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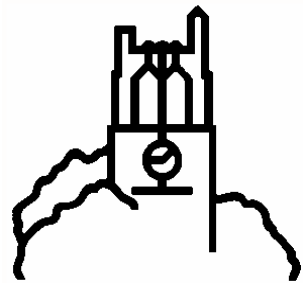
Agricultural Statistics in Sub-Saharan Africa: Differences in Institutional Arrangements and their Impacts on Agricultural Statistics Systems

A Synthesis of Four Country Case Studies

by

Valerie Kelly and Cynthia Donovan



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AGRICULTURAL STATISTICS IN SUB-SAHARAN AFRICA: DIFFERENCES IN INSTITUTIONAL ARRANGEMENTS AND THEIR IMPACTS ON AGRICULTURAL STATISTICS SYSTEMS A SYNTHESIS OF FOUR COUNTRY CASE STUDIES[1]

by

Valerie Kelly and Cynthia Donovan[2]

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Trying to get all the details about these four national agricultural statistics systems correct and current through a desk study was not an easy assignment given how rapidly some of the systems are changing. The authors of the synthesis and the country studies accept full responsibility for all errors of fact or interpretation and encourage readers to contact them with suggestions for corrections.

EXECUTIVE SUMMARY

A major push supporting improved data collection and analysis is required if African countries are to successfully design and implement results-based Poverty Reduction Strategy Programs (PRSP) and the Comprehensive Africa Agricultural Development Program (CAADP) being promoted by the New Partnership for African Development (NEPAD). Over the years there have been many initiatives to build statistical capacity in Africa. Many problems have plagued these efforts, including inadequate funding and the stop-go phenomenon. Recently the World Bank and development partners began a major new commitment to support Africa-wide improvements in statistical data through the Accelerated Data Program for Africa (ADP). It is hoped that this program will be more successful than previous programs by placing countries at the center of the program and building on the PRSP process.

To improve the effectiveness of this effort the World Bank (WB) Africa Region contracted with the Department of Agricultural Economics at Michigan State University (MSU) to carry out a desk study of the agricultural statistics programs in four countries: Mali, Zambia, Mozambique, and Rwanda. The objectives of the study are to:

- draw on existing experience to review the institutional arrangements for the collection of agricultural statistics;
- describe how information is collected and provided to meet macro and micro level policy requirements; and
- identify ways to make the process more efficient and effective.

Agricultural statistics are interpreted broadly in this report, including not only the standard annual agricultural production and livestock numbers, but also agricultural market information systems, rural household income and expenditure data, crop forecasting systems, and additional data necessary for policy analysis. The study focuses on the data user and policy maker perspective, but also includes observations from those involved in the data management process. A wide-range of sources were used, including personal communication with statistical specialists in each country, official reports, and the grey literature of project reports, as well as published literature.

This report comprises five stand-alone sections: a synthesis of findings drawing on results from the four country case studies and four annexes that present the detailed country studies. For each case study, researchers described the data available and being used by policymakers, identified the key agents involved in data collection and database organization, evaluated the data systems in place, detailed the main strengths and weaknesses of the systems, and then suggested changes that might improve the organization and use of agricultural statistics in the country.

The study concludes that the agricultural statistics systems in the four countries studied (Mali, Zambia, Mozambique, and Rwanda) are now more solid in terms of data quality and more relevant to the policy process than the systems that were in place in the 1970s and 1980s. Progress has been made in terms of the timeliness and the reliability of the annual crop and livestock production statistics for all four countries, although there are still major problems regarding sampling and measurement in some cases. Crop forecasting and food security assessments are also improved, but continue to exhibit some problems due to inadequate

coordination among the multitude of actors, conflicting methods and results, and some political interference. For example, inaccurate crop forecasts have led to government policies to ban exports or limit imports, creating crises in the markets with either too much or too little product available.

A comparison of institutional organization of agricultural statistics across the four countries reveals a diversity of organizational approaches and division of responsibilities for the collection of basic production and crop forecasting data. Ministries of Agriculture and/or Central Statistical Offices are usually the predominant actor with universities and agricultural research institutes often assisting, particularly with respect to analyses. There is little evidence that the institutional organization per se—particularly the unit of government to which the data collection and analysis units are attached—directly affects the performance of the overall system. In general, the weaknesses observed in the agricultural statistics systems appear to be more a function of inadequate budgets than institutional organization. Housing agricultural statistics in a Central Statistical Office or in the Ministry of Agriculture does not appear to be the key performance aspect, so much as how well functioning and well funded the chosen institution is. Different types of institutional arrangements may contribute to building greater stakeholder involvement, which can lead to increased budgetary support, a key feature of successful systems.

Results are mixed across countries in terms of market information systems, with strong performance in Mali, relatively good performance in Mozambique, and weaker performance in the other two countries. Institutional arrangements, which include a supporting role for trader and farmer organization, have contributed to Mali's relative success in this particular area of agricultural statistics because the end-users have lobbied for government financial support to the system. In terms of monitoring economic growth and poverty indicators for the PRSP, the agricultural sector appears to be performing better than other sectors in terms of basic reporting.

