
FOOD SECURITY RESEARCH PROJECT

**RECOMMENDATIONS FOR
ADJUSTING WEIGHTS FOR
ZAMBIA POST-HARVEST SURVEY
DATA SERIES AND IMPROVING
ESTIMATION METHODOLOGY
FOR FUTURE SURVEYS**

By

David J. Megill

***WORKING PAPER No. 13
FOOD SECURITY RESEARCH PROJECT
LUSAKA, ZAMBIA
March 2005***

(Downloadable at: <http://www.aec.msu.edu/agecon/fs2/zambia/index.htm>)

ACKNOWLEDGMENTS

The Food Security Research Project is a collaboration between the Agricultural Consultative Forum (ACF), the Ministry of Agriculture, Food and Fisheries (MAFF), and Michigan State University's Department of Agricultural Economics (MSU).

We wish to acknowledge the financial and substantive support of the United States Agency for International Development (USAID) in Lusaka. Research support from the Global Bureau, Office Agriculture and Food Security, and the Africa Bureau, Office of Sustainable Development at USAID/Washington also made it possible for MSU researchers to contribute to this work.

Comments and questions should be directed to the In-Country Coordinator, Food Security Research Project, 86 Provident Street, Fairview, Lusaka; tel: 234539; fax: 234559; email: fsrp@coppernet.zm

FOOD SECURITY RESEARCH PROJECT TEAM MEMBERS

The Zambia FSRP field research team is comprised of Jones Govereh, Billy Mwiinga, Jan Nijhoff and Ballard Zulu. MSU-based researchers in the Food Security Research Project are Antony Chapoto, Cynthia Donovan, Thom Jayne, David Tschirley, and Michael Weber.

TABLE OF CONTENTS

Acknowledgments	ii
Food Security Research Project Team Members	iii
Table of Contents	iv
1. Background	1
2. Review of the Total Number of Rural Agricultural Households from the PHS Weighted Data Series	2
3. Review of PHS Sampling, Listing and Weighting Procedures	3
4. Review of 1990 and 2000 Zambia Census Data on the Total Number of Rural and Urban Households and Agricultural Households	4
5. Recommended PHS Weight Adjustment Procedures	5
5.1. Preliminary PHS Weight Adjustment Options Based on the Projected Number of Rural Households	5
5.2. Proposed Modified Weight Adjustment Procedure Based on Projected Number of Rural Agricultural Households	8
5.3. Methodology for Estimating Projected Number of Rural Agricultural Households Based on 1990 and 2000 Census Data	9
6. Possible Refinements of Adjusted PHS Weights	11
7. Review of the Percentage of Agricultural Households in PHS Frame	12
8. Weights for the 2004 PHS Supplemental Panel Survey	13
9. Recommended Changes in the Listing and Weighting Procedures for Future PHS and CFS	15
10. Consideration for Special Crop Weights	17
Annex 1. Tables for Review of PHS Weighting Methodology	19

Recommendations for Adjusting Weights for Zambia Post-Harvest Survey Data Series and Improving Estimation Methodology for Future Surveys

1. BACKGROUND

The Central Statistical Office (CSO) has been conducting the Zambia Post-Harvest Survey (PHS) annually for about 15 years. This survey is one of the most important sources of data in Zambia for the annual production of crops and livestock, as well as socio-economic characteristics of agricultural households. In reviewing the results from the annual series of PHS results, it was found that there has been considerable variability in the total number of rural agricultural households over time, with noticeable jumps in years where there was a change in sampling methodology. Since this affects the estimates of total crop and livestock production, the CSO and the Food Security Research Project (FPRP) decided to review the survey sampling and weighting methodology that has been used for the PHS in the past. Based on the findings from this review, a weight adjustment procedure is proposed to provide more consistent annual PHS estimates for this data series.

The purpose of this report is to document the findings from this review of the PHS sampling, listing and estimation methodology and the proposed weight adjustment procedures, as well as to make recommendations for improving the methodology for the PHS and Crop Forecasting Survey (CFS) in the future. Most of the tables in this report are included in Annex I, given the size of the tables, but they are an integral part of this report.

In reviewing the PHS sampling, listing and weighting methodology, the consultant had valuable input from the CSO staff, including M. Sooka, Director of the Agricultural Division, Colby S. Nyasulu, Senior Statistical Officer, and Solomon Tembo, Systems Analyst. Valuable insights were also provided by Modesto Banda, CSO Deputy Director, and Julius Shawa, Ministry of Agriculture and Cooperatives (MACO) Deputy Director, in a meeting to discuss the best strategy for improving the PHS and CFS methodology. Throughout the visit the consultant worked in close consultation with Jan Nijhoff and Jones Govereh of the Food Security Research Project (FSRP) of Michigan State University (MSU), with remote consulting from Margaret and Donald Beaver of MSU.

2. REVIEW OF THE TOTAL NUMBER OF RURAL AGRICULTURAL HOUSEHOLDS FROM THE PHS WEIGHTED DATA SERIES

In order to understand the need for this review of the PHS methodology and the nature of the proposed weight adjustment procedures, we should begin by examining the distribution of the weighted total number of agricultural households from the annual PHS data series starting with the 1990/91 survey. Table 1 of Annex I shows the estimates of total number of agricultural households by district for each PHS based on the original survey weights.

It can be seen in Table 1 that at the national level the weighted total number of agricultural households varies considerably by year, with significant jumps in the PHS series for the years 1991/92, 1995/96 and 1999/2000. These particular years correspond to major changes in the PHS sampling methodology. For example, in 1995/96 a new sample was introduced based on the selection of the census supervisory areas (CSAs) and standard enumeration areas (SEAs) with probability proportional to size (PPS); and beginning with the 1999/2000 PHS only agricultural households were included in the last stage sampling frame from the listing. The purpose of the weight adjustment procedures will be to provide more consistent annual PHS estimates of the total number of agricultural households and related survey estimates.

3. REVIEW OF PHS SAMPLING, LISTING AND WEIGHTING PROCEDURES

Prior to the new sample design for the 2002/03 PHS (documented in the report on “Recommendations on Sample Design for 2003 Zambia Post-Harvest Survey Based on New Sampling Frame from the 2000 Census,” Megill, November 2003), the PHS sample had been based on the 1990 Census frame. A stratified three-stage sample design was used for the PHS. The stratification of the sampling frame was originally based on the 53 old districts, but this was later changed to the 68 new districts. The primary sampling units (PSUs) were the CSAs, selected with probability proportional to size (PPS) within each stratum. At the second stage one SEA was generally selected within each sample CSA, also with PPS; a few CSAs have more than one SEA selected. A new listing was conducted within each sample SEA, and households were selected at the third sampling stage within two farm size categories (A and B).

In reviewing the previous PHS sampling frame based on the 1990 Census, one finding was that the number of households in each CSA and SEA used for the PPS selection was different from the corresponding number of households in the 1990 Census data. Apparently a pre-census cartographic frame had been used for the PHS instead of the final 1990 Census count of households. A review of the measures of the size for the CSAs in one district indicated that the number of households in the CSA was generally higher in the PHS pre-census sampling frame than in the 1990 Census data. As long as the number of households in the PHS sampling frame is highly correlated with the corresponding number from the 1990 Census, this should not have a major effect on the efficiency of the sample design.

Another finding was that in some districts there are slight differences between the CSAs and SEAs classified as rural in the 1990 Census, and the corresponding areas in the PHS sampling frame. Some CSAs and SEAs classified as urban in the 1990 Census are included in the PHS sampling frame, and a few areas considered rural in the 1990 Census are excluded from the PHS frame. Table 2 of Annex I shows the total number of rural households by district from the 1990 Census, and the corresponding census figures for the number of households in the CSAs and SEAs included in the PHS frame, as well as the difference between these two. Discussions with CSO staff indicated that in some cases like Chingola District, some rural areas were incorrectly coded as urban in the 1990 Census results. In other cases, such as Kabwe Urban District, the CSO staff included some urban CSAs in the PHS frame because these areas had rural characteristics. A few rural CSAs were excluded from the PHS frame because they had refugee camps.

For the PHS series prior to 1999/2000, the non-agricultural households were included in the frame for size category A in the listing for each sample SEA, but then the methodology was changed to include only agricultural households in the last stage sampling frame. The issue of the percent of agricultural households in the rural areas is addressed in Section 7. Also, the non-contact households (for which the enumerator was not able to obtain information) are being excluded from the last stage sampling frame, resulting in a downward bias in the survey estimates of totals. Another concern regarding the listing is that sometimes the number of households listed in a sample SEA is not consistent with the corresponding count from the census frame, or with previous listing results. Any undercoverage of the listed households will also result in a downward bias in the survey estimates of totals. Recommendations for improving the listing and estimation procedures are presented in Section 9.

4. REVIEW OF 1990 AND 2000 ZAMBIA CENSUS DATA ON THE TOTAL NUMBER OF RURAL AND URBAN HOUSEHOLDS AND AGRICULTURAL HOUSEHOLDS

In studying the weight adjustment procedures for the PHS data series, it is important to examine the distribution of the number rural households from the 1990 and 2000 Censuses within each of the old districts, shown in Table 2. This table also shows the total number of rural agricultural households from the two censuses for each district and the corresponding percent of agricultural households. One reason for using the old districts for this comparison is that it was easier to obtain the summary data from each census for these districts, since the new districts were formed by subdividing some of the old districts.

It can be seen in Table 2 that the growth rate for rural households varies considerably by district; in a couple of districts the number of rural households actually decreased slightly during this 10 year interval. In the case of Chingola District, the extremely high increase in the number of rural households is actually related to the possible miscoding of some rural areas as urban in the 1990 Census data. The growth rate of the rural households by district will be used in the weight adjustment procedures, as described in the next section.

5. RECOMMENDED PHS WEIGHT ADJUSTMENT PROCEDURES

Initially two alternative weight adjustment procedures were considered for the PHS data series. Both of these methods are discussed here to examine which model would be the most appropriate for adjusting the weights. The conditions under which each alternative adjustment procedure would be appropriate are also discussed. Then the recommended adjustment procedure is specified, which is a modification of one of the preliminary alternatives.

