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Livestock pricing policy in sub-Saharan Africa: objectives, instruments and impact in five countries

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ABSTRACT

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Livestock pricing policies in many developing countries are often instituted without a good appreciation of the consequences of such policies for allocative efficiency, output and trade. This paper evaluates, in a comparative cross-country context, the objectives and instruments of livestock pricing policy in five sub-Saharan African countries: Ivory Coast, Mali, Nigeria, Sudan and Zimbabwe during the period 1970–86. It assesses the extent to which pricing policy objectives have been attained, and also estimates the effects of price interventions on output, consumption, trade and government revenues in order to draw out lessons for the future.

The empirical results indicate that in comparison with real border prices, a certain degree of success was achieved in stabilising real domestic producer prices in the study countries. The results also show that since the early 1980s, there has been a gradual shift away from taxation of producers. However, consumers still appear to gain as much as producers in three of the study countries, with negative consequences for foreign exchange earnings and government revenues. The analysis reveals the importance of domestic inflation and exchange rates as key variables for livestock pricing policies and highlights the need to address the macroeconomic imbalances that cause exchange rate distortions and high domestic inflation at the same time that direct price distortions are being tackled.

INTRODUCTION

Governments in many countries of sub-Saharan Africa manipulate agricultural and food prices to achieve a variety of economic, social and political objectives. The multiple objectives of price policy and the various

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instruments employed to influence prices often create a negative incentive environment for agricultural producers. Numerous recent studies have shown that governments in many African countries have consistently taxed the agricultural sector through price policy (see, for example, Cleaver, 1985; Oyejide, 1986; Tshibaka, 1986; Ghai and Smith, 1987). These studies, however, focused mainly on the effects of pricing policies on cash and staple crops. Yet, intervention by governments in the pricing and distribution of cash and food crops also extends to the livestock subsector. Unlike the situation for crops, the magnitude of the effects of price intervention policies on the efficiency of livestock production, trade and investment is often not fully appreciated.

This paper evaluates the effects of livestock pricing policies in five sub-Saharan African countries. The countries studied are Ivory Coast, Mali, Nigeria, Sudan, and Zimbabwe. They were selected because they represent a mixture of livestock importing and exporting countries with differing policy objectives. Furthermore, these countries in 1985 together accounted for over a third of total meat and cow's milk production (by weight) in sub-Saharan Africa (FAO, 1989). The paper examines the objectives and instruments of livestock pricing policy in these countries during the period 1970–86. The success of price policy in attaining the set objectives and the effects of government policy interventions on production incentives, output, consumption and foreign exchange earnings are analyzed. The impact of highly subsidized exports of industrialized countries on prices and investments in the livestock subsector of the study countries are also discussed.

METHODS

Information on livestock price policy objectives and time-series data on official and market prices for beef, mutton and cow's milk were collected from the study countries in 1988. A questionnaire was initially sent to a policy maker closely associated with the livestock subsector in each country. The questionnaire requested information on the main objectives and instruments of livestock price policy and on policy changes that had taken place in the preceding 5 years. The questionnaire was subsequently retrieved during visits to each country and discussed with policy makers and researchers. It was during these visits that price data and documents relating to the livestock subsector were collected. These documents, amongst other things, provided the data that were utilized to estimate domestic transport and processing costs in instances where these costs were not directly provided by marketing agencies in the study countries.

With respect to international prices, Argentinian FOB prices for frozen boneless beef were converted into carcass weight equivalent prices and used as world reference prices for beef. For mutton, London wholesale prices for New Zealand frozen whole carcass were used. Both prices were taken from IMF (1987). 'World prices' for reconstituted milk were obtained as a composite of the prices of skim milk powder and butter-oil. Both prices were taken from various issues of the FAO Commodity Review and Outlook. These world prices were subsequently adjusted for transport, marketing and processing costs as explained in the appendix, to obtain border equivalent prices. Ocean freight costs were estimated based on data obtained from the study countries and by extrapolating on the basis of freight rate indices contained in various issues of the World Bank Commodity Trade and Price Trends.

Real domestic producer prices were calculated by using the consumer price index (CPI) to deflate actual producer prices. The CPI was the only readily available and consistent price series in the study countries. The CPI published in the IMF Financial Statistical Yearbook was used for each country, except Mali. In the case of Mali, a CPI did not exist prior to 1988. The ILO Yearbook of Labour Statistics, however, contains a food price index (FPI) for Mali and this was used to deflate nominal prices in that country.

For each commodity studied, a real border equivalent price was estimated by converting a world representative price into domestic currency using the official exchange rate and then deflating by the domestic rate of inflation as measured by the CPI or FPI in the Malian case. The estimate thus obtained provides an indication of the real value of the border price in domestic terms and will vary from one country to the other depending on the rates of exchange and domestic inflation.

For all commodities, the nominal protection coefficient – a summary measure of price incentives – was calculated as the ratio of domestic price to border equivalent price. The efficiency and welfare effects of intervention policies were measured using a partial equilibrium framework. Before discussing the empirical results, a brief overview of objectives of livestock pricing policy in the study countries is first presented to provide a background for subsequent discussion.

OBJECTIVES AND INSTRUMENTS OF LIVESTOCK PRICING POLICIES

Although there are several objectives of livestock pricing policies in the study countries, the many different objectives pursued can be summarized under four headings: stabilization and inflation control, government revenue generation, self-sufficiency and export promotion. Of these four

objectives, the first three are ubiquitous. The export promotion objective is only common to Mali, Sudan and Zimbabwe.

