

Determinants of smallholder farmers' membership in co-operative societies: evidence from rural Kenya

Smallholder farmers' co-operative membership

165

Obadia Okinda Miroro

*Department of Community Development and Environmental Management,
Co-operative University of Kenya, Nairobi, Kenya*

Douglas Nyambane Anyona

*Institute of Anthropology, Gender and African Studies, University of Nairobi,
Nairobi, Kenya*

Isaac Nyamongo

*Co-operative Development Research and Innovation,
Co-operative University of Kenya, Nairobi, Kenya*

Salome A. Bukachi

*Institute of Anthropology, Gender and African Studies, University of Nairobi,
Nairobi, Kenya*

Judith Chemuliti

*Biotechnology Research Institute,
Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya*

Kennedy Waweru

*Department of Accounting and Finance, Co-operative University of Kenya,
Nairobi, Kenya, and*

Lucy Kiganane

*Department of Entrepreneurship, Co-operative University of Kenya,
Nairobi, Kenya*

Received 12 March 2022
Revised 29 June 2022
Accepted 29 July 2022

Abstract

Purpose – Despite the potential for co-operatives to improve smallholder farmers' livelihoods, membership in the co-operatives is low. This study examines factors that influence smallholder farmers' decisions to join agricultural co-operatives.

© Obadia Okinda Miroro, Douglas Nyambane Anyona, Isaac Nyamongo, Salome A. Bukachi, Judith Chemuliti, Kennedy Waweru and Lucy Kiganane. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

This project (Grant No. 109063) was funded by the Livestock Vaccine Innovation Fund which is supported by the Bill and Melinda Gates Foundation (BMGF), Global Affairs Canada (GAC), and Canada's International Development Research Center. However, the views expressed herein do not necessarily represent those of IDRC or its Board of Governors.



Design/methodology/approach – This study involved a survey of 1,274 smallholder chicken farmers. The data were analysed through a two-sample *t*-test of association, Pearson's Chi-square test and binary probit regression model.

Findings – The results suggest that farming as the main source of income, owning a chicken house, education attainment, attending training or accessing information, vaccination of goats and keeping a larger herd of goats are the key factors which significantly influence co-operative membership. However, gender, age, household size, distance to the nearest agrovet, vaccinating chicken and the number of chickens kept do not influence co-operative membership.

Research limitations/implications – The survey did not capture data on some variables which have been shown to influence co-operative membership. Nevertheless, the results show key explanatory variables which influence membership in co-operatives.

Practical implications – These findings have implications for development agencies that seek to use co-operatives for agricultural development and improvement of smallholder farmers' livelihoods. The agencies can use the results to initiate interventions relevant for different types of smallholder farmers through co-operatives.

Originality/value – This study highlights the influence of smallholder farmers' financial investments in farming and the extent of commercialisation on co-operative membership. Due to low membership in co-operatives, recognising the heterogeneity of smallholder farmers is the key in agricultural development interventions through co-operative membership.

Peer review – The peer review history for this article is available at: <https://publons.com/publon/10.1108/IJSE-03-2022-0165>.

Keywords Co-operative membership, Smallholder farmers, Livelihoods

Paper type Research paper

Introduction

Co-operatives play an important role in improving smallholder farmers' livelihoods and reducing poverty by enabling economic growth, skills development, partnership building and creating employment. In Africa, the 2017–2020 International Co-operative Alliance (ICA) Co-operative Development Strategy considers co-operatives key in boosting socio-economic development. Amongst smallholder farmers, co-operatives can mitigate market failures which lead to high transactions costs (Nugusse *et al.*, 2013). Co-operatives facilitate collective purchase of inputs and marketing of produce, which lower the cost of production, enhance bargaining power for favourable prices and build resilience (Sugden *et al.*, 2021). For example, in Malawi, farmers who transported their produce through the co-operatives incurred lower costs compared to those who used private means (Matchaya, 2010). Co-operatives also provide services such as credit to smallholder farmers at fairer rates (Ofori *et al.*, 2019; Ingutia and Sumelius, 2022). Moreover, co-operatives enable commercialisation of agricultural production by improving technical efficiency, innovation and adoption of new technologies (Markelova and Mwangi, 2010; Verhofstadt and Maertens, 2014; Ma *et al.*, 2018).

Agricultural co-operatives are appropriate for smallholder farmers because they are owned and managed by members and focus on meeting their socio-economic and cultural needs (ICA, 2022). Smallholder farmers operate in areas with incomplete or missing markets, incur high transaction costs, are unable to bargain for better terms and face difficulties accessing information (Amare *et al.*, 2019). In arid and semi-arid areas, farmers are more vulnerable to climate-related risks such as drought and non-farm livelihood opportunities are limited. Because they rely on their meagre resources to meet their household needs, they are more likely to dispose of household assets especially poultry and small livestock in response to shocks. Consequently, they have a high propensity of falling into poverty or find it difficult to improve their livelihoods. This implies that failure to address the constraints reduces the extent of attainment of the Sustainable Development Goals on ending poverty, hunger and reduced inequality amongst smallholder farmers.

With the myriad challenges that smallholder farmers face, they are likely to improve their agricultural production and livelihoods through producer groups in terms of co-operatives. Therefore, membership in agricultural co-operatives, which primarily prioritise their

interests, is essential. However, membership in co-operatives is low. In Kenya, although the number of registered co-operatives increased from 1,030 co-operatives with 355,000 members in 1963 to 20,901 with slightly over 10 million members in 2019 (KNBS, 2020a), 35–60% of the registered co-operatives are inactive and, in some co-operatives, members have withdrawn (Wanyama *et al.*, 2009). Furthermore, membership in agricultural co-operatives has proportionally decreased when compared to non-agricultural co-operatives. In 1982, about two-thirds (66%) of the 1,557,000 co-operative members in the country belonged to agricultural co-operatives (CBS, 1995). However, in 2019, only 18% of the 10,232,000 co-operative members had membership in agricultural co-operatives (KNBS, 2020a). Yet, addressing smallholder farmers' constraints through co-operatives requires the farmers to join them. It is therefore important to understand factors that influence farmer's decision to join co-operatives. The literature emphasises the need for context-specific factors for co-operative membership (Manning *et al.*, 2012). In Kenya, studies on the decision to join co-operatives are rare. This makes it difficult to initiate appropriate co-operative organising and mobilisation interventions. In this study, we assess the determinants of membership in co-operatives in Makeni, a rural area in Kenya. Understanding these factors is crucial in the interventions aimed at the improvement of smallholder farmers' livelihoods through co-operatives.