5.1. Preliminary PHS Weight Adjustment Options Based on the Projected Number of Rural Households

The preliminary PHS weight adjustment alternatives that were examined are based on the projected total number of rural households each year in a particular district, assuming an exponential growth rate calculated from the 1990 and 2000 Census data. The main reason for using the total number of rural households for the projections is that data on agricultural households from the 1990 and 2000 Censuses do not appear to be consistent. It can be seen in Table 2 that the overall percentage of rural households with agricultural operations from the 1990 Census data was 58.1 percent, compared to the corresponding 2000 Census estimate of 87.9 percent. Although it is possible that the actual percent of agricultural households in the rural areas increased slightly during this 10-year interval, the implied growth rate from these two census estimates appears to be too extreme. It is possible that the data on agricultural households from the two censuses are inconsistent because of the different forms and data collection methodology used for each census. As indicated in the next section, the 2000 Census appears to be a more accurate source of data for agricultural households. The preliminary alternative weight adjustment procedures described here rely on the PHS data to determine the percentage of agricultural households in each sample SEA, available in the survey data up to the 98/99 PHS. Initially it was thought that the listing information could be used for the PHS weight adjustment procedures, but it was found that the listing sheets for the earlier PHS years are lost, and information on non-agricultural households is not available in the listing information starting with the 1999/2000 PHS.

The first alternative adjusted weight considered for the PHS was defined as follows:

$$W'_{hij} = W_{hij} \times \frac{\hat{M}_{yh}}{\sum_{i \in h} W_{hi} \times M'_{hi}},$$

where:

W'_{hij} = adjusted weight for the j-th sample household (different for categories A or B) in the i-th sample SEA in stratum (district) h

W_{hij} = original weight for the j-th sample household in the i-th sample SEA in district h

\hat{M}_{yh} = estimated total number of rural households in district h for year Y, based on demographic projections using 1990 and 2000 Census data

$$W_{hi} = \frac{M_h}{n_h \times M_{hi}} = \text{weight for the } i\text{-th sample SEA in district } h \text{ (inverse of probability of selection of sample SEA)}$$

M_h = total number of households in the PHS frame for district h based on the 1990 Census

n_h = number of sample SEAs selected for the PHS in district h

M_{hi} = total number of households in the PHS frame for the i -th sample SEA in district h based on the 1990 Census

M'_{hi} = total number of households listed in the i -th sample SEA in district h for a particular PHS, including non-agricultural households; this information would have to be obtained from the original listing data

The second alternative adjusted weight was defined as follows:

$$W_{hij}' = W_{hij} \times \frac{\hat{M}_{yh} / n_h}{W_{hi} \times M'_{hi}}$$

Substituting the formula for W_{hi} , this adjusted weight can be expressed as follows:

$$W_{hij}' = W_{hij} \times \frac{\hat{M}_{yh} / n_h}{\frac{M_h}{n_h \times M_{hi}} \times M'_{hi}} = W_{hij} \times \frac{\hat{M}_{yh}}{M_h} \times \frac{M_{hi}}{M'_{hi}}$$

The first component of the adjustment factor is the ratio of the projected total number of in-scope (rural) households in the district divided by the corresponding total number of households from the original PHS frame for the district; this can be considered the growth rate for the rural households in the district. The second component of the adjustment factor is the ratio of the number of households in the sample SEA from the frame divided by the corresponding number from the updated listing. In this case, if the number of households listed in the SEA goes up, there would be a corresponding downward adjustment in the weight.

Next, let us examine the effect of the second alternative weight adjustment factor on the weighted number of households in each sample SEA within a district. The weighted number of Category A households in a sample SEA can be calculated as follows:

$$W_{hij}' \times \frac{\hat{M}_{yh}}{M_h} \times \frac{M_{hi}}{M'_{hi}} \times m_{Ahi} = \frac{M_h}{n_h \times M_{hi}} \times \frac{M_{Ahi}}{m_{Ahi}} \times \frac{\hat{M}_{yh}}{M_h} \times \frac{M_{hi}}{M'_{hi}} \times m_{Ahi} = \frac{\hat{M}_{yh}}{n_h} \times \frac{M_{Ahi}}{M'_{hi}}$$

where:

m_{Ahi} = number of sample households in Category A selected in the i-th sample SEA in district h

M_{Ahi} = total number of households listed in Category A in the i-th sample SEA in district h

All of the Category B households listed in the sample SEA will be selected (that is, $m_{Bhi} = M_{Bhi}$), so the weighted number of category B households in the SEA can be calculated as follows:

$$W_{hij} \times \frac{\hat{M}_{Yh}}{M_h} \times \frac{M_{hi}}{M'_{hi}} \times m_{Bhi} = \frac{M_h}{n_h \times M_{hi}} \times 1 \times \frac{\hat{M}_{Yh}}{M_h} \times \frac{M_{hi}}{M'_{hi}} \times M_{Bhi} = \frac{\hat{M}_{Yh}}{n_h} \times \frac{M_{Bhi}}{M'_{hi}}$$

Summing the weighted number of households in Categories A and B for the sample SEA and substituting $M_{Bhi} = M'_{hi} - M_{Ahi}$, we have:

$$\frac{\hat{M}_{Yh}}{n_h} \times \frac{M_{Ahi}}{M'_{hi}} + \frac{\hat{M}_{Yh}}{n_h} \times \frac{(M'_{hi} - M_{Ahi})}{M'_{hi}} = \frac{\hat{M}_{Yh}}{n_h}$$

That is, the effect of the second alternative weight adjustment procedure is to make the weighted number of sample households from each sample SEA within a district the same, regardless of any differential growth rates or the number of households listed in Categories A and B. In other words, it cancels any differential growth rate and assumes that all sample SEAs within a district have the exact same growth rate over time.

On the other hand, the first weight adjustment factor allows the weighted estimate from each sample SEA to reflect the differential growth rate of the SEA. Therefore this method would be less biased than the second alternative if there is an actual differential growth in the sample SEAs within a district, reflected by an accurate listing. However, if the difference between the number of households listed in the sample SEA and the corresponding number of households in the frame is due to variability in the quality of the coverage of the listing (instead of an actual increase or decrease in the number of households), the second alternative weight adjustment factor may be less biased.

At this point a modified version of the second alternative weight adjustment procedure is recommended, given the variability in the quality of the listing coverage by sample SEA, as well as a differential household non-contact rate by SEA which also affected the previous weighted estimates of the total number of agricultural households. This modified weight adjustment procedure is defined next.

5.2. Proposed Modified Weight Adjustment Procedure Based on Projected Number of Rural Agricultural Households

The proposed modified PHS weight adjustment procedure is based on the projected number of agricultural households in each district, using the number of agricultural households from the 2000 Census data as the benchmark. Table 2 shows the total number of agricultural households in each district from the 1990 and 2000 censuses, as well as the corresponding percent of rural households with agricultural operations. It can be seen that the percentage of agricultural households in the rural areas was only 58.1 percent based on the 1990 Census data, compared to 87.9 percent from the 2000 Census data. Based on discussions with CSO staff, there appears to be a consensus that the quality of the data on agricultural households from the 2000 Census is fairly good. On the other hand, the corresponding data from the 1990 Census appears to suffer from a downward bias. One possible reason for this situation is that the 1990 Census form only included a screening question to identify agricultural households. When an agricultural household was identified, an agricultural supplement form was administered to the household, representing a greater workload for the census enumerator; this process could act as a disincentive for some census enumerators to identify agricultural households.

Given the potential undercount of agricultural households in the 1990 Census, this information cannot be used as the baseline for determining the growth rate for the rural agricultural households in each district. However, the total number of rural households in the 1990 and 2000 Censuses can provide a good indicator of the growth rate for the rural households, which are mostly agricultural. Therefore the proposed modified weight adjustment procedure uses the growth rate for the total number of rural households between the 1990 Census and the 2000 Census, and applies this growth rate to the 2000 Census number of rural agricultural households (mostly retrospectively) to “project” (estimate) the number of agricultural households in each district for the PHS reference period. As mentioned previously, the PHS sampling frame based on the 1990 Census does not correspond exactly to the rural census frame, but it is fairly close, as shown in Table 2. For particular districts where there is a more pronounced difference between the 1990 and 2000 Census data on the total number of rural agricultural households, the growth rate in the rural households between 1990 and 2000 may be unrealistic because of inconsistent coding of some rural areas. Therefore it was decided to use the 1990 Census data for the PHS frame as the baseline for calculating the growth rate for rural households in each district instead of the corresponding 1990 Census rural frame. For example, in the case of Chingola District the total number of rural households in the 1990 Census was only 298, since only three CSAs were coded as rural, compared to fifteen CSAs in the 1990 PHS sampling frame (with a total of 3,871 rural households). The corresponding number of rural households in Chingola District from the 2000 Census is 4,955, which is more consistent with the PHS frame.

The recommended PHS adjusted weights are a modification of the second alternative method described previously. In this case both the numerator and denominator of the weight adjustment factor corresponds to the number of agricultural households, so any non-agricultural households are excluded from these calculations. The proposed adjusted weight can be expressed as follows:

$$W_{hij}' = W_{hij} \times \frac{\hat{M}_{AYh} / n_h}{\sum_{j \in Ah_i} W_{hij}}$$

where:

W_{hij} = original weight for the j-th sample household in the i-th sample SEA in stratum h

\hat{M}_{AYh} = projected number of rural agricultural households in year Y for district h; the methodology for the projections is described below

n_h = number of sample SEAs selected in district h

A_{hi} = set of sample PHS agricultural households in the i-th sample SEA in district h

The denominator of this adjustment factor is the sum of the original weights for all the agricultural households (in both Categories A and B) in the i-th sample SEA in district h.

Table 3 of Annex I presents the number of sample SEAs by district (n_h) for the PHS each year. It can be seen that only two sample SEAs were selected for some of the smaller districts, and in some years only one of the sample SEAs in a district were enumerated for the PHS. As a result, the estimates for such districts cannot be considered reliable, and the corresponding adjusted weight adjustment factors are more subject to variability. In the case Kabwe Urban District, there is no PHS sample for years prior to the 95/96 PHS. There was also no PHS sample for Luanshya and Mifumbwe Districts in particular years. In these cases there is no contribution to the survey total estimates from these districts, but given the small size of these districts this would have a very minor effect on the overall PHS estimates.

For the earlier years of the PHS data series, rural non-agricultural households are included in the data sets. In this case the weight for the agricultural households in Category A for a particular sample SEA can also be applied later to the non-agricultural households in the same SEA, since we are assuming the same growth rate for rural agricultural and non-agricultural households.

