PRICE STABILISATION POLICIES: HAS THE MEAT SCHEME BENEFITED BEEF PRODUCERS IN SOUTH AFRICA?

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Abstract

Prices should be non-distortive signals for production and consumption. Deterministic price behaviour patterns (cycles) and rainfall cycles resulted in cyclical supply variation through a process of herd expansion/liquidation. This apparently promoted inefficient management strategies at farm level and distorted production and marketing of beef. Significant seven year supply cycles for beef were isolated and used to determine producers' supply response flexibilities to rainfall and price cycle variation. Multiple regression analysis with distributed lag models were used. Significant lagged supply responses indicate that price signals were distorted and aided the climatological inflexibilities of beef production. Nominal beef producer prices were not stabilised and the control measures, employed for this purpose, effectively reduced farmers' marketing opportunities and thereby increase their exposure to production, price, marketing and income risks. Controlled marketing of red meat failed to stabilise producer prices of beef or to promote the producers' interests.

Uittreksel
Prysstabilisasiebeleid: Was dit tot voordeel van beesvleisprodusente in Suid-Afrika?

Pryse behoort te dien as seine vir produksie en verbruik. Deterministiese prysvariasie (siklusse) en reënvalsiklusse gee aanleiding tot sikliese aanbod deur kudde uitbreiding en vermindering. Gevolge hiervan is ondoeltreffende bestuurstrategieë op plaasvlak en oneffektiewe produksie en bemarking van beesvleis. Betekenisvolle sewe jaar beesvleis aanbodsiklusse is geisoleer en aangewend om die aanbod siklus reaksie se sensitiwiteit ten opsigte van reënval en pryse te bepaal. Meervoudige regressieanalise met verspreide sloerings is gebruik. Betekenisvolle gesloerde aanbod reaksie dui op verwronge prysseine wat die klimatologiese onplooibaarheid van beesvleisproduksie versterk. Beheermaatreëls wat gemik is op prysstabilisasie kon nie in die doel slaag nie, maar beperk produsente se bemarkingsgeleenthede en verhoog daardeur produsente se blootstelling aan produksie-, prys-, bemarkings- en inkome risiko's. Beheerde bemarking het daarin gefaal om pryse te stabiliseer en om produsente se belange te bevorder.

1. Introduction

Prices are generally considered as signals for production, consumption and agricultural marketing intervention policies. The inverse of this may however also be true, in that excessive demand may render inflationary prices, sustained over-production results in low prices and market intervention policies may induce abnormal price movements. If ignored, deterministic price behaviour my cause inefficient management strategies at farm level, distort agricultural markets and render agricultural policy strategies as ineffective.

One of the main objectives of the marketing act, ie. price stabilization, was, in the case of red meat, to be attained through price guarantees (floor prices) and other control measures such as supply control, restrictive trade registration, compulsory auctions, mandatory use of abattoir agents, mandatory slaughtering at controlled abattoirs and the restriction on the movement of meat to controlled areas (RSA, 1976; Van Biljon, 1972; Eales, 1979; Commission of Inquiry into the Red Meat Price Discovery Process, 1989). It was, and still is believed that price stabilisation is to the advantage of the farmer and therefore justifies controlled marketing of red meat. Controlled marketing in general failed to attain its stated objectives (Rees, 1979; Laubscher, 1982; Veenstra, 1986), but on the contrary it aided supply and producer price variation, increased producers' production, marketing and income risks and supported high consumer prices.

This article discusses the effectiveness of controlled marketing to stabilise producer prices of beef and the related benefits (or absence thereof) to livestock producers and individual producers in particular. Deterministic seven year beef price cycles were isolated and estimated for the Witwatersrand controlled market (Lubbe, 1990). These cycles were found to be partially self generating, caused by rainfall cycles, which in combination with real and psychological price expectations, resulted in a cyclical supply of cattle to controlled markets. Periodic surpluses and shortages of cattle at controlled markets in turn rendered cyclical price patterns. It is hypothesised that control

regulations aided these cyclical patterns and in turn negated any possible benefits of this scheme to the individual livestock producers.

2. Data and techniques

Cattle slaughterings at the Witwatersrand controlled market from 1964 to 1989, were used to estimate supply cycles of females, oxen and total slaughterings. Data for these and other analyses were obtained from the Meat Board, RSA Livestock and Meat Statistics (1983 to 1991), Meat Board Annual Reports (1980/81 to 1990/91) and the Abstract of Agricultural Statistics (1991).