Literature review

In Kenya, several county governments aim at co-operative development as a key strategy to improving livelihoods of their residents. Due to limited resources, to reach many smallholder farmers, they encourage them to join co-operatives or form new ones. The county governments also view increased membership in co-operatives key in strengthening smallholder farmers' participation and sustainability of the co-operatives. Co-operatives are voluntary organisations, and decisions about membership are influenced by the expected social or economic benefits. In the literature, membership in co-operatives is associated with social, economic, cultural and institutional factors of individuals, households or communities.

Divergent findings have been reported regarding the relationship between ownership assets such as household durable goods, land holding and size, and livestock and co-operative membership. Studies conducted in Nigeria (Afolabi and Ganiyu, 2021; Wossen *et al.*, 2017) indicate that households with larger land holdings were more likely to join co-operatives. Similar results were reported from studies in Ethiopia (Nugusse *et al.*, 2013; Ahmed and Mesfin, 2017) and Malawi (Matchaya, 2010). However, this is not the case in other studies. In Kenya, Fischer and Qaim (2012) found that although the likelihood for co-operative membership increased with land size, this decreased for farmers who had land sizes more than 11 acres. Further, amongst smallholder dairy farmers in Selale, Ethiopia, the likelihood of co-operative membership declined with increase in land size (Chagwiza *et al.*, 2016). In addition, in Bihar, India, the land size did not significantly affect the probability of co-operative membership (Kumar *et al.*, 2018). It appears that membership amongst farmers with very small holdings or very large holdings was likely to be low. Fischer and Qaim (2012) describe this as the "middle-class effect" where, on the one hand, farmers with very small land holdings are likely to be resource deprived and find the cost of membership unaffordable. On the other hand, those with very large holdings are likely to be wealthier and less likely to require co-operatives to solve their production and marketing challenges.

Some studies have associated livestock ownership and herd size with co-operative membership. The likelihood to join co-operatives was high amongst farmers who owned oxen in Ethiopia (Abebaw and Haile, 2013), livestock in Zambia (Manda *et al.*, 2020) and households with more livestock units in rural Nigeria and Thailand (Wossen *et al.*, 2017;

Jitmun *et al.*, 2020). For example, in central and north-eastern Thailand, Jitmun *et al.* (2020) established that an increase in herd size by 1% increased the likelihood of becoming a dairy co-operative member by about 0.8%. However, in Bihar, India, although farmers with higher share of crossbred animals and produced more milk were likely to join co-operatives, those with large herd sizes and high per capita income were less likely to become co-operative members (Kumar *et al.*, 2018). This is because they sold their milk at higher prices through private agencies. In Ethiopia, ownership of household durable goods such as a radio, television and mobile phone had a 35% higher probability of joining co-operatives compared to those who did not possess these gadgets (Nugusse *et al.*, 2013).

The distance from smallholder farmers' dwelling units to tarmac roads, co-operative offices and markets influence co-operative membership. On the one hand, farmers located closer to co-operative offices or milk collection centres were more likely to join co-operatives in Ethiopia (Abate, 2018; Mojo *et al.*, 2017; Chagwiza *et al.*, 2016). This was due to lower costs in terms of the time spent in co-operative activities and labour in communication with co-operative offices (Ahmed and Mesfin, 2017; Matchaya, 2010). On the other hand, farmers who were closer to markets were less likely to join co-operatives in Oromia, Ethiopia (Ahmed and Mesfin, 2017). For example, the likelihood of co-operative membership was 15% lower for households that resided within 15 km radius of the Woreda market in Northern Ethiopia (Nugusse *et al.*, 2013). This was because those who lived closer to the market operated small businesses or were engaged in casual work and did not require services which co-operatives provided.

Information, knowledge and awareness have been found to influence decisions to join co-operatives. Farmers who understood what co-operatives are and potential benefits for membership were more likely to become members. In Ethiopia, the probability of joining co-operatives was 18% higher for households that had access to information than their counterparts who did not (Nugusse *et al.*, 2013). Similarly, in Kazakhstan, rural households that were aware of co-operatives were keen to participate in collective action (Kaliyeva *et al.*, 2020).

Some studies show the relationship between education attainment and the decision to join co-operative societies. The probability of co-operative membership increased with increase in the years of schooling or literacy levels in Ethiopia (Chagwiza *et al.*, 2016; Abate, 2018), Zambia (Matchaya, 2010; Manda *et al.*, 2020), Nigeria (Afolabi and Ganiyu, 2021; Olagunju *et al.*, 2021) and in Thailand (Jitmun *et al.*, 2020). For example, in Zambia, education (years of schooling) increased the probability of membership in co-operatives by 1.4% (Manda *et al.*, 2020). In Bihar India, an increase in the household head's education by one year increased the likelihood of co-operative membership by 1.9% (Kumar *et al.*, 2018). However, in rural Kazakhstan, those with higher education were less likely to create co-operatives because agriculture was perceived as unattractive and they preferred to seek better paying economic activities (Kaliyeva *et al.*, 2020). This was the same in Uganda, where women non-co-operative members were more likely to be literate compared to members (Meier zu Selhausen, 2016). Furthermore, in Ethiopia, the probability of joining a co-operative was 33% lower for farmers from households that had special skills compared to those without special skills (Nugusse *et al.*, 2013).

Demographic characteristics such as age, gender and household size affect co-operative membership. The tendency to join co-operatives was higher amongst older heads of households in Selale, Ethiopia (Chagwiza *et al.*, 2016; Ahmed and Mesfin, 2017) and Nigeria (Afolabi and Ganiyu, 2021). In Selangor and Kuala Lumpur, farmers who were 45 years or older were 19 times more likely to join co-operatives compared to the younger ones (Othman *et al.*, 2012). This was because older farmers preferred lower risk contracts with co-operatives to other forms of marketing arrangements (Mojo *et al.*, 2017). However, other studies found contrary findings. In Malawi, older farmers had a lower probability of joining a co-operative (Matchaya, 2010).

