

Chapter 7:

Land Use Patterns and Growth in Commercial Input Use, Productivity, and Profitability by Farm Size Category

by

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I. Introduction

This chapter examines trends in cultivated area and production in order to understand the changing patterns of Zambian land use and management. Reported data suggest that in the commercial farms sector there has been over the past two decades a general diversification of production away from maize and into primarily wheat and soybeans. In the late 1980s, harvested land area under maize has been replaced by these other crops, with the overall harvested area remaining roughly constant. In the noncommercial farms sector, data suggest that production in much of the country has fluctuated greatly with no clearly discernible trend. The principal exception is the far northeastern region of the country where maize production has increased dramatically, particularly from 1976 to 1986. These and other results are discussed below in detail after a preliminary note concerning data sources and their reliability.

II. Data sources

The next chapter provides a detailed discussion of data issues. This section focuses on particular problems affecting the analysis of changes in land use patterns. Table 7.1 summarizes various selected Zambian data sources by year as used in the preparation of this chapter.

For verification and comparison purposes, a number of key national statistics were drawn from the Economic Research Service of the United States Department of Agriculture and from the World Bank. These other sources generally provide national statistics, sometimes broken down by crop, but are based upon primary CSO and other Zambian government data. This report focuses upon results gleaned directly from the primary Zambian sources.

The CSO of the Zambian Government conducted several crop forecasting exercises covering all farms. These provide the most recent data available for our analysis. Forecasts are available for 1991 and 1992,² and the publication for the 1991 crop forecast includes actual production data for the 1990 season, which is not available from any other known source. The 1992 forecast publication breaks down farms into two size categories, the first being a small/medium category and the second covering large farms, though the report does not provide definitions of these categories.

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² Years refer to the beginning of a cropping season.

Table 7.1: Zambia data sources

| Year | Commercial farms CSO | Noncommercial farms CSO | All farms ERS ^b | Price series | Forecasts CSO |
|-------------------|----------------------|-------------------------|----------------------------|--------------|---------------|
| 1961 ^a | | | X | | |
| 1962 | | | X | X | |
| 1963 | | | X | X | |
| 1964 | | | X | X | |
| 1965 | | | X | X | |
| 1966 | | | X | X | |
| 1967 | | | X | X | |
| 1968 | | | X | X | |
| 1969 | | | X | X | |
| 1970 | | | X | X | |
| 1971 | | X | X | X | |
| 1972 | | X | X | X | |
| 1973 | | X | X | X | |
| 1974 | | X | X | X | |
| 1975 | X | X | X | X | |
| 1976 | X | X | X | X | |
| 1977 | X | | X | X | |
| 1978 | X | | X | X | |
| 1979 | X | | X | X | |
| 1980 | X | | X | X | |
| 1981 | X | | X | X | |
| 1982 | X | X | X | X | |
| 1983 | X | X | X | X | |
| 1984 | X | X | X | X | |
| 1985 | X | X | X | X | |
| 1986 | X | | X | X | |
| 1987 | X | | X | X | |
| 1988 | X | | X | X | |
| 1989 | X | | X | X | |
| 1990 | | | X | X | X |
| 1991 | | | | | X |
| 1992 | | | | | X |

- a. Years are the **beginning** of the crop season (e.g., 1990 = 1990/91 crop season).
b. ERS: United States Department of Agriculture, Economic Research Service.

Principal time series data are drawn from publications of the CSO annual "Agricultural and Pastoral Production" reports, one each for commercial and noncommercial farms. A quite complete commercial farms series is available from 1975 to 1989. The noncommercial farms series begins in 1971, was interrupted from 1977 to 1981, and resumes for 1982 through 1985. Commercial farms data are generally divided by farm area size categories (0—199 hectares, 200-1,999 hectares, 2,000+ hectares). Data on noncommercial farms are not broken down by size.

Noncommercial farmers are defined in these "Agricultural and Pastoral Production" reports simply to be those farmers who are not commercial farmers. In order to determine who qualifies as a noncommercial farmer, the 1973 noncommercial farms report defines commercial farmers as:

- (a) a farmer who sold maize worth K600 or more at the line of rail prices;
- (b) a farmer who grew **virginia** [*sic*] or **burley** tobacco in his own name and was registered with the Tobacco Board of Zambia;
- (c) a farmer who sold dairy products to, and was registered with, the Dairy Produce Board;
- (d) a farmer who had title to land.

This definition has been amended over time. By the time of the 1982 commercial farms report, the commercial farms classification had been amended to include farms that sold to marketing boards any crops exceeding the value of 150 90kg bags of maize, farms that bred or sold livestock to licensed firms or boards, and state farms.

This classification and separate enumeration of commercial and noncommercial farms poses problems for analysis. For example, as economic conditions change from year to year, a farmer may choose to produce and market tobacco, thereby leaving the noncommercial classification and entering the commercial farms classification. There is also some question as to the reliability of the population lists for each classification, particularly since the mid-1980s when the state reduced its role in the marketplace and as a consequence reduced its ability to monitor market activity. For these reasons, it is difficult to determine whether increases in production of commercial crops is due to expansion of output by existing commercial crops producers, to marketed output by farmers previously classified as noncommercial, or to new market entrants. Better analysis would be possible if there were a more reliable and stable long-term program of farm data collection.

Data on commercial farms production in Zambia are available from 1975 to 1989, and are broken down by province and farm area size classification. These data are based on responses to an annual mailed census sent on average to about 3,000 farming households nationwide. (Response rates were generally low; e.g., 34 percent in 1978.)

The survey is intended to cover all the commercial farmers in the country and questionnaires are mailed on the basis of postal addresses. The response has however been quite poor. Many of the returned questionnaires were only partially completed requiring many imputations for individual reports to be summarized on a representative basis (CSO 1989a, p. iii).

A consultant's report to USAID (Scott 1990) notes, "The [commercial farms] list used is known to be incomplete and the response rate is below 20 percent, so that the purpose of this annual operation is not clear."

Data on noncommercial farms are from an enumerated sample survey conducted annually from 1971 to 1976 and also from 1982 to 1986, with no data collected by the CSO in the period from 1978 to 1981. While data were apparently collected and published for the 1977 season (CSO 1989b), these data are not available. Available data are broken down by province but not by farm area size. Using a two-stage design, a stratified random sample of geographic areas was first selected, with strata corresponding to ecological zone. In the second stage, two random samples were selected, one of households reporting livestock holdings, the other of households not reporting livestock. These details are generally explained in the introductions to the reports. While in most years farmers are asked to provide information on the agricultural period just completed, it should be noted that for a few provinces in 1982, data are based on recalled responses collected as part of the 1983 survey.

Additional limited data were collected on farm expenditures and revenues and are briefly inspected here. Significant difficulties with the consistency of categories in the collection of these data over time make it quite difficult to analyze relationships between prices, input uses, and output. A cursory inspection of these data for commercial farms is provided below.

Price indexes for bundles of consumer goods as well as for numerous commodity groups are available in the CSO's *Monthly Digest of Statistics*. Several editions of these digests have been compiled to compute a price series for the years 1962 to 1990, adjusted to the common base year of 1985. These data are also presented below. Consumer price indexes are used to deflate expenditure and revenue data to permit examination of real price trends independent of inflation. As will be seen, this is particularly important for data from the late 1980s when Zambia experienced significant hyperinflation.

Anomalies are apparent in the data sources. For example, in the 1987 commercial farms report, the same harvested area and production for soybeans in the Copperbelt province is given for two separate farm sizes categories. Such a coincidence seems unlikely. In Luapula province in 1990, farms of one size are reported to have produced one kilogram of wheat but then to have sold 37. Since reports do not distinguish sales from present harvest versus past harvests, it is impossible to determine whether this is an error or due to stock adjustment.

Given problems in data collection and reporting, policy recommendations arising out of analyses of these data should be regarded as tentative and subject to verification in more detailed retrospective studies of selected areas. Longitudinal analyses that follow particular farming households over time seem particularly warranted if an understanding of structural change in agriculture is to be gained.

III. National production trends

The aforementioned problems with the data notwithstanding, a number of important characteristics of production structure in Zambia can be discerned. Table 7.2 presents harvested crop areas for all farms in the nine regions of Zambia as a percentage of national totals. Data in the table are three-year averages drawn from CSO crop forecasts for 1991 and 1992, and from actual area figures for 1990. Of Zambia's 942,362 hectares planted nationwide in 1990-92 (three-year average), 63.8 percent are comprised of maize, followed by groundnuts (8.5 percent), seed cotton (7.3 percent), millet (5.4 percent), sorghum (4.4 percent), sunflower (3.4 percent), soybeans (2.9 percent), mixed beans (2.2 percent), rice (1.4 percent), and assorted other crop enterprises (0.7 percent).¹

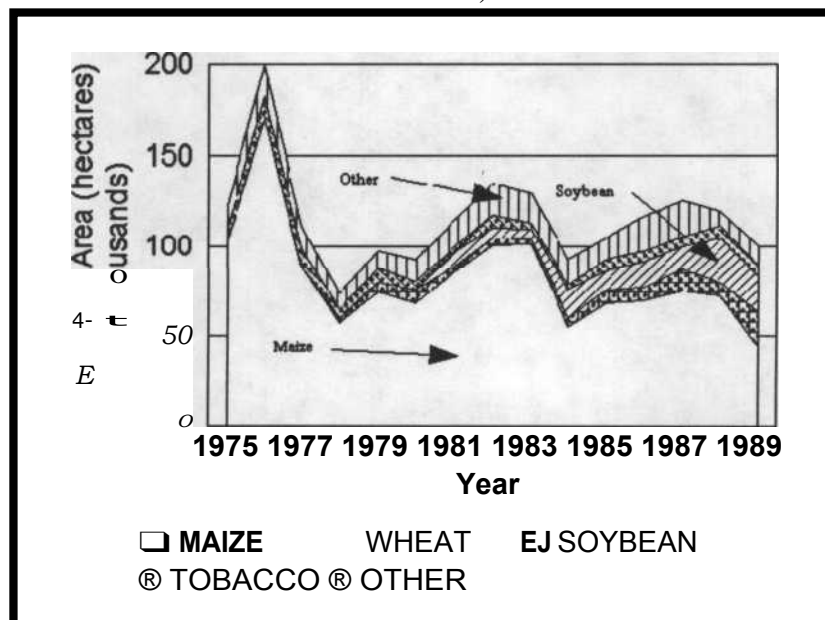
¹Total crop area is based only on data for crops that were reported. Area of unreported crops (horticultural crops, cassava, other vegetables) is not included. Note also that, in official publications, tree crops are reported as numbers of trees rather than area of planting; estimates of tree-crop area are thus not possible.

