International Scholars Journals

African Journal of Agricultural Economics and Rural Development ISSN: 2375-0693 Vol. 4 (4), pp. 328-336, April, 2016. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

The linkage between price and output of cotton in Zambia

***Obrian Ndhlovu and Venkatesh Seshamani**

Department of Economics, The University of Zambia, P.O. Box 32379 Lusaka - ZAMBIA. E-mail: obriandhlovu@yahoo.com. Tel. +260 211 290475; Cell: +260 974 496566.

Accepted 20 April, 2016

This paper investigated the relationship between output and price of cotton in Zambia. The paper was guided by three specific objectives: to establish the extent to which output affects cotton prices; to determine whether cotton production trails prices; and to determine the time lag by which production responds to prices. The paper used annual data on cotton output and price from 1999 to 2014 to estimate the regression models linking the two variables. The models involved regressing output on current price and varying lagged values of the price as well as regressing the price ratio on output. The paper found no significant evidence of output affecting the domestic price of cotton. On the other hand, strong evidence was found on price affecting cotton output with a lag. That is, current price was found to impact significantly on succeeding year's output. There was a strong indication of farmers basing their decisions on naive expectation in which only the immediate past price and not the trend is taken into account when deciding how much cotton to produce. The key lesson was that this year's price will strongly affect next year's output and that the effect will quickly die out.

Keywords: Cotton price, cotton output, naïve expectation, price index share, lag length, asset specificity, Pearson's correlation, regression, Dickey-Fuller test.

INTRODUCTION

Two main crops are grown in Zambia, maize and cotton. The former is a staple crop and largely grown for own consumption mostly by small scale farmers. It is the main crop behind food security or insecurity. As such, government has for a long time now been channelling resources to promote its production and post-harvest management. This has been through the Farmer Input Support Programme (FISP) initiated in 2002, which provides subsidised seed and inorganic fertiliser to eligible farmers. In addition, Government through the Food Reserve Agency (FRA) has engaged in intervention buying which has effectively maintained a high and stable price for maize. Such intervention has been guided by the overall Agriculture Policy with a specific objective on national and household food security to be realised through increased production and post-harvest management of foodstuffs.

Cotton, on the other hand, is a cash crop. It is solely produced for sale as an income-generating crop. While for an individual farmer, cotton is intended to generate income, to the economy it contributes to the industrial development through the provision of locally produced raw material as well as export earnings when exported. Though the agriculture policy objectives extend to income generation and provision of locally produced agro-based raw materials, cotton has not received as much attention as maize, save for the externalities emanating from maize production (Goeb, 2011).

The result of this bias in the treatment of crops that should have been assigned equal importance has manifested in the behaviour of the respective prices and output. The price of maize has been fairly stable and so has the output although it has trailed behind its moving average. On the other hand, the price of cotton has swung

with huge variations and, correspondingly, its output has seen many surges and plunges. While the prediction of maize output could be made with much ease owing to its smooth path, it is often difficult for both policy makers and producers to predict output and prices of cotton with any reliable degree of accuracy.

This paper therefore is an attempt to investigate the relationship between the price of cotton and its output. Since there could be dual causality between price and output, this paper used time series techniques to establish the true direction of causality. This will help to identify the leading variable which, once known, can be used to predict the other. While government would mainly be interested in output, because it determines incomes for the small scale farmers, the individual farmers are more likely to be interested in the price of their output at the time of harvest.

Objectives

As stated earlier, the overall objective of this paper is to investigate the relationship between the price and output of cotton in Zambia. Specifically, the paper is guided by the following specific objectives:

I. To establish the extent to which production of cotton affects market prices;

II. To establish the extent to which price of cotton affects output.

Rationale

For a farmer contemplating on growing cotton, the speculation of its price at the time of harvest is very important. This is because the farmer has alternative crops to grow and assuming their prices remain relatively stable, the respective relative profitability will depend upon the price of cotton. It is, therefore, imperative that the farmer be equipped with all the necessary information for decision making. This paper therefore seeks to establish a relationship which, in a way, will aid the farmer in making a good forecast of the price.

The government too is an interested party in the market for cotton. The National Agriculture Policy 2004-2015 stated three specific objectives which cover cash crop production such as cotton. They related to locally produced raw material, increased exports and income generation. In order to ensure that the three were achieved, government would have to keep track of cotton production in the country and initiate subsector-specific policy aimed at enhancing the performance of cotton in the country.