5.3. Methodology for Estimating Projected Number of Rural Agricultural Households Based on 1990 and 2000 Census Data

In order to project the total number of rural agricultural households in each district for a particular PHS it is necessary to determine the appropriate reference date for the survey population. Since the frame for selecting the sample households for each PHS is based on the listing, initially the approximate mid-point of the corresponding listing operation was used as the reference date for the projections. From 1990/91 to 1998/99 the listing operation was conducted mostly in February, prior to the CFS. The same sample of households selected for the CFS was used later in the year (around October) for the PHS. For the 1999/2000 agricultural season no CFS was conducted; the listing for the PHS was conducted in August. Due to limited resources, this same listing was used for the PHS in 2000/01 and 2001/02.

In order to improve the analysis of the PHS data series, it is recommended to standardize the reference date for all years of the PHS. Conceptually, it would be ideal for the reference period for each PHS to represent the beginning of the peak harvest season for most crops. After examining the harvesting patterns, there was a consensus among the analysts that a

reference date of 1 May would be appropriate each year for estimating the projected total number of rural agricultural households for adjusting the corresponding PHS weights.

Given the exponential nature of population growth, an exponential growth model was used for calculating the projected total number of rural agricultural households in each district for the corresponding PHS reference date each year. The exponential growth rate for all rural households in each district based on the 1990 and 2000 Census data was applied (mostly retrospectively) to the total number of agricultural households in the district from the 2000 Census data. The following formula was used to calculate the projected total number of rural agricultural households in each district for a particular PHS reference period, using an Excel spreadsheet:

$$\hat{M}_{AYh} = M_{00Ah} \times e^{-\ln\left(\frac{M_{00h}}{M_{90h}}\right) \times \left(\frac{t_{00}-t_Y}{t_{00}-t_{90}}\right)}$$

where:

M_{00Ah} = total number of rural agricultural households in district h from 2000 Census

M_{00h} = total number of rural households in district h from 2000 Census

M_{90h} = total number of rural households in district h from 1990 Census

$t_{00} - t_Y$ = number of days between the 2000 Census reference date, 1 August, 2000 (t_{00}), and the reference date for the PHS listing (t_Y)

$t_{00} - t_{90}$ = number of days between the 2000 Census reference date (t_{00}) and the 1990 Census reference date (t_{90}); that is, 3653 days

Table 4 of Annex I shows the projected total number of rural agricultural households for each PHS year by district, calculated using the formula specified above. In the case of Kabwe Urban District, there are no rural households, but some CSAs with rural characteristics were included in the 1990 PHS sampling frame. Since we do not have a corresponding number of rural households for Kabwe Urban District from the 2000 Census, this was estimated by applying the overall average growth rate for rural households (44.5 percent) to the number of households in the PHS frame based on the 1990 Census. The number of rural agricultural households in 2000 for Kabwe Urban District was estimated by applying the percent of agricultural households for Kabwe Rural District (84.5 percent) to the estimated total number of rural households for Kabwe Urban District.

Table 4 also shows the percent difference between the projected total number of rural agricultural households at the national level each year and the corresponding PHS estimates based on the original weights from Table 1. It can be seen that the weighted PHS estimates begin 7 percent higher than the corresponding projections for the 1990/91 PHS; this is the only year for which the weighted PHS estimate is higher than the projection. The following year the PHS estimate is lower than the projections by 37 percent. The difference reaches a peak of 54.8 percent for the 1994/95 PHS, followed by the lowest difference of 4.1 percent for the 1995/96 PHS. Then there is a steady increase in the difference for the following years, reaching 43.3 percent for the 2001/02 PHS.

6. POSSIBLE REFINEMENTS OF ADJUSTED PHS WEIGHTS

The accuracy of the PHS adjusted weights depends on the quality of the weight adjustment model and the projections for the number of rural agricultural households. Issues regarding the assumptions for the weight adjustment procedure were described previously; for example, the model assumes that all sample SEAs within a district experience the same growth rate. The CSO and analysts can review the projections by district and PHS year appearing in Table 4 and make any adjustments if more accurate information becomes available for some districts. Then the corresponding modified projections can be copied into the weighting spreadsheet and the formulas will automatically adjust the weights accordingly.

The original and adjusted PHS weights were examined to identify any extreme cases. In one case (Chilubi District, 95/96 PHS) the original weight was 0, and a few other original weights were less than 1. Some of the original weights were corrected, and any remaining original or adjusted weight that was less than 1 was changed to equal 1, so that the sample households in the corresponding SEAs will at least represent themselves in the weighted survey estimates. The largest weights and adjustment factors were also examined. The largest weight, 1982.86, was found in a sample SEA with only one agricultural household. Some other large adjusted weights correspond mostly to districts with a very small PHS sample, especially in years when only one SEA is included in the sample. The maximum weight adjustment factor is 100.64 for the sample SEA in Chilubi for which the original weight was increased from 0 to 1; therefore the corresponding adjusted weight is 100.64. This is probably a more reasonable weight anyway, since the weight of 1 was arbitrary. All the other weight adjustment factors are less than 50; the highest values are generally in sample districts with a very small PHS sample or in SEAs with few agricultural households.

It is possible to set a limit for the weight adjustment factors, although the resulting weighted estimates for the smaller districts may no longer closely follow the projections. Any minor adjustments may not have much impact on the overall survey results.

7. REVIEW OF THE PERCENTAGE OF AGRICULTURAL HOUSEHOLDS IN PHS FRAME

As mentioned previously, the PHS listing methodology was changed to exclude non-agricultural households starting with the 1999/2000 PHS. In order to determine the percentage of agricultural households in the PHS frame each year, the adjusted weights were used to estimate the total number of households and agricultural households by district. The resulting percent of agricultural households in the PHS frame each year by district is presented in Table 5 of Annex I.

It is interesting to note that in the early years of the PHS when all rural households were included in the PHS, the percent of agricultural households was fairly high. The lowest percent is 94.1 for the 1993/94 PHS. The corresponding estimate from the 2000 Census was 87.9 percent agricultural households in the rural areas. As expected, the percent increased to over 99 starting with the 1999/00 PHS, when only agricultural households were supposed to be selected for the survey. One exception is in the small district of Livingstone, where only 77 percent of the households in the 2001/02 PHS sample were agricultural households. Perhaps there are more non-farm economic activities available in the rural areas of this district.

The large percentage of agricultural households in the early years of the PHS could represent an emphasis on covering agricultural households in the listing. There is also the issue of the definition of an agricultural household implemented in the field, but the same criteria were used for counting the agricultural households in each PHS data set for Table 5. There is also a possibility that the 2000 Census slightly underestimated the number of agricultural households in the rural areas, depending on the definition used for agricultural households.

8. WEIGHTS FOR THE 2004 PHS SUPPLEMENTAL PANEL SURVEY

In 2001 a Supplemental Survey was conducted using the panel of the sample households selected for the 1999/2000 PHS. All of the sample households in the 1999/2000 PHS that were found in the sample SEAs in 2001 were included in the sample for the Supplemental Survey. The 2004 Supplemental Survey followed this same panel of sample households three years later to provide additional longitudinal data for these households. The main objective of the Supplemental Surveys was to provide longitudinal data for the sample households in the panel that can be used to study micro-level changes in agricultural practices and socio-economic status over time. The correlation in the sample data between the Supplemental Surveys and the 1999/2000 PHS will also improve the precision of the estimates of trends over time for relative indicators such means and proportions.

In developing the weighting procedures for the 2001 and 2004 Supplemental Surveys, it is important to first qualify the population represented by the panel of sample households. Since this panel was based on the sample selected for the 1999/2000 PHS from a listing conducted in August 1999, it represents the households from that period which still existed in the same geographic location at the time of each Supplemental Survey. For example, in the case of the 2001 Supplemental Survey, the sample represents more than 94 percent of the agricultural households in the 1999/2000 PHS frame. However, the panel does not represent any newer households or those that moved between 1999 and 2001. Given the attrition in this panel of sample households over time, this sample represents less of the current population each year.

Given that the frame for the Supplemental Surveys was the sample of households selected for the 1999/2000 PHS, the adjusted weights for each Supplemental Survey will be based on the adjusted weights for the 1999/2000 PHS. These weights were calculated as specified previously, that is, based on the projected total number of rural agricultural households for the reference date of May 1, 2000. The number of sample households in the panel decreased for each Supplemental Survey because of attrition and non-interviews. It is necessary to adjust the 1999/2000 PHS weights for sample households which existed in the sample SEAs at the time of the Supplemental Survey but were not interviewed due to refusals or non-contacts (such as no respondent available at home). However, the households which moved or were dissolved would no longer be considered part of the frame represented by each Supplemental Survey, so these households would be excluded from the sample SEA frame in calculating the non-interview adjustment factor for each sample SEA and category. In other words, the estimate of the total number of rural agricultural households from each Supplemental Survey data set based on the adjusted weights will be equal to the corresponding 1999/2000 PHS weighted estimates minus the weighted estimate of the total number of agricultural households that no longer existed in the same location.

