

Article

The Role of Cooperatives in Improving Smallholder Participation in Agri-Food Value Chains: A Case Study of One Local Municipality in Eastern Cape, South Africa

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Abstract: Increases in demand for food, product development, and agribusiness growth provide new opportunities for smallholder farmers in the developing world. Yet, the smallholder farming sector is still confronted by numerous constraints, including low quality and lower levels of produce. Agricultural cooperatives and other farmer organisations have been identified as crucial vehicles to link smallholder farmers with the evolving food systems. However, little is known about their contribution to enhancing their members' participation in sustainable agri-food chains. This paper aims to explore the effectiveness of agricultural cooperatives in empowering smallholder farmers to participate in sustainable agri-food chains in Eastern Cape, South Africa. In achieving this, the study adopted a multi-stratified sampling procedure to select 119 cooperative members in the study area. Data were analysed using descriptive statistics and a binary regression model. Our findings revealed that the majority (70%) of cooperatives were participating in crop production. Most (75%) of the cooperative members were old, with a mean average of 52 years. Additionally, the majority (93%) of members reported that agricultural cooperatives contributed positively to their livelihoods. The results of the probit model established that quality, quantity, level of education, and access to information influenced the level of participation in storage, processing, and distribution levels at different levels of significance. Although the findings of this research reported a positive contribution of cooperatives to their members, the study identifies a greater need for cooperatives to be inclusive of young people and improve government support. Also, the study recommends a blended financing model that will cater to smallholder farmers who do not have collateral. Finally, the study recommends that the current extension and advisory services be tailored to cater to the training needs of smallholder farmers.

Keywords: agricultural cooperatives; smallholder farmers; sustainability; agri-food chains; probit model; Eastern Cape



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1. Introduction

South Africa has an ugly history of separate development along racial lines. This development was perpetuated even in agriculture, where for many years, black farmers were suppressed through subsistence agriculture while white farmers were supported to commercialise. At the time of the transition to democracy, there was already a dualistic agriculture with black smallholder farmers operating on communal land for subsistence,

while on the other hand, whites enjoyed a thriving commercial farming sector [1]. It is on these grounds that the democratic government refocused its support for many poor black farmers engaging in farming on communal land [2]. This was done to correct the injustices of the apartheid era. The government of today recognises the urgent need to transform the smallholder farming sector. As a result, these farmers were classified into three sub-categories, namely, (i) those who are farming for home consumption, (ii) those who are farming for home consumption and sell some produce, and (iii) those who seek to become commercial farmers.

Smallholder farming is arguably the most important tool for rural economic development and nations' food security. However, its full potential is hindered by the lack of institutional innovation such as access to credit, markets, and technology adoption [3]. As one way of dealing with such issues, the post-apartheid government through its National Development Plan (NDP) recognised agricultural cooperatives as one of the possible solutions [4]. The success of cooperatives has been identified as a vehicle through which subsistence-orientated agriculture can be transformed into commercial agriculture [5]. The compelling argument for supporting cooperatives is that the government has limited funds to support the more than 2 million smallholders; therefore, it is more affordable to fund smallholders through cooperatives [6]. Furthermore, the government has fewer and fewer specialized extension officers to cater to farmers regularly [7].

Collective action would enhance smallholder farmers' participation in agri-food value chains thereby improving rural livelihoods [8,9]. In his seminal work, Draheim [10] has long argued that apart from sustaining themselves through the material base, cooperative societies also need to keep motivating and advocating for their members, thereby improving both economic benefits and social capital. Sartorius and Kirsten [11] ascertain that smallholder farmers can access the market down through the value chains through agricultural cooperatives. This is because these agricultural cooperative organisations are involved in different levels of the value chain such as production, processing, marketing, and distribution of agricultural products. However, it remains unclear whether the cooperative members participate in the commercial value chains in South Africa, particularly the Eastern Cape.

Existing studies in South Africa mainly focus on the performance of cooperatives, and most are based on a sample of cooperatives at the provincial or local levels. Thus, existing evidence is mainly a case study with limited evidence of large-scale national studies [12]. Therefore, this study is an attempt to enrich the literature by assessing the role of cooperatives in improving smallholder farmers' participation in agri-food value chains. Section 2 reviews relevant literature. Section 3 describes the study methodology. The findings are presented and discussed in Section 4. Section 5 provides conclusions and recommendations.

