

Modelling the determinants of rural household poverty: empirical evidence from Somalia

Dahir Abdi Ali, Nasra Abdulhalim Mohamed, Abdirahman Ibrahim Ismail, Jama Moahmed & Mohammad Sahabuddin

To cite this article: Dahir Abdi Ali, Nasra Abdulhalim Mohamed, Abdirahman Ibrahim Ismail, Jama Moahmed & Mohammad Sahabuddin (2025) Modelling the determinants of rural household poverty: empirical evidence from Somalia, *Cogent Food & Agriculture*, 11:1, 2445139, DOI: [10.1080/23311932.2024.2445139](https://doi.org/10.1080/23311932.2024.2445139)

To link to this article: <https://doi.org/10.1080/23311932.2024.2445139>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 26 Dec 2024.



Submit your article to this journal [↗](#)



Article views: 871



View related articles [↗](#)



View Crossmark data [↗](#)

Modelling the determinants of rural household poverty: empirical evidence from Somalia

Dahir Abdi Ali^a, Nasra Abdulhalim Mohamed^b, Abdirahman Ibrahim Ismail^b, Jama Moahmed^c and Mohammad Sahabuddin^d

^aFaculty of Economics, SIMAD University, Mogadishu, Somalia; ^bDepartment of Statistics and Planning, Faculty of Economics, SIMAD University, Mogadishu, Somalia; ^cFaculty of Statistics & Mathematics, College of Applied & Natural Science, Hargeisa University, Hargeisa, Somalia; ^dDepartment of Finance and Banking, University of Science and Technology Chittagong, Chattogram-4202, Dhaka, Bangladesh

ABSTRACT

Although poverty has been decreasing globally in recent years, it remains a significant challenge in Somalia, particularly in rural areas where the poverty rate is higher than the national figure. Most livelihoods in these areas rely on rain-fed agriculture and livestock. However, there is currently no comprehensive study examining the extent of poverty and the associated risk factors in these regions. This study utilizes multivariate logit model to analyze the impact of socio-economic characteristics of rural households on poverty in Somalia, using data from the Somalia High-Frequency Survey (SHFS) wave 2. Key determinants of rural household poverty include household size, access to modern energy, remittances, agricultural land ownership, house ownership, age group, and gender of the household head. It was found that household size and the age group of the household head can negatively affect the well-being of rural households. Conversely, access to modern energy, remittances, agricultural land ownership, house ownership, and the gender of the household head can reduce rural household poverty. Therefore, the BAXNAANO program should prioritize support for rural households headed by women, older individuals, and those with larger household sizes. Additionally, the government should implement electrification programs as an integral component of its rural development policy.

ARTICLE HISTORY

Received 25 April 2024
Revised 13 December 2024
Accepted 16 December 2024

KEYWORDS

Somalia; household; poverty; rural; logit

SUBJECTS

Economics; Economics and Development; Rural Development

1. Introduction

Globally, the number of people living in extreme poverty has been consistently dropping for nearly 25 years (World Bank, 2022). However, the trend was interrupted in 2020, when poverty increased due to the COVID-19 crisis, as well as the effects of conflict and climate change, which had previously slowed poverty reduction. Although global poverty has recently resumed its pre-pandemic downward trajectory, the lingering effects of the pandemic, the war in Ukraine, and rising inflation could result in between 75 million and 95 million additional people living in extreme poverty in 2022 compared to pre-COVID-19 projections.

For the last three (3) decades, the global poverty rate dropped in every region (World Bank, 2018). More than 36% of the people lived in extreme poverty while this figure dropped to approximately 10%

of the total population in 2015. These figures show that the worldwide poverty rate falls by one percent per year on average. Despite this excellent news, the number of people living in poverty in Sub-Saharan African countries is rising rapidly. In 1990, 56% of Africans were classified as poor, but by 2012, that figure had dropped to 43%. Nonetheless, the number of people living in poverty increased from 280 million in 1990 to 330 million in 2012 due to rapid population growth.

Somalia is one of the poorest countries in Sub-Saharan Africa due to decades of civil war and political disintegration, with over seven out of ten Somalis living in poverty (World Bank, 2019). After the Democratic Republic of Congo, Central African Republic, Madagascar, Burundi, and South Sudan, Somalia has the sixth highest poverty rate in the

region (World Bank, 2019). The incidence of poverty in Somalia stands at 69%, which is 19 percentage points higher than the unweighted average of low-income Sub-Saharan African nations which is 51% in 2017.

Nearly half of the population is unable to reach the average food consumption, indicating the poor living conditions of the Somali people. Poverty is prevalent and deep, particularly for households living in rural areas, emphasizing significant obstacles to overcoming poverty. The situation has worsened, with the present drought destroying crop harvests and animals dying from a lack of water and pasture, depriving many pastoral people of their sole source of income. The current drought has affected over 50% (6.1 million) of the Somali population and displaced 771,400 people, making Somalia one of the most severely drought-impacted countries in the Horn of Africa (OCHA, 2022).

The issue of poverty has been on the agenda of the Somali government. For instance, the current national development plan 9 (2020 to 2024) is based on four pillars: Inclusive and Accountable Politics; Improved Security and the Rule of Law; Inclusive Economic Growth (including increased employment); and Improved Social Development to address the root cause of poverty in Somalia. Despite efforts by the government, the international community, and non-governmental organizations (NGOs) to alleviate poverty and disparities in the distribution of benefits of economic growth across geographic areas and social groups, rural poverty has not yet declined. Therefore, the objective of this study is to investigate factors influencing poverty among rural households in Somalia.

