



**Analysis of the Poverty Impact of the January 2006  
Increase in Beef and Cattle Prices in Botswana,  
Using HIES 2002/03 Data**

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USAID / Southern Africa**

**Gaborone, Botswana**

**May 2007**

**USAID Contract No. 690-M-00-04-00309-00 (GS 10F-0277P)**



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## INTRODUCTION

This paper models the impact of the 2006 increase in cattle and beef prices on household poverty in Botswana, based on a simulation exercise using the 2002/03 Household Income and Expenditure Survey (HIES) data. The price increase was implemented by the Botswana Meat Commission (BMC), which raised both the average price it pays to farmers for purchases of cattle and the prices charged for beef sales to the domestic market. The main channels through which the increase in cattle and beef prices affects poverty are through income and price effects. In terms of the income effects, the 40% increase in beef and cattle prices raises the incomes earned by farmers from cattle sales. Modelling this requires some assumptions about the response of farmers to increased prices. A second income effect comes in the form of changes in employment and employment incomes. In principle, an increase in incomes from the 40 percent increase in beef and cattle prices should lead to farmers employing more workers and/or increasing the wages paid to labour. The extent of these responses depends on the farmer's elasticity of demand for labour and also on the state of the agricultural labour market. If there is high unemployment, farmers may be able to increase their employment of agricultural workers without increasing the wages of every worker since they can easily hire unemployed labour. Overall, the impact of the 40% increase in cattle and beef prices through the income effect is expected to be to reduce the amount of poverty in the country.

The other side of the increase in cattle prices is a general rise in the cost of living from increased beef prices. What the 40 percent increase in beef prices did was to increase the general cost of living for households that consume beef. Following the increase in beef prices, butcheries and other meat outlets increased the price of beef by a similar percentage to the BMC cattle price increases. The effect of this change was to increase the amount of poverty, by reducing spending power and real incomes.

Overall, the balance of these two effects on national poverty could be either positive or negative.

## METHODOLOGY

Using the 2002/03 HIES data we simulate these household income and expenditure effects on poverty on a regional basis. The analysis distinguishes between short run and medium term effects of the price change. In the short term, price increases are likely to be supply inelastic (in the order of 0.3)<sup>1</sup>, i.e. farmers are likely to increase cattle sales by a relatively small amount. In the longer term, farmers may sell considerably more cattle, given that the increase in prices was quite big. However, reliable empirical estimates of the long-run effect are not currently available, and here we focus on the short-term changes.

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<sup>1</sup> Refer to Jefferis (2007), a short note on the price responsiveness of cattle supply.

The first step in the exercise is to simulate the income effect, by allowing for farmers to sell the same amount of cattle in terms of volume even though prices of cattle and beef are 40% higher. The next step is to assume that there will be some response in terms of supply elasticity when we allow farmers to increase cattle sales volumes by some 10 percent. We lastly add the price effects by increasing the cost of living due to the increase in beef prices. The amount of this is determined by the weight of the beef component in the CPI. Because beef is relatively more expensive, there may be some substitution effect from expenditure on beef to expenditure on other related commodities, which will tend to reduce the overall income impact, although the quantification of such substitution effects is beyond the scope of this analysis.

## **ANALYSIS OF CATTLE OWNERSHIP FROM 2002/03 HIES DATA**

The HIES estimated that there were 394,272 households in the country, with 1,632,922 persons, in 2002/03 (CSO, 2004) <sup>2</sup>. Of these households, 62.5 percent did not own cattle, while 35.5 percent owned cattle (see table 1). Among those that owned cattle, a majority of them (52.6%) owned between 1 and 9 cattle (see figure 1). As the size of cattle herds increases, the number of households who own cattle generally declines.

Table 2 shows that the number of cattle owned generally rises as mean income increases (up to herd sizes of 99 cattle).

Figure 2 shows ownership of cattle by location of household. As would be expected, most of the people who owned cattle were resident in the rural areas (51%). Those in the urban villages own 31% of the national herd, while the smallest proportion is owned by those in the urban areas, with 18%. Given that cattle rearing is a rural activity, most farmers will be found in the rural areas, except for absentee farmers who may also be engaged in some other activities and have cattle farming as an additional activity.

