An Entrepreneurship Framework for Improved Productivity and Financial Performance of Primary Agricultural Cooperatives in North West Province

Mangoejane, T.P.[1], and Christian, M.[2]

Corresponding Author: T.P. Mangoejane. Correspondence Email: mangoejane40@gmail.com.

ABSTRACT

The study was conducted to establish an entrepreneurship framework for the improved productivity and financial performance of agricultural cooperatives in South Africa. For this reason, a sample of twenty-nine (29) agricultural cooperatives were selected in the North West Province using the snowball sampling method. Descriptive analysis was used to assess the nature and characteristics of primary agricultural cooperatives from the views of the cooperative managers. The results were presented using the general frequency distribution, and a summary of the descriptive analysis, such as frequencies and percentages, is illustrated using graphs, charts, and tables. Productivity was tested using a stochastic frontier, and three financial ratios (liquidity, solvency, and profitability) were used to measure financial performance. The study's findings assert that most of the agricultural crop cooperative managers are older men with primary education as the highest qualification, which is the lowest level of education. Moreover, the study finding from the stochastic frontier measure of technical efficiency revealed that the predicted technical efficiency varies slightly among cooperatives, with a minimum value of 0.9920, a maximum value of 0.9922, and a mean efficiency of .9920437. According to the results, the distribution of the technical efficiency shows that 100% of the sampled cooperative's technical efficiency skewed in the 0.90-1.00 range. It also identified that financial performance was the main contributor to the performance of the crop cooperatives. Moreover, the study's findings were used to formulate the proposed entrepreneurship framework, which will help improve the performance of

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[1] PhD Student. Department of Agricultural Economics and Extension, Faculty of Natural and Agricultural Sciences, North West University, Mahikeng Campus, P/Bag X2046, Mmabatho, 2745, mangoejane40@gmail.com ORCID: 0000-0001-8690-6580.

[2] Senior lecturer, Department of Agricultural Economics and Extension, Faculty of Natural and Agricultural Sciences, North West University, Mahikeng Campus, P/Bag X2046, Mmabatho, 2745, mzuyanda1990@gmail.com ORCID: 0000-0003-4446-0298.

agricultural cooperatives and affiliated members (smallholder farmers). The developed entrepreneurship framework suggests that agricultural managers should have management skills, opportunity skills, and networking skills to be entrepreneurial. By exploring these sets of skills, entrepreneurs will be developed in the agricultural value chain. Furthermore, this framework suggests that financial performance is the main contributor to crop cooperatives' performance.

Keywords: Agricultural Cooperatives, Performance, Productivity, Entrepreneurship Skills

1.   INTRODUCTION

Entrepreneurship is an important channel for bringing about transformation to sustainable products and processes, complimented by several high-profile thinkers promoting entrepreneurship as a possible solution for many social and environmental concerns (Hall, Daneke & Lenox, 2010, as cited by Kavari, 2016). Different institutional bodies (researchers, advisory services, policymakers, and farmers' unions) are all working towards developing entrepreneurship in agriculture and trying to find answers to questions on the relevance of entrepreneurship in agriculture.

South African agriculture plays a significant role in the development of the economy and in ensuring food security at the household level (DRDLR, 2019). The importance of the concept of sustainable development of the economy has been an ongoing debate for some time, and entrepreneurship is continuously being cited as a significant channel in addressing social and environmental concerns and for bringing a transformation to sustainable products and processes (Hall, Daneke & Lenox, 2010). In this context, entrepreneurship is defined by Ahmad and Seymour (2008) as a phenomenon that seeks to generate value through the creation or expansion of economic activity by identifying and exploiting new products, processes, and markets. According to Christian (2014), there has been little research on the field of entrepreneurship due to aspects such as the communal structure, framework, and formal definitions of constructs, and hence, there is no definite direction concerning the future of entrepreneurial research.

The South African economy faces the challenge of increasing the number and variety of viable and sustainable economic enterprises (DTI, 2004). The majority of the enterprises or cooperatives that were registered about a decade ago are inoperative now due to this challenge

(DAFF, 2015). The development of these enterprises is interrupted by South African history, such as the racial history and the destruction of wealth in black hands located both in rural and urban areas. DTI (2004) states these negatively affect income distribution, employment creation, and entrepreneurship. The success of such enterprises relies on the environment in which they operate, and in most cases, it is affected by factors beyond the farmers' control. In less-developed countries, smallholder farmers are known to be the drivers of agricultural development (Machethe, 1990). Thus, Delgado (1998) argues that "smallholder agriculture is simply too important to employment, human welfare, and political stability in Sub-Saharan Africa to be either ignored or treated as just another small adjusting sector of a market economy" (as cited by Chibanda, Ortmann & Lyne, 2009). Policies made by the government and agricultural investments have a greater influence on the environment, which is why the entrepreneurial environment differs from country to country (Kahan, 2012).

Agricultural cooperatives are promoted to boost smallholder farmers' productivity (Christian, 2014) and to equip them with entrepreneurship skills. The SA government promotes the use of these cooperatives as an organisation that can help to enhance the development of small-scale farmers and the communities around South Africa. A new Cooperatives Act (No.14 of 2005), which is based on international cooperative principles, was lawfully signed by the SA government in August 2005. This particular Act foresees a major role for cooperatives in promoting social and economic development, "more especially by creating employment, generating income, facilitating broad-based black economic empowerment and eradicating poverty" (RSA, 2005). The SA government has also committed and pledged itself to provide a supportive legal environment for cooperatives.

North West province has 222 registered agricultural cooperatives, of which only 215 are agricultural-related and constitute 13% of the total number of cooperatives found in the country (DAFF, 2015). Only 40% of the total cooperatives are classified as operational and expanding, and 23% are operational and stable. These cooperatives play a significant role through their contributions (production and employment) to the provincial and national economies. The province is well-known for producing crops and livestock; therefore, the highest number of cooperatives in the province are involved in the production of these two commodities (52 and 60, respectively), and the second dominant commodities are mixed farming, poultry and vegetables with 30 cooperatives each (DAFF, 2015). According to DAFF (2015), the estimated provincial turnover by local sector cooperatives has decreased destructively by more than 85%

from the previous period (2013/14), which signifies poor financial performance within the province, even though the increase in cooperative number has been recorded. Therefore, the main objective of this study was to develop an entrepreneurship framework that aimed at improving the productivity and financial performance of the primary agricultural cooperatives (crops) in Ngaka Modiri Molema district of the North West province.