The remaining sections of the paper are organized as follows. [Section 2](#) reviews the relevant literature on the topic. The third section of the study presents the methodology and data source. [Section 4](#) contains the results and discussions, and the fifth section, which is the final section, summarizes, concludes, and suggests appropriate policies from the study.

2. Literature review

Global poverty has been declining in the digital era, while the magnitudes of rural households living increasing in the Sub-Saharan African countries, particularly in Somalia. The determinants of rural household poverty are multifaceted and enormous. Thus, the following factors were reviewed and hypothesized to influence the poverty of rural households based on prior empirical studies.

2.1. Household head and household characteristics

Age, gender, and educational level of the household head are among the characteristics of the household head. Age is one of the major indicators of poverty. The age of the household head may reflect both work experience and a specific stage in their life cycle (Grootaert, 1997). According to findings from studies conducted in Nepal (Wagle, 2006), Tanzania (Litchfield & McGregor, 2008), Egypt (Datt & Jolliffe, 2005), Fiji (Gounder, 2012), Pakistan (Cheema & Sial, 2012), the household head's age increases the household's poverty. On the other hand, studies conducted in South Africa (Sekhampu, 2013) and Pakistan (Malik, 1996) have found that age is negatively associated with the wellbeing of households. Nevertheless, in line with the life cycle hypothesis, the relationship between age and poverty may not be linear, suggesting that poverty is higher in households with very young and very old heads than in households with middle-aged heads, and household wealth diminishes progressively as the household head ages. Between 1994 and 2002, Kitov (2006) noticed that annual personal incomes in the United States peaked between the ages of 45 and 55, and thereafter fell.

Gender of the household head is also one of the major determinants of household poverty. Most of the rural households are headed by males unless the household head dies or loses functionality due to aging. Deressa and Sharma (2014) and Negatu (2008) claim that cultural and societal standards in rural areas have a significant negative impact on the nutritional condition of women and children, making them susceptible social groups. Studies conducted in Kenya (Geda et al., 2005) have shown that the gender of the household head is associated with household welfare and poverty. Female-headed households are associated with a higher likelihood of poverty (Deressa & Sharma, 2014; Teka et al., 2019; Tsehay & Bauer, 2012). This means that rural females are less empowered when it comes to valuable assets like land. They work less compared to their counterparts.

Education has helped to reduce poverty and improve the well-being of the impoverished (World Bank, 2016a). In both urban and rural settings, education has a strong and beneficial relationship with consumption. This indicates that education has the ability to improve earning potential as well as occupational and geographic mobility (Deressa & Sharma, 2014; Teka et al., 2019; World Bank Institute, 2005). As a result, education is thought to have a good

impact on rural household welfare. For instance, studies conducted in Cote d'Ivoire (Grootaert, 1997), Kenya (Geda et al., 2005), South Africa (Serumaga-Zake & Naudé, 2002), Malawi (Mukherjee & Benson, 2003), Tanzania (Litchfield & McGregor, 2008), Pakistan (Cheema & Sial, 2012), and Fiji (Gounder, 2012) have revealed that an increase in education level is associated with a reduction in the likelihood of experiencing poverty.

The welfare of rural households is influenced by the overall family size. Families with a bigger number of members are more likely to be poor (Heshmati, 2016; Deressa & Sharma, 2014; Sekhampu, 2013; Serumaga-Zake & Naudé, 2002), Kenya (Geda et al., 2005), and Pakistan (Baulch & McCulloch, 2002; Gounder, 2012), Tanzania (Litchfield & McGregor, 2008), Egypt (Datt & Jolliffe, 2005), and Malawi (Mukherjee & Benson, 2003). Hence, if the family size increases, its impact is expected to be positive.

2.2. Access to services

Access to electricity services directly helps to economic growth and reduces poverty. For example, China has lifted 300 million people out of poverty since 1990 by improving access to energy. However, household access to electricity services in Somalia is low. Over 7 million people, which is about 50% of the population, do not have access to electricity (World Bank, 2019). In rural households, access to electricity is even lower, estimated at 32.3% (World Bank, 2022). According to Ogbeide-Osaretin (2021), Modern energy(electricity) is negatively and significantly linked to poverty alleviation.

The introduction of mobile money or mobile financial services is expected to address challenges related to traditional financial institutions in providing financial access to impoverished people in developing nations, and promote financial inclusion. Several studies, including Jack and Suri (2014) and Munyegera and Matsumoto (2016), suggest that mobile money is the best tool for individual financial inclusion. It allows individuals, particularly those in financially disadvantaged rural communities in many developing countries, to transfer purchasing power using simple SMS technology at a low cost over vast distances. According to Suri and Jack (2016), access to Kenya's M-PESA2 mobile money system improved per capita spending and moved 194,000 households, or 2% of the population, out of poverty. Furthermore, Munyegera and Matsumoto (2016) found that mobile money availability improves household welfare in Uganda.

2.3. Remittance receipt

Remittances may play a significant role in determining a country's poverty status. Acosta et al. (2006) find that remittances have reduced inequality and poverty in Latin American and Caribbean countries. Similarly, Gupta et al. (2009) reports that remittances have a negative impact on direct poverty by using a sample of 10 countries in Sub-Saharan Africa. Remittances can improve the living conditions of rural households (Adams, 1991). Furthermore, according Adams and Page (2005), International remittances have a negative and statistically significant impact on poverty indices. Adams and Cuecuecha (2013) pointed out that receiving remittances lowered the probability of household poverty in Ghana. For households receiving internal and international remittances, the chance of being poor reduced by 17% and 97%, respectively in Ghana. As a result, international remittances have huge impact on poverty alleviation than internal remittances in Ghana. Furthermore, López Córdova (2005) in Mexico and Lokshin et al. (2010) in Nepal found that foreign remittances alleviate poverty at the country level by roughly 0.4 percent.