Figure 3 shows proportion of households owning cattle by income group. The highest percentage of households who owned cattle is found in the income bracket of P6000-P8000 a month, with 44% of the households having indicated that they owned cattle during the survey. This is followed by those with income less than P200 per month, with 42.5% cattle ownership. The group with the lowest percentage of cattle ownership is those with incomes between P600 and P1000 a month, at 31.9%.

Figure 4 shows similar information to figure 3, except that we have now removed ownership of small herds (1-9 cattle). It is felt that these small farmers may be less likely to sell cattle even when prices are favourable, given that they are more likely to be rearing cattle on a non-commercial basis. Those with small herds are known to keep cattle for other forms of security, including for events such as funerals, payment of bride price and to some extent as a source of wealth. Such subsistence farmers normally do not respond to price changes significantly. Once we remove the ownership of small herds of cattle the pattern changes to what one would expect; generally more

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<sup>2</sup> The following tables are derived from the 2002/03 HIES data.

households with higher incomes own cattle. For people with disposable incomes above P8000 per month, about 27 percent of the households owned cattle. But for those with disposable incomes of less than P200 per month, a higher percentage of households still owned cattle more than those in the other income brackets up to P2000 per month.

**Table 1. Cattle ownership: HIES data**

<b>Herd Size</b>	<b>No. of households</b>	<b>Percent of total households</b>	<b>Percent of cattle-owning households</b>
1-9	77884	19.8	52.6
10-19	33312	8.4	22.5
20-39	20879	5.3	14.1
40-59	7889	2.0	5.3
60-79	2920	0.7	2.0
80-99	1142	0.3	0.8
100-149	1379	0.3	0.9
150-199	494	0.1	0.3
200+	2033	0.5	1.4
<b>Total</b>	<b>147937</b>	<b>37.5</b>	<b>100.0</b>
None	246334	62.5	
<b>Total</b>	<b>394272</b>	<b>100.0</b>	

**Table 2. Cattle ownership by income mean gross income**

<b>Cattle Herd Size</b>	<b>Mean income (P/month)</b>	<b>Std. Deviation</b>
1-9	2507.45	3332.34
10-19	2749.30	3736.34
20-39	4728.02	5956.01
40-59	5462.06	6705.32
60-79	6047.65	5891.75
80-99	9983.05	8205.69
100-149	7249.58	7563.94
150-199	11177.28	13342.54
200+	6125.85	5141.19
Total	3317.78	4601.39

**Figure 1: Cattle ownership (percentage): HIES 2002/03 data**

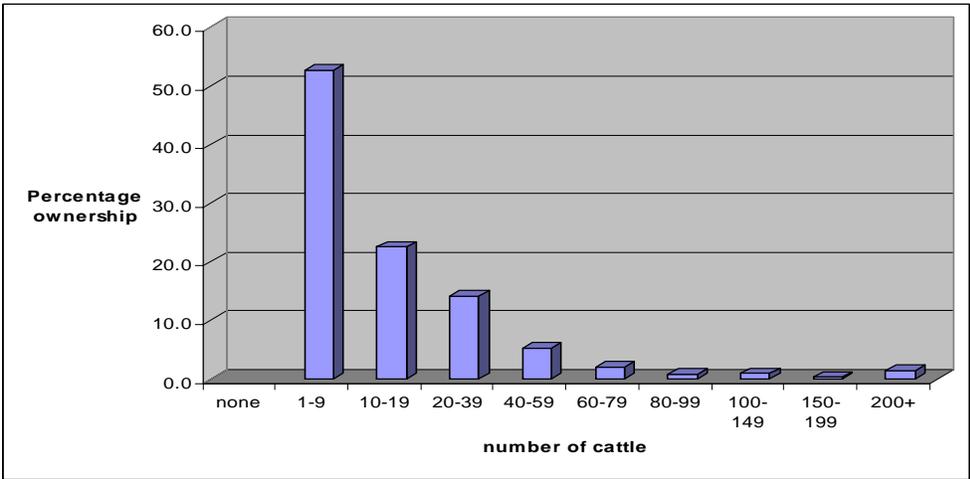


Figure 2. Cattle ownership by region: HIES 2002/03 data)