2.   DEFINITION OF THE PROBLEM

Entrepreneurship is a key factor for the survival of small-scale farming, which operates in an ever-changing and increasingly global economy (Kahan, 2012). Farmers see their farms as a business, a means of earning profits in agriculture. They are more than willing to take risks and grow their farms to generate profits from their farm operations. Therefore, they need a framework to help them understand the agribusiness environment and become innovative. To increase the chances of survival for small-scale farmers, they should become more entrepreneurial, increasing their production for markets and profits.

The entrepreneurial activity of South Africa is low compared to other countries that are still developing (DAFF, 2012; GEM, 2020). This is because most of the farmers in South Africa operate on a small scale (Ortmann & King, 2007). Makhura (2001) and Moloi (2010) are of the same view; they assert that most of the farmers in SA are subsistence farmers located in semi-arid areas that are overpopulated. According to DAFF (2015), these farmers face challenges such as low productivity and poor access to inputs, which may hinder them from being more productive in the markets and enhancing their revenues.

The ever-changing environment of farms forces farmers to develop their farm business economically for their survival and success (de Wolf & Schoorlemmer, 2007). Therefore, there might be a need to develop an entrepreneurial framework, which may assist cooperatives in developing corrective measures to ensure that smallholder farmers are equipped with entrepreneurial skills and have equal and satisfactory opportunities to access their respective production and marketing needs. This will increase the province's performance on the ideals of the National Development Plan (NDP 2025). It will also satisfy the mission of the Department of Agriculture, Forestry and Fisheries, which is to achieve the "advanced food security and transformation of the sector through innovative, inclusive and sustainable policies" (DAFF, 2017). To achieve this objective, the cooperative sector must increase the quality of cooperative, entrepreneurship education. The study carried out in Latvia by Zvirgzdina et al.

(2009) pointed out that farmers' productivity was low because there were considerable areas of unutilised agricultural land in Latvia. Land is also one of the significant production factors that may have a greater impact on the productivity of smallholder farmers.

There have been several studies about cooperative entrepreneurship in South Africa, such as those by Griffin and Oosthuizen (2016), Kavari (2016), and Modiba (2009), but none of them have ever developed an entrepreneurship framework. This study intends to fill this gap by creating an entrepreneurship framework to improve the productivity and financial performance of primary agricultural cooperatives, especially in the North West province. Thus, this framework aligns with goals 2 and 4 of the Sustainable Development Goals 2030 (SDG). Goal 2 aims to "By 2030, double the agricultural productivity and incomes of small-scale producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment". In contrast, goal 4 aims to "substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship" (UN General Assembly, 2015).

The study's main objective is to develop an entrepreneurship framework that can improve primary agricultural cooperatives' productivity and financial performance in the North West Province. Thus, the study aims to achieve this by assessing the nature and characteristics of primary agricultural cooperatives in the North West Province, assessing the current level of productivity and financial performance of primary agricultural crop cooperatives, and exploring the relationship that exists between the entrepreneurship skills of cooperative managers and cooperative performance.

3.   RESEARCH METHODOLOGY

3.1.   Overview of the Study Area

The study will be conducted in Ngaka Modiri Molema District of the North West Province (the central region). The size of Ngaka Modiri Molema District of the North West is 28 114 km square. It comprises 27% of the total area of the province, with a population of 885 737, which comprises 23% of the province's population. The district includes five local municipalities Mahikeng, Ratlou, Ramotshere Moiloa, Ditsobotla, and Tswaing. The province is dominated by villages with fewer suburbs (Msimango & Oladele, 2013), and the province's capital city is

Mafikeng (Stats SA, 2018). Agriculture is the major provider of many households in the province, and the province's main economic activity is the production of livestock and crops. The province has 215 cooperatives under the agricultural sector, and the highest number of cooperatives in the province are involved in livestock and crop farming, followed by mixed farming, poultry, and vegetables (27%, 23%,14%, 14%, and 14%, respectively) (DAFF, 2015).

3.2.   Sample and Sampling Techniques

The sample is known to be the true representative of the target population, and general observations about the population can be made by studying the sample (Goddard & Melville, 2001). The sampling procedure employed was a non-probability sampling method called snowball sampling. According to Etikan and Bala (2017), this method is useful and is mostly employed when the researcher does not know much about the study population; therefore, contact with a few individuals will direct him to the other group. This is mostly used when no complete population size or frame of reference. There was a limitation concerning obtaining the database of primary agricultural cooperatives within the study area; therefore, there was no complete population size. A database of cooperatives obtained from the North West Department of Agriculture and Rural Development (NWDARD) was not filtered according to provinces and districts. Therefore, cooperatives were selected randomly from the entire country's unfiltered list of primary crop cooperatives. The agreeable participants based in the district to be studied were then asked to recommend other contacts who fit the requirements and might also be willing to participate in this study, who also recommended other potential participants, and so on (Etikan & Bala, 2017).

The study was conducted in one of the North West province districts, Ngaka Modiri Molema District. Agriculture is the major provider of many households in this district, and crop production is the main economic activity. The district has five municipalities: Mahikeng, Ratlou, Ramotshere Moiloa, Ditsobotla, and Tswaing. Therefore, only agricultural crop cooperatives under those municipalities participated in the study. Due to time limitations and distance not all could be reached; the number of crop cooperatives that participated in the study was 29 agricultural crop cooperatives, which served as the sample size of the study.

3.3.   Data Collection

Primary data was collected using a semi-structured questionnaire to obtain qualitative and quantitative data. Unlike an unstructured questionnaire with open-ended questions, a structured questionnaire has closed questions (Cooper & Schindler, 2008). This questionnaire, which included only closed-ended questions, was given to the cooperative managers who used the chosen sample to gather data for the study. The questionnaire employed Likert-type scales and a five-point response format. Respondents were asked to rate their skill level on a scale of 1 to 5, with 1 representing no skill at all and five denoting very high proficiency. According to Kavari (2012), the Likert scale is the most effective method for gauging people's attitudes, conceptions, pictures, perceptions, and views.

