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Small ruminant value chain and empowerment: a gendered baseline study from Ethiopia

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Introduction: Despite growing interest in gender analysis in value chains, comparatively few studies have analyzed gender relations in small ruminant value chains using sex-disaggregated quantitative data in livestock-based systems.

Methods: Drawing on baseline data from the Small Ruminant Value Chain Development Program (SRVD) in Ethiopia, this study aims to address two research questions: what is the gender status along small ruminant value chain stages and the related associations among aspects of empowerment and socio-economic variables? We employed empowerment and value chain frameworks to address these research questions.

Results and conclusion: Our findings reveal that small ruminant market participation, related decisions, and control over income are gender differential. Estimation results identified several variables significantly associated with agency dimensions, achievements, or both, with mixed results. These are age group, context, being married, being men and head of household, participation in breeding stock selection, livestock ownership, contact with extension agents, access to market information, and participation in selling at marketplaces. Participation in a small ruminant value chain may encourage more egalitarian decision-making behaviors but does not guarantee the capacity to make autonomous decision-making, and thus needs to be coupled with interventions on empowerment dimensions. Nevertheless, further investigations are required to establish the mixed results with additional variables on norms.

KEYWORDS

gender, value chain, small ruminants, empowerment, Ethiopia

1. Introduction

Apart from its substantial role in Ethiopia's national GDP, livestock significantly contributes to the economic and social lives of Ethiopian farmers, ranging from smallholder farm households in mixed farming systems to agropastoral and pastoral farming systems (Negassa et al., 2011; Gebreyohanes et al., 2021). In mixed farming systems, livestock provides smallholder farm households with various benefits such as nutritious food, income, traction power, transportation means, source of energy (fuel for cooking), and farm outputs and inputs (Covarrubias et al., 2012; Waithanji et al., 2013a; Galiè et al., 2015; Wodajo et al., 2020; Banda and Tanganyika, 2021; Management Entity, 2021). For livestock keepers in the agropastoral and pastoral systems, livestock offers many important functions. These include the capacity to cope with financial shocks, serving as a safeguard stock to smooth consumption, being a means of income accumulation, and also a store of wealth, thus being a way to build social capital (Negassa et al., 2011; Catley et al., 2021; Bekele et al., 2022; Ozkan et al., 2022). Moreover, livestock is also a source of pride and has symbolic value (Wodajo et al., 2020). In the pastoral system, livestock is the only means that support

and sustain pastoralist livelihoods (Negassa et al., 2011; Headey et al., 2014; Mekuyie et al., 2018). Therefore, improving livestock production and marketing through livestock value chain development is critical to enhancing livelihoods and thus alleviating poverty in developing countries like Ethiopia.

Interventions to develop agricultural value chains (VC)¹ have flourished as instruments for rural transformation and poverty reduction over the last few decades. Nevertheless, scholars argue that it is challenging to achieve development outcomes while making VC interventions empowering women (Minten et al., 2009; Malapit et al., 2020). In the past, the focus has been on the development of tools and methods for analyzing VC efficiency and profitability (GebreMariam et al., 2019). However, although VC analysis with special attention on equity and distributional impacts is a recent phenomenon (Malapit et al., 2020), a growing body of literature now explicitly addresses gender inequalities in value chain analysis (Van den Broeck et al., 2018). Among other things, these studies have exposed and highlighted important insights into unintended gendered consequences of VC participation, mainly through qualitative assessments (Malapit et al., 2020). Such consequences include increased gendered responsibilities and time burden (Lyon et al., 2016), and loss of control over production and marketing (Forsythe et al., 2016). The empowerment dimensions within the livestock VC development assessment efforts are often neglected (Galiè et al., 2019), although livestock VCs are not “socially neutral” in their gendered effects (Nally, 2016: 564 cited in Bain et al., 2020). As a result, much is unknown regarding the context or preconditions for empowerment and the processes by which it is achieved (Mahmud and Tasneem, 2014). Nevertheless, the consideration of empowerment in baseline and end-line impact assessments can increase our understanding of the likely gendered outcomes and what does and does not work beyond the conventional outcomes of development interventions. Doing so has the potential to inform the design and implementation of VC development interventions that would help to achieve better results (Petesch et al., 2005).

The goal of this study is, therefore, to examine patterns of the gendered status of empowerment resources,² decision-making (agency), and achievement. This study also investigates the associations that are hypothesized to exist among these aspects of empowerment (empowerment resources, decision-making (agency), and achievement) along the key small ruminant (SR) VC stages. It starts by examining the gendered status of resource ownership, participation status in VC activities, market-related decisions, and achievement in terms of control over income proceeds from SR marketing, and moves on to examine the associations among these factors. To provide context-specific

information on gender dynamics related to empowerment within livestock-based systems in Ethiopia, this study seeks to answer the following research questions:

- 1) What are the gender gaps in empowerment resources, agency (decision-making), and achievement (control over income from small ruminants)? and
- 2) How are empowerment resources and demographic characteristics related to men’s and women’s agency and achievement across the key stages of SR VC in livestock-based systems of Ethiopia?

To address these research questions, our case study focused on the Small Ruminant (goats and sheep) Value Chain Development (SRVCD) program in Ethiopia. To transform the current low level of productivity of the indigenous Ethiopian SR breeds under the smallholder production systems, ICARDA,³ ILRI,⁴ and the University of Natural Resources and Life Sciences (BOKU), in partnership with the Ethiopian National Agricultural Research System (NARS), designed and implemented a community-based breeding program in 2007. Up until 2021, about 8,000 households had been enrolled in the project from four potential sheep and goats producing areas, Afar, Bonga, Horro, and Menz (Kangethe et al., 2021). Since the end of the project, the more successful breeding programs have been continued under the CGIAR⁵ Research Program on Livestock and Fish by ICARDA, ILRI, and the National Agricultural Research Systems (NARS) in three sites (Menz, Horro, and Bonga). This program also expanded to new potential sheep- and goat-producing areas (Doyogana and Atsbi, and Abergele and Yabello, respectively), with increased numbers of participating sheep- and goat-keeping households (Gutu et al., 2015).

The program, through its research and development partners, has been working to develop and deliver innovations for SR value chain development in an integrated manner to improve impact. The four specific intervention components that the program has been working on since 2012, in an integrated manner across the target sites, include breed improvement through community-based approaches; animal health management; animal feed and nutrition improvement; and market development through collective action. Among the interventions, the breeding improvement interventions were undertaken in potential goat and sheep locations in various parts of the country. Community-based sheep breeding programs have been implemented in Bonga, Horro, Menz, and Doyogana districts, representing sheep-dominated production systems. Goat genetic improvement interventions were undertaken in Abergele and Yabello districts, representing goat-dominated production systems. The intervention on the two species (sheep and goat) was combined by the program and called SRVC transformation.

The remainder of this article is structured into four sections. First, the literature relating to the livestock value chain context, gender and livestock value chain, and a conceptual framework for empowerment and participation in the livestock value chain, are discussed. Next, the methodology section provides information on

1 “A value chain is the sequence of interlinked agents and markets that transforms inputs and services into products with attributes for which consumers are prepared to pay. VC development often involves subsidies or competitive grants, capacity or skills development, inputs or information provision, policy or institutional innovations, and other types of support aimed at different actors or aspects of the enabling environment” (Malapit et al., 2020).

2 Empowerment resources encompass human, economic, material, social, informational, and psychological assets (Alsop et al., 2006).

3 The International Centre for Agricultural Research in the dry areas.

4 The International Livestock Research Institute.

5 CGIAR is The Consultative Group on International Agricultural Research.

sampling procedures, data sources, variables selection, and data analysis techniques used in the study. The third section discusses the major findings of the study, while the final section discusses these findings and presents conclusions.

1.1. Literature on livestock VC and gender

Livestock VCs operate within the opportunity structure—which is defined as the social, economic, political, and institutional (formal and informal institutions) context in which men and women pursue their interests (Alsop et al., 2006; Akter and Chindarkar, 2020). Equitable access to resources, and their accumulation and use, is largely determined by this structure. The interactions among the institutions within the system are what determine the gender outcomes (The World Bank, 2011) and, thus, are responsible for shaping the gender dimensions of livestock VCs. Specifically, how these interactions play out in a given context shape the distribution of resources, how agents can exercise their agency, and more importantly determine the wellbeing outcomes they can achieve through participation in the value chain (Malapit et al., 2020). Here, we define *agency* as the agents' ability to make decisions with freedom from external influences (instrumental agency), their ability to collectively achieve shared interests (collective agency), and their internal sense of freedom, self-confidence, self-efficacy, and self-respect (intrinsic agency; Rowlands, 1997; Alkire et al., 2013; Galiè and Farnworth, 2019).

VCs embedded within the opportunity structures cannot be gender-neutral (Malapit et al., 2020). Although an increasing number of studies (see Dolan and Humphrey, 2000; Kidder and Raworth, 2010; Malapit et al., 2019) have shown the benefits of VCs to women, they have also uncovered its role in exacerbating gender inequalities (Malapit et al., 2020). Yet, VCs can be an instrument for reducing the gender gap and enhancing women's empowerment if implemented intentionally to avoid such pitfalls (Maertens and Verhofstadt, 2013; Van den Broeck et al., 2018). On the other hand, gender roles and time burdens may shift with greater commercialization negatively impacting women's domestic responsibilities (Lyon et al., 2016). Evidence shows that women generally have limited access to empowerment resources; as VC actors, they face several production and market constraints (Forsythe et al., 2016) and simply increasing their involvement in higher nodes of VCs may not automatically result in empowerment (Malapit et al., 2020). In livestock-based systems, women face specific challenges, such as poor access to improved breeds, limited livestock extension services, and inadequate land for forage production (Njuki et al., 2013; Galiè et al., 2017). Although the current extension system being implemented in Ethiopia targets women household heads, based on quota systems, with specific support packages (Mogues et al., 2009), to address the needs of women livestock keepers, empirical evidence consistently shows that there is still a substantial gender gap when it comes to quality services, which is mainly due to the existing biased social norms (Ragasa et al., 2013). Although intra-household gender analysis in livestock-based systems is scarce, existing evidence shows that the problem is more pronounced for women in

men-headed households because women and men within the same households do not always share resources or preferences and men often dominate household decision-making processes (see Doss and Kieran, 2014; Kinati et al., 2018; Joshi et al., 2019). Although, in recent years, there is an increased effort to mainstream gender into development efforts in Ethiopia (Mogues et al., 2009) including policies that encourage joint ownership (Kumar and Quisumbing, 2015), women household heads are the target of extension services based on quota systems with specific support packages directed to them (Mogues et al., 2009). Similarly, although women's empowerment is one of the core objectives of most of the development programs by non-governmental organizations, the focus is on women-headed households (Woldu et al., 2013). Thus, the empowerment of women in men-headed households is generally neglected.

