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Full-Length Research Paper

The Role of Public Expenditure, Labour and Producer Price in Forecasting Cocoa Production in Nigeria Using ARIMAX Model

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ABSTRACT: The study analyzed the role of public expenditure, labour and producer price in predicting annual cocoa production in Nigeria using ARIMAX model. Secondary data on annual cocoa production, public expenditure, labour and producer price for the period of 1981 – 2016 was used for the study. Data was analyzed using descriptive and inferential statistics. The result of Augmented Dickey- Fuller test showed that all the variables (annual cocoa production, public expenditure, labour and producer price) were stationary at first difference. The findings revealed that ARIMAX 1,1,2 was the best model to forecast annual cocoa production in Nigeria, and further indicated that public expenditure and labour had negative effect on annual cocoa production in Nigeria during the period under study while producer price two years' prior, had positive effect. The result of the forecast showed a gradual upward trend in annual cocoa production during the period of 2017 to 2031. The result further showed that the mean of annual cocoa production forecast for the period under study was statistically significant different at 1% probability level from the mean of the present value, and also revealed that the forecast for 2031 was higher by about 61.06% compared to the value at 2016.

Keywords: Annual cocoa production, forecast, autoregressive (AR), moving average (MA)

INTRODUCTION

Cocoa has been a major source of income for many Nigerians and a major source of foreign exchange earnings for the country. However, its production has been experiencing a declining trend in recent times (Adeniyi and Ogunsola, 2014). According to Offor *et al.* (2017), world data showed that about 2.5 million producers of cocoa are small holder farmers that produced 4.1 million metric tons of cocoa beans in more than 50 countries for a total export value of 8.4 billion US$ in 2012. Furthermore, Tothmihaly (2017) stated that, in the new millennium, the soaring economic growth in Asia and Africa, the increase of world trade and globalization has boosted the global demand for cocoa. However, world cocoa supply could barely keep up with demand. According to Olufikayo (2019), the global cocoa market value will be worth US$14.572 billion by 2026 from US$10.14 billion in 2015, due to the rising inclination of younger consumers towards chocolate across the globe. Cocoa is the leading agricultural export of the country and Nigeria is currently the world's seventh largest producer of Cocoa, after Ivory Coast, Ghana, Indonesia, Ecuador, Cameroon and Brazil, and the third largest exporter in the world, after Ivory Coast and Ghana (Hütz-Adams *et al.,* 2016). According to Nkang *et al.* (2009) and Industry ARC (2019), in terms of foreign exchange earnings, no single agricultural export commodity has earned more than cocoa. With respect to employment, the cocoa sub-sector still offers quite a sizeable number of employments, both directly and indirectly. In addition, it is an important source of raw materials, as well as source of revenue to governments of cocoa producing states. Thus, the high unemployment and poverty levels have prompted the government to look again at cocoa as a feasible alternative to increase the number of jobs and enhance the economy (Industry ARC, 2019). It is widely acknowledged in Nigeria that there is under-investment in agriculture while studies have highlighted a strong relationship between cocoa output, farm size and access to finance (Adelodun, 2017). According to Bamidele (2016), public expenditure, which serves as the bed rock of financing for the agricultural sector has consistently fallen short of the public expectation. Spending on agriculture in Nigeria is exceedingly low. According to the study, the expenditure on agriculture was highest in 1983 (12.6%) and lowest in 1992 (1%). The country has however, the potentials to return to its previous position if adequate attention is given to agricultural growth policy through finance and the provision of rural infrastructure. Adelodun (2017) stated that cocoa farm is prone to disease and maintenance of cocoa farms is labour intensive and it requires the use of expensive chemicals to keep black pod disease at bay. Labour constitute the highest cost of cocoa production and that it would likely determine the viability and profitability of cocoa production. According to Nkwi *et al.* (2021), there is a positive and statistically significant relationship between annual cocoa production and producer price at 1% level, and it was concluded that a sustained increase in cocoa producer price, export and area harvested of cocoa will lead to increased cocoa output.

According to Ajetomobi and Olaleye (2019), cocoa production forecasting is important to the Nigerian Agricultural Transformation Agenda (ATA), now Agriculture Promotion Policy (APP), as there exist many institutions that rely on forecasts in providing capital for crop production. (Choudhury and Jones, 2014). While, Pankratz (1983) stated that Box-Jenkins ARIMA models are especially suited to short-term forecasting of either discrete or continuous data that are measured at equally spaced, discrete time intervals. Though the ARIMAX model has not been widely used in terms of forecasting in the economic field, it proves good to predict variables such as production, that are affected by some other variables (Anggraeni *et al.,* 2017).

