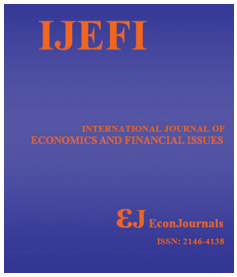

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Empirical Investigation into the Role of Agriculture in Employment Generation in South Africa

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ABSTRACT

Job creation is a primary goal for the South African government, with the agricultural sector seen as crucial for development and employment. However, despite agriculture's vast potential, unemployment remains a significant issue. As a result, research on the relationship between agriculture and employment in South Africa is urgently needed. This study provides empirical evidence on whether agriculture has contributed to job creation in the South African economy. Using secondary data from 1990 to 2023, the analysis applied the Fully Modified Ordinary Least Squares technique and Pairwise Granger causality to examine this relationship. The findings from FMOLS highlight that agriculture significantly contributes to employment generation, as a one-unit increase in agricultural GDP contribution leads to a 13% reduction in the unemployment rate. Furthermore, the results from Granger causality analysis confirmed that no feedback relationship exists between agricultural GDP contribution and unemployment rate in South Africa. The study recommends for policymakers in South Africa and across Africa to boost employment by implementing strategies to enhance the agricultural sector's contribution to GDP, given its significant impact on employment generation. Additionally, substantial investment in agriculture is essential to promote long-term job creation.

Keywords: Agriculture, Employment Generation, Fully Modified Ordinary Least Squares, Pairwise Granger Causality, South Africa
JEL Classifications: Q10, J21, E24, C32

1. INTRODUCTION

South Africa faces longstanding challenges such as unemployment, poverty, stagnant growth, and inequality (Maskaeva and Msafiri, 2021). Efforts to transform the agricultural sector for rural economic development and job creation have had varying success (Geza et al., 2022). However, the persistently high youth unemployment rate is concerning, reaching a record 34.9% in the third quarter of 2021, up 0.5% from the previous quarter. Currently, South Africa has a youth unemployment rate of 66.5%, ranking among the highest globally (Stats SA, 2021).

The South African labour market exhibits bias toward men, with a higher proportion of men employed and a lower unemployment rate compared to women, as reported by Stats SA in 2021 (Stats SA, 2021). In the third quarter of 2021, the unemployment rate among women was 37.3%, while it was 32.9% among men (Herbst, 2005). Despite the majority of South Africa's population being young and female, challenges persist due to the legacy of apartheid, leading to high levels of poverty, unemployment, and limited upward mobility, particularly affecting the "born free" generation (Leibbrandt et al., 2009). Rural areas, marginalized and underdeveloped historically, offer poorer employment prospects, prompting many youths to migrate to cities in search of opportunities (Zizzamia, 2020). Agriculture, viewed as a potential catalyst for rural economic growth, holds promise in creating employment opportunities for rural youth where they reside (Festus et al., 2016).

The agricultural sector in developing nations plays a critical role in driving overall economic growth. It holds significant potential

for creating employment opportunities and alleviating poverty (Osabohien et al., 2019). Historically, there has been limited scholarly attention on how agricultural development influences employment and poverty reduction (Dzingirai, 2021). However, as global poverty and hunger levels rise, there is increasing interest in exploring the connections between agricultural development, job creation, and poverty alleviation (Ayoo, 2022).

Transforming agriculture in developing countries is crucial for boosting their economies and reducing poverty and hunger (Pawlak and Kołodziejczak, 2020). Food system outcomes affect various aspects such as human nutrition, food security, health, environment, society, and economy (Leach et al., 2020). To harness the potential of food systems, creating quality jobs for young people by helping them gain job-relevant skills and enhancing income security is essential (Mwaura and Glover, 2021).

South Africa experienced a dip in primary agricultural employment from 956,000 in the third quarter of 2023 to 920,000 in the fourth quarter, marking a 4% decrease (Agbiz, 2024). This decline was notable in provinces like the Eastern Cape, Western Cape, Gauteng, Mpumalanga, and Limpopo. Despite this, these provinces still contribute significantly to annual agricultural job numbers. Overall, the fourth quarter of 2023 showed an increase compared to 2022 levels, except for Mpumalanga, which saw a slight decrease. Notably, the 920,000 jobs in primary agriculture in the fourth quarter of 2023 represent a 7% increase compared to the previous year and surpass the long-term average of 793,000 agricultural jobs (Agbiz, 2024).