Several studies have associated household size with co-operative membership (Abate, 2018; Chagwiza *et al.*, 2016; Mojo *et al.*, 2017; Olagunju *et al.*, 2021). Notably, membership can vary in different regions of a country or in different countries. In rural areas of Nigeria, although Olagunju *et al.* (2021) found the likelihood to join a co-operative increased with the household size, on the contrary, Southwest Nigeria, Afolabi and Ganiyu (2021) found that households with small household sizes had a higher probability of joining co-operatives compared to those with large household sizes.

Regarding gender, individuals from male-headed households were more likely to join co-operatives in Malawi (Matchaya, 2010), Kazakhstan and Ethiopia (Ahmed and Mesfin, 2017). This was due to cultural norms which hindered women's decision making (Adegbite and Macheche, 2020). In western Uganda, Meier zu Selhausen (2016) found that women who jointly owned land and pooled their incomes with their spouses were more likely to participate in the collective marketing of coffee.

Several studies have investigated the relationship between farm and off-farm sources of income and co-operative membership. Off-farm income source was likely to increase the probability of co-operative membership in Ethiopia due to increased income security (Abebaw and Haile, 2013). However, in rural Alberta, Klein *et al.* (1997) found that increase in off-farm income led to a decline in the likelihood of co-operative membership because high income reduced the need for co-operative services. This was the same in Malawi, where non-farming sources of income were associated with lower likelihood of joining a co-operative (Matchaya, 2010).

Social networks, usually associated with collective action, have been associated with the likelihood of co-operative membership. Farmers who had access to credit (Afolabi and Ganiyu, 2021) or were members of rural associations (Nugusse *et al.* (2013), had a higher probability of being co-operative members. In Zambia, farmers with access to credit were 10% more likely to be co-operative members compared to those who had no access (Manda *et al.*, 2020). Similarly, Wossen *et al.* (2017), reported that farmers who had no liquidity constraints, were more likely to join co-operatives. However, although access to credit was found to positively influence farmers' decisions to join co-operatives, in Nigeria this was not significant (Olagunju *et al.*, 2021).

Perception and willingness to take risks is associated with membership in co-operatives. Risk seeking rural households such as those who invested and borrowed money, tried new things and opportunities to develop their businesses were more likely to join co-operatives (Kaliyeva *et al.*, 2020). In Nigeria, farmers who were willing to try new seed varieties and intercropping were more likely to join co-operatives (Olagunju *et al.*, 2021). Similarly, in Northern China, Zheng *et al.* (2012) found that, farmers who perceived their costs of selling products and operational risks to be high, were more likely to participate in co-operatives.

From the literature, the determinants of smallholder farmers' co-operative membership have been extensively studied. The determinants vary within and between countries. This is due to varying social, economic, climatic, demographic and infrastructural conditions. The livelihood sources for smallholder farmers also vary. Overall, the determinants are shaped by the smallholder farmers' contexts at micro, meso and sometimes macro levels (Manning *et al.*, 2012). This makes it difficult to apply results from existing studies in different contexts. One of the contexts that has not been extensively investigated is semi-arid areas. In Kenya, arid and semi-arid areas make up about 84% of the land mass and with an average annual rainfall of 400 mm (Kalele *et al.*, 2021). Despite this, livestock production, including goat and poultry farming, thrives. Co-operatives can enhance the livelihoods of smallholder farmers in these areas. This paper, therefore, contributes to the literature on co-operatives by assessing the determinants of co-operatives in a semi-arid area in Kenya.

Methodology

This study was conducted in Makueni County, Eastern Kenya in January and February 2020. The county is mostly arid and semi-arid and the annual rainfall ranges from 250 mm to 900 mm (GoMC, 2019). Over 80% of the residents in the county derive their livelihood from farming (KNBS, 2019). The incidence of multidimensional poverty in the county was 59% in 2020 (KNBS, 2020b). This study involved a survey of 1,274 smallholder chicken farming households. The households were selected from six County Assembly Wards, namely Masongaleni and Mito Andei (Kibwezi East sub-County); Kikumbulyu and Makindu (Kibwezi West sub-County); and Kathonzweni and Kitise (Makueni sub-County). Our pre-hoc power calculations indicated that a 20% dropout inflated sample of 212 per ward achieves a 96% power to detect a difference of 0.1 between wards with a significance level of 0.05. Target households were required to be smallholder chicken farmers. The selection of households followed the adaptive cluster sampling with the initial village selection done at random. Neighbourhood villages were added until the target sample for the ward was reached. The sampling of respondents did not consider members of co-operatives or not. In total, 126 villages were covered. In each household, respondents who were aged 18 years or older, had chicken or had owned them three months before the survey, were interviewed. A written informed consent was obtained before interviews. The survey was administered digitally on the ArcGIS Survey 123 platform by trained enumerators. The survey captured data about the demographic and socio-economic characteristics of the respondents and their households, distance to the nearest agrovet, access to information and training and membership in co-operatives.

Model specification

This study investigated the determinants of membership in co-operative societies. Co-operative membership, the dependent variable in this study, is dichotomous and can be modelled as a binary choice decision. As a binary dependent variable, co-operative membership is measured by 1 if the farmer is a member and 0 otherwise. Linear probability models are not appropriate for estimating the determinants because they violate homoscedasticity assumption and the predicted value can fall outside the relevant probability range of 0 and 1. Instead, logit or probit models are appropriate because they translate the values of the independent variables into a probability for which the dependent variable ranges 0 to 1 and compel the error terms to be homoscedastic (Gujarati and Porter, 2009). This study used the probit model because the error term follows a cumulative normal standard distribution. Following Maddala (1992), probit is based on the existence of a latent variable for which a dichotomous observation is realised. This can be expressed as:

$$y_i^* = \beta_0 + \sum_{i=1}^n \beta_1 x_{1i} + \beta_2 x_{2i} \dots + \beta_k x_{ki} + u_i \quad \text{where } u_i \sim N(0, \sigma^2) \quad (1)$$

where y_i^* is not observed and describes the propensity to join a co-operative, determined by explanatory variables $x_{1i} \dots x_{ki}$. What is observed is a binary choice y_i which denotes whether or not a farmer is a member of an agricultural co-operative defined by:

$$y_i = \begin{cases} 1 & y^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