In Ethiopia, about 92% of households keep livestock of mainly local breeds and in 78% of these households, the literature suggests that animals are jointly owned (Njuguna-Mungai et al., 2022), although the indicator "joint" ownership is problematic when it comes to empowerment (Kabeer, 2011). Commercialization of agricultural output is one of the country's pillars for development policies (World Bank, 2007). Although livestock is an important asset for women—because they offer a unique opportunity for their economic empowerment—on average, women own fewer herds and control less valuable species, such as poultry, while men control large animals, such as cattle (Kristjanson et al., 2010). Women are prone to lose their traditional resource entitlements when the value of the assets they control improves. Increasingly, evidence shows that this is because men tend to take away ownership and control rights from women when VCs are upgraded and gain higher value through greater commercialization (Ashby et al., 2019; Kinati and Mulema, 2019). These studies shed light on the need to investigate gendered patterns of participation along VC stages and the associated benefits, and also the unintended consequences. Empirical studies investigating gendered VC participation have reported mixed results making it difficult to find general patterns (Malapit et al., 2020). Moreover, empirical evidence within the livestock-based system is generally scarce (Galiè et al., 2019).

Literature on gender roles in livestock is mainly based on headship (Yisehak, 2008; Njuki et al., 2013) and thus tends to mask women's roles. Studies on intra-household gender analysis with regard to small ruminant production are scarcely available in Ethiopia and what is existing shows that both genders play an important role in livestock management and husbandry practices (Kifetew, 2006; Hulela, 2010; Ragasa et al., 2012). However, who does what is not addressed well in these studies. For example, a study conducted by Mulema et al. (2017) in Ethiopia found that livestock management and husbandry practices are generally shared among household members, with men controlling the management of large animals, while women mostly dominate that of small animals. Likewise, studies conducted in the different farming systems of Ethiopia not only have shown that most of the husbandry practices are jointly shared but also revealed that there are gender-based distinct roles—depending on the livestock they keep, women perform roles such as cleaning, gathering feed and feeding, watering, taking care of sick and weak animals, and milking, whereas men mostly do the work of herding, cutting

forage, marketing, and taking sick animals to vet posts (Belete, 2006; Yisehak, 2008; Aklilu et al., 2014; Wegari, 2020). However, in-depth qualitative studies in Ethiopia revealed that women generally carry out all of the husbandry practices while men control the “political” aspects of these roles—making decisions on who should do which activities (Kinati et al., 2018). However, in studying gender relations in agriculture, particularly in livestock, the gender of the informant matters and need to be considered in gender analysis (Kamo, 2000). In our study, we tried to uncover this fact quantitatively by analyzing the gender relations in SRs from the perspectives of both men and women respondents. It is suggested that such sex-disaggregated information is essential to inform and influence interventions in livestock-based systems.

Although the productivity of livestock is low in Ethiopia, on average, it contributes about 37–87% of the household income (Solomon et al., 2003). Quantitative research with sex-disaggregated data on women’s participation in livestock and their product marketing is limited (Meinzen-Dick et al., 2011) and is also difficult to generalize as roles vary within and among countries. However, what is apparent from existing studies is that women generally have a low level of involvement in livestock-related marketing as a result of various socio-economic factors (Njuki et al., 2011; Waithanji et al., 2013a; Boogaard et al., 2015; Giziew, 2018; Wegari, 2020). Although women own SRs in most cases, men are responsible for their disposal and thus control decisions related to their sales (FAO, 2011). In this study, decision-making refers to the ability to make one’s own decisions without external influences that affect one’s own life (Galiè et al., 2019). The most commonly used element in defining women’s empowerment in the literature is the concept of women’s decision-making power as an indicator of agency (Sell and Minot, 2018; Seymour and Peterman, 2018). Literature on intrahousehold gender dynamics suggests that individuals’ asset-holding status influences bargaining power within the household (Quisumbing et al., 2015) whether in production or marketing-related decision-making. Generally, women have little, if any, control over income from small ruminant sales and this is worse among women in male-headed households as compared to households that are headed by women (Boogaard et al., 2015).

If there are gender differentials in livestock production and benefits, gender dynamics will likely influence and potentially hamper the achievement of the SRVCD program. Understanding the gendered status and empowerment dimensions of the livestock VC development in Ethiopia is vital from the perspectives of the reviewed literature. Because what is evident is that the small ruminant VC development is neither gender-neutral nor its empowerment dimension sufficiently studied. Drawing on the SRVC dataset collected as a baseline for the program on SRVC transformation being implemented in Ethiopia, this study contributes to the literature gaps on patterns of the gendered status of empowerment resources, decision-making (agency), achievement, and associations among aspects of empowerment along the key small ruminant (SR) VC stages.

Three types of household surveys are noted in the literature to quantify gender dynamics in agriculture—inter-household surveys (male-headed vs. female-headed households), intra-household surveys (wives vs. husbands), and inter-household level of

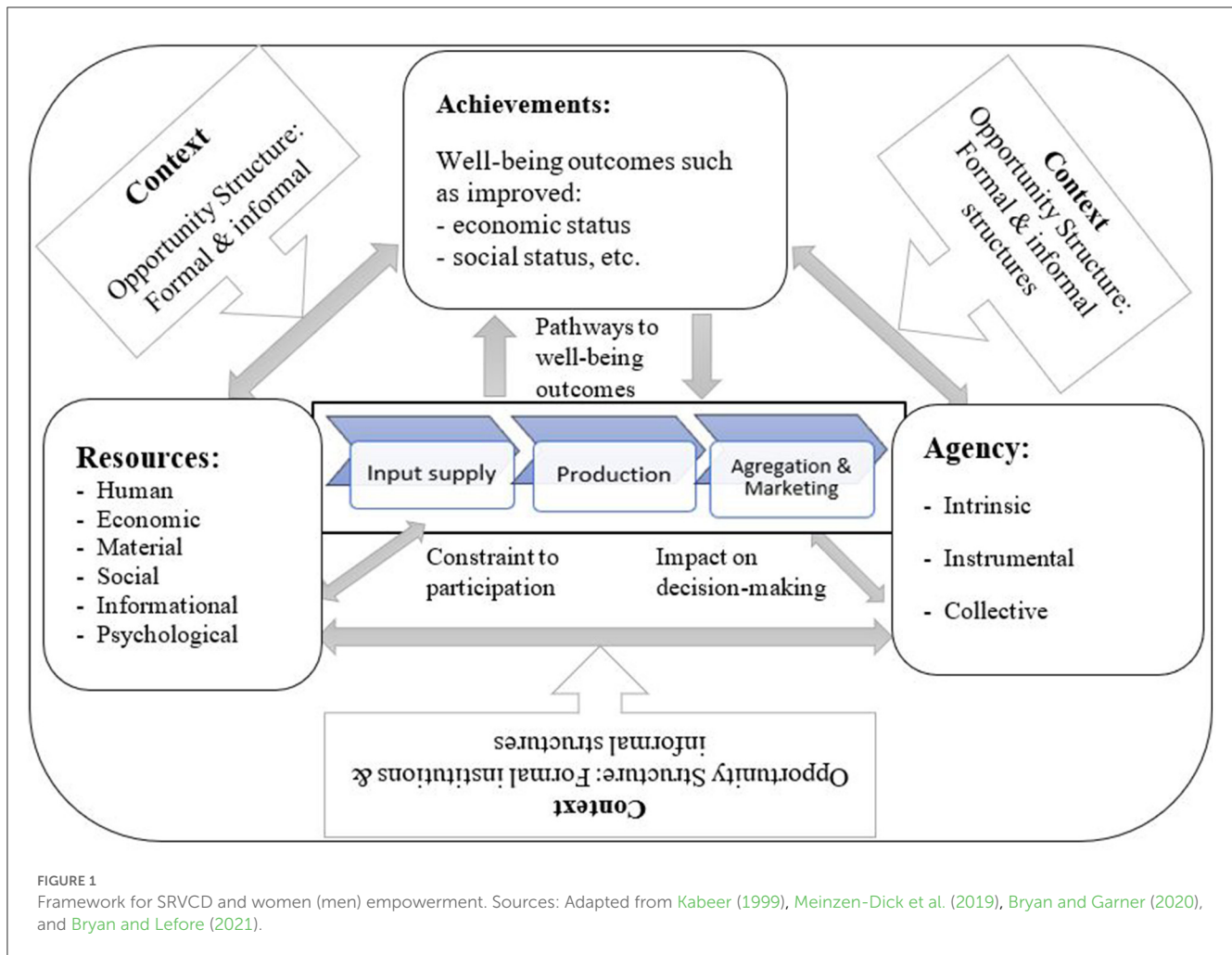
analysis (male landholders vs. female landholders to explore intra-household questions; Tavenner et al., 2018). This study analyzes data from the third type of survey, whereby respondents were asked a series of questions regarding the intra-household distribution of roles, resources, and decisions regarding small ruminant production and marketing. Although data that captures an intra-household dynamic is widely appreciated (Meinzen-Dick et al., 2011, 2019; Waithanji et al., 2013a; Quisumbing et al., 2015; Wegari, 2020), it is also likely to encounter some level of gender respondent bias that requires caution when interpreting survey results (Tavenner et al., 2018). However, if the gender respondent bias is considered when analyzing and interpreting survey data, men’s and women’s accounts of participation in the SRVCD program can offer indicative trends useful to inform gender-responsive mitigation interventions in livestock VC development.

1.1.1. The conceptual framework

The framework for the current study draws on empowerment and value chain frameworks. The combination of these frameworks allows the interactive process of empowerment, which enables us to better understand the gendered patterns across empowerment aspects and value chain stages. It helps us to consider how agents utilize empowerment resources to improve their decision-making abilities (agency) which ultimately leads to improved wellbeing outcomes (achievements; Kabeer, 1999; Meinzen-Dick et al., 2019). So, empowerment is understood as a multidimensional construct and a process of change whereby agents obtain the ability to achieve their own choices. It is a complex process and at the same time context-specific, meaning it plays out differently under different contexts (Richardson, 2018a). This implies that not all aspects of empowerment are necessarily considered in the existing studies on gender and agricultural value chains.

Resources enable agents to strategically position themselves with relative power to be effective when bargaining within decision-making processes (Bernard et al., 2020). On the other hand, agents need to have the required agency to access and control empowerment resources (Kabeer, 2011; Choudhary, 2016). This backward and forward interaction between resources and agency gives rise to achievements. In the framework adapted (Figure 1), this process is iterative, meaning achievements can also influence an agent’s access to and control over the empowerment resources and their level of decision-making ability (agency). The social and political context in which actors pursue their interests influences all aspects of the empowerment process—the patterns of resources distribution, how agents participate in decision-making processes and exercise their agency, and the economic outcomes that an agent can achieve (Kabeer, 1999; Alsop et al., 2006; Richardson, 2018b).

A large body of literature that attempted to measure empowerment has identified various correlates and determinants of empowerment. However, these analyses have typically focused on empowerment outcomes, with limited or no exploration relating to the process of empowerment (agency), including the pre-conditions (opportunity structure). Table 1 summarizes the correlates and determinants of empowerment and their effects relevant to the current study.



2. Methodology

2.1. Sampling, data, variables, measurements, and analysis

We relied on baseline data from the International Center for Agricultural Research in the Dry Areas (ICARDA) collected for the SRVCD program. The survey was conducted in 2014 across locations in various parts of the country. The baseline dataset can be taken as a nationally representative survey and covers five of the nine regions across the main agroecological zones of Ethiopia. The survey covered the major SR value chain nodes and used a combination of both purposive and random sampling techniques. Study districts were identified to develop benchmarks for the interventions on SRVCD. After the intervention, Kebeles were selected purposively, which meant that the program identified a list of households in Kebeles based on the health service/taxpayers' roster. Finally, sampled households were identified using a lottery method with recruitment from each district proportional to its population size. The sampled sites initially included nine districts across five regions. In drawing the final sample for the current study, we focused on currently active SRVCD participant districts and limited the sampled sites

to six districts for which information regarding gender indicators was available in the baseline dataset. Thus, the final sample used in this study consisted of 723 SR-keeping households from six districts.