2. LITERATURE REVIEW

The creation of quality jobs in developing nations is a key focus of the Sustainable Development Goals (United Nations, 2015). South Africa, however, has long grappled with persistent challenges of unemployment and poverty (Akwara et al., 2013). The country faces significant hurdles in addressing unemployment and stagnant economic growth, as highlighted by Kimberly in 2019. The unemployment rate of 29% exceeds the acceptable rate of 5% (Statistics South Africa, 2018), a consequence of apartheid policies that restricted job opportunities for the black majority (South Africa History Online, 2019). Even after gaining independence, sufficient job growth has not been realized for those seeking employment.

Kingdon and Knight (2001) suggest that high unemployment levels could lead to negative impacts on economic welfare, production, human capital erosion, social exclusion, crime, and social instability. Simbi and Aliberk (2000), on the other hand, argue that agricultural employment trends may worsen the poverty crisis in South Africa's rural areas. This is supported by Armstrong et al. (2008), who found poverty rates of 54.2% for rural households and 67.7% for individuals in these areas.

While rising unemployment in agriculture can exacerbate poverty in rural areas, some scholars doubt that agricultural employment alone can guarantee a decent living for farm workers. Jacobs (2009) contends that low agricultural wages often fail to lift rural households permanently out of poverty because much of the income is spent on basic food items, leaving them vulnerable to food price fluctuations. Patel et al. (2020) and Pekeur (2010) confirm that farm workers earn the lowest wages among formally employed workers in the country.

2.1. South African Agricultural Sector-Employment

In 1992, there were 1.1 million individuals employed in commercial agriculture, supporting about four million dependents (Newman et al., 1997). By 1996, the number of employees in commercial agriculture dropped to 914,000, with 67% in regular positions and 33% as casual or seasonal workers. Regular employment in commercial farms decreased by 15.7%, from 724,000 in 1988 to 610,000 in 1996. Among the 2.2 million people employed in the former homelands, 37% reported engaging in subsistence farming (Statistics South Africa and National Department of Agriculture, 2000).

Simbi and Aliber (2000) contend that the commercial farming sector lost a significant 140,000 regular jobs between 1988 and 1998, representing a 20% decrease. They also observe a shift from hiring permanent workers to employing more casual labor, leading to less secure and stable jobs. If this trend persists, the already serious issue of rural unemployment will worsen further.

Vink and Kirsten (1999) argue that the decrease in agricultural sector employment in recent decades was worsened by ineffective policies. These policies hindered export opportunities, discouraged the advancement of labour-saving technology, and promoted the adoption of capital-intensive farming methods.

2.2. Recent Studies

Oji-Okoro (2011) analysed the impact of Nigeria's agricultural sector on its economy using a multiple regression model with data from the CBN statistical bulletin and World Bank indicators. The study found a positive correlation between GDP, domestic savings, government spending on agriculture, and foreign direct investment from 1986 to 2007. About 81% of the GDP variation was explained by these factors. To enhance the agricultural sector, the author suggests increased funding for agricultural research at Nigerian universities to boost exports and competitiveness in global markets. Additionally, stable loan policies with reasonable interest rates from the Central Bank of Nigeria (CBN) would benefit farmers.

Osabohien et al. (2019) explored Agriculture Development, Employment Generation, and Poverty Reduction in West Africa. They highlighted the concentration of poverty eradication efforts within the Economic Community of West African States (ECOWAS), which houses over 40% of the global poor, primarily rural farmers reliant on agriculture. Agriculture remains the primary source of employment in West Africa, engaging over 60% of the active labor force. Using the Generalized Method of Moments (GMM) econometric technique over a 17-year period (2000–2016), the study assessed agriculture's potential to reduce poverty by creating jobs. The results indicated that agriculture offers opportunities for the poor to increase earnings and escape poverty, contingent on their human capital development. The

study recommended incorporating effective policies, such as social protection, into agricultural development plans focusing on sustainable land and water management, market access, and food security.

Loizou et al. (2019) explored the significance of agriculture as a developmental tool for regional economies. Their study utilized Input-Output analysis alongside the construction of a regional model to assess the primary sector's contribution to the regional economy and the effects of the Common Agricultural Policy (CAP) reform on the broader local economy. The analysis demonstrated that the new CAP's impact extends beyond the primary agricultural sector, influencing other industries and affecting regional output, employment, and household income both directly and indirectly. Their findings indicated that agriculture serves as a key growth driver across the region, contributing approximately €300 million to the local gross output through fund inflows. Notably, around 14% of this impact was observed in non-agricultural sectors, highlighting agriculture's broader economic influence. This underscores the interconnectedness of agricultural policy and regional economic development.