Provincial-level data from the CSO reveal that the bulk of planted area of cultivated maize, tobacco, sunflower, and seed cotton is situated in the Eastern, Central, and Southern provinces. This is the primary agriculture production region of Zambia, with cultivation based on a hand-hoe farming system, and with oxen used in some areas. Maize is generally the chief staple followed by sorghum, while relish crops are vegetables, beans, and groundnuts. Cash income for most farmers obtains from sales of beer, fish, chicken, and a portion of the maize harvest. Only minimal inputs are used in production (USAID n.d.). In percentage terms, the Eastern province accounts for the bulk of national area allocated to maize (34.8 percent), groundnuts (33.7 percent), and burley tobacco (93.3 percent); the Southern province accounts for the largest area allocated to sorghum (28.7 percent) and sunflowers (43.8 percent); and the Central province contains the most area under production of seed cotton (38.9 percent), rainfed wheat (73.0 percent), and Virginia tobacco (50.2 percent).

IV. Commercial farms sector

Table 7.3 presents time series data on the area harvested of principal crops for the period 1975 to 1989 in the commercial farm sector. These data are depicted in graphical form in figure 7.1 for all crops, and for all crops excluding maize in figure 7.2. Maize clearly dominates the cropping system. The data suggest a complex pattern of crop diversification characterized by three major trends over time: a stagnation in total crop area; a decreasing emphasis on maize; and an increasing emphasis on wheat and soybeans. Aside from the sharp increase in area harvested between 1975 and 1976, followed by the sharp decline from 1976 to 1978, total area harvested appears relatively stable to gradually increasing.

Figure 7.1: Changes in areas of principal crops, cumulative distribution, 1975 to 1989



Source: CSO.

Figure 7.2: Changes in areas of principal crops, excluding maize, cumulative distribution, 1975 to 1989

Source: CSO.

Figure 7.3: Commercial farms production of maize, wheat, and soybean, 1975 to 1989 (in metric tons)

Source: CSO.

Table 7.3: Harvested area (hectares), commercial farm sector, 1975 to 1989

| Year | Maize | Wheat | Virginia tobacco | Sun-flower | Soy-bean | Seed maize | Seed cotton | Potato | Cotton | Coffee | Burley tobacco | Total |
|------|---------|--------|------------------|--------------|--------------|------------|-------------|------------|------------|--------|----------------|---------|
| 1975 | 103,650 | | 7,400 | 4,970 | | 5,220 | | 2,470 | 400 | | | 124,110 |
| 1976 | 169,860 | | 12,240 | 5,750 | | 9,130 | | 2,330 | 590 | | | 199,900 |
| 1977 | 88,159 | | 10,360 | 4,544 | | 5,821 | | 130 | 2,071 | | | 111,085 |
| 1978 | 57,070 | 2,150 | 5,340 | 4,160 | | 3,680 | | 186 | 630 | | | 73,216 |
| 1979 | 74,233 | 5,213 | 7,990 | 3,606 | | 3,824 | | 775 | 1,333 | | 151 | 97,125 |
| 1980 | 67,860 | 7,494 | 4,874 | 3,625 | | 4,528 | | 1,541 | 2,156 | | 94 | 92,172 |
| 1981 | 84,701 | 3,390 | 3,444 | 8,719 | 8,150 | 2,695 | | 422 | 3,444 | | | 114,965 |
| 1982 | 100,859 | 3,963 | 5,601 | 11,146 | 5,307 | 3,509 | | 390 | 2,708 | | 2,287 | 135,770 |
| 1983 | 101,286 | 2,645 | 3,372 | 6,312 | 5,758 | 4,916 | 2,587 | 448 | 2,587 | | 97 | 130,008 |
| 1984 | 54,922 | 5,074 | 2,762 | 2,947 | 15,323 | 8,603 | | 797 | 1,695 | | 118 | 92,241 |
| 1985 | 67,739 | 7,266 | 5,206 | 4,316 | 11,660 | 5,277 | | 875 | 2,016 | | 540 | 104,895 |
| 1986 | 69,477 | 7,620 | 6,480 | 5,234 | 13,899 | 8,959 | | 659 | 1,373 | 3,137 | | 116,838 |
| 1987 | 74,763 | 12,168 | 5,682 | 5,989 | 12,868 | 5,938 | | 627 | 4,680 | 3,340 | | 126,055 |
| 1988 | 72,090 | 7,180 | 6,293 | 3,219 | 25,963 | | | 1,172 | 3,296 | 894 | 103 | 120,210 |
| 1989 | 43,630 | 19,187 | 3,003 | 3,990 | 20,305 | 5,697 | | 1,274 | 201 | | 2,865 | 100,152 |

Source: Derived from Zambia CSO data.

Table 7.4: Crop production, commercial farm sector, 1975 to 1989
(thousand metric tons)

| Year | Maize | Wheat | Virginia tobacco | Sun-flower | Soy-bean | Seed maize | Seed cotton | Potato | Cotton | Coffee | Burley tobacco |
|-------------|--------------|--------------|-------------------------|-------------------|-----------------|-------------------|--------------------|---------------|---------------|---------------|-----------------------|
| 1975 | 418.31 | | 7.67 | 4.37 | | 20.86 | | 5.85 | .43 | | |
| 1976 | 451.33 | | 6.26 | 5.53 | | 23.00 | | 4.25 | .75 | | |
| 1977 | 324.10 | | 8.10 | 2.57 | | 19.79 | | .66 | 2.01 | | |
| 1978 | 187.82 | 9.62 | 4.72 | 3.94 | | 10.64 | | 1.24 | .45 | | |
| 1979 | 239.12 | 16.39 | 7.19 | 3.21 | | 11.75 | | .08 | 1.36 | | .06 |
| 1980 | 274.03 | 16.17 | 3.72 | 3.62 | | 17.98 | | 5.24 | 3.24 | | .05 |
| 1981 | 245.50 | 14.41 | 2.74 | 6.54 | 7.23 | 8.92 | | .40 | 2.73 | | |
| 1982 | 340.77 | 13.44 | 4.60 | 10.49 | 6.76 | 18.05 | | 4.88 | 2.62 | | 1.99 |
| 1983 | 223.89 | 10.40 | 4.07 | 5.91 | 7.41 | 10.42 | 2.61 | 5.44 | 2.61 | | .06 |
| 1984 | 172.54 | 26.30 | 2.69 | 2.27 | 23.05 | 29.25 | | 19.00 | 1.20 | | .08 |
| 1985 | 315.01 | 32.17 | 5.93 | 4.03 | 19.81 | 20.99 | | 12.78 | 1.86 | | .29 |
| 1986 | 315.41 | 43.53 | 7.70 | 6.26 | 26.09 | 10.88 | | 10.65 | 1.33 | 2.33 | |
| 1987 | 290.80 | 59.82 | 7.03 | 5.05 | 28.03 | 31.80 | | 8.62 | 9.20 | 1.18 | |
| 1988 | 317.99 | 38.43 | 5.57 | 3.48 | 24.45 | | | 14.51 | 5.32 | .26 | .19 |
| 1989 | 153.79 | 38.87 | 3.66 | 4.48 | 21.82 | 25.50 | | 1.07 | .20 | | 2.70 |

Source: Derived from Zambia CSO data.

The declining importance of maize relative to other crops in the commercial farms sector is further confirmed by production quantity data. Table 7.4 presents these data in tabular form for all recorded crops, while figure 7.3 illustrates changes in production for the three leading crops in the commercial farms sector: maize, wheat, and soybeans. The graph indicates increases in wheat and soybean production that are large in percentage terms but that do not match the magnitude of the decrease in maize production for the same period. Note, however, that the most recent indicated downturn in maize production (1989) is not substantially greater than previous downturns from which production later recovered.

A more complete analysis of these data would attempt to reconcile fluctuations in production with specific political and economic events such as droughts, changes in government, currency devaluations, or price liberalizations. Such an analysis would require additional data not contained in the CSO reports and is therefore beyond the scope of the present exercise. In the absence of specific statistical controls for such events, a growth rate may nonetheless be calculated, though it matters a great deal where one places the starting and finishing points for the calculation.

The growth rate "r" is derived as follows:

$$(1) \quad Y = a(1+r)^T$$

where Y is either area, production, or yield, depending on which growth rate is desired. The variable T is a time trend.

Equation (1) can be linearized in logs as shown in equation (2):

$$(2) \quad \ln Y = \ln(a) + \ln(1+r)(T) = A + BT$$

Equation (2) then forms the basis for a linear regression of the log of either area, production, or yield on a time trend. The growth rate estimate is then calculated from the ordinary least squares parameter estimate for the trend variable:

$$(3) \quad r = e^B - 1$$

Area growth rates estimated from the data in table 7.3 are presented in table 7.5 for two time periods: a fifteen-year period from 1975 to 1989 and a seven-year period from 1983 to 1989. The data suggest that area under maize has declined at an average annual rate of 4.1 percent since 1974, with the decline accelerating in more recent years. On the other hand, areas under wheat, soybeans, and several other crops have increased at an accelerating rate. Given the volatile nature of the figures, care must be exercised in interpretation.