2. Literature Review and Study Framework

2.1. Defining Agricultural Cooperatives

There are various definitions of agricultural cooperatives in South Africa and across the world. Generally, cooperatives are business organisations that can be formed in any sector of the economy [13]. A cooperative is defined as "an autonomous association of persons united voluntarily to meet their common economic and social goal as well as aspirations through a jointly owned and democratically owned initiative" [14]. Furthermore, cooperatives are guided by seven principles, namely, voluntary, and open membership, democratic member control, member economic participation, autonomy and independence, education training and information, cooperation, and community concerns.

According to Ubandoma et al. [15], a cooperative society is defined as an association of people who have voluntarily joined together to have a common end through the formation of a democratically controlled enterprise. Furthermore, cooperative societies are voluntary associations of people who work together to promote their economic interests [15]. Christian [16] added that cooperatives work on the notion of self-help as well as mutual help.

The Department of Agriculture, Forestry and Fisheries (DAFF) categorises agricultural cooperatives based on their roles in areas such as production, processing, and marketing [17]. Agricultural cooperative establishment has been encouraged as an agricultural policy development tool that will assist farmers in curbing their production and marketing constraints [18]. Agricultural cooperatives play a critical role in food value chains by helping members improve their farming activities while at the same time improving sustainable livelihoods [19]. According to Candemir [20], agricultural cooperatives have been identified as catalysts of economic growth and rural development.

In South Africa, agricultural cooperatives were crucial in the development of white commercial farms during the apartheid days [21]. The establishment of agricultural cooperatives was first witnessed in Orange Free State in the mid-1900s, just after the Cooperative Act 1908 came into effect [16]. Such cooperatives were responsible for the marketing of agricultural products. As the years progressed, they began to operate in different agri-food chains such as input supply, credit distribution, and marketing [22]. The main aim of these cooperatives was to give farmers the bargaining power to negotiate prices and to provide opportunities for value addition for their members.

2.2. Empirical Studies of the Role of Agricultural Cooperatives in Agri-Food Systems

Recent research conducted by Okwoche et al. [23] assessed the use of agricultural credit by farmers belonging to cooperative organisations in Benue State, Nigeria. The study found a significant difference between agricultural yield and farmers' income before and after obtaining loans. Additionally, the farmers in the study primarily joined cooperative societies to access credit. To enhance agricultural production, the study recommended that farmers be provided with the necessary credit facilities and motivation. Gertler [24] utilised the probit regression model to explain how cooperatives can serve as practical tools for collaboration, collective action, and community reinforcement. The study discovered that cooperatives could reduce spatial inequality and ensure fair cost-sharing. In a similar vein, Ofuoku and Urang [25] explored the effect of farmer-cooperative society cohesion on loan repayment among members in Delta State, Nigeria using Spearman's rank-order correlation analysis. Their findings indicated a positive correlation between loan repayment perception and cohesion, leading to a recommendation that extension agents leverage the effect of cohesion on loan repayment to promote it in upcoming cooperative societies. Another study conducted by Ojiako and Ogbukwa [26] found that farm credits play a significant role in the socio-economic transformation of rural economies. The findings showed that cooperative membership was positively linked to farm performance, and the study recommended further government and NGO interventions to encourage individual farmers to join cooperatives and operate within organised groups. Lastly, a different study [27–29] revealed that the sizes of a family and cooperative are significant contributors to collective performance.

2.3. Empirical Studies of the Participation of Farmers in Agri-Food Value Chains

Several studies have delved into the factors that impact the involvement of smallholder farmers in agricultural value chains, specifically in Gauteng Province's agro-processing sector in South Africa. Baloyi and Poole's research indicates that meeting market expectations concerning quality, standards, and supply consistency is crucial in influencing farmers' participation. In contrast, [30], the study highlights how institutional design, participation conditions, and collaboration play significant roles in motivating farmers' involvement. Khoza et al.'s findings suggest that only a few smallholder farmers participate in the agro-processing industry, with factors like distance to the market and off-farm income negatively affecting their decision to join. Conversely, a review [31] suggests that a lack of physical, human, and social capital restricts smallholders' participation in the mainstream economy, and good roads are essential for successful market linkages. These studies recommend that support institutions develop strategic plans that consider these influential factors to facilitate the transformation of agro-processing industries.