3.4.   Data Analysis

3.4.1. Descriptive Analysis

The descriptive analysis was used to describe and profile the nature and characteristics of smallholder agricultural cooperatives in Ngaka Modiri Molema district. To emphasise the nature and characteristics of the cooperatives from the views of the cooperatives' management to analyse the data acquired from the sampled managers. The results were presented using the general frequency distribution, and a summary of the descriptive analysis, such as frequencies and percentages, is illustrated using graphs, charts, and tables. To assess the current level of productivity and financial performance of primary agricultural cooperatives, the study used the stochastic frontier and three financial ratios (Liquidity, solvency, and profitability).

3.4.2. Inferential analysis: Canonical Correlation Analysis Model specification

3.4.2.1. Canonical Correlation Analysis

The study employed canonical correlation analysis to explore the relationship between entrepreneurship skills and cooperative performance (profitability and financial performance).

The canonical correlation studies the relationship between two sets of variables.

$$(X1, …, Xr) \text{ and } (X1, …, Xs) \qquad\qquad ….(1)$$

It requires that each set of variables should be reduced to a single variable and, thereafter, find their correlation. These variables can be found by forming linear combinations of the variables in each set under certain pre-fixed criteria. The variables obtained from the linear combinations

are known as 'canonical variables', and the correlation between them is known as 'canonical correlation'.

Suppose:

$(X1i, X2i)$ for i = 1, …, n i.e we have n × (r + s) data matrix.

Let there be r- variables in the 1st group: $X1 = (X1, …, Xr)$ and   ….(2)

s-variables in the 2nd group: $X2 = (Xr+1, …, Xr+s)$ ….(3)

Assume without loss of generality: $r \leq s$.

Also let,

$E(X1) = \mu1$ and $E(X2) = \mu2$ ….(4)

Var $(X1) = \Sigma11$, Var $(X2) = \Sigma22$ and Cov $(X1, X2) = \Sigma12$ ….(5)

Define: m = r + s

$X = (\,X1\ X2\,)$ ….(6)

$E(X) = (\,\mu1\ \mu2\,)$ and   .   …(7)

Cov $(X) = (\,\Sigma11\ \Sigma12\ \Sigma21\ \Sigma22\,)$ ….(8)

$\Sigma12$ contains rs elements which gives the correlation between each variable of set 1 with those of set 2

For r and s dimensional coefficient vectors **a** and **b,** define

$U = a'X1$ and $V = b'X2$ …. (9)

Then Var $(U) = a'\Sigma11a$, Var $(V) = b'\Sigma11b$ …. (10)

and Cov $(U, V) = a'\Sigma11b$ …. (16)

so that Corr $(U, V) = a'\Sigma11b\sqrt{a'\Sigma11a}\ \sqrt{b'\Sigma22b}$ …. (11)

The 1st pair ($U1'$, $V1$) is chosen to maximise Cov (U, V), while the 2nd pair ($U2'$, $V2$) are chosen to maximise Cov (U, V) subject to their combinations being orthogonal to the 1st choice.

In general, the jth pair (Uj, Vj) are chosen to maximise Cov (U, V) subject to their combinations being orthogonal to the previous (j-1) choices.

This can be done till j = r

Therefore, (U, V) are canonical variables, where U = a'$X1$ and V = b'$X2$ …. (12)

$X1$ represents cooperative performance variables (Financial performance and Productivity), whereas

$X2$ represents the entrepreneurship skills (Professional skills, Management skills, Opportunity skills, Strategic skills, and Co-operation/Networking skills)

"a" and "b" are coefficient vectors.

TABLE 1: Model Specifications for Canonical Correlation Analysis

Variables	Description	Unit of	Exp. sign
Dependent variables			
Productivity Financial Performance			
Independent variables			
Professional skills		Scale variables: Ordinal scale	+/-
Management skills	1= not at all skilled 2= slightly skilled 3= moderately skilled 4= skilled 5= very skilled	Scale variables: Ordinal scale	+/-
Opportunity skills		Scale variables: Ordinal scale	+/-
Strategic skills		Scale variables: Ordinal scale	+/-
Co-operation/ Networking skills		Scale variables: Ordinal scale	+/-

4.   RESULTS AND DISCUSSION

This section is divided into two sections: the descriptive results of the primary agricultural cooperative managers and the inferential results.

4.1.   Demographic Information

Demographic information assists in determining the extent to which they influence the managers' response in the study. The demographical information discussed in this section includes age, sex, marital status, past working experience, highest qualification, and entrepreneurship alertness. Table 2 shows the demographic information of cooperative managers.

TABLE 2: Demographic Information of Sampled Cooperatives' Managers

	Frequency	Percentage
Sex		
Male	18	62.07
Female	11	37.93
Marital Status		
Single	8	27.59
Married	6	20.69
Divorced	5	17.24
Widowed	10	34.48
Past working experience		
Unemployed	0	0.00
Self-employed	4	13.79
Worker	4	13.79
Farm worker	12	41.38
Supervisor	6	20.69
Middle-management	3	10.34
Top management	0	0.00
Other	0	0.00
Period(years) in current position		
1-2 years	10	34.48
3-6 years	14	48.28
7-10 years	5	17.24
10+ years	0	0.00
Highest qualification		
No qualification	0	0.00
Primary school completed	14	48.28
High school completed	3	20.69

Post Grade 12 certificate	5	17.24
Post Grade 12 diploma	0	0.00
University degree	3	10.34
University Post Grade degree	1	3.45
Other	0	0.00
Entrepreneurship alertness		
Alert	5	17.24
Non-alert	24	82.76

The findings of the study showed that most (72%) of the agricultural cooperative managers are between the ages of 45-60 and that there is only one manager (3.45%) who is considered to be youth (less or equal to 35 years of age). Moreover, the study's findings suggest that managers of agricultural crop cooperatives are mostly older. This is in line with Gotyi (2019), who confirmed that most cooperatives are usually formed by pensioners. According to a study conducted by Black (2020), the results from the interviewed participants suggest that women entrepreneurs lack confidence and self-belief. Therefore, the results of this study shown in the table, show that most of the respondents were male, with a share of 62.07% compared to 37.93% females. This can also be attributed to the fact that the active gender in agriculture is male (Stats SA, 2021); therefore, most of the respondents were likely to be males. According to the results, there are four main groups: single, married, divorced, and widowed. Table 2 shows that most of the managers are widows (34.48%), which may imply that they are older adults who were married at one point in time. This figure was followed by 27.59% for single people, 20.69% for married managers, and 17.24% for divorced managers. This contrasts with the results obtained from Modiba (2009), who claim that most of the people who participate in agriculture are married and not widows. The results indicated that 41.38% of the managers were once farm workers, 20.69% previously worked as supervisors, 13.79% of the managers were self-employed and working class, whereas 10.34 were in middle management before they could be managers of the cooperatives. This implies that most of the managers had prior experience in farming before they could be managers of cooperatives. The results from Table 2 showing the demographics of the crop cooperative managers show that the majority (48.28%) of the managers have completed primary school grades, and this should be a major concern that most of the people who are managing cooperatives do not necessarily have the necessary skills and academic knowledge. The majority is followed by those with Post grade 12 certificates, those who completed high school, and those with a university degree at 17.24%. This is in line with Gotyi (2019), where the author asserts that cooperative education and