Household interviews were conducted in the local language, *Amharic* and *Oromiffa*, and responses were documented in English by well-trained enumerators using a pre-tested VC questionnaire. One person was interviewed from each of the selected households, mostly the head of household or his spouse in the case of male-headed households where the head was not present. Whether it was a man (head of the household) or his spouse who was interviewed, the respondent responded to all the questions including those on the roles of the other household members (intra-household questions). Hence, this enables us to conduct an inter-household level analysis based on the intra-household questions included in the baseline survey. Information related to demographics, access to inputs, ownership, decision-making related to SR market participation, and control over income from SRs were collected. However, no data were collected on structures—norms, social status, and class differences. Nevertheless, the intra-household questions used for the data collection allowed us to carry out intra-household gender analysis in addition to analysis at the household level. Data on agency dimensions and achievement indicators

TABLE 1 Correlates and determinants of women's empowerment and their effects identified in the literature.

Variable	Empowerment aspect measured	Effect	References
Agricultural extension information	Agricultural decision-making; Quantity of maize women sold to the market	+	Lecoutere et al., 2019
Women's empowerment through value chain development	Attitudes to women's economic roles	+	Fuller, 2012
Women's empowerment through value chain development.	Ability to influence decisions in associations	+	Fuller, 2012
Age of men household head	Agricultural decision-making; Quantity of maize women sold to the market	-	Lecoutere et al., 2019
Land rights	Household decision-making	+	Allendorf, 2007
Income and context (being in urban)	Household and financial decisions; empowerment in healthcare and social contacts making	+	Disassa et al., 2016; Akram, 2017
Ownership of asset	Decision-making power	+/-	Lim et al., 2007; Disassa et al., 2016; Akram, 2017
Women's empowerment	Economic, political, social, and psychological capitals	+	Legovini, 2004
Family size	Bargaining power and decision-making	+/-	Lim et al., 2007; Disassa et al., 2016; Akram, 2017; Lecoutere et al., 2019
Involvement in credit programs	Economic security, mobility, making purchases, contribution to family support, political awareness	+	Hashemi et al., 1996
Formal and non-formal education	Use of contraception	+	Al Riyami et al., 2004; Parveen and Leonhäuser, 2004; Gupta and Princy, 2006
Traditional socio-cultural norms (early marriage, dowry and domestic violence)	Resource ownership, contribution to household income and decision-making; Perception on gender awareness	-	Parveen and Leonhäuser, 2004
WDIP program on women's empowerment	Improved dimensions of various resources (economic, social, and psychological assets)	+	Legovini, 2004
Membership in savings and credit groups	Risk of domestic violence	+	Koenig et al., 2003

(dependent variables) were aggregate observations for both sheep and goats.

In the descriptive analysis, we used the intra-household information, gender of the respondent, and location for studying differences in access, ownership, and control over empowerment resources related to SRVC. One of the advantages of the baseline data is that it allows us to identify gendered indicators across aspects of empowerment along the main SR value chain nodes. For example, (1) at the input acquisition stage, the survey asked questions such as “how many sheep/goat do you have?, have you access to extension, credit, training, group membership, etc.?” (2) at the production stage, the survey asked questions such as “Who make breeding stock selection for SRs?, Who sell SRs at market place?” (3) at the marketing stage, the survey asked questions such as “Who define the price of the first goat/sheep? Who decide when to sell goat/sheep? Who kept the sale proceeds of the goat/sheep? Who decides on the goats/sheep sell proceeds?”

Recorded responses for who does what were (1) Head, (2) Spouse, (3) Joint (Head and spouse), (4) Adult male member, (5) Adult female member, (6) Children, and (7) All household members. For further analysis within the regression model, the responses to the questions on agency dimensions and achievement indicators were re-coded into binary. We identified decision-making on defining SR price, when to sell SRs, and

controlling the sale proceeds of SRs as our outcome variables, and observations with only head or only spouse to these outcome variables were coded as 1, otherwise 0 (Table 2). However, if they do decide jointly with others, we considered it as not making decisions autonomously because joint decision-making often refers to masked male dominance in the literature (Kabbeer, 2011). The identification and measurement of independent and dependent variables are considered for fitting three models in this study. For each of the independent variables, respondents are considered to exercise sole decision-making if they do so alone.

The data analysis for this study was done in two stages. First, mean and frequency tabulation by gender and study areas were computed to summarize basic information on respondents, as well as their responses to empowerment resources, agency dimensions, and achievement indicators. Second, significant variables identified as indicators along the aspects of empowerment and VC stages were further analyzed using logistic regression. Using IBM SPSS Statistics version 26—after cleaning, regrouping, and recoding categorical variables—a binary logistic model (BLM) was applied to describe the relationship of many independent variables to a dichotomous dependent variable (Kleinbaum, 1994) such as: “do you make sole decisions on defining SR price, where to sell, and income from SRs?” The full list of the baseline variables identified along with their meanings, and the descriptive results with the test

TABLE 2 Brief description of variables used in the binary logistic regression model (valid $N = 343$).

Variables	Description	Code	Categories
Demographics			
Gender	Binary, sex of the respondent	1	Male
		0	Otherwise
District name	Nominal, study areas	1	Abergele
		2	Doyogena
		3	Horro
		4	Menz Gera
		5	Menz Mama
		6	Yabello
Age group	Ordinal, age of the respondent in years	1	≤30 years old
		2	31–40 years old
		3	41–50 years old
		4	51–60 years old
		5	>60 years old
Marital status	Ordinal, marital status of the respondent	1	Married
		2	Single
		3	Divorced
		4	Widowed
Educational status	Binary, education status of the respondent	0	Illiterate
		1	Literate
Family size	Nominal, number of household members	1	<5
		2	6–10
		3	>10
Indicators of empowerment resources			
Land holding	Continuous, size of land (<i>in Kert</i>) owned by the household	1	<4
		2	5–10
		3	>10
SR ownership	Ordinal, number of SRs (sheep and goats) owned by the household	1	≤10 heads
		2	11–20 heads
		3	>20 heads
Livestock ownership	Ordinal, total number of livestock owned by the household	1	≤5 heads
		2	6–10 heads
		3	>10 heads
Do you select breeding stock for SRs?	Binary, if the respondent selects breeding stock	1	Yes

(Continued)

TABLE 2 (Continued)

Variables	Description	Code	Categories
		0	Otherwise
Contact with extension agent for advice	Binary, if the respondent has contact with extension agents	1	Yes
		0	Otherwise
Access to credit services	Binary, if the respondent has access to credit services	1	Yes
		0	Otherwise
Market/marketing information	Binary, if the respondent gets market information for SRs	1	Yes
		0	Otherwise
Receive training	Binary, if the respondent receives training on SR production	1	Yes
		0	Otherwise
Membership to groups	Binary, if any of the HH members is membership of group (CBOs)	1	Yes
		0	Otherwise
Participate in selling SRs in the market	Binary, if the respondent participates in selling SRs at market locations	1	Yes
		0	Otherwise
Annual income category from livestock	Continuous, respondent's total annual income from livestock	1	≤5,220.3 (average)
		2	>5,220.3 (average)
Indicators of agency			
Decision-making on defining SR price	Binary, if the respondent makes the sole decision on defining SR price	1	Yes
		0	Otherwise
Decision-making on when to sell SRs	Binary, if the respondent makes the sole decision on when to sell SRs	1	Yes
		0	Otherwise
Indicator of achievement			
Controlling income (decision-making on the sell proceeds) from SRs	Binary, if the respondent control or makes the sole decision on SR sell proceeds	1	Yes
		0	Otherwise

statistics of the differences in means and percentages are reported in [Table 3](#) and under [Tables 4–6](#). BLR results showed an overall percentage predictive correctness of 79.9, 75.8, and 77.1% and a Nagelkerke R^2 of 0.364, 0.338, and 0.355 for defining SRs' price, deciding on when to sell SRs, and controlling the sale proceeds of SRs, respectively ([Table 7](#)).

The BLR is robust, including that the independent variables do not require linearity, normality, homoscedasticity, or equal

variance in each group (Hilbe, 2015). Since our outcome variables were dichotomous, they were built as a binary-choice model which assumed that respondents (individual households) were confronted with two alternatives and their choice was contingent on a set of independent variables that were composed of ordinal and categorical variables (Table 2). The logistic regression model is mathematically represented as follows (Gujarati, 1995):

$$\frac{\text{Prob}(Y_i = 1)}{\text{Prob}(Y_i = 0)} = \frac{P_i}{1 - P_i} = e^{(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki})} \quad (1)$$

Where P_i is the probability that Y_i takes the value 1 (sole decision-making and membership to group); $1 - P_i$ is the probability that Y is 0 (no sole decision-making, and no membership to group); e is the exponential constant. Taking the natural log of both sides of Equation 1 will give us:

$$L_i = \ln(P_i/(1 - P_i)) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} \quad (2)$$

Where,

L_i : stands for logit model, which is linear in X_i as well as in β ;

i : represents the i th observation in the sample;

P : is the probability of the outcome;

β_0 : is the intercept term; while, $\beta_1 + \beta_2 + \dots + \beta_k$ are the coefficients associated with each independent variable X_1, X_2, \dots, X_k .

3. Results

3.1. Descriptive analysis

3.1.1. Characteristics of respondents

Table 3 shows the descriptive information on selected demographic and empowerment indicator variables. The majority of the respondents were men (84.8%). While over 88% of the female respondents were widowed or divorced (88.2 and 95.7%, respectively), and only 3% were married, almost all the men (97%) respondents were married. Higher widowed (23.1%) and less married (67.7%) statuses were reported from Menz Gera compared to the other study sites. The average age of respondents was 46.1 years (SD = 14.67). The average family size is about 6 (SD = 2.07), where men-headed households (HH) had slightly higher family sizes, and the highest was reported from Dyogena. More women (65.5%) respondents are illiterate compared to their men (38.5%) counterparts. The proportion of literacy was lowest among Yabello (22.6%) and Abergele (37%) value chain participants. These findings are not surprising as the survey was designed to give preference for the head of household, with wives being interviewed in the event of their husband not being at home during the time of survey completion.

3.1.2. Value chain participation

Systems of ownership of key empowerment resources such as land, SRs, and livestock (mainly cattle) significantly vary across study areas ($p < 0.001$) but do not differ along gender lines except for livestock. On average, respondents own 6.43 (SD = 4.85) kerts of land, and land ownership does not vary by gender. Similarly, SR

ownership does not vary by gender. Respondents own about 13 (SD = 12.3) heads of goats and 9 (SD = 8.45) heads of sheep on average and the result is not statistically different between gender. On the other hand, variations in the ownership status of these assets are evident across study sites. The largest owner of these assets, except livestock, was reported from Abergele whereas the opposite was observed in Doyogena and the difference is statistically significant ($p < 0.001$) and consistent with similar studies (Management Entity, 2021; Table 3).