The stabilization objective takes two forms: price – and income – stabilization. With respect to the former, the aim is to minimize erratic price fluctuations with a view to achieving both consumer and producer price stability. The income stabilization objective, on the other hand, is basically producer oriented. For those countries pursuing the price stabilization objective (e.g. Ivory Coast, Mali, Sudan and Zimbabwe), the main instrument on the consumption side has been consumer price controls. On the production side, a complementary instrument in the form of a marketing board (e.g. in Zimbabwe) is usually employed in conjunction with controlled or administered prices.

Another objective of price policy is to raise revenue for government development tasks. Price policy is often pressed into service to raise government revenue because most developing countries lack an adequate administrative apparatus to impose direct taxes. Thus indirect taxes, e.g. import and export tariffs, are commonly used in all the study countries.

A third reason for intervention derives from the common desire to achieve self-sufficiency in livestock products. The nutritional importance of meat and milk is often cited as the rationale for this objective. Equally important is the desire to reduce dependence on imports in the face of foreign exchange shortages and unpredictable world prices. Some of the instruments used in the past include remunerative producer prices, trade quotas and outright bans on imports and exports.

A fourth objective is associated with the desire of most governments to improve the contribution of the livestock sub-sector to net foreign exchange earnings. This objective constitutes an important aspect of the agricultural export programme in Mali, Sudan and Zimbabwe. Export marketing boards or parastatals that provide regulatory and service functions are commonly established for the purpose of attaining this objective. However, the method of intervention used by these agencies, which in the past sometimes resulted in taxation of producers, and inappropriate exchange rate policies have partly contributed to a decline in the level of exports in some of the study countries.

RESULTS

Effects of intervention on real domestic and border equivalent producer prices

The issue of producer price incentives is central to some of the stated livestock policy objectives. Real producer prices provide a direct, albeit incomplete, measure of incentives provided to livestock producers when

TABLE 1

Annual percentage growth in real domestic and border equivalent producer prices in the study countries, 1970–86 ^a

Product and country	Compound annual percentage rate of growth, 1970/72 to 1984/86	
	Real domestic producer price	Border equivalent producer price in real domestic terms
<i>Beef</i>		
Ivory Coast	-1.3	-3.9 ns
Mali	-3.9	-5.3
Nigeria	0.2 ns	-4.6
Sudan	5.8	-6.5
Zimbabwe	-0.2 ns	-0.7 ns
<i>Mutton</i>		
Ivory Coast	3.3	-2.5
Nigeria	-0.7 ns	-6.7
Sudan	6.4	-1.6 ns
<i>Milk</i>		
Mali	2.4 ns	-2.9
Sudan	1.3 ns	-7.4
Zimbabwe	4.0	-1.6 ns

ns, not statistically significant at the 0.1 level.

The annual growth rates have been estimated as log-linear trends by ordinary least squares regression.

For milk, growth rates were estimated for the period 1971/73–1984/86

Source: Estimated from data collected from the study countries by the author.

technology and input prices are held constant. In principle, the implementation of a producer oriented price policy should lead over time to a rise in producer prices relative to the general cost of living. An examination of the trends in real prices over the period 1970–86 (Table 1) indicates that there were four statistically significant cases of increases and two statistically significant cases of decreases in the real domestic producer prices of the commodities surveyed. If the signs of the non-significant coefficients are examined, the table shows that on balance there was a general picture of upward movement in real domestic producer prices. The pattern, however, varies among commodities even within the same country. For example, in Ivory Coast the producer price for beef fell, while it increased for mutton over the same period. The fall in the real producer price of beef partly reflects the impact of cheap imports of frozen beef from the European Community on domestic producer prices in Ivory Coast (see also Delgado,

1989). These imports, which increased substantially from 1980 onwards, depressed domestic beef prices. At the same time that domestic beef prices were depressed, the consumer price index increased fourfold. The result was a fall in the real domestic producer price of beef. The situation in Mali, the other country where the real price of beef also fell, was somewhat similar. Although nominal producer prices increased over the period covered, the food price index increased much faster leading to a fall in the real price.

The rates of growth of real border equivalent producer prices (RBEPP) also shown in Table 1 provide a basis for comparing real domestic and border prices. In principle, the lower the rate of inflation and/or the higher the rate of devaluation of the exchange rate, the greater will be the tendency for the RBEPP to rise in domestic currency terms. Conversely, countries with a high rate of inflation and a relatively constant exchange rate, i.e. countries allowing their currencies to become overvalued, will show a declining RBEPP. As Table 1 shows, RBEPPs fell in real domestic terms in all the countries studied. The implications of this for producer incentives will be examined below.

Effects on stability of producer prices

As previously noted, one policy objective that is frequently mentioned is price stabilization. The extent to which price stabilization measures meet their goals depends on the degree to which prices are actually stabilized. Table 2 compares the variation in real domestic prices to the variation in border equivalent prices over the period 1970–86. This table gives an indication of how successful the study countries have been in minimizing year-to-year fluctuations in producer prices. Except for mutton in Ivory Coast and milk in Mali, real domestic producer prices have fluctuated less than real border equivalent prices over the entire period covered. Although not shown here, when the entire period covered was divided into two sub-periods, the above results remained largely unchanged.

Overall, the results suggest that in comparison with real border equivalent prices, a certain degree of success was achieved in the study countries in minimizing the year-to-year variations in real domestic producer prices during the period covered. On a different note, the results indicate just how unstable beef markets in the study countries would have been if they had been exposed directly to world prices.