Statement of the problem

Cocoa was a major foreign exchange earner for Nigeria in the 1950s and 1960s, and in 1970 the country was the second largest producer in the world but in the 1970s and 1980s, Nigeria's share of world output declined (FAOSTAT, 2019). Also, less than 4% of total federal expenditure was allotted to agriculture during 1980 to 2010 which dropped to 3.2% in 2018. This contradicts the self-acclaimed will-power of the government to diversify the economy using agriculture (Bamidele, 2016; Ibirogba, 2018). Again, cocoa farm is labour intensive and demand for labour becomes most alarming particularly at very short wet season, a slight delay will be costly (Obike *et al.,* 2016). Furthermore, cocoa prices had a drop of more or less than 30% between 1997 and 1999, the price of cocoa was around US$ 0.75/lb (N89,687/tonne) in 1997 and 1998, went down to US$ 0.5/lb (N85,766/tonne) in 1999 and still lost 20% in 2000 (Adelodun, 2017; FAOSTAT, 2019). This in turn led to mass exit of cocoa farmers into more prosperous industrial sector. Also, Nigeria with a potential to produce over 600,000 tons of cocoa per year, production only amounted to 225,000 tons in 1999 and 298,029 tons in 2016, and cocoa yield declined to less than 0.3 tons per hectare the same year (Adelodun, 2017; FAOSTAT, 2019). However, the problem is that most individual investors and even governments have only a vague idea of the potential of the industry and as such are sometimes slow in committing investment funds into the sub-sector (Nkang *et al.,* 2009).

The study tends to answer the following research questions:

(I) What is the effect of public expenditure, labour and producer price on cocoa production in Nigeria?

(II) How will the output of cocoa be in 2017 – 2031?

METHODOLOGY

The study was conducted in Nigeria. Nigeria, officially known as the Federal Republic of Nigeria is one of the largest countries in Africa and lies wholly within the tropics along the Gulf of Guinea on the western coast in Sub- Saharan Africa. Nigeria lies between latitudes 4^0 and 14^0 North of the equator and between longitudes 3^0 and 15^0 east of the Greenwich. The country features 36 states and its Federal Capital Territory, which is known as Abuja. The country of Nigeria features over five hundred different ethnic groups, many different languages, and declared its independence from the United Kingdom on October 1, 1960 (Worldometers, 2019). Nigeria has a total land area of 923,768.622 square kilometers or about 98.3 million hectares, and population of 151.874 million people as of July 2010 (estimate) (Udah et al., 2015). The current population of Nigeria is 200,512,373 (about 200.512 million) as of Monday, June 3, 2019, based on the latest United Nations estimates, ranking 7th in the world (Worldometers, 2019).

Method of data collection

Data for this study was collected from secondary sources. For the purpose of the empirical analysis, annual time series data spanning from 1981 to 2016 was used. The data for annual cocoa production and producer price was sourced from Food and Agriculture Organization Statistic (FAOSTAT, 2019), public expenditure on agriculture (used as proxy for public expenditure on cocoa) was sourced from Central Bank of Nigeria Statistics Data Base (CBN, 2020), and labour on agriculture (used as proxy for labour on cocoa production) was sourced from National Bureau of Statistics – Nigeria (NBS, 2020).

Data analysis techniques

Data collected for this study was analyzed using both and descriptive statistics and inferential statistics. Augumented Dickey-Fuller (ADF) test was used to test the stationarity of the data collected for this study. The effect of public expenditure, labour and producer price on cocoa production in Nigeria, and the forecast of annual cocoa production for 2017 – 2031 were analyzed using ARIMAX model.
The ARIMAX (p,d,q) model is expressed as;

$$DACP_t = \phi_0 + \phi_1 DACP_{t-1} + \beta_1 DPEX_t + \beta_2 DLB_t + \beta_3 DPP_t + \xi_t + \theta_1 \epsilon_{t-6} + \theta_2 \epsilon_{t-11}$$

Where,

ACP= Annual cocoa production in Nigeria (tonne)
PEX=Public expenditure on cocoa (Naira)
LB=Labour (man-day)
PP=Producer price (Naira/tonne)
D=First difference
t=2016
$\beta_1 - \beta_3$=The coefficients associated with the respective variables
ϕ_i = The *i*th autoregressive parameter
θ_i = The *i*th moving average parameter
ξ_t = White noise disturbance on the model
p denotes the number of lagged values of ACP and *q* denotes the number of lagged values of the error term.

To determine the effect of public expenditure, labour and producer price on annual cocoa production in Nigeria, the level of significance of the variables, signs of the coefficients and Durbin-Watson (DW) estimates were considered in the estimation.