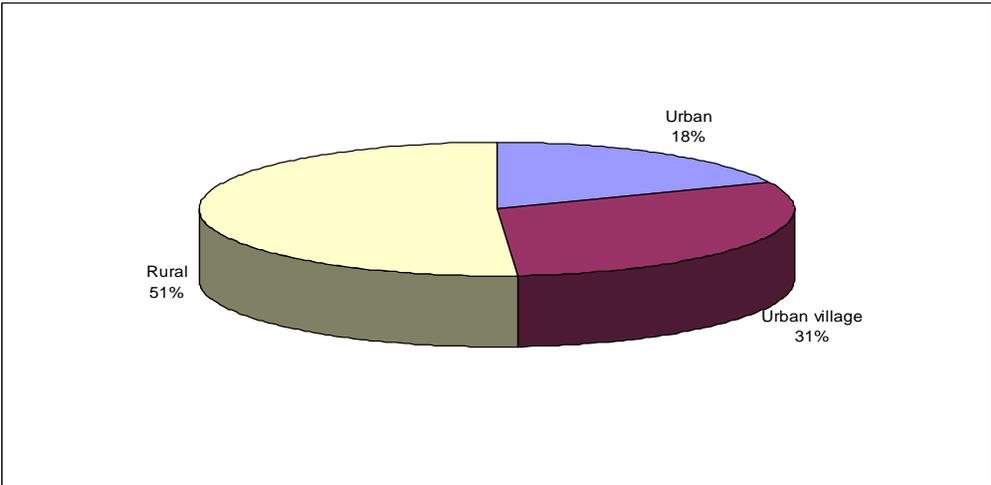
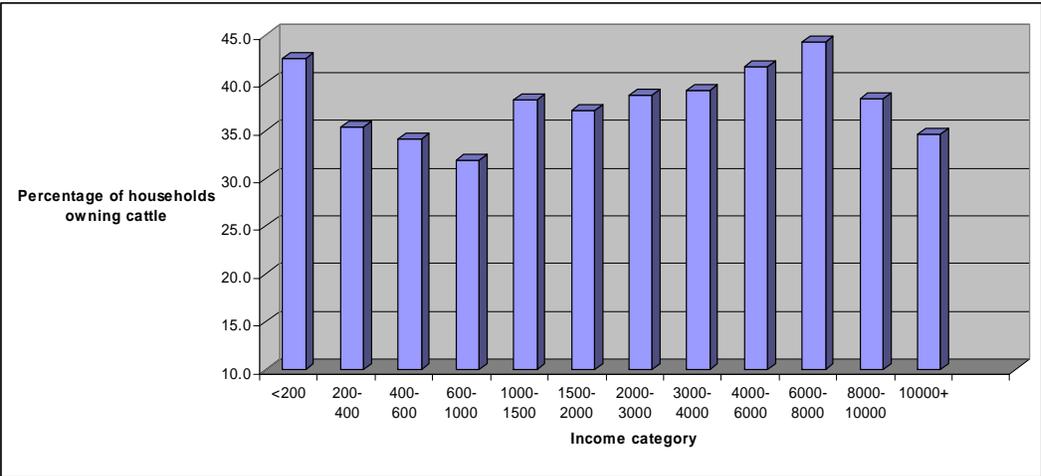
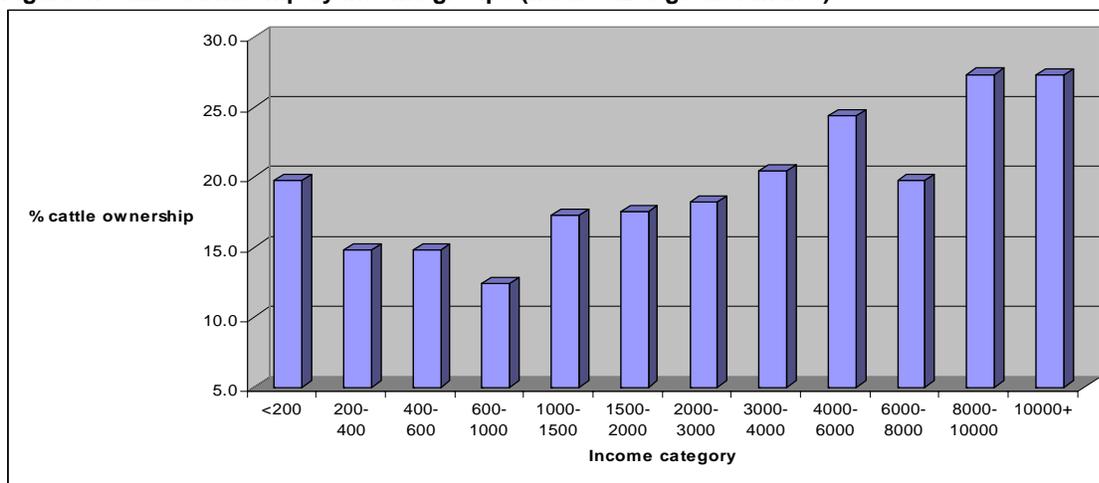