The proposed adjusted weights for the 2001 Supplemental Survey can be expressed as follows:

$$W_{AS01hi} = W_{A00hi} \times \frac{n_{00hi} - m_{S01hi} - d_{S01hi}}{C_{S01hi}},$$

where:

W_{AS01hi} =	adjusted weight for the sample households in the 2001 Supplemental Survey for the i-th sample SEA (by size category) in stratum (district) h
W_{A00hi} =	adjusted weight for the 1999/2000 PHS sample households in the i-th sample SEA (by size category) in district h
n_{00hi} =	number of households in the 1999/2000 PHS sample for the i-th sample SEA in district h
m_{S01hi} =	number of sample households that moved from the i-th sample SEA in district h prior to the 2001 Supplemental Survey
d_{S01hi} =	number of sample households in the i-th sample SEA in district h that were dissolved prior to the 2001 Supplemental Survey
c_{S01hi} =	number of sample households with completed interviews for the 2001 Supplemental Survey in the i-th sample SEA in district h

The recommended adjusted weight for the 2004 Supplemental Survey can be expressed as follows:

$$W_{AS04hi} = W_{A00hi} \times \frac{n_{00hi} - m_{S01hi} - d_{S01hi} - m_{S04hi} - d_{S04hi}}{c_{S04hi}},$$

where:

W_{AS04hi} =	adjusted weight for the sample households in the 2004 Supplemental Survey in the i-th sample SEA (by size category) in stratum (district) h
m_{S04hi} =	number of sample households that moved from the i-th sample SEA in district h prior to the 2004 Supplemental Survey
d_{S04hi} =	number of sample households in the i-th sample SEA in district h that were dissolved prior to the 2004 Supplemental Survey
c_{S04hi} =	number of sample households with completed interviews for the 2004 Supplemental Survey in the i-th sample SEA in district h

After generating these adjusted weights for the 2001 and 2004 Supplemental Surveys, the weighted total number of households by district for each survey was tabulated and compared to the corresponding results from the 1999/2000 PHS. Table 6 of Annex I shows the estimated total number of households from each Supplemental Survey and the percentage of the 1999/2000 PHS frame that is represented by each survey. It can be seen that at the national level the 2001 Supplemental Survey represents 94.2 percent of the 99/00 PHS frame, while the corresponding percent for the 2004 Supplemental Survey is 79.4. That is, it is estimated that slightly more than 20 percent of the rural households moved or were dissolved between the 1999/2000 PHS and the 2000 Supplemental Survey.

9. RECOMMENDED CHANGES IN THE LISTING AND WEIGHTING PROCEDURES FOR FUTURE PHS AND CFS

As indicated previously, one of the problems with the listing procedures for the PHS is that the non-contact households were not accounted for in the estimation procedures. This can lead to a downward bias in the estimates of the total number of agricultural households, total crop and livestock production, etc. Although the weight adjustment methodology will offset part of the deficiencies in the listing procedures, it is only a temporary solution and is also subject to bias, since it depends on the quality of the projected number of agricultural households and various assumptions. Therefore it is critical to improve the quality of the listing procedures for the future PHS and CFS.

The first step in improving the coverage of the listing of households would be to update the sample SEA sketch maps in order to clarify the SEA boundaries, so that the areas covered by the listing are consistent with the boundaries defined for the census. Additional landmarks can be introduced on the sketch maps to better identify the SEA boundaries. Identifying the location of each housing unit on the sketch map should also help.

Another important quality control procedure is to compare the total number of households listed in each sample SEA to the corresponding number from the 2000 Census. The district supervisor should be provided with information on the number of households enumerated in the sample SEAs for the 2000 Census for verification purposes. Any large discrepancy between the number of households enumerated in the census and listing operation for the sample SEA should be accounted for to determine whether it is due to a large movement of households in or out of the SEA, or to poor quality of the enumeration.

The CSO is also considering the possibility of having the listing operation conducted by a separate staff with cartographic experience, in order to improve the quality of the listing. This should improve the coverage of the listing, as long as it is introduced together with the additional quality control procedures.

In order to correct for the bias in the previous weighting procedures, it will be necessary to modify the listing procedures to account for all households within the boundaries of each sample SEA, including the non-agricultural households and non-contacts. Previously only the households in categories A, B and C (that is, agricultural households) were taken into account. The information on the total number of listed households will be used to adjust the weights for the sample households in categories A, B and C. The following weight adjustment factor should be applied to the weights for all sample households within a sample SEA:

$$F_{hi} = \frac{A_{hi} + B_{hi} + C_{hi} + NA_{hi} + NC_{hi}}{A_{hi} + B_{hi} + C_{hi} + NA_{hi}},$$

where:

F_{hj} = weight adjustment factor for non-contacts in the i-th sample SEA in stratum (district) h

A_{hi} = total number of households listed in category A in the i-th sample SEA in district h

B_{hi} = total number of households listed in category B in the i-th sample SEA in district h

C_{hi} = total number of households listed in category C in the i-th sample SEA in district h

NA_{hi} = total number of non-agricultural households listed in the i-th sample SEA in district h

NC_{hi} = total number of non-contact households (without listing information) in the i-th sample SEA in district h

The numerator of this weight adjustment factor is the total number of households listed in the sample SEA, including non-agricultural and non-contact households. This weight adjustment factor at the sample SEA level will have the same effect as a proportional allocation of the number of non-contact households between the three categories of agricultural households and the non-agricultural households. The reason that the non-agricultural households have to be included in the listing is to account for the total number of households for this adjustment procedure, even though they will not be included the sample for the PHS and the CFS.

One problem in reviewing the current weights for the PHS is that some of the information used for calculating the weights for past PHS surveys is missing, and the listing information is also not available. For each PHS and CFS, it is very important to archive all the information from the sampling frame and listing used for calculating the weights. Secure backups of all the files should also be maintained.

10. CONSIDERATION FOR SPECIAL CROP WEIGHTS

There is some concern about the PHS estimates for certain crops that are highly localized, given the potentially large sampling errors for such crops. In the past the CSO had calculated special crop weights for such crops that are only found in certain parts of a district. In this case, they post-stratified the CSAs within each stratum (district) into two groups based on information from the 1990 Census frame: CSAs which have households with the specified crop in the frame, and those without. The weight for each localized crop was then modified as follows:

$$W_{XChi} = \frac{N_{Xh}}{m_{Xh} \times N_{hi}} \times \frac{N_{Chi}}{n_{Chi}},$$

where:

W_{XChi} = weight for localized crop X in sample households in farm size category C in the i-th sample SEA in stratum h

N_{Xh} = total number of households in the frame for the CSAs with crop X within stratum h

m_{Xh} = number of sample CSAs with crop X in the frame within stratum h

N_{hi} = total number of households in the frame for the i-th sample SEA in stratum h

N_{Chi} = total number of households in farm size category C from the listing for the i-th sample SEA in stratum h

n_{Chi} = number of sample households selected in farm size category C from the listing for the i-th sample SEA in stratum h

There is some question as to whether these special crop weights were implemented in the PHS tabulations. In the case of the future PHS estimation procedures, it is important first to examine the tabulations based on the original weights and the corresponding sampling errors. Such crop weights may be considered in the future when certain crops are only found in part of a district and the resulting sampling errors are high. This crop weighting procedure could be refined further by checking the crops in the frame at the SEA level, and redefining the terms N_{Ch} and m_{Ch} as follows:

N_{Ch} = total number of households in the frame for the SEAs with crop C within stratum h

m_{Ch} = number of sample SEAs with crop C in the frame within stratum h

It may also be possible to improve the survey estimates through ratio estimation in the case of crops for which independent data are available from other sources such as frames maintained by the Ministry of Agriculture, processing plants or farming associations.

Ratio estimation involves the use of independent information for a survey variable such as area planted for a particular crop. For example, it can be used to estimate total crop production when the total area planted for the crop is known from another source. In this case, the average crop yield would be estimated from the survey data and then multiplied by the total area planted, as follows:

$$\hat{P}_C = \frac{\left(\sum_h \sum_i W_{hij} \times y_{Chij} \right)}{\left(\sum_h \sum_i W_{hij} \times x_{Chij} \right)} \times X_C ,$$

where:

y_{Chij} = production of crop C for the j-th sample household in the i-th sample SEA in stratum h

x_{Chij} = area planted for crop C for the j-th sample household in the i-th sample SEA in stratum h

X_C = good estimate of total area planted in crop C from independent source

The first term represents the survey estimate of the average crop yield per hectare. Of course, one limitation of this ratio estimation procedure is the availability of accurate information on the total area planted for the particular crop. However, such data may be available for particular crops such as tobacco for which there may exist farmer associations or special arrangements with a factory.

In other cases such as cotton, an accurate figure for crop production may be available from a processing or marketing company. In this case the total production of cotton from the independent source can be divided by the survey estimate of the average yield for cotton in order to estimate the total area planted in cotton.

ANNEX I. Tables for Review of PHS Weighting Methodology

Table 1. Weighted Estimate of Total Number of Agricultural Households for Each PHS by District, Based on Original Weights

PROVINCE	OLD DISTRICTS	Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
CENTRAL	11 Kabwe Rural	29,578	26,594	25,751	26,495	25,462	33,402	38,695	32,325	31,099	27,040	24,314	24,723
	12 Kabwe Urban						2,007	2,167	1,995	2,053	1,583	1,647	1,583
	13 Mkushi	18,245	15,891	15,324	17,910	15,826	19,203	13,664	16,989	17,072	11,354	11,338	11,396
	14 Mumbwa	18,740	16,100	16,682	15,002	16,919	16,518	15,977	16,105	16,251	13,857	13,513	13,857
	15 Serenje	16,095	14,151	16,860	15,025	15,079	19,322	19,364	19,964	19,098	17,082	16,977	16,977
COPPERBELT	21 Chililabombwe	2,633	1,645	1,960	1,261	3,890	1,770	1,836	1,506	1,418	1,374	1,457	1,449
	22 Chingola	340	601	605	566	812	2,147	2,378	2,422	1,038	1,475	1,307	1,431
	23 Kalulushi	3,880	335	319	1,073	1,153	2,689	2,737	2,658	2,328	2,626	2,419	2,513
	24 Kitwe	320	248	1,017	2,129	3,711	795	828	1,361	1,517	1,067	1,011	1,043
	25 Luanshya	4,937	3,116		5,140	3,279	2,061	1,750	2,809	2,746	1,803	1,890	1,982
	26 Mufulira	4,587	2,979	2,440	1,044	2,504	2,936	2,175	2,752	2,896	1,477	1,483	1,467
	27 Ndola Rural	30,198	19,147	23,313	19,743	23,426	27,280	27,044	26,184	25,925	24,718	21,075	24,769
EASTERN	31 Chadiza	11,785	9,056	10,830	9,974	9,612	14,280	12,781	12,568	14,592	14,440	14,281	14,241
	32 Chama	9,653	7,596	5,304	4,016	1,999	6,678	8,248	12,707	11,991	12,566	12,417	12,417
	33 Chipata	44,470	33,562	41,720	41,533	33,862	58,185	57,359	57,996	51,977	52,711	53,499	53,617
	34 Katete	27,463	21,389	20,958	20,318	21,087	32,195	32,118	31,629	31,339	32,134	32,799	32,405
	35 Lundazi	33,752	27,131	23,942	25,914	22,169	29,353	29,422	28,408	29,938	30,241	33,024	29,521
	36 Petauke	44,953	35,161	37,018	35,466	33,843	45,977	56,911	51,900	50,114	46,533	47,055	46,376
LUAPULA	41 Kawambwa	14,313	11,764	11,640	11,745	10,730	19,291	18,453	18,401	17,994	16,375	16,430	16,430
	42 Mansa	21,096	13,360	17,107	14,869	15,669	22,732	21,680	26,165	25,756	21,874	20,643	20,476
	43 Mwense	15,159	10,416	10,394	10,317	10,545	18,028	19,209	16,967	18,055	15,768	15,951	15,624
	44 Nchelenge	18,454	10,329	9,340	11,233	8,730	27,756	25,841	27,946	30,788	27,640	28,816	28,816
	45 Samfya	19,328	9,712	7,722	12,471	11,875	29,446	29,563	38,189	37,241	25,056	25,115	25,171
LUSAKA	51 Luangwa	2,880	2,790	3,996	2,202	1,098	2,394	2,508	2,133	2,544	2,176	2,176	2,176
	52 Lusaka Rural	21,952	18,892	16,328	19,625	19,232	25,330	20,984	20,448	19,672	15,089	16,778	16,753