Implicit taxation / subsidisation effects

The discussion of real producer price trends indicates that a certain amount of incentive has been provided to livestock producers through the

TABLE 2

Average prices and variability in real domestic and border equivalent producer prices, 1970–86

Country and Product	Real domestic producer price		Border equivalent producer price in real domestic terms	
	Mean	cv (%)	Mean	cv (%)
<i>Ivory Coast</i>				
Beef	514.1 (CFA/kg)	10.7	400.7 (CFA/kg)	42.8
Mutton	867.8	16.2	686.1	15.5
<i>Mali</i>				
Beef	482.6 (CFA/kg)	19.5	306.4 (CFA/kg)	45.8
Milk	89.8	34.7	147.0	23.3
<i>Nigeria</i>				
Beef	3.1 (N/kg)	23.4	1.5 (N/kg)	25.1
Mutton	5.2	22.4	1.7	29.8
<i>Sudan</i>				
Beef	0.7 (S£/kg)	39.3	0.3 (S£/kg)	67.3
Mutton	1.1	34.3	0.4	36.0
Milk	0.2	18.5	0.3	33.5
<i>Zimbabwe</i>				
Beef	83.1 (Z¢/kg)	11.9	45.7 (Z¢/kg)	48.1
Milk	15.6	17.3	19.9	18.8

The price indices used to deflate nominal prices have 1980 as the base year, thus all prices are in terms of 1980 values.

Border prices were converted to domestic currencies using official exchange rates. On the average, over the period 1970–86, US\$1.00 was equal to 283.5 CFA, 0.68 Naira, 0.48 Sudanese Pound and 0.74 Zimbabwean Dollar.

Source: Calculated using price data collected from the study countries and price indices from IMF (1987).

rise in real producer prices of some of the commodities surveyed. Real price trends, however, provide only a partial picture of the impact of direct and indirect price policies on production incentives. To provide a better measure of the effect of price policy interventions on production incentives, nominal protection coefficients (NPCs) were estimated for the commodities studied. By comparing domestic producer prices to the maximum that could be offered to producers through international trade (i.e. border price less domestic marketing costs), the NPC provides an indication of the taxation (or subsidisation) rate for producers, and thus, a measure of the distortion of production incentives.

The estimated NPCs for beef, mutton and milk, summarized in Table 3, indicate that producers were implicitly protected over the period covered (i.e. NPC greater than 1.0). When the NPCs for beef and mutton are

TABLE 3

Average nominal protection coefficients for livestock producers in the study countries, selected periods ^a

Product and Country	Period		
	1970/72 ^b	1977/79	1984/86
<i>Beef</i>			
Ivory Coast	0.99	2.24	0.97
Mali	1.33	2.68	1.08
Nigeria	1.52	2.59	2.27
Sudan	1.18	4.33	3.01
Zimbabwe	2.46	1.80	1.20
<i>Mutton</i>			
Ivory Coast	0.97	1.64	1.50
Nigeria	2.35	3.50	4.12
Sudan	2.39	3.64	4.51
<i>Milk</i>			
Mali	0.36	0.61	1.21
Sudan	0.51	0.60	1.32
Zimbabwe	0.58	0.81	1.04

^a NPCs were estimated using official exchange rates.

^b For milk, the period considered was 1971/73.

Source: Estimated from data collected from the study countries by the author.

compared, the latter appear higher mainly due to higher domestic mutton prices.

In explaining inter-country differences in the NPCs, it is useful to distinguish between importing and exporting countries. For the livestock products considered in Table 3, Ivory Coast and Nigeria are net importers. In the case of milk, all the countries considered in the table can be classified as net importers for most of the period covered. In these circumstances, we would expect the domestic price for these products to rise in relation to the border price because of the increasing need to import to meet the domestic deficit. This indeed occurred to some extent in most of the importing countries, with beef in Ivory Coast being the only major exception. ¹ If this fact is taken together with the decline in the real border equivalent producer price in these countries, we would expect the ratio of producer price to border price to rise over time for beef, mutton and milk in the importing countries. This expectation is largely confirmed by the results in Table 3.

¹ Although the rise in the real producer price in some of the importing countries was statistically insignificant (see Table 1), the sign of the coefficients suggest an upward trend.

In Mali, which is a livestock exporting country, the real border equivalent producer price for beef fell markedly between 1974 and 1975 and remained at a depressed level until about 1981 (see Fig. 1). The real domestic producer price also fell but not rapidly, thus leading to a rise in NPC over the period covered.