Cycles of females, oxen and the total cattle slaughterings were isolated using the same MA-ANOVA time series decomposition method described by Lubbe (1990). The following models were hypothesised in each case:

$$Y_t = (T_t . C_t . S_t) . E_t \qquad (1)$$

where:
Y_t = slaughterings at time t,
T_t = trend at time t,
C_t = cycle index at time t,
S_t = seasonal index at time t,
E_t = random error at time t and
t = time values in years (eg. 64 for 1964).

The use of yearly data excludes the seasonal component, and only the cyclical components (Ct) were retained in this study. Trends were relatively weak or non significant. Real prices from 1964 to 1990 of all grades beef were deflated using the Consumer Price Index (CPI) and Agricultural Price Index (API) with 1980 = 100%. Price difference margin ratios (PDR) were calculated for Super and All grades beef from 1970 to 1989 as $(P_{Super} - P_{All\ grades}) / P_{All\ grades}$.
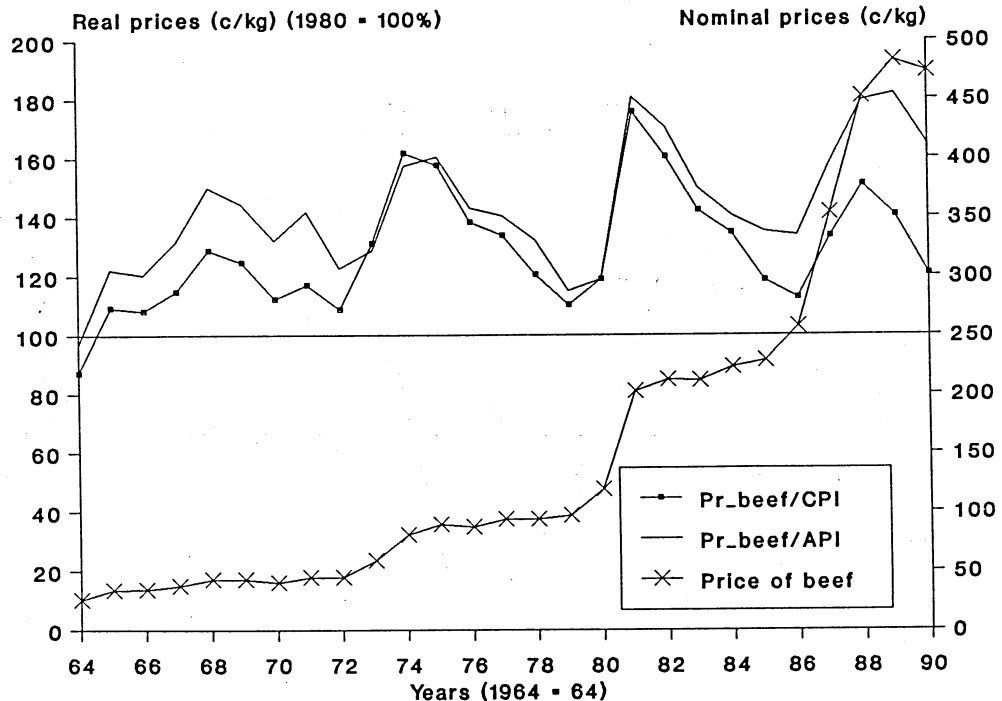
Figure 1: Real prices of beef (c/kg) deflated with the Consumer Price Index and Agricultural Product Price Index (1980 = 100%) and nominal beef producer prices from 1964 to 1990 for the Witwatersrand controlled market.

Cycle adjustment coefficients between price cycles, rainfall cycles (Lubbe, 1990) and the isolated supply cycles were estimated using multiple regression analysis with distributed lags. The following model were adapted from Judge *et al*. (1985).

$$Z_t = a + \Sigma_i b_i P_{t-i} + \Sigma_i c_i R_{t-i} + e_t \qquad (2)$$

where:

Z_t = supply cycle response value at time t,
P^t = price cycle index value at time t,
R_t = rainfall cycle value at time t,
b_i and c_i = coefficients of cycle adjustments pertaining to price or rainfall cycles at lag i,
i = lags in prices or rainfall cycle indices and
e_t = random error at time t.

Analyses were done using typical seven year rainfall and price cycles isolated by Lubbe (1990). These cycles represent stationary time series.

