Factors influencing empowerment of rural women in farm households in Arsi Zone, Oromia, Ethiopia

Tekelab Cherent [a,*], Fekadu Beyene [a], Million Sileshi [b],
Zegeye Tirfe [c]

[a]*School of Agricultural Rural Development and Agricultural, Haramaya University, Dire Dawa, Ethiopia*
[b]*School of Agricultural Economics and Agribusiness, Haramaya University, Dire Dawa, Ethiopia*
[c]*Department of Agricultural Economics, Arsi University, Ethiopia*

Abstract

Rural Ethiopian women play a critical yet under-documented role in farm production and household welfare but entrenched socio-economic and cultural barriers persistently hinder their empowerment. This study examines the determinants of empowerment among 415 women farm households in Arsi Zone, Oromia, Ethiopia, using a mixed-methods approach that combines the Women's Empowerment in Agriculture Index (WEAI), binary probit regression, structured surveys, and focus group discussions via multi-stage sampling (purposive selection of four districts, random selection of eight farmer associations, and stratification into microfinance participants and non-participants). Findings reveal that only 18 % of women exceed the empowerment threshold, highlighting severe disempowerment driven by excessive workloads, lack of leisure time, limited social group involvement, and nervousness in public speaking a WEAI leadership indicator reflecting constrained agency amid cultural norms. Probit analysis identifies age, education, landholding size, livestock ownership, total assets, savings, aspirations, social capital, and dependency ratio as significant positive influencers, with education boosting empowerment probability by 19.2 % and total assets by 30.9 %. These results underscore the need for integrated, context-specific policies to enhance access to education, economic resources, and social networks, thereby fostering women's agency, inclusive rural development, and amplified agricultural contributions.

Keywords: determinants of women's empowerment, microfinance institution, probit model, Women's Empowerment in Agriculture Index (WEAI)

1 Introduction

Agriculture remains the backbone of many developing economies, including Ethiopia, where it is central to food security, livelihoods, and national development (Timmer, 1992; Yigezu Wendimu, 2021). Within this sector, rural women play a vital role, contributing nearly 48 % of agricultural labour and producing around 70 % of household food (Chandel *et al.*, 2022). However, due to deep-rooted socio-cultural norms, their contributions often go unacknowledged, and they encounter significant barriers in gaining ownership of farmland, securing financial resources, and participating in key decision-making processes (Chakona *et al.*, 2024; Yayeh *et al.*, 2024).

Empowering rural women is increasingly recognized as a crucial approach to alleviating poverty, promoting gender equality, and fostering sustainable development (Gnawali, 2018). Empowerment involves strengthening women's independence in making choices, access to and authority over economic assets, and engagement in activities that contribute to earnings (Ogbari *et al.*, 2024; Mulema *et al.*, 2021). However, factors such as illiteracy, economic dependency, and cultural barriers continue to restrict women's agency (Akinwale, 2023).

Conceptually, empowerment is a concept that spans disciplines and includes both external dimensions, such as access to resources, and internal aspects, such as self-confidence and agency (Oxaal & Baden, 1996; Hennink *et al.*, 2012; Kabeer, 2021). Some authors categorize empower-

* Corresponding author: cheretekele@gmail.com

ment into economic, social, political, and psychological domains (Moghadam & Senftova, 2005), while others emphasize informed choice and autonomy Lord & Hutchison (1993); (Oxaal & Baden, 1996; Hennink *et al.*, 2012). Similarly, Gbenro (2009) and describe empowerment as an ongoing process involving increased control, awareness, and justice.

Microfinance has become an instrument to advance women's empowerment by improving their capability to obtain credit and engage in entrepreneurial ventures (Andriamahery & Qamruzzaman, 2022). Key indicators include resource control, decision-making participation, and benefit-sharing (Kabeer, 1999; Yuniriyanti & Sudarwati, 2017). Ultimately, empowered women contribute significantly to household welfare, human development, and national progress (Saleh *et al.*, 2022).

Theoretical frameworks such as Women in Development (WID) and Women and Development (WAD) provide important historical context. WID emerged prominently after the 1975 Mexico City Conference, emphasizing the inclusion of women in development initiatives. However, it has been critiqued for overlooking women's reproductive roles and failing to address broader gender-related concerns (Rathgeber, 1990; Brief *et al.*, 2013). In contrast, WAD emphasized collective action and political engagement as a path to empowerment (Moser *et al.*, 1990; Guillen-Royo, 2020).

While global indices such as the Gender Development Index (GDI), the Gender Inequality Index (GII), and the Social Institutions and Gender Index (SIGI) are useful for comparing gender disparities across countries, they may fail to account for specific cultural and regional differences (Buvinic & Furst-Nichols, 2014; Ibnouf, 2020). In contrast, the Women's Empowerment in Agriculture Index (WEAI), introduced by Alkire *et al.*, (2013), offers a more context-sensitive tool, as it assesses dimensions such as decision-making power, leadership roles, and control over productive resources.