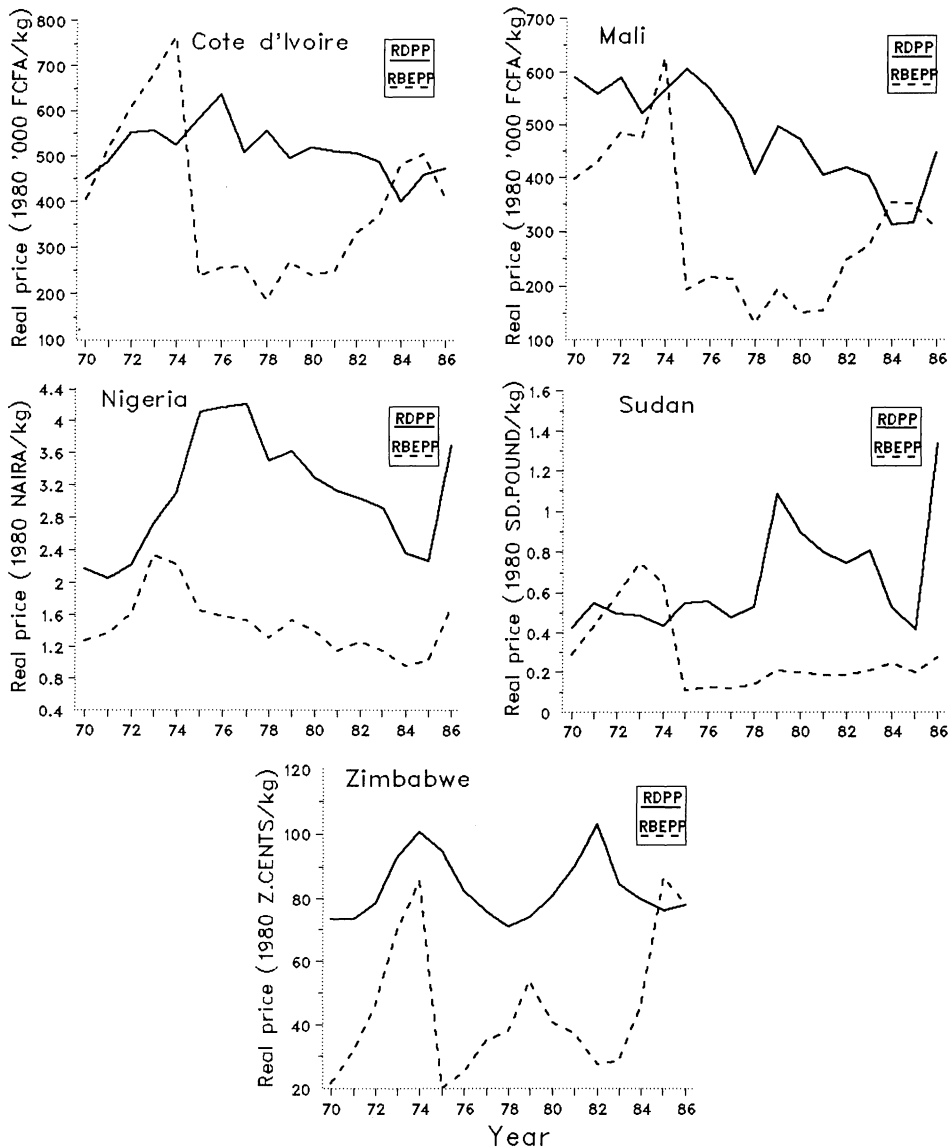


Fig. 1. Comparison of real domestic and border equivalent producer prices for beef in the study countries, 1970–86.

In Sudan, another livestock-exporting country, the lucrative export market provided by the oil-rich Gulf states, and the frequent devaluations of the Sudanese pound from 1979 onwards indirectly led to a rise in the real producer price of meat products. At the same time that the real domestic producer price was rising, the real border equivalent price declined. The result was a substantial rise in the NPCS of beef and mutton.

With respect to Zimbabwe, a beef exporting country, the fall in the NPC for beef, particularly between 1984–86, was caused by a rise in the real border equivalent price coupled with a moderate fall in the real domestic producer price (see Fig. 1). The rise in border price was in large part due to Zimbabwe's realistic exchange rate policy during this period. Although the nominal producer price increased between 1984 and 1986, domestic inflation increased much faster leading to a fall in the real producer price. The overall effect of the divergent directions of these two prices was a decline in the NPC for beef.

Table 4 shows the NPCS estimated for consumers: In this case, a NPC of less than one implies implicit subsidisation, while a coefficient greater than one implies implicit taxation. For meat products, the results show that in

TABLE 4

Average nominal protection coefficients for consumers in the study countries, selected periods ^a

Product and Country	Period		
	1970/72 ^b	1977/79	1984/86
<i>Beef</i>			
Ivory Coast	0.56	1.06	0.74
Mali	0.79	1.84	1.12
Nigeria	0.82	1.28	1.26
Sudan	0.51	1.06	1.40
Zimbabwe	0.98	1.18	0.59
<i>Mutton</i>			
Ivory Coast	0.98	0.87	1.11
Mali	0.54	0.87	0.79
Nigeria	0.83	0.95	1.15
Sudan	0.80	0.95	2.02
<i>Milk</i>			
Mali	0.78	0.72	0.59
Nigeria	1.11	2.53	3.27
Sudan	1.16	0.97	1.45
Zimbabwe	0.88	1.16	1.06

^a NPCs were estimated using official exchange rates.

^b For milk, the period considered was 1972/73.

Source: Estimated from data collected from the study countries by the author.

the period between the early and late 1970s, there was a gradual shift away from subsidisation of consumers to taxation. The taxation of consumers continued till mid-1980s in most countries, the only exception being beef in Ivory Coast and Zimbabwe. As mentioned earlier on, in Ivory Coast, the period beginning from 1980 marked the era of importation of highly subsidised beef from the European Community, which directly benefited consumers. The government of Zimbabwe also pursued a policy of keeping the consumer price of beef low during this period (see Zimbabwe, Ministry of Lands, Agriculture and Rural Resettlement, 1988). Throughout the period covered, milk consumers were subsidized in Mali, but were implicitly taxed in the remaining countries. The results thus appear to indicate that in the majority of cases, the objective of keeping retail prices down for the benefit of consumers has not been fully realised. The only caveat is that the NPCS shown here may overstate the actual level of consumer taxation since official exchange rates were used to estimate them.

OUTPUT AND MONETARY EFFECTS

The real (i.e. volume) and monetary effects of price intervention policies in the study countries were also measured using the standard partial equilibrium framework based on the Marshallian concept of economic surplus (see Currie et al., 1971). The basic analytical structure of the partial equilibrium model used is represented by equations (1) through (8). The formulae allow for differentiation between producer and consumer prices.