2.4. Agricultural land and homeownership

Agricultural land ownership is one of the basic assets of rural household poverty. Agricultural holding ownership is inversely related to rural household wellbeing (Heshmati, 2016; Deressa & Sharma, 2014). Hence, households with agricultural land are expected to lower poverty levels of the rural households.

Evidence suggests that households that own houses experience lower levels of poverty. For instance, studies conducted by Adarkwa (2010) and Adarkwa and Oppong (2007) concluded that homeownership reduces the probability of being poor and enhances households' welfare.

Based on the existing literature, many empirical studies have been carried out to investigate the determinants of household poverty in different regions of the world. In the context of Somalia, Mohamoud and Bulut (2020) have conducted studies to determine the factors that influence the likelihood of poverty. However, currently there is no single study examining the extent of rural household poverty and the associated risk factors. Therefore, this study contributes to the literature in two ways. Firstly, it is the first study conducted in Somalia to investigate the impact of socioeconomic factors on rural household poverty in Somalia. Secondly, while

previous research has primarily focused on national poverty dynamics and inequality, this study specifically identifies the determinants of poverty in rural households, which can inform the development of poverty reduction policies and programs tailored to rural areas. To address this gap, this study quantifies the extent of socioeconomic factors on rural household poverty using a multivariate logit model.

3. Data and methods

3.1. Data source

The data employed in this study were extracted from the second wave of the Somalia High-frequency Survey (SHFS), which was conducted in December 2017 by the World Bank in partnership with the Somali National Bureau of Statistics (SNBS) to track Somalis' welfare and attitudes in all 17 regions. The survey, the first extensive household survey conducted, covered urban, rural, nomadic and IDP households in the country. In this survey, a multi-stage stratified random sample was used to ensure that the sample represented all the subpopulations of interest. Stata was defined based on pre-war regions and types of residence (urban, rural, IDPs, and nomadic populations). In both urban and rural areas, the enumeration area (EA) served as the primary sampling unit (PSU). In the case of IDP strata, the primary sampling units were the IDP settlements as defined by UNHCR's Shelter Cluster. PSUs were selected across all strata using a systematic random sampling approach called selection probability proportional to size (PPS). In IDP strata, PPS sampling is applied at the IDP settlement level. For the second and final stage of sample selection, a micro-listing approach was utilized. This involved dividing EAs into 12 smaller enumeration blocks, which were then selected with equal probability. As each EA required 12 interviews, every block was chosen. A similar second-stage sampling strategy was employed for IDP strata. In this case, each IDP settlement was manually segmented into enumeration blocks. Ultimately, one household per block was randomly selected for an interview in all selected blocks within the enumeration area. The household selection process followed a two-stage micro-listing protocol, with equal probability in both stages. The strategy for sampling nomadic households relied on lists of water points. These lists were divided by stratum at the federated member state level, serving as primary sampling units. Water points were selected in the first stage with equal probability, with 12 interviews conducted at each chosen water point.

This survey targeted 6,400 households distributed among different geographical areas in Somalia. Of these 1106 are rural households. This study ascertains the impact of socioeconomic determinants on rural household poverty. To this end, the study utilizes nationally representative rural data of 1106 households.

3.2. Definitions of the variables used in the study

The response variable of this study is a dichotomous variable, meaning it assumes a value of 1 for poor households and 0 for non-poor households. The socio-economic and demographic predictors considered to determine their impact on rural household poverty are depicted in Table 1.

3.3. Measuring poverty

In order to measure poverty, three components are necessary. Firstly, there needs to be a measure of welfare. Secondly, a poverty line must be established to determine whether a household is considered poor or not. Lastly, an aggregate poverty measure is required (Coudouel et al., 2002; Haughton & Khandker, 2009).

3.3.1. Household consumption aggregate

For this analysis, the measure of welfare used is the per-capita consumption or cost of basic needs (CBN). The nominal household consumption aggregate consists of four components: expenditures on food items, expenditures on non-food items, the value of consumption from durable goods, and housing (Deaton & Zaidi, 2002). However, due to the lack of a well-functioning housing market that can provide reliable estimates for housing costs, the consumption

Table 1. Variables and their description.

Explanatory variable	Description
Sex	Sex of the household head (0=Female, 1=Male)
Age group	Age group of the household head (0 = at most 50years, 1 = >50years)
HHS	Household size
HHEL	Household head education level No education = 0 Primary education = 1 Secondary education = 2 University education = 3 Others = 4 (reference category)
HHHO	Household house ownership (0 = No, 1=Yes)
AMM	Access to mobile money (0 = No, 1=Yes)
AE	Access to energy-electricity (0 = No, 1=Yes)
RR	Remittance receipt (0 = No, 1=Yes)
AGRL	Ownership of agricultural land (0 = No, 1=Yes)

aggregate is calculated using only the first three components: food consumption, non-food consumption, and consumption of durable assets.

3.3.2. Poverty line

This study employs the international poverty line of US\$ 1.90 per person per day (2011 PPP) (World Bank, 2016b). The international poverty line was preferred to obtain a comparable measure of poverty across countries (Ravallion et al., 2009).