Table 1. Weighted Estimate of Total Number of Agricultural Households for Each PHS by District, Based on Original Weights (Continued)

PROVINCE	OLD DISTRICTS	Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
NORTHERN	61 Chilubi	8,504	5,204	4,281	6,356	6,423	8,273	9,389	10,387	11,716	6,166	4,182	4,107
	62 Chinsali	15,924	11,083	10,507	11,120	12,170	17,172	17,785	16,490	17,421	15,957	15,894	15,952
	63 Isoka	23,581	15,969	12,465	16,314	13,797	22,803	23,192	23,339	22,776	17,585	17,589	17,589
	64 Kaputa	8,321	5,133	6,327	5,984	6,170	12,358	12,660	13,760	12,225	13,018	13,607	12,803
	65 Kasama	25,920	18,074	22,410	21,278	19,520	38,602	39,173	37,618	41,498	24,399	22,670	24,215
	66 Luwingu	11,852	7,584	7,608	8,078	10,227	12,280	12,680	14,401	14,383	12,135	12,373	11,971
	67 Mbala	16,895	14,151	14,182	15,499	15,414	25,195	24,956	27,665	27,557	22,478	22,239	22,235
	68 Mpika	16,989	11,863	11,508	10,977	11,246	17,639	19,055	16,621	18,559	15,133	14,903	15,133
	69 Mporokoso	10,704	7,473	7,817	7,710	7,710	8,835	8,835	8,631	9,239	9,667	9,667	9,667
	71 Mufumbwe	3,203	2,253	4,462	5,140		2,657	2,436	2,034	3,108	1,766	1,766	1,766
	72 Kabompo	10,294	6,772	6,232	6,456	5,930	10,346	10,349	9,637	9,753	9,353	9,253	9,253
	73 Kasempa	6,428	4,260	3,541	5,890	4,014	7,619	7,705	5,753	5,033	5,790	5,665	5,665
	74 Mwinilunga	15,389	10,748	12,580	13,429	13,419	13,416	15,652	16,498	14,311	15,052	14,475	14,784
	75 Solwezi	19,745	12,976	14,791	13,314	11,119	11,651	11,535	10,727	11,931	9,176	9,176	9,176
	76 Zambezi	15,571	10,286	5,242	7,314	5,572	9,465	13,021	12,278	12,680	9,243	8,929	9,361
SOUTHERN	81 Choma	19,346	13,614	13,656	13,568	16,728	20,408	20,293	21,018	23,669	18,676	19,213	18,676
	82 Gwembe	5,437	2,943	1,499	4,382	1,968	4,000	3,949	4,291	4,714	5,359	5,359	9,128
	83 Kalomo	22,391	16,256	13,752	16,495	13,668	22,799	22,821	26,480	29,530	23,283	19,303	22,730
	84 Livingstone	1,146	819	3,874	1,207	1,207	1,450	1,134	916	2,948	860	2,275	860
	85 Mazabuka	16,571	11,649	15,429	15,019	11,248	21,023	20,586	21,244	23,278	19,661	17,744	19,661
	86 Monze	14,273	10,032	7,758	10,035	9,395	20,563	22,085	20,961	21,626	18,788	18,788	18,788
	87 Namwala	11,826	8,316	3,635	5,275	3,632	13,679	11,065	10,728	11,342	11,252	11,135	11,135
	88 Siavonga	4,543	4,514	5,818	3,054	2,223	1,312	2,512	2,359	2,611	4,272	4,286	4,272
	89 Sinazongwe	9,512	6,714	9,153	6,708	5,543	8,502	8,242	7,923	7,784	8,659	8,659	8,659
WESTERN	91 Kalabo	19,498	10,307	8,445	9,150	9,461	14,231	14,649	13,003	16,271	13,510	13,360	13,510
	92 Kaoma	19,021	10,246	8,560	16,556	15,445	24,451	26,229	26,078	23,871	21,928	21,720	21,827
	93 Lukulu	9,899	4,305	2,607	5,469	4,542	14,068	15,421	14,804	13,608	10,871	10,871	10,837
	94 Mongu	23,014	12,385	15,060	16,019	11,351	15,651	18,824	18,645	21,817	19,921	20,139	19,890
	95 Senanga	25,264	13,563	17,223	12,908	13,092	22,307	14,861	13,410	14,599	16,663	16,772	16,664
	96 Sesheke	11,181	6,918	6,585	5,885	6,336	11,704	21,206	20,960	21,602	19,850	19,580	19,976
ZAMBIA		837,053	588,375	597,577	621,660	581,082	896,234	915,992	921,186	936,902	818,530	809,007	817,503

Table 2. Distribution of Total Number of Rural Households and Agricultural Households in the 1990 and 2000 Zambia Censuses, and the PHS Frame Based on the 1990 Census Data

Province	District	Total No. of Rural Households			Total No. Households in PHS Frame - 1990 Census	Difference, No. Hhs. in PHS Frame and Rural Areas -	Rural Agricultural Households from Census Data			
		1990 Census	2000 Census	Percent Change			1990 Census		2000 Census	
							No. Agric. Hhs.	% Agric. Hhs.	No. Agric. Hhs.	% Agric. Hhs.
CENTRAL	11 Kabwe Rural	32,291	70,162	117.3%	32,960	669	10,757	33.3%	59,305	84.5%
	12 Kabwe Urban	0	0	-	2,559	2,559	0	-	0	-
	13 Mkushi	16,923	17,309	2.3%	16,923	0	7,730	45.7%	14,205	82.1%
	14 Mumbwa	17,505	23,224	32.7%	17,019	-486	8,843	50.5%	20,669	89.0%
	15 Serenje	14,903	21,098	41.6%	14,903	0	10,717	71.9%	19,815	93.9%
COPPERBELT	21 Chililabombwe	1,897	2,762	45.6%	2,092	195	127	6.7%	2,246	81.3%
	22 Chingola	298	4,955	1,562.8	3,871	3,573	31	10.4%	4,346	87.7%
	23 Kalulushi	2,906	4,480	54.2%	2,425	-481	554	19.1%	3,719	83.0%
	24 Kitwe	474	2,670	463.3%	2,733	2,259	82	17.3%	1,987	74.4%
	25 Luanshya	2,896	7,192	148.3%	3,666	770	378	13.1%	5,151	71.6%
	26 Mufulira	2,300	4,833	110.1%	3,106	806	553	24.0%	4,183	86.6%
	27 Ndola Rural	30,670	45,088	47.0%	32,584	1,914	16,624	54.2%	39,800	88.3%
EASTERN	31 Chadiza	11,372	15,374	35.2%	11,372	0	9,617	84.6%	14,721	95.8%
	32 Chama	9,505	13,773	44.9%	9,505	0	8,631	90.8%	13,301	96.6%
	33 Chipata	46,039	66,220	43.8%	46,483	444	32,319	70.2%	62,238	94.0%
	34 Katete	26,865	36,449	35.7%	26,865	0	21,027	78.3%	33,725	92.5%
	35 Lundazi	31,164	44,451	42.6%	31,692	528	25,945	83.3%	42,802	96.3%
	36 Petauke	44,650	57,100	27.9%	45,215	565	32,398	72.6%	54,916	96.2%
LUAPULA	41 Kawambwa	15,269	17,621	15.4%	16,881	1,612	10,934	71.6%	15,645	88.8%
	42 Mansa	22,013	34,701	57.6%	21,985	-28	14,843	67.4%	32,160	92.7%
	43 Mwense	18,078	22,052	22.0%	18,078	0	13,790	76.3%	20,868	94.6%
	44 Nchelenge	22,069	38,700	75.4%	24,218	2,149	13,842	62.7%	27,333	70.6%
	45 Samfya	22,511	31,553	40.2%	22,511	0	11,443	50.8%	28,371	89.9%
LUSAKA	51 Luangwa	2,999	3,210	7.0%	2,999	0	1,913	63.8%	2,821	87.9%
	52 Lusaka Rural	26,198	43,533	66.2%	27,892	1,694	10,395	39.7%	27,501	63.2%

Table 2. Distribution of Total Number of Rural Households and Agricultural Households in the 1990 and 2000 Zambia Censuses, and the PHS Frame Based on the 1990 Census Data (Continued)