RESULTS AND DISCUSSION

Unit root test - Augmented Dickey- Fuller (ADF)

Table 1 shows the preliminary investigation of the properties of the variables before analysis using Augmented Dickey- Fuller (ADF). The result of the ADF test on Annual cocoa production, Public expenditure, labour and producer price, indicated that all the variables were non-stationary at level but were stationary at first difference. This imply that the level form of these variables exhibited random walk or have multiple means of covariance. Therefore, the first difference of these variables would be used for the analysis.

Effect of public expenditure, labour and producer price on annual cocoa production and forecast of annual cocoa production in Nigeria using ARIMAX model

To determine the effect of public expenditure, labour and producer price on annual cocoa production (ACP) and consequently forecast ACP in Nigeria using ARIMAX model, the best ARIMA model which formed the basis for the chosen ARIMAX model was selected following four (4) basic steps.

ARIMA model selection

Step 1: Identification

Figure 1 shows the correlogram of ACP, which is the plot of Autocorrelation Functions (ACF) and Partial Autocorrelation Functions (PACF) against lag lengths of ACP. The ACF pattern showed gradual decay while the PACF pattern showed lag 1 statistically significant and then cuts off at lag 2, indicating non-stationarity. The first difference of ACP (DACP) was found to be stationary (Figure 2). From the correlogram of DACP, both ACF and PACF patterns showed good exponential decay and a damp sine wave patterns, indicating stationarity of the series and ARIMA patterns. For the ACF, lags 1, 4, 11 and 12 were statistically significant (indicating moving average), while for the PACF, lags 1 and 11 were also statistically significant (indicating autoregressive). To determine the ARIMA model, statistically significant lags had to be captured in the model, though parsimony was key in the identification of the tentative ARIMA models. Four (4) tentative models were identified: ARIMA 1,1,1; ARIMA 1,1,11; ARIMA 11,1,1 and ARIMA 11,1,11.

Step 2: Estimation

Table 2 shows the summary of the estimate of each of the four tentative models based on the criteria for choosing the most appropriate model. ARIMA 1,1,11 chosen as the most appropriate model based on its lowest AIC, lowest BIC, lowest Sigma square (volatility) and highest adjusted R^2.

Table 1: Unit root test - Augmented Dickey- Fuller (ADF) test.

Variable	Level		First difference	
	t-Stasistic	Probability	t-Stasistic	Probability
ACP	-1.730573 (-3.639407)	0.4074	-8.755483*** (-3.639407)	0.0000
PEX	-0.024511 (-3.632900)	0.9498	-5.554298*** (-3.639407)	0.0001
LB	2.034976 (-3.646342)	0.9998	-8.983757*** (-3.639407)	0.0000
PP	-1.553066 (-3.653730)	0.4944	-8.455665*** (-3.639407)	0.0000

Note: (***) denote rejection of the null hypothesis at 1% significant level. Result is based on Mikinon (1996) one sided p-value. In parenthesis () is t-critical value of the corresponding t-statistics value. ACP = Annual cocoa production; PEX = Public expenditure; LB = Labour; PP=Producer price.
Source: Author's computation (2021).

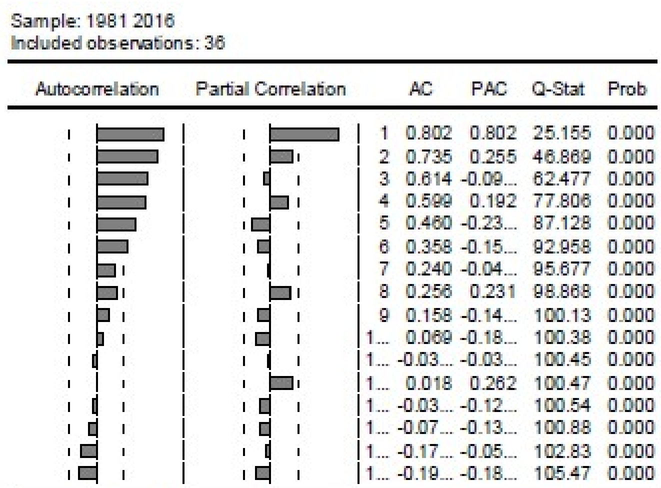


Figure 1: Correlogram of Annual Cocoa Production (ACP)
Source: Author's computation (2021).