3.   Price stabilisation and supply variation

A significant seven year price cycle was estimated for beef (Lubbe, 1990) which indicates the inability of the red meat marketing regulations to effectively stabilise prices over the medium or the short terms. This cycle is reproduced in Figures 2 and 3. Relatively high variation in nominal beef prices (1964 to 1990) is indicated by a coefficient of variance (CV) of 90,37%. A growth rate of 12,6% over the long term in beef prices (Lubbe, 1990) which accompanied this cycle explains the high CV and the stepwise price behaviour of nominal prices illustrated in Figure 1. The variation in real beef prices was however relatively lower, as indicated by CV's of 14,7% and 13,5%, if deflated by the CPI and API, respectively. These deflated price time series are illustrated in Figure 1. It is evi-

dent that real beef prices on average were above parity levels in comparison with the CPI and API since 1964, but were also exposed to extensive cyclical behaviour.

The price cycle is the result of the combined effects of guaranteed prices, production capacity responses, rainfall effects and controlled marketing policies. During the minima of the price cycle, supply control is used to maintain guarantee prices and producer prices cannot reach equilibrium price levels due to the psychological and real limits set by the floor prices. This results in the inability to either clear markets or absorb surplus supplies. Inadequate abattoir capacity was also used as a justification of supply control (Meat Board, 1989), while stringent health and hygiene regulations restricted entry into the abattoir industry. It also prohibited market access through other abattoirs. Subsequent relaxation of some regulations which allowed Class 2 abattoirs to supply meat to the controlled areas with quotas followed, but it is questionable if it benefited the smaller individual farmer (Lubbe, 1991). More than 80% of this capacity is owned by only three large vertically integrated organisations, who also have extensive feedlot operations.

During a shortage of cattle for slaughtering, which occurs at the maximum of the price cycle, producers expand their herds anticipating that prices will further increase or stay relatively high. The increasing phase of the price cycle is only three years, which consist of a first year with moderate price increases and two years of rapid price increases. Importation of meat, however, only commences in the middle stages of the four year downswing of the price cycle, but continue into the herd liquidation phase which clearly enhances the decline in producer prices. Due to the inflexibility of livestock production, farmers cannot timeously adjust to the short period of rapid price increases, while regulative measures and importation policies lag in response to rapid supply increases (herd liquidation).

Cycle index ratios

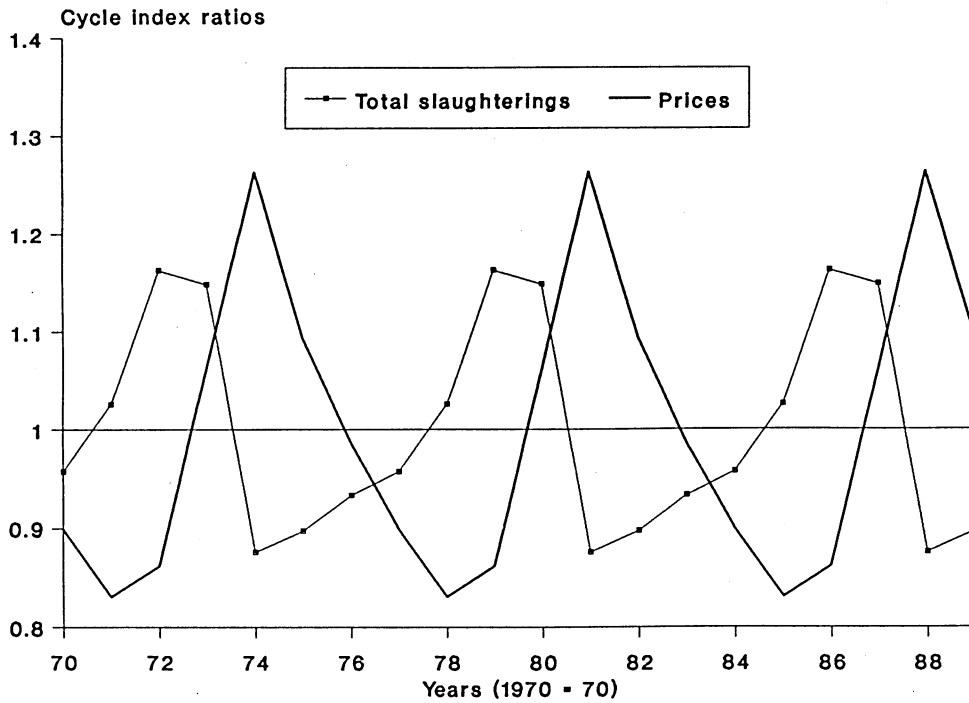

Figure 2: Seven year price and total slaughterings (supply) cycle indices (ratios) from 1970 to 1989 for the Witwatersrand controlled market.

