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Short Term Market Forecast for Cassava Crops in Oyo State, Nigeria

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ABSTRACT

The nature of the study is both positive and normative. It also seeks to diagnose the present trend of growth, adjustment in cropping pattern and projection of cassava price in the state. The diagnoses of growth pattern and projection necessitate the prescriptive measure for adjustment in the cropping pattern and needed for technological development and higher level of productivity. Looking to the overall problem of cassava production, its potential and future requirement, and the present investigation is carried out to safeguard the active players in different cassava market in the state. Farmer can used the forecast price for planning and effective utilization of their scarce resources in a right direction that support optimization with less cost involved during production.

KEYWORDS: Market forecast, short term, cassava crops, Oyo state and Nigeria.

INTRODUCTION

The agricultural system in Nigeria has been improved due to recent transformation by the ministry of agriculture in Nigeria. These innovative programmes had been increased the production of crops. Cassava is globally a top ranking tuber crops not only in productivity but also as human food, animal feed and as a source of large number of industrial products. Cassava considered as queen of the tuber crop in Nigeria. Worldwide the area, production and productivity of cassava are 437 million ha, 650 million tonnes and 6.43 t/ha, respectively (**World Bank, 2000**).

Cassava pictures.
Source: Google Map

Cassava in Nigeria occupies fourth place in average area in the world, the first three being US, China, and Brazil respectively and ranks sixth in production (World Bank, 2000). It is grown in 23 states in Nigeria with an area of 8.78 million hectare and production of 21.59 million tons with average productivity of 2470kg/ha during 2011-12 (NBS, 2011). In Nigeria, cassava and potato among tuber crops and cassava among the tuber took a large share in the country's agricultural economy (Badmus *et.al.*, 2011). Cassava is having a promising option for diversifying agriculture in low land areas of Nigeria and has got more than 3500 value added products as food, feed etc. in daily consumption (Badmus *et.al.*, 2011).Also, 55 per cent of the cassava produce concurrently is used for food purposes, about 14 per cent for livestock feed. 18 per cent for poultry feed, 12 per cent for starch and 1 per cent for seed. By the end of this century the expected demand will be around 46 per cent for food, 14 per cent for livestock feed, 19 per cent for poultry feed, and 19 per cent for starch industry and 2 per cent for seed (World Bank, 2000).

Oyo state is one of the traditional and potential cassava growing states, (**NBS, 2011**) accounting for almost 10 per cent area and contributing 6 per cent to the gross domestic product in Nigeria **(NBS, 2011**). However, the productivity of cassava in Oyo state (1500kg/ha) is very low as compared to that of other cassava -growing states and average productivity in the country (2470kg/ha).

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Work performed by other scientists on forecasting and projection

There are relatively few studies that estimate agricultural projection in developing countries such as Nigeria. Most of these have come out with rather surprising and paradoxical results of declining projection in the developing countries even in the years which are well documented for success stories where green revolution varieties of cassava has been widely adopted.

The studies of agricultural projection in developing countries include work done by Badmus and Ariyo (2011). They used ARIMA model to analyse maize projection in Nigeria. Their findings showed that maize production for the year 2020 will be 13425.64 thousand tons. Suleman and Sarpong, (2012), employed the Box-Jenkins approach to model milled rice production in Ghana using time series data from 1960 to 2010. Although, a ten years forecast with the model shows an increasing trend in production, the forecast value at 2015 (283.16 thousand metric tons) was not good enough to compare with the current production of Nigeria (2700 thousand metric tons), the leading producer of rice of rice in West Africa. Najeeb *et al*. (2005) employed Box-Jenkins model to forecast wheat area and production in Pakistan.

Kirtti and Goyari (2013); used kink exponential growth rate model to analyse growth rates of area, production and yield of major crops in Odisha for pre-liberalization and post-liberalization periods The results show that all crops, except rice experienced deceleration in area during post-liberalization period. Among those crops, bajra, jowar, wheat, ragi and small millet experienced a higher deceleration. Even the positive growth rate of rice area was very trivial.