Empirical evidence indicates that women's empowerment is influenced by a range of factors that vary according to specific social and cultural settings, including prevailing norms, access to education, economic status, and intra-household relationships (Mulatu & Prasad, 2018; Demssie, 2020). For instance, Kuma (2021) found that only 42.38 % of women in Ethiopia's Basona Worena district were empowered, with education and credit access as key determinants.

Despite growing literature, gaps remain particularly in Ethiopia's Arsi Zone, a region of agricultural importance that has been under-researched. Existing studies often rely on limited variables or lack regional specificity (Awuni *et al.*, 2022; Mohamed, 2023). This study fills these research gaps

by conducting a comprehensive evaluation of female empowerment in the Arsi Zone, employing an adapted WEAI framework alongside qualitative and quantitative research approaches.

The research investigates: the socio-economic and demographic determinants shaping women's empowerment in agricultural contexts; and the prevailing degree of empowerment among women in the study location. By identifying both structural constraints and enabling conditions, this study contributes to the design of evidence-based strategies aimed at strengthening women's engagement and leadership within agricultural development. Ultimately, empowering rural women is not only a matter of equity but an economic imperative for Ethiopia's sustainable growth.

2 Materials and methods

A mixed-methods research design was adopted, combining numerical data analysis with qualitative inquiry. Consequently, participant selection involved a combination of multistage sampling for the quantitative component and purposive sampling for the qualitative aspect. Primary and secondary data were collected through structured surveys and focus group discussions (FGDs). The data were analysed using econometric models and descriptive statistics.

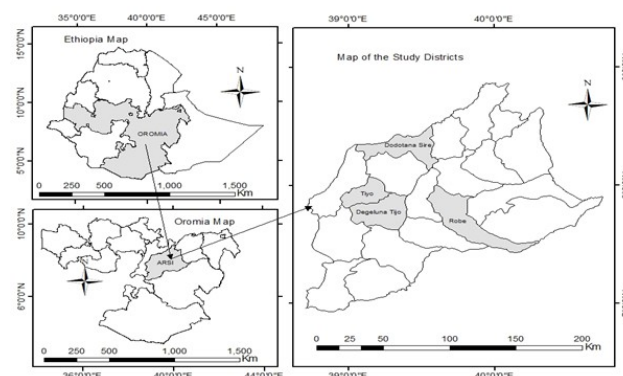### 2.1 Description of the study area

Fig. 1: *Map of the study area*

Arsi Zone is one of the 20 zones in the Oromia National Regional State, located in southeastern Ethiopia. The administrative capital, Asella, lies 175 km from Addis Ababa. The zone is categorised into four agro-ecological zones: 29.1 % Kolla (lowland with a warm climate), 27.5 % Woinadega (mid-altitude with temperate weather), 39.7 % Dega (highland), and 3.7 % Wurch (very cold conditions). The area's elevation varies from 500 to 3,300 meters above sea level. Annual temperatures range between 10°C and 25°C, with

rainfall levels between 700 and 2,000 mm. It is bordered by Bale Zone to the south, West Arsi to the southwest, East Shewa to the northwest, Afar Region to the north, and West Hararghe to the east. Covering 19,825.22 km², it consists of 25 districts and 501 farmer associations (FA), with an estimated population of 3,894,248 (Zenaye *et al.*, 2024; The Second Proceedings Conference Oromia Regional State, 2024). Arsi Zone has an estimated population of around 3.98 million, with nearly equal proportions of men and women. The majority (over 88 %) live in rural areas, while a small fraction is urban or pastoralist communities. Wheat is the dominant crop, grown by over 360,000 farmers; contributing 43.7 % of cereal output from 39.8 % of cultivated land. Women hold less than 20 % of titled land. Women in Arsi Zone face persistent socio-economic challenges marked by low levels of formal economic participation, with the majority engaged in unpaid agricultural labour. Female education and literacy rates around 29.5 % remain significantly lower than male counterparts, particularly in rural areas where school dropout and early marriage are prevalent. Food insecurity, exacerbated by climate variability and limited access to resources, disproportionately affects women, further constraining their economic and educational opportunities (Zenaye *et al.*, 2024).

2.2 Sampling procedure and sample size

A multi-stage sampling method was used to select the respondents and determine the study region. In the first stage, four districts (Robe, Sira, Tiyo, and Degeluna Tijo) were purposively chosen from the zone based on accessibility to microfinance services and participation in agricultural activities. In the second stage, eight farmer associations (FAs) were randomly selected from these districts using probability proportional to size (PPS). In the third stage, women in the selected FAs were categorised as microfinance institution (MFI) participants or non-participants.

To determine the appropriate sample size, Cochran's (1963) formula for large populations was applied, as commonly used in cross-sectional household surveys (Wooldridge & Zhu 2020; Liu *et al.*, 2021). The calculation yielded a minimum sample size of 385 households. To account for potential non-response and omissions, a 10 % contingency was added Wooldridge & Zhu (2020), resulting in a final sample of 415 households. Of these, 205 were MFI participants and 210 were non-participants, selected at random from the eight FAs using PPS. The distribution of the sample across districts was also determined proportionally based on population size (Table 1).

