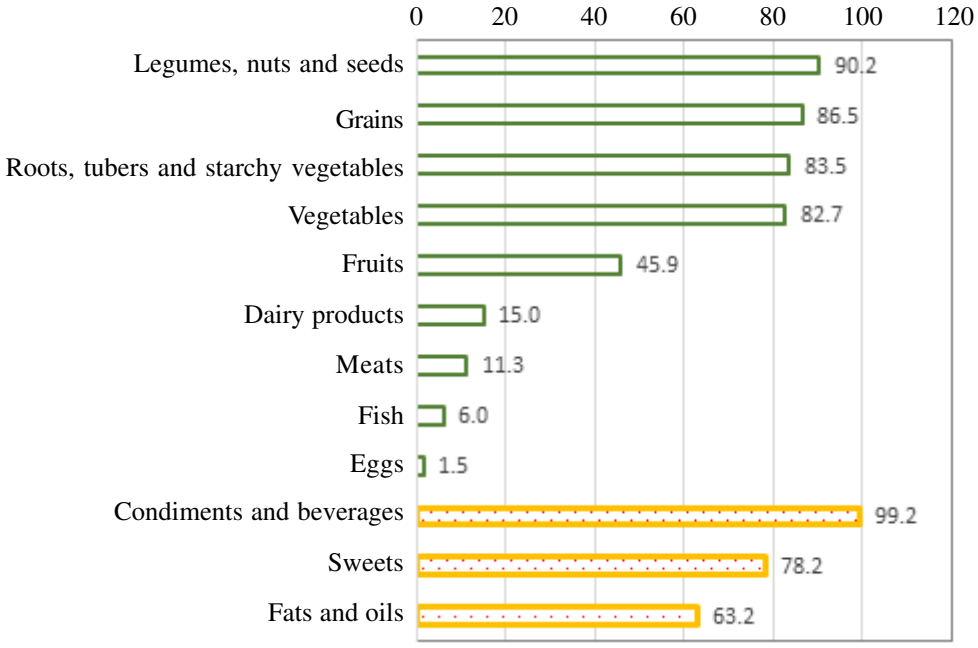

Figure 2. Proportion of households that selected each food group (n=133).

in agricultural sustainability. The observed patterns underscore the necessity of re-evaluating and dismantling gendered structures that limit women's agency in financial decision-making within the agricultural sphere. Empowering women to actively participate in decisions carrying financial weight not only fosters gender equity but also holds the potential to optimise household agricultural strategies and enhance overall economic resilience. This reorientation is paramount for achieving a more inclusive and sustainable agricultural landscape.

Women's engagement in social and leadership institutions

Findings as shown in Table 5 reveal a low level of engagement of women in social institutions. For instance, a small number of women (20%) had accessed agricultural extension and advisory services (AEAS) within the year preceding the study, which indicates that most women are not getting access to agricultural information. This does not only reduce women's agricultural production and household food security but also reduces their knowledge and skills in adopting new technologies. It has been argued that extension provides a source of information on new technologies for farming communities which when adopted can improve production, incomes, and standards of living (Bonye *et al.*, 2012). Hence, the limited access to extension services further disempowers women in making decisions that can improve their incomes and quality of life. Also, women's limited access to extension services can be partly attributed to low engagement in community groups. In Uganda the ratio of extension workers to

Table 5. Socioeconomic and leadership institutions/groups that women are engaged in (n=133)

Social institutions	Yes (%)
Access to credit	33.3
Access to agricultural extension/advisory services	20.0
Membership in community groups and networks	45.2
Others	1.5
Saving and credit groups	*85*
Farmers' association	*5*
Burial/good Samaritan group	*3.3*
Religious association	*3.3*
Others	*3.3*

farmers is high (estimated at 1:1500) hence it is not easy to reach individual farmers. Women's membership is community groups may thus be necessary for them to access extension services because most development programs by both government and non-government agencies provide extension services to farmers, through groups for efficient service delivery (Mbo'o-Tchouawo and Colerson, 2014). In this study, according to Table 5, less than a half (45.2%) of the women belonged to community groups and networks. Of these, majority (85%) belonged to savings and credit groups (SACCOs), 5% belonged to farmers' associations, women's association (good Samaritan) (3.3%), religious association (3.3%) while other women groups were about 3.3%.

Household dietary adequacy because of women's participation in agricultural decision-making

Results showed that 2.26% of the households had a low diet of 1-3 food group only; 18.80% of households had medium diets of 4-5 food groups, while 78.95% of households had high diets of 6+ food groups (Table 6). With a chi value of 4.97 (P=0.083), there was a weak relationship between participation in agriculture decision-making and dietary adequacy in as much it is taking a positive trend. The study loosely suggests that increased participation of women in agricultural decision-making is associated with improved dietary adequacy. This can partly be attributed to the fact that the majority of women assessed reported adhering to diverse diets and thus most had high dietary adequacy levels (Table 6). The weak relationship between decision-making and dietary adequacy may suggest that other factors play a role in influencing households' food consumption patterns. These factors might include access to resources, income levels, food availability, cultural practices, and social norms, among others (Larson *et al.*, 2019; Deaconu *et al.*, 2021). A majority