METHODOLOGY

Study Area

The study was conducted in Oyo state, Nigeria. Oyo state has tropical climate, high temperatures, high relative humidity and peak rainfall period between March to October. Annually rainfall varies from 1200mm to 1800mm and Secondary data published from reliable sources were used for the analysis **(Oyo State ministry of Information report)**.

Data Analysis

Box and Jenkins introduced this procedure in the year 1970 in their famous book **"Time series analysis forecasting and control".** The set of models introduced by them are popularly known as ARIMA and the full meaning of ARIMA is Autoregressive Integrated Moving Average. The main application of this methodology is to analyse short term market forecast for cassava crops in the study area. Arima method is superior to other method when the data is reasonably for longer period and there is a stable correlation pattern among past observation. Some of the basic concepts associated with this methodology are:

Stationality

Before applying the ARIMA methodology, the time series should be checked for stationality. A time series is said to be Stationality if the joint probability distribution associated with k observation Z_{t1}, Z_{t2}…….. Z_{tk}, made at any set of time t_1, t_2 ……..t_k respectively and Zt_1+_k, Zt_{2+k},……..Zt_{k+m} made at any set of time t_{1+m} t_{2+m} …….t_{k+m}. A time series must satisfy these stationality conditions in order to be eligible for the application of this methodology.

Differencing

Differencing is a technique by which non stationary time series is transformed into Stationality time series. It is analysed by subtracting the observations in the current period from the previous one and it is called "first Differenced". The outcomes of the findings will determine the number of differencing to be formed.

Autocorrelations

The properties of a time series can be deciphered with the help of a series of quantities called as autocorrelation coefficients. They measure the correlation, if any among observations at different distances apart and provide useful descriptive information. The model is expressed as:

$$Y(t) = A(1) * Y(t-1) + E(t)$$

Where;

Y (t) = time series under investigation.

A (1) = the autoregressive parameter of order 1.

Y (t-1) =the time series lagged 1 period.

E (t) =the error term of the model.

RESULTS AND DISCUSSION

Table 1: ARIMA Model Description and Model Fit Statistics for Cassava Price

Model Description			
			Model Type
Model ID	price	Model_1	ARIMA(0,1,0)(0,1,0)

Source: Results of field survey 2014 analysed by spss package

Model Fit											
Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	-1.726E-16	.	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16	-1.726E-16
R-squared	.924	.	.924	.924	.924	.924	.924	.924	.924	.924	.924
RMSE	73.859	.	73.859	73.859	73.859	73.859	73.859	73.859	73.859	73.859	73.859
MAPE	6.974	.	6.974	6.974	6.974	6.974	6.974	6.974	6.974	6.974	6.974
MaxAPE	25.030	.	25.030	25.030	25.030	25.030	25.030	25.030	25.030	25.030	25.030
MAE	57.360	.	57.360	57.360	57.360	57.360	57.360	57.360	57.360	57.360	57.360
MaxAE	203.423	.	203.423	203.423	203.423	203.423	203.423	203.423	203.423	203.423	203.423
Normalized BIC	8.644	.	8.644	8.644	8.644	8.644	8.644	8.644	8.644	8.644	8.644

Source: Results of field survey 2014 analysed by spss package

Model Statistics												
Model	Number of Predictors	Model Fit statistics								Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC	Statistics	DF	Sig.	
price-Model_1	0	-1.726E-16	.924	73.859	6.974	57.360	25.030	203.423	8.644	78.355	18	.000	0

Source: Results of field survey 2014 analysed by spss package

Table 2: Forecast values of Cassava

Forecast

Model		Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sep 2014	Oct 2014
price-Model_1	Forecast	1117.65	1157.47	1114.34	1195.74	1303.88	1280.67	1328.13	1150.71
	UCL	1325.04	1469.16	1489.11	1667.73	1887.54	1916.69	2048.87	1825.45
	LCL	935.46	897.92	814.77	831.23	866.55	816.92	815.58	681.87