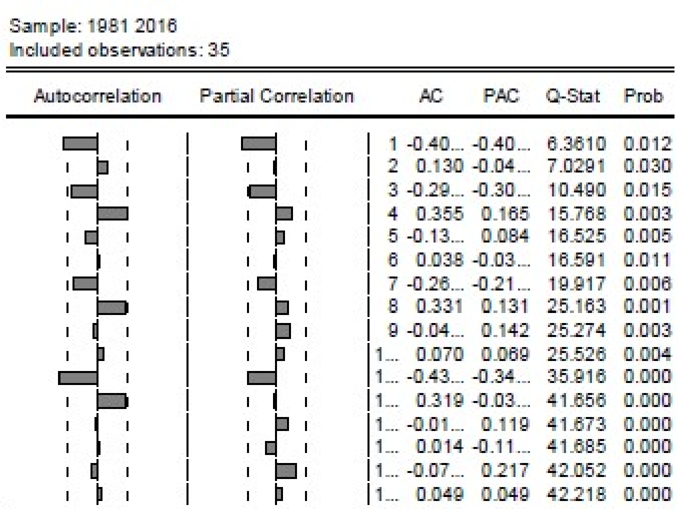


Figure 2: Correlogram of First Difference of Annual Cocoa Production (DACP)
Source: Author's computation (2021).

Table 2: Summary of Tentative Models for ARIMA (p,d,q) for DACP.

Determinant	ARIMA 1,1,1	ARIMA 1,1,11	ARIMA 11,1,1	ARIMA 11,1,11
Sigma Sq.	2.39E+09	1.14E+09	1.78E+09	1.49E+09
Adj. R^2	0.11	0.57	0.33	0.44
AIC	24.67	24.37	24.45	24.58
BIC	24.84	24.55	24.63	24.76

Source: Author's computation (2021)

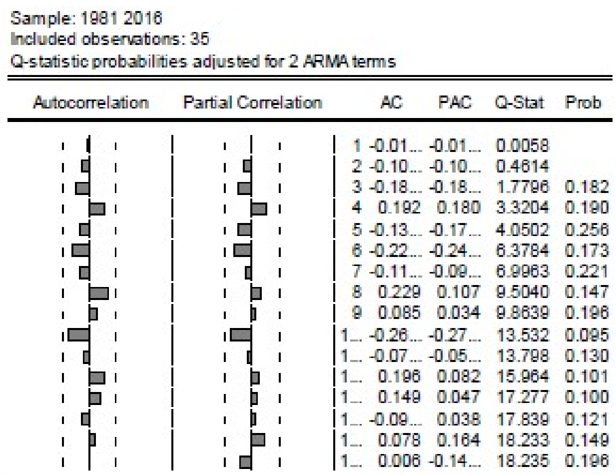


Figure 3: Correlogram of Residual (Q-statistics)
Source: Author's computation (2021).

Table 3: ARIMA 1,1,1 in-sample (Expost) forecast of ACP (2010 – 2016).

Year	ACP (tonnes)	ACPF (tonnes)
2010	399200	425839.0
2011	391000	363599.6
2012	383000	373929.1
2013	367000	362279.2
2014	329870	347292.0
2015	302066	336864.8
2016	298029	322722.8

Source: Author's computation (2021).

Step 3: Diagnostic checking

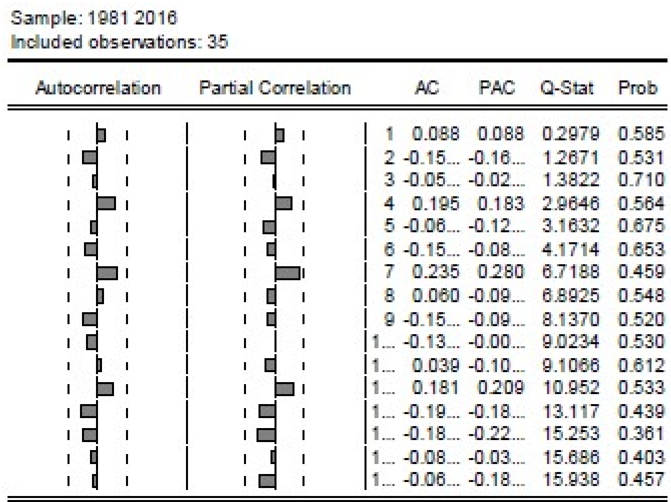
Figure 3 shows the correlogram of residual (Q-statistics) which was plotted to perform diagnostic check to be certain that there is still no information left yet uncaptured. The correlogram was flat, that is, all the lag structures were within the 95% confidence interval or standard error bound. This indicated that all information has been captured, so the forecast was based on this model. The Ljung-Box test was performed, which is the test for autocorrelation in the ARIMA 1,1,11. Figure 4 shows the correlogram of residual squared error (Ljung-Box test), which revealed that from lag 1 to lag 16, the probability values were higher than 5%, indicating that there was no autocorrelation in this model. This imply that the model is good.