In the probit model, estimates are based on standard normal distribution and from equations (1) and (2), the probability of co-operative membership can be computed as:

$$\begin{aligned}
 P_i &= P(y_i = 1 | x_1, x_2, \dots, x_k) = \left[u_i > - \left(\beta_0 + \sum_{i=1}^n \beta_1 x_{1i} \right) \right] = F \left(\beta_0 + \sum_{i=1}^n \beta_1 x_{1i} \right) \\
 &= \Phi \left(\beta_0 + \sum_{j=1}^k \beta_j x_{1i} \right) = \int_{-\infty}^{X_i} \Phi(x) dx = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-(1/2)X^2} dx
 \end{aligned} \tag{3}$$

where P_i is the probability that the i th farmer is a member of a co-operative. Φ is the cumulative standard normal distribution function. X_i represents the factors which influence co-operative membership. β represents the parameters of the predictors and u_i is the error term.

The magnitude of the coefficients was interpreted by marginal effects at the means for binary and continuous independent variables derived by:

$$\frac{\partial P_i}{\partial x_{ij}} = \beta_j \Phi \left(\beta_0 + \sum_{i=1}^n \beta_i x_{ij} \right) \tag{4}$$

where, β_j represents the coefficients of the variables, $\Phi(\cdot)$ is cumulative normal distribution value associated with the mean dependent variable from the probit estimation.

The choice of independent variables for this study draws from the literature on co-operatives which associate co-operative membership with human and financial capital, assets and access to information and infrastructure for individuals, households and communities. In this study, the demographic characteristics used were the household size, gender, age and education. The economic status of household was captured by the livestock kept (number of chickens and goats), presence of a chicken house and the main source of income. Adoption of technology was measured by vaccination of chicken to prevent Newcastle Disease (NCD) and goats to prevent Contagious Caprine Pleuropneumonia (CCPP). Access to information was captured by whether the respondents had attended training or received information on chicken farming. In addition, proximity to infrastructure was measured by the distance to the nearest agrovet. This was measured using proximity analysis of GPS locations of the respondents and nearest location of agrovet. [Table 1](#) shows the independent variables which were selected for this paper.

Results and discussion

Descriptive statistics

The survey interviewed 1,274 respondents. The youngest was 18 years and the eldest 105 years old while the median age was 48 years. About 14% of the respondents had not attended school. The median years of schooling were four and a quarter of the respondents had completed at least eight years of schooling. Farming was the main source of livelihood and those who ranked farming as the main source of income were 70.67%. In terms of livestock, a quarter of the respondents owned six chickens or fewer. The mean number of chickens kept was 15 while the highest was 290. The mean number of sheep and goats kept was nine. Three-quarters of the respondents had a chicken house (75.35%). Further, a quarter of the respondents were within 3.96 kilometres of the nearest agrovet while the longest distance was 36.23 kilometres. In addition, about a quarter of the respondents (24.19%) had received information or attended training on chicken farming.

The respondents were classified into two: members and non-members of co-operatives. From the survey, the proportion of farmers who were members of agricultural co-operatives was low (9.9%). Membership was highest in Makueni sub-county (18%) followed by Kibwezi

Table 1.
Independent variables
for the probit model

Variables	Description
Age	Years (continuous)
Gender	Dummy (0 female, 1 = male)
Education	Years of schooling (continuous)
Household size	Number (continuous)
Farming as the main income source	Dummy (0 = otherwise, 1 = farming)
Number of chickens kept	Number (continuous)
Own a chicken house	Dummy (0 = no, 1 = yes)
Number of goats kept	Number (continuous)
Distance to the nearest agrovet	Kilometres (Continuous)
Attended training or received information on chicken farming	Dummy (0 = no, 1 yes)
Vaccinates chicken to prevent NCD	Dummy (0 = no, 1 = yes)
Vaccinates goats to prevent CCP	Dummy (0 = no, 1 = yes)

East with 9.4% while Kibwezi West sub-county had only 5.8% of the respondents in co-operatives. Table 2 shows the two-sample *t*-test of association for the continuous variables based on whether farmers were members or non-members of co-operatives.

The results show that members and non-members were significantly different based on education, number of chickens and goats kept ($p < 0.05$). Whereas members kept an average of 19.53 chickens, non-members kept an average of 14.48 chickens. In addition, members kept an average of more goats (10.65) compared to non-members (7.98). Farmers who were members of co-operatives had significantly more years of schooling (5.4) compared to 4.7 years for those who were not members. However, members and non-members are not significantly different based on the distance to the nearest agrovet and household size. Table 3 shows the association between categorical variables and membership in co-operatives using the Pearson chi-square test.

Pearson chi-square analysis indicates members and non-members are significantly different in terms of owning a chicken house ($\chi^2 = (1) = 13.7971, p < 0.001$), attending training or accessing information ($\chi^2 = (1) = 26.2589, p < 0.001$), vaccination of chicken and goats ($\chi^2 = (1) = 12.1069, p < 0.05$) and ($\chi^2 = (1) = 25.9976, p < 0.001$). From the descriptive analysis, it appears that members and non-members of co-operatives are different based on the chicken flock size, goat herd size, education, level of awareness and use of livestock vaccines. This means that smallholder farmers are heterogenous. One way to categorise them is based on the number and type of livestock that they own and the financial resources that they invest in their chicken and goat farming activities. Farmers who invest more financial resources by

Table 2.
Two sample *t*-test of
association for
continuous variables

Variable	Members ($n = 126$)		Non-members ($n = 1,143$)		Two-sample <i>t</i> -value	<i>p</i> value
	Mean	SD	Mean	SD		
Age (years)	52.30	1.29	49.37	16.26	-1.9938	0.0464
Education (years of schooling)	5.37	2.67	4.70	2.85	-2.5361	0.0113
Number of chickens kept	19.53	21.56	14.48	16.25	-3.1894	0.0015
Number of goats kept	10.65 ($n = 103$)	11.27	7.98 ($n = 854$)	6.44	-3.6003	0.0003
Distance to the nearest agrovet	9.65	7.33	9.82	7.25	0.2504	0.8023
Household size	5.55	2.21	5.19	2.38	-1.6218	0.1051