Province	District	Total No. of Rural Households			Total No. Household in PHS Frame - 1990 Census	Difference, No. Hhs. in PHS Frame and Rural Areas - 1990 Census	Rural Agricultural Households from Census Data			
		1990 Census	2000 Census	Percent Change			1990 Census		2000 Census	
							No. Agric. Hhs.	% Agric. Hhs.	No. Agric. Hhs.	% Agric. Hhs.
NORTHERN	61 Chilubi	8,850	13,629	54.0%	8,655	-195	3,774	42.6%	12,158	89.2%
	62 Chinsali	15,431	23,262	50.7%	15,431	0	9,472	61.4%	21,518	92.5%
	63 Isoka	20,669	30,138	45.8%	20,752	83	13,049	63.1%	28,761	95.4%
	64 Kaputa	9,211	18,105	96.6%	9,329	118	3,205	34.8%	13,252	73.2%
	65 Kasama	29,471	43,681	48.2%	31,182	1,711	14,910	50.6%	40,560	92.9%
	66 Luwingu	12,607	15,934	26.4%	12,712	105	6,628	52.6%	13,930	87.4%
	67 Mbala	26,163	40,181	53.6%	26,163	0	14,480	55.3%	34,554	86.0%
	68 Mpika	19,081	25,405	33.1%	19,081	0	11,007	57.7%	21,827	85.9%
	69 Mporokoso	9,296	14,398	54.9%	9,563	267	6,150	66.2%	13,308	92.4%
NORTHWESTERN	71 Mufumbwe	3,084	6,872	122.8%	3,856	772	2,141	69.4%	6,445	93.8%
	72 Kabompo	8,747	13,032	49.0%	8,804	57	5,216	59.6%	11,756	90.2%
	73 Kasempa	5,623	8,411	49.6%	5,623	0	4,012	71.3%	7,867	93.5%
	74 Mwinilunga	14,681	20,645	40.6%	14,681	0	10,847	73.9%	18,947	91.8%
	75 Solwezi	18,497	31,573	70.7%	16,724	-1,773	9,496	51.3%	26,595	84.2%
	76 Zambezi	12,947	17,812	37.6%	12,995	48	6,032	46.6%	16,299	91.5%
SOUTHERN	81 Choma	17,601	25,724	46.2%	17,752	151	11,935	67.8%	22,174	86.2%
	82 Gwembe	5,384	5,302	-1.5%	5,384	0	2,933	54.5%	4,606	86.9%
	83 Kalomo	22,088	37,590	70.2%	22,088	0	13,655	61.8%	33,203	88.3%
	84 Livingstone	1,088	1,208	11.0%	1,547	459	218	20.0%	661	54.7%
	85 Mazabuka	16,207	26,930	66.2%	16,292	85	6,525	40.3%	18,981	70.5%
	86 Monze	14,000	21,748	55.3%	14,434	434	5,592	39.9%	20,208	92.9%
	87 Namwala	10,935	18,062	65.2%	10,979	44	4,998	45.7%	16,474	91.2%
	88 Siavonga	4,464	7,763	73.9%	4,829	365	3,369	75.5%	6,183	79.6%
	89 Sinazongwe	8,621	11,745	36.2%	8,621	0	4,483	52.0%	7,736	65.9%
WESTERN	91 Kalabo	17,795	22,736	27.8%	18,121	326	9,969	56.0%	21,644	95.2%
	92 Kaoma	18,597	27,623	48.5%	18,597	0	11,359	61.1%	24,104	87.3%
	93 Lukulu	9,591	12,959	35.1%	9,591	0	3,501	36.5%	12,074	93.2%
	94 Mongu	19,700	24,027	22.0%	20,464	764	6,807	34.6%	20,766	86.4%
	95 Senanga	22,876	19,345	-15.4%	22,984	108	11,498	50.3%	17,904	92.6%
	96 Sesheke	10,757	27,184	152.7%	11,361	604	4,803	44.6%	25,526	93.9%
	ZAMBIA	835,857	1,241,534	48.5%	859,132	23,275	485,557	58.1%	1,091,849	87.9%

Table 3. Number of Sample SEAs per District for the PHS each Year

PROVINCE	OLD DISTRICTS	Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
CENTRAL	11 Kabwe Rural	22	23	17	17	16	15	18	18	18	18	18	18
	12 Kabwe Urban						2	2	2	2	2	2	2
	13 Mkushi	20	19	7	8	8	8	5	5	5	5	5	5
	14 Mumbwa	13	13	10	8	9	8	8	8	7	8	8	8
	15 Serenje	24	23	6	8	8	7	7	7	7	7	7	7
COPPERBELT	21 Chililabombwe	1	3	2	3	3	2	2	2	2	2	2	2
	22 Chingola	2	2	1	2	2	2	2	2	2	2	2	2
	23 Kalulushi	1	1	1	2	1	2	2	2	2	2	2	2
	24 Kitwe	1	1	1	3	4	2	2	2	2	2	2	2
	25 Luanshya	2	2		2	2	2	2	2	2	2	2	2
	26 Mufulira	5	6	2	1	2	2	2	2	2	2	2	2
	27 Ndola Rural	36	35	18	10	11	12	12	12	12	12	12	12
EASTERN	31 Chadiza	10	9	6	4	4	5	5	5	5	5	5	5
	32 Chama	13	12	2	2	1	4	2	2	4	4	4	4
	33 Chipata	40	41	17	18	18	20	20	20	19	20	20	20
	34 Katete	6	6	12	12	12	11	11	11	11	11	11	11
	35 Lundazi	30	30	15	11	10	13	12	12	12	13	13	13
	36 Petauke	37	35	17	20	20	19	19	18	19	19	19	19
	LUAPULA	41 Kawambwa	22	14	11	8	8	8	8	8	8	8	8
42 Mansa		9	8	12	12	13	11	11	11	11	11	11	11
43 Mwense		24	20	9	8	8	8	8	8	8	8	8	8
44 Nchelenge		29	24	9	9	7	11	11	11	11	10	11	11
45 Samfya		17	12	5	11	10	11	11	9	9	9	9	9
LUSAKA	51 Luangwa	4	2	2	2	1	2	2	2	2	2	2	2
	52 Lusaka Rural	23	21	11	12	11	12	12	12	12	11	11	11

Table 3. Number of Sample SEAs per District for the PHS each Year (Continued)

PROVINCE	OLD DISTRICTS	Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
NORTHERN	61 Chilubi	5	5	2	4	4	5	5	5	5	5	5	5
	62 Chinsali	18	18	8	7	9	8	8	8	8	8	8	8
	63 Isoka	46	46	21	11	11	10	8	8	10	10	10	10
	64 Kaputa	6	4	3	4	4	5	5	5	5	5	5	5
	65 Kasama	29	28	13	15	15	17	13	14	17	17	16	17
	66 Luwingu	8	8	4	5	6	7	6	6	7	7	7	7
	67 Mbala	12	12	7	12	12	13	12	11	13	13	13	13
	68 Mpika	19	19	8	8	8	10	10	10	10	10	10	10
	69 Mporokoso	18	18	9	5	5	5	5	5	5	5	5	5
NORTHWESTERN	71 Mufumbwe	6	6	2	2	2	2	2	2	2	2	2	2
	72 Kabompo	8	7	4	5	5	4	4	4	4	4	4	4
	73 Kasempa	7	7	3	2	3	3	3	3	3	3	3	3
	74 Mwinilunga	13	12	5	8	8	6	6	6	6	6	6	6
	75 Solwezi	15	13	10	9	8	8	7	8	8	8	8	8
	76 Zambezi	11	11	4	4	3	5	4	4	4	5	4	5
SOUTHERN	81 Choma	12	13	11	10	10	8	8	8	8	8	8	8
	82 Gwembe	7	7	1	2	1	3	3	2	2	2	2	1
	83 Kalomo	24	23	13	10	8	10	10	10	10	10	10	10
	84 Livingstone	1	2	1	2	2	2	2	2	2	2	2	2
	85 Mazabuka	13	13	6	8	6	8	8	8	8	8	8	8
	86 Monze	15	14	5	7	7	7	7	7	7	7	7	7
	87 Namwala	8	8	4	3	3	5	6	6	6	6	6	6
	88 Siavonga	6	6	2	2	1	2	2	2	2	2	2	2
	89 Sinazongwe	8	8	3	4	4	4	4	4	4	4	4	4
WESTERN	91 Kalabo	20	18	9	7	7	8	6	6	6	6	6	6
	92 Kaoma	21	20	6	12	11	8	8	7	7	8	8	8
	93 Lukulu	7	7	1	4	3	5	4	3	4	5	5	5
	94 Mongu	9	9	5	9	9	8	7	7	8	8	8	8
	95 Senanga	22	22	14	11	11	11	6	6	6	6	6	6
	96 Sesheke	9	9	5	6	6	5	8	8	9	9	9	9
ZAMBIA		794	755	382	391	379	401	383	378	390	394	393	394

Table 4. Projected Total Number of Rural Agricultural Households in Frame for Each PHS Year by District

