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RESEARCH NOTE : PEASANT FARMER SUPPLY RESPONSE TO MAIZE PRICE CHANGES IN THE MIDDLEDRIFT DISTRICT

G.C.G. Fraser

Senior Lecturer, Department of Agricultural Economics, University of Fort Hare

A. Belete

Senior Lecturer, Department of Agricultural Economics, University of Fort Hare

B.S. Jack

Senior Lecturer, Department of Agricultural Economics, University of Fort Hare and Development Consultant

Arguments of irrational response of peasants to changes in product prices have been put forward, as have arguments for rational economic behaviour. The paper investigates whether the farmers' behaviour complies with economic theory - if they respond in an economically rational manner - when they produce a crop both as a staple and cash crop. A Nerlovian partial adjustment lagged model was used to estimate the maize supply response of farmers in the Middledrift district of the Eastern Cape to changes in product prices. The results indicate that producers are responsive to price incentives and their response is elastic in both the short (1,23) and long run (1,41). The coefficient of adjustment which measures the speed of adjustment is 0,87. The prices of maize and the competing crop (sorghum) and the areas under maize in the preceding season are found to be important factors to the producers in their land allocation decision making process. The model therefore shows that farmers to changes in product prices to product price changes to changes in product prices.

KLEINBOERE SE AANBODRESPONS OP MIELIEPRYSVERANDERING IN DIE MIDDELDRIFT DISTRIK

Argumente vir en teen die irrasionele respons van bestaansboere op veranderinge in produkteprysse sowel as rasionele ekonomiese gedrag word in die literatuur gevind. Die artikel ondersoek of die boere se gedrag aan die ekonomiese teorie voldoen wanneer hulle 'n gewas as beide 'n stapel- en kontantgewas produseer, m.a.w. of hulle in 'n ekonomiese rasionele manier reageer. 'n Nerlovianse partiële aanpassing sloermodel is gebruik om die mielieproduksierespons van bestaansboere, na aanleiding van veranderinge in die produkteprys, in die Middledrift distrik van die Oos-Kaap te ondersoek. Die resultate toon dat produsente se reaksie op prysaansporing elasties is vir beide die kort (1,23) en lang (1,41) termyn. Die aanpassingskoëffisiënt wat die spoed van aanpassing meet, is 0,87. Daar is gevind dat produsente die prys van mielies en van die mededingende gewas (graansorghum), asook die oppervlakte onder mielies in die vorige seisoen, as belangrike faktore in hul besluitnemingprosesse vir grondtoedeling beskou. Die model toon dat bestaansboere betekenisvol en ekonomies konsekwent reageer op veranderende produkteprysse.

1. INTRODUCTION

Arguments of peasant irrationality are derived from the belief that peasant farmers respond in an unorthodox manner to changes in product prices. This implies that their behaviour is guided by non-market related forces (Wharton, 1963). It has been argued that peasants lack the initiative and creativity that is needed in a capitalistic economy. This has led to suggestions that a peasant household is a unique entity that should be analysed through the use of special techniques. Some authors, in support of these arguments, attributed the apparent peasant farmer irrationality to his 'complex personality and lifestyle' (Jones, 1960; Barber, 1960; Livingstone, 1977).

There are, however, strong arguments against a presumption of peasant irrationality (Neumark, 1958; Schultz, 1964; Lipton, 1968; Medani, 1976; Bundy, 1979). These arguments are based on empirical evidence which has been obtained from surveys and case studies conducted in purely peasant farming communities. The supporters of peasant rationality theories argue that peasant farmers are rational producers and that they base their decision-making on factors that maximise their utility. It does, however, happen that the

decisions of peasant producers appear to contradict conventional economic theory. That does not necessarily mean that the peasants' actions are irrational.

The aim of this paper is to investigate the effect of product prices of maize and sorghum on the maize supply response of peasant farmers in three villages in the Middledrift district of the Eastern Cape. The purpose is to establish whether the farmers' behaviour complies with economic theory and therefore whether they respond in an economically rational manner when they produce a crop both as a staple food and cash crop.