Variable		Non-member (%)	Member (%)	Chi-Sq	<i>p</i>
Farming as the main source of income	No	341 (93.68)	23 (6.32)	7.8522	0.005
	Yes	772 (88.43)	101 (11.57)		
	Total	1,113 (89.98)	124 (10.02)		
Owns a chicken house	No	299 (95.53)	14 (4.47)	13.7971***	0.000
	Yes	845 (88.30)	112 (11.70)		
	Total	1,144 (90.80)	126 (9.92)		
Attended training or received information	No	888 (92.69)	70 (7.31)	26.2589***	0.000
	Yes	254 (82.74)	53 (17.26)		
	Total	1,142 (90.28)	123 (9.72)		
Gender of respondent	Female	897 (89.34)	107 (10.66)	2.8515	0.091
	Male	246 (92.83)	19(7.17)		
	Total	1,443 (90.07)	126 (9.93)		
Vaccinates chicken to prevent NCD	Yes	157 (83.07)	32 (16.93)	12.1069***	0.001
	No	984 (91.28)	94 (8.72)		
	Total	1,141 (90.06)	126 (9.94)		
Vaccinates goats to prevent CCPP	Yes	200 (80.65)	48 (19.35)	25.9976***	0.000
	No	265 (94.98)	14 (5.02)		
	Total	465 (88.24)	62 (11.76)		

Note(s): *** denotes 1% significance level

Table 3.
Chi-square test for categorical variables

constructing a chicken house to manage their flock perhaps due to its size, own more goats and vaccinate them are likely to be more commercially oriented. Because commercially oriented smallholder farmers focus on marketing their produce (Cousins, 2009), they are likely to manage their flock through a chicken house and use vaccines to prevent losses. This is different from semi-subsistence farmers who engage in farming largely for subsistence and sell any surplus. Below, we interrogate the characteristics which make members and non-members different from each other and the implications of this on membership in co-operatives.

Determinants of co-operative membership

Through collective action, co-operatives seek to address the constraints that smallholder farmers face, catalyse agricultural development and enhance livelihoods of their members. The main objective of this study is, therefore, to establish the factors which influence membership in co-operatives. Understanding these factors is important in agricultural development and livelihood improvement strategies based on the co-operative model. The cross-sectional survey for this study did not capture some of the variables, which have been shown to influence co-operative membership. Furthermore, only smallholder farmers who owned chicken during the survey or three months to the survey were selected. These may limit the applicability of the findings although the results show key variables which influence membership in co-operatives.

The results show that farming as the main source of income, owning a chicken house, education attainment, attending training or accessing information, vaccinating goats and the size of goat herd are the key factors which significantly influence the smallholder farmer's likelihood to join co-operatives. As shown in Table 4, the gender, age, household size, distance to the nearest agrovet, vaccinating chicken and the number of chickens do not significantly influence the probability of being a co-operative member.

Our findings regarding the relationship between education attainment, attending training or accessing information, the number of goats kept, vaccination of goats and farming as the

Table 4.
Probit model
coefficient and
marginal estimations
for co-operative
membership variables

Variables	Coef. (β_i)	Marginal effects (dy/dx)	Std.err
Male respondent	-0.292	-0.042	(0.031)
Age of the respondent	0.006	0.001	(0.001)
Household size	0.037	0.006	(0.005)
Farming as the main income source	0.432	0.061**	(0.027)
Owens a chicken house	0.561	0.076**	(0.026)
Distance to the nearest agrovet	-0.018	-0.003	(0.002)
Education (years of schooling)	0.079	0.012**	(0.005)
Number of chickens kept	-0.002	-0.000	(0.001)
Attended training or received information	0.602	0.112***	(0.037)
Vaccinates chicken to prevent NCD	0.192	0.033	(0.043)
Vaccinates goats to prevent CCPP	0.630	0.099***	(0.028)
Number of goats kept	0.019	0.003*	(0.002)
_cons	-3.382		
Number of observations	517		
LR χ^2 (12)	70.58		
Prob > R^2	0.0000		
Pseudo R^2	0.1923		
Log likelihood	-148.26557		
Note(s): Average marginal effects; Standard errors in parentheses			
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

main source of income and membership in co-operatives are consistent with previous studies (Afolabi and Ganiyu, 2021; Wossen *et al.*, 2017; Olagunju *et al.*, 2021; Abate, 2018; Chagwiza *et al.*, 2016; Nugusse *et al.*, 2013; Mojo *et al.*, 2017; Manda *et al.*, 2020). However, they differ with other studies. Regarding education, Meier zu Selhausen (2016) established that in Uganda, women who had no membership in co-operatives had higher literacy levels than members. Kaliyeva *et al.* (2020) found that rural households in Kazakhstan that had higher education levels had a lower likelihood to join co-operative societies. In addition, in India, herd size was inversely associated with co-operative membership members (Kumar *et al.*, 2018).

The results show that, those with more years of schooling are more likely to be members of co-operative and is significant at 1% level. This could be attributed to the fact that education enhances a person's awareness and knowledge about alternative livelihood options including the potential for co-operatives to address their challenges. Table 4 shows that the likelihood to join a co-operative is 1.2% higher for farmers who had years of schooling above the average compared to those having below the average. However, in other studies, those who had special skills were less likely to join co-operatives (Nugusse *et al.*, 2013). This could be attributed to the respondents being involved in livelihood activities which generate more income compared to agriculture, hence can pay for the services offered by co-operatives.

The study investigated whether access to information or attending training influences co-operative membership. Results in Table 4 show that access to information or attending training was positively associated with co-operative membership, and this was significant at 5%. The likelihood to become a member of a co-operative is 11.2% higher for farmers who attend training or access information compared to those who do not. Information and training increase awareness about potential opportunities and benefits of participation in collective action, which enables farmers to decide about membership (Adesina *et al.*, 2000). High levels of awareness also increase the likelihood to take risks including the decision to join co-operatives. Access to information is also likely to lead to co-operative membership when it engenders positive perceptions and attitudes about co-operatives (Möllers *et al.*, 2017). This points to the critical role of agricultural extension in livelihood improvement through co-

operatives. Farmers in arid and semi-arid areas which are poorly connected to the main roads and are far from government offices are less likely to access information or training opportunities. Such farmers would incur higher transaction costs in accessing information or training through extension programmes. They are also likely to incur higher costs in accessing through information and communications technology which would discourage membership in co-operatives.