2.4. Conceptual Framework of the Agri-Food Value Chain

Agri-food value chains are a set of processes involved in the flow of food from the production site (farm) to the end user (consumer) [32]. In some instances, this process is also referred to as a food supply chain. This chain links a network of key players such as input suppliers, farmers, processors, distributors, and consumers. In most cases, these chains involve several intermediaries operating between farmers and consumers. The actors, which include farmers, in this whole chain, aim to maximise profit while satisfying consumers at minimal operation costs.

Amongst the main issues that impede farmers from realising this objective is a long chain between marketing and distribution. In other words, farmers tend to depend on supply chain intermediaries to collect, market, and distribute agricultural products to the final consumer. The main issues associated with intermediary use include unfair costing of products, delays in delivery, and a lack of product control [33]. One way of dealing with this issue is to integrate agricultural cooperatives into the chain. Agricultural cooperatives assist farmers with the supply of inputs, storage, processing, and distribution. Figure 1 below shows the relationship between these actors.

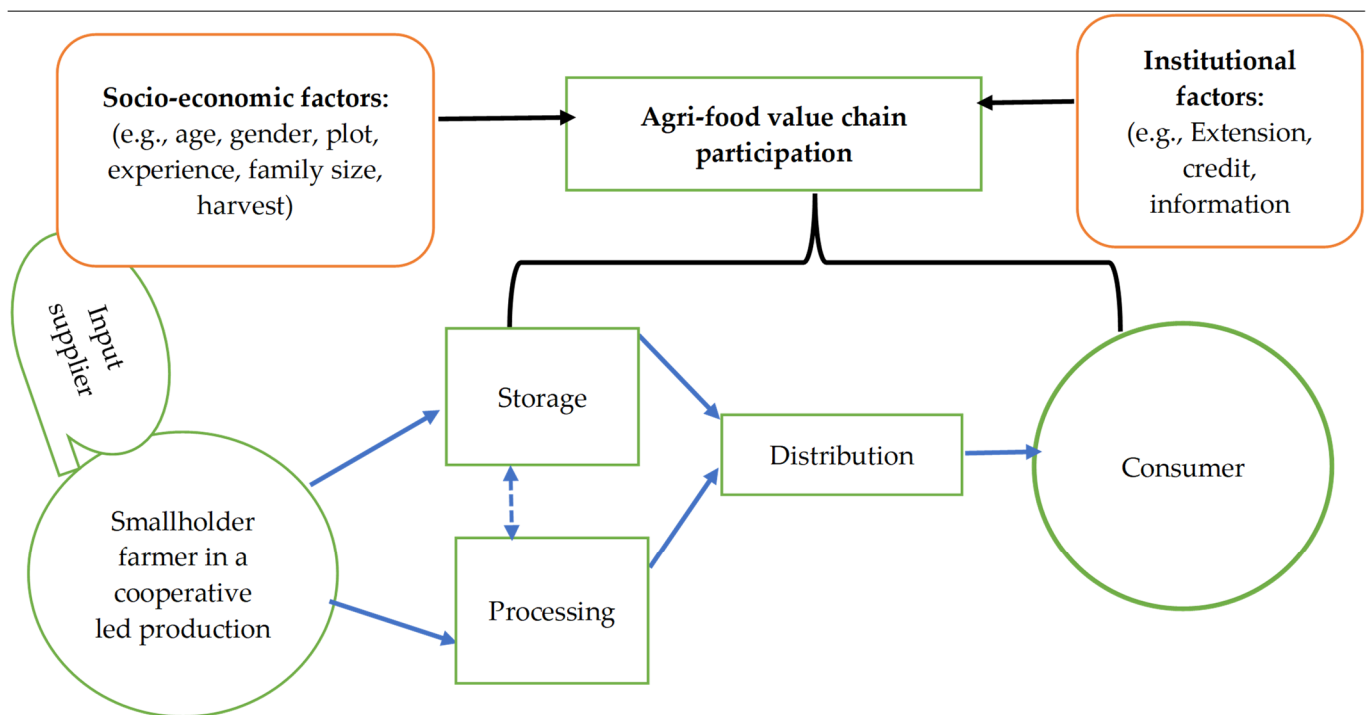


Figure 1. Smallholder farmers' agri-food chain. Source: Author compiled.