2. CROP PRODUCTION IN THE MIDDLEDRIFT DISTRICT

In a study in the Middledrift district, Bembridge (1987: 104) found that "practically all respondents had non-viable farming units which was a clear disincentive to full-time farming". The average arable land holding for the area is 1,6 hectares. In spite of the small allotments of arable land held by individual farmers in the district there is not a shortage of land in aggregate. Page (1981) noted that tracts of land were lying fallow because of absentee owners. Crop farming in the area is

entirely dependent on rainfall, which is generally unreliable and droughts often pose a threat to farmers.

The dominant crops are maize and sorghum, while other crops such as beans and pumpkins are grown on a smaller scale. Bembridge (1987) argued that maize was bound to be a major crop as it was both a staple food and cash crop for the farmers. Maize yields for farmers in communal areas are extremely low, averaging between two and four bags per hectare (De Wet, 1985).

3. RESEARCH PROBLEM AND HYPOTHESES

This study attempts to ascertain the hectare response for maize of peasant farmers to changes in the prices of maize and sorghum. The analysis is based on aggregate farm production time series data for the period 1969 to 1989 that was obtained from the local and district agricultural offices. The peasant farmers in the study area did not provide any production and marketing information because they did not keep any records.

The nature of the problem as outlined suggests the following hypotheses:

Null hypothesis (H_0)

There is no positive hectare response in maize production to changes in the producer prices of maize and sorghum.

Research hypothesis (H_1)

There is a positive hectare response in maize production to changes in the producer prices of maize and sorghum.

4. RESEARCH METHODOLOGY

This study consists of data that relates to two field crops, viz maize and sorghum. No other crops are grown in significant quantities in the study area that could influence maize planting decisions. The prices of both these crops have therefore been included in the model to estimate their impact on the maize hectare responses of peasant farmers. The area of maize planted the previous year has also been included in the model. A time variable was included in the model to capture changes in technology in maize production.

An attempt could have been made to incorporate a risk element in the supply response equation by including a coefficient of variation of gross profitability of maize over the years considered in the study. Due to a lack of data on the gross profitability of maize, the idea of considering the risk factor in the analysis was abandoned.

The basic model used was the Nerlovian Adjusted Lagged Model in equations (1) and (2):

$$AM_t^* = B_0 + B_1 PM_{t-1} + B_2 PS_{t-1} + B_3 T + U_t \quad (1)$$

$$AM_t - AM_{t-1} = r(AM_t^* - AM_{t-1}) \quad (2)$$

where:

AM_t^* = the planned or desired hectare of maize;
 AM_t = actual hectare of maize in period t ;
 AM_{t-1} = actual hectare of maize in period $t-1$;
 PM_{t-1} = real price of maize (R/ton) in period $t-1$;
 PS_{t-1} = real price of sorghum (R/ton) in period $t-1$;
 T = a time variable representing changes in technology;
 r = coefficient of adjustment, and
 U_t = error term.

Substituting equation (1) into (2) gives the reduced form

$$AM_t = b_0 + b_1 PM_{t-1} + b_2 PS_{t-1} + b_3 T + bu AM_{t-1} + V_t \quad (3)$$

where:

$$b_0 = rB_0, b_1 = rB_1, b_2 = rB_2, bu = 1-r \text{ and } V_t = rU_t$$

5. RESULTS OF THE DATA ANALYSIS

Several combinations of the variables were used in multiple regression analysis and the most promising estimated equation of the adjusted lagged model is presented below:

$$\hat{AM}_t = 59,760 + 0,127 AM_{t-1} + 0,162 PM_{t-1} - 0,183 PS_{t-1} + 0,88 T \quad (4)$$

(11,69) (0,05) (0,07)
(0,08) (0,67)

$$\bar{R}^2 = 0,67$$

$$h = 1,56$$

where the variables are as defined earlier, h is the calculated h -test statistic, \bar{R}^2 is the adjusted coefficient of multiple determination and the figures in parentheses are the standard errors.