From the point of view of both the farmer and the government, the ability to forecast the market situation in respect of price becomes important.

REVIEW OF LITERATURE

The economics of cotton production

There is a fair amount of literature on the economics of cotton, including some recent literature relating to Africa. One may cite, as examples, the paper by Mahofa (2007) on Zimbabwe, Baffes (2009) on Uganda, Kimani's (2014) study in Kenya and the paper by Mumin (2012) on Ghana. But none of them deal specifically with the theme of our paper, namely, the relationship between the output and price of cotton. In this sense, our paper purports to make a useful value addition to the literature on the relation between these two variables, especially in the African context. The rest of this section is, therefore, devoted to a discussion of the issues in Zambia.

Cotton production in Zambia

The historical background of cotton in Zambia probably has a lot more to tell than many other crops in Zambia. It has evolved from an *all-state-controlled* to a completely *no-state-interference* situation. In the pre-liberalisation era, the state-owned Lint Company of Zambia (LINTCO) constituted the demand side of the market. All cotton produced throughout the country was sold through the only legal buyer, LINTCO (Tschirley and Kabwe, 2010). The company exercised monopsony on the market and producers were merely price takers. As a public entity however, it had a moral obligation not to exploit the poor and fragmented producers.

The production of cotton is also highly input-intensive (Tschirley and Kabwe, 2010). It requires a high usage of specialised inputs such as inorganic fertilisers and insecticides. Because growers are predominantly peasant (Goeb, 2011), they can seldom afford the needed inputs. Traditional credit is also rare among peasant farmers due to the high risk of agriculture production coupled with low profit margins.

In order to access inputs, farmers would enter into interlocking arrangements or contract farming with output buyers to supply inputs on credit (Brambilla and Porto, 2011). In this arrangement, the cotton buyer provided farmers with all the needed inputs on credit. At harvest, the farmer was obliged to sell all the output to the contracted buyer at a price that would be known only after harvest. The price was largely driven by the world price. The value of inputs advanced was deducted from the dues to the farmer.

The foregoing effectively meant that LINTCO, as the only output buyer at the time, also enjoyed a monopoly in the supply of cotton inputs. It was the only source of inputs for the farmer and after harvest, the only market for cotton. The contract farming arrangement which provided the only source of inputs for farmers would live to hinder effective competition in the post-LINTCO era. Once a farmer acquired inputs from a particular buyer, they became legally locked to that particular buyer, even in cases where the market might provide the much cherished competition.

During the privatisation period, LINTCO became one of the many parastatals to be sold. It was sold to two privately owned companies. The ginneries in Eastern province were sold to Clark Cotton Co (Pvt) Ltd and gins from the rest of the country went to LONRHO Cotton Ltd (Tschirley and Kabwe, 2009). This should have resulted into a duopoly and duopsony with some fair amount of competition between the two buyers. Producers could

have been provided with choice in terms of which company to engage and gain some market flexibility.
However, this was not the case. The two buyers instead segmented the country into two regions with Clark cotton operating in the eastern part of the country and LONRHO in the remaining part of the country (Ibid). Each company exercised both monopoly in input market and monopsony in output market. This ruled out the possibility of competition (Brambilla and Porto, 2011 and Goeb, 2011). As such, not much change was recorded save the effect of improved efficiency by the private companies.
In the few years that followed, many ginning companies entered the Zambian market. This induced some competition in the output market which saw farmers gaining on their bargaining power. The scenario gave farmers a choice of where or to whom to sell their output. With little government support for the interlocking contracts, however, the new firms on the market seldom provided inputs to farmers. Instead, they bought output from farmers that benefited from other input suppliers.
This led to a fall in the credit recovery rate as the monopsony which provided some sort of a guarantee or security for the advanced inputs no longer existed. Farmers could get inputs from one company and sell the resulting output to another. This has been often cited as the precursor to the crisis in the late 1990s.
The post-2000 period saw many more ginneries coming onto the market. This brought competition in the input supply as ginneries scrambled for farmers. This, however, did not give farmers any bargaining power on the price as the price continued to be determined by the international commodity price. Further, the Zambia Cotton Ginners Association exercised some monopsony in the cotton market by setting the producer prices on behalf of the ginning companies. This resulted in some sort of cartelisation which gave buyers a greater influence on the price in comparison to the fragmented small-scale cotton farmers.
Since the 2013 cotton marketing season, ginners were allowed to set individual prices (the Globe Newspaper, 2013). This was aimed at increasing competition in the market, a move that was expected to boost the producer's share of the cotton value. The effects are yet to be assessed but are likely to be hindered by the contractual arrangements in the cotton subsector. Even if other ginners offered attractive prices, many cotton farmers might still be locked to single buyers because of pre-existing contracts emanating from the supply of inputs.