Source: Results of field survey 2014 analysed by spss package

Table 3: Forecasted Price for Cassava using exponential smooth methods

Model	R^2	July 2014	August 2014	Sept. 2014	Oct. 2014
Simple Seasonal	.969	1163	1191	1187	1102
Holts trend	.958	1135	1142	1149	1155
Winter's multiplicative	.965	1269	1284	1273	1119
Winter's Additive	.917	1201	1229	1226	1140

Source: Results of field survey 2014 analysed by spss package

Table 4: Forecasted price of cassava using winter's additive model

Forecast					
Model		Jul 2014	Aug 2014	Sep 2014	Oct 2014
sssprice-Model_1	Forecast	1201.00	1229.28	1225.74	1140.01
	UCL	1389.85	1435.22	1447.46	1376.48
	LCL	1012.15	1023.34	1004.01	903.55

Source: Field survey analysed by spss package

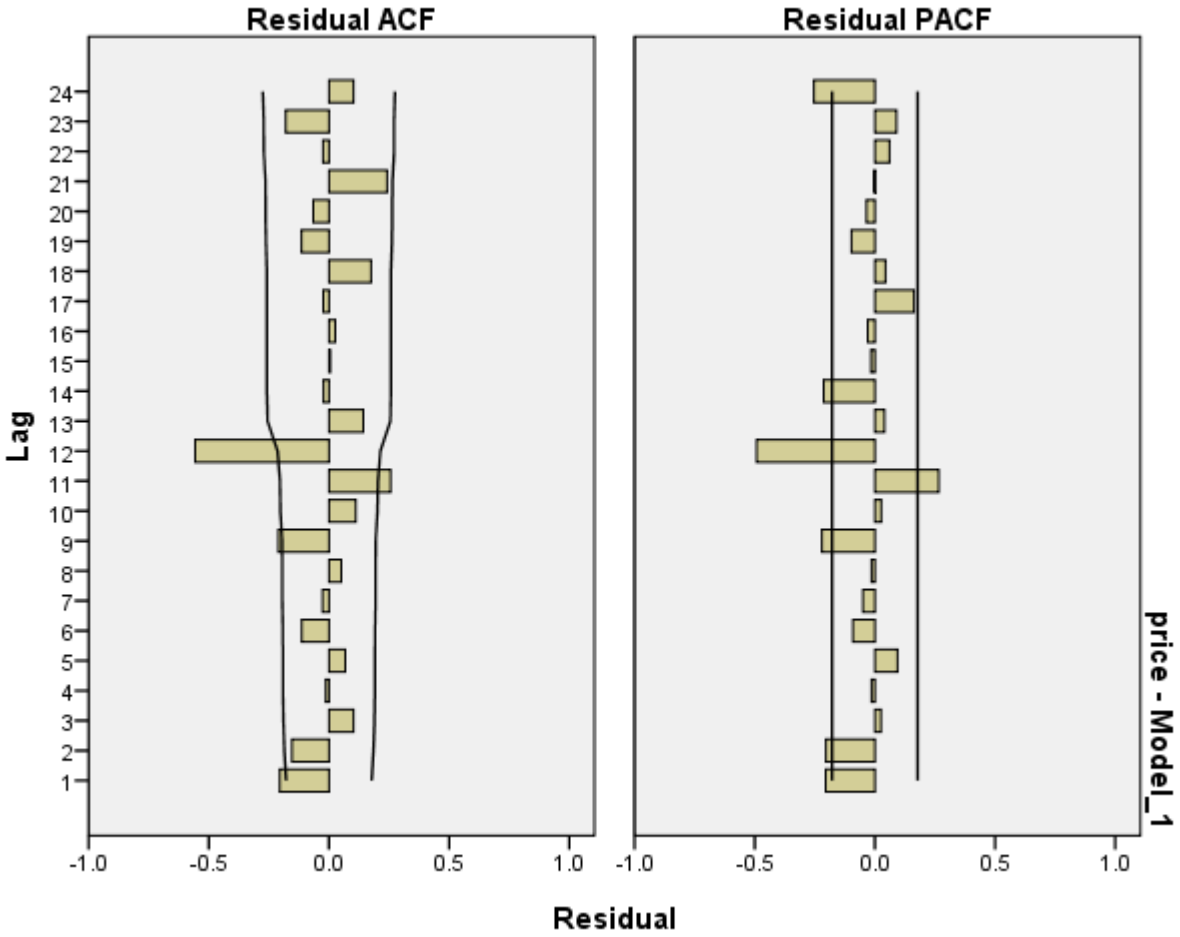


Figure 2: Residual auto and partial Autocorrelations for Cassava Price

The forecast price is accurate on the basis of the values of multiple determinant of coefficient (R^2). If the R^2 is high, it indicates that the price is free of error but if the R^2 is low, it means inconsistence forecast