The CSO data permit further disaggregation of commercial farm data by region, but the way data have been disaggregated has changed over time. In 1975-76, data were disaggregated by Central, Southern, and "Copperbelt and others" categories, along with a national total. In 1981-82, this division was changed to Central, Lusaka, Southern, and "Copperbelt and others," a system of classification that remained unchanged through 1989-90. In order to facilitate statistical computations and conserve on reporting, two regionally disaggregated time series were generated from these data: northwest representing the data from "Copperbelt and others" and including the Western, Northwestern, Copperbelt, Luapula, and Northern provinces; and southeast including the Central,

**Table 7.5: Crop area growth rates commercial farms sector
(percent)**

| | 1975-1989 | 1983-1989 |
|------------------|-------------------|-------------------|
| Maize | -4.1 ^a | -6.5 |
| Wheat | 13.8 ^a | 29.1 ^a |
| Virginia tobacco | -5.2 ^a | 5.1 |
| Sunflower | -1.0 | -3.1 |
| Soybean | 18.0 ^a | 19.3 ^a |
| Seed maize | 1.6 | -.2 |
| Potato | 1.2 | 13.6 ^b |
| Cotton | 4.8 | -17.8 |
| Coffee | -46.6 | -46.6 |
| Burley tobacco | 15.6 | 41.2 |
| All crops | -.6 | -.2 |

a. The estimate of B in the regressions is significant at the 5 percent level.

b. The estimate of B in the regressions is significant at the 10 percent level.

Eastern, Lusaka, and Southern provinces. With the exclusion of southern areas of the Western province, the northwest region is generally situated in areas receiving in excess of 1,100 millimeters (or 44 inches) of annual precipitation, while the provinces in the southeast region receive 1,000 millimeters (or 40 inches) of rainfall per year or less.

Data in the commercial farm series are further disaggregated by farm size categories, but the categories have not remained the same over time. In 1975-76, six categories were used: 0-79 hectares, 80-199 hectares, 200-399 hectares, 400-799 hectares, 800-1,999 hectares, and 2,000+ hectares. This classification system was maintained until 1986-87 when the number of categories was reduced to four—0-199 hectares, 200-799 hectares, 800-1,999 hectares, and 2,000+ hectares—and remained so through 1989-90. To ease computation burdens, data series were further consolidated into three categories for purposes of growth rate analysis: small farms (less than or equal to 199 hectares), medium farms (200-1,999 hectares), and large farms (2,000+ hectares).

Table 7.6: Crop area growth rates, commercial farms sector (percent)

| | Farm size | | | | | |
|-------------------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
| | 1975-1989 | | | 1983-1989 | | |
| | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) |
| Northwest region¹ | | | | | | |
| Maize | 13.7 ^{**} | -1.7 | -2.9 | 1.1 | 1.6 | -46.3⁻ |
| Wheat ^o | -45.0 | 3.2 | -14.3 ¹ | -12.1 | 58.6 | -27.3 |
| Virginia tobacco | -9.0^{**} | -13.5¹ | -10.7 ^{**} | -12.8 | 2.6 | -14.6 |
| Sunflower ^o | 15.3 ¹ | -1.4 | 33.7 | 5.0 | 6.2 | |
| Soybean | 5.6 | -18.9 | 8.4 | 68.1¹ | -17.2 | -33.4 ⁻ |
| Seed maize ^o | 15.2 | 31.6 ^{**} | -.2 | -30.9¹ | -49.7 | -42.7 |
| Potato | 13.4 | 12.9 | -11.1 | 33.0 | 70.7 | 45.7 |
| Cotton ^d | 20.1 | 1.1 | | 73.9 ⁻ | | 31.8 |
| Coffee ^o | -77.2 | -43.8 | -77.3 | -77.2 | -43.8 | -77.3 |
| Burley tobacco ^d | 34.3 | -.6 | -06.7 | 147.0 | | 17.2 |
| All crops | 13.9 | 1.2 | 1.2 | 00.8 | -5.1 | -34.3 |
| Southeast region² | | | | | | |
| Maize | -3.5 | -7.4 [~] | -3.2 | 4.9 | -1.6 | -8.4 |
| Wheat | 5.4 | 17.1 ⁻ | 25.2 ⁻ | -6.3 | 26.3 ^{***} | 69.1^{**} |
| Virginia tobacco | -4.0 | -7.7 ^{**} | -.9 | 43.5 | 3.0 | 8.2 |
| Sunflower | -.4 | -7 ^{**} | -8.9^{**} | -14.1 | 6.6 | -16.4 |
| Soybean | -6.4 | 23.9 | 27.0 ^o | -2.1 | 25.8 ^{**} | 32.4 ^{**} |
| Seed maize ^o | 7.5 | -.1 | -1.5 | 62.4 | 10.1 | -2.7 |
| Potato | -3.6 | 2.3 | 1.4 | 30.9 | 16.9 | 2.7 |
| Cotton | 12.1 ^{**} | -.5 | 7.6 | 2.1 | -36.6 | -8.2 |
| Coffee ^o | | -77.1 | -49.7^{**} | | -77.1 | -49.7⁻ |
| Burley tobacco ^o | 9.5 | 40.3 | 64.8⁻ | 54.4 | 178.0 | 139.0 |
| All crops | -.5 | -4.1 | 1.5 | .8 | 4.4 | 3.7 |

The estimate of B in the regressions is significant at the 10 percent level.

The estimate of B in the regressions is significant at the 5 percent level.

- Years with missing data on a particular crop/region combination were excluded.
- Includes Western, Northwestern, and Copperbelt, but not Luapula and Northern provinces.
- Includes Central, Eastern, Lusaka, and Southern provinces.
- Data exist for the following crops/regions/farm sizes in the listed years only: wheat/northwest/small (1982, 86-90); sunflower/northwest/large (1975, 80-82, 88); seedmaize/northwest/small (1976-79, 81, 85-87, 89); seedmaize/southeast/small (1975-81, 84, 86-87, 89); cotton/northwest/medium (1982-83, 86-87); coffee/northwest/small (1987-88), coffee/northwest/medium and large (1986-88), coffee/southeast/medium (1989-90), coffee/southeast/large (1986-88), burley tobacco/northwest/small (1980-85), burley tobacco/northwest/medium (1980, 89), burley tobacco/northwest/large (1979, 82-85, 89), burley tobacco/southeast/small (1979-80, 84, 89), burley tobacco/southeast/medium (1979, 82-84, 89), burley tobacco/southeast/large (1979-80, 85, 88-90).

Source: Derived from Zambia CSO data.

Table 7.7: Crop production growth rates, commercial farms sector (percent)

| | Farm size | | | | | |
|-------------------------------------|---------------------|---------------------------|---------------------------|---------------------|--------------------------|----------------------------|
| | 1975-1989 | | | 1983-1989 | | |
| | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) |
| Northwest region^o | | | | | | |
| Maize | 16.7 ^o | -4.1 | .7 | 11.1 | .1 | -43.1 [*] |
| Wheat' | -45.5 | 15.1 | 10.4 | 566.4 | 116.6 | -31.6 |
| Tobacco | -8.4 | | -14.9 | -6.6 | -1.3 | -28.4 ^{''} |
| Sunflower' | 22.6 ^o | 2.0 | 21.7 | 15.8 | 13.1 [*] | |
| Soybean | .6 | -19.4 | 14.8 | 40.9 | -23.4 | -32.5 ^{''} |
| Seed maize' | 34.0 [*] | 44.7 | -14.3 | -51.5 | -39.3 ^{'''} | -41.3 |
| Potato | 8.0 | 51.3 | -1.6 | -25.3 | 130.3 | 68.4 |
| Cotton' | 10.5 | -19.1 | | 39.6 | 1.9 | |
| Coffee' | 57.0 | -38.8 [*] | -90.1 | 57.0 | -38.8 | -90.1 |
| Burley tobacco' | 33.3 | -1.4 | -6.7 | 142.2 | | 6.5 |
| Southeast region[`] | | | | | | |
| Maize | -3.3 | -7.1 ^o | 00.4 | 14.0 | 1.6 | 1.8 |
| Wheat | 8.4 | 17.2 ['] | 23.2 ^o | -12.8 | 32.7 ^o | 58.1 ^o |
| Tobacco | -5.3 | -4.9 | 05.0 | 19.1 | 1.8 | 9.5 |
| Sunflower | 2.1 | 2.1 ^{'''} | -08.8 [*] | -5.2 | 5.8 | -19.2 |
| Soybean | -10.2 | 30.5 | 23.9 ^{'''} | -10.3 | 22.6 ^o | 19.3 |
| Seed maize' | 17.7 | .1 | -01.0 | 70.1 | 16.6 | 20.9 |
| Potato | -8.5 | 13.8 | 15.2 | -11.2 | -15.4 | -23.0 |
| Cotton | -6.8 | -6 | 08.9 | -53.8 | -37.9 | -1.8 |
| Coffee' | | -13.1 | -43.1 [*] | | -13.1 | 43.1 [*] |
| Burley tobacco' | 32.9 | 35.7 | 73.4 ^o | 183.0 | 312.0 | 198.8 |

The estimate of B in the regressions is significant at the 10 percent level.

The estimate of B in the regressions is significant at the 5 percent level.

- Years with missing data on a particular crop/region combination were excluded.
- Includes Western, Northwestern, and **Copperbelt**, but not **Luapula** and Northern provinces.
- Includes Central, Eastern, Lusaka, and Southern provinces.
- Data exist for the following crops/regions/farm sizes in the listed years only: wheat/northwest/small (1982, 86-90); **sunflower/northwest/large** (1975, 80-82, 88); **seedmaize/northwest/small** (1976-79, 81, 85-87, 89), **seedmaize/southeast/small** (**1975-81, 84, 86-87, 89**); cotton/northwest/medium (1982-83, 86-87); coffee/northwest/small (1987-88), coffee/northwest/medium and large (1986-88), coffee/southeast/medium (1989-90), coffee/southeast/large (1986-88), burley tobacco/northwest/small (1980-85), burley tobacco/northwest/medium (1980, 89), burley tobacco/northwest/large (1979, 82-85, 89), burley tobacco/southeast/small (1979-80, 84, 89), burley tobacco/southeast/medium (1979, 82-84, 89), burley tobacco/southeast/large (1979-80, 85, 88-90).

Source: Derived from Zambia CSO data.