PROVINCE	OLD DISTRICTS	PHS Post Harvest Year and Reference Date											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
		01-May-91	01-May-92	01-May-93	01-May-94	01-May-95	01-May-96	01-May-97	01-May-98	01-May-99	01-May-00	01-May-01	01-May-02
CENTRAL	11 Kabwe Rural	29,478	31,796	34,289	36,978	39,877	43,013	46,386	50,023	53,945	58,187	62,750	67,670
	12 Kabwe Urban	2,224	2,308	2,395	2,486	2,580	2,677	2,779	2,884	2,993	3,106	3,223	3,345
	13 Mkushi	13,912	13,943	13,975	14,006	14,038	14,069	14,101	14,133	14,165	14,197	14,229	14,261
	14 Mumbwa	15,503	15,993	16,498	17,018	17,555	18,110	18,682	19,271	19,879	20,508	21,155	21,822
	15 Serenje	14,365	14,874	15,400	15,944	16,508	17,093	17,697	18,322	18,970	19,642	20,337	21,055
COPPERBELT	21	1,737	1,786	1,836	1,888	1,941	1,996	2,052	2,110	2,169	2,230	2,293	2,358
	22 Chingola	3,458	3,545	3,634	3,724	3,817	3,913	4,011	4,111	4,214	4,319	4,427	4,537
	23 Kalulushi	2,108	2,241	2,383	2,534	2,694	2,865	3,046	3,239	3,444	3,662	3,894	4,140
	24 Kitwe	2,030	2,026	2,021	2,016	2,011	2,007	2,002	1,997	1,993	1,988	1,984	1,979
	25 Luanshya	2,761	2,954	3,160	3,380	3,615	3,868	4,137	4,425	4,734	5,064	5,417	5,794
	26 Mufulira	2,779	2,904	3,036	3,173	3,316	3,466	3,623	3,786	3,957	4,137	4,324	4,519
	27 Ndola Rural	29,469	30,444	31,448	32,485	33,557	34,667	35,810	36,992	38,212	39,476	40,778	42,123
EASTERN	31 Chadiza	11,137	11,479	11,830	12,192	12,565	12,950	13,346	13,754	14,175	14,610	15,056	15,517
	32 Chama	9,437	9,795	10,164	10,548	10,946	11,361	11,790	12,235	12,697	13,177	13,675	14,191
	33 Chipata	44,859	46,478	48,151	49,884	51,679	53,545	55,472	57,468	59,537	61,686	63,906	66,206
	34 Katete	25,431	26,220	27,031	27,868	28,731	29,623	30,539	31,485	32,459	33,467	34,503	35,571
	35 Lundazi	31,298	32,377	33,490	34,641	35,833	37,068	38,342	39,661	41,024	42,439	43,898	45,407
	36 Petauke	44,251	45,298	46,366	47,460	48,580	49,729	50,902	52,103	53,332	54,594	55,882	57,201
LUAPULA	41 Kawambwa	15,036	15,101	15,166	15,231	15,296	15,362	15,428	15,495	15,561	15,628	15,695	15,763
	42 Mansa	21,082	22,069	23,098	24,176	25,304	26,488	27,724	29,017	30,371	31,792	33,276	34,828
	43 Mwense	17,363	17,712	18,068	18,430	18,800	19,178	19,562	19,954	20,355	20,764	21,180	21,605
	44 Nchelenge	17,714	18,566	19,457	20,389	21,367	22,395	23,468	24,594	25,773	27,012	28,307	29,665
	45 Samfya	20,758	21,472	22,209	22,971	23,760	24,577	25,420	26,293	27,195	28,131	29,096	30,094
LUSAKA	51 Luangwa	2,649	2,667	2,685	2,704	2,722	2,741	2,759	2,778	2,797	2,816	2,835	2,855
	52 Lusaka Rural	18,216	19,047	19,913	20,819	21,766	22,759	23,794	24,877	26,008	27,194	28,431	29,725
NORTHERN	61 Chilubi	7,987	8,359	8,747	9,153	9,578	10,024	10,489	10,976	11,485	12,020	12,578	13,161
	62 Chinsali	14,719	15,337	15,979	16,648	17,344	18,073	18,829	19,617	20,439	21,297	22,188	23,117
	63 Isoka	20,364	21,140	21,943	22,776	23,641	24,542	25,474	26,442	27,446	28,492	29,574	30,698
	64 Kaputa	7,175	7,668	8,193	8,755	9,354	9,997	10,681	11,413	12,195	13,033	13,925	14,879
	65 Kasama	29,693	30,713	31,765	32,853	33,978	35,145	36,349	37,594	38,882	40,217	41,595	43,019
	66 Luwingu	11,302	11,561	11,825	12,095	12,371	12,654	12,943	13,239	13,541	13,851	14,167	14,491
	67 Mbala	23,232	24,253	25,315	26,424	27,581	28,793	30,054	31,370	32,744	34,183	35,680	37,243
	68 Mpika	16,748	17,235	17,736	18,250	18,780	19,326	19,887	20,464	21,058	21,670	22,299	22,946
	69 Mporokoso	9,114	9,495	9,891	10,304	10,734	11,183	11,650	12,136	12,642	13,172	13,721	14,294

Table 4. Projected Total Number of Rural Agricultural Households in Frame for Each PHS Year by District (Continued)

PROVINCE	OLD DISTRICTS	PHS Post Harvest Year and Reference Date											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
		01-May-91	01-May-92	01-May-93	01-May-94	01-May-95	01-May-96	01-May-97	01-May-98	01-May-99	01-May-00	01-May-01	01-May-02
NORTHWESTERN	71 Mufumbwe	3,776	4,001	4,239	4,491	4,758	5,041	5,341	5,658	5,995	6,352	6,729	7,129
	72 Kabompo	8,178	8,506	8,846	9,199	9,567	9,951	10,348	10,762	11,192	11,640	12,106	12,589
	73 Kasempa	5,420	5,643	5,875	6,116	6,367	6,629	6,901	7,185	7,480	7,788	8,107	8,440
	74 Mwinilunga	13,821	14,301	14,797	15,310	15,840	16,391	16,959	17,546	18,154	18,785	19,436	20,109
	75 Solwezi	14,772	15,743	16,775	17,875	19,047	20,299	21,630	23,048	24,558	26,173	27,888	29,717
	76 Zambezi	12,175	12,565	12,968	13,383	13,811	14,254	14,711	15,181	15,667	16,170	16,688	17,222
SOUTHERN	81 Choma	15,732	16,328	16,944	17,584	18,248	18,939	19,654	20,396	21,166	21,968	22,797	23,658
	82 Gwembe	4,672	4,665	4,658	4,650	4,643	4,636	4,629	4,622	4,615	4,608	4,601	4,594
	83 Kalomo	20,301	21,412	22,580	23,812	25,111	26,485	27,931	29,455	31,062	32,761	34,549	36,434
	84 Livingstone	831	811	791	772	753	734	716	699	682	665	649	633
	85 Mazabuka	11,923	12,538	13,184	13,863	14,577	15,330	16,119	16,949	17,822	18,742	19,707	20,722
	86 Monze	13,829	14,409	15,011	15,639	16,293	16,976	17,686	18,425	19,196	20,000	20,837	21,708
	87 Namwala	10,393	10,925	11,482	12,068	12,683	13,332	14,012	14,726	15,477	16,269	17,098	17,970
	88 Siavonga	3,985	4,179	4,382	4,595	4,818	5,053	5,298	5,556	5,826	6,110	6,406	6,717
	89 Sinazongwe	5,811	5,994	6,182	6,376	6,576	6,783	6,996	7,215	7,442	7,676	7,917	8,165
WESTERN	91 Kalabo	17,546	17,949	18,361	18,782	19,212	19,654	20,105	20,565	21,037	21,521	22,014	22,519
	92 Kaoma	16,715	17,391	18,092	18,822	19,581	20,372	21,194	22,048	22,937	23,865	24,827	25,828
	93 Lukulu	9,139	9,419	9,707	10,003	10,308	10,624	10,948	11,282	11,627	11,983	12,349	12,726
	94 Mongu	17,900	18,190	18,484	18,783	19,087	19,396	19,710	20,028	20,352	20,682	21,017	21,356
	95 Senanga	21,000	20,640	20,288	19,941	19,601	19,265	18,936	18,613	18,295	17,982	17,675	17,373
	96 Sesheke	11,387	12,427	13,559	14,794	16,141	17,616	19,220	20,971	22,881	24,971	27,246	29,727
ZAMBIA		778,695	806,892	836,300	867,060	899,242	933,015	968,273	1,005,190	1,043,853	1,084,471	1,126,921	1,171,418
Percent Difference from PHS Estimates Based on Original Weights (Table 1)		-7.0%	37.1%	39.9%	39.5%	54.8%	4.1%	5.7%	9.1%	11.4%	32.5%	39.3%	43.3%

Table 5. Weighted Estimates of the Percent of Agricultural Households in the Frame for Each PHS by District

PROVINCE	OLD DISTRICTS	Percent of Agricultural Households in the Frame											
		Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
CENTRAL	11 Kabwe Rural	99.8%	98.7%	90.0%	87.0%	92.4%	95.9%	95.6%	97.1%	97.2%	100.0%	99.7%	97.8%
	12 Kabwe Urban	-	-	-	-	-	78.6%	74.1%	97.0%	92.3%	100.0%	100.0%	100.0%
	13 Mkushi	93.3%	99.6%	96.1%	86.7%	97.7%	83.9%	88.9%	88.9%	95.9%	100.0%	100.0%	100.0%
	14 Mumbwa	81.3%	95.9%	88.7%	96.8%	97.3%	93.6%	98.8%	96.7%	97.3%	100.0%	100.0%	99.3%
	15 Serenje	98.9%	99.3%	92.2%	95.1%	99.2%	96.8%	99.0%	96.1%	97.2%	100.0%	98.4%	100.0%
COPPERBELT	21 Chililabombwe	92.9%	100.0%	100.0%	100.0%	100.0%	94.6%	96.8%	84.2%	93.3%	100.0%	100.0%	90.0%
	22 Chingola	98.3%	100.0%	100.0%	100.0%	100.0%	92.3%	92.2%	93.1%	100.0%	100.0%	100.0%	100.0%
	23 Kalulushi	93.1%	100.0%	100.0%	100.0%	100.0%	93.6%	96.5%	100.0%	96.0%	100.0%	96.6%	97.0%
	24 Kitwe	100.0%	100.0%	100.0%	100.0%	100.0%	78.9%	100.0%	62.4%	71.3%	100.0%	97.0%	97.2%
	25 Luanshya	98.2%	100.0%	-	100.0%	100.0%	97.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	26 Mufulira	89.6%	100.0%	80.5%	100.0%	95.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	93.1%
	27 Ndola Rural	97.7%	100.0%	97.8%	100.0%	100.0%	97.3%	98.9%	98.9%	98.4%	100.0%	100.0%	100.0%
EASTERN	31 Chadiza	100.0%	100.0%	97.4%	94.5%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.9%
	32 Chama	100.0%	99.5%	97.3%	97.4%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	33 Chipata	100.0%	98.3%	99.1%	96.3%	100.0%	100.0%	100.0%	98.8%	98.0%	100.0%	100.0%	98.8%
	34 Katete	100.0%	100.0%	99.5%	100.0%	100.0%	98.8%	100.0%	99.4%	99.5%	100.0%	100.0%	100.0%
	35 Lundazi	100.0%	94.2%	99.1%	96.8%	99.1%	98.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	36 Petauke	100.0%	99.8%	98.7%	97.4%	100.0%	97.5%	100.0%	99.4%	99.0%	100.0%	99.6%	99.7%
LUAPULA	41 Kawambwa	99.2%	100.0%	100.0%	95.4%	100.0%	95.1%	95.9%	93.7%	97.0%	100.0%	99.3%	100.0%
	42 Mansa	92.5%	99.0%	100.0%	99.1%	99.5%	98.4%	100.0%	96.3%	98.3%	100.0%	100.0%	99.4%
	43 Mwense	96.9%	99.4%	100.0%	97.8%	99.3%	97.3%	94.6%	100.0%	99.3%	100.0%	96.6%	95.6%
	44 Nchelenge	95.4%	99.7%	100.0%	93.5%	99.1%	92.1%	97.0%	95.6%	98.0%	100.0%	94.6%	99.3%
	45 Samfya	95.4%	100.0%	100.0%	91.4%	95.1%	93.8%	96.5%	98.7%	94.5%	100.0%	100.0%	96.6%
LUSAKA	51 Luangwa	100.0%	100.0%	100.0%	88.9%	100.0%	100.0%	100.0%	97.1%	93.9%	100.0%	100.0%	96.8%
	52 Lusaka Rural	75.0%	100.0%	98.7%	75.2%	100.0%	69.9%	43.8%	62.8%	72.6%	100.0%	94.7%	97.2%