price. The result of analysis indicated that the forecasted price per tons during October, November and December 2014 will be 1161, 1151, 1177 naira's respectively. In November 2014 price decline to 1151 naira per tons. In October month actual model price prevail in the market was 1161 naira per tons.

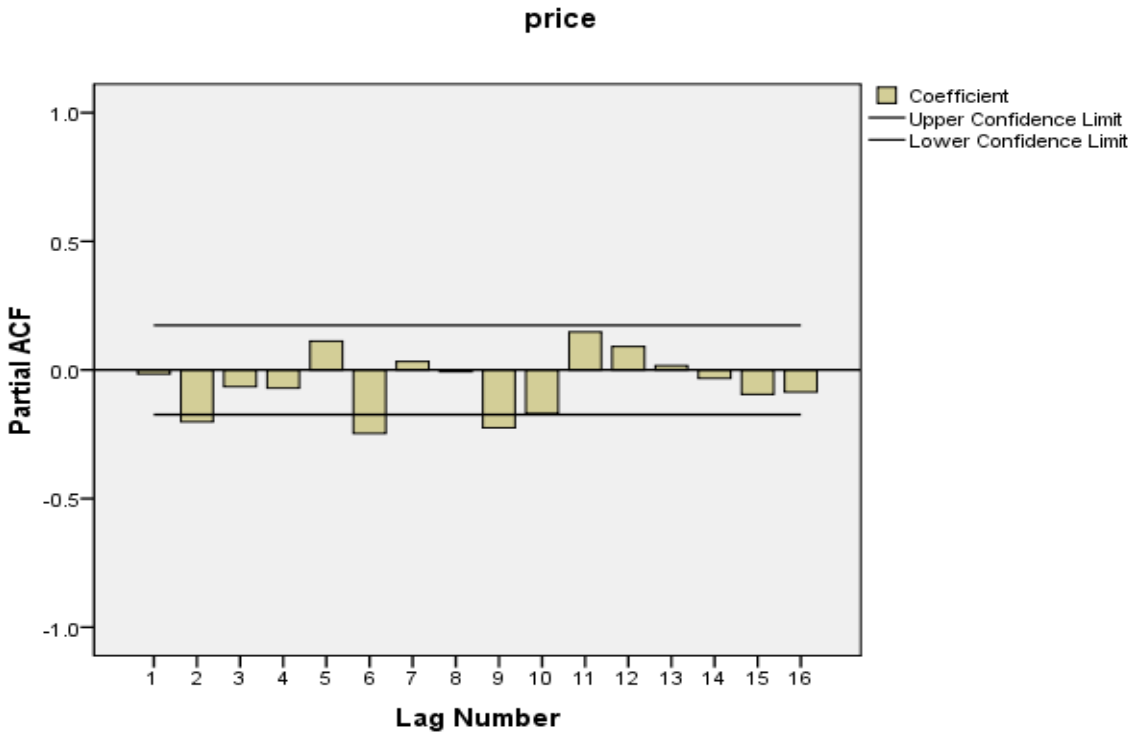
The finding is supported by Ariyo and badmus work but their results is differ from my own findings because the values of their multiple determinant of coefficient is not high as compare to my own findings. It implies that there are some omissions of key variables in their own model. If the values of multiple determinant of coefficient is low (R^2), it implies that there is multicollinearity problems in the model and the forecast price will not be accurate unless the necessary corrections such as transformations of model, dropping non significant variables, addition of more variables, application of backward elimination approach, stepwise approach and the use of principal component methods has been done.