Table 6. Association between the level of women's participation in agriculture decision-making and household dietary adequacy

Extent of participation in decision-making	Level of dietary adequacy		
	Low	Moderately	High
Low participation	0	11	56
High participation	3	14	49
%Total with level of diet adequacy (n)	2.26 (3)	18.80 (25)	78.95 (105)

χ^2= 4.97; p-value = 0.083.
NB: Figures in parentheses are total number of households in each category

of these households exhibited diets exceeding five food groups (78.9%), aligning with recognised standards of food security (Sambo *et al*., 2022). The diversity spanned essential elements, including legumes, grains, roots, tubers, starchy staples, vegetables, as well as nutrient-dense animal-source foods like meats, fish, eggs, and dairy products, though the animal proteins were the least mentioned (Fig. 2).

Socio-demographic and Institutional factors influencing women's participation in agricultural decision-making

The analysis with marginal effects provides a nuanced understanding of how each factor influences women's participation in agricultural decision-making. Socio-demographic factors of workload, age and education were not significant predictors of decision making in women (Table 7). On the other hand, the institution factors of membership in community groups and access to credit emerge as strong predictors with substantial marginal effects. The findings highlight the importance of collective action, social capital, and economic empowerment in fostering women's active roles in agricultural decision-making. A woman's access to credit increases the probability of high participation by 2.212 times, i.e., every time a woman accesses credit, her likelihood of highly participating in agricultural decision-making increases by a factor of 2.212. Access to credit emerges as a key factor, indicating that financial empowerment significantly contributes to women's agency in making decisions related to agriculture. The inference drawn from this finding is that when a woman has access to credit, she may use it to purchase extra farm inputs for her garden without necessarily having to hustle with the spouse. Cherotich *et al.* (2022) reported that without credit, women are less likely to afford production factors such as inputs, labor and storage facilities which inhibits their effective participation in agricultural production activities. Interventions that improve rural women's access to financial services can enhance women's productive capacity and individuals' relative power within the households which could lead to both a more efficient allocation of production resources with

Table 7. Logistic regression of socio-demographic and Institutional factors associated with women's participation in agricultural decision-making

Independent variables	B	Odds ratio	Probability	Marginal effects
Socio-demographic factors				
Workload	.014	1.014	.975	0.025
Education	-.032	.968	.592	0.395
Age	.012	1.012	.499	0.507
Institutional factors				
Access to credit	.828	2.288	.033	2.212
Membership in community groups	1.391	4.019	.001	4.052
Access to agricultural extension	.221	1.247	.572	0.534
Constant	-1.631	.196	.042	0.188

families producing more with the same resources (Fletschner and Kenney, 2014). Earlier studies indeed indicated that access to tailor made credit services will be instrumental in helping women to access agricultural inputs such as fertilisers and agro-chemicals, which will boost agricultural production (Fletschner and Kenney 2014; Makate *et al*., 2019).

Membership in community groups increases the probability of high participation by 4.015 times. Women who are members of community groups are 4.015 times more likely to highly participate in agricultural decision-making. This substantial effect underscores the importance of social capital and community engagement in fostering women's active roles in decision-making. Existing literature underscores the significance of groups and cooperatives in facilitating access to critical inputs, financial capital, produce markets, value addition operations, and crucial services for smallholder farmers (Xaba and Masuku, 2013; Simelane *et al*., 2019). Other studies suggests that women that engage in community groups have a high level of empowerment with information, knowledge as well as resources (Raghunathan *et al*., 2018). Women who participate in groups are also more trusted by their spouses and are perceived to have ability to contribute ideas and to develop the household (Brody *et al*., 2015). Involvement of women in group activities within the communities increases their access to information and knowledge of good agricultural practices as well as access to markets. Notably, membership of women in groups and cooperatives increased women decision-making power in coffee value chains in western Uganda; and this was attributed to information exchange and exposure to innovations and credit which women get while in groups (Lecoutre, 2017). Additionally, women who are in groups also have access to benefits like social security, credit and group bargaining which

improves decision-making skills (Ingutia and Summelius, 2022). Moreover, empowering women through such groups extends beyond agriculture, encompassing areas like social skills acquisition and nutrition sensitisation, thereby bolstering their bargaining power and improving overall household nutrition status. It is imperative for these groups to transcend the mere dissemination of information and actively engage women in translating knowledge into practice, leading to enhanced agricultural productivity outcomes. Therefore, we conclude that the confidence of women is enhanced by collectiveness which is brought about by peer support and commendation.

Conclusion

There was a marginal positive trend linking increased women's participation in decision making with improved dietary adequacy. Access to credit and membership in community groups were the strong predictors for women participation in agricultural decision-making.

Recommendations

There is a need to enhance women's access to credit. This may include developing and disseminating women-friendly credit services tailored to the specific needs and challenges faced by women in agriculture. Also, efforts should be geared towards encouraging women involvement in groups and association for better access to education, extension and other services.

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