– Change in production:

$$- dQ_i = E_{si} dP_i Q_i / P_i \quad (1)$$

– Change in consumption:

$$dC_i = E_{di} dP_i C_i / P_i \quad (2)$$

– Net social loss in production:

$$NSL_p = 1/2 dQ_i dP_i \quad (3)$$

– Net social loss in consumption:

$$NSL_c = 1/2 dC_i dP_i \quad (4)$$

– Welfare gain of producers:

$$G_p = dP_i Q_i - NSL_p \quad (5)$$

– Welfare gain of consumers:

$$G_c = dP_i C_i - NSL_c \quad (6)$$

– Change in foreign exchange earnings:

$$dF = P_{wi}(dQ_i - dC_i) \quad (7)$$

– Change in government revenue:

$$dR_g = dP_i(Q_i - D_i) \quad (8)$$

where E_{si} is the own-price supply elasticity of commodity i , E_{di} the own-price demand elasticity of good i , dP_i is the impact of distortion on price, and Q_i is the domestic production of commodity i , P_i is the domestic producer (or consumer) price of commodity i , C_i is the domestic consumption of commodity i , and P_{wi} is the border equivalent producer (or consumer) price of commodity i .

Equations (1) and (2) measure, respectively, the changes in production and consumption as a result of a price distortion. Equations (3) and (4) represent the net efficiency losses in production and consumption to society as a whole, respectively. In interpreting these equations, if domestic prices move toward border equivalent prices (i.e. a shift toward free trade position), then NSL_p and NSL_c are benefits (gains) to society. If, as in the case of the imposition of an export or import duty, the trend is away from free trade, then the values reflect costs (losses) to society. Equations (5) and (6) measure the welfare changes or the extent of monetary gains and losses of producers and consumers. Equation (7) measures the change in the foreign exchange bill due to government intervention in the pricing of the commodity in question. It is the difference between the actual bill and what it would have been without intervention. Equation (8) is interpreted analogously.

In utilizing these equations, apart from the summary measures of distortion, i.e. the nominal protection coefficients presented in the previous section, other basic parameters needed for the evaluation of welfare effects are the elasticities of supply and demand. Although a few studies have attempted to estimate demand and supply elasticities for livestock products in sub-Saharan Africa, serious methodological and data problems tend to make the reported estimates to be numerous and diverse (see Olayide and Oni, 1969, 1972; Khalifa and Simpson, 1972; Doran, Low and Kemp 1979; Rodriguez, 1986, 1987). Because elasticity estimates can differ widely, ranges of plausible elasticities have been assumed for the analysis reported here. The elasticity ranges assumed were largely based on a careful review of the empirical estimates provided in the sources cited above and also in Askari and Cummings (1976) and Braverman et al. (1985). In all cases, long-run supply elasticities for beef were assumed to range from 0.3 (low elasticity) to 1.0 (high elasticity), while similar figures for mutton and milk were from 0.5 to 1.25 and 0.6 to 1.50, respectively. Long-run demand

TABLE 5

Gross effects of price distortions on production, consumption and trade of livestock products, 1984-86 ^a (1000 t)

Country and Commodity	Actual production	'Actual' consumption	Actual exports or imports (-)	Estimated					
				change in production		change in consumption		change in exports	
				Low	High	Low	High	Low	High
<i>Ivory Coast</i>									
Beef	42.5	85.5	-43.0	-0.4	-1.3	15.0	31.5	-15.4	-31.8
Mutton	6.2	8.0	-1.8	1.0	2.6	-0.5	-1.0	1.5	3.6
<i>Mali</i>									
Beef	57.6	21.4	36.2	1.3	4.3	-1.1	-2.4	2.4	6.7
Mutton	19.6	17.2	2.4	n.e.	n.e.	2.7	5.7	n.e.	n.e.
Milk	94.1	126.0	-31.9	10.1	25.4	58.0	105.4	-47.9	-80.1
<i>Nigeria</i>									
Beef	245.4	288.2	-42.9	41.2	137.3	-29.7	-62.4	70.9	199.7
Mutton	44.2	45.1	-0.9	16.7	41.8	-3.5	-7.3	20.3	49.2
Milk	348.3	600.2	-251.9	n.e.	n.e.	-275.0	-500.0	n.e.	n.e.
<i>Sudan</i>									
Beef	221.0	219.1	1.9	44.3	147.6	-31.3	-65.7	75.6	213.4
Mutton	98.6	93.1	5.5	38.4	95.9	-28.2	-58.7	66.6	154.6
Milk	1734.3	1837.8	-103.5	249.6	624.1	-377.0	-655.4	626.6	1309.5
<i>Zimbabwe</i>									
Beef	67.5	50.4	17.2	3.4	11.2	17.5	36.8	-14.1	-25.5
Milk	203.6	215.4	-11.8	3.9	9.8	-8.1	-14.8	12.0	14.5

t, metric tonne = 1000 kg.

n.e., means not estimated.

^a 'Gross effects' include changes due to direct price distortions and those arising from the use of the official exchange rate when it is over- or under-valued. The 'low' and 'high' refer to the low- and high-elasticity assumptions and do not necessarily correspond to the absolute levels of the real effects.