training are not taken seriously in South Africa, and there's only one University that offers a 3-year formal qualification in cooperative management, which is the University of KwaZulu-Natal (UKZN). This explains why most of the cooperative managers have the highest qualifications, which are lower than Post grade 12 certificates. The results from Table 2 show that most cooperative managers (82.76%) are not entrepreneurial alert, while 17.24% are alert.

4.2.   Entrepreneurship Skills of Agricultural Cooperative Managers

The results of the study, as illustrated in the table below, showed that 58.6 % of the respondents highlighted that they are slightly skilled with Opportunity and Strategic skills, 44.8% maintained that they are moderately skilled with Management and Networking skills. Moreover, only 17.2% of the managers believed they were very Professionally skilled. Overall, Table 3 shows that most managers possess moderate entrepreneurship skills. According to McElwee (2006), these results show that most managers cannot recognise problems before they arise because they lack skills such as opportunity and strategic skills, which can help them solve problems they are faced with. Therefore, farmers under such cooperatives may face difficult challenges because of this insufficiency. Rudmann *et al*. (2008) suggest that farmers mostly need professional skills for their success, one of the skills most cooperative managers lack based on the above results.

TABLE 3: Entrepreneurship Skills of Cooperative Managers

Entrepreneurship skills										
	Professional		Management		Opportunity		Strategic		Networking	
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent
Not at all	0	0	5	17.2	7	24.1	11	37.9	10	34.5
Slightly		10.4	13	44.8	17	58.6	17	58.6	14	48.3
Moderately		37.9	5	17.2	3	10.3	1	3.4	3	10.3
Skilled		34.5	6	20.7	2	6.9	0	0	2	6.9
Very		17.2	0	0	0	0	0	0	0	0
Total	**29**	**100**	**29**	**100**	**29**	**100**	**29**	**100**	**29**	**100**

4.3.   Cooperative Performance

4.3.1. Level of Productivity

The study used technical efficiency to measure primary agricultural cooperatives' productive efficiency (productivity). Technical efficiency is the farm's ability to maximise output using a

given set of resource inputs (Chirwa, 2007). The stochastic frontier approach was adopted to measure productive efficiency in these cooperatives. The results are presented below.

TABLE 4: Stochastic Frontier Regression Model Results

					Number of observation = 29	
					Wald chi2 (2) = 11.74	
					Prob > chi = 0.0028	
CTFERT	**Coef.**	**Std. Err**	**z**	**P>l z l**	**[95% Conf. Interval]**	
CTHERB	.7897741	.2549977	3.10	0.002*	.2899877	1.289561
CTSEED	-.1400162	.1180896	-1.19	0.236	-.3714677	.0914352
_cons	7.028553	2.097747	3.35	0.001	2.917044	11.14006
/lnsig2v	-.4936692	.2631091	-1.88	0.061	-1.009354	.0220152
/lnsig2u	-9.203449	267.5857	-0.03	0.973	-533.6617	515.2548
LR test of sigma_u=0: chibar (01) = 0				Prob >= chibar2 = 1.000		
F-statistic p-value 0.0121						
VIF mean 1.01						
Adjusted R-squared 0.2334						
***, **, * significant at 1%, 5% and 10% respectively						

CTFERT= Crop Ton Fertilizer, CTHERB= Crop ton Herbicides, CTSEED= Crop ton Seeds (Frontier variables)

Table 4 above shows the stochastic frontier regression model's results as outlined in the previous chapter. The analysis aimed to assess the current level of productivity of primary agricultural crop cooperatives in Ngaka Modiri Molema District. The goodness-of-fit of the estimated model was measured using F-statistic, and the results show an F-statistic p-value of 0.0121, which indicates an acceptable measure of fit. Moreover, multicollinearity was tested, and the results showed an average Variance Inflation Factor of 1.01, which is lower than 8, showing no multicollinearity in the analysis. The Breusch-pagan/Cook-Weisberg test was also performed to check heteroscedasticity. The results showed that heteroscedasticity was 0.6375, which is higher than 0.05. Therefore, this asserts that there was no heteroscedasticity.

4.3.2. Technical Efficiency Estimates

According to Ali and Byerlee (1991), a farmer is technically inefficient in increasing farm output without increasing the use of at least one input is impossible. Moreover, factors like improper timing or method of input application such as fertilisers, which in most cases is caused by lack of information, can cause technical inefficiency. Given the specification of the stochastic frontier model in equation (1), the results in Table 5 of the predicted technical efficiency vary slightly among cooperatives, with a minimum value of 0.9920, a maximum value of 0.9922, and a mean efficiency of 0.9920437. Table 5 shows the frequency distribution of technical efficiency estimates of the sampled crop cooperatives.

TABLE 5: Frequency Distribution of Technical Efficiency Estimates of the Cooperatives

Figure	Frequency	Percent	Cum.
0.90 – 1.00	29	100.00	100.00
Total	**29**	**100.00**	

Source: Results obtained from STATA (version 15) generated from telephone survey, 2021, 2022

According to the results in Table 5, the distribution of the technical efficiency shows that 100% of the sampled cooperative's technical efficiency skewed in the 0.90-1.00 range. This indicates that most cooperatives use their advanced technological resources efficiently in the production process.

4.3.4. Financial Performance

The study employed the Data Envelope Analysis Program (DEAP) to analyse the financial performance of the primary agricultural crop cooperative in Ngaka Modiri Molema District of the North West Province. This computer program is used to conduct Data Envelopment Analysis (DEA) using financial ratios to calculate efficiencies in production. This study used Malmquist DEA methods to calculate catalogues of Total Factor Productivity (TFP) change, technical efficiency change, and scale efficiency change. Table 6 below shows the results of the Malmquist method of the DEA.