Since then, annual fluctuations in both the price and volume of output have been recorded. Often, supply would fall because prices in the previous period were low which, theoretically, puts an upward pressure on the price. The precise causal relationship between the two variables is not quite certain. This paper is devoted to investigate and establish the nature of this relationship. In particular, the paper seeks to investigate the extent and pace at which supply responds to changing cotton lint prices.

METHODOLOGY AND DATA

Model formulation

In Zambia, planting of cotton is done in one year and harvesting follows in the succeeding year. At the time of deciding how much to plant, the farmer only knows the prevailing price. He is very sure, however, that at the time of harvesting next year, the price is likely to change. The direction and magnitude of change remain unknown. The price may fall or rise.
The decision on how much to plant will therefore be made, not on the known price, but on the *expected price*. That is, the price that the farmer thinks the commodity will be fetching at the time of harvest.
Since most of our farmers have a humble education, it is unlikely that the decision will be based on complicated models such as rational expectations or adaptive expectations. It is likely that a naïve expectations model could explain the farmers' output decision-making behaviour. In the naïve model, expectations are made on the basis of the present value. The expectation of the price is a function of the current price. The simplest form of this model is the *no-change* model in which the price is expected to remain the same.
In a *not-so-naïve* model, expectations are made not only on the basis of the current price but past prices as well. The formulation of this model is shown in equation 1.

$$E_{t-1}(P_t) = f(P_{t-1}, P_{t-2}, P_{t-3}, \ldots) \qquad (1)$$

In making the decision of how much to plant (which in turn will determine how much to supply in the following period) the farmer will base the decision on what the price is expected to be. Since the expectation is made on the basis of the past prices, the supply of cotton is assumed to be a function of lagged prices. The exact effect of past prices will depend on how expectations are made. Assuming a not-so-naive expectations model, supply would be a function of past prices as shown in equation 2.

$$Q_t^S = f(P_{t-1}, P_{t-2}, \ldots, P_{t-k}) \qquad (2)$$

Farmers are more likely to consider past experiences and make the best guess of the price. In addition, the concept of asset specificity in Agriculture cannot be overlooked. Farmers may become less responsive to prices because of high cost crop-specific installations (Colman and Young, 1989). It becomes cheaper to grow cotton for a farmer that grew cotton in the previous period because there are some assets or implements which can only be re-used on cotton.
Since such assets cannot be used elsewhere, a farmer may

opt to continue with cotton even though the price is no longer attractive. Such decision is based on the need to fully utilize the asset for which huge investment was outlaid. For instance, a farmer that grew cotton in the preceding farming season will find it cheaper to grow cotton since they would have acquired most needed cotton-specific tools like sprayers from the previous season.

Because of limited data, we have not been able to incorporate the asset-specificity concept into the model. The available time series is not long enough to allow the examination of this concept. Nonetheless, as our analysis will show, the concept does not pose a serious limitation to our analysis and results. With this caveat, we proceed to estimate the specific linear equation shown in equation 3 below.

$$Q_t^S = \alpha + \beta_1 P_{t-1} + \beta_2 P_{t-2} + \ldots + \beta_k P_{t-k} \quad (3)$$

The α and the β_i are the regression parameters. We therefore run this model arbitrarily choosing up to three lagged values to see which one gives the best results.

Data

Two pieces of data were used in this paper. Data on cotton output was obtained from the Index Mundi, an online country profiles' site which contains detailed country statistics on all crop output. The data is presented in '1000 480 lb bales' and is available for Zambia from 1969 to 2014. It was converted to the metric tonnes so as to conform to the international standard measure. The producer price data was obtained from the Cotton Board of Zambia, an overseer body in the cotton subsector. Though the price tends to fluctuate within a year at the international level, the available data only has one price per year. This is a relatively short time series since the data are available only from 1999 to 2014. In sync with price data, the output data were also used only from 1999 to 2014.