The dataset also provides information on inputs and services. On average, a low proportion of households (22.1%) have access to credit services for investment related to SR production, with significant differences among study sites. Close to half of the respondents from Abergele and Menz Gera reported that they have access to credit services but this is as low as 7.6% for Horo. Most of the respondents (60.9%) generally have contact with extension agents and this does not significantly vary by gender; however, significant variations were observed among study sites. The highest percentage was reported from Menz Gera (84.6%) and Mama (85.2%) study sites. Whereas, a lower proportion (32.9%) of study participants received training, being as low as 13.3% in Abergele study site, which is a common phenomenon in Ethiopia. Engagement in community-based groups is more common in mixed livestock-based systems than in goat-dominated systems. When disaggregated by location, the lowest membership status was reported from Abergele (40%), followed by Yabello (53.5%). Interestingly, in Horo, Menz Gera, and Mama, nearly all of the respondents are members of community-based associations. Nevertheless, the survey data did not provide additional information on the type and purpose of the associations.

The average annual income from livestock for men and women is 5,504.41 (SD = 5,095.38) and 3,583.91 (SD = 3,618.41) birr, respectively, and the difference is statistically significant ($p < 0.001$). Interestingly, when disaggregated by study areas, the highest average income from livestock was reported from Menz Mama (7,808.01 birr, SD = 5,789.55) whereas the lowest was reported from Doyogena and Horro which is 3,135.15 birr (SD = 3,608.7) and 3,449.49 birr (SD = 2,918.43) on average, respectively.

3.1.2.1. Input into production and gender status: instrumental agency domains

Gender roles in key activities of small ruminant management and husbandry practices such as breed selection, feeding, monitoring, herding, and marketing were analyzed. The result shows that on average 69.9 and 17.9% of the men and women respondents said that the task of selecting breeding stock for SR production is done only by the head of the household, while the figures were only 0.2 and 38.8% for women, respectively. Similarly, across the study areas, the role of selecting breeding stock is dominated by men except in Horo (<25%) where generally respondents said it is a joint task.

Feeding goats and sheep seems the responsibility of all household members. The majority of respondents agree with this fact, although there is a significant difference between the study sites. As opposed to the study areas in the Amhara region, where all household members take part, the majority of the respondents agree that goat feeding is the work of the head of the household in the rest of the study areas. Whereas, sheep feeding appears the

TABLE 3 HH characteristics, resource ownership, and access to services by gender and study areas, SR VC baseline data, 2014, rural Ethiopia.

Indicators	N	Gender of the respondent		Test statistics	Study area						Full sample	Test statistics	
		Male	Women		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama	Yabello			
Household characteristic													
Marital status (%)	Married	610	97	3	500.383**	87	87.5	81.5	67.7	84.4	89.3	84.4	71.965**
	Single	14	78.6	21.4		0	6.6	0	1.5	2.2	0.6	1.9	
	Divorced	23	4.3	95.7		6	0.7	0.6	7.7	7.8	1.9	3.2	
	Widowed	76	11.8	88.2		7	5.3	17.8	23.1	5.6	8.2	10.5	
Sex (%)	Female	110				10.9	16.4	29.1	13.6	11.8	18.2	15.2	9.404
	Male	613				14.4	21.9	20.4	8.2	12.6	22.7	84.8	
Age		722	46.0 (14.9)	46.2 (13.8)	0.017	45.6 (12.1)	44.3 (13.6)	46.5 (15.3)	51.1 (14.2)	46.9 (14.1)	45.1 (16.7)	46.1 (14.7)	2.227
Education (%)	Illiterate	308	38.5	65.5	28.27**	63	25	28.7	24.6	25.6	77.4	42.6	234.632**
	No formal but literate	96	13.9	10		13	5.3	6.4	30.8	8.9	11.9	13.3	
	Completed primary school	220	33	16.4		24	42.8	40.1	32.3	37.8	8.2	30.4	
	Secondary school and above	99	14.7	8.2		0	27	24.8	12.3	7.8	2.5	13.7	
HH size		665	6.4 (2.1)	5.2 (1.8)	27.564**	6.4 (2.1)	6.9 (2.1)	6.1 (2.0)	5.4 (1.8)	5.2 (1.6)	6.4 (2.1)	6.2 (2.1)	10.198**
Ownership of empowerment resources and access to services													
Resource ownership	Land holding (in kerk)	695	6.5 (4.8)	6.5 (5.2)	0.010	11.4 (6.2)	3.0 (1.6)	7.5 (5.7)	6.1 (2.8)	5.4 (3.2)	6.5 (3.7)	6.4 (4.9)	49.769**
	Goat	253	13.8 (12.7)	11.0 (9.1)	1.120	20.9 (13.4)	1.4 (0.79)	2.7 (2.38)	0.0	2.5 (2.1)	10.6 (9.7)	13.3 (12.3)	38.331**
	Sheep	600	9.1 (8.43)	9.3 (8.6)	0.055	12.6 (10.3)	3.3 (2.13)	9.0 (6.9)	16.0 (10.1)	13.5 (8.3)	8.0 (7.9)	9.1 (8.5)	41.218**
	Livestock	634	10.9 (8.2)	8.54 (7.1)	6.888*	9.16 (6.6)	7.14 (4.5)	16.55 (10.1)	8.5 (5.3)	8.2 (4.7)	11.6 (9.1)	10.5 (8.1)	25.295**

(Continued)

TABLE 3 (Continued)

Indicators		N	Gender of the respondent		Test statistics	Study area					Full sample	Test statistics	
			Male	Women		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama			Yabello
Average annual income from livestock ^b		553	5,504.4 (5,095.4)	3,583.9 (3,618.4)	11.23**	5,943.44 (5,024.32)	3,135.15 (3,608.7)	3,449.49 (2,918.4)	6,475.2 (5,222.8)	7,808.0 (5,789.6)	6,553.7 (5,657.89)	5,220.34 (4,949.92)	7.30**
Access to credit (%)	Yes	160	22.2	21.8	0.007	48.0	14.5	7.6	35.4	24.4	20.8	22.1	70.208**
	No	563	77.8	78.2		52.0	85.5	92.4	64.6	75.6	79.2	77.9	
Access to market info.	Yes	303	44.0	41.1	0.315	18.5	45.0	43.8	58.5	69.3	36.3	43.6	56.631**
	No	392	56.0	58.9		81.5	55.0	56.2	41.5	30.7	63.7	56.4	
Contact with extension (%)	Yes	423	61.9	55.1	1.739	48.9	61.4	56.9	84.6	85.2	47.8	60.9	55.186**
	No	272	38.1	44.9		51.1	38.6	43.1	15.4	14.8	52.2	39.1	
Received training (%)	Yes	217	33.0	32.3	0.016	13.3	29.3	40.8	35.5	34.1	37.5	32.9	21.052**
	No	443	67.0	67.7		86.7	70.7	59.2	64.5	65.9	62.5	67.1	
Membership to group (%)	Yes	563	76.7	84.5	3.355	40.0	86.8	98.1	100.0	96.7	53.5	77.9	219.474**
	No	160	23.3	15.5		60.0	13.2	1.9	0.0	3.3	46.5	22.1	
Who selects Male SR breeding stock for SRs	Husband	323	69.9	17.9	259.899**	76.0	70.8	24.3	66.1	66.7	82.4	63.1	164.414**
	Wife	27	0.2	38.8		2.7	2.8	7.5	7.1	7.6	4.9	5.3	
	Head and wife	105	22.7	6.0		2.7	15.1	57.0	10.7	18.2	7.8	20.5	
	Male child	19	1.3	19.4		10.7	2.8	2.8	1.8	3.0	2.0	3.7	
	All members	31	4.7	14.9		8.0	7.5	7.5	7.1	3.0	2.9	6.1	
	Others	7	1.1	3.0		0.0	0.9	0.9	7.1	1.5	0.0	1.4	

(Continued)

TABLE 3 (Continued)

Indicators	N	Gender of the respondent		Test statistics	Study area						Full sample	Test statistics	
		Male	Women		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama	Yabello			
Agency dimensions													
Who defines the price of a goat?	Head	155	80.2	47.4	22.054**	51.4		55.6	100.0	100.0	93.7	77.1	62.698**
	Spouse	2	1.1	0.0		0.0		0.0	0.0	0.0	1.8	1.0	
	Other member	5	1.1	15.8		2.8		0.0	0.0	0.0	2.7	2.5	
	Trader	36	15.9	36.8		41.7		44.4	0.0	0.0	1.8	17.9	
	Other buyers	3	1.6	0.0		4.2		0.0	0.0	0.0	0.0	1.5	
Who defines the price of sheep?	Head	323	71.4	70.0	6.710	35.0	65.1	63.7	90.4	72.3	95.8	71.1	89.501**
	Spouse	12	2.3	4.3		0.0	1.2	5.6	0.0	4.8	0.0	2.6	
	Other member	10	1.6	5.7		2.5	2.4	2.4	1.9	2.4	1.4	2.2	
	Trader	104	23.4	20.0		57.5	30.1	27.4	5.8	20.5	2.8	22.9	
	All members	4	1.0	0.0		5.0	1.2	0.8	0.0	0.0	0.0	0.9	
	Other buyers	1	0.3	0.0		0.0	0.0	0.0	1.9	0.0	0.0	0.2	
Who decides when to sell goat?	Head	83	40.1	52.6	44.162**	23.6		33.3	50.0	33.3	53.2	41.3	24.902*
	Spouse	3	1.1	5.3		2.8		0.0	0.0	0.0	0.9	1.5	
	Head and spouse	106	57.1	10.5		62.5		66.7	50.0	66.7	45.0	52.7	
	All members	9	1.6	31.6		11.1		0.0	0.0	0.0	0.9	4.5	

(Continued)

TABLE 3 (Continued)

Indicators		N	Gender of the respondent		Test statistics	Study area						Full sample	Test statistics
			Male	Women		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama	Yabello		
Who decides when to sell sheep?	Head	163	29.4	71.4	67.983**	20.0	38.6	29.0	50.0	26.5	54.2	35.9	53.406**
	Spouse	7	0.8	5.7		5.0	1.2	2.4	0.0	0.0	1.4	1.5	
	Head and spouse	255	64.1	12.9		62.5	44.6	63.7	48.1	68.7	44.4	56.2	
	Other male member	3	0.5	1.4		0.0	2.4	0.8	0.0	0.0	0.0	0.7	
	All members	26	5.2	8.6		12.5	13.3	4.0	1.9	4.8	0.0	5.7	
Achievement indicators													
Who controls the sale proceeds of goats?	Head	70	32.4	57.9	43.67**	23.6		33.3	50.0	33.3	41.4	34.8	19.28
	Spouse	5	2.2	5.3		1.4		0.0	0.0	0.0	3.6	2.5	
	Head and spouse	119	64.3	10.5		65.3		6.7	50.0	66.7	55.0	59.2	
	Other male members	7	1.1	26.3		9.7		0.0	0.0	0.0	0.0	3.5	
Who controls the sale proceeds of sheep?	Head	152	26.0	74.3	80.18**	22.5	41.0	32.3	42.3	20.5	41.7	33.5	49.29**
	Spouse	10	1.8	4.3		2.5	1.2	2.4	0.0	1.2	5.6	2.2	
	Head and spouse	265	67.2	10.0		60.0	43.4	62.1	51.9	75.9	52.8	58.4	
	Other male members	3	0.5	1.4		2.5	2.4	0.0	0.0	0.0	0.0	0.7	
	All members	24	4.4	10.0		12.5	12.0	3.2	5.8	2.4	0.0	5.3	

Figures in parenthesis are standard deviations.