Table 7.8: Crop yield growth rates, commercial farms sector (percent)

| | Farm size | | | | | |
|-------------------------|---------------------|--------------------------|--------------------------|---------------------|--------------------------|----------------------|
| | 1975-1989 | | | 1983-1989 | | |
| | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) | Small (0-199 ha) | Medium (200-1,999 ha) | Large (2,000+ ha) |
| Northwest region | | | | | | |
| Maize | 2.7 | -2.5 | 3.7* | 9.9 * | -1.5 | 6.1 |
| Wheat' | -10.0 | 11.6 | 28.9 ^o | 124.2 | 36.6 | -6.0 |
| Tobacco | .6 | -1.0 | -4.7 | 7.0 | -3.8 | -16.2 |
| Sunflower' | 1.4 | 3.4 | -8.9 ^o | 10.2 | | 6.5 |
| Soybean | -4.7 | - .7 | 5.9 | -16.2` | -7.4 | 1.3 |
| Seed maize" | 16.4" | 10.0 | -14.2 | -29.8 ^o | 20.7 | 2.3 |
| Potato | -6.9 | 36.8 | 10.6 | -43.9 | 34.9 | 15.6 |
| Cotton' | -12.2 | -20.0 ^o | | -19.7 | | -22.7 |
| Coffee' | 589.5 | 8.8 | -56.2 | 589.5 | 8.8 | -56.2 |
| Burley tobacco' | -7 | -8 | .0 | -2.0 | | -9.1 |
| Southeast region | | | | | | |
| Maize | .2 | .3 | 3.8* | 8.6 | 3.2 | 11.2 |
| Wheat | 2.9 | .1 | -1.6 | -6.9 | 5.1 | -6.5 |
| Tobacco | -1.3 | 3.0 | 6.0 ^{'''} | -17.0 | -1.2 | 1.2 |
| Sunflower | 2.5* | 2.8 | .1 | 10.4* | -.7 | -3.4 |
| Soybean | -4.1 | 5.4 | -2.4 | -8.4 | -2.5 | -9.9 |
| Seed maize" | 9.4 | .2 | .5 | 4.7 | 5.9 | 24.3 |
| Potato | -5.2 | 11.3 | 13.6 | -32.2 | -27.6 | -25.1 |
| Cotton | 4.7` | -0.1 | 1.2 | 22.9* | -2.2 | 6.9 |
| Coffee' | | 279.6 | 13.1 | | 279.6 | 13.1 |
| Burley tobacco' | 21.4 | -3.3 | 5.2 | 83.3 | 48.2 | 25.0 |

* The estimate of B in the regressions is significant at the 10 percent level.

** The estimate of B in the regressions is significant at the 5 percent level.

- Yields derived from area and production data. Years with missing data on a particular crop/region combination were excluded.
- Includes Western, Northwestern, and Copperbelt, but not Luapula and Northern provinces.
- Includes Central, Eastern, Lusaka, and Southern provinces.
- Data exist for the following crops/regions/farm sizes in the listed years only: wheat/northwest/small (1982, 86-90); sunflower/northwest/large (1975, 80-82, 88); seedmaize/northwest/small (1976-79, 81, 85-87, 89), seedmaize/southeast/small (1975-81, 84, 86-87,89); cotton/northwest/medium (1982-83, 86-87); coffee/northwest/small (1987-88), coffee/northwest/medium and large (1986-88), coffee/southeast/medium (1989-90), coffee/southeast/large (1986-88), burley tobacco/northwest/small (1980-85), burley tobacco/northwest/medium (1980, 89), burley tobacco/northwest/large (1979, 82-85, 89), burley tobacco/southeast/small (1979-80, 84, 89), burley tobacco/southeast/medium (1979, 82-84, 89), burley tobacco/southeast/large (1979-80, 85, 88-90).

Source: Derived from Zambia CSO data.

Results are presented in table 7.6 for area growth rates, table 7.7 for production growth rates, and table 7.8 for yield growth rates. Missing data for some years and crops render interpretation of some rates problematic, but rates are presented whenever at least three years of data are available. A number of findings stand out:

Area harvested

- ▶ Total area cultivated by small farms in the northwest region appears to have been increasing at annualized rate of 13.9 percent since 1975 but has stagnated (0.8 percent) in recent years. Total area cultivated in the southeast appears to have remained relatively flat since 1975.
- ▶ Data suggest that total area cultivated by the largest farms in the northwest region has increased moderately at an annualized rate of 1.2 percent since 1975 but declined 34.4 percent since 1983. In the southeast, total area appears to have remained relatively flat (an increase of 1.5 percent since 1975 and 3.7 percent since 1983).
- ▶ The decline in maize area over time mentioned earlier for national-level figures seems to have been the result primarily of declining maize production on large farms. Maize area cultivated in the northwest region by the smallest farm size category appears to have increased at an average annualized rate of 13.7 percent since 1975 and 1.1 percent since 1983. In contrast, growth in maize area in the same region on the largest farms (2,000+ hectares) appears to have declined at an annualized rate of 2.9 percent since 1975, and data suggest maize area has plummeted (46.3 percent) since 1983. Roughly similar trends are observed for the southeast region.
- ▶ Small farm hectareage of nearly all crops in the northwest region (excluding wheat and Virginia tobacco, where the base is small) seems to have increased rapidly since 1975, particularly so for cotton (20.1 percent), sunflower (15.3 percent), potatoes (13.4 percent), and soybeans (5.6 percent). Growth in cotton area (73.9 percent) and soybeans (68.1 percent) since 1983 appears particularly high and comes at the expense of coffee, wheat, and tobacco. In the southeast region, data suggest growth in cotton area (12.1 percent) and wheat (5.4 percent) is displacing other crops, particularly maize and soybeans.
- ▶ Data suggest that large farms in the southeast have over the long term been shifting emphasis to burley tobacco (64.8 percent), wheat (25.2 percent), soybeans (27.0 percent), and cotton (7.6 percent), and away from maize (-3.2 percent), and sunflower (-8.9 percent). Area growth since 1983 in burley tobacco (139.0 percent), wheat (69.1 percent), and soybeans (32.4 percent) appears particularly robust.

Production and yield

- ▶ *Small farms.* Data from the northwest suggest rapid growth in the production of coffee (57.0 percent), seed maize (34.0 percent), burley tobacco (33.3 percent), sunflower (22.6 percent), maize (16.7 percent), and cotton (10.5 percent) has been achieved by small farms since 1975. Growth in output by small farms in the southeast has been more moderate, with production declines experienced in maize, tobacco, soybeans, potato, and cotton.

- ▶ *Large farms.* Large farms in the northwest region since 1975 appear to have experienced rapid growth in production of wheat (10.4 percent), soybeans (14.8 percent), and sunflowers (21.7 percent), and declining production in seed maize (-14.3 percent), coffee (-90.1 percent), and tobacco (-14.9 percent). In the southeast region, production over the long term seems to have grown most rapidly in wheat (23.2 percent), soybeans (23.9 percent), and burley tobacco (73.4 percent).

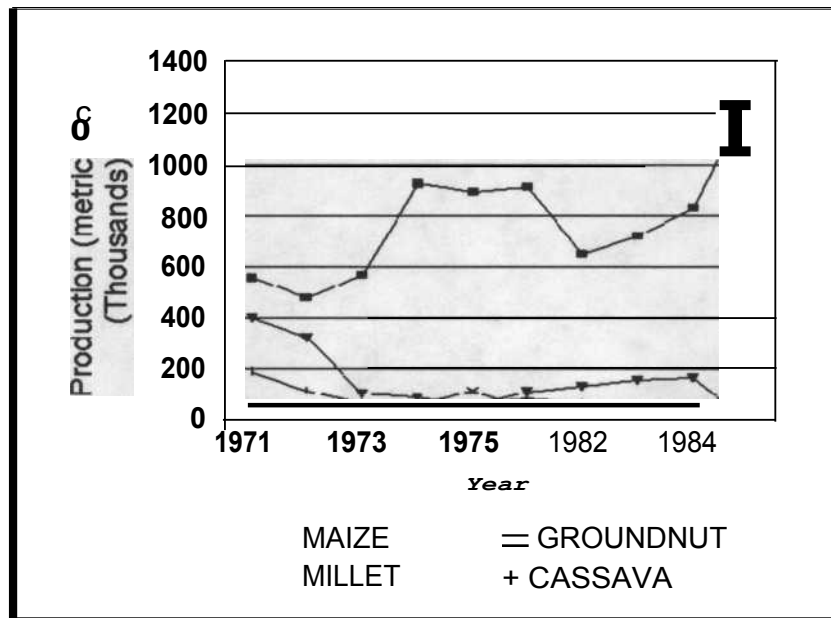
In principle, the sum of growth rates for area and yield should equal that of production. Differences in the tables arise at times due to missing values and rounding errors.

V. Noncommercial farms sector

Production data from the noncommercial farms sector are available from 1971 to 1985, though with a gap from 1977 to 1981. Data on area for this sector are available only in the most recent years, 1982 through 1985. Since yield calculations require data on both area and production, yields can only be calculated for the period 1982 to 1985.

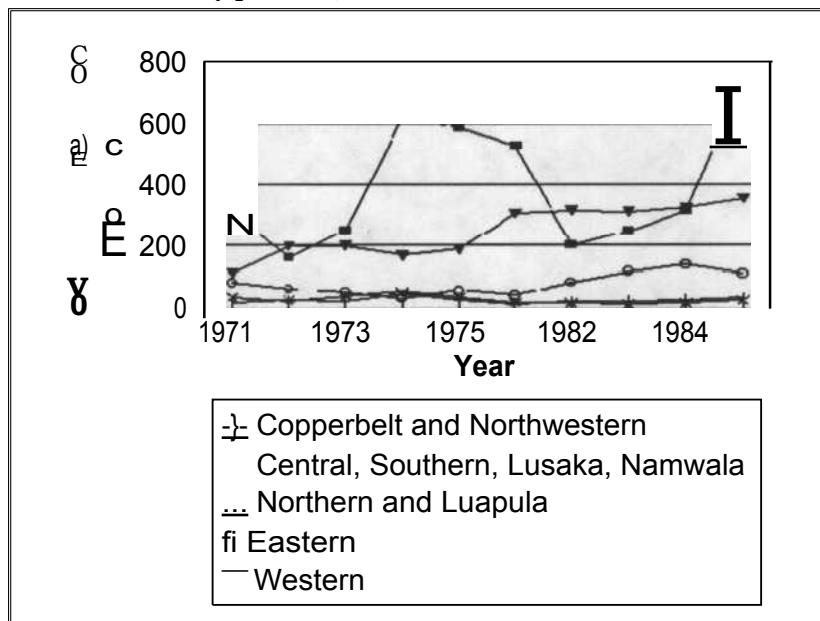
Figure 7.4 depicts changes in the production of maize, groundnuts, millet, and cassava, and suggests that for the noncommercial sector, the diversification story found in the commercial farms sector does not apply. Indeed, the story seems to be precisely the opposite. Instead of a gradual decline in maize production, a dramatic increase is apparent, and other crops generally appear to decline over time.