Table 1: *Sample districts, farmer association, and number of selected households (HHs)*

Selected districts	Selected kebeles	Total HHs	Total resp.	MFI Part.	Non-Part.
Tiyo	Dosh	692	26	15	11
	Bilalo	859	30	17	13
Digalu Tijo	Ashake	2099	88	40	48
	Gusha	2370	99	45	54
Arsi Roba	Asnadabo	1189	43	22	21
	L/Gado	660	24	13	18
	A/Robe	994	36	18	11
Sire	Borera	1838	69	35	34
Total		10701	415	205	210

Source: Arsi Zone Agricultural and Rural Development Office and MFI (2023).
MFI=micro finance institution; resp. = respondents; Part. = participants.

2.3 Method of data analyses

2.3.1 Determinants of women farm household empowerment using the women's empowerment in agriculture index

The WEAI was used to assess empowerment outcomes, focusing specifically on domains relevant to the agricultural sector. Although empowerment is multidimensional, affecting family, social, economic, and health aspects. WEAI specifically targets agriculture-related indicators (Bennett *et al.*, 2023).

As summarised in Table 2, WEAI covers five domains originally defined by USAID (1) production, (2) resources, (3) income, (4) leadership, and (5) time allocation each with sub-indicators and assigned weights (Alkire *et al.*, 2013). These domains and indicators were used to construct the Five Domain Empowerment (5DE) measure, which evaluates both empowerment and disempowerment.

The 5DE is calculated as $1 - M_0$ where M_0 represents the disempowerment index. The method identifies (i) the proportion of disempowered women (headcount ratio, H_P) and (ii) the intensity of their inadequacies across domains (A_P) (Alkire & Foster, 2011). A woman is considered empowered if she achieves adequacy in at least 80 % of the weighted indicators or in four out of five domains. This composite measure thus captures both the prevalence and depth of disempowerment while providing an overall empowerment score for each respondent.

2.3.2 Econometric model specification and estimation

A binary probit regression model was employed using STATA version 17 to identify the determinants of women's

Table 2: *The five domains and ten sub-indicators weights in the WEAI.*

Domain	Indicator	Weight
Production	Input in productive decisions	0.10
	Independence in production	0.10
Resources	Ownership of properties	0.07
	Buying, sale, or handover of assets	0.07
	Access to and decisions about loan	0.07
Income	Control over use of profits	0.20
Leadership	Group affiliate	0.10
	Speaking in community	0.10
Time	Workload	0.10
	Relaxation	0.10

Source: adopted from Alkire *et al.*, (2013)

empowerment. The dependent variable is binary 1 if the women = is empowered, 0 = otherwise. The probit model is suitable for estimating probabilities within the (0, 1) interval (Gallani *et al.*, 2015).

Let Y_i represent the observed empowerment status of woman *i*, where:

$$Y_i = \{1 \text{ if woman } i \text{ is empowered}; 0 \text{ otherwise}\}$$

We assume the existence of an unobserved latent variable Yi^* that captures the propensity of a woman to be empowered. The latent variable model is specified as:

$$Y_i^* = Xi\beta + \varepsilon i, \quad \text{where } \varepsilon_i \sim \mathcal{N}(0,1)$$

The observed binary outcome Y_i relates to the latent variable as follows:

$$Y_i = \{1 \text{ if } Y_i^* > 0; \ 0 \text{ if } Y_i^* \leq 0\}$$

The probability that woman *i* is empowered is:

$$Pr(Y_i = 1 \mid X_i) = Pr(Y_i^* > 0 \mid X_i) = Pr(\varepsilon_i > -X_i\beta)$$
$$= 1 - \Phi(-X_i\beta) = \Phi(X_i\beta)$$

Where *x* is the cumulative distribution function (CDF) of the standard normal distribution. This can also be articulated as:

$$\Phi(X_i\beta) = \int_{-\infty}^{X_i\beta} \frac{1}{\sqrt{2\pi}} e^{-z^2/2} \, dz$$

The log-likelihood function for the probit model is assumed by:

$$\ln L(\beta) = \sum_{i=1}^{n} \Big[Y_i \ln \Phi(X_i\beta) + (1 - Y_i)\ln(1 - \Phi(X_i\beta)) \Big]$$

The probit model is projected using the Maximum Likelihood Estimation (MLE) method. The empirical specification of the model is as follows:

$$Y_i = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ij} + \mu_i$$

Where: Y_i is the binary response variable indicating women's empowerment status, Xi_j are the explanatory variables influencing empowerment, βj are the coefficients to be estimated, and μi is a random error term.

Since the coefficients in a probit model do not directly replicate marginal effects, we compute marginal effects to interpret the impact of explanatory variables. The marginal effect of a variable X_j on the probability of empowerment is given by:

$$\frac{\partial \Pr(Y = 1)}{\partial X_j} = \varphi(X\beta) \cdot \beta_j$$

Where $\varphi(.)$ is the standard normal probability density function, clear as:

$$\varphi(z) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right)$$

Marginal effects were computed in order to interpret the influence of the explanatory variables, which were evaluated at mean values or values of specific interest. This makes easier to understand how changes in the explanatory variables influence the likelihood of women being empowered.