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TABLE 6: Malmquist Index Summary

	Year 1					Year 2					
Cooperative	effch	techch	Pech	sech	tfpch	effch	techch	pech	sech	tfpch	
1	0.755	0.684	0.104	7.250	0.517	0.417	1.808	0.417	1.000	0.755	
2	7.706	0.334	14.500	0.531	2.574	0.257	2.336	1.000	0.257	0.601	
3	2.900	0.686	2.900	1.000	1.990	0.381	1.213	0.381	1.000	0.462	
4	5.750	0.150	5.750	1.000	0.860	0.174	5.913	0.174	1.000	1.028	
5	0.972	0.636	0.972	1.000	0.618	1.029	0.769	1.029	1.000	0.791	
6	1.000	2.425	1.000	1.000	2.425	1.000	0.723	1.000	1.000	0.723	
7	1.000	0.529	1.000	1.000	0.529	2.154	0.952	4.000	0.538	2.051	KEY CODES:
8	1.014	0.632	1.014	1.000	0.641	0.998	0.677	0.998	1.000	0.676	effch–
9	1.000	0.611	1.000	1.000	0.611	1.000	0.667	1.000	1.000	0.667	efficiency
10	2.900	1.003	2.900	1.000	2.907	0.435	1.950	0.435	1.000	0.848	change
11	1.000	0.500	1.000	1.000	0.500	1.000	0.667	1.000	1.000	0.667	techch–
12	1.481	1.082	1.000	1.481	1.602	0.477	0.917	0.477	1.000	0.437	technical
13	0.893	0.554	0.893	1.000	0.495	1.000	0.667	1.000	1.000	0.667	efficiency
14	0.905	2.549	0.560	1.616	2.307	1.786	0.467	1.786	1.000	0.833	change
15	1.216	0.544	1.216	1.000	0.661	0.968	0.994	0.968	1.000	0.962	pech–pure
16	0.963	0.566	0.963	1.000	0.545	1.058	0.680	1.058	1.000	0.719	efficiency
17	1.000	0.500	1.000	1.000	0.500	1.000	0.667	1.000	1.000	0.667	change
18	1.068	1.484	1.068	1.000	1.585	0.944	0.552	0.944	1.000	0.521	sech–scale
19	1.058	0.635	1.058	1.000	0.672	0.934	0.950	0.934	1.000	0.887	efficiency
20	1.157	1.315	1.157	1.000	1.521	0.932	1.092	0.932	1.000	1.018	change
21	1.314	0.635	1.362	0.964	0.834	0.761	1.018	0.734	1.037	0.775	tfpch–total
22	1.053	0.608	1.053	1.000	0.640	1.198	1.403	1.198	1.000	1.680	factor
23	1.000	0.286	1.000	1.000	0.286	1.000	2.601	1.000	1.000	2.601	productivity
24	1.060	2.355	1.060	1.000	2.497	1.000	0.723	1.000	1.000	0.723	change
25	1.000	2.425	1.000	1.000	2.425	1.000	0.723	1.000	1.000	0.723	
26	1.000	0.611	1.000	1.000	0.611	1.077	0.943	1.077	1.000	1.016	
27	1.000	0.611	1.000	1.000	0.611	1.022	0.661	1.022	1.000	0.676	
28	1.000	0.611	1.000	1.000	0.611	1.000	0.667	1.000	1.000	0.667	
29	1.000	0.570	1.000	1.000	0.570	1.000	1.491	1.000	1.000	1.491	
Mean	1.256	0.725	1.165	1.078	0.911	0.832	0.994	0.890	0.935	0.827	

The above Table 7 indicates that for 2018/19, the average total factor productivity change is 8.9%, signifying a decline in total productivity from 2017/18 due to efficiency change. The results further assert that cooperative number 10 had the highest total factor productivity change amongst the 29 cooperatives in the study area during year 2 at 90.7%. This increase was due to the rise in the efficiency change to the extent of 90% and pure efficiency change to the extent of 90%, while the scale efficiency change remained constant. During the year 2018/19, 65.52% of the cooperatives experienced a decline in total factor productivity change, and a cooperative that had the lowest total factor productivity change was cooperative number 13, which experienced a total decline of 50.5%. For the year 2019/20, the average total factor productivity change was 17.3%, which was less than the year 2018/19.

Furthermore, this average total productivity change of 17.3% of the year 2019/20 shows that there has been a decline in the productivity of cooperatives in that year, and this decline was mainly due to technical efficiency changes within cooperatives. This means that most of the cooperatives were not growing, and the technical efficiency of some was high, which meant that they used most of their advanced technologies. Moreover, 21 out of 29 cooperatives had a decline in the total factor productivity change during 2019/20, which is 72% of the cooperatives. In the case of cooperative number 10, which was doing great in the year 2018/19, in the year 2019/20, it faced a decline in total factor productivity change of 15.2%. This suggests that even cooperatives doing well in 2018/19 are now struggling financially.

4.4.   Malmquist Index Summary of Annual Means

TABLE 7: Malmquist Index Summary of Annual Means

Year	effch	techch	Pech	sech	tfpch	*KEY CODES:*
2	1.256	0.725	1.165	1.078	0.911	**effch**– efficiency change
3	0.832	0.994	0.890	0.935	0.827	**techch**–technical efficiency change
Mean	1.023	0.849	1.018	1.004	0.868	**pech**–pure efficiency change
						sech–scale efficiency change
						tfpch–total factor productivity change

Table 7 above shows the malmquist index summary of annual means for sampled primary agricultural crop cooperatives. For the entire study period, the average total factor productivity change experienced a decline of 13.2%. This decline was due to a decrease in the technical

change of cooperatives to an extent of 15.1%, although there was an increase in scale efficiency to the extent of 0.4% and pure efficiency by the value of 1.8%. From 2018/19 to 2019/20, the total factor productivity change declined by 0.084 units.