Agricultural cooperatives enhance smallholder farmers' participation in the agri-food value chain by providing collective strength, improving resource efficiency, facilitating market access, and supporting sustainable agricultural practices [34,35]. Precisely, agricultural cooperatives empower smallholder farmers by providing them with a collective voice. Through cooperation, farmers can negotiate better prices for their produce, access resources, and engage with other actors in the value chain on more equal terms [36].

Additionally, agricultural cooperatives often provide risk-sharing mechanisms, helping farmers cope with uncertainties such as price fluctuations and weather-related challenges. Maertens and Swinnen [37] argued that agricultural cooperatives additionally assist as platforms for knowledge transfer and capacity building. Through cooperative structures, farmers can access training, extension services, and information on sustainable agricultural

practices. This knowledge-sharing contributes to the adoption of environmentally friendly and socially responsible farming methods.

The agri-food value chain must include everyone, especially the smallholder farmers, through the agricultural cooperatives so that they can participate in the sustainability of agri-food [38]. Oertwig et al. [39] emphasise that the value chain is a combination of resources, including natural capital, knowledge, and skills within social structures, aiming to deliver products or services, with the result often impacting the environment. The sustainability of the agri-food value chain serves as a foundational concept that necessitates a comprehensive understanding, avoiding prioritization among social, environmental, and economic dimensions. In practical terms, at each stage of the value chain, economic, environmental, and social dimensions must be considered to ensure a holistic and sustainable approach [39]. A fully sustainable value chain is only possible if all three dimensions are aligned. Figure 1 below shows the smallholder farmers' agri-food value chain.

3. Materials and Methods

3.1. Description of Study Area

This research study was carried out in the Mquma Local Municipality of Eastern Cape Province of South Africa. The Eastern Cape forms part of the nine (9) South African Provinces and is in South-Central South Africa and bordered by Western Cape Province to the west and Lesotho to the north. Although it is the second-largest province in the country after the Northern Cape [40], the Eastern Cape is one of the poorest provinces consisting largely of communal land. This province is home to 7.2 million or more people, making it the fourth most populated province of South Africa [41,42]. The Eastern Cape is sometimes referred to as a world in one province. As a result, the province has a summer rainfall pattern with a small peak in spring and a large peak in autumn. Crops grown in the Eastern Cape include maize, dry beans, vegetables, chicory, and hemp. In addition, Eastern Cape Province is also known for citrus, wool, and mohair production. Furthermore, the annual rainfall in Eastern Cape Province ranges from 500 mm (19.7 inches) to 657 mm (25.9 inches). Eastern Cape Province consists of 37 local municipalities, and Mquma is amongst them [42].

Mquma is a local municipality within the Amatole District Municipality of Eastern Cape Province. The municipality consists of three (3) main towns, namely, Butterworth, Ngqamakhwe, and Centane. According to Statistics South Africa [41], Mquma has a total population of 232,993 housed in 69,732 households. The majority (99.4%) of residents in this municipality are black and mostly practise agriculture for their livelihoods.

3.2. Sampling Methods and Sample Size

This quantitative study adopted a descriptive research design. The study targeted all the smallholder farmers who belonged to operational cooperatives during the data collection period (2017). Before data collection, we made use of a multistage sampling methodology. In the first stage, the researchers selected two towns, namely, Ngqamakhwe and Centane, due to the concentration of cooperatives in these towns. In the second phase, we selected ten (10) operational agricultural cooperatives purposively. Thirdly, smallholder farmers were selected randomly from the different cooperatives based on their availability and willingness to participate. In the end, the sample size of this research was 119 smallholder farmers. Table 1 below gives an illustration of how farmers were sampled in this study. A further detail of the population and sample size is provided.

3.3. Data Collection

The research made use of primary data obtained from smallholder farmers who belonged to the selected cooperatives in 2017. A semi-structured questionnaire was used to collect the necessary information from the farming household head. Furthermore, the focus group discussion was conducted with the chairpersons of agricultural cooperatives to supplement the information collected from the members. The researchers pre-tested the

questionnaire on a few members of the cooperatives to check its reliability and validity. Data were collected by the researcher and well-trained enumerators who were fluent both in isiXhosa and English. Moreover, secondary data were obtained from different sources, including scientific publications and government and non-government entities.