3 Results

3.1 Result of calculating women's empowerment in agriculture index

The WEAI is the first measure to directly capture levels of women's empowerment and inclusion in the agricultural sector. This innovative tool tracks women's engagement in agriculture across five domains each containing ten sub-indicators.

The WEAI results demonstrate that women in the study area are relatively empowered in the domains of production, resources, and income, where most respondents reported meaningful participation in decisions over farming practices, asset use, and household earnings. These findings indicate

Table 3: *Adequacy and inadequacy scores of WEAI sub-indicators by 5DE domains wit a sample size of n=415.*

Domain	Sub-indicators	Adequacy (%)	Inadequacy (%)	Domain average (%) adequacy (%)	inadequacy (%)
Production	Input in productive decisions	86.27	14.22	80.49	18.76
	Autonomy in production	74.69	25.30		
Resources	Ownership of assets	84.09	15.90	84.42	15.58
	Buying, selling, transfer of assets	86.51	13.49		
	Access to and decisions about loans	82.65	17.35	82.65	17.35
Income	Control over use of profits	80.72	19.23	82.65	17.35
Leadership	Group membership	58.55	41.45	63.37	36.63
	Speaking in public	68.19	31.81		
Time	Workload	54.46	45.54	30.00	70.00
	Leisure / relaxation	5.54	94.45		

that women's role in economic and agricultural decision-making is becoming more recognized, reflecting gradual improvements in gender relations. The low 5DE score (Table 4) indicates a high level of disempowerment among rural women in the study area, with nearly all respondents experiencing inadequacies across multiple domains (Abdelaal, 2022; Awotona *et al.*, 2022).

By contrast, the leadership and time domains show clear gaps. Limited participation in community groups and lower confidence in speaking in public suggest restricted influence in social spaces. Similarly, heavy workloads combined with very limited leisure time underscore the double burden of women's labour responsibilities. This imbalance highlights the need for interventions that address not only access to resources but also structural barriers to women's social participation and personal well-being. During FGDs, women expressed that "men do not know how to cook or care for children. "Men are widely regarded as household heads, and many women stated that caregiving is a woman's duty." They noted that men who engage in domestic tasks are often disrespected by the community, reflecting deep-rooted gender norms. The highest adequacy scores were observed in the 'Production' and 'Resources' domains, while 'Time' showed the lowest empowerment levels, particularly in leisure/relaxation.

The analysis reveals notable differences between microfinance participants and non-participants in terms of empowerment outcomes. Women who participated in microfinance programs generally exhibited higher empowerment scores across several WEAI domains, particularly in production, control over income, and access to resources. This suggests that participation in microfinance enhances women's decision-making power and economic agency, providing them with both financial tools and confidence to influence household and agricultural decisions. By contrast, non-participant women often faced more limited opportunities and constraints, including restricted access to credit, weaker involvement in group activities, and a heavier workload that limited their time for decision-making or community engagement.

Qualitative observations during the survey reinforced this pattern. Several participants noted that access to loans allowed them to purchase inputs independently and negotiate household expenditures, while non-participants described reliance on male family members for financial decisions. This contextual insight complements the quantitative results and illustrates how structural factors interact with individual agency to shape women's empowerment in the study area.

Table 4: *Summary of women empowerment measures (5DE index).*

Index components	Value
Disempowered = headcount (H)	196
Average inadequacy score (H_P)	0.94
Average intensity of disempowerment (A_P)	0.87
5DE disempowerment index ($M_0 = A_P \times H_P$)	0.82
5DE empowerment score ($1 - M_0$)	0.18

3.2 Result of descriptive analysis

The descriptive analysis uses means, standard deviations, frequencies, and percentages to summarize respondents' demographic and socioeconomic characteristics, while t-tests and chi-square tests are applied to assess differences between empowered and disempowered women.

3.2.1 Result of demographic characteristics of respondents

The study included a total of 415 female household respondents. Tables 5 and 6 present the mean values related to the same opportunity, along with the statistical tests for both continuous and categorical variables. Table 5 shows, empowered women are older than disempowered women ($p < 0.01$). Regarding educational attainment, the average years of schooling for the entire sample was 3.69, with empowered women averaging 6.04 years and disempowered women averaging 1.4 years. This suggests that age and education are associated with higher empowerment. Additionally, there was a significant difference in household size between the two groups at the 1 % significance level. Women from lesser families were found to have greater levels of empowerment compared to those from larger families.