In here, two points are worth noting: first, Zambia rebased its currency by lopping off three zeros effective the beginning of 2013. Thus for instance, a price of K3,500.00 became K3.50 in 2013 and after. In order to deal with this change, the prices have been rebased for all the years. Second, while the Ginning Companies Association has been exercising some monopsony in the market, ginners were allowed to freely set their own prices. As such, the prices for the last years are really an average price and not necessarily what ginners were offering.

The data was analysed using STATA, a general-purpose statistical software package.

EMPIRICAL RESULTS AND DISCUSSION

In order to give a clear picture of cotton production in Zambia, Figure 1 below has been generated to show output as well as prices of cotton for the study period.

The figure shows cotton prices climbed steadily until about 2004 and then declined until 2006. Thereafter, it recovered and reached its highest level in 2011 followed by an unprecedented steep fall which saw pockets of unrest by farmers. 2014 witnessed an optimistic sign of recovery. Output also followed a similar pattern. It was increasing from 2000 until 2005. It remained low in the next four years before picking up after 2010. Output was highest in 2012, a period that may have benefited from the high price of 2011. It also plunged to about half of its 2012 value in 2013. This also may have been a consequence of the price fall in the preceding year.

Cotton Production on Price-Index share

The direction of causality between the cotton output and the producer price is not obvious. While we can traditionally think of the price driving output, with or without a lag, it is possible that the level of output can have an impact on the price. This is a case of an increased supply exerting a downward pressure on the price. A lower level of output will cause price to go up as ginners compete for the limited output. This scenario has the potential to distort the results.

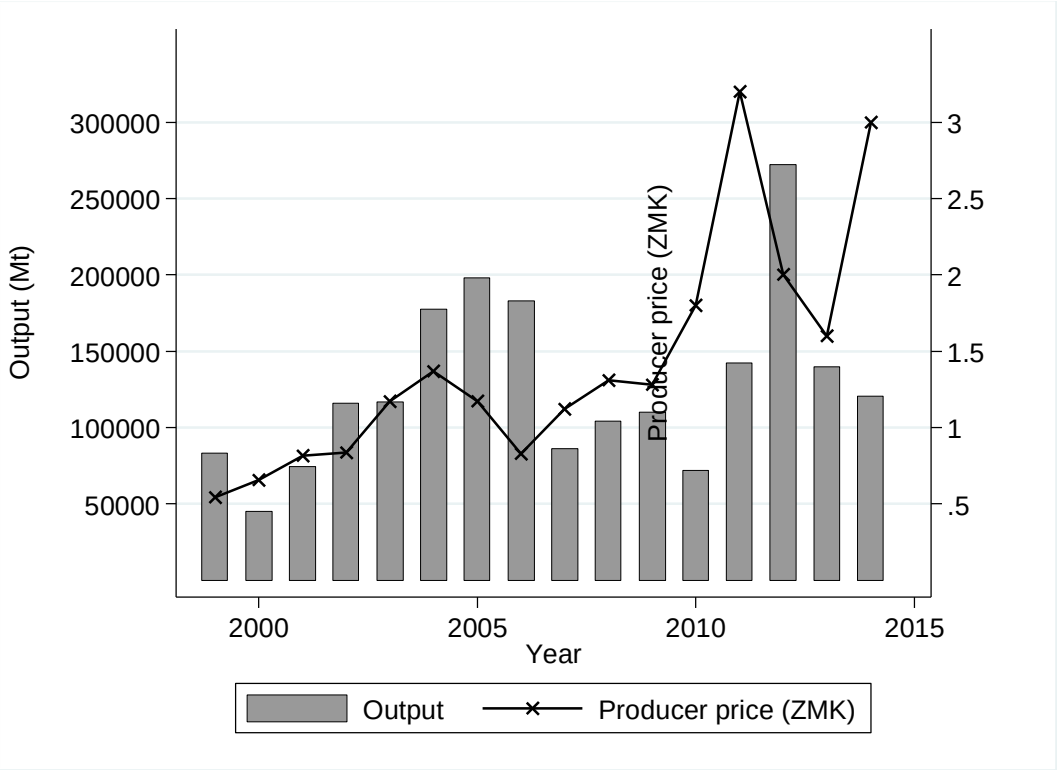
In order to examine this possibility, this paper defines two prices. The producers sell the cotton to the ginners at what we call the producer price P^f. After some value addition, the ginner sells the cotton on the international market at price P^x. While local output may influence the producer price, Zambia's output is too small to affect the international price P^x. As such, fluctuation in the producer price could be driven or explained by two presumably independent variables; local output and movements in the international price. A fall in the international price of cotton will directly affect the domestic price. The domestic demand for cotton is a derived demand, derived from the global demand for lint cotton. Alternatively, when domestic output is low, *ceteris paribus*, ginners will compete for the limited output by offering high price, sacrificing their own margins because the international price is unlikely to respond. In this regard, it is the share of producer price to international price that will fluctuate with output. The interest in this paper is to assess the significance of movements in the producer price caused by output.