Table 5. Weighted Estimates of the Percent of Agricultural Households in the Frame for Each PHS by District (Continued)

PROVINCE	OLD DISTRICTS	Percent of Agricultural Households in the Frame											
		Post-Harvest Survey Year											
		90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02
NORTHERN	61 Chilubi	100.0%	100.0%	100.0%	100.0%	100.0%	91.9%	98.6%	100.0%	100.0%	100.0%	98.8%	100.0%
	62 Chinsali	99.8%	99.5%	100.0%	97.6%	100.0%	98.6%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	63 Isoka	100.0%	100.0%	100.0%	98.4%	100.0%	99.4%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	64 Kaputa	100.0%	98.5%	96.4%	96.1%	98.5%	96.7%	100.0%	98.3%	100.0%	100.0%	98.6%	100.0%
	65 Kasama	99.5%	99.2%	100.0%	97.5%	100.0%	94.1%	94.7%	98.6%	98.7%	100.0%	99.0%	99.3%
	66 Luwingu	100.0%	99.1%	100.0%	100.0%	100.0%	99.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	67 Mbala	100.0%	100.0%	100.0%	97.6%	99.4%	99.0%	99.0%	93.0%	99.4%	100.0%	98.9%	99.5%
	68 Mpika	99.8%	99.7%	100.0%	90.7%	98.0%	95.7%	99.3%	99.4%	100.0%	100.0%	100.0%	98.4%
	69 Mporokoso	100.0%	99.2%	100.0%	98.8%	100.0%	97.8%	96.8%	98.9%	98.7%	100.0%	100.0%	100.0%
NORTHWESTERN	71 Mufumbwe	98.2%	100.0%	100.0%	97.1%	-	92.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	72 Kabompo	99.6%	100.0%	100.0%	84.8%	100.0%	94.7%	98.6%	98.6%	94.1%	97.3%	98.5%	100.0%
	73 Kasempa	97.8%	100.0%	100.0%	83.8%	100.0%	85.5%	97.4%	97.5%	100.0%	100.0%	98.0%	100.0%
	74 Mwinilunga	98.6%	100.0%	100.0%	95.3%	100.0%	99.0%	100.0%	100.0%	100.0%	100.0%	99.0%	100.0%
	75 Solwezi	97.6%	100.0%	100.0%	95.2%	100.0%	95.1%	98.0%	100.0%	100.0%	100.0%	99.0%	100.0%
	76 Zambezi	99.4%	99.5%	100.0%	97.2%	98.0%	99.0%	98.6%	98.5%	100.0%	100.0%	98.4%	100.0%
	SOUTHERN	81 Choma	100.0%	98.7%	97.8%	88.7%	97.4%	90.8%	100.0%	96.4%	98.6%	100.0%	99.0%
82 Gwembe		100.0%	100.0%	100.0%	94.7%	100.0%	91.4%	100.0%	100.0%	92.3%	100.0%	100.0%	100.0%
83 Kalomo		100.0%	99.2%	94.9%	98.9%	99.2%	96.5%	96.3%	99.2%	96.3%	99.5%	98.7%	100.0%
84 Livingstone		100.0%	83.7%	58.9%	67.0%	87.4%	56.2%	70.3%	76.9%	83.5%	100.0%	96.7%	77.0%
85 Mazabuka		99.3%	92.0%	85.9%	69.7%	94.7%	96.1%	98.2%	95.8%	89.9%	100.0%	100.0%	100.0%
86 Monze		99.1%	100.0%	98.2%	90.4%	97.1%	99.1%	98.7%	98.3%	100.0%	100.0%	100.0%	99.2%
87 Namwala		100.0%	95.1%	98.0%	100.0%	94.3%	97.7%	96.3%	99.1%	98.8%	100.0%	97.0%	98.7%
88 Siavonga		100.0%	95.7%	100.0%	94.7%	89.5%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
89 Sinazongwe		100.0%	95.0%	100.0%	97.2%	100.0%	88.3%	95.8%	94.9%	100.0%	100.0%	92.3%	97.0%
WESTERN		91 Kalabo	99.3%	99.3%	100.0%	98.5%	100.0%	97.4%	93.5%	97.6%	97.1%	100.0%	95.0%
	92 Kaoma	100.0%	98.9%	100.0%	96.7%	99.3%	100.0%	97.3%	93.2%	96.3%	100.0%	100.0%	99.3%
	93 Lukulu	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.6%	100.0%	100.0%	98.7%
	94 Mongu	100.0%	95.8%	100.0%	92.5%	79.1%	100.0%	92.8%	91.8%	98.4%	100.0%	100.0%	97.7%
	95 Senanga	99.9%	99.2%	99.6%	97.0%	96.0%	100.0%	100.0%	100.0%	97.8%	100.0%	100.0%	100.0%
	96 Sesheke	100.0%	100.0%	100.0%	98.6%	98.4%	99.0%	97.9%	98.5%	97.3%	100.0%	99.4%	98.1%
	ZAMBIA		97.7%	98.9%	98.0%	94.5%	98.1%	95.7%	95.0%	96.4%	97.3%	100.0%	99.1%

Table 6. Estimates of Total Number of Agricultural Households for 2001 and 2004 Supplemental Surveys, Based on Adjusted Weights

PROVINCE	OLD DISTRICT	PHS 99/00	Supplemental Survey 2001	% of 99/00 PHS	Supplemental Survey 2004	% of 99/00 PHS
CENTRAL	11 Kabwe Rural	58,187	52,691	90.6%	45,757	78.6%
	12 Kabwe Urban	3,106	2,944	94.8%	2,423	78.0%
	13 Mkushi	14,197	12,876	90.7%	10,244	72.2%
	14 Mumbwa	20,508	19,089	93.1%	16,332	79.6%
	15 Serenje	19,642	18,800	95.7%	15,903	81.0%
COPPERBELT	21 Chililabombwe	2,230	2,230	100.0%	1,929	86.5%
	22 Chingola	4,319	4,079	94.4%	3,959	91.7%
	23 Kalulushi	3,662	3,118	85.1%	2,323	63.4%
	24 Kitwe	1,988	1,839	92.5%	1,591	80.0%
	25 Luanshya	5,064	4,617	91.2%	3,678	72.6%
	26 Mufulira	4,137	3,590	86.8%	3,034	73.3%
	27 Ndola Rural	39,476	35,489	89.9%	30,536	77.4%
EASTERN	31 Chadiza	14,610	13,859	94.9%	11,828	81.0%
	32 Chama	13,177	13,177	100.0%	11,506	87.3%
	33 Chipata	61,686	59,331	96.2%	53,405	86.6%
	34 Katete	33,467	32,295	96.5%	28,006	83.7%
	35 Lundazi	42,439	40,107	94.5%	35,452	83.5%
	36 Petauke	54,594	53,089	97.2%	46,744	85.6%
LUAPULA	41 Kawambwa	15,628	14,441	92.4%	13,318	85.2%
	42 Mansa	31,792	31,015	97.6%	26,362	82.9%
	43 Mwense	20,764	20,224	97.4%	17,684	85.2%
	44 Nchelenge	27,012	24,745	91.6%	18,679	69.2%
	45 Samfya	28,131	26,857	95.5%	24,579	87.4%
LUSAKA	51 Luangwa	2,816	2,455	87.2%	2,095	74.4%
	52 Lusaka Rural	27,194	24,053	88.5%	18,261	67.2%

Table 6. Estimates of Total Number of Agricultural Households for 2001 and 2004 Supplemental Surveys, Based on Adjusted Weights (Continued)

PROVINCE	OLD DISTRICT	PHS 99/00	Supplemental Survey 2001	% of 99/00 PHS	Supplemental Survey 2004	% of 99/00 PHS
NORTHERN	61 Chilubi	12,020	11,400	94.8%	9,173	76.3%
	62 Chinsali	21,297	19,778	92.9%	15,950	74.9%
	63 Isoka	28,492	26,417	92.7%	23,607	82.9%
	64 Kaputa	13,033	11,869	91.1%	8,811	67.6%
	65 Kasama	40,217	37,314	92.8%	31,501	78.3%
	66 Luwingu	13,851	12,375	89.3%	11,033	79.7%
	67 Mbala	34,183	33,013	96.6%	26,583	77.8%
	68 Mpika	21,670	20,300	93.7%	17,816	82.2%
	69 Mporokoso	13,172	12,507	95.0%	10,629	80.7%
NORTHWESTERN	71 Mufumbwe	6,352	5,928	93.3%	4,959	78.1%
	72 Kabompo	11,640	11,037	94.8%	8,907	76.5%
	73 Kasempa	7,788	6,889	88.5%	4,774	61.3%
	74 Mwinilunga	18,785	17,383	92.5%	14,947	79.6%
	75 Solwezi	26,173	23,865	91.2%	17,116	65.4%
	76 Zambezi	16,170	15,200	94.0%	12,451	77.0%
SOUTHERN	81 Choma	21,968	20,879	95.0%	17,516	79.7%
	82 Gwembe	4,608	4,608	100.0%	3,571	77.5%
	83 Kalomo	32,761	31,844	97.2%	28,293	86.4%
	84 Livingstone	665	601	90.4%	514	77.2%
	85 Mazabuka	18,742	17,044	90.9%	13,585	72.5%
	86 Monze	20,000	19,140	95.7%	17,049	85.2%
	87 Namwala	16,269	15,453	95.0%	12,677	77.9%
	88 Siavonga	6,110	5,411	88.6%	4,713	77.1%
	89 Sinazongwe	7,676	7,185	93.6%	5,670	73.9%
WESTERN	91 Kalabo	21,521	20,426	94.9%	17,119	79.5%
	92 Kaoma	23,865	23,404	98.1%	17,632	73.9%
	93 Lukulu	11,983	11,462	95.6%	10,179	84.9%
	94 Mongu	20,682	19,907	96.3%	16,627	80.4%
	95 Senanga	17,982	17,682	98.3%	13,166	73.2%
	96 Sesheke	24,971	23,861	95.6%	19,006	76.1%
ZAMBIA		1,084,472	1,021,194	94.2%	861,201	79.4%