The results indicate that rural women who are considered empowered tend to have greater TLU revenue compared to those who are not. Statistically significant variances were found in the amount of credit accessed by empowered versus disempowered females, with the difference being meaningful at the 1 % level. Additionally, the time taken to reach the nearest market (min) was particularly different among the two groups at the 5 % significance level. Women living closer to market places likely had greater exposure to market-related information and social interactions, which enhanced their participation in economic activities and increased their likelihood of being empowered compared to those in more remote areas. Asset ownership also showed a significant difference, with empowered women more likely to possess assets than their disempowered peers, a difference confirmed at the 5 % probability level. Furthermore, the dependency ratio had a statistically significant inverse relationship with women's empowerment at the 1 % level. Higher dependency burdens on women often correlate with limited household resources, slower economic advancement, and increased income inequality. Overall, the data suggest that asset ownership strongly contributes to women's empowerment, as women with property are more likely to be empowered than those without.

Determinants of women's empowerment are positively correlated with access to information and marital status they are statistically significant at a 1percent significance level with regard to the discrete variable in Table 6. Of the respondents, 55 percent had access to the media, 42 percent were married, and empowered women had greater access to information. 70.4 percent of the women in this research were empowered and educated. Empowered women are confirmed to have higher levels of education. Empowered women typically have stronger educational backgrounds, easier

access to financing, better media availability, are located close to markets, and have low dependency ratios.

3.3 Results of probit model on causes of rural women empowerment

Table 7 presents the log-likelihood value of –58.620 and the likelihood ratio chi-square statistic of 445.16 ($p < 0.001$), indicating that the overall model is statistically significant. This confirms that all fifteen independent variables collectively have a significant influence on rural women's empowerment. The pseudo R-square significance ($R^2 = 0.792$) reveals that approximately 79.15 % of the difference in women's household empowerment is described by the variables included in the model, demonstrating strong explanatory power. The remaining 21 % of variation may be attributed to external factors not took by the model.

One key objective of the model is to identify and quantify the effect of specific variables on rural women's empowerment. Simply recognizing the factors is not sufficient; understanding their relative importance is crucial for designing effective interventions. To this end, econometric analysis was employed, specifically a binary probit model, to guess the determinants of empowerment. The model is statistically robust at a 1 % significance level, refusing the null hypothesis that all slope coefficients are zero. The probit estimation results (Table 7) confirm that the set of explanatory variables jointly predicted women's empowerment in the sample. Nine variables were statistically associated with empowerment: age, education, landholding, livestock holdings, asset ownership, dependency ratio, aspiration, social capital, and savings. Among these, education, livestock holdings, land size, and asset ownership showed the strongest positive associations, indicating that both human and productive capital significantly enhance women's decision-making power and economic agency. Higher aspirations and stronger social capital were also associated with a greater likelihood of empowerment, highlighting the importance of non-material resources and social networks. Although the dependency ratio was expected to negatively influence empowerment, the model produced a positive and significant coefficient. This suggests that women in households with more dependents may assume greater economic and decision-making responsibilities to support their families, which in turn enhances their empowerment. The finding also implies that household demographic pressures can, in certain contexts, motivate rather than constrain women's agency. Variables not statistically significant in this sample are also reported in Table 7. These results describe associations rather than causal effects; therefore, interpretation is framed in terms of correlates and

Table 5: *Summary descriptive statistics on continuous variable (n=415).*

Variables	Pooled mean	Empowered mean	Disempowered mean	Mean difference	p-value
AGE	41.8	43.00	37.91	-4.95	***
EDULEVEL	6.04	3.69	1.39	4.69	***
FAMSIZE	4.42	4.01	4.75	1.83	***
Land size	1.23	1.23	1.15	-0.13	
DMARKET	56.00	53.27	65.59	12.33	**
FREXTCON	26.14	26.34	25.42	-0.91	
FEXP	16.27	15.78	15.78	-0.65	
TLU	4.97	5.06	4.67	-0.39	**
CREDIT	11301.20	13585.14	3283.00	-13831.50	***
Total asset	54732.02	60269.40	60269.40	-24978.30	***
DEPRATIO	1.15	1.05	1.51	0.46	***

Note: *** $p < 0.01$; ** $p < 0.05$; AGE = age of respondent (years); EDULEVEL = years of schooling; FAMSIZE = household size (number of members); Land Size = cultivated land area (ha); DMARKET = distance to nearest market (minutes); FREXTCON = frequency of extension contact (times per month); FEXP = farming experience (years); TLU = total livestock units; CREDIT = amount of credit accessed (ETB); Total Asset = total value of household assets (ETB); DEPRATIO = dependency ratio (non-working to working members).

Table 6: *Percentage distribution of empowered and disempowered women by selected discrete variables (n = 415).*

Variable	Response	Empower (%)	Disempower (%)	Total (%)	$X^{2(p)}$
Marital status	Yes	41.5	1.2	43	66.93***
	No	36.4	21.0	57	
Social capital	Yes	53.3	17.0	69	0.17
	No	25.0	6.0	31	
Aspiration	High	34.5	7.2	42	4.05
	Low	19.0	6.3	25	
Access to information	Yes	55.0	23.0	78	12.64***
	No	11.0	11.0	22	

Note: *** $p < 0.01$; ** $p < 0.05$; MSTATUS = marital status (1 = married, 0 = otherwise); SCAPITAL = social capital (membership in community group, 1 = yes, 0 = no); ASPIRATION = future aspiration level (1 = high, 0 = low); ACCESSINF = access to information (1 = yes, 0 = no).

potential targets for policy interventions rather than proven causal pathways.