4.5.   Malmquist Index Summary of Firm Means

TABLE 8: Malmquist Index Summary of Firm Means

Cooperative	effch	Techch	pech	sech	tfpch
1	0.561	1.112	0.209	2.693	0.624
2	1.408	0.883	3.808	0.370	1.243
3	1.051	0.913	1.051	1.000	0.959
4	1.000	0.940	1.000	1.000	0.940
5	1.000	0.699	1.000	1.000	0.699
6	1.000	1.324	1.000	1.000	1.324
7	1.468	0.710	2.000	0.734	1.042
8	1.006	0.654	1.006	1.000	0.658
9	1.000	0.638	1.000	1.000	0.638
10	1.123	1.398	1.123	1.000	1.570
11	1.000	0.577	1.000	1.000	0.577
12	0.840	0.996	0.690	1.217	0.837
13	0.945	0.608	0.945	1.000	0.574
14	1.271	1.091	1.000	1.271	1.386
15	1.085	0.735	1.085	1.000	0.798
16	1.009	0.620	1.009	1.000	0.626
17	1.000	0.577	1.000	1.000	0.577
18	1.004	0.905	1.004	1.000	0.909
19	0.994	0.777	0.994	1.000	0.772
20	1.038	1.198	1.038	1.000	1.244
21	1.000	0.804	1.000	1.000	0.804
22	1.123	0.924	1.123	1.000	1.037
23	1.000	0.862	1.000	1.000	0.862
24	1.030	1.305	1.030	1.000	1.344
25	1.000	1.324	1.000	1.000	1.324
26	1.038	0.759	1.038	1.000	0.788
27	1.011	0.636	1.011	1.000	0.643

KEY CODES:

effch– efficiency change

techch–technical efficiency change

pech–pure efficiency change

sech–scale efficiency change

tfpch–total factor productivity change

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28	1.000	0.638	1.000	1.000	0.638	
29	1.000	0.922	1.000	1.000	0.922	
Mean	1.023	0.849	1.018	1.004	0.868	

The results in Table 8 illustrate that cooperative number 10 was more efficient in the study period than other cooperatives because it had the highest total factor productivity change of 57%. This was due to an increase in pure efficiency change to an extent of 1.8% and an increase in scale efficiency by 0.4%. This cooperative was followed by a cooperative number with a total factor productivity change of 38.6%, and this increase was due to scale efficiency change by 27.1% and technical change by an extent of 9.1%, although pure efficiency remained stagnant.

4.5.1. Canonical Analysis

This study used canonical correlation analysis to measure the relationship between two variables cooperative performance (Financial performance and Productivity) and Entrepreneurship skills (Professional skills, Management skills, Opportunity skills, Strategic skills, and Networking skills). A canonical analysis is used to show how much variance of the dependent variables is explained by the dimensions. Furthermore, the study employed Wilk's Lamda and corresponding F-test to evaluate the study's null hypothesis, which stated that the canonical correlations for all functions are zero. Only one of the two canonical correlation coefficients for this model is statistically significant, $p < 0.05$. The other function is not statistically significant and will not be interpreted.

The CCA coefficient reflects the strength of the relationship between the pair of variates (R_c). For the first function, $R_c = 0.5883$. For the second function, $R_c = 0.4631$. The canonical correlation, when squared, shows how much variance in one canonical variate with ideal weights is explained by the other canonical variate with optimal weights.

A measure of redundancy is the variance of one set of variables as anticipated from the other set of variables when they are combined linearly. Like the squared multiple R in multiple regression R_d. Remember that the squared. R_c must also be exactly equal to 1 for the redundancy coefficient to be equal to 1 and the synthetic variables for the function to accurately represent all the variance of each variable in the set. The canonical correlation's meaning may be tested using the redundancy index. For the first function $R_d = 0.1741$ for the u-variables, and

R_d= 0.0791 for the *v*-variables. For the second function, R_d= 0.1066 for the *u*-variables, and R_d= 0.0584 for the *v*-variables.

Canonical loadings and standardised canonical coefficients were used to assess the relative weights of the model's variables. Table 9 below shows the significant (first) function's normalised canonical coefficients. For the first variable set, *productivity* is most important; a one standard deviation increase in *productivity* leads to a 0.7581 increase in the score on the first canonical variate in the second variable set when the other variable in the model is held constant. For the second variable set, *networking skills* are most important; a one standard deviation increase in *networking skills* leads to a 0.7971 increase in the score on the second canonical variate in the first variable set when the other variables in the model are held constant. Financial performance favourably contributes to the canonical connection, as shown by the data in Table 9. Only one variable in the first dependent variate has a loading equal to or greater than 0.59, indicating a high degree of correlation between the two variables and indicating that the financial performance measure is the only reliable indicator of the cooperative level performance of crop cooperatives. However, ranking the average proportion of canonical loading shows that the only reliable indication of farm-level performance is financial performance.

Except for one negative loading, the independent variates in function one all show positive loadings between 0.2671 and 0.7971. It is not surprising that the three variables with the highest loading are "Management skills" (0.5152) and "Networking skills" (0.7971), which are the variables that contribute most to cooperative performance since the extraction of the variates in canonical correlation to maximise the predictive objectives. Opportunity skills, however, also account for a sizeable portion of the observed range in cooperative performance (0.2671).

Moving on to Function 2, the coefficients in Table 9 show a very different pattern, with "Management skills" being the factor that most significantly influences the canonical connection (0.7737). Both "Strategic skills" and "Networking skills" have negative coefficients in this function.

TABLE 9: Standardised Coefficients

Standardised coefficient for the first variable set

	1	2
Productivity	0.7581	0.6522
Financial performance	-0.6475	0.7621

Standardised coefficient for the second variable set

	1	2
Management skills	0.5152	0.7737
Opportunity skills	0.2671	0.0589
Strategic skills	-0.4153	-0.2580
Networking skills	0.7971	-0.6271

Canonical loadings are illustrated in Figure 4.10 for the *u*-variables; *productivity* is most closely related to the first canonical function, and *financial performance* is most closely associated with the second canonical function. For the *v*-variables, *networking skills* are most closely related to the first canonical function, and *management skills* are most closely associated with the second canonical function.

TABLE 10: Canonical Loadings

Canonical loadings for variable list 1

	1	2
Productivity	0.7621	0.6475
Financial performance	-0.6522	0.7581

Canonical loadings for variable list 2

	1	2
Management skills	0.5228	0.7406
Opportunity skills	0.1011	0.3811
Strategic skills	-0.2448	-0.0415
Networking skills	0.7552	-0.6280

Heenkenda and Chandrakumara's (2016) interpretation was adopted in this study. The canonical correlation demonstrates the extent to which the dimensions account for the variance of the dependent variables. The overall multivariate significance tests are displayed in Table 10. In Panel A and Panel B of Table 10, the latent successive root tests, eigenvalues, and canonical correlation coefficients obtained from the study are displayed. The canonical correlations demonstrate the extent to which the dimensions account for the variation of the dependent variables. Only the first of the two canonical dimensions this model shows is statistically significant. The first test of dimensions, which examined the significance of each dimension individually and together, concluded that it was significant. It was also significant in the second test of dimensions, which looked at whether dimensions 1 and 2 taken together were significant. The final test of dimensions, which examined the significance of the combination of dimensions 2 and 2, did not find any significance.