A price ratio is then defined as the ratio of the producer price to the international price. This is the proportion of the international cotton price that goes to the producer

$$PS = \frac{P^f}{P^x} \quad (4)$$

If fluctuations in the producer price are as a result of changes in the international price, then the price share

Figure 1.Cotton Production and Price.



PS would remain fairly stable or unchanged in the extreme case. If, however, the producer price changes because of output, the price share should change as well. In order to separate the two sources of change, the price share is used as a proxy in the regression of price on output.

The following equation is estimated.

$$PS_t = \gamma + \delta Q_t + u_t \quad (5)$$

The model does not have lagged values of output because it is the assumption of this paper that past levels of output cannot affect the contemporary price. In the regression, a log-log version of the model is used with differenced variables. The regression results are presented in the Table 1 below.

As can be seen in Table 1, none of the coefficients are significant and the overall explanatory power of the model is also poor as reflected by the low values of R-squared. In other words, the results do not show any signs of the price share responding to changing production levels. This means whatever the output in the country, the price received by the producers is unaffected.

Output and Price

In view of the preceding discussion and the nature of cotton production, the paper estimates the impact of past prices on output. For a farmer, the decision to produce cotton is made at the onset of the farming season. In Zambia, this is in the third and fourth quarters of the year. Once decision is made and action taken, the resulting output is only available on the market the following year. Because of this, it is not conceivable for current output to be affected by the current price.

This is in tandem with the pair wise Pearson's correlation coefficients in Figure 2 below. There are two values corresponding to each pair of variable in the figure. The first or the value on top indicates the value of the correlation coefficient. The second value indicates the p-value, the measure of significance. The correlation coefficient is significant if $p < 0.05$. It is highly significant if $p < 0.01$.

The figure shows a weak correlation between current output and current price. A strong and significant positive correlation nonetheless exists between output and price with one lag. The correlation disappears with further lags. Hence the relevant equation to estimate is equation 6.

$$\Delta \ln Q_t = \alpha + \sum_{i=0}^{3} \beta_i \Delta \ln P_{t-i} + e_t \quad (6)$$

The model is run in differences in order to obviate the possibility of spurious results due to non-stationarity in the variables. The justification for doing this can be seen

Table 1. Regression of Price share on Output.

	(1)	(2)	(3)
VARIABLES	D.lps	D.lps	D.lps
D.loutput	-0.0296	-0.00634	0.0163
	(0.101)	(0.103)	(0.115)
Lpricex		-0.151	-0.252
		(0.146)	(0.244)
Year			0.00935
			(0.0179)
Constant	0.0652	0.578	-17.84
	(0.0463)	(0.498)	(35.28)
Observations	15	15	15
R-squared	0.007	0.088	0.110
Standard errors in parentheses			

*** p<0.01, ** p<0.05, * p<0.1

Figure 2. Pairwise Pearson's correlation coefficient.

```
. pwcorr output price l.price l2.price l3.price, sig

             |   output    price  L.price L2.price L3.price
-------------+---------------------------------------------
      output |   1.0000
             |
       price |   0.2843   1.0000
             |   0.2860
             |
     L.price |   0.7610   0.5920   1.0000
             |   0.0010   0.0201
             |
    L2.price |   0.2737   0.4205   0.6372   1.0000
             |   0.3437   0.1343   0.0142
             |
    L3.price |  -0.0666   0.6621   0.3207   0.6389   1.0000
             |   0.8288   0.0137   0.2854   0.0187
```

from the differences between the Mackinnon approximate p-values obtained from the Dickey-Fuller unit root test on price and output on the one hand and differenced price and differenced output on the other, as shown in Tables 2 to 5 below. The drastic fall in the p values in Tables 4 and 5 from their corresponding values in Tables 2 and 3 enables us to reject the null hypothesis of unit roots after first differencing.