Step 4: Forecast

To know whether the forecast is good or not, an in-sample (expost) forecast of ACP was carried out for the year 2010 – 2016 using the ACP data from 1981 – 2009 (Table 3), and the graph of the forecasted series (ACPF) against the actual series (ACP) was plotted (Figure 5). From Figure 5, there was an intersection between 2010 – 2011, followed by close values in 2012 and another around 2013. This indicated that the ARIMA 1,1,11 model which is of order p,d,q (ARIMA 1,1,1), is a good model. So, the ARIMAX model will be based on this model.

ARIMAX model selection

To choose a good ARIMAX model, the four (4) steps were also followed with the chosen ARIMA 1,1,11 model as the base model.



Sample: 1981 2016
Included observations: 35

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.088	0.088	0.2979	0.585
		2	-0.15...	-0.16...	1.2671	0.531
		3	-0.05...	-0.02...	1.3822	0.710
		4	0.195	0.183	2.9646	0.564
		5	-0.06...	-0.12...	3.1632	0.675
		6	-0.15...	-0.08...	4.1714	0.653
		7	0.235	0.280	6.7188	0.459
		8	0.060	-0.09...	6.8925	0.548
		9	-0.15...	-0.09...	8.1370	0.520
		1...	-0.13...	-0.00...	9.0234	0.530
		1...	0.039	-0.10...	9.1066	0.612
		1...	0.181	0.209	10.952	0.533
		1...	-0.19...	-0.18...	13.117	0.439
		1...	-0.18...	-0.22...	15.253	0.361
		1...	-0.08...	-0.03...	15.686	0.403
		1...	-0.06...	-0.18...	15.938	0.457

Figure 4: Correlogram of Residual Squared Error (Ljung-Box test)
Source: Author's computation (2021).

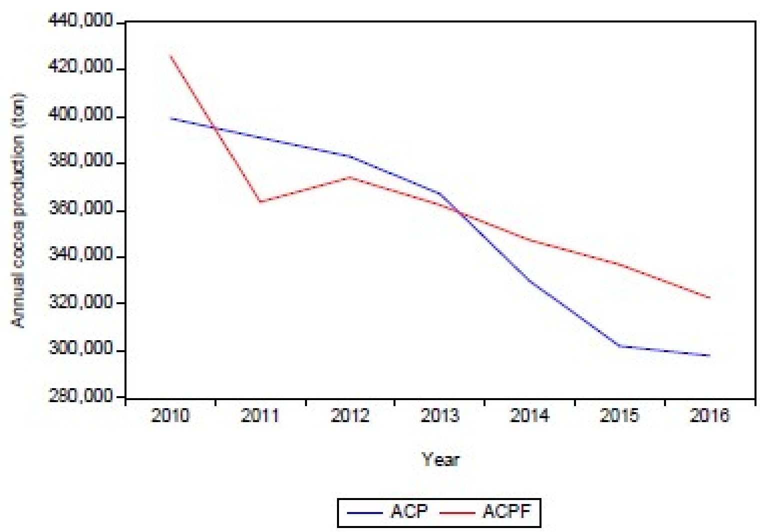


Figure 5: Graph of ACPF against ACP (2010 – 2016) based on ARIMA 1,1,11
Source: Author's computation (2021)

Step 1: Identification

The Augmented Dickey- Fuller (ADF) test (Table 1) already established that Public expenditure (PEX), Labour (LB) and Producer price (PP) were non-stationary at level but were stationary at first difference, that is, DPEX, DLB and DPP were stationary series. To identify the ARIMAX pattern for the differenced model, parsimony is also important here. Figure 6 shows Correlogram of Residual (Q-statistics) of ARIMAX 1,1,11 for DACP to check whether there is any information left uncaptured or statistically significant in the ACF and PACF of the ARIMAX model. The result showed that lag 6 was significant in both ACF and PACF, hence, lag 6 has to be include in the model. The tentative models were, ARIMAX [1,6,]1,11 *i.e.* AR (1) AR (6) MA (11) and ARIMAX 1,1, [6,11] *i.e.* AR (1) MA (6) MA (11).

Step 2: Estimation

Table 4 shows the summary of estimation of the two tentative models to choose the best estimation model. ARIMAX 1,1, [6,11] was chosen as the model of best fit based on its lower AIC and lower BIC.