3.3.3. Poverty incidence

The poverty headcount ratio, a standard measure of poverty, can be derived from the following general formula:

$$F(\alpha) = \frac{1}{n} \sum_{i=1}^p \left[\frac{z - y_i}{z} \right]^\alpha \quad (1)$$

where y_i denotes the consumption of individual i , n is the total population, p is the poor population, and z is the poverty line. Equation (1) reduces to the poverty headcount ratio, which can be expressed as the sum of poor individuals (p) over the total population (n):

$$F(0) = \frac{p}{n} \quad (2)$$

3.4. Multivariate logit model

The study used a logistic regression model, which was found by Cox (1958) and later refined by Walker and Duncan (1967). Lee and Wang (2003) have more recently developed the model. The multiple logit model has been widely employed to examine the determinants of the likelihood of being poor in developing nations (Geda et al., 2005; Malik, 1996; Mok et al., 2007; Sekhampu, 2013; Serumaga-Zake & Naudé, 2002). The multivariate logit model can be specified as:

$$E(y/x) = \ln \left[\frac{\pi_j}{(1 - \pi_j)} \right] = \beta_0 + \sum_i^n \beta_i X_{ij} + u_j \quad (3)$$

where π_j is the probability that the i th household is poor satisfying the important requirement of $0 \leq \pi \leq 1$, β_0 and β_i are the parameters to be estimated, u_j is the random error, and X_{ij} 's are the predictors in the model.

With a fitted multivariate logit model, the estimated probability at X_{ij} is given by

$$\hat{\pi}(x) = \frac{\text{Exp}(\hat{\beta}_0 + \sum_i^n \hat{\beta}_{ij} X_{ij})}{1 + \text{xp}(\hat{\beta}_0 + \sum_i^n \hat{\beta}_{ij} X_{ij})} \quad (4)$$

The most commonly used method of estimating the parameters of a multivariate logit model is the technique of Maximum Likelihood (ML) instead of Ordinary Least Square Criterion.

3.5. Multivariate probit model

To further verify the results of the multivariate logit model, we employed multivariate probit model as an alternative method to validate the significance of the key determinants of rural household poverty. Similar to the multivariate logit model, the probability of being poor is modelled based on a non-linear function:

$$PY = 1 | x_1, \dots, x_k = f(x_1, \dots, x_k) \quad (5)$$

Nevertheless, for the multivariate probit model, the following relationship was assumed:

$$PY = 1 | x_1, \dots, x_k = \Phi \left(\beta_0 + \sum_i^n \beta_i x_i \right) \quad (6)$$

where f represents the function of the standard normal distribution which converts the regression into the interval of zero and one (0, 1). In general, the results of the multivariate probit model are expected to be quite similar to the multivariate logit model.

3.6. Ethical approval & consent to participate

The study was approved by the Ethics Committee of the Center for Research and Development, SIMAD University (ref. EC000129). The dataset used was in the public domain and fully anonymized and un-linkable with any human subjects.

Before data collection, the enumerators provided a detailed explanation of the survey's objectives and purpose to the participants. Verbal consent for participation was obtained before the commencement of the interview. The survey was conducted in all accessible areas of 17 regions within Somalia and involved interviews with 6,092 households. During data collection, the survey employed a computer-assisted personal interview (CAPI) approach, in which the enumerator asked questions and recorded

responses on a tablet. This process included reading the consent statement to the respondent, who then provided verbal agreement or disagreement. The CAPI approach was chosen because many of these households do not read or write, which is common in less developed countries.

4. Results and discussion

4.1. Descriptive statistics

Table 2 presents the descriptive statistics of the variables utilized in the model. Regarding gender and age group, it is evident that the majority of household heads are female (62.2%) and under 50 years old (78.4%). In relation to education, household homeownership, and agricultural land, it is discovered that 60.1% of household heads had no formal education, 74.6% owned houses, and 64.7% did not possess agricultural land. In terms of accessibility to mobile money, electricity, and remittance, 60.6% had access to mobile money, while the majority of household heads (74.4%) lacked access to electricity and did not receive money (82.9%).

4.2. Poverty rate

As discussed in sub-section 3.3, the measure of household welfare used is the per-capita household

Table 2. Descriptive statistics of the variables in the study.

Variable	Frequency	%
Sex		
Male	666	39.8
Female	440	60.2
Age group		
<50 years	877	79.4
At least 50 years	228	20.6
HHEL		
No education	475	60.1
Primary education	237	17.3
Secondary education	49	6.2
University education	117	14.8
Others	12	1.5
HHHO		
Yes	824	74.6
No	282	25.4
AMM		
Yes	434	60.6
No	668	39.4
Access to energy (AE)		
Yes	283	25.6
No	823	74.4
Remittance receipt (RR)		
Yes	189	17.1
No	917	82.9
Agricultural land (AGRL)		
Yes	387	35.3
No	710	64.7
Continuous variable	Min	Max
HHS	1	13

Note: Samples are not equal due to missing cases.

consumption, which is based on household consumption expenditure. Real per capita consumption expenditure is calculated by dividing total consumption expenditure by family size (Deaton & Zaidi, 2002). This results in total household expenditure per capita, serving as a measure of welfare for each household member. Therefore, households whose daily consumption falls below the international poverty line of \$1.90 per person per day are considered to be poor (in poverty).

Table 3 presents the poverty headcount ratio for rural households in Somalia. According to a consumption-based measure of poverty, 72 percent of the rural households are living in poverty.