Smallholder farmers rely on farm and non-farm income generation activities for their livelihoods. This study sought to find the relationship between the main source of income and membership in co-operatives. The results show that farming as the main source of income is positively and significantly associated with co-operative membership (at 5% level). The probability to become members of co-operatives is 6.1% higher for those having farming as the main income source compared to those whose main income source is not farming. In arid and semi-arid areas, farming is the main source of livelihood and opportunities for non-farm income are few (GoMC, 2019). Therefore, farmers are likely to join co-operatives to access services such as farm inputs and marketing which would boost their productivity and incomes. Co-operatives can also enable them to cope with climate induced shocks through collective action.

This study investigated whether household assets measured by the number of goats and owning a chicken house were associated with membership in co-operatives. The results show that owning a chicken house has a positive effect on co-operative membership and is significant at 5%. This means that smallholder farmers who own a chicken house are more likely to be members of co-operative as compared to their counterparts who do not. From the marginal effects in Table 4, farmers who own a chicken house have a 7.6% higher likelihood to join a co-operative compared to those who do not. A chicken house may not be directly linked to membership in co-operatives. Farmers use a chicken house to confine their chicken, evidence of more intensive chicken management. A chicken house may become necessary for farmers who seek to control diseases, reduce the risk of loss of the flock to chicken predators or manage increasing flock. This could be because some smallholder farmers have financial resources to invest in poultry farming and are more commercially oriented. Although commercially oriented smallholder farmers largely focus on marketing their produce (Cousins, 2009), they face several constraints. Such farmers may opt for co-operatives to access resources that would increase their production or for collective marketing of produce. Another household asset that was investigated is the number of goats. The number of goats kept influenced the likelihood of co-operative membership and is statistically significant at 10%. Table 4 shows that the probability to become a co-operative member was 0.3% higher for farmers who owned goats above the average than farmers having below the average. This could be because farmers who keep more goats are likely to be commercially oriented and their decision to join co-operatives could be due to a need to access farm inputs, collectively market their produce or benefit from other services such as credit. This implies that semi subsistence farmers especially those in arid and semi-arid areas with fewer assets or lack financial resources to invest in their farming activities are less likely to join co-operatives. Therefore, recognising the heterogeneity of smallholder farmers especially the extent of commercialisation of their agricultural activities is important in the strategies aimed at increasing co-operative membership.

Adoption of new technology is important in agricultural productivity. This study measured adoption of new technology through vaccination of chicken and goats. As shown in Table 4, whereas vaccination of chickens does not significantly influence co-operative membership, farmers who vaccinate their goats are likely to be members of co-operatives compared to those who do not vaccinate, and this is statistically significant at 1%. Furthermore, the probability to join a co-operative was 9.9% higher for farmers who vaccinated their goats compared to those who did not. In Kenya smallholders have difficulties

adopting CCPV vaccines because the vaccines are not readily available and they cost relatively more compared to other livestock vaccines (Kyotos *et al.*, 2022). This suggests that smallholder farmers who vaccinate their goats invest more resources in goat farming and risk by adopting vaccines to mitigate potential loss. Such farmers are more likely to be those who are commercially oriented and join co-operatives to enhance their incomes through the collective services provided by the co-operatives.

Conclusions and policy implications

The main purpose of the study was to analyse the determinants of co-operative membership in Makueni County, a semi-arid area in Eastern Kenya. The findings illustrate that the factors which significantly influence smallholder farmers' membership in co-operatives are having farming as the main source of income, owning a chicken house, keeping a larger herd of goats, vaccinating goats, years of schooling and attending training or accessing information. However, gender, household size, distance to the nearest agrovet, the size of chicken flock and vaccinating do not significantly influence membership in co-operatives.

Government and non-government agencies increasingly use co-operatives to initiate interventions to address smallholder farmers' constraints and to improve their livelihoods. The results of this study show that membership in co-operatives is likely to be higher amongst farmers who are more commercially oriented because they invest more financial resources in chicken and goat farming. This is evident in adoption of goat vaccination, access to information or attending training and owning a chicken house probably due to a need to manage their flock. Such farmers may find co-operative membership key in enhancing their productivity and incomes through collective access to inputs or markets. It could also be because the services target farmers who can afford. This implies that farmers who cannot afford initial and regular fees for co-operative membership or are subsistence oriented have a lower likelihood to join co-operatives. Presently, livelihood improvement interventions implemented through co-operatives are unlikely to reach most smallholder farmers. Therefore, recognising the heterogeneity of smallholder farmers especially, the extent of commercialisation of their agricultural activities and assets that they own is important in livelihood improvement and co-operative membership strategies.

Because co-operative membership is low yet co-operatives do play a key role in addressing the constraints that smallholder farmers' face, increasing membership is the key. One of the ways of boosting co-operative membership is through training and providing information to farmers. Especially, reaching out to those with lower levels of education or located in areas with little access to information or training opportunities is essential. For agencies that intervene through co-operatives identification of the farmers' information needs, the costs of accessing information and training and providing this through appropriate channels that consider the context of the farmers is essential.

References

- Abate, G.T. (2018), "Drivers of agricultural cooperative formation and farmers' membership and patronage decisions in Ethiopia", *Journal of Co-operative Organization and Management*, Vol. 6 No. 2, pp. 53-63, doi: [10.1016/j.jcom.2018.06.002](https://doi.org/10.1016/j.jcom.2018.06.002).
- Abebaw, D. and Haile, M.G. (2013), "The impact of co-operatives on agricultural technology adoption: empirical evidence from Ethiopia", *Food Policy*, Vol. 38, pp. 82-91, doi: [10.1016/j.foodpol.2012.10.003](https://doi.org/10.1016/j.foodpol.2012.10.003).
- Adegbite, O.O. and Machethe, C.L. (2020), "Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: an untapped potential for sustainable development", *World Development*, Vol. 127, 104755, doi: [10.1016/j.worlddev.2019.104755](https://doi.org/10.1016/j.worlddev.2019.104755).