Table 1. Details of the sampling method applied.

1st Stage: District Selection	2nd Stage: Cooperative Selection	Population	3rd Stage: Sample Size
Ngqamakhwe	Masizakhe Co-op	18	8
	Ntuzenyandu Co-op	33	21
	Lilona Farming Co-op	41	36
	Blythswood Farming Co-op	11	6
	Laphumilanga Trading and Projects	20	11
	Vulindlela Youth Project	10	10
Centane	Vukayise Farming Co-op	6	5
	Mthumeni Co-op	17	13
	Zanokhanyo Co-op	5	5
	Bunono Youth Farming Cooperative	10	4
Total		171	119

Source: Authors' compilation.

3.4. Analytical Framework

After collecting the relevant data from smallholder farmers, data were coded, cleaned, and further processed into a Microsoft Excel spreadsheet. Additionally, data were exported from the MS Excel (version 2010) spreadsheet to STATA 13 and SPSS version 24 for analysis. In this study, descriptive statistics and binary models were used to analyse data.

3.4.1. Descriptive Statistics

The study made use of descriptive statistics to analyse and profile the ten (10) agricultural cooperatives. In addition, the researchers used descriptive statistics to describe the socio-economic characteristics of cooperative members and the contribution of cooperatives to members in the study area. In doing so, the study made use of descriptive statistics tools such as frequency tables, graphs, charts, and mean and standard deviations.

3.4.2. Binary Regression Model

To estimate the participation of smallholder cooperative members in an agri-value chain in Eastern Cape Province, the study used a binary probit regression model. The binary probit regression model allowed for each agri-food value chain to be analysed separately and independently. Most farmers participate in one or more agri-food value chains, thus ruling out the use of a multinomial logit regression model. In this study, member participation was a dependent variable that took a value of 1 if the farmer participated in value chains and 0 otherwise. The binary probit for the two choices is expressed as follows:

$$Y_i = \begin{cases} 1 & \text{if } Y_i > \gamma \\ 0 & \text{if } Y_i \leq \gamma \end{cases} \quad (1)$$

where γ = a threshold which is assumed to be zero in this study.

Assuming a normal distribution of errors, as follows:

$$\Pr(Y = 1) = \int_{-\infty}^{\beta'x} \phi(t) dt = \Phi(\beta'x) \quad (2)$$

where Φ represents the normal distribution, $(Y = 1)$ indicates participation in the agri-food value chain, and x shows the explanatory variables that are likely to influence participation. Additionally, the study made use of marginal effects for continuous variables. The marginal effects can be estimated as follows:

$$\frac{\partial E(Y|x)}{\partial x} = \Phi(\beta'x)\beta \quad (3)$$

However, the marginal effects of a dummy variable are expressed as follows:

$$\Pr[Y = 1|x., d = 1] - \Pr[Y = 1|x., d = 0] \quad (4)$$

where x refers to the mean value of all continuous variables. Finally, the model for estimating the drivers of member participation in agri-food value chains is given as

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n + \varepsilon \quad (5)$$

where

Y = dependent variable

β = Vector of parameters to be estimated

X = Set of explanatory variables and

ε = error term

3.5. Data

This section in Table 2 shows data used in the probit regression model.

Table 2. Description of the explanatory variables included in the probit regression model.

Variable	Description	Variable Type	Expected Sign
Location	Geographic location of farmers (1 = Ngqamakhwe; 2 = Centane)	Nominal	+/-
Age of farmers	Age of the interviewed person in years	Continuous	+/-
Gender	Sex of farmers (1 = male; 2 = female)	Nominal	+/-
Level of education	Actual number of years spent in school	Continuous	+/-
Position held in a co-op	(1 = leadership; 2 = ordinary member)	Nominal	+
Number of years in a co-op	Actual number of years as a member of a cooperative	Continuous	+/-
Access to extension	Extension visits (1 = access; 0 = no access)	Dummy	+
Farming experience	Number of years in farming	Continuous	+
Access to credit	1 = access; 0 = otherwise	Dummy	+
Plot size	Actual number of Ha under production	Continuous	+/-
Quantity harvested	The amount of produce ready to be sold (in kg)	Continuous	+
Training on value chains	Access to training on different chains (1 = Yes; 2 = No training)	Nominal	+