Figure 7.4: Noncommercial farm production of maize, millet, groundnuts, and cassava, 1971 to 1976 and 1982 to 1986 (000 metric tons)



Source: CSO.

Figure 7.5: Noncommercial farms production of maize by province, 1971 to 1976 and 1982 to 1985



Source: CSO.

There appear to be significant regional variations. Focusing specifically on maize, it can be seen from figure 7.5 that production has increased steadily in the Eastern province, as well as in the North and Luapula provinces.⁴ Production trends have been mixed elsewhere. Table 7.9 presents production growth rates for the 1972-1986 period. Table 7.10 presents growth rates for production, area and yield for the 1983-1986 period.

Regional breakdowns in the data time series vary from year to year; for example, data for the Copperbelt/Northwest region were reported separately sometimes and as one combined total at other times. The regional breakdowns in Tables 7.9 and 7.10 represent the finest level of disaggregation possible from the published data without eliminating data for certain years.

These data are somewhat inconsistent with a report on the Eastern province from the International Food Policy Research Institute that implies growth in maize production only until 1980, at which time production in the Eastern province reportedly began to decline (Cells, Milimo, and Wanmali 1991, p. 24). Data from the CSO are consistent with statistics reported by the Economic Research Service of the US Department of Agriculture, which suggest a growth rate in cereals production in Zambia of roughly 1.1 percent (figure 7.6).

⁴ Production in the combined Central, Southern, and Lusaka provinces has fluctuated greatly but has increased on average 1.3 percent per year.

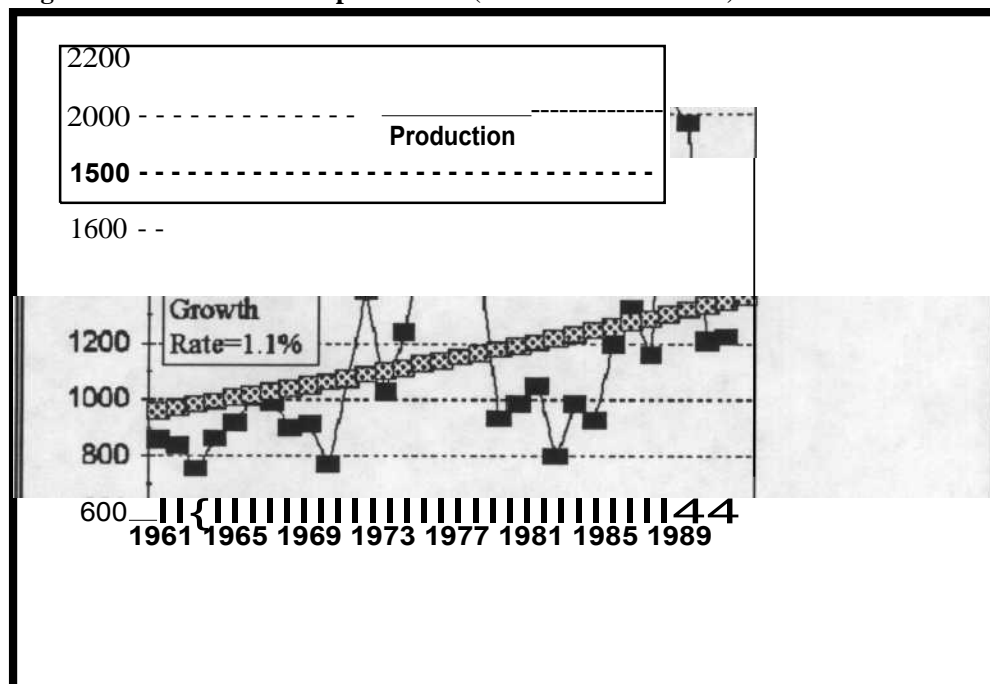
Table 7.9: Production growth rates, 1972 to 1986, noncommercial farms sector

| | Copperbelt/ Northwestern | Central/ Southern/Lusaka | Northern/ Luapula | Eastern | Western |
|-------------------|-----------------------------|-----------------------------|----------------------|---------|---------|
| Beans | -0.009 | -0.066 | -0.042 | .049 | -0.038 |
| Cassava | .015 | -0.208' | -0.013 | -.109 | -.042 |
| Groundnuts | -0.013 | -0.118" | -.074" | -.060" | -.039 |
| Maize | .010 | .013 | -.065" | -.063" | -.052" |
| Millet | -0.063' | -0.021 | -.046' | -.022 | -.022 |
| Sorghum | .011 | -0.043 | -.027 | -.001 | .036 |

* The estimate of B in the regressions is significant at the 10 percent level.

The estimate of B in the regressions is **significant at the 5 percent level.

Source: Derived from **Zambia CSO data**.

Figure 7.6: Zambia cereals production (thousand metric tons)

Source: ERS.

Table 7.10: Production, area, and yield growth rates, 1983 to 1986, noncommercial farms sector

| | Copperbelt/ Northwestern | Central/ Southern/Lusaka | Northern/ Luapula | Eastern | Western |
|-------------------|-----------------------------|-----------------------------|----------------------|--------------------------|----------------------|
| Production | | | | | |
| Beans | -.010 | .624 | -.258 [~] | .025 | |
| Cassava | .232 | -.154 | .054 | 57.500 | .805 |
| Groundnuts | -.056 | .338 | .050 | .178 | -.042 ^{'''} |
| Maize | .167 [°] | .516 ['] | .100 | .041 | .130 |
| Millet | .258 | .249 | .051 | .024 | .322 |
| Sorghum | .329 [*] | .244 ^{''} | .052 [*] | .678 [*] | .468 |
| Area | | | | | |
| Beans | .034 | .472 | -.254 [°] | .037 | |
| Cassava | .130 | -.132 | .079 | 3.800 | .706 ^{''} |
| Groundnuts | -.012 | .219 | -.036 | .016 | .039 |
| Maize | .013 | .336 | .129 | -.062 | .241 |
| Millet | .354 | .071 | -.021 | .034 | .275 |
| Sorghum | .242 [*] | .268 [*] | -.017 | .475 | .641 [*] |
| All crops | .026 ^{'''} | .301 | -.094 | -.046 | .218 ['] |
| Yield | | | | | |
| Beans | -.043 | .104 | -.006 | -.011 | |
| Cassava | .090 [*] | -.026 | -.023 | 11.188 | .058 |
| Groundnuts | -.045 | .097 | .090 | .159 | -.078 |
| Maize | .152 [*] | .135 | -.026 | .110 | -.090 [*] |
| Millet | -.071 | .166 | .074 | -.010 | .037 ['] |
| Sorghum | .071 | -.019 | .070 [*] | .138 | -.105 |

* The estimate of B in the regressions is **significant** at the 10 percent level.

** The estimate of B in the regressions is **significant** at the 5 percent level.

Source: Derived from **Zambia** CSO data.

The World Bank estimates growth rates for the combined set of commercial and noncommercial farms for the period 1974 to 1990 (World Bank 1993b, p. 25). Area and production of maize are reported by the Bank to have increased by 8 and 10 percent, respectively, over the period, with yields declining by about 2 percent. Results here, on the contrary, suggest modest declines in maize production on commercial farms on the order of 3 to 7 percent, and modest increases of from 1 to 6 percent in maize production on noncommercial farms. It should be noted that the World Bank starting point for growth rate calculations is 1974, a momentary trough in output, which may account for the high calculated rates. Again, the highly volatile nature of the data cannot be overemphasized.

A further example of data volatility can be seen by examining the number of reported farming households. In contrast to the commercial farms sector where the number of farming households is reported to fluctuate around a mean of 3,000, significant changes in the number of reported noncommercial farming households appears in the CSO data. From a high near 1.3 million in the early 1970s, the number of households drops to around 1 million for an extended period, until increasing again to near 1.2 million in the mid-1980s (see table 7.11). Fluctuations of 300,000 households in the farming population (plausibly 1 million or more individuals) is difficult to explain except perhaps as a general problem with the data collection system.

Table 7.11: Number of noncommercial farm households

| Year | Copperbelt/ Northwestern | Central/ Southern/ Lusaka | Northern/ Luapula | Eastern | Western | All |
|-------------|-----------------------------|---------------------------------|----------------------|---------|---------|-----------|
| 1971 | 144,400 | 273,000 | 499,600 | 230,400 | 148,600 | 1,296,000 |
| 1972 | 146,400 | 239,500 | 488,100 | 209,000 | 191,600 | 1,274,600 |
| 1973 | 97,600 | 203,300 | 348,100 | 273,200 | 109,000 | 1,031,200 |
| 1974 | 95,700 | 232,900 | 381,900 | 192,600 | 158,000 | 1,061,100 |
| 1975 | 111,800 | 247,400 | 318,600 | 128,500 | 157,500 | 963,800 |
| 1976 | 129,700 | 197,800 | 372,900 | 222,600 | 148,600 | 1,071,600 |
| 1982 | 124,200 | 180,580 | 320,890 | 208,350 | 151,900 | 985,920 |
| 1983 | 124,880 | 172,710 | 320,760 | 222,890 | 133,600 | 974,840 |
| 1984 | 135,970 | 183,360 | 318,120 | 247,350 | 152,120 | 1,036,920 |
| 1985 | 111,328 | 260,201 | 343,651 | 256,627 | 189,130 | 1,160,937 |

Source: Derived from Zambia CSO data.