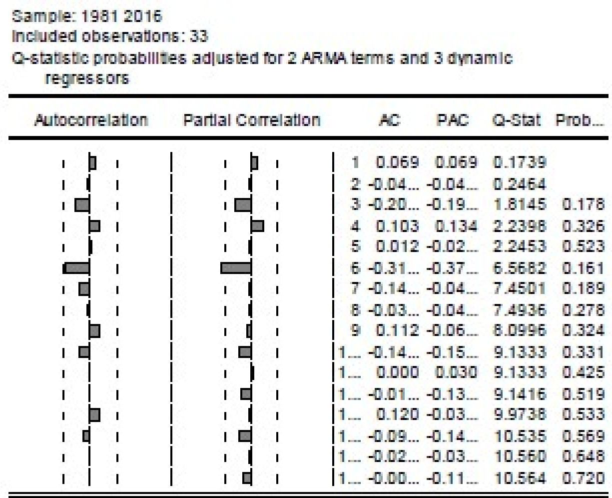


Figure 6: Correlogram of Residual (Q-statistics) of ARIMAX 1,1,11 for DACP
Source: Author's computation (2021).

Table 4: Summary of ARIMAX (p,d,q) for DACP.

Determinant	ARIMAX AR(1) AR(6) MA(11)	ARIMAX AR(1) MA(6) MA(11)
Sigma Sq.	8.06E+08	1.01E+09
Adj. R^2	0.66	0.56
AIC	24.31	24.26
BIC	24.67	24.62

Source: Author's computation (2021).

Table 5: Effect of public expenditure, labour and producer price on ACP based on ARIMAX 1,1,2.

Variable	Coefficient	t-Statistic	Probability
C	21318.89	4.052973	0.0004
DPEX	-2.15E-09	-3.436455***	0.0021
DLB	-0.011353	-2.491562**	0.0197
DL2PP	0.141707	0.557214	0.5823
AR(1)	-0.823614	-5.199750	0.0000
MA(6)	-0.522987	-1.259230	0.2196
MA(11)	-0.463172	-1.086798	0.2875
SIGMASQ	1.01E+09	2.061655	0.0498

R^2 = 0.671786; AIC = 24.25754
Adjusted R^2 = 0.579886; BIC = 24.62033
Note: (*** and **) denote 1% and 5% significant level respectively. DPEX = First difference of Public expenditure; DLB = First difference of Labour; DL2PP = First difference of Producer price lagged two periods.
Source: Author's computation (2021).

The model of choice in order p,d,q, is given as ARIMAX 1,1,2.

Effect of public expenditure, labour and producer price on annual cocoa production

Table 5 shows the result of the effect of public expenditure (PEX), Labour (LB) and Producer price (PP) on Annual Cocoa Production (ACP) based on ARIMAX 1,1,2. The result indicated that PEX was significant at 1% level with the coefficients -2.15E-09 and LB was significant at 5% level with the coefficients -0.011353, while PP lagged two periods (two years ago) was not statistically significant with the coefficient 0.141707. Coefficients of PEX and LB were found to be negative,

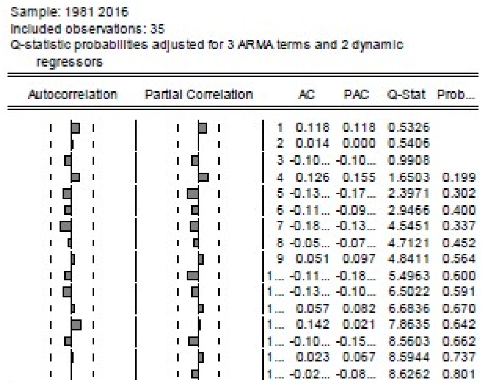


Figure 7: Correlogram of Residual (Q-statistics) of ARIMAX 1,1, [6,11] for DACP
Source: Author's computation (2021).

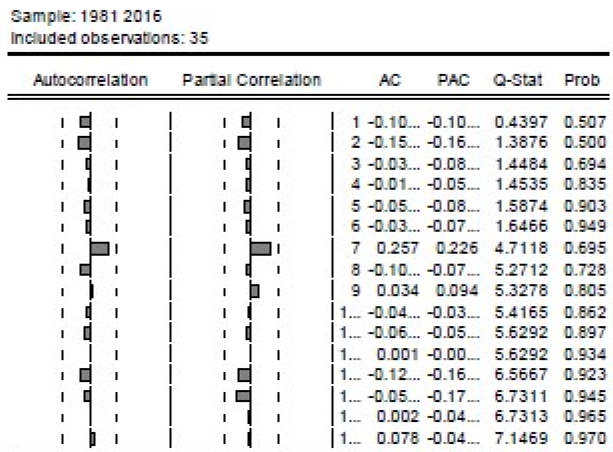


Figure 8: Correlogram of Residual Squared Error (Ljung-Box Test)
Source: Author's computation (2021).

which indicated that PEX and LB had negative effect on ACP in Nigeria during the period under study while the coefficient of PP lagged two periods is positive, indicating a positive effect on ACP. The result on PEX is in agreement with Bamidele (2016) which stated that public expenditure, which serves as the bed rock of financing for the agricultural sector in Nigeria is exceedingly low, while the result is contrary to Idoko and Jatto (2018) which revealed that there exist a positive and significant relationship between government expenditure on agriculture and economic growth in Nigeria.