Asogwa (2021) investigated the impact of agricultural value-added output on employment and regional trade in sub-Saharan Africa. They examined data from 22 countries using a Dynamic panel data Econometric model (GMM) from 2000 to 2017, sourced from World Bank Development Indicators. The study found that increased agricultural value-added output led to a 0.102% reduction in unemployment and a 0.441% increase in regional integration. The long-run elasticity of agro-allied industrialization output to regional trade was 0.56%. These findings support policies promoting agricultural value-added output to enhance regional integration and reverse unemployment trends in the region.

3. METHODOLOGY AND DATA

The section affords information concerning the source of dataset, descriptive statistics, unit root test applying Augmented Dickey Fuller (ADF) test, and the inferential of analytical methods. The analytical technique of inferential statistics includes the Johansen test for assessing cointegration between included variables; The Fully Modified Ordinal Lest Square (FMOLS) Model was applied after the cointegration test. Furthermore, pairwise granger causality test was employed to determine the causality among variables.

3.1. Data Set

The paper utilised annual date of observations from the period from 1990-2023 to explore the impact of Agriculture on Job Creation in South Africa. Statistical data on the sector's contribution to GDP, unemployment rate in South Africa was sourced from Statistics South Africa (Stats SA), the Department of Agriculture, Forestry and Fisheries (DARLRRD) furnished with data for gross capital formation in agriculture and total value of agricultural exports and imports. Lastly, from the World Bank's World Development Indicators Foreign Direct Investment (FDI) data was obtained.

3.2. Model Specification

The aim of the study is to investigate whether agriculture remains a strong force in employment generation in South Africa. Getting an appropriate model for the estimation of the relationship between agriculture and employment generation requires an insight drawing from works such as Thaba et al. (2020) and Aderemi et al. (2020) by adapting their model with the elimination of variables that do not have relevance with this study. Therefore, the functional form of the model could be presented as follows;

$$UEMR = F(AGDP) \quad (1)$$

If model one is written in explicit form in order to include some control variables, the model is in this form

$$UEMR = F(AGDP, GCFA, VAEX, FDI) \quad (2)$$

Model (2) could be linearized by introducing natural log to some of the control variables in identity form.

$$UEMR = \alpha_1 + \beta_1 AGDP_t + \beta_2 LogGCFA_t + \beta_3 LogVAEX_t + \beta_4 FDI_t + \varepsilon_t \quad (3)$$

Meanwhile, UEMR is unemployment level measured by unemployment rate in South Africa. AVGDP is used to proxy the contribution of agriculture and is measured by agricultural value added of GDP. GCFA represent the Gross capital formation in agriculture measured in millions. VAEX is used as a proxy to total value of agricultural imports and exports measured in millions. FDI represent Foreign Direct investment inflows in the country measured in percentage to the GDP. s is error term, t ranges from 1990 to 2023.

4. RESULTS AND DISCUSSION

The section presents and discuss the empirical results. In a sequential way it starts with the descriptive statistics or statistical properties, trailed by the unit root test for stationarity property of time series data. Afterward that, the Johansen Cointegration Test results are presented and discussed, furthermore Fully Modified Least Squares (FMOLS) and pairwise Granger causality test together are deliberated.

In Table 1, the results of the estimated descriptive statistic of the relevant variables were presented as follows; UEMR used to proxy unemployment rate from 1990 to 2023 in South Africa had 25.3% and 33.9% as minimum and maximum values concurrently. The mean value of the data is 25.92% alongside of standard deviation of 25.61%. The implication of this is that the unemployment rate data dispersed moderately from its mean because the standard deviation is less than its mean value. In the same vein, other variables, AGDP, LogGCFA, LogVAEX and FDI had similar features like unemployment rate. Therefore, these variables dispersed moderately from their mean.

One essential preliminary step in estimating relationships among variables in this paper is testing for the stationarity of time series data. This is crucial to prevent misleading or

Table 1: Statistical properties

Properties	UEMR	AGDP	LogGCFA	LogVAEX	FDI
Mean	25.92000	99.45000	15915.65	99268.12	5.020000
Median	25.61000	99.73000	15915.98	99268.25	5.090000
Maximum	33.90000	151.0000	28051.20	193276.4	9.680000
Minimum	16.50000	47.90000	3780.100	5260.100	0.500000
Std. Dev.	6.513928	2.784105	1.603490	0.868325	1.041785
Skewness	0.068181	0.620194	0.430374	0.350617	0.601640
Kurtosis	6.322489	5.511654	2.445134	1.705185	2.256032
Jarque-Bera	37.18827	19.38347	1.502116	2.650261	1.690287
Probability	0.000000	0.000051	0.471134	0.233897	0.038702
Sum	244.2150	756.3564	105.0005	79.86062	666.0609
Sum Sq. Dev.	1488.831	412.6136	106.0518	0.187481	28.21239
Observations	33	33	33	33	33