In equation (4), lagged maize hectare (AM_{t-1}), price of maize (PM_{t-1}) and the price of sorghum (PS_{t-1}) all had coefficients significant at the 5 per cent level of significance. From a statistical viewpoint, the farm price of maize is the most important factor determining maize production. The estimated parameter suggests that a R1,00 increase in the lagged price of maize per ton would lead to an increase in production of 0,162 hectares.

The variables in the model explained 67 per cent of the variation in hectare of land planted to maize. This is not an impressive fit and the balance of the variation is possibly explained by the existence of wage employment opportunities in the adjacent Dimbaza industrial area.

When a lagged dependent variable is included as an independent variable in the Nerlovian model, the Durbin-Watson statistic will give a biased measurement of the existence of serial correlation (Doran and Guise, 1984). To overcome this problem the h -statistic has been used and the value of this statistic indicates no problem of serial correlation.

The positive relationship between the time variable and the hectare of maize may indicate that technological changes directly affect maize

Table 1: Short- and long-run supply elasticities

Independent Variable	Elasticity of maize area with respect to maize and sorghum price changes		Coefficient of adjustment	Mean value of independent variable
	Short-run	Long-run		
Maize price (R/ton)	+1,23	+1,41	0,87	389
Sorghum price (R/ton)	-1,29	-1,48	0,87	361

production decisions over the time period. However the relationship is not significant.

Short- and long-run elasticities of supply are calculated from the equations below. The short-run elasticity for hectareage response can be derived as follows:

$$n_{sr} = \frac{\delta A_t}{\delta P_{t-1}} \cdot \frac{\bar{P}_{t-1}}{\bar{A}_t} \quad (5)$$

while the long-run price elasticity is derived by

$$n_{lr} = \frac{\delta A_t}{\delta P_{t-1}} \cdot \frac{P_{t-1} \bar{A}_t}{1 - \frac{\delta A_t}{\delta A_{t-1}}} \quad (6)$$

As shown in Table 1, the estimated long-run elasticity coefficient suggests that a 1 per cent change in the price of maize would lead to a 1,41 per cent change in the area planted. By comparison, the short-run elasticity suggests a 1,23 per cent change in the area of maize for each 1 per cent change in maize price. The short- and long-run elasticities for sorghum are -1,29 and -1,48 respectively. These coefficients suggest that maize producers switch relatively easily between the production of the two commodities.

The estimated parameter for lagged hectareage suggests 87 per cent of the adjustment towards long-run equilibrium occurs during the first year. This rapid rate of adjustment is theoretically plausible since most of the producers in the study area operate on a small scale with limited fixed investments in maize.

6. CONCLUSIONS AND IMPLICATIONS

The objective of the study was to investigate the maize supply response of peasant farmers in the Middledrift district. The results showed a positive relationship between maize hectareage and the lagged maize hectareage, the real maize price. The relationship between maize hectareage and lagged sorghum price is found to be negative. This indicates that the hectareage of maize would decline when the price of sorghum increases. The analysis further indicates that farmers acted in an economically rational manner both in terms of maize being both a staple and cash crop. A higher price for maize will result in an increased income for any surplus over subsistence consumption.

Increased production for home consumption due to the higher price would also be considered rational. Higher producer prices are invariably passed on to the consumer and therefore increased production to meet subsistence needs would reduce expenditure on the staple food.

Most of the adjustment towards equilibrium occurs in the first year after a price change. The policy implication is that the price of maize can be used to increase production of maize to enhance food security for subsistence farmers and to increase the marketable surplus. In addition this, adjustment can be made fairly rapidly. The authors agree that the failure to incorporate risk in the analysis is a limitation of the study. It is strongly suggested that future research on supply response should include a risk variable in the analysis.

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