^aData are missing for Doyogena on defining price, decide when to sell, and who controls the sale proceeds of a goat.

^bIncome values are in ETB. There were ~19.65 ETB to the U.S. dollar in 2014.

**, **Significant at 1 and 5%, respectively.

"Kert," a measurement unit locally used to measure land that is roughly equal to 1/4 of a hectare.

TABLE 4 Gender roles in SR VC activities at production level by study areas, SR VC baseline data, 2014.

SR husbandry and management practices		N	HH members						Full sample	Test statistics
			Abergele	Doyogena	Horro	Menz Gera	Menz Mama	Yabello		
Who selects male breeding stock (%)?	HH head only	323	76.0	71.4	24.5	71.2	67.7	82.4	64.0	147.026**
	Spouse only	27	2.7	2.9	7.5	7.7	7.7	4.9	5.3	
	Head and spouse only	105	2.7	15.2	57.5	11.5	18.5	7.8	20.8	
	Sons only	19	10.7	2.9	2.8	1.9	3.1	2.0	3.8	
	All HH members	31	8.0	7.6	7.5	7.7	3.1	2.9	6.1	
Who selects female breeding stock (%)?	HH head only	302	71.6	66.7	22.9	70.4	68.2	80.9	61.3	146.440**
	Spouse only	26	2.7	3.8	6.7	7.4	7.6	4.5	5.3	
	Head and SPOUSE only	114	4.1	21.0	60.0	11.1	18.2	9.0	23.1	
	Sons only	19	13.5	1.9	2.9	1.9	1.5	2.2	3.9	
	All HH members	32	8.1	6.7	7.6	9.3	4.5	3.4	6.5	
Who feeds goats (%)?	HH head only	81	18.9	66.7	41.2	0.0	14.3	36.1	29.7	88.095**
	Spouse only	15	2.1	0.0	5.9	0.0	0.0	8.2	5.5	
	Head and spouse only	55	6.3	0.0	17.6	0.0	14.3	30.6	20.1	
	Daughters only	9	6.3	0.0	0.0	25.0	0.0	1.4	3.3	
	Sons only	5	0.0	0.0	11.8	0.0	0.0	2.0	1.8	
	All HH members	108	66.3	33.3	23.5	75.0	71.4	21.8	39.6	
Who feeds the first sheep (%)?	HH head only	47	7.7	12.5	7.9	6.2	2.3	4.1	7.3	82.482**
	Spouse only	59	1.5	15.8	12.5	3.1	2.3	9.1	9.2	
	Head and spouse only	60	3.1	17.8	9.2	4.6	6.8	6.6	9.3	
	Daughters only	24	7.7	3.3	3.3	3.1	1.1	5.0	3.7	
	Sons only	3	0.0	0.0	0.0	0.0	1.1	1.7	0.5	
	Hired labor only	4	1.5	0.0	2.0	0.0	0.0	0.0	0.6	
	All HH members	446	78.5	50.7	65.1	83.1	86.4	73.6	69.4	
Who monitors breeding goats (%)?	HH head only	80	19.6	66.7	46.7	0.0	14.3	41.3	32.4	94.803**
	Spouse only	9	2.2	0.0	6.7	0.0	0.0	4.8	3.6	
	Head and spouse only	55	6.5	0.0	20.0	0.0	14.3	35.7	22.3	

(Continued)

TABLE 4 (Continued)

SR husbandry and management practices		N	HH members						Full sample	Test statistics
			Abergele	Doyogena	Horro	Menz Gera	Menz Mama	Yabello		
	Daughters only	7	6.5	0.0	0.0	25.0	0.0	0.0	2.8	
	Sons only	3	0.0	0.0	6.7	0.0	0.0	1.6	1.2	
	All HH members	93	65.2	33.3	20.0	75.0	71.4	16.7	37.7	
Who monitors breeding sheep (%)?	HH head only	182	16.9	31.6	28.0	24.6	14.8	43.0	28.4	108.288**
	Spouse only	28	1.5	7.9	6.7	1.5	1.1	2.5	4.4	
	Head and spouse only	104	4.6	25.0	23.3	6.2	9.1	13.2	16.2	
	Daughters only	16	7.7	3.9	1.3	1.5	1.1	0.8	2.5	
	Sons only	1	0.0	0.7	0.0	0.0	0.0	0.0	0.2	
	Hired labor only	1	0.0	0.0	0.7	0.0	0.0	0.0	0.2	
	All HH members	309	69.2	30.9	40.0	66.2	73.9	40.5	48.2	
Who cleans goat house (%)?	HH head only	12	2.2	0.0	6.7	33.3	0.0	5.6	4.6	30.546
	Spouse only	53	15.6	33.3	26.7	0.0	33.3	22.5	20.5	
	Head and spouse only	22	5.6	0.0	6.7	0.0	0.0	11.3	8.5	
	Daughters only	10	1.1	33.3	0.0	0.0	0.0	5.6	3.9	
	Sons only	14	8.9	0.0	6.7	0.0	0.0	3.5	5.4	
	All HH members	148	66.7	33.3	53.3	66.7	66.7	51.4	57.1	
Who cleans sheep house (%)?	HH head only	21	1.5	1.3	7.2	6.2	1.1	1.7	3.3	69.458**
	Spouse only	147	6.2	34.2	28.9	13.8	12.5	22.5	22.9	
	Head and spouse only	16	3.1	1.3	2.0	3.1	4.5	2.5	2.5	
	Daughters only	5	1.5	0.0	0.0	1.5	1.1	1.7	0.8	
	Sons only	26	6.2	7.2	0.7	3.1	3.4	4.2	4.0	
	Hired labor only	2	0.0	0.0	1.3	0.0	0.0	0.0	0.3	
	All HH members	425	81.5	55.9	59.9	72.3	77.3	67.5	66.2	
Who monitors goats health (%)?	HH head only	83	31.5	66.7	40.0	0.0	14.3	32.6	32.0	93.907**
	Spouse only	8	2.2	0.0	0.0	0.0	0.0	4.3	3.1	
	Head and spouse only	77	5.6	0.0	26.7	0.0	28.6	46.8	29.7	

(Continued)

TABLE 4 (Continued)

SR husbandry and management practices		N	HH members						Full sample	Test statistics
			Abergele	Doyogena	Horro	Menz Gera	Menz Mama	Yabello		
	Daughters only	5	4.5	0.0	0.0	25.0	0.0	0.0	1.9	
	Sons only	3	0.0	0.0	6.7	0.0	0.0	1.4	1.2	
	All HH members	83	56.2	33.3	26.7	75.0	57.1	14.9	32.0	
Who monitors sheep health (%)?	HH head only	192	23.4	40.7	29.9	27.0	22.5	40.4	32.3	97.929**
	Spouse only	25	1.6	6.7	5.6	1.6	0.0	5.3	4.2	
	Head and spouse only	102	3.1	25.3	18.8	6.3	10.0	24.5	17.1	
	Daughters only	10	4.7	2.7	1.4	1.6	0.0	0.0	1.7	
	Sons only	1	0.0	0.0	0.0	0.0	0.0	1.1	0.2	
	Hired labor only	1	0.0	0.0	0.7	0.0	0.0	0.0	0.2	
	All HH members	264	67.2	24.7	43.8	63.5	67.5	28.7	44.4	
Who herd the goats around homestead (%)?	HH head only	18	5.8	0.0	21.4	33.3	14.3	5.9	7.2	37.648
	Spouse only	21	8.1	33.3	0.0	0.0	0.0	9.6	8.4	
	Head and spouse only	13	1.2	0.0	7.1	0.0	0.0	8.1	5.2	
	Daughters only	40	29.1	0.0	0.0	0.0	0.0	11.0	16.1	
	Sons only	16	8.1	0.0	7.1	0.0	0.0	5.9	6.4	
	All HH members	141	47.7	66.7	64.3	66.7	85.7	59.6	56.6	
Who herd sheep around homestead (%)?	HH head only	41	6.5	10.2	9.3	4.9	1.2	5.3	7.0	116.722**
	Spouse only	38	3.2	12.9	2.9	0.0	2.4	11.6	6.5	
	Head and spouse only	36	0.0	6.8	7.9	8.2	7.3	4.2	6.1	
	Daughters only	73	24.2	17.7	12.1	3.3	0.0	13.7	12.4	
	Sons only	16	4.8	1.4	2.9	0.0	0.0	7.4	2.7	
	Hired labor only	11	8.1	0.0	4.3	0.0	0.0	0.0	1.9	
	All HH members	372	53.2	51.0	60.7	83.6	89.0	57.9	63.4	
Who herd the goats at distance areas (%)?	HH head only	48	8.1	0.0	40.0	0.0	0.0	30.2	21.0	67.592**
	Spouse only	6	2.3	0.0	0.0	0.0	14.3	2.6	2.6	
	Head and spouse only	9	0.0	0.0	0.0	0.0	28.6	6.0	3.9	

(Continued)

TABLE 4 (Continued)

SR husbandry and management practices		N	HH members						Full sample	Test statistics
			Abergele	Doyogena	Horro	Menz Gera	Menz Mama	Yabello		
	Daughters only	69	51.2	0.0	6.7	33.3	0.0	19.8	30.1	
	Sons only	16	8.1	0.0	0.0	0.0	0.0	7.8	7.0	
	All HH members	81	30.2	100.0	53.3	66.7	57.1	33.6	35.4	
Who herd sheep at distance areas (%)?	HH head only	88	6.3	18.6	14.6	6.7	11.3	32.6	16.1	160.576**
	Spouse only	11	0.0	3.9	0.8	0.0	1.3	4.7	2.0	
	Head and spouse only	33	0.0	3.1	9.2	11.7	12.5	0.0	6.0	
	Daughters only	109	50.8	26.4	14.6	10.0	1.3	19.8	19.9	
	Sons only	8	0.0	0.8	1.5	0.0	0.0	5.8	1.5	
	Hired labor only	14	7.9	0.0	6.2	1.7	0.0	0.0	2.6	
	All HH members	285	34.9	47.3	53.1	70.0	73.8	37.2	52.0	
Who sells goat in the market (%)?	HH head only	177	81.7		77.8	83.3	100.0	93.7	88.5	19.179
	Spouse only	2	0.0		0.0	0.0	0.0	1.8	1.0	
	Head and spouse only	7	4.2		0.0	16.7	0.0	2.7	3.5	
	Sons only	14	14.1		22.2	0.0	0.0	1.8	7.0	
Who sells sheep in the market (%)?	HH head only	368	82.5	81.9	71.0	86.3	83.1	91.7	81.2	47.282**
	Spouse only	24	0.0	3.6	12.1	0.0	7.2	0.0	5.3	
	Head and spouse only	29	0.0	7.2	10.5	5.9	2.4	6.9	6.4	
	Sons only	28	17.5	7.2	5.6	5.9	4.8	1.4	6.2	
	All HH members	4	0.0	0.0	0.8	2.0	2.4	0.0	0.9	

**Significant at 1%.

TABLE 5 SR market location and channel, SR VC baseline data, 2014.