Source: Authors' computation (2024)

Table 2: Unit root test

Variables	ADF test					Prob.	Decision
	Level	Prob	1st Diff.	Prob.	2nd Diff.		
UEMR	2.84352	1.0000	−1.811664	0.3113	6.21108	0.0000	I (2)
AGDP	1.977242	0.3109	5.55054	0.0000			I (1)
LogGCFA	1.51142	0.4770	5.20310	0.0000			I (1)
LogVAEX	2.61420	0.0841	0.791659	0.0520			I (1)
FDI	1.345040	0.5936	2.322456	0.1725	9.42289	0.0000	I (2)
Variables	**PP test**					**Prob.**	**Decision**
	Level	**Prob.**	**1st Diff.**	**Prob.**	**2nd Diff.**		
UEMR	7.2336	1.0000	1.93766	0.3113	8.9132	0.0000	I (2)
AGDP	−2.371956	0.1578	−5.703532	0.0001			I (1)
LogGCFA	1.404285	0.5664	6.532478	0.0000			I (1)
LogVAEX	1.204553	0.0659	0.79246	0.0435			I (1)
FDI	1.691017	0.4254	2.187524	0.2113	6.74379	0.0000	I (2)

Source: Authors' computation (2024)

Table 3: Johansen Cointegration Test (Trace Statistics) and (Maximum Eigen value)

Hypothesized No. of CE (s)	Eigenvalue	Trace statistic	P-value	Max-Eigen statistic	P-value
None*	0.982471	111.3348	0.0000	112.8012	0.0000
At most 1	0.595651	29.55859	0.7232	22.26173	0.0757
At most 2*	0.479562	51.29185	0.0143	16.16072	0.1923
At most 3	0.222594	8.133435	0.3534	7.122655	0.3672

Source: Authors` computation (2024)

Table 4: Effect of agriculture on employment levels in South Africa

Dependent variable: UEMP			
Regressors	**Coefficient**	**T-statistics**	**P value**
AGDP	−1.134128	3.764558	0.0210
LogGCFA	3.588692	3.985094	0.0351
LogVAEX	−104.7185	2.818977	0.0085
FDI	2.832489	1.251006	0.2431
R-Squared	0.576571		

Method: Fully Modified least squares (FMOLS)
Source: Authors' computation (2024)

unreliable results that can arise from improperly handled time series analysis. To address this, the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied to evaluate the stationarity of the data series as shown in Table 2 above. The estimated results indicate that UEMR and FDI are become stationary after second difference of integration. AGDP, LogGCFA and LogVAEX are become stationary after first difference of integration. The implication of this is that all the data series in this study are not free from the problem of unit root.

The detection of a unit root in the series used for this study prompted a test for long-term equilibrium relationships between the dependent and explanatory variables in South Africa, utilizing the Johansen Cointegration Test. The results in Table 3 confirm the presence of up to three cointegration vectors among these variables, the trace test reveals one cointegration link at a 5% significance level indicating a long-term equilibrium relationship exists within the model.

Table 4 presents the long-run estimated results examining the relationship between agricultural gross domestic product (AGDP) and employment levels in South Africa, utilizing the Fully Modified Ordinary Least Squares (FMOLS) technique. Notably, AGDP and LogVAEX align with theoretical expectations, as indicated by their negative signs. The R-squared value of 0.576 indicates that AGDP, LogGCFA, LogVAEX, and FDI

Table 5: Pairwise Granger Causality Test

Null hypothesis	F-Statistic	Prob.	Decision	Causality
AGDP does not Granger Cause UEMR	0.06273	0.8211	Reject	
UEMR does not Granger Cause AGDP	0.51720	0.6437		
LogGCFA does not Granger Cause UEMR	0.18810	0.8713	Reject	
UEMR does not Granger Cause LogGCFA	1.02393	0.4381		
LogVAEX does not Granger Cause UEMR	0.46710	0.7261	Reject	Unidirectional
UEMR does not Granger Cause LogVAEX	4.82727	0.0119	Accept	
FDI does not Granger Cause UEMPR	0.31302	0.6719	Reject	
UEMR does not Granger Cause FDI	0.23352	0.7114	Reject	
LogGCFA does not Granger Cause AGDP	2.49227	0.0719	Reject	
AGDP does not Granger Cause LogGCFA	1.52348	0.3200	Reject	
LogVAEX does not Granger Cause AGDP	8.66082	0.0023	Accept	Unidirectional
AGDP does not Granger Cause LogVAEX	0.72015	0.4560	Reject	
FDI does not Granger Cause AGDP	0.83125	0.3224	Reject	
AGDP does not Granger Cause FDI	0.54531	0.3382	Reject	
LogVAEX does not Granger Cause LogGCFA	2.16923	0.1475	Reject	
LogGCFAdoes not Granger Cause LogVAEX	1.73033	0.1581	Reject	
FDI does not Granger Cause LogGCFA	2.24232	0.1401		
LogGCFA does not Granger Cause FDI	0.51265	0.5567	Reject	
FDI does not Granger Cause LogVAEX	2.75971	0.0510	Reject	Unidirectional
LogVAEX does not Granger Cause FDI	3.70202	0.0219	Accept	