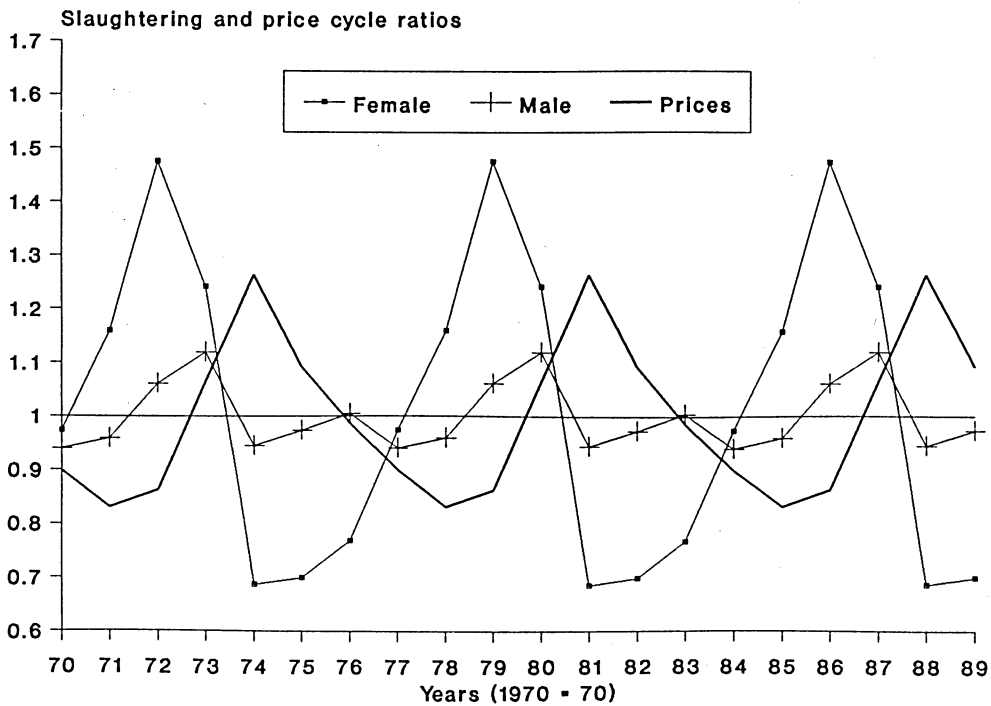**Slaughtering and price cycle ratios**

Figure 3: Seven year beef price and cattle slaughtering cycle indices (ratios) of females, males and total slaughterings from 1970 to 1989 for the Witwatersrand controlled market.

It therefore strengthened the price cycle and increased producers' exposure to production, marketing and price risks. Neither price or income stabilisation was attained in an environment of price expectations and cyclical behaviour of supply and prices.

Table 1: Summary of cycle estimates for cattle slaughterings (all grades) at the Witwatersrand controlled market with adjusted means and coefficients.

Years	Total C_j^{**}	Female C_j^{*}	Oxen C_j^{*}
1	1.026	1.158	0.958
2	1.162	1.475	1.060
3	1.149	1.241	1.119
4	0.875	0.686	0.944
5	0.897	0.699	0.973
6	0.933	0.767	1.004
7	0.957	0.973	0.940
Statistics			
Mean	1.000	1.000	1.000
R^2	0.723	0.768	0.755
Df	18	18	18
F_{model}	2.610***	6.630*	6.16*

The total supply (slaughtering) and price cycles (both seven years) are illustrated in Figure 2. These illustrations demonstrate the directional adjustments between supply and prices and the regularity of shortages and surpluses at the Witwatersrand controlled market. It is apparent that the minimum of the supply cycle coincides with the maximum of the price cycle, while the maximum of the supply cycle occurs in the year following the minimum of the price cycle. It is possible that this lagged responses originated from ill-timed policy adjustments. The cycle index estimates of supply are summarised in Table 1.