Variables	N	By gender (%)		Test statistics	By study areas (%)						Full sample	Test statistics
		Male	Female		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama	Yabello		
Did you sell any sheep/goat in the last 12 months?												
Yes	472	65.3	65.5	0.002	53.0	55.9	79.0	80.0	92.2	47.2	65.3	83.580**
No	251	34.7	34.5		47.0	44.1	21.0	20.0	7.8	52.8	34.7	
If you sold goat, marketing channel for first type of goat selling?												
Butchery	1	0.5	0.0	3.135	1.4		0.0	0.0	0.0	0.0	0.5	41.025*
Individual consumers	16	8.2	5.3		15.3		33.3	0.0	33.3	0.9	8.0	
Collectors	25	12.1	15.8		4.2		0.0	0.0	0.0	19.8	12.4	
Traders	148	74.2	68.4		70.8		66.7	83.3	66.7	75.7	73.6	
Retailers/supermarkets	1	0.5	0.0		1.4		0.0	0.0	0.0	0.0	0.5	
Farmers/pastoralists for breeding purposes	8	3.3	10.5		5.6		0.0	16.7	0.0	2.7	4.0	
Other	2	1.1	0.0		1.4		0.0	0.0	0.0	0.9	1.0	
If you sold goat, the place where the first type of goat sold?												
Farm gate	20	9.9	10.5	0.322	6.9		0.0	0.0	0.0	13.5	10.0	5.506
Buyers place	2	1.1	0.0		1.4		0.0	0.0	0.0	0.9	1.0	
On the road to the market	1	0.5	0.0		0.0		0.0	0.0	0.0	0.9	0.5	
In the market	178	88.5	89.5		91.7		100	100	100	84.7	88.6	
If you sold sheep, marketing channel for first type of sheep selling?												
Butchery	2	0.5	0.0	2.057	2.5	0.0	0.0	0.0	1.9	0.0	0.4	86.317**
Individual consumers	30	6.3	8.6		12.5	6.0	6.0	11.3	7.7	2.4	6.6	
Collectors	59	13.3	11.4		2.5	26.5	26.5	14.5	0.0	0.0	13.0	
Traders	339	74.7	74.3		77.5	57.8	57.8	71.8	82.7	91.6	74.7	
Retailers/supermarkets	2	0.3	0.0		0.0	1.2	1.2	0.0	0.0	0.0	0.2	
Farmers/pastoralists for breeding purposes	20	4.2	5.7		5.0	8.4	8.4	0.8	5.8	6.0	4.4	
Other	3	0.8	0.0		0.0	0.0	0.0	1.6	1.9	0.0	0.7	
If you sold sheep, the place where the first type of sheep sold?												
Farm gate	23	5.2	4.3	2.299	7.5	1.2	1.6	3.8	1.2	19.4	5.1	51.542**
Buyers place	2	0.5	0.0		0.0	0.0	0.0	1.9	0.0	1.4	0.4	
On the road to the market	2	0.3	1.4		0.0	0.0	0.0	1.9	0.0	1.4	0.4	
In the market	427	94.0	94.3		92.5	98.8	98.4	92.3	98.8	77.8	94.1	

**Significant at 1 and 5%, respectively. Results may not add up to 100 due to rounding.

^aData on who sold the first goat are missing for Doyogena in the baseline data.

TABLE 6 Participation in marketing-related decisions on Small ruminants by gender and study areas, SR VC baseline data, 2014.

Variables		N	By Gender (%)		Test statistics	By study sites (%)						Full sample (%)	Test statistics		
			Male	Female		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama	Yabello				
Number of SRs sold in 12 months		525	4.0 (3.218)	3.6 (2.514)	0.864	6.5 (4.129)	1.6 (1.115)	3.0 (1.943)	4.6 (3.647)	4.0 (2.801)	4.5 (2.860)	3.9 (3.123)	28.553**		
Who defines the price of goat?	Head	155	80.2	47.4	22.054**	51.4		55.6	100.0	100.0	93.7	77.1	62.698**		
	Spouse	2	1.1	0.0		0.0		0.0	0.0	0.0	1.8	1.0			
	Other HH members	5	1.1	15.8		2.8		0.0	0.0	0.0	2.7	2.5			
	Trader	36	15.9	36.8		41.7		44.4	0.0	0.0	1.8	17.9			
	Other buyers	3	1.6	0.0		4.2		0.0	0.0	0.0	0.0	1.5			
Who defines the price of sheep?	Head	323	71.4	70.0	6.710	35.0	65.1	63.7	90.4	72.3	95.8	71.1	89.501**		
	Spouse	12	2.3	4.3		0.0	1.2	5.6	0.0	4.8	0.0	2.6			
	Other HH members	10	1.6	5.7		2.5	2.4	2.4	1.9	2.4	1.4	2.2			
	Trader	104	23.4	20.0		57.5	30.1	27.4	5.8	20.5	2.8	22.9			
	All HH members	4	1.0	0.0		5.0	1.2	0.8	0.0	0.0	0.0	0.9			
	Other buyers	1	0.3	0.0		0.0	0.0	0.0	1.9	0.0	0.0	0.2			
Who decides when to sell goat?	Head	83	40.1	52.6	44.162**	23.6		33.3	50.0	33.3	53.2	41.3	24.902*		
	Spouse	3	1.1	5.3		2.8		0.0	0.0	0.0	0.9	1.5			
	Head and spouse	106	57.1	10.5		62.5		66.7	50.0	66.7	45.0	52.7			
	All HH members	9	1.6	31.6		11.1		0.0	0.0	0.0	0.9	4.5			
Who decides when to sell sheep?	Head	163	29.4	71.4	67.983**	20.0	38.6	29.0	50.0	26.5	54.2	35.9	53.406**		
	Spouse	7	0.8	5.7		5.0	1.2	2.4	0.0	0.0	1.4	1.5			
	Head and spouse	255	64.1	12.9		62.5	44.6	63.7	48.1	68.7	44.4	56.2			
	Other male HH member	3	0.5	1.4		0.0	2.4	0.8	0.0	0.0	0.0	0.7			
	All HH members	26	5.2	8.6		12.5	13.3	4.0	1.9	4.8	0.0	5.7			
Who kept the sale proceeds of goat?	Head	125	59.9	84.2	18.738**	65.3		55.6	50.0	33.3	62.2	62.2	12.651		
	Spouse	19	10.4	0.0		9.7		0.0	0.0	33.3	9.9	9.5			
	Head and spouse	54	29.1	5.3		20.8		44.4	50.0	33.3	27.9	26.9			
	Other male HH member	3	0.5	10.5		4.2		0.0	0.0	0.0	0.0	1.5			

(Continued)

TABLE 6 (Continued)

Variables	N	By Gender (%)		Test statistics	By study sites (%)					Full sample (%)	Test statistics	
		Male	Female		Abergele	Doyogena ^a	Horo	M. Gera	M. Mama			Yabello
Who kept the sale proceeds? of sheep?	Head	57.0	91.4	33.562**	65.0	78.3	51.6	63.5	57.8	65.3	62.3	50.520**
	Spouse	11.7	4.3		7.5	4.8	14.5	5.8	10.8	15.3	10.6	
	Head and spouse	29.2	1.4		17.5	12.0	33.1	30.8	30.1	19.4	24.9	
	Other male HH member	1.6	2.9		10.0	3.6	0.8	0.0	0.0	0.0	1.8	
	All HH members	0.5	0.0		0.0	1.2	0.0	0.0	1.2	0.0	0.4	

**Significance at 1 and 5%, respectively.

SD in parenthesis.

^aData on who defines the price, who decides when to sell, and who kept the sale proceeds from goats are missing for Doyogena in the baseline data.

work of all household members across the study sites. Monitoring goats and sheep breeding and health in most cases appears to be the role of the household head in Doyogena, Horo, and Yabello. Apart from that, close to 50% of the respondents said that monitoring the health of goats is only done by spouses in Yabello; however, in the remaining sites, all household members participate significantly in these activities. Overall, 66.2% of the respondents said all household members participate in cleaning, while more than 20% of respondents said this work is only done by women spouses. Although the task of herding is accomplished by all household members across the study areas, daughters were found to be the key players in this role both around the homestead and in distant areas.

Less than 45% of respondents have access to market information (input–output market information) and this significantly differed among study areas ($p < 0.001$), but not between genders. Goat-dominating production systems have less market information as compared to sheep-dominating production systems. More than 65% of the respondents sold on average about four heads of SRs during the period covered by the survey (Table 6). The largest proportion of respondents who sold SRs was from Menz Mama (92.2%), followed by Menz Gera (80.0%) and Horo (79%). SR keepers generally sell their animals in the market and use traders as their main market channel, and there are no gender differences in relation to these activities. Interestingly, selling goats and sheep in the market location appeared to be the role of the head of the household or older male family members (Table 5). In Menz Mama, all of the respondents agree that it is only done by the head of the household.

3.1.2.2. Input into marketing decisions: marketing-related decisions and gender status

The responses to the question of the market channel and location for SRs in the baseline data do not demonstrate a variation between genders. The majority of the respondents sell their goats and sheep to traders in the market (Table 5). One of the questions on the agency dimension in the baseline data is who defines the price of SR animals. Although there were significant differences between the gender groups on who defines the price of goats, generally men control defining the price of both goats and sheep across the study areas. The result shows that defining the price of goats is dominated by the head of the household according to the men (80.2%) and women (47.4%) respondents. Across the study sites, except in Abergele and Horo, defining the price of sheep appears solely the role of men. In Abergele and Horo, however, traders observed playing a key role in defining the price of SRs. Similarly, decisions on the timing of sale related to goats and sheep were asked in the baseline questionnaire. The result indicated that the gender groups do not agree. According to men respondents (57.1% for goats and 64.1% for sheep), this work was primarily a joint (husband and wife) role. However, the women respondents (52.6% for goats and 71.4% for sheep) believe it is the other way round, suggesting that this role is the job of the head of the household; this difference is statistically significant ($p < 0.001$). This difference in reporting demonstrates the importance of interviewing both husband and wife in future surveys as their perceptions differ around decision-making responsibilities. Across the study areas,

TABLE 7 Binary logistic regression estimates of associations of empowerment (agency and achievements) in the livestock-based systems, SRVC baseline data, 2014, rural Ethiopia.