Figure 3. Cattle ownership by income groups



**Figure 4: Cattle ownership by income groups (herds sizes greater than 9)**



## POVERTY ANALYSIS USING HIES DATA

Data from the HIES 2002/03 provides some information on poverty levels disaggregated by region. Households are classified as poor if their income is less than their relevant household PDL<sup>3</sup>. The national or regional poverty rate is then the percentage of households in the relevant area with incomes below their PDL.

Table 3 shows the poverty rates from the HIES data. The national household poverty rate was 33 percent in 2002/03. Poverty is highest for rural areas of North West, North East, and South West and lowest for cities and towns, with Gaborone having a 7 percent poverty rate. These poverty rates form the base, from which we can then simulate the impact of increased beef and cattle prices. One obvious weakness in this approach is that beef and cattle prices were increased in 2006, while the data base is for 2002/03. Poverty will also have changed by 2006. We believe, however, that even though the price levels were different at that time, the analysis is still very rich in terms of indications of the magnitude of poverty changes. What is important for this analysis is the direction and magnitude of change rather than the specific level of poverty at that time.

**Table 3. Poverty rates in 2002/03**

Region	Poverty Rate
Gaborone	7.1
Francistown	14.8
Other Cities & Towns	14.8
Rural South-East	33.0

<sup>3</sup> The household PDL depends on factors such as composition (number of children and adults) and location (urban, rural etc.)

Rural North-East	41.8
Rural North-West	46.1
Rural South-West	53.2
<b>National</b>	<b>33.4</b>

### Income Effects

From the HIES data, approximately 79 000 households indicated having had income from sale of livestock during the 2002/03 HIES survey period<sup>4</sup>; this represents around 20% of all households. In addition, income from cattle sales made up around 7.4 percent of all household income sources. Unfortunately, the HIES data does not show what the proportion of total income is to total incomes of the households that had sold livestock (only the numbers of income sources). We make an assumption that income from livestock makes up 30 percent of total household income in cattle owning households, We therefore increase this share of the incomes of those households who indicated that they had an income from sale of livestock) by 40 percent. The total increase in the income of cattle owning households is therefore 12 percent. Table 4 shows the results of simulating changes in poverty from only an income effect, which is a result of households with this income having increases in incomes from cattle increasing by 40%. This relates only to higher incomes from increased prices, and does not take into account any supply response through changed volume of cattle sales.

The result is that poverty falls marginally, by 1.3 percentage points, to 32.14 percent as a result of these effects. As would be expected, the biggest fall in poverty is in the rural areas by between 1.5 and 1.8 percentage points (see table 4). This follows from the higher cattle ownership being in the rural areas as shown in figure 2. Only 18 percent of cattle ownership was by urban households; therefore, Gaborone and other cities have very low changes in poverty from this effect.

**Table 4: Poverty with 12% increase in incomes of households reporting incomes from sale of livestock**

Region	Old Poverty Rate (%)	New Poverty Rate (%)	Change
Gaborone	7.1	7.1	-0.1
Francistown	14.8	14.6	-0.20
Other Cities & Towns	14.8	14.8	0.0
Rural South-East	33.0	31.5	-1.5
Rural North-East	41.8	40.1	-1.7
Rural North-West	46.1	44.5	-1.5
Rural South-West	53.2	51.2	-1.8
<b>National</b>	<b>33.4</b>	<b>32.1</b>	<b>-1.3</b>

<sup>4</sup> Livestock includes goats, sheep, etc. Unfortunately the data is not disaggregated to show income from sale of cattle separately.