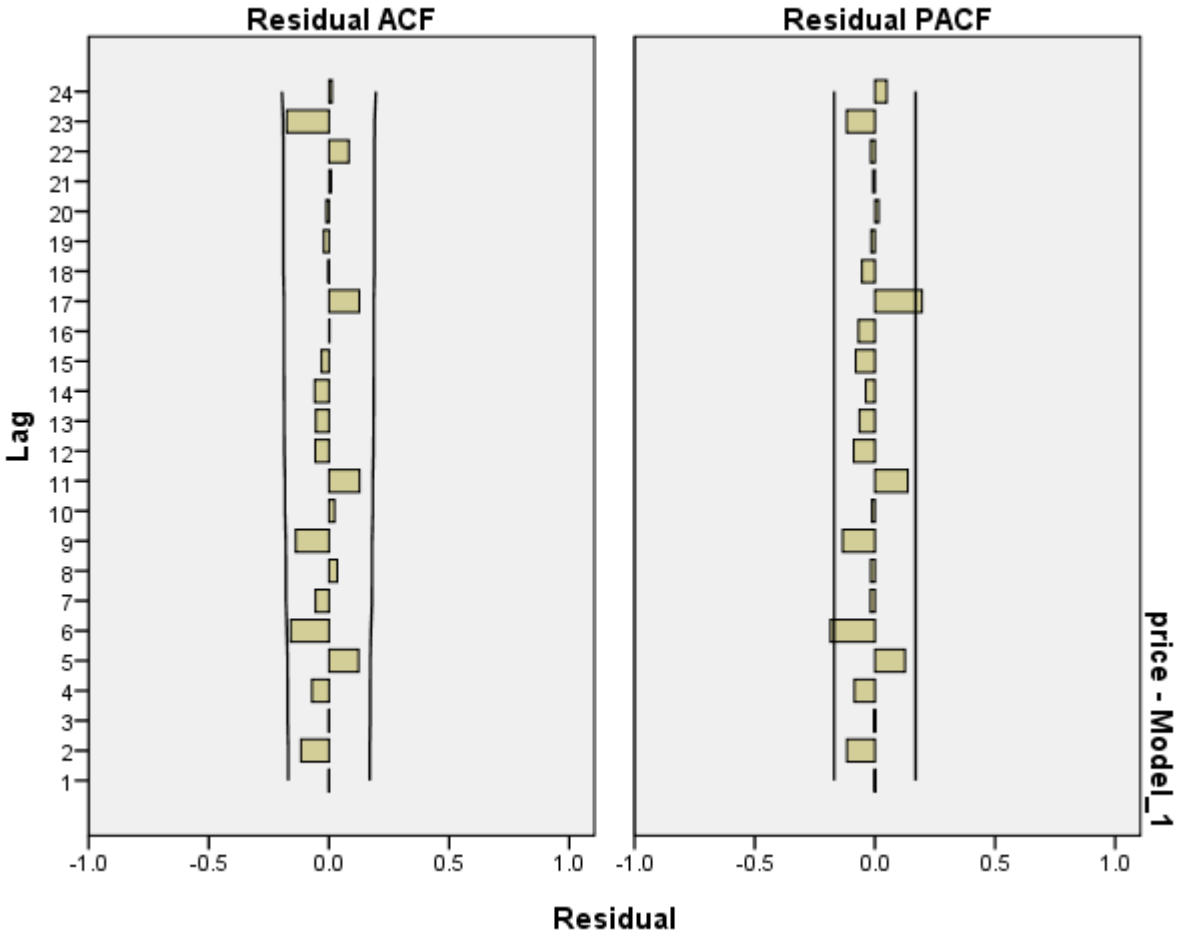
The support price of cassava during the agricultural year 2014-15 announced by government of Nigeria was1360 naira per quintal. Due to bumper production of cassava model price remains to be lesser than the support price. In the coming months, the result of econometric analysis showed that the forecasted price per tons during October 2014 to January 2015 continuously increased and range marginally between 1140 naira in October to 3696 naira in January. Cassava price mainly depends upon exchange rate and government policies. Crop production in USA, Brazil, Argentina, china are more modernised due to advancement in technology.**(World Bank, 2000**).