Furthermore, the result on LB is in agreement with Akanni and Dada (2012) which found out that labour has negative implication on the level and quality of farm output among small holder farmers of cocoa. Again, the result on LB is at variance with Panwal (2017) which stated that labour has a positive economic consequence in farm production of small-scale farming communities. Lastly, the result on PP agrees with Idowu *et al.* (2007) and Nkwi *et al.* (2021) which found a positive effect of producer price on cocoa production in Nigeria.

Step 3: Diagnostic checking

Figure 7 shows the correlogram of residual (Q-statistics) of ARIMAX 1,1, [6,11] for DACP which was plotted to perform diagnostic check to be certain that there is still no information in ARIMAX 1,1, [6,11] that is left uncaptured. The result showed that both ACF and PACF were "flat", that is, all the lag structures lie within the 95% confidence interval. This indicated that all the information has been captured by the model. Hence, the forecast will be based on this model.

Figure 8 shows the result of Correlogram of residual squared error (Ljung-Box test) which was performed to

Table 6: In-sample (Expost) Forecast for 2010 – 2016 based on ARIMAX 1,1,2.

Year	ACP (tonnes)	ACPF (tonnes)
2010	399200	384019.0
2011	391000	345841.1
2012	383000	340894.4
2013	367000	343677.3
2014	329870	349658.6
2015	302066	316489.9
2016	298029	338694.4

Source: Author's computation (2021)

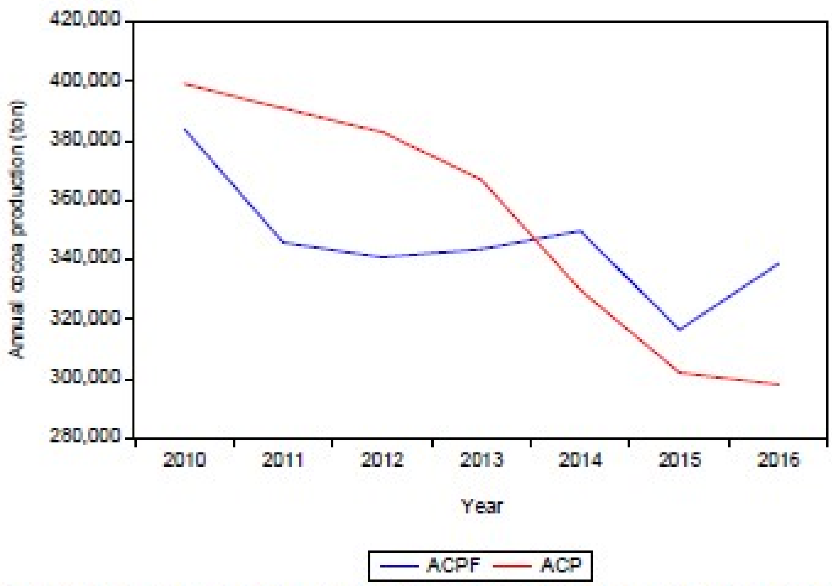


Figure 9: Graph of ACPF against ACP for 2010 – 2016 based on ARIMAX 1,1,2
Source: Author's computation (2021)

check for possible autocorrelation among the residuals of the model. It was found that from lag 1 to lag 16, the probability values were higher than 5%, which indicated that there is no autocorrelation in the chosen model. This means that the model is good.

Step 4: Forecasting

To check the reliability of the forecast values based on the selected model, an in-sample (expost) forecast of ACP was performed for the year 2010 – 2016 (Table 6). Then, forecast series (ACPF) was plotted against the actual series (ACP) in a graph and comparison was made to know how well the series has been predicted (Figure 9). The result indicated that the values of ACPF and ACP were close from 2010 – 2012, followed by an intersection between 2013 – 2014, and the values from 2015 – 2016 were also close. This indicated that the selected model (ARIMAX 1,1,2) is good and the forecast of ACP for 2017 – 2031 was based on this model.