Cyclical price variation is both the cause and effect of cyclical production through a process of herd expansion and liquidation, which simultaneously responds to price expectations and current prices. Figure 3 shows seven year cycles of prices, female slaughterings and oxen slaughterings at the Witwatersrand abattoirs. The female slaughtering cycle is more volatile than the oxen cycle, with the latter probably filtered by feedlot activities. It is apparent from Figure 3 that the cyclic behaviour of female slaughterings is the driving force of cyclical supply in the form of variation in production capacity. Du Toit (1982) showed that female slaughterings had a profound effect on the determination of beef supply to the controlled markets. It is apparent that this cycle is at its maximum during the minimum of the price cycle, demonstrating producers reaction to prices and price expectations. Cyclical production may thus be the result of combined influences of price expectations, price guarantees, inadequate market access (due to supply control), other restrictive regulations, importation policies and the cyclical behaviour of rainfall.

This state of affairs evidently indicates a distorted production process, which amplifies climatological inflexibilities and also indicates distorted price signals. High prices during the upswing and maximum of the cycle are incentives for production capacity expansion. Female animals, which are then in great demand, are kept from markets, while the excess production capacity subsequently results in a herd liquidation process during the decline of the price cycle.

4. Supply cycle adjustments

According to Figure 2 it is clear that synchronising lags between the seven year price and supply cycles exist. The inherent inflexibility of supply from biological and climatological

parameters is not compensated for, but exaggerated by price cycle and regulative measures. High prices and progressive floor price increases provide incentives for livestock producers to expand production capacity, while increased production is met by low prices, supply control and continued importation of meat (or livestock).

Table 2: Results of supply cycle adjustment coefficients from regression of price and rainfall cycles on supply cycles.

Variables	Functions F_1	F_2	F_3	F_4
Intercept	2.259	1.255	1.796	1.227
$Price_{L1}$	-0.623* (11.76)	-0.707* (-8.59)	-0.453* (-7.66)	-0.335* (-8.38)
$Price_{L5}$			0.237* (3.86)	0.317* (8.30)
Rainfall	-0.636** (2.25)		-0.582* (-7.74)	-0.519* (-11.54)
$Rainfall_{L1}$		0.45** (2.87)		
$Rainfall_{L2}$				0.310* (5.72)
R^2 (%)	91.9	81.4	95.8	98.7
DW	2.56	2.43	3.50	2.90
Df	19	19	19	19
F_{model}	96.08*	37.26*	121.43	279.84*

This may influence the farmers' ability to adjust their supplies in accordance to climatological hazards in the long term, and may in the short term also render farmers subject to increased market and drought risks. The net result is a distorted production process and the inability of farmers to stabilise their incomes. Cycle adjustment coefficients were estimated by regressing stationary seven year price and rainfall cycles to a stationary total supply cycle. The results are summarised in Table 2.

Functions which contained only combinations of lagged rainfall cycle variables or short term lagged price variables were non-significant. It is thus apparent that the adjustment of supply depends both on price and rainfall parameters. From Table 2 it is apparent that supply responded negatively to a one year lag in the price cycle and to the current rainfall cycle level. The relatively short term inverse response to the price cycle is probably due to anticipations that prices will continue to increase (during the increasing price cycle) and *vice versa*. The positive supply cycle response to a five year lag in prices, represents the herd expansion and liquidation processes, which links the maxima of the price and supply cycles. The one and two year rainfall lags pertain to medium term climatological-supply reactions. These analyses indicate that supply flexibility to a large extent depends on climatological influences, but is evidently distorted by price signals.