4. Findings and Discussion

4.1. Characteristics of the Studied Agricultural Cooperatives

The age of cooperatives' existence was investigated, and the findings are reported in Table 3. The findings showed that the minimum duration of existence was (2) years while the maximum was (18) years. These results indicate that these cooperatives have been in existence for a longer period. In terms of the membership size, the findings in Table 3 indicate that the minimum number of members in a cooperative was five (5) people and the maximum members per cooperative was forty-one (41). These results show that most cooperatives have enough capacity to carry out agricultural activities aimed at increasing

production. These findings are in line with the findings of Christian et al. [27], who found that most cooperatives employ more people in rural areas.

Table 3. Features of agricultural cooperatives.

Variable	Category	Mean	Std Dev	Maximum	Minimum
Age of establishment	Number of years a co-op existed	10.201	3.781	18	2
Membership number	Number of persons in a cooperative	27.740	13.605	41	5
	Category	Frequency (n)		Percentage (%)	
Source of capital	Government	1		10	
	Loan from financial institution	3		30	
	Self-funded	6		60	
Type of agricultural activity	Crop production	7		70	
	Livestock production	3		30	
Total income (p.a) (ZAR)	0–5000	3		30	
	5100–10,000	6		60	
	10,100–15,000	1		10	
	>15,100	0		0	

Credit is one of the crucial aspects of agricultural production. The results from Table 3 show that the majority (60%) of farmers' cooperatives obtained their startup capital from self-funding. In addition, 30% and 10% of these cooperatives received funding from a credit institution (30%) and government (10%), respectively. These findings are in line with Merrett and Walzer [43] who found that cooperatives are self-funded and rarely receive donations from external sources. Regarding the type of agricultural activity, the results showed that most (70%) cooperatives are engaged in crop production and the rest of them are in livestock production (30%). These findings are in line with Zantsi [4] who discovered that most agricultural cooperatives in South Africa are involved in crop production. The income from farming activities of cooperatives is shown in Table 3 below. The income generated per annum was discussed with the management of these farmer organisations. The findings demonstrate that most (60%) of the cooperatives generated an income of ZAR 5100–ZAR 10,000 annually. Some (30%) of the cooperatives had an income range of ZAR 0–ZAR 5000 annually. Only 10% of the cooperatives had an annual income of ZAR 10,100–ZAR 15,000 per year.

4.2. Socio-Economic and Demographic Characteristics of Cooperative Members

The information about the socioeconomic and demographic characteristics of cooperative members was obtained using a semi-structured questionnaire. The observation in Table 4 illustrates the distribution of cooperative members according to their demographic and socio-economic characteristics. Results indicate that most farmers were male (53.78%), with a smaller percentage of females (46.22%). The cooperative farmers were found to have a mean average age of 52.176 years. These revelations concur with Stats SA's [42] concerns about the ageing farming population in South Africa. The results further revealed that the interviewed farmers had a mean farming experience of 12.294 years, with a minimum of 2 years and a maximum of 36 years of farming. These findings suggest that many farmers in Eastern Cape Province are well experienced in farming. Furthermore, cooperative farmers were probed about their qualifications, measured by the number of years in the schooling system. The results in Table 4 show that the participants had a mean average of 8.512 years of schooling, indicating a minimum of 1 years and a maximum of 20 years. Moreover,

results revealed that more (77.31%) of these farmers were from Ngqamakhwe. This may be because Ngqamakhwe is more rural than Butterworth. Smallholder farmers in the study area had a plot size mean average of 5.547 ha with a minimum of 2 ha and a maximum of 20 ha.

Table 4. Description of the demographics and socio-economic characteristics of farmers.

Variables		Standard Deviation	Mean	Min	Max
Age of respondents		13.825	52.176	19	75
Household size		3.039	4.605	1	14
Years spent in school		4.507	8.512	1	20
Farming experience		6.211	12.294	2	36
Years in a cooperative		3.781	10.201	2	18
Plot size		3.959	5.547	2	20
		Frequency (n)	Percentage of respondents (%)		
Sex	Male	64	53.78		
	Female	55	46.22		
Towns	Ngqamakhwe	92	77.31		
	Centane	27	22.69		
Position held in a co-op	Leadership	35	29		
	Ordinary member	74	71		
Access to credit	Yes	56	47		
	No	63	53		
Access to extension services	Yes	31	26		
	No	88	74		
Training on value chains	Yes	4	3		
	No	115	97		

Most (71%) smallholder farmers indicated that they were just ordinary members in their cooperative societies, while only 29% were in leadership structures. When asked about their perception of the leadership structure, the farmers indicated that they have confidence in their leadership.