## Expenditure Effects

From the HIES data, expenditure on beef and related products made up 1.5% of total household expenditure. A 40% increase in beef prices results in an increase in the cost of living of about 0.6 percent. Table 5 shows the results of the simulation of the price effects of the 40 percent increase in beef prices. As a result poverty goes up by up to 3 percentage points due to an increase in cost of living from the increase in beef prices. The biggest increase is in rural South East, rural South West and rural North East by about 3 and 4 percentage points.

**Table 5: Poverty with 0.6% increase in cost of living (price effects only)**

Region	Old Poverty Rate (%)	New Poverty Rate (%)	Change
Gaborone	7.1	9.0	1.9
Francistown	14.8	16.8	2.1
Other Cities & Towns	14.8	16.6	1.8
Rural South-East	33.0	35.8	2.8
Rural North-East	41.8	45.9	4.1
Rural North-West	46.1	48.3	2.2
Rural South-West	53.2	56.4	3.2
<b>National</b>	<b>33.4</b>	<b>36.4</b>	<b>3.0</b>

Table 6 shows the results that combine the two effects. Here the cost of living goes up by 0.6 percent, while the income effect makes households with incomes from livestock to go up by 12 percent. The overall effect is for poverty to increase by 0.9 percentage points. Poverty only decreases marginally in Rural North West and Rural South West. The rest of the regions experience an overall poverty increase meaning that the effect from the cost of living was dominating the marginal income effects from the increase in incomes from better prices of cattle.

**Table 6: Poverty rates with 0.6% increase in cost of living and increase in incomes by 12%**

Region	Poverty Rate (%)	New Poverty Rate (%)	Change
Gaborone	7.1	8.8	1.7
Francistown	14.8	16.6	1.8
Other Cities & Towns	14.8	16.5	1.7
Rural South-East	33.0	33.6	0.7
Rural North-East	41.8	42.9	1.1
Rural North-West	46.1	45.9	-0.1
Rural South-West	53.2	52.3	-0.9
<b>National</b>	<b>33.4</b>	<b>34.3</b>	<b>0.9</b>

Table 7 shows results as shown in table 6 plus a cattle supply response of 10 percent. In other words, the cost of living goes up by 0.6% for all households, those who indicated having income from cattle sales have a 40% increase in their income from sale of livestock (12%), plus a further 10 percent increase in incomes from livestock due to more volumes of cattle sold as a response to the 40% increase in prices. Poverty increases marginally by 0.2 percent. Except for Rural North East, all the other rural areas experienced a marginal decrease in poverty. In general we can conclude that the rural areas have experienced a fall in poverty while the urban areas generally had increases in poverty, and furthermore that on a national basis the two effects balance each other out leaving the overall poverty rate largely unchanged.

**Table 7: Poverty rates with 0.6% increase in cost of living, increase in incomes by 12%, plus 10% cattle supply response.**

Region	Poverty Rate	New Poverty Rate	Change
Gaborone	7.1	8.2	1.1
Francistown	14.8	16.6	1.8
Other Cities & Towns	14.8	15.4	0.6
Rural South-East	33.0	32.8	-0.1
Rural North-East	41.8	42.2	0.4
Rural North-West	46.1	45.9	-0.1
Rural South-West	53.2	51.9	-1.3
<b>National</b>	<b>33.4</b>	<b>33.6</b>	<b>0.2</b>

## SUMMARY AND CONCLUSION

From the results of these simulations, especially those shown in table 7, the results indicate that poverty was likely to have fallen in the rural areas due to the increase in beef and cattle prices generally due to the dominance of the income effects in the rural areas. To that extent therefore, the increase in beef prices was not positive in terms of poverty reduction in the rural areas. However, the results also indicate that rural poverty reduction was achieved at a cost of marginally impoverishing urban households, who were facing an increasing cost of living, which for them outweighs the income effect. Overall, the two effects (reduced rural poverty and increased urban poverty) largely balance out, with the simulation results indicating that the national poverty rate increases marginally by 0.2 percentage points as a result of the increase in cattle prices by 40%.

While the overall poverty rate was largely unchanged, the fact that poverty will have fallen in the rural areas (which are relatively poor) and increased in the urban areas (which are relatively better off) means that national income distribution will have been improved by the cattle price increase, with reduced income inequality.

## **REFERENCES**

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