4.3. Determinants of rural household poverty

This study investigated the link between the dependent variable and a set of covariates that explain the risk of a particular rural household being poor. The study's main goal was to uncover the fundamental socioeconomic determinants that explain rural household poverty. Table 4 depicts the parameter estimates of the multivariate logistic regression model, which estimates the binary poverty outcomes of being poor or non-poor. The following factors were significantly related to rural households' poverty status. AE (access to energy) was found to be a significant determinant of rural household poverty. Households with access to modern energy (electricity) were 44.9% less likely to experience poverty compared to those who have no access to electricity (OR = 0.449, 95% CI = 0.308–0.655). This finding is consistent with the findings of previous studies (Hydropower Resource Assessment of Africa, 2008; Ogbeide-Osaretin, 2021). Access to energy services directly contributes to the wellbeing of the households, and this, in turn reduces household poverty. However, the lack of access to energy services seriously hinders economic growth, undermines employment opportunities and consequently results in a vicious circle of poverty. This is not surprising, given the low access to the modern form of energy, i.e. electricity, and poor electricity services in Somalia.

Households with access to mobile money (AMM) services were 44.2% less likely to experience poverty relative to those who have no access to mobile money services (OR = .442, 95% CI = 0.309–0.632).

Table 3. Poverty incidence in rural households.

Poverty status	Percent
Poor	72
Non_poor	28

Table 4. Results of multivariate logit model.

Covariate	β	S.E	Wald	p Value	OR	95% CI OR	
						Lower	Upper
HHS	0.327	0.049	44.034	0.000***	1.387	1.259	1.527
Age group	0.424	0.210	4.065	0.044**	1.528	1.012	2.306
Sex	-0.336	0.176	3.636	0.057*	0.715	0.506	1.009
HHEL							
No education	0.445	0.641	0.483	0.487	1.561	0.444	5.487
Primary education	0.486	0.662	0.032	0.857	1.041	0.669	1.621
Secondary education	0.109	0.339	0.104	0.747	1.116	0.574	2.167
University education	0.168	0.241	0.486	0.486	1.183	0.737	1.898
Other(base category)	-	-	-	-	-	-	-
AGRL	-0.773	0.180	18.525	0.000***	0.462	0.325	0.656
AMB	-0.816	0.182	20.082	0.000***	0.442	0.309	0.632
AE	-0.800	0.192	17.356	0.000***	0.449	0.308	0.655
RR	-1.132	0.223	25.697	0.000***	0.322	0.208	0.499
HHHO	-0.808	0.211	14.715	0.000***	0.446	0.295	0.673

Note: ***, **, * denotes significant at 1%, 5% and 10% level of significant, respectively.

This suggests that mobile money is a powerful tool for individual financial inclusion because it allows individuals, particularly those in financially disadvantaged rural communities in Somalia, to transfer money using simple SMS technology at no cost over vast distances. This is especially the case in less developed countries where the formal banking sector is not functional. This finding is in line with previous studies of Munyegera and Matsumoto (2016) and Suri and Jack (2016).

Furthermore, households that did receive remittances (RR) were 33.2% less likely to be poor relative to those who did not receive remittances (OR = 0.322, 95% CI = 0.208–0.499). It is worth noting that remittances increase households' income and, in turn, reduce the probability of being poor. This finding is in line with the results of other studies carried out by researchers (Adams & Cuenquecha, 2013; Gupta et al., 2009; Lokshin et al., 2010). From the empirical results, it can be concluded that remittances are a powerful anti-poverty tool with the potential to increase income for rural households.

We also observe that age group of the household heads is significant in explaining household poverty. The odds of being poor are higher among household heads whose age is greater than 50 years than among those households whose age is at most 50 years (OR = 1.528, 95% CI = 1.012–2.306). This finding is consistent with the study of Wang et al. (2020). It is claimed that poverty rises with old age as individual's productivity declines and they have limited savings to compensate for this loss of output and income. This is more likely to be the case in underdeveloped countries like Somalia, where savings are very limited because merely 7.7% of rural individuals possess a bank account.

Sex of the household head is also statistically significant in determining the household's poverty. The

odds of being poor are higher among female-headed households than those headed by males (OR = .715, 95% CI = .0506–1.009). This implies that male-headed households were 71.5% less likely to be poor than female-headed households. This finding is consistent with the studies conducted by Deressa and Sharma (2014); Teka et al. (2019); Tsehay and Bauer (2012) and Eyasu (2020). One remarkable explanation could be the presence of discrimination against women in the labor market as well as in the education system, i.e. the culture of sending boys to schools than girls rather dominant in rural areas.

The results indicate that possession of agricultural land (AGRL) by a household decreases the likelihood of being poor. This means that households with agricultural land are 46.2% less likely to remain poor than those households without agricultural land (OR = .462, 95% CI = 0.325–0.656). This reaffirms that the country's GDP is mainly based on agricultural production. This finding of a negative effect of agricultural land ownership on poverty reduction in rural households is corroborated by studies (Heshmati, 2016; Kassie et al., 2014; Shibru et al., 2013). One possible explanation is that the majority of the rural population is employed in the agricultural sector. Therefore, the agricultural sector is a key player when it comes to reducing poverty in rural households.

Homeownership (HHHO) is also a significant determinant of the poverty status of rural households. Households that possess a home were about 44.6% less likely to be poor than those households that did not own a house (OR = .446, 95% CI = 0.295–0.673). The results are consistent with the findings of Adarkwa (2010) and Adarkwa and Oppong (2007), who concluded that homeownership reduces the probability of being poor. This means that homeownership plays a significant role in poverty reduction as it increases the well-being of households. Therefore, government-

subsidized homeownership initiatives should be introduced among rural households as a solution to poverty.