- Adesina, A.A., Mbila, D., Nkamleu, B.G. and Endamana, D. (2000), "Econometric analysis of the determinants of adoption of alley farming by farmers in the forest zone of southwest Cameroon", *Agriculture Ecosystems and Environment*, Vol. 80, pp. 255-265, doi: [10.1016/S0167-8809\(00\)00152-3](https://doi.org/10.1016/S0167-8809(00)00152-3).
- Afolabi, N.S. and Ganiyu, O.Y. (2021), "Impact of Co-operative membership on rural income generation in southwest, Nigeria", *REVESCO Revista de Estudios Cooperativos*, Vol. 138, pp. 1-12, doi: [10.5209/REVE.75563](https://doi.org/10.5209/REVE.75563).
- Ahmed, M.H. and Mesfin, H.M. (2017), "The impact of agricultural co-operatives membership on the wellbeing of smallholder farmers: empirical evidence from eastern Ethiopia", *Agricultural and Food Economics*, Vol. 5 No. 6, pp. 1-20, doi: [10.1186/s40100-017-0075-z](https://doi.org/10.1186/s40100-017-0075-z).
- Amare, M., Mariara, J., Oostendorp, R. and Pradhan, M. (2019), "The impact of smallholder farmers' participation in avocado export markets on the labor market, farm yields, sales prices, and incomes in Kenya", *Land Use Policy*, Vol. 88, 104168, doi: [10.1016/j.landusepol.2019.104168](https://doi.org/10.1016/j.landusepol.2019.104168).
- Central Bureau of Statistics-Kenya (1995), *Statistical Abstract 1995*, Central Bureau of Statistics, Ministry of Planning and National Development, Nairobi.
- Chagwiza, C., Muradian, R. and Ruben, R. (2016), "Co-operative membership and dairy performance among smallholders in Ethiopia", *Food Policy*, Vol. 59, 165173, doi: [10.1016/j.foodpol.2016.01.008](https://doi.org/10.1016/j.foodpol.2016.01.008).
- Cousins, B. (2009), "What is a 'smallholder'? Class-analytic perspectives on small-scale farming and agrarian reform in South Africa", Working Paper 16, Poverty, Land and Agrarian Studies (PLAAS), University of the Western Cape, Cape Town, available at: <http://hdl.handle.net/10566/4468>.
- Fischer, E. and Qaim, M. (2012), "Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya", *World Development*, Vol. 40 No. 6, pp. 1255-1268, doi: [10.1016/j.worlddev.2011.11.018](https://doi.org/10.1016/j.worlddev.2011.11.018).
- Government of Makueni County (2019), *Spatial Development Plan 2019-2029*, Government of Makueni County, Wote.
- Gujarati, D.N. and Porter, D.C. (2009), *Basic Econometrics*, McGraw-Hill, New York.
- Ingutia, R. and Sumelius, J. (2022), "Determinants of food security status with reference to women farmers in rural Kenya", *Scientific African*, Vol. 15, e01114, doi: [10.1016/j.sciaf.2022.e01114](https://doi.org/10.1016/j.sciaf.2022.e01114).
- International Co-operative Alliance (2022), "What is a cooperative?", available at: <https://www.ica.coop/en/cooperatives/what-is-a-cooperative> (accessed 22 May 2022).
- Jitmun, T., Kuwornu, J.K., Datta, A. and Anal, A.K. (2020), "Factors influencing membership of dairy co-operatives: evidence from dairy farmers in Thailand", *Journal of Co-operative Organization and Management*, Vol. 8 No. 1, pp. 100-109, doi: [10.1016/j.jcom.2020.100109](https://doi.org/10.1016/j.jcom.2020.100109).
- Kalele, D.N., Ogara, W.O., Oludhe, C. and Onono, J.O. (2021), "Climate change impacts and relevance of smallholder farmers' response in arid and semi-arid lands in Kenya", *Scientific African*, Vol. 12, e00814, doi: [10.1016/j.sciaf.2021.e00814](https://doi.org/10.1016/j.sciaf.2021.e00814).
- Kaliyeva, S., Areal, F.J. and Gadanakis, Y. (2020), "Attitudes of Kazakh rural households towards joining and creating Co-operatives", *Agriculture*, Vol. 10 No. 11, p. 568, doi: [10.3390/agriculture10110568](https://doi.org/10.3390/agriculture10110568).
- Kenya National Bureau of Statistics (2019), *The 2019 Kenya Population and Housing Census Volume IV: Distribution of Population by Socio-Economic Characteristics*, Kenya National Bureau of Statistics, Nairobi.
- Kenya National Bureau of Statistics (2020a), *Economic Survey 2020*, Kenya National Bureau of Statistics, Nairobi.
- Kenya National Bureau of Statistics (2020b), *Comprehensive Poverty Report*, Kenya National Bureau of Statistics, Nairobi.
- Klein, K.K., Richards, T.J. and Allan, W. (1997), "Determinants of co-operative patronage in Alberta", *Canadian Journal of Agricultural Economics*, Vol. 45 No. 2, pp. 93-110, doi: [10.1111/j.1744-7976.1997.tb00195.x](https://doi.org/10.1111/j.1744-7976.1997.tb00195.x).