Sources. Production: FAO (1989). Consumption was derived as the difference between production (column 1) and exports (column 3). Exports/Imports: FAO (1988). Changes in production, consumption and exports were calculated using equations in the text and price data collected from the study countries.

elasticities were from -0.5 (low elasticity) to -1.05 (high elasticity) for beef; -0.6 to -1.25 for mutton; and -0.66 to -1.2 for milk. The other basic data inputs for the calculations are presented in the first three columns of Table 5. The data represent the average annual values for 1984–86. The table also shows the gross effects of price distortions on production, consumption and trade for the same period. These estimates are based on the elasticity ranges, the absolute levels of demand and supply and on the magnitude of price distortions as measured by the NPCCs. As the estimates indicate, the gross real effects of price intervention policies are often sizeable. This is evident in the case of beef in Zimbabwe and milk in Mali. In Zimbabwe, for example, under the hypothesis of low demand and supply elasticities, the positive protection to producers resulted in an increased beef output of 3400 t. However, the implicit subsidy to consumers at the same time increased consumption by 17 500 t, eventually reducing exports by 14 100 t. The case of milk in Mali is similar. Under the low elasticity assumptions, milk production increased by 10 100 t, but consumption also increased by 58 000 t. Thus, compared with a situation not influenced by price distortions, imports increased by 47 900 t.

TABLE 6

Summary of gross and net monetary effects of price distortions by country, 1984/86

Panel A: Gross effects (US\$ million)						
Country	Net social loss in production	Net social loss in consumption	Welfare gain – producers	Welfare gain – consumers	Change in foreign exchange earnings	Change in government revenue
Ivory Coast	0.5	6.2	3.8	60.7	–44.0	–71.2
Mali	0.6	7.0	14.4	25.5	–38.5	–47.5
Nigeria	141.5	661.3	1 103.5	–3 936.4	924.1	2 030.1
Sudan	72.1	80.5	511.0	–817.3	402.7	153.6
Zimbabwe	0.3	5.8	14.1	22.8	–27.4	–43.1
Panel B: Net effects (US\$ million)						
Ivory Coast	0.5	6.7	0.5	63.0	–47.5	–70.7
Mali	2.3	21.0	–30.8	52.9	–98.8	–45.5
Nigeria	8.1	183.9	121.2	–692.1	20.8	378.8
Sudan	41.1	44.6	348.9	–529.0	296.4	94.4
Zimbabwe	5.2	1.7	64.2	–17.7	29.6	–53.4

Gross estimates were obtained by using NPCCs estimated at official exchange rates, while net estimates were obtained by using revised NPCCs based on adjusted exchange rates.

Monetary estimates were derived by aggregating the estimate of gains and losses for all the commodities considered in each country. The estimates reported here were obtained using the low-elasticity assumption.

Turning to the gross monetary effects of price distortions, the total net social losses in production aggregated for the commodities studied in each country ranged from US\$0.3 million in Zimbabwe to US\$141.5 million in Nigeria in 1984–86 (Table 6, Panel A). The total net social losses in consumption ranged from US\$5.8 million in Zimbabwe to about US\$660 million in Nigeria. Compared to the efficiency losses, the welfare gains (losses) for producers and consumers were larger. For example, the welfare gains to producers in 1984–86 were from 7 times (Ivory Coast, Nigeria and Sudan) to 40 times (Zimbabwe) as large as the net social losses in production during the same period. On the face of it, this suggests a gradual shift away from discrimination against producers. On the other hand, consumers appeared to have gained even more than producers from pricing policy interventions in Ivory Coast, Mali and Zimbabwe during the same period. In these three countries, foreign exchange earnings appeared to have been negatively affected by the particular policies pursued. For most of the period covered, Nigeria and Sudan obtained net revenues from the interventions, whereas the policy of the other countries were such that the government incurred a deficit. This implies that taxes, if any, were more than fully offset by subsidies.

Thus far, the analysis has been conducted without adjusting for exchange rate distortions. However, it is widely known that for part of the period covered, governments in all the study countries intervened in the foreign exchange markets either directly, through exchange rate restrictions (as in Nigeria, Sudan and Zimbabwe), or indirectly through import tariffs and licences (as in Ivory Coast, Nigeria, Sudan and Zimbabwe), with the result that their currencies were typically distorted. In order to separate the effects of currency overvaluation from that of specific tariffs, nominal protection coefficients (NPCs) were reestimated using adjusted exchange rates.² The recalculated NPCs were then used to estimate the net real and monetary effects of price distortions. Table 6 Panel B shows the aggregated net monetary effects by country.

The use of adjusted NPCs exposes the hidden distortionary effect of overvalued exchange rates for producers, consumers and governments alike. Mali and Nigeria represent two prime examples of how an overpriced

² The adjusted exchange rates are meant to correct for distortions in the official exchange rates. In each case, the extent of overvaluation of the official exchange rate was estimated using the differential inflation rate between domestic prices (approximated by the consumer price index) and foreign prices (based on the consumer price index of the USA). The base period for the adjustment reported here was 1970. The results showed that relative to the base year, the official exchange rate in all the study countries, except Zimbabwe, was overvalued between 1984 and 1986.

exchange rate adversely affects producers and governments. For Mali, for example, a comparison of the gross and net monetary estimates show that producer welfare effects switched from being positive to negative (i.e. producers suffered monetary losses), losses in foreign exchange earnings were three times higher, while the increase in benefits to consumers was about twice as high as in the base case. Similarly, in Nigeria, welfare gains to producers and government revenues became significantly reduced, foreign exchange earnings switched from being positive to negative, while consumer welfare losses became substantially reduced compared to the base case. What these results seem to imply is that the structural imbalances which cause exchange rate distortions need to be addressed at the same time that reforms in direct livestock pricing policy are being pursued.