Forecasting annual cocoa production (ACP) for 2017 – 2031 using ARIMAX model

To forecast ACP for 2017 – 2031 using ARIMAX 1,1,2 model, values for PEX, LB and PP were extrapolated for the years 2017 – 2031 using Excel worksheet. Figure 10 shows the ex-ante (out of sample) forecast of ACP for 2017 – 2031 based on ARIMAX 1,1,2. The result showed a gradual upward trend in ACP between 2017 – 2020 which declined between 2021 – 2024. 2025 indicated a rise in ACP which continued gradually to 2031. Furthermore, the result in Table 7 shows that the mean of ACP forecast for the period under study is 335958.3 ton which is statistically significant different at 1% probability level ($-4.538 \leq t \leq 0.000$) from the mean of the present ACP (299835.1 ton). The result also revealed that ACP forecast for 2031 (480000 ton) was higher compared to the ACP value at 2016 (298029 ton) by about 61.06%. This result is contrary to Ajetomobi and Olaleye (2019) which forecast Nigeria cocoa production between 2018

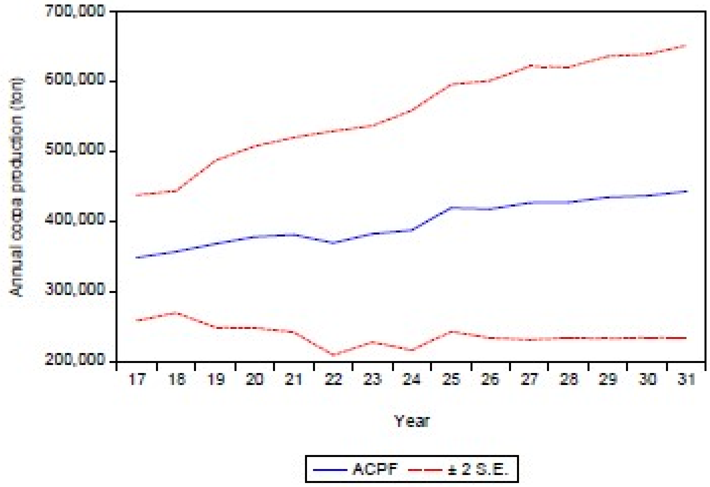


Figure 10: Ex-ante Forecast of ACP for 2017 – 2031 based on ARIMAX 1,1,2

Table 7: Descriptive statistics for actual ACP and ACP forecast.

	ACP (tonne)	ACPF (tonne)
Mean	299835.1	335958.3
Median	320500.0	361374.5
Maximum	485000.0	485000.0
Minimum	140000.0	140000.0
Std. Dev.	92561.89	98146.46
Skewness	-0.281409	-0.565568
Kurtosis	2.152104	2.366728
Jarque-Bera	1.553538	3.571069
Probability	0.459889	0.167707
Sum	10794065	17133899
Sum Sq. Dev.	3.00E+11	4.82E+11
Observations	36	51

$-4.538 \leq t \leq 0.000$ Source: Author's computation (2021).

and 2025 using ARIMA 1,1,0 model will fall by more than 20% by 2025 in comparison to the 2017 value. Likewise, the result is at variance to Kozzicka, *et al.* (2018) which used ARIMA 1,0,1 to forecast cocoa yield in Nigeria for 2050 and their findings detected no trend in forecasted yield values which stabilized on the level of 0.32 tons/ha.

Conclusion

The study was carried out to analyze the role of public expenditure, labour and producer price in forecasting annual cocoa production in Nigeria using ARIMAX model. The study revealed that ARIMAX 1,1,2 is the model of best fit to forecast annual cocoa production in Nigeria. The study also indicated that public expenditure and labour had negative effect on annual cocoa production in Nigeria while producer price lagged two periods had positive effect during the period under study. The result showed that the future level of annual cocoa production in Nigeria is higher than the present level, and the annual cocoa production forecast for 2031 was higher by about 61.06% compared to the annual cocoa production value at 2016.

Recommendations

(i) Private investors and Government should invest more in cocoa production in Nigeria to take advantage of the increase in annual cocoa production and to boosts it.
(ii) Government should make cocoa production

attractive to the youths who can use their youthful energy and skills to change the negative effect that labour had on annual cocoa production in Nigeria.

(iii) Government should increase the allocation for the cocoa sub-sector and consequently allocation for the agricultural sector so as to improve the equipment and technology of cocoa production thereby increasing labour productivity in the sub-sector.

(iv) Producer price of cocoa should be reviewed and increased so that more farmers will go into cocoa production to boost cocoa output in Nigeria.

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