Household size is positively and significantly associated with poverty. In other words, a larger family size contributes positively to the likelihood of being poor. A one-unit increase in household size increases the odds of being impoverished by 0.327. This implies that as family size increases, the demand for food also increases with limited economic opportunities. The finding is in line with previous empirical studies of (Lekobane & Seleka, 2017; Teka et al., 2019).

The education level of the household head, identified as a significant determinant in multiple studies (Deressa & Sharma, 2014; Geda et al., 2005; Teka et al., 2019) was not statistically associated with rural household poverty in this study. A similar finding was found by Ermiyas et al. (2019). One possible explanation could be the difference in the quality of education offered across different countries. Additionally, Somalia's educational system has been severely affected by over two decades of armed conflict, resulting in poor quality education, a shortage of competent teachers, and inadequate resources. Furthermore, the variation in sample sizes may also contribute to the discrepancy.

4.4. Robust analysis

The results of the multivariate probit model are presented in Table 5. These results confirm that the size of the household, the gender of the household head, the age group of the household head, access to electricity, access to mobile money, receiving remittance and house ownership are key significant determinants of rural household poverty. Therefore, they comply with the findings of the multivariate logit model.

5. Conclusions and policy implications

The primary objective of this study was to identify the factors influencing rural household poverty in Somalia, based on data from household surveys conducted in 2017/2018. The study found that household size, access to modern energy, remittances, agricultural land ownership, house ownership, age, and gender of the household head were significant determinants of rural household poverty. The study revealed that larger household sizes and older household heads were positively correlated with poverty among rural households, while access to electricity, mobile money, and remittances had a poverty-reducing effect. Furthermore, the ownership of agricultural land and houses was associated with lower poverty rates among rural households. These findings highlight the importance of considering these factors in poverty reduction policies and efforts. Therefore, to fight against poverty in rural households, the study suggests the following public policies. Firstly, the Shock Responsive Safety Net for Human Capital Project (SNHCP), known as BAXNAANO in the Somali language, should place more emphasis on rural households headed by women and those with large household sizes. Additionally, the program should provide support to households led by older individuals as they belong to one of the most vulnerable groups. Secondly, the government should initiate electrification programs in order to increase rural households' access to modern energy, such as electricity. In Somalia, only 39% of the rural population has access to electricity. The country cannot manage to develop beyond a subsistence economy without having access to cheap electricity for a larger proportion of people. Thirdly, the government should support intervention programs that educate the community about the benefits of family planning

Table 5. Results of multivariate probit model.

Covariate	β	S.E	Wald	P	OR	95% CI OR	
						Lower	Upper
HHS	0.194	0.0284	46.685	0.000***	1.215	1.149	1.284
Age group	-0.198	0.1048	3.588	0.044**	0.820	1.012	2.306
Sex	-0.198	0.105	3.588	0.058*	0.820	0.668	1.007
HHEL							
No education	0.289	0.335	0.738	0.390	0.390	0.690	2.583
Primary education	0.313	0.350	.798	0.372	1.367	0.688	2.717
Secondary education	0.355	0.3791	0.879	0.348	1.427	0.679	3.000
University education	0.398	0.3536	1.265	0.486	1.488	0.744	2.977
Other(base category)	-	-	-	-	-	-	-
AGRL	-0.490	0.1075	20.833	0.000***	0.612	0.496	0.756
AMM	-0.816	0.182	20.082	0.000***	0.442	0.309	0.632
AE	-0.478	0.115	17.237	0.000***	0.620	0.495	0.777
RR	-0.680	0.131	26.658	0.000***	0.506	0.391	0.656
HHHO	-0.495	0.1194	17.193	0.000***	0.609	0.482	0.770

Note: ***, **, * denotes significant at 1%, 5% and 10% level of significant, respectively.

and the availability of family planning services to the rural population. Finally, improving the services of financial institutions and reviewing the existing land tenure system should be prioritized.

Authors' contribution

Dahir Abdi Ali & Jama Mohamed performed idealization, introduction writing of the manuscript, literature review, methodology, data extraction, analysis, interpretation, first draft preparation and organization of the manuscript. Nasra Abdulhalim Mohamed & Abdirahman Ibrahim Ismail analyzed the data using Probit model. Mohammad Sahabuddin reviewed critically and edited the first draft. All authors approved the final version of the manuscript.

Disclosure statement

The authors declare that they have no competing interests.

Availability of data and materials

The data set used and/or analyzed during the current study is available from the corresponding author on reasonable request.

Funding

We would like to thank SIMAD University for supporting this research.

About the authors

Mr. Dahir Abdi Ali is the Dean of the Faculty of Economics at SIMAD University. He earned his M.Sc. in Applied Statistics from Universiti Putra Malaysia (UPM) and his B.Sc. in Applied Statistics from the Islamic University in Uganda (IUIU). His research interests include survival analysis, econometric analysis, socioeconomics modeling, agricultural production, climate change, biostatistics, and machine learning.

Nasra Abdulhalim Mohamed is M.Sc. in Applied Statistics at Universiti Putra Malaysia. His research interests include applied statistics, regression analysis, time series analysis, epidemiology, biostatistics, data science, and econometrics.

Abdirahman Ibrahim Ismail, PhD in Business Economics at Universiti Putra Malaysia (UPM), Malaysia. His research interest includes Islamic Finance, FinTech, Sustainable Development, and Development Economics.