- Kumar, A., Saroj, S., Joshi, P. and Takeshima, H. (2018), "Does co-operative membership improve household welfare? Evidence from a panel data analysis of smallholder dairy farmers in Bihar, India", *Food Policy*, Vol. 75, pp. 24-36, doi: [10.1016/j.foodpol.2018.01.005](https://doi.org/10.1016/j.foodpol.2018.01.005).
- Kyotos, K.B., Oduma, J., Wahome, R.G., Kaluwa, C., Abdirahman, F.A., Opondoh, A., Mbobua, J.N., Muchibi, J., Bagnol, B., Stanley, M. and Rosenbaum, M. (2022), "Gendered barriers and opportunities for women smallholder farmers in the contagious caprine Pleuropneumonia vaccine value chain in Kenya", *Animals*, Vol. 12 No. 8, p. 1026, doi: [10.3390/ani12081026](https://doi.org/10.3390/ani12081026).
- Ma, W., Renwick, A., Yuan, P. and Ratna, N. (2018), "Agricultural co-operative membership and technical efficiency of apple farmers in China: an analysis accounting for selectivity bias", *Food Policy*, Vol. 81, pp. 122-132, doi: [10.1016/j.foodpol.2018.10.009](https://doi.org/10.1016/j.foodpol.2018.10.009).
- Maddala, G.S. (1992), *Introduction to Econometrics*, 2nd ed., Macmillan, New York.
- Manda, J., Khonje, M.G., Alene, A.D., Tufa, A.H., Abdoulaye, T., Mutenje, M., Setimela, P. and Manyong, V. (2020), "Does co-operative membership increase and accelerate agricultural technology adoption? Empirical evidence from Zambia", *Technological Forecasting and Social Change*, Vol. 158, pp. 120-160, doi: [10.1016/j.techfore.2020.120160](https://doi.org/10.1016/j.techfore.2020.120160).
- Manning, S., Boons, F., von Hagen, O. and Reinecke, J. (2012), "National contexts matter: the Co-evolution of sustainability standards in global value chains", *Ecological Economics*, Vol. 83, pp. 197-209, doi: [10.1016/j.ecolecon.2011.08.029](https://doi.org/10.1016/j.ecolecon.2011.08.029).
- Markelova, H. and Mwangi, E. (2010), "Collective action for smallholder market access: evidence and implications for Africa", *Review of Policy Research*, Vol. 27 No. 5, pp. 621-640, doi: [10.1111/j.1541-1338.2010.00462.x](https://doi.org/10.1111/j.1541-1338.2010.00462.x).
- Matchaya, G.C. (2010), "Cooperative patronage: the national smallholder farmers' association of Malawi in Kisungu District", *Development Southern Africa*, Vol. 27 No. 3, pp. 397-412, doi: [10.1080/0376835X.2010.498950](https://doi.org/10.1080/0376835X.2010.498950).
- Meier zu Selhausen, F. (2016), "What determines women's participation in collective action? Evidence from a Western Ugandan coffee cooperative", *Feminist Economics*, Vol. 22 No. 1, pp. 130-157, doi: [10.1080/13545701.2015.1088960](https://doi.org/10.1080/13545701.2015.1088960).
- Möllers, J., Traikova, D., Bîrhala, B.A. and Wolz, A. (2017), "Why (not) cooperate? A cognitive model of farmers' intention to join producer groups in Romania", *Post-communist Economies*, Vol. 30 No. 1, pp. 56-77, doi: [10.1080/14631377.2017.1361697](https://doi.org/10.1080/14631377.2017.1361697).
- Mojo, D., Fischer, C. and Degefa, T. (2017), "The determinants and economic impacts of membership in coffee farmer co-operatives: recent evidence from rural Ethiopia", *Journal of Rural Studies*, Vol. 50, pp. 84-94, doi: [10.1016/j.jrurstud.2016.12.010](https://doi.org/10.1016/j.jrurstud.2016.12.010).
- Nugusse, Z.W., van Huylbroeck, G. and Buysse, J. (2013), "Determinants of rural people to join co-operatives in Northern Ethiopia", *International Journal of Social Economics*, Vol. 40 No. 12, pp. 1094-1107, doi: [10.1108/IJSE-07-2012-0138](https://doi.org/10.1108/IJSE-07-2012-0138).
- Ofori, E., Sampson, G.S. and Vipham, J. (2019), "The effects of agricultural co-operatives on smallholder livelihoods and agricultural performance in Cambodia", *Natural Resources Forum*, Vol. 43 No. 4, pp. 218-229, doi: [10.1111/1477-8947.12180](https://doi.org/10.1111/1477-8947.12180).
- Olagunju, K.O., Ogunniyi, A.I., Oyetunde-Usman, Z., Omotayo, A.O. and Awotide, B.A. (2021), "Does agricultural co-operative membership impact technical efficiency of maize production in Nigeria: an analysis correcting for biases from observed and unobserved attributes", *PLoS One*, Vol. 16 No. 1, e0245426, doi: [10.1371/journal.pone.0245426](https://doi.org/10.1371/journal.pone.0245426).
- Othman, A., Kari, F., Jani, R. and Hamdan, R. (2012), "Factors influencing Co-operative membership and share increment: an application of the logistic regression analysis in the Malaysian Co-operatives", *World Review of Business Research*, Vol. 2 No. 5, pp. 24-35.
- Sugden, F., Agarwal, B., Leder, S., Saikia, P., Raut, M., Kumar, A. and Ray, D. (2021), "Experiments in farmers' collectives in Eastern India and Nepal: process, benefits, and challenges", *Journal of Agrarian Change*, Vol. 21 No. 1, pp. 90-121, doi: [10.1111/joac.12369](https://doi.org/10.1111/joac.12369).

-
- Verhofstadt, E. and Maertens, M. (2014), "Smallholder cooperatives and agricultural performance in Rwanda: do organizational differences matter?", *Agricultural Economics*, Vol. 45 No. 1, pp. 39-52, doi: [10.1111/agec.12128](https://doi.org/10.1111/agec.12128).
- Wanyama, F.O., Develtere, P. and Pollet, I. (2009), "Reinventing the wheel? African cooperatives in a liberalized economic environment", *Annals of Public and Cooperative Economics*, Vol. 80 No. 3, pp. 361-392, doi: [10.1111/j.1467-8292.2009.00390.x](https://doi.org/10.1111/j.1467-8292.2009.00390.x).
- Wossen, T., Abdoulaye, T., Alene, A., Haile, M.G., Feleke, S., Olanrewaju, A. and Manyong, V. (2017), "Impacts of extension access and co-operative membership on technology adoption and household welfare", *Journal of Rural Studies*, Vol. 54, pp. 223-233, doi: [10.1016/j.jrurstud.2017.06.022](https://doi.org/10.1016/j.jrurstud.2017.06.022).
- Zheng, S., Wang, Z. and Awokuse, T.O. (2012), "Determinants of producers' participation in agricultural cooperatives: evidence from Northern China", *Applied Economic Perspectives and Policy*, Vol. 34 No. 1, pp. 167-186, doi: [10.1093/aep/pper044](https://doi.org/10.1093/aep/pper044).

Corresponding author

Obadia Okinda Miroro can be contacted at: omiroro@cuk.ac.ke