Production efficiency became a response to cyclical slaughterings, while periodic surpluses and shortages occurred at the controlled markets. This benefited neither the producer nor the consumer; the producer suffers from inadequate market access during over-supply periods, a deterioration in his natural resources and an enhanced income variability, while the consumer has to face high beef prices even during over-supply periods (Veenstra, 1986). The Meat Scheme regulations followed a policy of market avoidance rather than surplus removal, and simultaneously an ill-timed importation policy. Supply control, restrictive health and hygiene regulations and restrictions to entry into the abattoir industry are major factors in this regard. This may probably be due to ignorance and/or the absence of knowledge of these supply and price cycles, leading to a lag in marketing policy implementation.
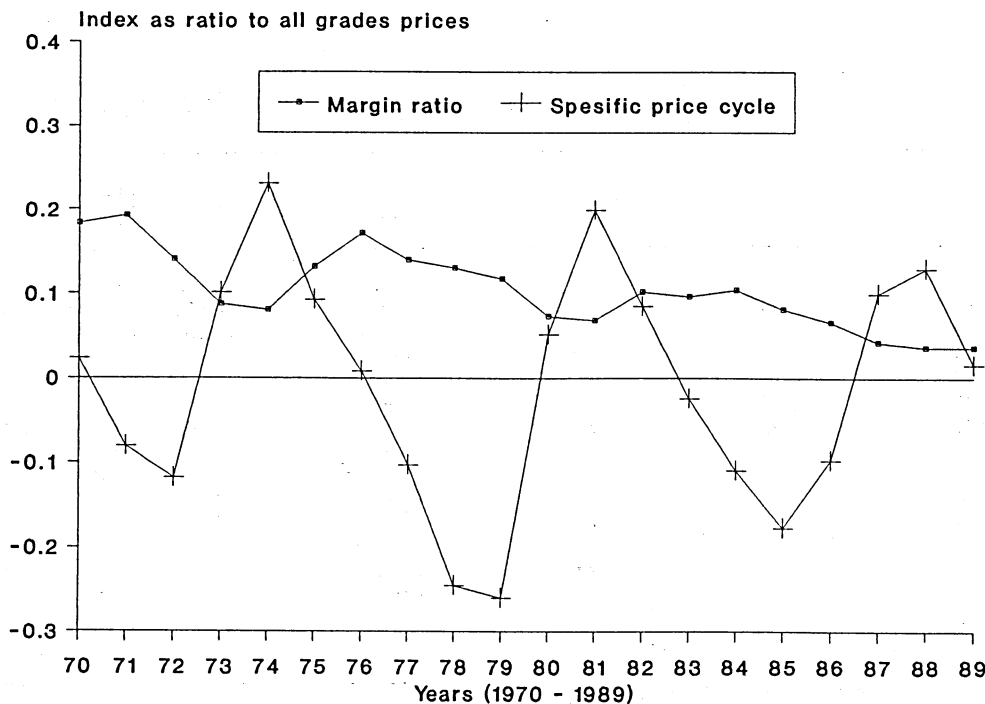
Figure 4: Super and All grades beef price differences (ratio to all grades prices) and the specific All grades price cycle at the Witwatersrand controlled market.

Supply control measures are not suspended timeously, effective imports are delayed and floor price adjustments are still positive. Thus instead of a anti-cyclical policy that would effectively have stabilised prices, the regulations and their lagged implementation contributed to disproportionate adjustments in supply enhancing the inflexibility from climatological variation.

5. Grading and levies

The price difference margin ratio between All grades and Supers (($P_{Super} - P_{All grades})/P_{All grades}$), followed an anti-cyclic pattern to the beef price cycle. This behaviour is illustrated in Figure 4. The price difference between Super and All grades beef widens when prices decrease (downward phase) and narrows when prices increase (upward phase). In the past this price behaviour has been used successfully by the author as an indicator in forecasting beef price cycle turning points. It is apparent from Figure 4 that the relative price difference between Super and All grades beef diminished over time. This effect may be due to the grading system which favours "Super" and "A" grades, while these grades also have relatively higher floor prices than other grades. Producers have in the past experienced favouritism towards these grades during over-supply periods, as embodied in floor and basis price differentials. The composition of slaughterings to the controlled areas also favoured a change towards the more "expensive" grades as indicated by an increase of the "Super" and "A" slaughterings from 44,2% in 1983 to 65,2% in 1990. This is probably due to the increase in the controlled market supply share of feedlots, which increased from 28,9% in 1983/84 to 53,8% in 1989/90 (Lubbe, 1991). This supply originated from 65 feedlots out of an approximate 9500 beef producers supplying controlled markets. Producers therefore tend to concentrate on producing higher priced grades in their controlled marketing strategies which, in times of high prices, result in shortages of lower grades. Prices of lower grade meat increase relative to that of higher priced

grades and importation, of mostly lower grade meat, commence. Price differentials between grades are also artificially based on floor price differentials. It is questionable if these price differentials resulted from consumer preferences, and if handling costs differ between grades. Consumers are therefore virtually forced to consume high priced meat, which is more profitable to both the major suppliers of these grades (feedlots), the trade and in particular the large vertically and horizontally integrated organisations (Lubbe, 1991).

Marketing costs which consist of levies, slaughtering fees and other costs, totals about 15% of the producer's carcass income. These costs, however, do not differentiate between grades (RSA Livestock and Meat statistics, 1990). The levies, slaughtering fees, inspection, transportation etc. are the same - whether an animal is graded as "Super" or as "Grade 4". This implies that suppliers of the more expensive grades (mostly feedlots) are to some extent subsidised by the suppliers of the lower grade beef (the majority of the producers) and also by levies from non-controlled slaughterings, payable by the producers without any controlled market access.