4 Discussion

The findings highlight the multifaceted nature of women's empowerment in rural Ethiopia, showing that it is shaped by human capital, economic assets, and social factors.

Human capital
Age, education, and aspirations emerged as important determinants of empowerment. Older women were more likely to be empowered, potentially due to accumulated experience, social recognition, and decision-making authority within households. Education had a strong positive effect, with higher education levels enhancing awareness of rights and opportunities, facilitating participation in economic activities. Similarly, women with higher aspirations demon-

strated proactive behaviours and a greater likelihood of empowerment, reflecting their openness to new opportunities and innovative practices. These results are consistent with previous empirical studies conducted both in Ethiopia and other developing countries. Similar positive associations between women's education, access to productive assets, and empowerment were reported by Chandel *et al.*, (2022) and Neway & Zegeye, (2022) in Ethiopia, and by Kabeer, (1999) and Mayoux *et al.*, (1998) in South Asia and other contexts.

Economic assets
Land ownership, livestock, total household assets, and savings were positively associated with empowerment. Women with larger landholdings or more livestock had increased economic security, higher productivity, and greater decision-making power. Ownership of durable goods and productive equipment further enhanced bargaining power and independence, while savings promoted financial autonomy and

Table 7: *Probit regression model estimation of the likelihood of women's empowerment.*

Variable	Coeff.	Std. Err.	z-Stat.	P > z	Marg. Eff. (dy/dx)
AGE	0.03	0.02	1.73	0.07	0.00
MSTATUS	−0.03	0.30	−0.10	0.92	−0.00
EDULEVEL	1.29	0.30	4.34	0.00	0.19
FEXP	−0.02	0.03	−0.67	0.51	−0.00
FAMSIZE	−0.09	0.08	−1.11	0.27	−0.01
Land Size	0.85	0.30	2.83	0.01	0.12
TLU	0.58	0.09	6.64	0.00	0.08
Total Asset	0.00	5.01	≈ 0	0.00	0.31
DEPRATIO	0.37	0.15	2.54	0.01	0.05
Aspiration	0.59	0.28	2.10	0.04	0.09
SCAPITAL	0.57	0.29	1.95	0.05	0.08
SAVING	0.00	0.00	–	0.00	0.00
FREEXTCON	0.01	0.01	1.00	0.29	0.00
DMARKET	−0.00	0.01	−0.29	0.75	≈ 0
Get training MFI	0.15	0.27	0.53	0.59	0.02
Constant	−6.93	1.21	−5.73	0.00	–

Note: see table 5 for the explanation of the abbreviations.

investment capacity. These results align with prior findings (Alene, 2020; Adera & Abdisa, 2023; Ghimire *et al.*, 2024) and indicate that access to and control over tangible resources is a critical pathway to empowerment. Notably, MFI participants often reported higher asset accumulation and savings compared with non-participants, illustrating how institutional support can strengthen economic agency.

Social factors

Social capital and household dependency were also influential. Participation in community groups and social networks increased access to information and collective resources, supporting women's engagement in income-generating activities. Conversely, higher dependency ratios reduced empowerment by increasing caregiving responsibilities and limiting time for economic participation. These findings highlight the dual importance of social support and manageable household structures in fostering empowerment (Beriso 2023; Machio *et al.*, 2024).

5   Conclusions

Overall, the results demonstrated that empowerment is not determined by a single factor, but rather by the interaction of human capital, economic resources, and social context. Integrating these dimensions provides a more cohesive understanding of how women's agency is shaped in rural Ethiopia.

Therefore, interventions aiming to enhance empowerment should adopt comprehensive strategies, including improving access to education, promoting saving habits, facilitating asset ownership, supporting participation in social networks and reducing burdens associated with household dependency. Linking these strategies with microfinance programmes can benefit participants in particular by reinforcing both economic and social pathways to empowerment.

Conflict of interest

The authors declare no conflict of interest.

References

Abdelaal, E. (2022). Economic Analysis of Women Empowerment in Agriculture Index (WEAI), a Comparative Study between some Egyptian Regions. *Journal of Agricultural Economics and Social Sciences*, 13(6), 223–232. doi: `10.21608/jaess.2022.141581.1053`.

Adera, A., & Abdisa, L. T. (2023). Financial inclusion and women's economic empowerment: Evidence from Ethiopia. *Cogent Economics and Finance*, 11(2). doi: `10.1080/23322039.2023.2244864`.

Akinwale, A. A. (2023). International Journal of Pedagogics. *International Journal of Pedagogics*, 3(9), 43–47.

Alene, E. T. (2020). Determinants that influence the performance of women entrepreneurs in micro and small enterprises in Ethiopia. *Journal of Innovation and Entrepreneurship*, 9(24).

Alkire, S., & Foster, J. (2011). Understandings and misunderstandings of multidimensional poverty measurement. *Review of Income and Wealth*, , 289–314. doi: `10.1007/s10888-011-9181-4`.