VI. Revenues and expenditures

The CSO also provides data on farm expenditures and revenues. Tables 7.12-7.15 present results for the two broad regions of commercial farms defined above, excluding data on farm livestock revenue. They suggest a dramatic nominal increase in the kwacha value of operations in the late 1980s, on both the revenue and the expenditure side, which corresponds to a period of hyperinflation. When nominal values are deflated by a low-income CPI, farm sales and operating expenses for all farm categories are shown to increase in real terms as well, although wide fluctuations are evident. Results are not substantially different if the high-income CPI is used as a deflator. The rather astounding 1989 increase in operating expenses (fertilizer and pesticide applications, machinery, seed, etc.) in the Central, Southern, and Lusaka combined provinces on medium-sized farms cannot readily be explained.

The net effect of these adjustments in commercial farm sales, operating expenses, and wage expenses, are summarized in the partial net revenue figures in table 7.15. Partial net revenue is negative for the small farm sector in nearly all years from 1975 to 1989, partly because of missing income from livestock and the fact that revenues include only farm sales, not the value of home consumption. However, even for medium-scale farms for which auto-consumption should theoretically be much smaller, very large negative figures for net revenue are reported. Only for the large-farm sector is net revenue positive, and then only in the early to mid-1980s. However, by 1988, even the large-scale sector again appeared to be operating in the red, with very large deficits reported for medium-scale farms.

Data presented for CPIs and selected commodity and input price indexes (agricultural wholesale prices, building materials, and fixed capital goods) in table 7.16 reflect rapid inflation in the 1970s and hyperinflation by the late 1980s. The CPI of low income consumers tripled over the period 1970 to 1980, then increased by a factor of 43 between 1980 and 1990. Prices of building materials and capital goods rose faster than the CPI, while the wholesale index of agricultural prices grew at a slower rate suggesting a worsening terms of trade for agriculture in the 1980s. The effect on prices of selected individual farm commodities (maize, tobacco, wheat and cotton) and fertilizer prices (triple super phosphate and urea) are presented in table 7.17. Real output prices of maize, which were relatively constant in the 1970s, tended to rise over the period 1980 to 1986 before falling sharply to a twenty-year low in 1989. Real tobacco and wheat prices declined during the 1970s, fluctuated up and down in the early- to mid-1980s, before also falling precipitously in 1989. Real cotton prices appear to have been in a long-term secular decline from 1970 to 1989. The price of fertilizer over time has tended to be constant to increasing over the period 1971 to 1985-86, before also falling sharply in the late 1980s.

Growth in farm profitability can theoretically occur through a number of sources: (a) increasing production through area expansion; (b) increasing production through technical change; (c) increasing output prices; (d) decreasing tradable input use; and/or (e) decreasing input prices. Data on commercial farms from section IV indicate that over the period 1975 to 1989 (southeast region), production of maize fell, and that of wheat, soybeans, and burley tobacco increased, largely due to crop area adjustments. However, these adjustments moved in directions surprisingly counter to trends in real prices, i.e., rising real maize prices and falling prices for industrial crops. No data were reported on tradable input use, but the above analysis of price indexes suggests rising real costs of fixed and variable capital inputs. Assuming these data are correct, it may be that commercial farms are shifting away from maize not because of price incentives but due to restrictions on marketing that act to limit the amount of maize sold in the marketplace.

The analysis thus suggests that profitability has historically been closely linked with the ability to expand crop area and substitute land for capital inputs. Such strategies would work to the advantage of smaller farms employing oxen and labor-intensive management, and to the disadvantage of larger farms relying on capital-intensive techniques. The data are far from sufficiently reliable to reach strong conclusions (and this analysis is highly speculative), but the analysis does provide some very weak evidence for the increasing area cultivated by small farms, as documented in chapter 3.

Table 7.12: Annual commercial farm sales, nominal and 1985 deflated kwacha

| Year | Farm size | | | | | |
|-------------------------|-------------------|-------------------|-----------------------|-------------------|-------------------|------------------|
| | Small (0-199 ha) | | Medium (200-1,999 ha) | | Large (2,000+ ha) | |
| | Nominal | Deflated | Nominal † | Deflated | Nominal | Deflated |
| Northwest region | | | | | | |
| 1975 | 38,560 | 165,739 | 637,220 | 2,738,910 | 1,104,440 | 4,747,124 |
| 1976 | 448,350 | 1,680,493 | 1,665,740 | 6,243,480 | 1,328,070 | 4,977,835 |
| 1977 | 416,344 | 1,307,712 | 2,069,577 | 6,500,422 | 2,941,521 | 9,239,147 |
| 1978 | 627,848 | 1,672,290 | 1,246,315 | 3,319,594 | 1,411,260 | 3,758,929 |
| 1979 | 658,883 | 1,556,307 | 1,003,442 | 2,370,169 | 2,936,569 | 6,936,291 |
| 1980 | 611,594 | 1,304,469 | 2,462,836 | 5,252,983 | 4,065,529 | 8,671,366 |
| 1981 | 653,605 | 1,234,504 | 3,646,138 | 6,886,683 | 4,782,206 | 9,032,444 |
| 1982 | 1,318,870 | 2,200,621 | 9,864,834 | 16,460,123 | 29,800,277 | 49,723,718 |
| 1983 | 3,253,783 | 4,669,982 | 1,810,816 | 2,598,968 | 9,856,298 | 14,146,220 |
| 1984 | 1,112,400 | 1,332,378 | 13,282,619 | 15,909,268 | 47,298,385 | 56,651,680 |
| 1985 | 4,488,066 | 4,488,066 | 20,943,035 | 20,943,035 | 32,592,720 | 32,592,720 |
| 1986 | 17,859,026 | 12,911,365 | 17,775,775 | 12,851,177 | 119,197,265 | 86,174,876 |
| 1987 | 15,982,721 | 7,758,227 | 34,139,319 | 16,571,683 | 82,152,580 | 39,877,962 |
| 1988 | 46,204,737 | 14,854,102 | 75,727,593 | 24,345,239 | 46,938,639 | 15,090,040 |
| 1989 | 18,737,511 | 3,017,191 | 21,125,009 | 3,401,636 | 11,381,725 | 1,832,732 |
| Southeast region | | | | | | |
| 1975 | 2,370,840 | 10,190,387 | 23,506,790 | 101,037,309 | 12,983,680 | 55,806,687 |
| 1976 | 4,257,440 | 15,957,617 | 22,717,360 | 85,148,569 | 12,388,240 | 46,433,252 |
| 1977 | 3,608,362 | 11,333,656 | 20,954,172 | 65,815,842 | 8,339,458 | 26,193,755 |
| 1978 | 2,884,862 | 7,683,908 | 15,665,928 | 41,726,624 | 9,113,582 | 24,274,273 |
| 1979 | 3,210,976 | 7,584,451 | 23,293,395 | 55,019,911 | 12,940,515 | 30,566,003 |
| 1980 | 5,229,649 | 11,154,318 | 30,142,149 | 64,290,186 | 17,916,608 | 38,214,331 |
| 1981 | 7,286,861 | 13,763,138 | 25,688,377 | 48,519,203 | 12,218,440 | 23,077,712 |
| 1982 | 8,004,097 | 13,355,361 | 36,825,758 | 61,446,194 | 19,237,815 | 32,099,557 |
| 1983 | 8,406,376 | 12,065,224 | 35,269,976 | 50,621,119 | 25,718,732 | 369,127,27 |
| 1984 | 5,879,813 | 7,042,551 | 33,990,139 | 40,711,718 | 37,990,810 | 45,503,525 |
| 1985 | 34,892,784 | 34,892,784 | 132,954,469 | 132,954,469 | 140,293,368 | 140,293,368 |
| 1986 | 25,205,982 | 18,222,921 | 172,599,774 | 124,782,763 | 289,224,028 | 209,097,455 |
| 1987 | 98,785,330 | 47,951,722 | 299,833,301 | 145,543,099 | 384,874,747 | 186,823,356 |
| 1988 | 161,526,275 | 51,928,176 | 365,268,613 | 117,428,158 | 225,185,002 | 72,393,464 |
| 1989 | 90,368,388 | 14,551,488 | 957,438,581 | 154,170,687 | 852,845,309 | 137,328,650 |

Source: Derived from Zambia CSO data.

Table 7.13: Annual commercial farm operating expenses, nominal and 1985 deflated kwacha^a