Canonical correlation measures the percentage of variance the predictor canonical variate explains in the dependent canonical variate. The result shows a significant function ($p < .005$) and provides the proportion of total variability that is not explained. The null hypothesis that the provided canonical correlation and any smaller ones are equal to zero in the population is tested using the Wilks lambda test statistic. Each value can be calculated as the sum of 'cooperative performance' for the set of canonical correlations being investigated. According to the results of this analysis, the canonical correlations are 0.5883 and 0.4631; therefore, the value for testing both correlations are zero (1- 0. 5883)*(1-0. 4631) * = 0.51369.

TABLE 10: Multivariate Tests and Canonical Analysis

Multivariate Tests of significance (S=2, M=O, N=29					Panel A
Test Name	Value	Approximate F	Hypothesis DF	Error DF	Significance of F
Pillais's	0.56053	2.3364	8	48	0.0331
Hotellings's	0.802214	2.2061	8	44	0.0453
Wilks's	0.51369	2.2726	8	46	0.0386
Roys's	0.529176	3.1751	4	24	0.0315
Eigenvalues and Canonical Correlations					**Panel B**

Root No.	Eigenvalue	%	Cumulative %	Canonical correlation	Squared Correlation
1	0.6980	49.3600	49.3600	0.5883	0.3461
2	0.7161	50.6400	100.000000	0.4631	0.2145
Dimension Reduction Analysis					**Panel C**
Roots	Wilks λ	F	Hypothesis DF	Error DF	Significance of F
1 TO 2	0.51369	2.2726	8	46	0.0386
2 TO 2	0.785523	2.1843	3	24	0.1161

The canonical correlations are shown in Figure 1 for a simple understanding of the findings. It demonstrates that for root 1 and root 2, respectively, the correlations between the two sets of variables are 0.5883 and 0.4631. Given a significant link between "cooperative performance" and "entrepreneurship skills," these show statistically significant correlations between the two variables. When all dimensions (roots) are considered, two sets of variables exhibit a strong link; however, when the dimensions are reduced from 2 to 1, the association steadily deteriorates from 0.5883 to 0.4631.

Important economic insights can be gained by interpreting the correlations (factor loadings) between the dependent and canonical variables, reflecting latent components. Regarding Root 1 of 2, the factor loadings of "Management skills, Opportunity skills, Strategic skills, Networking skills" are 0.52, 0.27, -0.42, and 0.80, respectively. On the other hand, the left side of the figure's factor loadings shows how much of the variance in the dependent variables may be attributed to the latent, independent factors. It demonstrates that "Financial performance" and "Productivity" have factor loadings of 0.7581 and -0.6475, respectively. The factor loadings for "management skills," "opportunity skills," "strategic skills," and "networking skills" are 0.78, 0.06, -0.26, and -0.63, respectively, for Root 2 of 2. However, factor loadings for "Financial performance" and "Productivity" are 0.6522 and 0.7621, respectively, as seen on the left-hand side of the figure.

1ˢᵗ Canonical Function
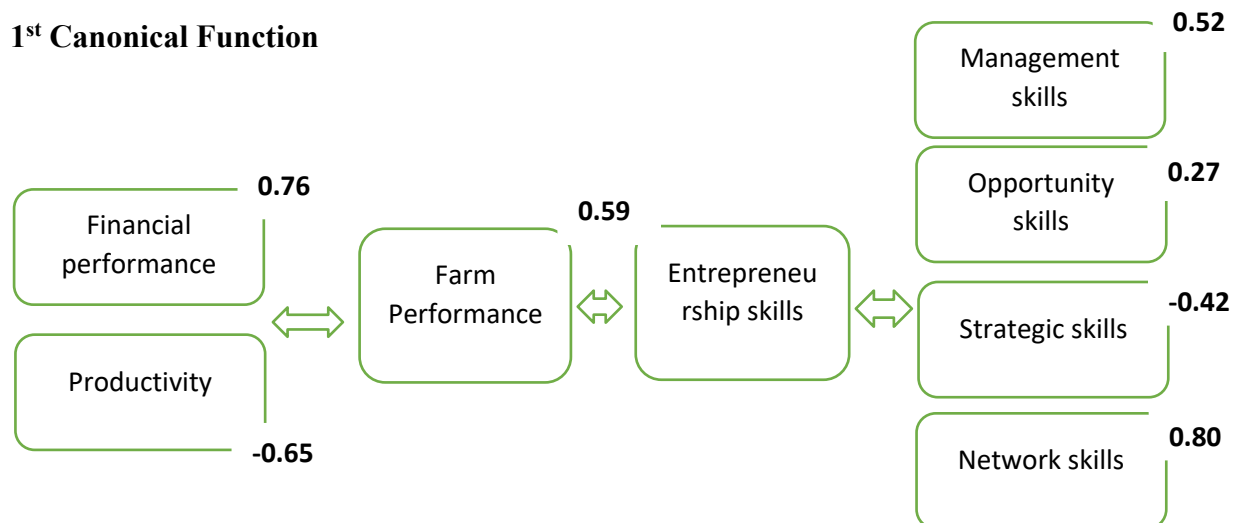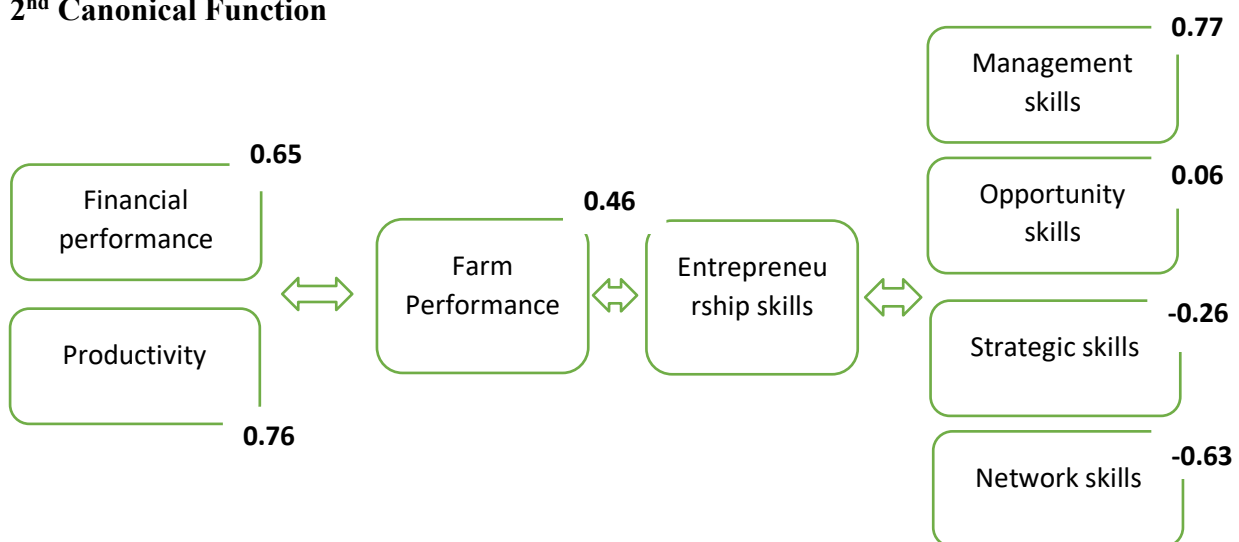