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A. R., Seymour, G., & Vaz, A. (2013). The Women's Empowerment in Agriculture Index. OPHI Working Paper No. 58.

Andriamahery, A., & Qamruzzaman, M. (2022). Do Access to Finance, Technical Know-How, and Financial Literacy Offer Women Empowerment Through Women's Entrepreneurial Development? *Frontiers in Psychology*, 12, 1–16. doi: `10.3389/fpsyg.2021.776844`.

Awotona, T. O., Oladimeji, Y. U., & Damisa, M. A. (2022). Analysis of gender dynamics in cassava production for resource empowerment among farmers in Oyo State, Nigeria. *Journal of Agricultural Science and Environment*, 23(1), 1–12. https://journal.funaab.edu.ng/index.php/JAgSE/article/view/2263.

Awuni, I. A., Baataar, C. K. M., Mohammed, A. D., & Boateng, B. (2022). Socio-Cultural Dynamics of Women Participation in Socio-Economic Development: Experiences of Women in The Bongo Traditional Area of the Upper East Region. *European Journal of Development Studies*, 2(5), 114–121. doi: `10.24018/ejdevelop.2022.2.5.165`.

Bennett, D., Metatla, O., Roudaut, A., & Mekler, E. D. (2023). How does HCI Understand Human Agency and Autonomy? In *Proceedings of the Conference on Human Factors in Computing Systems*. doi: `10.1145/3544548.3580651`.

Beriso Guduro, A. A., & A., E. (2023). Women empowerment in agricultural activities and its impact on farming household food security: The case of Anna Sorra District, Guji Zone, Oromia regional state, Ethiopia. *Cogent Food and Agriculture*, 9(2). doi: `10.1080/23311932.2023.2263952`.

Brief, M., Manfre, C., Rubin, D., Allen, A., Summerfield, G., Colverson, K., & Akeredolu, M. (2013). *Reducing the Gender Gap in Agricultural Extension and Advisory Services: How to Find the Best Fit for Men and Women Farmers*. Technical Report USAID/MEAS.

Buvinic, M., & Furst-Nichols, R. (2014). *Measuring Women's Economic Empowerment*. Technical Report United Nations Foundation.

Chakona, G., Mapedza, E., Gartaula, N., Joshi, D., & Puskur, R. (2024). Enabling socio-technical innovation bundles (STIBs) Implementation in Ethiopia: A Literature Review of the policy context.

Chandel, A. S., Bedecha, T. G., Hordofa, E. G., Mathewos, M., & Leta, D. B. (2022). Contributions of Ethiopian Women in Farming and Its Allied Fields. *Asian Journal of Geographical Research*, 5(3), 50–64. doi: `10.9734/ajgr/2022/v5i3150`.

Demssie, A. T. (2020). Factors affecting women entrepreneurs in establishing their own business: The case of Afar Region, Ethiopia. *African Journal of Business Management*, 14(3), 86–92. doi: `10.5897/ajbm2019.8919`.

Gallani, S., Krishnan, R., & Wooldridge, J. (2015). Applications of Fractional Response Model to the Study of Bounded Dependent Variables in Accounting Research. *SSRN Electronic Journal*, . doi: `10.2139/ssrn.2642854`.

Ghimire, P. R., Devkota, N., Marasini, T., Khanal, G., Deuja, J., & Khadka, U. (2024). Does joint land ownership empower rural women socio-economically? Evidence from Eastern Nepal. *Land Use Policy*, 138, 107052. doi: `10.1016/j.landusepol.2024.107052`.

Gnawali, A. (2018). Impact of Microfinance Institutions in Women Economic Empowerment: With reference to Butwal Sub-Municipality. *International Journal of Research in Humanities and Social Studies*, 5(5), 10–17.

Guillen-royo, M. (2020). Applying the fundamental human needs approach to sustainable consumption corridors: participatory workshops involving information and communication technologies. *Sustainability: Science, Practice and Policy*, 16(1), 114–127. doi: `10.1080/15487733.2020.1787311`.

Hennink, M., Kiiti, N., Pillinger, M., & Jayakaran, R. (2012). Définir l'autonomisation: Points de vue d'organisations internationales de développement. *Development in Practice*, 22(2), 202–215. doi: `10.1080/09614524.2012.640987`.

Ibnouf, F. O. (2020). Women and Unpaid Care Work: A Review. In *Gender, Development and Social Change* (pp. 31–51). doi: `10.1007/978-3-030-26195-5_3`.

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change*, 30(3), 435–464. doi: `10.1111/1467-7660.00125`.

Kabeer, N. (2021). *Women's Economic Empowerment and Inclusive Growth: Labour Markets and Enterprise Development*. Technical Report UN Women.

Kuma, R. (2021). Access to Land for Women's Empowerment: The Case of Basona Werana Woreda, North Showa, Amhara National Regional State, Ethiopia. https://cgspace.cgiar.org/bitstream/10568/115888/1/rahel_thesis_2021.pdf.