Variables (demographic and indicators of empowerment resources)		Indicators of agency				Indicator of achievement	
		Define price of SRs		Decide on when to sell SRs		Control income from SRs	
		B	Exp (B)	B	Exp (B)	B	Exp (B)
Age group	≤30	0.427 (0.580)	1.532	-0.494 (0.459)	0.610	-0.444 (0.470)	0.641
	31-40	-0.422 (0.390)	0.656	0.106 (0.340)	1.111	-0.275 (0.350)	0.760
	41-50	0.452 (0.425)	1.572	-0.530 (0.362)	0.589	-0.760 (0.382)	0.468*
	>50 (rf)						
Study areas	Abergele	-3.362 (0.770)	0.035**	-2.466 (0.574)	0.085**	-2.058 (0.596)	0.128**
	Doyogena	-3.623 (0.871)	0.027**	-0.529 (0.538)	0.589	0.283 (0.550)	1.327
	Horro	-2.654 (0.780)	0.070**	-1.340 (0.485)	0.262**	-0.355 (0.481)	0.701
	Menz Gera	-1.135 (0.951)	0.322	-1.170 (0.566)	0.310*	-0.772 (0.604)	0.462
	Menz Mama	-2.444 (0.786)	0.087**	-1.797 (0.500)	0.166**	-1.541 (0.532)	0.214**
	Yabello (rf)						
Gender	Men	1.032 (1.011)	2.808	-0.663 (0.768)	0.516	-1.552 (0.786)	0.212*
	Women (rf)						
Marital status	Married	-0.792 (1.090)	0.453	-1.996 (0.820)	0.136*	-1.722 (0.821)	0.179*
	Single	0.630 (1.702)	1.878	-0.274 (1.203)	0.760	-0.110 (1.251)	0.896
	Divorced	-1.152 (0.980)	0.316	-0.120 (0.898)	0.887	-0.318 (0.896)	0.727
	Widowed (rf)						
Size of livestock owned	≤5	1.370 (0.463)	3.935**	0.989 (0.351)	2.688**	0.869 (0.357)	2.385*
	6-10	0.410 (0.351)	1.507	0.137 (0.324)	1.147	-0.129 (0.339)	0.879
	>10 (rf)						
Select breeding stock	Yes	-0.852 (0.410)	0.427*	0.627 (0.368)	1.871	0.655 (0.379)	1.926
	No (rf)						
Contact with the extension agent	Yes	0.753 (0.359)	2.123*	-0.355 (0.310)	0.701	-0.653 (0.323)	0.521*
	No (rf)						
Get market information on SR	Yes	-0.690 (0.328)	0.501*	0.549 (0.295)	1.732	0.781 (0.308)	2.184*
	No (rf)						
Participate in selling SRs in the market	Yes	-1.563 (0.456)	0.210**	-1.091 (0.491)	0.336*	-0.653 (0.470)	0.521
	No (rf)						

(Continued)

TABLE 7 (Continued)

Variables (demographic and indicators of empowerment resources)	Indicators of agency				Indicator of achievement	
	Define price of SRs		Decide on when to sell SRs		Control income from SRs	
	B	Exp (B)	B	Exp (B)	B	Exp (B)
Constant	3.016 (1.332)	20.401*	3.248 (1.096)	25.731**	3.791 (1.134)	44.314**
N	383		384		384	
Nagelkerke R square	0.364		0.338		0.355	
Hosmer and Lemeshow Test	Chi-square = 12.388		Chi-square = 6.177		Chi-square = 5.979	
Omnibus Tests of Model Coefficients	Chi-square = 105.801**		Chi-square = 109.775**		Chi-square = 114.042**	
Overall predicted percentage correctness	79.9		75.8		77.1	

S.E. in parenthesis; rf, reference category; HH, Household.

* **Significant at 1 and 5% level, respectively.

Only covariates with a significant association are shown.

Possible interactions were checked and found insignificant but not shown.

the majority of the respondents agree that the decision on when to sell SRs is a joint role of husband and wife. However, in Yabello and Menz Gera, more than 50% of the respondents suggested that it is mainly the role of the head of the household (Table 6).

3.1.2.3. Achievements and gender status: control over income from SRs

In the empowerment process, the final aspect of empowerment is achievements that an agent needs to realize, which can be manifested in terms of controlling the proceeds from SRs. In the baseline data, it appears that men and women respondents do not agree on the indicators of achievement. While the majority of the women respondents said income from goats and sheep is controlled by the head of the household (57.9 and 74.3%, respectively), the majority of the men believed that it is jointly controlled (64.3 and 67.2%, respectively). When location is considered, it appears that significant proportions of both men and women respondents suggest men's upper hand over control of income from goats, while the task of controlling the sale proceeds of sheep appears a joint task between husband and wife.

3.2. Empirical results

3.2.1. Correlates of agency and achievement

Binary logistic regression analysis was applied to investigate existing associations between the independent variables and dependent variables, as presented in Table 7 along with the statistical results from the analysis. The values of the model chi-square and the Hosmer-Lemeshow statistics are reported at the end of Table 7 indicate that the selected variables fit the model well. Results show that the variables that are significantly associated with agency dimensions include context (represented by study areas), marital status, size of SR and livestock ownership, participation in breeding stock selection, contact with extension agents, market information on SRs, and participation in selling SRs in the market. Similarly, the variables that are significantly associated with the achievement (measured with control over income from SRs) are age, context, gender, marital status, size of livestock ownership, participation in breeding stock selection, contact with extension agents, and access to market information on SRs.

With regard to the age group and its association with empowerment dimensions, the age group between 41 and 50 years is negatively and significantly ($P < 0.05$) associated with one's control over the sale proceeds from SRs compared to older age groups. Considering the study areas, except Menz Gera and Doyogena, it negatively and significantly ($P < 0.01$) influenced agency dimensions (sole decision-making on defining SR prices and when to sell) as compared to Yabello. Gender is negatively and significantly ($P < 0.05$) associated with controlling income from the selling of SRs, implying that men household heads are less likely to make decisions alone on income from SRs compared to women household heads. Being married is negatively and significantly ($P < 0.05$) associated with agency and achievement suggesting that married men and women are less likely to make independent decisions on when to sell and control over income from SRs.

Contact with extension agents and access to market information are significantly ($P < 0.05$) associated with agency and achievement in an opposing manner. The odds ratio shows that respondents who have contact with extension agents and access to market information are 2.1 times more likely to make sole decisions on defining SR prices and 0.5 times less likely to have control over income from SRs, and vice-versa, respectively.

Smaller ownership of livestock (<5 heads) is positively and significantly ($P < 0.05$) associated with agency and achievement. Compared to ownership of more than 10 heads, respondents who own <5 heads of livestock are 3.9, 2.7, and 2.4 times more likely to make independent decisions on defining price, when to sell, and control over income from SRs, respectively. Whereas, participation in SR breeding stock selection is negatively and significantly ($P < 0.05$) associated with agency dimensions. Respondents who took part in breed selection are less likely to make sole decisions on defining the price of SRs. Another variable significantly ($P < 0.05$) associated with agency dimensions is participation in selling SRs in the market. Respondents, who participate in selling SRs in the market are 0.21 and 0.34 times less likely to make sole decisions in defining prices and deciding when to sell, respectively.

4. Discussion

4.1. Input acquisition and gender status: asset ownership and access to services

Systems of ownership of key empowerment resources, such as land, goat, and sheep, significantly vary across study areas but do not differ along gender lines, except for livestock ownership. These findings support the importance of considering context in empowerment interventions as suggested by scholars such as Richardson (2018a). In particular, ownership of small ruminants was less of an obstacle to both men and women across the study areas, except in Doyogena, where the lowest level of ownership was observed. However, men own more livestock as compared to their women counterparts, mainly because gender norms mediate ownership of large and more valuable assets (Ragasa et al., 2013).

The non-significant findings in relation to gender differences in key asset ownership are contrary to existing evidence (Doss et al., 2013; Boogaard et al., 2015; Debela, 2017; Wegari, 2020) because headship status is generally associated with privileges, such as ownership, control, and decision-making on key household assets (Kristjanson et al., 2010). Moreover, for women in male-headed households (and sometimes in women-headed households), ownership does not necessarily translate to control over these owned assets; in most cases, men in the household report rights to decide whether to buy or sell even jointly owned assets (Ahmed et al., 2009), which is influenced by gender norms. The non-significance observed in this study might be attributed to the demographic structure of the sampled HHs. More than 90.9% of the sampled women were the head of their household and women's empowerment is a core objective of most of the non-governmental organizations in Ethiopia targeting these households (Woldu et al., 2013). It is also expected that gender gaps have been narrowed, at least between men- and women-headed households, in the last decade due to an increased effort to mainstream gender

equity into development efforts (Mogues et al., 2009). This has included policies encouraging joint ownership, which has led to more equitable divisions of household assets upon divorce, death, or separation (Kumar and Quisumbing, 2015). Nevertheless, when the context was considered, ownership of SRs is higher in lowland areas which is consistent with similar past studies (for example, see Management Entity, 2021). Farmers in lowland areas mainly depend on livestock for their livelihoods, compared to mixed farming systems in the mid and highland areas.

Access to agricultural credit market services is generally a challenge for most Ethiopian farmers (Shete and Garcia, 2011). But the higher rate of credit services observed in Abergele and Menz Gera in this study could be related to the presence and services of non-governmental organizations as these areas often experience food shortages. Similarly, the general betterment in terms of contact with extension agents, with no difference between genders, could be partly associated with the current extension system being implemented in the country, which has had an emphasis in recent years on addressing gender gaps, at least at the household level. Women household heads are the target of extension services based on quota systems with specific support packages (Mogues et al., 2009). However, evidence consistently shows that generally women (female heads of households) have limited access to the same quality of services as their male counterparts, mainly due to the existing biased social norms (Ragasa et al., 2013).

4.2. Input into production and gender status: husbandry and management practices

In the face of the introduction of community-based breeding programs across the study areas, the role of breed selection appears to be more important than before for participating in the initiative. Breed improvement through community-based approaches, which involves participatory breeding stock selections, is one of the key components of the program on SRVCD. The breeding stock selection involves participatory breeding goal definition and trait identification, breeding male and female selections, distribution of selected sires along with mating management, and culling of unselected males (Haile et al., 2020). In this study, the significant disagreement between gender groups regarding whose role is this activity has implications. If findings were based on data collected through only talking to men, as the head of the household, this would not only be misleading but also may negatively affect indicators of program performance. Thus, the findings reported here suggest that women (including women spouses) need to be targeted and supported by the SRVCD program as they are also active participants in breeding management activities and may provide different information and viewpoints than men.

The other key activity among SR management and husbandry practices is feeding the animals. It is apparent that on average respondents agree that feeding goats and sheep is the responsibility of all household members including hired labor, although this differed significantly among the study sites, which could be influenced by the differences in farming systems. A similar study investigating gender roles in the same study areas has shown

that all household members participate with varying degrees of involvement in the different practices across the different farming systems. That study, however, found that women dominate in carrying out all of the husbandry-related roles while men control the decision-making aspect of SR husbandry and management practices (Kinati et al., 2018). Thus, although, gender roles in SR appear non-gendered, care should be taken in generalizing, as when these roles are further decomposed into their components, distinct gender roles could be identified (Kinati et al., 2018). Men, for example, tend to control only the decision-making aspects while women and other household members carry out the actual practices (physical work), implying the importance of intrahousehold analyses with in-depth information on gender roles for targeting.

4.3. Market participation and gender status: market-related decisions (instrumental agency)

Households generally sell their SRs in the market and this appeared to be the role of male household members, particularly that of male household heads. This could be because animal marketplaces are often located at a distance and market infrastructures are less developed in the Ethiopian context (Abate et al., 2021), and, in many cases, women do not own or control means of transport to distant marketplaces (Waithanji et al., 2013a). This means that women may face more physical and social barriers to actively participate in SR marketing (Njuki et al., 2011). For example, gender norms in Ethiopia likely prevent women, but not men, from traveling long distances in search of better prices (Mulema et al., 2019). The evidence further suggests that the level of women's market participation diminishes as vertical integration of markets is promoted, when sales move away from farm gates, and when the value chain is more developed and becomes more complex (Njuki et al., 2011). This implies that value chain development, such as the SR transformations program in Ethiopia that is the case for this study, needs to consider women's economic and social conditions when designing SR value chain developments. Moreover, the gender differences may reflect that women face other specific barriers to their market participation, including being more occupied with household chores and thus being less mobile, giving them fewer opportunities to travel and sell animals, as has been suggested by, for example, Waithanji et al. (2013a).