Three equations were estimated. The first regressed output on current as well as lagged price. In the second equation, the second lag of price was added. The third equation had up to the third lag of price.

In the regressions, the coefficients on the present price were all insignificant. This is in conformity with the discussion presented that current output is not influenced by current price. It was expected that the influence of price on output would be lagged. What was uncertain, however, was the lag length.

The results in Table 6 above answer the question. The coefficients on the first lag were significant for all the regressions. The overall explanatory power of the regression was also strong with the adjusted coefficient of determination $\overline{R}^2 = 0.788$. The second lag was insignificant and the explanatory power marginally fell. Though there was a slight gain in the adjusted $\overline{R}^2$ when the third lag was added, the coefficient of the said lag was insignificant. With the second and third lags insignificant, we found no justification to consider trying further lags in the model. It was clear from the above regressions that only the first lag mattered. Only the immediate period's price had a significant influence on

Table 2. Dickey-Fuller Unit root test on Output.

```
. dfuller loutput

Dickey-Fuller test for unit root                    Number of obs   =        15

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -2.260            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.1852
```

Table 3. Dickey-Fuller Unit root test on price.

```
. dfuller lprice

Dickey-Fuller test for unit root                    Number of obs   =        15

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -1.271            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.6424
```

Table 4. Dickey-Fuller Unit root test on Differenced Output.

```
. dfuller d.loutput

Dickey-Fuller test for unit root                    Number of obs   =        14

                                 ---------- Interpolated Dickey-Fuller ----------
                    Test         1% Critical       5% Critical      10% Critical
                Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             -4.170            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0007
```

current output. This was an indication that the effect of price on output did not persist. It did not have a long-term effect.

The sign on the coefficients were also in accord with theory. They were positive implying that an increase in price resulted in an increase in output.

In terms of size, a percentage change in price caused about 1.5 percent change in output. These are huge fluctuations. They demonstrate the high price-elasticity of cotton output. This was noted by Goeb (2011) when he noted that support to other competing crops has often affected the production of cotton. The elasticity is also high because of the many alternative crops farmers can get into. In spite of the asset specificity concept discussed earlier, it seems from the results that farmers find it quite easily to migrate to or from other crops when cotton price changes. This is an indication that the said asset specificity concept is not very strong in the particular case of cotton. This is perhaps due to the low fixed capital necessary to produce cotton.

Lag length of Price Effect on Output

From the results in Table 6, price lagged by one period is significant while the rest of the lagged values are insignificant. This is an indication that it is the immediate past period's price (not the current or older prices) that explains fluctuations in cotton output. We find no evidence

Table 5. Dickey-Fuller Unit root test on Differenced price

```
. dfuller d.lprice

Dickey-Fuller test for unit root                    Number of obs   =        14

                                 ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic          Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -3.566           -3.750            -3.000            -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0064
```

Table 6. Regressing Output on Price.

	(1)	(2)	(3)
VARIABLES	D.loutput	D.loutput	D.loutput
D.lprice	0.0844	0.0538	-0.0150
	(0.180)	(0.253)	(0.243)
LD.lprice	1.426***	1.393***	1.552***
	(0.202)	(0.207)	(0.239)
L2D.lprice		-0.00636	-0.00436
		(0.292)	(0.277)
L3D.lprice			0.446
			(0.317)
Constant	-0.0486	-0.0632	-0.148
	(0.0623)	(0.0803)	(0.0921)
Observations	14	13	12
Adjusted R-squared	0.788	0.783	0.810
Standard errors in parentheses			

*** p<0.01, ** p<0.05, * p<0.1

that farmers will look at the behaviour of price in the near or more remote past. Instead, only the immediate past price is considered. This is a simple naïve approach of forming expectations. This is a case where farmers will always think that the price will be what it is today. This is in contrast with our earlier assumptions of a not-so-naïve approach.