4.3. The Contribution of Cooperative Organizations to Their Members' Welfare

The responses of the cooperative members regarding the role and contribution of their cooperative association are presented in this sub-section. The responses in Table 5 were categorised according to the order of importance. The results show that the majority (96.64%) of members reported that their cooperative has, in one way or the other, assisted with production and marketing training. The second most frequent contribution was the provision of training for management and leadership roles at 91 (76.47%). The third most frequent contribution was the benefit of lower cost of agricultural inputs at 75 (63.03). Lastly, a few farmers reported the provision of credit facilities by the cooperative (52.94%). These findings are in line with the findings of Mhembwe [44], who argued that cooperatives serve their members with marketing services.

4.4. Factors Influencing Participation of Cooperative Members in Agri-Food Value Chains

Several factors may influence smallholder farmers' participation in agricultural food value chains. In this study, such factors were estimated using the probit regression model fitted with eleven explanatory variables. This model has been used by authors such as [45]

to explore value chain partnerships and farmer entrepreneurship as balancing ecosystem services. The findings are presented in Table 6 and show that the age of farmers, level of education, access to credit, quantity harvested, and training positively and significantly influence agri-food value chain participation. Regarding the model fit, the models showed that the explanatory variables were jointly significant in explaining the outcome variables at an acceptable level. As a result, the three R-squared were obtained as 0.584; 0.591; and 0.580.

Table 5. Responses on the contribution of cooperatives.

Contribution	Frequency	%	Rank
Providing credit to the members	63	52.94	4
Production and marketing training	115	96.64	1
Lower expense on agricultural inputs	75	63.03	3
Training on management and leadership	91	76.47	2

Table 6. Factors affecting members' participation in agri-food value chains.

Variable	B	Model 1 Processing	Model 2 Storage	Model 3 Distribution
Constant	B	(−4.141) 0.012	(−3.109) 0.040	(−4.383) 0.008
Location	β_1	(−0.673) 0.750	(0.085) 0.651	(−0.030) 0.887
Age of farmers	β_2	(0.023) 0.079 *	(0.025) 0.040 **	(0.024) 0.071 *
Gender	β_3	(0.202) 0.526	(0.353) 0.556	(0.147) 0.646
Level of education	β_4	(0.039) 0.281	(0.018) 0.698	(0.070) 0.062 *
Number of years in a cooperative	β_5	(0.475) 0.568	(0.302) 0.698	(0.442) 0.591
Transport availability	β_6	(−0.606) 0.251	(−0.934) 0.056 *	(−0.526) 0.337
Access to market information	β_7	(0.169) 0.644	(0.062) 0.851	(0.131) 0.724
Farming experience	β_8	(−0.055) 0.035 **	(−0.052) 0.032 **	(−0.070) 0.011 **
Access to credit	β_9	(1.083) 0.029 **	(1.145) 0.012 **	(0.950) 0.066 *
Quantity harvested	β_{10}	(0.054) 0.001 ***	(0.025) 0.013 **	(0.058) 0.001 ***
Training on value chains	β_{11}	(1.068) 0.007 ***	(0.477) 0.175	(1.132) 0.008 ***
Model summary				
Chi-square		40.86	43.55	45.54
Log likelihood		48.138	60.53	46.95
R ²		0.584	0.591	0.580
Observations		119	119	119

*, **, *** Represent significance levels at 10%, 5%, and 1%, respectively.

The study findings confirm that age positively and significantly influences farmers' participation in all the selected agri-food value chains. In model 1, we discovered that age influences farmers' participation in agri-food value chains and was positively significant at a 10% level. In models 2 and 3, age was found to positively influence agri-food value chain participation and was significant at 5%. All these findings about age together indicate that the higher the age of farmers, the greater the probability of their participating in different value chains.