6. Consumption effects

Controlled marketing is aimed at promoting price stability and inhibiting controlled market access, rather than expanding demand through market development. Efforts to promote demand and consumption are negated by policies of controlled marketing, which limit quantities available for consumption. These regulations also created, supported and maintained an inflexible and highly concentrated market structure (Lubbe, 1991). It evidently supported high consumer prices and resulted in a subsequent decline in the per capita consumption of beef; it declined from 19.5 kg in 1976 to 15.5 kg in 1989 (RSA Livestock and Meat Statistics, 1990). A high income preferential market for beef was created by the controlled

marketing system, which failed to satisfy the preferences and needs of either the high income or poorer consumers (Veenstra, 1986). The latter group is technically excluded from consumption by inaffordable and unavailable beef. Price support through controlled marketing can only be to the advantage of the producer if both, the supply and demand is relatively inelastic (Tomek and Robinson, 1983). It has been shown by Du Toit (1982), Hancock (1983) and Uys (1986) that the demand for beef is relatively price elastic (more than unitary) which renders the Meat Scheme regulations instrumental in the decline of the *per capita* consumption of beef, and therefore results in a diminishing market for the beef producer. The substitution of cheaper poultry for beef is also a reality and probably irreversible over the long term (Uys, 1986). The main beneficiaries of controlled marketing are seemingly the trade and in particular the concentrated and vertically integrated organisations, while the poorer consumers are excluded from the consumption of affordable beef and the market risks are effectively transferred from the trade to the producers. The demand for beef has a positive income elasticity of 0,73 among the total population, 1,19 for the urban black population and only 0,48 for the urban white population (Laubscher, 1982). This implies that failure to explore the black market and serving only a declining market segment represent a loss of market share for beef. The availability, limitations on quantities, grading, concentrated market structure and hygiene regulations are major deterrents in the decline of the market share for beef consumption.

7. Marketing strategies of farmers

The controlled marketing system also influenced farmers' business strategies. Farmers' strategies are basically production orientated as marketing options are limited and fixed. These marketing strategies are reduced to price seeking and competition for permits or quotas. Elliott *et al*. (1987), found that farmers had the opinion that permits are hard to obtain during the high price seasons (Easter and December) and also during over-supply periods in the longer term. They also had the perception that feedlots and larger producers were favoured by the marketing scheme. This may possibly be due to the preferential fixed quotas allocated to feedlots and the criterion pertaining to permit allocations which favours regular suppliers. Market development strategies of farmers are non existent and farmers are also prevented from stabilising their incomes by following an increased turnover, low price policy during over-supply periods or droughts. Such a policy is possible, considering the elastic demand for beef. These restrictions can, in effect, prohibit farmers to adjust their production according to rainfall cycles (Lubbe, 1990).

Competition is limited to a possible stake in a fixed market and the farmers' business and climatological risks are therefore increased. Farmers' business strategies may therefore be limited to an improvement of production efficiency as there is no scope for any individual controlled marketing strategy. This worsens the farmer's income potential because his marketing opportunities are limited. Controlled marketing policies were unable to stabilise prices or improve farmers' incomes but effectively increased the variability thereof (Louw, 1975; Lubbe 1981). Marketing risks and income instability of small farmers and farmers relatively far from the controlled markets have been increased by controlled marketing costs (mainly transportation) and limited controlled marketing opportunities via permit or quota allocations (Elliott et al, 1987). Farmers effectively subsidise the trade, which is protected by the control measures, while the controlled marketing system and price supports are financed by all the producers.

8. Policy implications

Continued implementation of controlled marketing may further increase producers' risks and diminish the market, which calls for corrective actions or market reform. One alternative may be to implement the scheme according to its intentions, that is, to remove surpluses by exports (as was intended with the large

controlled abattoirs) which would free capacity to absorb surpluses. Negative consumption effects due to increased consumer prices and probable increased substitution by poultry may however render this alternative infeasible (Nieuwoudt, 1985). It may possibly also strengthen the concentrated market structure and thereby increase marketing inflexibility (Lubbe, 1990). An appropriate regulated red meat marketing system may be a more viable option, if it promotes equality in benefits, free choice, free entry and exit and workable competition. This approach should however include a decentralised and deregulated abattoir policy aimed at reducing farmers' risks and marketing costs (Eales, 1979).