| Year | Farm size | | | | | |
|-------------------------|--------------------|-------------------|-----------------------|-------------------|-------------------|-------------|
| | Small (0-199 ha) | | Medium (200-1,999 ha) | | Large (2,000+ ha) | |
| | Nominal | Deflated | Nominal | Deflated | Nominal | Deflated |
| Northwest region | | | | | | |
| 1975 | 1,027,770 | 4,417,580 | 1,462,490 | 6,286,101 | 846,300 | 3,637,582 |
| 1976 | 1,831,590 | 6,865,114 | 2,856,990 | 10,708,489 | 1,481,660 | 5,553,516 |
| 1977 | 1,425,481 | 4,477,353 | 3,530,924 | 11,090,428 | 2,315,283 | 7,272,170 |
| 1978 | 2,064,080 | 5,497,733 | 4,320,730 | 11,508,382 | 2,637,460 | 7,024,946 |
| 1979 | 3,654,722 | 8,632,597 | 3,192,670 | 7,541,212 | 3,986,588 | 9,416,477 |
| 1980 | 2,536,975 | 5,411,114 | 5,600,683 | 11,945,696 | 3,535,818 | 7,541,546 |
| 1981 | 3,786,497 | 7,151,788 | 11,343,599 | 21,425,347 | 3,631,218 | 6,858,503 |
| 1982 | 9,689,398 | 16,167,396 | 20,307,255 | 33,883,987 | 5,762,067 | 9,614,387 |
| 1983 | 3,687,741 | 5,292,818 | 9,219,046 | 13,231,606 | 3,680,049 | 5,281,778 |
| 1984 | 3,261,358 | 3,906,294 | 16,100,177 | 19,284,001 | 15,771,369 | 18,890,170 |
| 1985 | 22,134,990 | 22,134,990 | 29,068,671 | 29,068,671 | 23,956,634 | 23,956,634 |
| 1986 | 64,114,761 | 46,352,419 | 25,787,081 | 18,643,033 | 90,599,461 | 65,499,803 |
| 1987 | 119,172,564 | 57,847,958 | 34,375,926 | 16,686,535 | 68,086,610 | 33,050,152 |
| 1988 | 35,214,022 | 11,320,758 | 253,260,212 | 81,419,206 | 66,526,979 | 21,387,385 |
| 1989 | 78,757,704 | 12,681,889 | 9,271,714,613 | 1,492,969,515 | 14,600,470 | 2,351,028 |
| Southeast region | | | | | | |
| 1975 | 3,032,760 | 13,035,464 | 18,982,720 | 81,591,869 | 18,987,560 | 81,612,673 |
| 1976 | 2,300,670 | 8,623,307 | 29,939,390 | 112,217,979 | 17,293,010 | 64,817,173 |
| 1977 | 4,577,150 | 14,376,563 | 20,313,688 | 63,804,119 | 28,479,720 | 89,453,153 |
| 1978 | 4,272,000 | 11,378,588 | 24,982,630 | 66,541,913 | 34,001,830 | 90,564,796 |
| 1979 | 4,461,744 | 10,538,814 | 35,405,748 | 83,629,764 | 34,396,719 | 81,246,398 |
| 1980 | 4,330,558 | 9,236,647 | 44,469,648 | 94,849,306 | 29,010,392 | 61,876,261 |
| 1981 | 13,102,790 | 24,748,038 | 43,393,887 | 81,960,679 | 29,947,982 | 56,564,579 |
| 1982 | 13,675,085 | 22,817,777 | 43,845,941 | 73,159,830 | 25,531,058 | 42,600,246 |
| 1983 | 14,832,245 | 21,287,932 | 42,808,609 | 61,440,917 | 44,270,155 | 63,538,597 |
| 1984 | 16,271,308 | 19,488,973 | 56,379,475 | 67,528,564 | 77,326,276 | 92,617,612 |
| 1985 | 22,353,101 | 22,353,101 | 89,325,498 | 89,325,498 | 101,636,018 | 101,636,018 |
| 1986 | 33,579,194 | 24,276,420 | 157,303,061 | 113,723,849 | 212,899,764 | 153,918,051 |
| 1987 | 85,692,368 | 41,596,223 | 295,734,214 | 143,553,347 | 232,586,587 | 112,900,644 |
| 1988 | 783,251,905 | 251,803,263 | 500,947,351 | 161,046,755 | 225,049,519 | 72,349,908 |
| 1989 | 418,319,638 | 67,359,544 | 1,004,500,030 | 161,748,715 | 1,136,914,161 | 183,070,581 |

a. **Includes equipment** hire, feed, soil inputs, veterinary supplies, implements, and maintenance. Excludes wages.

Source: Derived from **Zambia CSO data**.

Table 7.14: Annual commercial farm wage bill, nominal and 1985 deflated kwacha

| Year | Farm size | | | | | |
|-------------------------|------------------|------------------|-----------------------|------------------|-------------------|------------|
| | Small (0-199 ha) | | Medium (200-1,999 ha) | | Large (2,000+ ha) | |
| | Nominal | Deflated | Nominal | Deflated | Nominal | Deflated |
| Northwest region | | | | | | |
| 1975 | 266,200 | 1,144,186 | 474,990 | 2,041,611 | 464,860 | 1,998,070 |
| 1976 | 857,860 | 3,215,407 | 1,558,060 | 5,839,877 | 538,580 | 2,018,690 |
| 1977 | 400,615 | 1,258,309 | 1,580,059 | 4,962,874 | 1,090,033 | 3,423,731 |
| 1978 | 1,706,850 | 4,546,241 | 766,960 | 2,042,819 | 796,210 | 2,120,727 |
| 1979 | 857,409 | 2,025,234 | 1,012,535 | 2,391,647 | 1,671,595 | 3,948,373 |
| 1980 | 1,318,350 | 2,811,909 | 1,137,435 | 2,426,035 | 1,398,510 | 2,982,882 |
| 1981 | 956,470 | 1,806,543 | 3,021,996 | 5,707,828 | 1,905,349 | 3,598,749 |
| 1982 | 1,310,466 | 2,186,599 | 3,731,350 | 6,226,002 | 7,735,055 | 12,906,447 |
| 1983 | 949,639 | 1,362,966 | 4,064,313 | 5,833,292 | 2,201,807 | 3,160,136 |
| 1984 | 628,582 | 752,885 | 4,206,774 | 5,038,667 | 8,280,695 | 9,918,209 |
| 1985 | 6,389,381 | 6,389,381 | 8,036,546 | 8,036,546 | 7,883,322 | 7,883,322 |
| 1986 | 13,168,843 | 9,520,549 | 12,701,236 | 9,182,488 | 30,394,968 | 21,974,351 |
| 1987 | 11,677,183 | 5,668,261 | 13,107,524 | 6,362,568 | 18,560,342 | 9,009,439 |
| 1988 | 12,044,948 | 3,872,263 | 24,647,278 | 7,923,715 | 24,298,815 | 7,811,690 |
| 1989 | 10,479,608 | 1,687,469 | 20,579,334 | 3,313,769 | 1,237,000 | 199,187 |
| Southeast region | | | | | | |
| 1975 | 917,530 | 3,943,744 | 6,151,850 | 26,441,993 | 6,385,130 | 27,444,681 |
| 1976 | 850,800 | 3,188,945 | 7,589,380 | 28,446,300 | 7,989,370 | 29,945,532 |
| 1977 | 1,143,089 | 3,590,376 | 9,643,821 | 30,290,684 | 12,060,667 | 37,881,858 |
| 1978 | 1,188,430 | 3,165,416 | 12,037,390 | 32,061,915 | 5,560,690 | 14,811,049 |
| 1979 | 998,178 | 2,357,736 | 17,692,459 | 41,790,281 | 11,520,015 | 27,210,727 |
| 1980 | 1,160,911 | 2,476,107 | 19,982,267 | 42,620,175 | 9,387,735 | 20,023,099 |
| 1981 | 2,111,946 | 3,988,961 | 9,679,489 | 18,282,241 | 7,774,976 | 14,685,071 |
| 1982 | 2,487,040 | 4,149,789 | 16,413,275 | 27,386,626 | 4,097,295 | 6,836,606 |
| 1983 | 3,449,377 | 4,950,707 | 9,741,551 | 13,981,530 | 13,050,177 | 18,730,224 |
| 1984 | 4,687,643 | 5,614,628 | 17,554,679 | 21,026,132 | 26,683,982 | 31,960,762 |
| 1985 | 4,161,863 | 4,161,863 | 20,784,751 | 20,784,751 | 17,481,002 | 17,481,002 |
| 1986 | 5,780,490 | 4,179,064 | 29,382,383 | 21,242,293 | 37,165,726 | 26,869,340 |
| 1987 | 11,050,099 | 5,363,866 | 65,505,507 | 31,797,250 | 45,913,446 | 22,287,001 |
| 1988 | 124,709,755 | 40,092,240 | 187,458,457 | 60,264,968 | 53,102,424 | 17,071,601 |
| 1989 | 28,424,054 | 4,576,958 | 217,665,700 | 35,049,424 | 209,085,128 | 33,667,745 |

Source: Derived from Zambia CSO data.

Table 7.15: Annual commercial farm partial net revenue, nominal and 1985 deflated kwacha^a

| Year | Farm size | | | | | |
|-------------------------|------------------|-------------------|-----------------------|--------------------|-------------------|-----------------|
| | Small (0-199 ha) | | Medium (200-1,999 ha) | | Large (2,000+ ha) | |
| | Nominal | Deflated | <u>Nominal</u> | <u>Deflated</u> | Nominal | Deflated |
| Northwest region | | | | | | |
| 1975 | -1,255,410 | -5,396,027 | -1,300,260 | -5,588,802 | -206,720 | -888,528 |
| 1976 | -2,241,100 | -8,400,028 | -2,749,310 | -10,304,886 | -692,170 | -2,594,371 |
| 1977 | -1,409,752 | -4,427,950 | -3,041,406 | -9,552,880 | -463,795 | -1,456,754 |
| 1978 | -3,143,082 | -8,371,684 | -3,841,375 | -10,231,607 | -2,022,410 | -5,386,744 |
| 1979 | -3,853,248 | -9,101,524 | -3,201,763 | -7,562,690 | -2,721,614 | -6,428,559 |
| 1980 | -3,243,731 | -6,918,554 | -4,275,282 | -9,118,748 | -868,799 | -1,853,062 |
| 1981 | -4,089,362 | -7,723,827 | -10,719,457 | -20,246,492 | -754,361 | -1,424,808 |
| 1982 | -9,680,994 | -16,153,374 | -14,173,771 | -23,649,866 | 16,303,155 | 27,202,884 |
| 1983 | -1,383,597 | -1,985,802 | -11,472,543 | -16,465,930 | 3,974,442 | 5,704,306 |
| 1984 | -2,777,540 | -3,326,801 | -7,024,332 | -8,413,400 | 23,246,321 | 27,843,301 |
| 1985 | -24,036,305 | -24,036,305 | -16,162,182 | -16,162,182 | 752,764 | 752,764 |
| 1986 | -59,424,578 | -42,961,603 | -20,712,542 | -14,974,344 | -1,797,164 | -1,299,278 |
| 1987 | -114,867,026 | -55,757,992 | -13,344,131 | -6,477,420 | -4,494,372 | -2,181,629 |
| 1988 | -1,054,233 | -338,919 | -202,179,897 | -64,997,682 | -43,887,155 | -14,109,035 |
| 1989 | -70,499,801 | -11,352,167 | -9,271,168,938 | -1,492,881,648 | -4,455,745 | -717,483 |
| Southeast region | | | | | | |
| 1975 | -1,579,450 | -6,788,821 | -1,627,780 | -6,996,553 | -12,389,010 | -53,250,667 |
| 1976 | 1,105,970 | 4,145,365 | -14,811,410 | -55,515,710 | -12,894,140 | -48,329,453 |
| 1977 | -2,111,877 | -6,633,283 | -9,003,337 | -28,278,961 | -32,200,929 | -101,141,256 |
| 1978 | -2,575,568 | -6,860,096 | -21,354,092 | -56,877,204 | -30,448,938 | -81,101,572 |
| 1979 | -2,248,946 | -5,312,099 | -29,804,812 | -70,400,134 | -32,976,219 | -77,891,122 |
| 1980 | -261,820 | -558,436 | -34,309,766 | -73,179,295 | -20,481,519 | -43,685,029 |
| 1981 | -7,927,875 | -14,973,861 | -27,384,999 | -51,723,717 | -25,504,518 | -48,171,938 |
| 1982 | -8,158,028 | -13,612,205 | -23,433,458 | -39,100,262 | -10,390,538 | -17,337,295 |
| 1983 | -9,875,246 | -14,173,415 | -17,280,184 | -24,801,328 | -31,601,600 | -45,356,094 |
| 1984 | -15,079,138 | -18,061,050 | -39,944,015 | -47,842,978 | -66,019,448 | -79,074,849 |
| 1985 | 8,377,820 | 8,377,820 | 22,844,220 | 22,844,220 | 21,176,348 | 21,176,348 |
| 1986 | -14,153,702 | -10,232,563 | -14,085,670 | -10,183,379 | 39,158,538 | 28,310,064 |
| 1987 | 2,042,863 | 991,633 | -61,406,420 | -29,807,498 | 106,374,714 | 51,635,711 |
| 1988 | -746,435,385 | -239,967,327 | -323,137,195 | -103,883,565 | -52,966,941 | -17,028,045 |
| 1989 | -356,375,304 | -57,385,014 | -264,727,149 | -42,627,452 | -493,153,980 | -79,409,676 |