Regarding educational attainment, the results show that education influences farmers' participation in distribution activity and was positively significant at a 10% level. This means that the probability of participating in distribution activity along the agri-food value chain increases marginally if a farmer remains at school. The analysis of information shows that farmers who have many years of schooling experience are likely to engage in agricultural value chains. The findings of this study confirm those of Manyise and Dentoni [45], who reported a positive relationship between a high level of education and participation in value chain activities.

The variable "transport availability" is statistically significant (at a 10% level) and has a negative influence on farmers' participation in agri-food value chains. This means that farmers who do not have transport in their cooperatives are less likely to participate in the processing and distribution of agricultural products. The reason could be that the processing and distribution centres are a bit far from the production centres. Also, the results imply that farmers with access to transport may require less of a storage facility.

Access to credit was positively significant at different levels. In models 1 and 2, access to credit positively influenced farmers' participation in the processing and storage of agri-food value chains at a 5% level. Whereas in model 3, access to credit positively influenced farmers' participation in the distribution stage of the value chain at a 10% level. Normally, the Department of Agriculture, through their comprehensive agricultural support programme (CASP/Ilima), supports farmers with funding or links them with private funders for credit. In addition to this, the Small Enterprise Development Agency (SEDA), through its cooperative development and support programme, assists smallholder farmers with credit. As value chain activities require some form of capital, farmers who have access to credit are likely to engage in different agricultural value chains.

Quantity harvested measured in (kg) was positively significant at different levels. In models 1 and 3, the quantity of produce positively influenced farmers' participation in processing and distribution at a 1% level, whereas in model 2, the quantity of produce positively influenced participation in storage at a 5% level. This means that the more produce there is, the higher the participation in different agri-food value chains.

Access to and frequency of training on value chain activities were found to be positively related to agri-food value chain participation, particularly processing and distribution at a 1% level. This implies that the more the exposure to training, the higher the farmers' likelihood to participate in different value chains. If the farmer receives agri-food value chain training, this will increase the knowledge and skills of the farmer, which ultimately increases the chances of participating in all food value chain activities.

5. Conclusions and Recommendations

5.1. Conclusions

A successful co-operative movement is one of the ways of transforming subsistence-orientated agriculture into commercial agriculture. This study investigated the role of cooperatives and the factors influencing members' participation in agri-food value chains using primary data collected among 119 farmers in Eastern Cape Province in South Africa. The Tobit model was applied to estimate the factors influencing participation in different agri-food value chains. The socio-economic characteristics of cooperatives showed that the number of persons in a cooperative was between 5 and 41. The results also revealed that all the studied cooperatives existed for more than ten years. The majority (60%) of the cooperatives reported that they were self-funded. Moreover, the majority (70%) of the

studied agricultural cooperatives were involved with crop production. This shows that crop production is dominant in the study area. The estimation of farmers' participation in agri-food value chains was done using the probit regression model. The model results indicated that the age of farmers, level of education, access to credit, quantity harvested, and training significantly influenced agri-food value chain participation among smallholder cooperative farmers.

5.2. Recommendations

Against this background, the study recommends policies that favour institutional and technical support to encourage participation. These include (i) blended finance of the Land Bank and Department of Agriculture and Rural Development; (ii) improved agricultural extension and advisory services, and (iii) continuous encouragement of youth involvement in agricultural cooperatives.

Access to credit is very crucial in agricultural value chains. For instance, farmers require capital to purchase input supplies, maintain their storage facilities, and process and distribute the produce to the last consumer. This study recommends that private financial service providers partner with the Department of Agriculture and Rural Development to develop a sustainable cooperative funding framework that will not discriminate against smallholder farmers who in most cases struggle to access such finance.

Although extension service access was found to be significant in encouraging farmers' participation in agri-food value chains, some farmers indicated that the training was irrelevant. The current public agricultural and advisory services need to be improved. Services provided to farmers should be relevant to their specific needs. Farmers should be trained on optimum input use, disease management practices, and processing and distribution requirements for agricultural products.

By implementing all these recommendations, the effectiveness of cooperative organisations in encouraging participation in agri-food value chains could be realised in Eastern Cape Province.

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Informed Consent Statement: All individuals participating in the study provided informed consent. Participants were briefed on their entitlement to pose inquiries regarding the research. Measures were taken to uphold confidentiality and privacy throughout the process.

Data Availability Statement: The datasets used or analysed during the current study are available from the corresponding author on reasonable request.

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