Jama Moahmed is a Master candidate in Economics at Kyushu University, Japan. Her research interests include econometric analysis, applied statistical modeling, health data analysis, as well as time series analysis and forecasting.

Mohammad Sahabuddin is a Master candidate in Public Health at Lincoln University, Malaysia. His research interests include econometric analysis, applied statistical modeling,

health data analysis, as well as time series analysis and forecasting.

References

- Acosta, P., Calderón, C., Fajnzylber, P., & López, H. (2006). Remittances and development in Latin America. *World Economy*, 29(7), 957–987. <https://doi.org/10.1111/j.1467-9701.2006.00831.x>
- Adams, R. H.Jr. (1991). The economic uses and impact of international remittances in rural Egypt. *Economic Development Cultural Change*, 39(4), 695–722.
- Adams, R. H., Jr, & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World Development*, 33(10), 1645–1669. <https://doi.org/10.1016/j.worlddev.2005.05.004>
- Adams, R., & Cueuruecha, A. (2013). The impact of remittances on investment and poverty in Ghana. *World Development*, 50, 24–40. <https://doi.org/10.1016/j.worlddev.2013.04.009>
- Adarkwa, K. (2010). *Housing as a strategy for poverty reduction in Ghana*. Un-Habitat.
- Adarkwa, K., & Oppong, R. (2007). Poverty reduction through the creation of a liveable housing environment: A case study of Habitat for Humanity International housing units in rural Ghana. *Property Management*, 25(1), 7–26. <https://doi.org/10.1108/02637470710723236>
- Baulch, B., & McCulloch, N. (2002). Being poor and becoming poor: Poverty status and poverty transitions in rural Pakistan. *Journal of Asian and African Studies*, 37(2), 168–185. <https://doi.org/10.1177/002190960203700208>
- Cheema, A. R., & Sial, M. H. (2012). Incidence, profile and economic determinants of poverty in Pakistan: HIES. *Management Science and Engineering*, 6(2), 120–129.
- Coudouel, A., Hentschel, J. S., & Wodon, Q. T. (2002). *Poverty measurement and analysis* (Vol. 1). World Bank.
- Cox, D. R. (1958). The regression analysis of binary sequences. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 20(2), 215–232. <https://doi.org/10.1111/j.2517-6161.1958.tb00292.x>
- Datt, G., & Jolliffe, D. (2005). Poverty in Egypt: Modeling and policy simulations. *Economic Development and Cultural Change*, 53(2), 327–346. <https://doi.org/10.1086/425224>
- Deaton, A., & Zaidi, S. (2002). *Guidelines for constructing consumption aggregates for welfare analysis*. In *Living standards measurement study working paper* (Vol. 135). World Bank Publications.
- Deressa, T. K., & Sharma, M. (2014). Determinant of poverty in Ethiopia. *Ethiopian Journal of Economics*, 23(1), 113–130.
- Ermiyas, A., Batu, M., & Tekla, E. (2019). Determinants of rural poverty in Ethiopia: a household level analysis in the case of Dejen woreda. *Arts Social Sciences Journal*, 50, 10.
- Eyasu, A. M. (2020). Determinants of poverty in rural households: Evidence from North-Western Ethiopia. *Cogent Food & Agriculture*, 6(1), 1823652. <https://doi.org/10.1080/23311932.2020.1823652>
- Geda, A., De Jong, N., Mwabu, G., & Kimenyi, M. (2005). Determinants of poverty in Kenya: A household level analysis. *ISS Working Paper Series/General Series*, 347, 1–20.