a. Excludes revenue from livestock activities.

Source: Derived from Zambia CSO data.

Table 7.16: Zambia price indexes (1985 = 100)

| Year | High income CPI | Low income CPI | Agriculture wholesale PI | Building materials PI | Fixed capital formation goods PI |
|-------------|--------------------|-------------------|-----------------------------|--------------------------|-------------------------------------|
| 1962 | 10.90 | 9.20 | | | |
| 1963 | 11.10 | 9.20 | | | |
| 1964 | 11.50 | 9.50 | | | |
| 1965 | 12.00 | 10.20 | | | |
| 1966 | 12.60 | 11.30 | | | |
| 1967 | 13.30 | 11.80 | 11.50 | | 5.90 |
| 1968 | 14.40 | 13.10 | 11.80 | | 6.00 |
| 1969 | 15.10 | 13.40 | 12.40 | | 6.10 |
| 1970 | 15.90 | 13.80 | 12.50 | | 6.20 |
| 1971 | 16.70 | 14.60 | 13.00 | | 6.80 |
| 1972 | 17.60 | 15.40 | 13.70 | | 7.40 |
| 1973 | 18.90 | 16.40 | 14.30 | | 7.90 |
| 1974 | 20.60 | 17.70 | 15.30 | | 9.00 |
| 1975 | 22.40 | 19.50 | 17.60 | 21.40 | 10.90 |
| 1976 | 26.00 | 23.10 | 18.30 | 25.80 | 14.50 |
| 1977 | 30.60 | 27.70 | 21.10 | 29.10 | 18.30 |
| 1978 | 34.20 | 32.30 | 24.10 | 34.00 | 23.70 |
| 1979 | 38.00 | 35.40 | 27.00 | 38.90 | 27.90 |
| 1980 | 42.40 | 39.50 | 32.40 | 42.30 | 31.20 |
| 1981 | 46.80 | 45.10 | 44.90 | 47.50 | 34.30 |
| 1982 | 53.00 | 50.70 | 50.90 | 55.40 | 39.40 |
| 1983 | 62.40 | 60.60 | 63.00 | 63.40 | 48.70 |
| 1984 | 75.30 | 72.80 | 68.50 | 70.40 | 69.90 |
| 1985 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| 1986 | 160.10 | 154.00 | 166.90 | 148.40 | 283.30 |
| 1987 | 250.30 | 224.30 | 201.30 | 237.00 | 601.50 |
| 1988 | 375.80 | 346.90 | 271.20 | 300.50 | 486.10 |
| 1989 | 847.00 | 793.50 | 582.10 | 864.40 | 764.70 |
| 1990 | 1,695.20 | 1,674.40 | 1,124.30 | 2,062.90 | 1,963.80 |

Source: Derived from Zambia CSO data.

Table 7.17: Zambia commodity prices, nominal and 1985 deflated kwacha^a

| Year | Maize | | Tobacco | | Wheat | | Cotton | | Triple super phosphate | | Urea | |
|------|---------------|--------------|-------------|-------------|---------------|--------------|-------------|-------------|------------------------|----------|-------------|--------------|
| | Nominal' | Deflated | Nominal' | Deflated | Nominal' | Deflated | Nominal | Deflated | Nominal | Deflated | Nominal' | Deflated |
| 1970 | 3.50 | 25.36 | 0.81 | 5.87 | | | 0.17 | 1.23 | | | | |
| 1971 | 4.00 | 27.40 | 0.81 | 5.55 | | | 0.17 | 1.16 | 4.70 | 32.19 | 4.19 | 28.70 |
| 1972 | 4.30 | 27.92 | 0.88 | 5.71 | | | 0.17 | 1.10 | 3.13 | 20.32 | 2.80 | 18.18 |
| 1973 | 4.30 | 26.22 | 0.88 | 5.37 | | | 0.17 | 1.04 | 4.00 | 24.39 | 3.55 | 21.65 |
| 1974 | 4.30 | 24.29 | 0.96 | 5.42 | | | 0.25 | 1.41 | 3.90 | 22.03 | 4.05 | 22.88 |
| 1975 | 5.00 | 25.64 | 0.84 | 4.31 | 16.00 | 82.05 | 0.30 | 1.54 | 3.90 | 20.00 | 4.05 | 20.77 |
| 1976 | 6.30 | 27.27 | 0.97 | 4.20 | 16.00 | 69.26 | 0.40 | 1.73 | 6.45 | 27.92 | 6.74 | 29.18 |
| 1977 | 6.30 | 22.74 | 1.10 | 3.97 | 16.00 | 57.76 | 0.40 | 1.44 | 6.45 | 23.29 | 6.74 | 24.33 |
| 1978 | 6.30 | 19.50 | 1.45 | 4.49 | 20.00 | 61.92 | 0.46 | 1.42 | 6.45 | 19.97 | 6.74 | 20.87 |
| 1979 | 9.00 | 25.42 | 1.51 | 4.27 | 20.00 | 56.50 | 0.46 | 1.30 | 13.50 | 38.14 | 8.75 | 24.72 |
| 1980 | 11.70 | 29.62 | 1.57 | 3.97 | 20.00 | 50.63 | 0.46 | 1.16 | 11.50 | 29.11 | 11.65 | 29.49 |
| 1981 | 13.50 | 29.93 | 1.65 | 3.66 | 26.00 | 57.65 | 0.46 | 1.02 | 13.65 | 30.27 | 9.65 | 21.40 |
| 1982 | 16.00 | 31.56 | 2.40 | 4.73 | 32.00 | 63.12 | 0.47 | 0.93 | 16.65 | 32.84 | 10.95 | 21.60 |
| 1983 | 18.30 | 30.20 | 2.70 | 4.46 | 35.75 | 58.99 | 0.52 | 0.86 | 25.80 | 42.57 | 14.95 | 24.67 |
| 1984 | 24.50 | 33.65 | 2.80 | 3.85 | 42.50 | 58.38 | 0.58 | 0.80 | 28.45 | 39.08 | 24.10 | 33.10 |
| 1985 | 28.32 | 28.32 | 3.45 | 3.45 | 45.20 | 45.20 | 0.67 | 0.67 | 28.45 | 28.45 | 26.75 | 26.75 |
| 1986 | 55.00 | 35.71 | 5.12 | 3.32 | 86.40 | 56.10 | 0.84 | 0.55 | 64.00 | 41.56 | 26.75 | 17.37 |
| 1987 | 78.00 | 34.77 | 6.25 | 2.79 | 111.00 | 49.49 | 1.60 | 0.71 | 64.00 | 28.53 | 65.00 | 28.98 |
| 1988 | 80.00 | 23.06 | 14.00 | 4.04 | 190.00 | 54.77 | 3.00 | 0.86 | 64.00 | 18.45 | 65.00 | 18.74 |
| 1989 | 108.00 | 13.61 | 14.40 | 1.81 | 225.80 | 28.46 | 3.60 | 0.45 | 77.00 | 9.70 | 71.00 | 8.95 |

a. Price deflator is the low-income CPI.

Source: Derived from Zambia CSO data.

VII. Conclusions

It should be stressed that these are foundational national data upon which much of the published national statistics found in international sources is based. The reliability of these foundational data has been questioned, suggesting that extreme caution be exercised as statistics based upon these data are used to inform policy. In reporting rather remarkable growth rates from 1974 to 1990 of as much as 78 percent for commodities in Zambia, the World Bank adds in a footnote:

Unfortunately, the data on gross output...do not appear to be consistent with the official data on GDP growth in agriculture.... We include this information, however, because it is the only data on this subject and because the relative importance of land increases and yield increases is consistent with our understanding and other evidence (World Bank 1993b, p. 24).

The "other evidence" that corroborates high growth rates in commodity production in Zambia is not cited by the World Bank. The evidence examined here, problematic as it may be, does not corroborate the World **Bank report**.

Rather than booming growth, analysis here suggests a more complicated story of diversification in the commercial sector, and increased noncommercial maize production centered in the far northern and eastern areas of Zambia. Problems of data quality render more detailed conclusions quite tentative. Longitudinal surveys, both retrospective and into the future, would greatly assist analysis of agrarian structural change in Zambia.