Other issues related to pricing policy

Two other issues relating to pricing policy are discussed below. The first concerns the effect of pricing interventions on parallel markets in the study countries. Distortions created by government pricing policies often promote illegal trade and/or parallel market activities. While empirical data on prices and volume of trade in parallel markets are scanty, other evidence indicates that producers, particularly in those countries where there were price controls, often shun or reduce their supplies to official agencies in order to benefit from higher prices offered by private traders. For example, in Zimbabwe, a government document stated that the beef marketing agency, i.e. the "Cold Storage Commission's throughput shortage in 1985 and 1986 was partially due to increased private trade activities induced by higher prices offered by private butchers to producers" (Zimbabwe, Ministry of Land, Agriculture and Rural Resettlement, 1988, p. 3). Another report concluded that "as a result of the Cold Storage Commission's inflexible pricing, large numbers of cattle were sold to private abattoir operators and butchers at prices substantially above the Commission's government controlled levels" (Zimbabwe, CSC, 1986, p. 12).

Similarly, at the time of field visit to Sudan in 1988, government officials reported the reluctance of producers associated with the government sponsored Kuku Dairy Production scheme in North Khartoum to deliver milk to government dairy processing plants. The milk produced was being sold instead to private traders.

A second issue relates to the impact of subsidised exports of beef and milk from the European Community (EC) on prices in some of the study countries. The examples of beef in Ivory Coast and milk in Nigeria are particularly illustrative. In Ivory Coast, which has traditionally depended on meat imports, beef imports from the EC increased from 2400 t between

1976 and 1978 to 16 720 t between 1985 and 1987 (Eurostat, various issues). Between 1984 and 1987, meat from non-African sources accounted for a quarter of total meat supply (Delgado, 1989). These cheap imports depressed domestic prices and partly contributed to the negative rate of growth of real producer prices during this period as shown in Table 1.

Similarly, in Nigeria, prior to the devaluation of the naira in 1986, dairy imports were quite substantial. Between 1982 and 1984, imports of powdered milk from the EC alone amounted to 116 000 t (Eurostat, various issues). One immediate consequence of the availability of cheap imports was that milk processing plants abandoned the use of locally produced milk and instead started reconstituting imported powdered milk which was cheaper. Admittedly, this process was aided by the overvaluation of the naira and the dumping of the EC milk surplus in the mid-1980s. With the steep fall in the value of the naira since the start of the medium-term structural adjustment programme in September 1986, the situation has changed. A price differential now exists in favour of locally produced milk. Nonetheless, the two examples cited here illustrate the negative impact that subsidized exports of industrialized countries can have on prices and investments in the livestock subsector of sub-Saharan African countries. Such cheap exports discourage new investments and undermine the ability of small-scale producers to find domestic or export markets for their products.

LIMITATIONS

There are several limitations to the analysis reported in this paper. First, the domestic price series utilized were mainly obtained from official sources. In most instances they were the best available, but they do not always adequately reflect farm gate and rural retail prices.

A second limitation concerns the measure of price incentive (i.e. NPC) used in the analysis. While the NPC represents a simple and straight forward measure of price incentives, it suffers from the disadvantage that only the product price is considered, and not the prices of inputs. More complex measures such as the effective protection coefficient and effective subsidy equivalent which take the prices of inputs into consideration require data on farm budgets which were not readily available in most of the study countries. In any case, given the low level of purchased inputs in ruminant livestock production in the majority of the study countries, it is most likely that the NPC will closely approximate these other measures.

Another limitation pertains to the use of adjusted exchange rates. While their use is justified on account of the distortions in official exchange rates, the adjusted rates utilized may not necessarily be the true equilibrium

exchange rates. More importantly, the adjustment of exchange rates should have significant impact on domestic prices, and possibly on the elasticities of demand and supply of the commodities under consideration. However, these other effects were not considered in the analysis.

Similar reservations have to be expressed concerning the use of a partial equilibrium approach which neglects linkages between commodity markets and assumes instantaneous adjustments from one static equilibrium to another. Nonetheless, as other studies (e.g. Lutz and Saadat, 1988) have shown, this approach can provide reasonably good first approximations of the order of magnitude of the efficiency and welfare effects of price distortions.

CONCLUSION

This study has examined the objectives and instruments of livestock pricing policies in a selected sample of sub-Saharan African countries. A major objective of the study has been to provide a cross-country comparison of the effects of livestock pricing policies on production incentives, producers and consumers' welfare and government revenues. Based on the findings of this study, it appears that since the early 1980s there has been a reduction in the level of price discrimination against livestock producers in the study countries. This reduction in taxation has come about through the institution of a variety of direct and indirect policy measures and represents an improvement over the situation in the 1970s.

However, there still exists scope for improving price incentives in the study countries. Ordinarily, some of the measures already instituted such as liberalization of agricultural marketing and devaluation can help to raise real price incentives. But these measures will have the desired effect only to the extent that they are not offset by increased domestic inflation. If governments are able through appropriate fiscal and monetary policies to reduce inflation, this can serve to support and strengthen the other more direct measures aimed at improving real price incentives. This implies that macroeconomic policies and direct measures designed to raise price incentives need to be closely coordinated if they are to provide maximum benefit to livestock producers.

While the focus of this study has been on the impact of pricing policies on the livestock subsector, it is fair to acknowledge that there are also structural impediments to increased livestock production in sub-Saharan Africa. These include climatic and disease problems, inadequate infrastructure, feed resources and extension services. Lack of attention to these other factors can weaken whatever improvement is achieved in the area of pricing policy. Thus, simultaneously with pricing reforms, investments in

infrastructure, animal nutrition, disease control, improved support services, marketing and processing facilities would also be needed in order to achieve sustainable livestock production in the study countries and elsewhere in sub-Saharan Africa.