Source: Authors` computation (2024)

Table 6: Diagnostic tests

Tests	Statistics/ P-value	Decision
Durbin Watson	1.99	No serial correlation
Breusch-Godfrey test	0.001 (0.971)	No autocorrelation
White's test (Heteroskedasticity)	22 (0.399)	No heteroskedasticity
Jarque-Bera (Normality)	0.95 (0.623)	Normal distribution

Values in parentheses represents the *P* values

Source: Authors` computation (2024)

collectively account for approximately 58% of the systematic variations in South Africa's unemployment rate, suggesting the model is suitable for this analysis. Furthermore, agricultural GDP contribution as a percentage is shown to have a significant and negative relationship with unemployment, with a 1% increase in agricultural GDP reducing the unemployment rate by 13%. This result aligns with findings from Mitullah et al. (2017) in Kenya and Frija et al. (2020) across 14 African nations, In contrast, Girard (2017) and Ramakgasha et al. (2024) for South Africa and Behera (2016) for India found differing results, likely due to variations in estimation methods and data scope. Gross capital formation in agriculture, however, shows a positive and significant relationship with the unemployment rate, suggesting it has not effectively contributed to employment generation in South Africa. Similarly, the total value of agricultural imports and exports has a significant negative relationship with unemployment, while FDI inflows show an insignificant positive relationship with unemployment in the country.

After establishing a cointegration relationship among the variables of interest, the authors proceeded to analyze Granger causality using a Pairwise Granger causality approach. Notably, the results in Table 5 indicate the following findings. There is no Granger causality between the agricultural GDP contribution and the unemployment rate in South Africa. However, a unidirectional causal relationship flows from the unemployment rate to the total value of agricultural imports and exports. Additionally, there is no feedback relationship between the unemployment rate and FDI inflows, nor between Gross capital formation in agriculture and the agricultural GDP contribution. Moreover, the total value of agricultural imports and exports Granger causes agricultural GDP contribution, as does the relationship between the total value of agricultural imports and exports and FDI.

Finally, the regression was subjected to several diagnostic tests, which included the Durbin Watson for serial correlation, Breusch-Godfrey test for autocorrelation, white test for heteroskedasticity and Jarque Bera for normality test. The results of Durbin Watson (DW) test as presented in Table 6, shows that regression does not suffer from serial correlation as their DW values are close to 2, which is 1.99. The Breusch-Godfrey serial correlation test indicates that the estimated model does not suffer from serial correlation as their value of 0.971 are above 0.05 significance level. Lastly, the Jarque Bera test for normality reveals that residuals are normally distributed since P-value of 0.623 exceeds 0.05 significance level.

5. CONCLUSION AND RECOMMENDATION

This study empirically examines the role of agriculture in generating employment within the South African economy. Using secondary data from 1990 to 2023, the analysis employed the Fully Modified Ordinary Least Squares technique and Pairwise Granger causality to assess the data. The findings highlight that agriculture significantly contributes to employment, as a one-unit increase in agricultural GDP contribution leads to a 13% reduction in the unemployment rate. However, gross capital formation in agriculture does not appear to influence employment generation. Similarly, the total value of agricultural imports and exports has a significant negative relationship with unemployment, while

Foreign Direct Investment (FDI) has an insignificant positive relationship with the unemployment rate in South Africa. The Granger causality analysis further reveals no feedback relationship between agricultural GDP contribution and unemployment rate. A one-way causal link exists from the unemployment rate to the total value of agricultural imports and exports, while unemployment and FDI lack a feedback relationship. The same applies to gross capital formation in agriculture and agricultural GDP contribution. Additionally, the total value of agricultural imports and exports Granger-causes agricultural GDP contribution, as does the relationship between agricultural imports and exports and FDI.

Based on these findings, this study offers recommendations for policymakers in South Africa and across Africa. To boost employment in South Africa, policymakers should implement strategies to enhance the agricultural sector's contribution to GDP, given its significant impact on employment generation. Additionally, substantial investment in agriculture is essential to promote long-term job creation.

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