Defining the prices of SRs is controlled by men, which is consistent across locations. However, in some study areas, women also tend to believe that the prices of SRs were defined by traders. Since women do not generally go to the market when animals are sold, they might tend to believe and report what their husbands might have told them. Waithanji et al. (2013b) also reported that, because women's participation in selling SRs in the marketplace was minimal compared to their men counterparts, they rely on their husbands or other male household members for marketing activities. Similarly, decisions on the timing of the sale of goats and sheep and keeping the market proceeds, appear to be controlled by men, although gender groups do not agree. Men tend to report joint decisions while women believe that it was primarily decided

by men. This result is consistent with Waithanji et al. (2013a). Importantly, this finding suggests that what men describe as "joint decision-making" may indeed not mean what is commonly referred to as joint decision-making, which warrants surveys to question what joint decision-making means in a specific context and for a specific gender. In Ethiopia, others have reported men, who typically control the productive resources in the household, as the major decision-makers in relation to production, consumption, and sales in the market (Aregu et al., 2011).

4.4. Achievements: control and use of income

There is a disagreement between gender groups regarding who controls income from SRs. Men tend to suggest the task as a joint role whereas women say it is men-dominated. The findings of this study are in concordance with the study conducted by Boogaard et al. (2015) in *Inhassoro* District of Mozambique. He concluded that the income from SR selling was mainly controlled by men or jointly. Meanwhile, women in men-headed households hardly control the income from goats on their own. It has to be noted that, however, the term "joint control of income" can be ambiguous and misleading. It requires a further investigation of what "joint" really means to the respondents, both men and women. At what degree of involvement the term "joint" qualifies was not considered in the baseline study.

Income distribution significantly varies across gender and study sites. The unexpected findings in the income gap from livestock across study areas are contrary to the ownership status reported in Table 3—households with less livestock size ownership reported more income—which might imply differences in production orientation among the study areas. In Ethiopia, while 86% of farmers practice mixed farming (Negassa et al., 2011), two of the sites, Abergele and Yabello, have more livestock-based systems than the rest of the study areas, which would suggest that these two areas would also have a higher level of income from livestock. However, this was not found to be the case, in that the livestock income of Abergele and Yabello was close to that of Horo and less than that of Menz Mama. This could be partly attributed to the fact that, although farmers in Abergele and Yabello keep more animals than crop farmers in the rest of the areas, their participation in marketing is low (Negassa et al., 2011). For example, Negassa et al. (2011) reported that 43 and 50% of Ethiopian smallholder farmers did not participate in the marketing of sheep or goats during the period from 2003 to 2005, respectively. However, for the pastoralists in Yabello, it was about 72 and 66% during the same period, respectively. It is common for pastoralists to sell most of their animals only during shock times, such as drought, in fear of total loss, particularly because animals are also kept for symbolic and social purposes in Ethiopia (Wodajo et al., 2020), and not just for income generation.

4.5. Factors affecting empowerment

This section focuses on exploring the relationship between aspects of empowerment and socioeconomic characteristics along

key SRVC stages in Ethiopia. By strictly limiting our definitions of agency and achievement to the ability to make decisions alone (or autonomously) and having full control over income from SRs, respectively, leaving aside the ambiguous “joint decision-making”—as the term entails masked dominance of men (Kabeer, 2011)—we show that age group, context, marital status, sex of HH head, able to select breeding stock, livestock ownership, contact with extension agent, access to market information, and participation in selling at marketplaces are all factors that are significantly associated with agency dimensions, achievement, or both. These findings agree with several studies (Wayack et al., 2014; Nahayo et al., 2017; Thandar et al., 2020).

The negative relationship of the age category (41–50 years) with one's control over the sale proceeds from SRs, as compared to older age groups, might be related to the demographic status of the study participants. About 42% of the “>50 years old” age group were widowed (descriptive result not reported) and expected to have full control over income as the head of their households, which was a higher proportion than for younger age groups. In the Ethiopian context, and as elsewhere, most women become widowed in their later years and may gain authority in this manner (Wayack et al., 2014). This finding demonstrates the importance of closely examining demographic factors, including age, gender, and marital status, when investigating empowerment and, importantly, the need to be cautious in interpreting results when age is entered as a continuous variable. Context, represented by the study areas, was also found to be an important variable affecting dimensions of agency and achievement in Ethiopia. This could be related to the diverse socio-cultural contexts that exist across the farming systems in the country (Epple and Thubauville, 2012). Hence, further analysis from this perspective is needed to ensure local differences in social norms, spanning from religion and culture, which play vital roles in shaping women's empowerment (Thandar et al., 2020), are not lost when national datasets are compiled and analyzed.

We also found that gender is negatively associated with controlling income from the sale of SRs, suggesting that men household heads are less likely to make decisions alone compared to women household heads. This appears true because the majority of the male respondents (>60%) said income is controlled jointly; however, the women respondents did not agree, which is consistent with evidence from Kabeer (2011) who suggests that joint decision-making is male-masked dominance (Kabeer, 2011). Moreover, researchers noted that male participants behave differently in different research approaches (Jejeebhoy, 2002). In household surveys, male participants tend to display more liberal attitudes toward women's autonomy in decision-making as opposed to in focus group discussions where they appear more conservative because they are with their peers (Jejeebhoy, 2002; Tavenner et al., 2018). Thus, in this study, we assumed it as a non-autonomy indicator. Moreover, married men tend to make decisions in consultation with their spouses, while women household heads do not as they are often widowed, divorced, or do not have adult male members in their household, a finding that is consistent with Aregu et al. (2011). This was also supported by the result that being married is negatively associated with agency and achievement, suggesting that married men and women are less likely to make sole decisions on when to sell and also less likely to have sole control over income

from SRs. Respondents in this marital status tend to report joint decision-making.

The positive relationship observed between smaller ownership of livestock (<5 heads) and aspects of empowerment is not consistent with the general trend of decision-making in Ethiopia (Aregu et al., 2011), which suggests that decisions in rich and middle households are male-dominated while it is generally joint in poorer households. Reasons for this conflicting observation might include the following: people tend to be more restrictive and autonomously decide alone when resources are scarce or limited; smaller farms may have an over-representation of female HH heads; smaller farms may have less contact with VCs (both input and markets); smaller farms may be less sensitive to VC-related decisions and thus exhibit joint decision-making behavior; and smaller farms may have recently encountered shocks which reduced their size and influenced what kinds of decisions were made and by whom. All of these possibilities warrant further investigation.

The relationships between participation in VCs activities at the production level (such as breed selection, getting market information, and selling in the market) and agency dimensions were found to be negative, which might imply that participation alone does not generate the capacity to make sole decision-making, but rather may encourage more egalitarian decision-making behaviors (Galiè et al., 2015).

The positive associations observed between contact with extension agents and the ability to define SR prices, and access to market information and control over income, are consistent with other similar studies (Nahayo et al., 2017; Carnegie et al., 2020), implying that access to extension agents and market information improves one's ability to make market-related decisions and exert control over income from SRs. However, the negative associations between contact with extension agents and control over income, access to market information, and ability to define SR market prices are contrary to what is reported from past studies (Carnegie et al., 2020). These differences could be partly attributed to the fact that those individuals who are accustomed to collecting market information on SRs to inform decisions might also tend to consult at home or believe in joint, rather than sole, decision-making, and vice-versa. Similarly, those who often consult with extension agents might become more egalitarian in their attitude and tend to believe in shared control of resources. Again, these are matters requiring further investigation.

By employing existing theory to direct the exploration of the available dataset, this study offers lessons for future research as well as productivity-related program design. Although empowerment indicators are not objectively included in the design of the tools used to collect the baseline data, the dataset allowed us to identify limited but direct measurements of agency and achievement. Nevertheless, some limitations are evident. First, the list of independent variables used missed an important variable related to direct measurements of social norms which is hypothesized as being strongly associated with empowerment. Second, determining the groupings of some of the variables is a complex task due to the existence of heterogeneity among the study locations and thus might affect the reported results. Finally, the baseline data did not collect any qualitative information, and thus interpreting some of the unexpected findings is difficult.

5. Conclusion and implications

This study attempted to generate measures of empowerment and apply them in relation to smallholder livestock systems that are seen as a driver of economic and social development. Using a program conventionally targeted at productivity and efficiency, the study sheds light on other aspects of success for such programs. Empowerment is defined in relation to the decisions surrounding the generation of income—and hence resilience—from livestock. This is one of the first attempts to do this and several lessons have emerged to inform future research. Several explanatory variables have been identified for empowerment, and this informs future program design.

The descriptive analysis highlighted the importance of context with regard to access to major VC imputes, systems of ownership of empowerment resources, and decision-making. At the production stage in the SRVC, although roles in SR appear non-gendered for most of the activities, care should be taken since significant disagreement was observed between gender groups with respect to key activities, such as breed selection, indicating the importance of consulting both men and women. Only talking to men, as the head of the household, may not only generate biased information but also may negatively affect program performance by misunderstanding and undermining the role of women. Market participation, related decisions, and control over income from SRs appear to be under the control of men. Market locations and channels for SR keepers are limited to local marketplaces and traders, respectively, and generally biased against women, mainly because of restrictive norms combined with a lack of market facilities which are often out of the reach of women. However, policymakers need to take into account the trade-off between VC development and gender equality—literature shows that women's market participation diminishes as vertical integration of markets is promoted through value chain development if due consideration is not given to the normative contexts governing resource control rights.

The empirical analysis confirmed the major role of context in determining one's empowerment in terms of making autonomous decisions in SRVC. It provides, thus, additional arguments for further research focusing on the socio-cultural contexts and gender attitudes that make up the opportunity conditions for empowerment across the study areas, which is missing in the current study. The strong associations of gender and marital status with the agency and achievement indicators also affirm the need to give due consideration to women SRVC participants to achieve gender equality for the program. This could be done through various approaches including designing women-targeted interventions. However, to ensure long-lasting gender equality, gender transformational interventions must be in place. The development of national gender policies should focus on transforming the socio-cultural contexts. The strong associations between aspects of empowerment and the various SRVC stages observed asserts the importance of SRs for empowerment. Participation in SRVCs may encourage more egalitarian decision-making behaviors but does not guarantee the capacity for sole decision-making and, thus, the program needs to be coupled with gender-specific interventions to strengthen women's agency.

Nevertheless, further investigations are apparent to gain an understanding in relation to the mixed results observed in the livestock-based systems. In particular, those findings which appear to contradict the existing evidence, and where men and women disagreed, need to be further investigated.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

WK accessed the dataset from ICARDA, conceptualized the idea, and wrote the draft manuscript. ET, DB, and DN reviewed and contributed to the final analysis and write up of the manuscript. All authors agreed on the final appearance of the manuscript after careful review, read, and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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