9. Conclusion

It can be concluded that whilst price cycles are partly self generating due to rainfall and production inflexibilities, policy measures and price expectations contributed to the generation and the maintenance of supply cycles. These policy effects mainly influenced cyclic price behaviour and sustained price incentives with floor prices, basis prices, supply control, inadequate abattoir capacity, the non-timeous implementation or suspension of measures and trade restriction. The price stabilisation policies were unable to attain its objective to stabilise beef prices, but effectively increased farmers' climatological, income and marketing risks. Distorted price signals aided supply variation and decreased the farmers' ability to adjust to climatological hazards. These negative effects as well as a reduced *per capita* consumption of beef contributed to inefficient production strategies, diminishing marketing opportunities, an increase in natural resource deterioration and inefficient marketing strategies at the farm level. Controlled marketing of red meat failed to promote the producers' interest with price stabilisation policies.

Note

References

ABSTRACT OF AGRICULTURAL STATISTICS. (1989, 1990 and 1991). Directorate of agricultural trends, Department of Agricultural Marketing and Economics, Pretoria.

COMMISSION OF INQUIRY INTO THE RED MEAT PRICE DISCOVERY PROCESS. (1989). Report of: Government printer, Pretoria.

DU TOIT, JPF. (1982). 'n Ekonometriese ontleding van die vraag na en aanbod van vleis in Suid Afrika. MBA thesis, University of Pretoria, Pretoria.

EALES, R. (1979). A long-term physical abattoir development plan for South Africa. PhD thesis, University of the Witwatersrand, Johannesburg.

ELLIOTT, MB. (1986). An economic analysis of an opinion survey of South African beef farmers. MSc. dissertation, University of Natal, Pietermaritzburg.

HANCOCK, PJ. (1983). An econometric demand and policy analysis of the South African meat industry. MSc. dissertation, University of Natal, Pietermaritzburg.

JUDGE, GG, GRIFFITH, WE, HILL, RC, LUETKEPOHL, H and LEE, TS. (1985). The theory and practice of econometrics. John Wiley, New York.

LAUBSCHER, JM. (1982). An analysis of the economic performance of the South African beef and cattle market. PhD thesis, UOFS, Bloemfontein.

LOUW, A. (1975). Wisselings in die finansiële resultate van beesboerdery in die Noordwes Transvaalse soetbosveld. MSc. thesis, University of Pretoria, Pretoria.

LUBBE, WF. (1981). Norme vir sakebestuur en finansiering van boerderye in ekstensiewe gebiede, met besondere verwysing na die Noordwes Transvaalse bosvelddele., MSc. Thesis, University of Pretoria, Pretoria.

LUBBE, WF. (1990). Decomposition of price time series components of the red meat industry (beef) for efficient policy and marketing strategies. Agrekon, Vol 29, No 4:296-304.

LUBBE, WF. (1991). Normalising competition in agricultural marketing - the case for red meat in South Africa. Agrekon, Vol 30, No 4:253-259.

MEAT BOARD. (1989). Annual report June 1988 to July 1989. Pretoria.

MEAT BOARD ANNUAL REPORTS. (1980/81 to 1990/91). Pretoria.

NIEUWOUDT, WL. (1985). Ekonomiese ontleding van die vraag en beleide in die vleisbedryf. Agrekon, Vol 24, No 2:9-13.

REES, DJ. (1979). Regulation of South African agriculture - performance of agricultural marketing boards. PhD thesis, University of Cape Town, Cape Town.

RSA LIVESTOCK and MEAT STATISTICS. (1983 to 1991). Meat Board, Pretoria.

RSA. (1976). Verslag van die kommissie van ondersoek na die Bemarkingswet, (Wet no 59 van 1968). RP 39/1976, Staatsdrukker, Pretoria.

TOMEK, WG AND ROBINSON, KL. (1983). Agricultural Product Prices. 2nd ed., Cornell University Press, Ithaca.

UYS, PW. (1986). Demand for meat in South Africa : A non-additive dynamic linear expenditure model. South African Joural of Economics, Vol 52, No 2:207-219.

VAN BILJON, FJ. (1972). Belangrike feite in verband met slagvee- en vleisproduksie en -bemarking in Suid Afrika. Agrekon, Vol 11, No 4:5-13.

VEENSTRA, HP. (1986). The disparity between consumer and producer prices for beef, mutton and pork in South Africa. MSc.- dissertation, University of Natal, Pietermartizburg.