Liu, T., He, G., & Turvey, C. G. (2021). Inclusive Finance, Farm Households Entrepreneurship, and Inclusive Rural Transformation in Rural Poverty-stricken Areas in China. *Emerging Markets Finance and Trade*, 57(7), 1929–1958. doi: 10.1080/1540496X.2019.1694506.

Lord, J., & Hutchison, P. (1993). The process of empowerment: Implications for theory and practice. *Canadian Journal of Community Mental Health*, 12(1), 5–22. doi: 10.7870/cjcmh-1993-0001.

Machio, P. M., Kimani, D. N., Kariuki, P. C., Ng'ang'a, A. M., & Njoroge, M. M. (2024). Social Capital and Women's Empowerment. *Forum for Social Economics*, 53(3), 322–340. doi: 10.1080/07360932.2022.2115526.

Mayoux, L. (1998). Impact Research Round-Up. *Development in Practice*, 8(2), 235–241.

Moghadam, V. M., & Senftova, L. (2005). Measuring women's empowerment: Participation and rights in civil, political, social, economic, and cultural domains. *International Social Science Journal*, 184, 389–412. doi: 10.1111/j.1468-2451.2005.00557.x.

Mohamed, F. (2023). Socio-Cultural Factors and Women's Representation in Political Leadership: Case Study Mbale City Councils. *OALib*, 10(11), 1–15. doi: 10.4236/oalib.1110847.

Moser, C. O. N. (1990). Reassessing urban poverty reduction strategies: The asset vulnerability framework. *World Development*, 26(1), 1–19.

Mulatu, M., & Prasad, R. D. (2018). A study on factors affecting success of women entrepreneurs in Tigray region, Ethiopia. A case study of Adigrat town entrepreneurs. *American Journal of Economics and Business Management*, 1(1), 10–19. doi: 10.31150/ajebm.v1i1.4.

Mulema, A. A., Boonabaana, B., Debevec, L., Nigussie, L., Alemu, M., & Kaaria, S. (2021). Spiraling up and down: Mapping women's empowerment through agricultural interventions using the community capitals framework in rural Ethiopia. *Community Development*, 52(1), 113–130. doi: 10.1080/15575330.2020.1838589.

Neway, M. M., & Zegeye, M. B. (2022). Gender differences in the adoption of agricultural technology in North Shewa Zone, Amhara Regional State, Ethiopia. *Cogent Social Sciences*, 8(1). doi: 10.1080/23311886.2022.2069209.

Ogbari, M. E., Folorunso, F., Simon-Ilogho, B., Adebayo, O., Olanrewaju, K., Efegbudu, J., & Omoregbe, M. (2024). Social Empowerment and Its Effect on Poverty Alleviation for Sustainable Development among Women Entrepreneurs in the Nigerian Agricultural Sector. *Sustainability (Switzerland)*, 16(6). doi: 10.3390/su16062225.

Oxaal, Z., & Baden, S. (1996). *Gender and Development: Concepts and Definitions*. Technical Report Report No. 55 Institute of Development Studies, BRIDGE. https://www.bridge.ids.ac.uk/reports/re55.pdf.

Proceedings of the Second Regional Conference on the Oromia Regional State Economic Development (2024). Proceedings of the Second Regional Conference on the Oromia Regional State Economic Development.

Rathgeber, E. M. (1990). WID, WAD, GAD: Trends in Research and Practice. *Journal of Developing Areas*, 24(4), 489–502.

Saleh, A., Kuswanti, A., Nahla Amir, A., & Nur Suhaeti, R. (2022). Determinants of Economic Empowerment and Women's Roles Transfer. *Jurnal Penyuluhan*, 18(1), 118–133. doi: 10.25015/18202238262.

Timmer, C. P. (1992). Agriculture and economic development revisited. *Agricultural Systems*, 40(1–3), 21–58. doi: 10.1016/0308-521X(92)90015-G.

Wooldridge, J. M., & Zhu, Y. (2020). Inference in Approximately Sparse Correlated Random Effects Probit Models With Panel Data. *Journal of Business and Economic Statistics*, 38(1), 1–18. doi: 10.1080/07350015.2019.1681276.

Yayeh, F. A., Ferede, W., & Demissie, W. M. (2024). Debating the Relationship Between Social Capital and Economic Development in Ethiopia. *Forum for Social Economics*, , 1–19. doi: 10.1080/07360932.2024.2341662.

Yigezu Wendimu, G. (2021). The challenges and prospects of Ethiopian agriculture. *Cogent Food and Agriculture*, 7(1). doi: 10.1080/23311932.2021.1923619.

Yuniriyanti, E., & Sudarwati, R. (2017). The Development Model of Woman Empowerment in Order to Increase Family's Food Tenacity. *Jurnal Ekonomi dan Pembangunan*, 9(1), 41–56.

Zenaye, D. A., Mada, M., & Alemu, M. (2024). Production efficiency of wheat farmers in the Arsi Zone, Oromia Region of Ethiopia. *Discover Food*, 4(1). doi: 10.1007/s44187-024-00134-3.