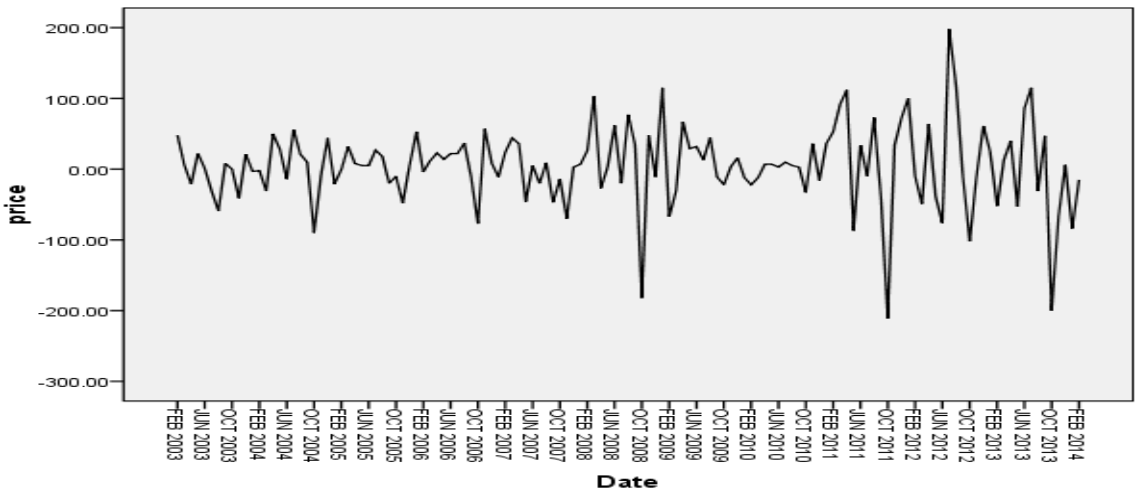
The major cassava producing countries in the world are United States (31%) Brazil (31%) Argentina (21%), china (5%), and Nigeria (4%) during the year 2012-13. Nigeria ranks among the first top five exporters of cassava and export about 11 million tons mostly to Iran, Japan, France, Thailand, Oman, Indonesia, countries, Nigeria is among the largest importer of Cassava in the world and Nigeria produced 9600 thousand tons (**World Bank, 2000**).