2ⁿᵈ Canonical Function

FIGURE 1: Canonical Correlation

To assess the shared multivariate relationship between the two sets of variables, the canonical correlation analysis was performed utilising two farm-level performance characteristics as predictors of the four entrepreneurship skills variables. The analysis produced two functions for each succeeding function with squared canonical correlations (Rc2) of 0.3461 and 0.2145. Using the Wilks' = 0.51369 criteria, $F_{(8, 46)} = 2.2726$, p.005, the whole model for all functions was statistically significant. Wilks denotes the variance that the model cannot account for, and 1 denotes the whole model effect size in an r2 metric.

The hierarchical arrangement of functions was tested for statistical significance using the dimension reduction analysis that the analysis produced. At $F_{(3, 24)} = 2.1843$, $p>0.005$, function 2 to 2 was not statistically significant.

5.   PROPOSED ENTREPRENEURSHIP FRAMEWORK

The purpose of the study was to examine whether a relationship exists between the entrepreneurship skills of agricultural primary crop cooperative managers and the level of cooperative performance. The study recognised that management skills, opportunity skills, and networking skills are significantly associated with the cooperative performance factors (Financial performance and productivity) as shown in Figure 2 below. It also identified that financial performance was the main contributor to the performance of the crop cooperatives.

The relationship between the variables demonstrates that management and opportunity skills are important policy variables that can improve the cooperatives' financial performance and productivity. The analysis in Figure 2 above indicates that the relationship between management skills, opportunity skills, and cooperative financial performance is the one that is strongest among the relationships that have been identified. As a result, it can be recommended that cooperative managers be strengthened with these skills to direct practically all economic performance indicators positively. Figure 2 below illustrates the entrepreneurship framework that is proposed by the study.
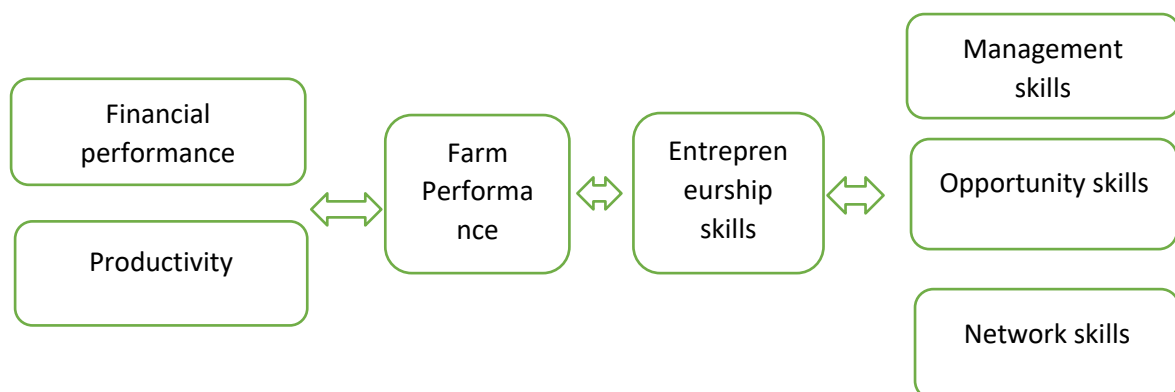

FIGURE 2: Proposed Entrepreneurship Framework

6.   CONCLUSION AND RECOMMENDATIONS

The empirical part of the study involved exploring the relationship between the entrepreneurship skills of cooperative managers and cooperative performance, which led to the formulation of the entrepreneurship framework to improve the performances of primary crop

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cooperatives. However, according to the results, the association between variables shows that management and opportunity skills are significant policy variables that can raise the financial performance and productivity in agricultural crop cooperatives.

Based on the results of this study, recommendations can be drawn to improve the performance of primary agricultural crop cooperatives in Ngaka Modiri Molema District. The results obtained suggest that to improve the performance of those agricultural crop cooperatives, cooperative managers should be equipped with entrepreneurial skills and be entrepreneurially alert. The results suggest that cooperative managers need support programs where they will be equipped with such skills. Despite the numerous debates about cooperative failures in developing countries, the study's findings confirm that entrepreneurship remains the solution to most of the problems faced by smallholder farmers and primary cooperatives. According to the study, cooperative membership improves the welfare of participating farmers. The findings imply that both parties must be entrepreneurial to improve the performance of smallholder farmers and cooperative managers. Furthermore, the result of this study suggests that management skills, opportunity skills, and networking skills are significantly associated with the cooperative performance factors (Financial performance and productivity). The association between variables shows that management and opportunity skills are significant policy variables that can raise agricultural crop cooperatives' financial performance and productivity.

The development of an entrepreneurship framework to improve the performance of primary agricultural cooperatives was only done in Ngaka Molema District. Therefore, it is suggested that such studies, which may be more or less similar to this, be conducted in North West province as a whole. Furthermore, the focus of this study was on primary agricultural crop cooperatives. Therefore, it is suggested that further studies be done on all North West cooperatives to improve their performances.

7.   ACKNOWLEDGEMENTS

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