- Gounder, N. (2012). *The determinants of household consumption and poverty in Fiji (Discussion Paper No. 2012-05)*. Griffith University.
- Grootaert, C. (1997). The determinants of poverty in Cote d'Ivoire in the 1980s. *Journal of African Economies*, 6(2), 169–196. <https://doi.org/10.1093/oxfordjournals.jae.a020925>
- Gupta, S., Pattillo, C. A., & Wagh, S. (2009). Effect of remittances on poverty and financial development in Sub-Saharan Africa. *World Development*, 37(1), 104–115. <https://doi.org/10.1016/j.worlddev.2008.05.007>
- Houghton, J., & Khandker, S. R. (2009). *Handbook on poverty + inequality*. World Bank Publications.
- Heshmati, A. (2016). *Poverty and well-being in east Africa: A multi-faceted economic approach*. Springer.
- Hydropower Resource Assessment of Africa. (2008). *Ministerial conference on water for agriculture and energy in Africa: The challenges of climate change*. <http://www.sirtewaterandenergy.org/docs/2009/Sirte2008BAK3.pdf>
- Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1), 183–223. <https://doi.org/10.1257/aer.104.1.183>
- Kassie, G. T., Abate, T., Langyintuo, A., & Maleni, D. (2014). Poverty in maize growing rural communities of southern Africa. *Development Studies Research*, 1(1), 311–323. <https://doi.org/10.1080/21665095.2014.969844>
- Kitov, I. (2006). *Modelling the age-dependent personal income distribution in the USA*. Available at SSRN 886670.
- Lee, E. T., & Wang, J. (2003). *Statistical methods for survival data analysis* (Vol. 476). John Wiley & Sons.
- Lekobane, K. R., & Seleka, T. B. (2017). Determinants of household welfare and poverty in Botswana, 2002/2003 and 2009/2010. *Journal of Poverty*, 21(1), 42–60. <https://doi.org/10.1080/10875549.2016.1141381>
- Litchfield, J., & McGregor, T. (2008). *Poverty in Kagera, Tanzania: Characteristics, causes and constraints*. Poverty Research Unit at Sussex, University of Sussex.
- Lokshin, M., Bontch-Osmolovski, M., & Glinskaya, E. (2010). Work-related migration and poverty reduction in Nepal. *Review of Development Economics*, 14(2), 323–332. <https://doi.org/10.1111/j.1467-9361.2010.00555.x>
- López Córdova, E. (2005). *Globalization, migration and development: The role of Mexican migrant remittances*. Mimeo, Inter-American Development Bank.
- Malik, S. (1996). Determinants of rural poverty in Pakistan: A micro study. *Pakistan Development Review*, 35(2), 171–187.
- Mohamoud, A. M., & Bulut, E. (2020). Determinants of poverty in Somalia: A logit model analysis. *Fiscaeconomia*, 4(2), 437–451. <https://doi.org/10.25295/fsecon.2020.02.009>
- Mok, T. Y., Gan, C., & Sanyal, A. (2007). The determinants of urban household poverty in Malaysia. *Journal of Social Sciences*, 3(4), 190–196. <https://doi.org/10.3844/jssp.2007.190.196>
- Mukherjee, S., & Benson, T. (2003). The determinants of poverty in Malawi, 1998. *World Development*, 31(2), 339–358. [https://doi.org/10.1016/S0305-750X\(02\)00191-2](https://doi.org/10.1016/S0305-750X(02)00191-2)
- Munyegera, G. K., & Matsumoto, T. (2016). Mobile money, remittances, and household welfare: Panel evidence from rural Uganda. *World Development*, 79, 127–137. <https://doi.org/10.1016/j.worlddev.2015.11.006>
- Negatu, W. (2008). Food security strategy and productive safety net program in Ethiopia. *Digest of Ethiopia's National Policies, Strategies*(pp.1–22). Forum for Social Studies.
- OCHA. (2022). *UN: As impact of drought worsens, growing risk of famine in Somalia*. <https://www.unocha.org/story/un-impact-drought-worsens-growing-risk-famine-somalia>
- Ogbeide-Osaretin, E. N. (2021). Analysing energy consumption and poverty reduction nexus in Nigeria. *International Journal of Sustainable Energy*, 40(5), 477–493. <https://doi.org/10.1080/14786451.2020.1815744>
- Ravallion, M., Chen, S., & Sangraula, P. (2009). Dollar a day revisited. *World Bank Economic Review*, 23(2), 163–184. <https://doi.org/10.1093/wber/lhp007>
- Sekhampu, T. J. (2013). Determinants of poverty in a South African township. *Journal of Social Sciences*, 34(2), 145–153. <https://doi.org/10.1080/09718923.2013.11893126>
- Serumaga-Zake, P., & Naudé, W. (2002). The determinants of rural and urban household poverty in the North West province of South Africa. *Development Southern Africa*, 19(4), 561–572. <https://doi.org/10.1080/0376835022000019392>
- Shibru, M. T., Mohamad, J. H., & Woldemichael, Y. M. (2013). Dimensions and determinants of agro-pastoral households' poverty in Dembel District of Somali Regional State, Ethiopia. *Journal of Economics Sustainable Development*, 4(15), 13–19.
- Suri, T., & Jack, W. (2016). The long-run poverty and gender impacts of mobile money. *Science (New York, N.Y.)*, 354(6317), 1288–1292. <https://doi.org/10.1126/science.aah5309>
- Teka, A. M., Woldu, G. T., & Fre, Z. (2019). Status and determinants of poverty and income inequality in pastoral and agro-pastoral communities: Household-based evidence from Afar Regional State, Ethiopia. *World Development Perspectives*, 15, 100123. <https://doi.org/10.1016/j.wdp.2019.100123>
- Tsehay, A. S., & Bauer, S. (2012). Poverty and vulnerability dynamics: Empirical evidence from smallholders in northern highlands of Ethiopia. *Quarterly Journal of International Agriculture*, 51(892-2016-65173), 301–332.
- Wagle, U. (2006). The estimates and characteristics of poverty in Kathmandu: What do three measurement standards suggest? *Social Science Journal*, 43(3), 405–423. <https://doi.org/10.1016/j.soscij.2006.04.010>
- Walker, S. H., & Duncan, D. B. (1967). Estimation of the probability of an event as a function of several independent variables. *Biometrika*, 54(1), 167–179. <https://doi.org/10.1093/biomet/54.1-2.167>
- Wang, C., Wang, Y., Fang, H., Gao, B., Weng, Z., & Tian, Y. (2020). Determinants of rural poverty in remote mountains of southeast China from the household perspective. *Social Indicators Research*, 150(3), 793–810. <https://doi.org/10.1007/s11205-020-02348-1>
- World Bank Institute. (2005). *Introduction to poverty analysis*. Poverty Manual, All, J. H. Revision of August, 8.
- World Bank. (2016a). *Ethiopia: priorities for ending extreme poverty and promoting shared prosperity, systematic country diagnostic (Report No: 100592-ET)*.
- World Bank. (2016b). *Monitoring global poverty: A cover note to the report of the commission on global poverty chaired by Prof. Sir Anthony B. Atkinson*.
- World Bank. (2018). *Poverty and shared prosperity 2018: Piecing together the poverty puzzle*. Washington, DC. <https://www.worldbank.org/en/publication/poverty-and-shared-prosperity-2018>
- World Bank. (2019). *Somali poverty and vulnerability assessment: Findings from wave 2 of the Somali high frequency survey*.
- World Bank. (2022). *Poverty*. <https://www.worldbank.org/en/topic/poverty/overview>