Nigeria produces about 4% of global cassava production. The area under cassava in Nigeria was 120 thousand hectares and production was 130 thousand MT. during 2012-13. South- west states are the major cassava producing states in Nigeria. The forecast price graphs showed the fluctuations in price of cassava in the market and also give the information about the upper and lower price boundaries. The result of the forecast price is different to each other when different techniques such as simple seasonal, Holts trend, winter multiplicative and winter additive models were used. The variation in price forecast for cassava in the market in the study area were small but the multiple of correlation coefficient for all the four models were perfect since above ninety percent out of hundred percent of the explainable variables can be explained(table 2 and 3). This findings is in line with **Najeeb I., Khuda B., Asif M., and Abid, S.A. (2005), Falak, S. and Eatzaz, A. (2008), Kirtti A. and Goyari T. (2013).**

Simple Seasonal ACF and PACF Residual graph

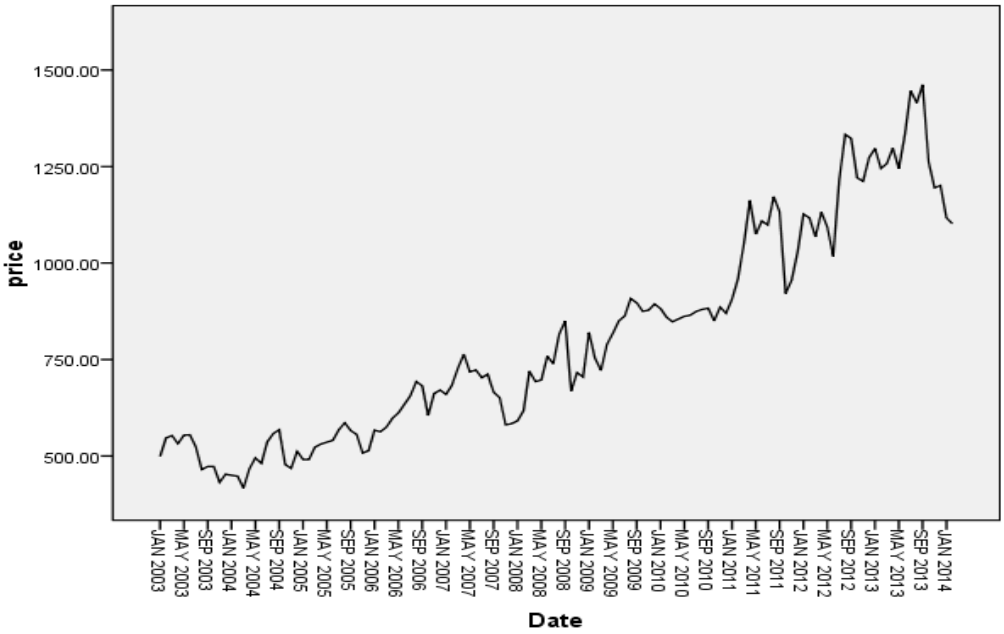






Transforms: difference(1)

Sequence chart



CONCLUSION

The short term market forecast for cassava price in the study area was estimated in the aforementioned tables but this can be increased, if the growth in productivity is maintained by expansion of area under hybrid cassava and this can promote further increase in cassava production in the state by bringing more industries for production of cassava based products. The result of analysis indicated that the forecasted price per tons during October, November and December 2014 will be 1161, 1151, 1177 naira's respectively. In November 2014 price decline to 1151 naira per tons. In October month actual model price prevail in the market was 1161 naira per tons. Farmer can used the forecast price for planning and effective utilization of their scarce resources in a right direction that support optimization with less cost involved during production.

Recommendations

Government should sponsored more food crops research so that all the problems attributed to production can be minimized and either direct or indirect will solved vicious poverty in Nigeria. Intensive problem oriented research should be planned and conducted for cassava crop so that appropriate and economically sound package of cultivation practices can be developed and recommended for each zone separately with the consideration of variation in the climate, soil type and available resources. This will solve the problem of variability in income among the cassava growers. Efforts should also be made to intensify cassava production especially in the zone where the productivity levels at present is poor. It is because the channel for delivery of incentives provide by Government is not effective due to high corruption. Therefore the socioeconomic condition of the cassava grower remains stagnant without improvement and this resulted to low productivity since there is positive correlation between the price and production level.

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