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REFERENCES

- Askari, H. and Cummings, J.H., 1976. *Agricultural Supply Response: A Survey of the Econometric Evidence*. Praeger, New York.
- Bale, M.D. and Lutz E., 1981. Price distortions in agriculture and their effects: an international comparison. *Am. J. Agric. Econ.*, 63: 8–22.
- Braverman, A., Hammer, J.S. and Jorgenson E., 1985. Reducing input subsidies to livestock producers in Cyprus: an economic analysis. Staff Work. Pap. 782, World Bank, Washington, DC.
- Cleaver, K.M., 1985. The impact of price and exchange rate policies on agriculture in sub-Saharan Africa. Staff Work. Pap. 728, World Bank, Washington, DC.
- Currie, J.M., Martin, J.A. and Schmitz, A., 1971. The concept of economic surplus and its use in economic analysis. *Econ. J.*, 81: 741–799.
- Delgado, C.L., 1989. Cereals protection within the broader regional context of agricultural trade problems affecting the Sahel. Paper prepared for the CILSS/Club du Sahel conference on Regional Cereals Markets in West Africa: Ongoing Dynamics and Future Implications, 6–11 November 1989, Lomé, Togo.
- Doran, M.H., Low, A.R.C. and Kemp, R.L., 1979. Cattle as a store of wealth in Swaziland: implications for livestock development and overgrazing in eastern and southern Africa. *Am. J. Agric. Econ.*, 61: 41–47.
- Eurostat, 1976–1987. *Analytical tables of foreign trade, SITC/CTCT, exports, 1976–1987*. Luxembourg.
- FAO, 1988. *Trade Yearbook standard tapes*. Food and Agriculture Organization, Rome.
- FAO, 1989. *Production Yearbook standard tapes*. Food and Agriculture Organization, Rome.
- Ghai, D. and Smith, L.D., 1987. *Agricultural prices, policy and equity in sub-Saharan Africa*. Lynne Rienner, Boulder, CO, 174 pp.
- ILO, 1981, 1988. *Yearbook of Labour Statistics*. International Labour Organization, Geneva.
- IMF, 1987. *International Financial Statistics Yearbook*. International Monetary Fund, Geneva.
- Khalifa, A.H. and Simpson M.C., 1972. Perverse supply in nomadic societies. *Oxford Agrar. Stud.*, 1: 47–56.

- Lutz, E. and Saadat, Y., 1988. Issues relating to agricultural pricing policies and their analysis in developing countries. *Agric. Econ.*, 2: 19–37.
- Lutz, E. and Scandizzo, P.L., 1980. Price distortions in developing countries: a bias against agriculture. *Eur. Rev. Agric. Econ.*, 7: 1–22.
- Olayide, S.O. and Oni, S.A., 1969. Short run demand for beef in western Nigeria. *Nigerian J. Econ. Social Stud.*, 2: 165–172.
- Olayide, S.O. and Oni, S.A., 1972. Statistical analysis of the demand for beef in Lagos. *Bull. Rural Econ. Sociol.*, 7: 103–125.
- Oyejide, T.A., 1986. The effects of trade and exchange rate policies on agriculture in Nigeria. Res. Rep. 55, IFPRI, Washington, DC, 61 pp.
- Rodriguez, G., 1986. Beef supply price response estimation and implications for policy analysis: the Zimbabwe case. ALPAN Network Pap. 11, ILCA, Addis Ababa, 12 pp.
- Rodriguez, G., 1987. The impacts of the milk pricing policy in Zimbabwe. *ILCA Bull.* 26: 2–7.
- Tshibaka, T.B., 1986. The effects of trade and exchange rate policies on agriculture in Zaire. Res. Rep. 56, IFPRI, Washington, DC, 65 pp.
- Waters-Bayer, 1988.
- Zimbabwe, CSC, 1986. Report and financial statements. Cold Storage Commission, Harare.
- Zimbabwe, Ministry of Lands, Agriculture and Rural Resettlement, 1988. The national livestock development policy. Harare.

APPENDIX

Procedure used to calculate border equivalent prices

For an imported commodity, the border equivalent producer price was calculated as:

$$P_b = (P_w + T_w) + T_d - C_d \quad (\text{A1})$$

where P_b is the border equivalent producer price at the farm gate, P_w is the world price, T_w represents ocean freight and insurance charges, $(P_w + T_w)$ represents the CIF price which was converted to domestic currency at the official exchange rate, T_d represents handling, transport and marketing charges from port to domestic market, and C_d represents transport, processing and marketing charges from farmgate to domestic market.

For an export commodity, the border equivalent producer price was estimated as:

$$P_b = P_w - T_w - T_d - C_d + V_b \quad (\text{A2})$$

where V_b is the value of by-products, and all other variables are as defined above.

In all cases, the reference market was assumed to be the largest city – usually the capital city. However, the case of Mali deserves special mention. Although Mali was classified as a meat exporter, the border equivalent price for Malian producers was not estimated as explained above. The

land-locked nature of the country and the fact that Mali's traditional export market had always been Ivory Coast necessitated a different approach. Thus, for beef in Mali, the border equivalent price was estimated by using the CIF price in Abidjan port rather than P_w as the starting point of the analysis – the assumption being that Abidjan is the place where beef from Mali will have to compete with imported beef.