In addition, farmers are also limited by the low education levels coupled with poor access to analytical tools. As such, they are unable to take into consideration the behaviour of the price in order to make the best guess of what it will be at the time of crop marketing. They are more likely to think that the price will remain static in the next period. As a result, the marketed cotton will depend only on the price from the immediate past period.

CONCLUSION

The paper sought to determine three items; whether cotton output affects local price; the extent to which cotton price affects output; and to determine the optimal lag of the price effect on output. Time series data was used and analysed using STATA. The following came out. The first objective was investigated using the ratio of the producer price to international price as the proxy for local price. This was necessary to avoid the possibility of a reverse causality. The results indicate that output will not immediately affect price. Nonetheless, there is some evidence of the lagged output having a downward pressure on the ratio. The justification is vague and will rely on the price determination mechanism. The evidence obtained indicates that the producer price will fall, relative to international price, when previous output is high and the opposite is true.

With respect to the second objective, output was regressed on current and lagged prices (in logs).The regressions consistently show that the one-period lagged price of cotton has a strong bearing on output. Variations in price explain about 80 percent of variations in output. Since only the first lag is significant, we conclude that price only has a temporary effect on output. This means production does not depend on the long run behaviour of price but rather on the immediate past price. This is consistent with the naive expectation approach.

In summary, the paper concludes that cotton production

is strongly dependent on the level of the price in the previous period. It tends to increase when price is high and fall when it is low. No evidence of persistence is found.

The paper has one major shortcoming, the unavailability of local data on cotton output and price for a longer period. Though price can be broken into monthly data in order to increase the time points, output is an annual occurrence. The findings are therefore based on a relatively short time series.

REFERENCES

Baffes J (2009). The Cotton Sector of Uganda. Africa Region Working Paper Series No. 123, World Bank.

Brambilla I, Porto GG (2011). Market Structure, Out-grower Contracts and Farm Output. Evidence from Cotton Reforms in Zambia. Oxford Economic Papers, Oxford University Press. 63(4): 740-766.

Central Statistical Office, Ministry of Health, Tropical Disease Research Centre, University of Zambia, Macro International Inc (2009). Zambia Demographic and Health Survey 2007. Maryland. CSO and Macro International Inc.

Colman D, Young T (1989).Principles of Agricultural Economics: Markets and Prices in less developed Countries.Cambridge. Cambridge University Press.

Fulginiti L, Perrin RK (1992). Prices and Productivity in Agriculture. GATT Research Paper No. 93-GATT 2. Iowa. Center for Agricultural and Rural Development, Iowa State University.

Goeb JC (2011). Impacts of Government Maize Supports on Smallholder Cotton Production in Zambia. MSc Thesis, Michigan State University.

Kimani MG (2014). Determinants of Cotton Production among Smallholder Farmers in Kenya: The Case of Makueni County. Kenyatta University.

Mahofa G (2007). Economic Analysis of Factors Affecting Cotton Production in Zimbabwe. MA dissertation, University of Zimbabwe.

Ministry of Agriculture and Cooperatives (2004). National Agriculture Policy 2004-2015. Lusaka.

Mumin YA, Amegashie DPK, Mensah-Bonsu A (2012). Determinants of Seed Cotton Output: Evidence from the Northern Region of Ghana. J. Econ. Sustain. Dev. 3(9): 38 – 46.

Stock JH, Watson MW (2003). Introduction to Econometrics. Boston, Pearson Education, Inc.

Tembo G, Chapoto A, Jayne TS, Weber M (2010). Fostering Food Market Development in Zambia. Zambia Social Science Journal.1(1): 43-78.

Tembo G, Jayne TS (2010). Increasing Return to Marketing in Zambian Maize Markets. Zambia Social Science Journal.1(2): 141-157.

The Globe Newspaper (2013) Zambia Cotton Growers Association Announces Competitive Cotton Pricing: http://theglobenewspaper.blogspot.com/2013_05_01_archive.html (accessed on 17th March 2015)

Tschirley D, Kabwe S (2010). A Case Study of Regulation in Zambia's Cotton Sector. Lusaka. Food Security Research Project, WP 45.