A weakness in all systems is their inability to respond to the demand for more disaggregated data (e.g., statistics that are representative for increasingly smaller administrative districts and for target groups of interest such as women and youth). Another weakness is the inability to produce reliable statistics on the increasingly wide range of agricultural production activities that generate income for rural households (e.g., livestock and horticultural products).

The conduct of supplementary surveys dealing with particular issues of relevance to the agricultural sector (e.g., HIV/AIDS, links between agricultural productivity growth and poverty reduction) has resulted in the development of panel datasets that can inform key policy debates. However, the lack of incorporation of such surveys into a national strategy and the lack of analysis by government analysts and other local institutions represents a lost opportunity. This lack of analysis spreads across the entire agricultural statistical system, calling to question the relevance of these statistics to the policy process. This is further exacerbated by a poor understanding of statistical methods and the benefits of sampling versus informal surveys on the part of decision makers.

In moving forward, the most critical institutional issue is mobilizing funding to build and maintain capacity and to conduct the larger and more complex data collection and analysis activities being requested by stakeholders in the agricultural statistics system. Instead of focusing on questions about which institutions (e.g., national statistical offices or ministries of agriculture) are the appropriate ones for delivering statistical services, there is a need to

develop a joint strategy among all the actors in the agricultural statistics system to fund (a) the foundation work involved in collecting the basic data, documenting it, and issuing annual reports of descriptive statistics and (b) the policy analysis that adds value to the foundation data through supplementary analyses and/or surveys.

The key institutional actors in the foundation work will normally be some combination of the Central Statistics Office and the Ministry of Agriculture. To the extent that stakeholders are asking for the expansion of the foundation data to include new products and new levels of disaggregation, they should be expected to contribute to the increased funding needed to accomplish these goals. The potential institutional actors for the policy analysis and supplemental survey work are numerous, including the NARS, universities, planning units in the ministry of agriculture or other relevant ministries (plan, environment, finance, etc.), or donor-funded projects as well as those institutions building the foundation data bases. To date, most efforts in this area have been through donor-funded projects that fail to develop independent funding mechanisms. The Central Statistics Offices and statistical units in the Ministries of Agriculture should not be the only actors conducting policy analysis. The primary role of these two institutions should be making sure that there is a reliable set of basic agricultural data available and well enough documented for others to use, as well as themselves.

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LIST OF ACRONYMS

ADP	Accelerated Data Program for Africa
ASU	agricultural statistics unit
CAADP	Comprehensive Africa Agricultural Development Program
CD	Computer storage medium
CGE	Computable General Equilibrium (a type of econometric model)
CSLP	Cadre Strategique pour la Lutte contre la Pauvrité (Mali's Poverty Reduction Strategy)
CSO	Central Statistics Office (used in a "generic" sense across all countries)
CWIQ	Core Welfare Indicators Questionnaire
EMEP	Enquête Malienne d'Evaluation de la Pauvreté (Malian Poverty Evaluation Survey)
EWS	Early Warning System (generic term used by FAO for all early warning systems)
FAO	Food and Agriculture Organization of the United Nations
FEWU	Famine Early Warning Unit in Zambia
FSRP	Food Security Research Project in Zambia
GDP	Gross Domestic Product
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
InWEnt	Internationale Weiterbildung und Entwicklung (Capacity Building International, Germany)
LSMS	Living Standards Measurement Survey
MDG	Millennium Development Goals
MIS	Market information system
MOA	Ministry of Agriculture (used in a *generic* sense across all countries)
MSU	Michigan State University
NEPAD	New Partnership for African Development
NEWU	National Early Warning Unit
NGO	Non-governmental organization
PRSP	Poverty Reduction Strategy Programs
VAC	Vulnerability Assessment Committees
WB	World Bank

1. BACKGROUND AND OBJECTIVES

A major push supporting improved data collection and analysis is required if African countries are to successfully design and implement results-based Poverty Reduction Strategy Programs (PRSP) and the Comprehensive Africa Agricultural Development Program (CAADP) being promoted by the New Partnership for African Development (NEPAD). Over the years there have been many initiatives to build statistical capacity in Africa. Many problems have plagued these efforts, including inadequate funding and the stop-go phenomenon. Recently the World Bank and development partners began a major new commitment to support Africa-wide improvements in statistical data through the Accelerated Data Program for Africa (ADP). It is hoped that this program will be more successful than previous programs by placing countries at the center of the program and building on the PRSP process.

To improve the effectiveness of this effort the World Bank (WB) Africa Region contracted with the Department of Agricultural, Food and Resource Economics at Michigan State University (MSU) to carry out a desk study of the agricultural statistics programs in four countries: Mali, Zambia, Mozambique, and Rwanda. The countries are ones in which MSU has been active during the recent past and therefore MSU had relatively easy access to information about the statistics programs and how data and information were being used in the policy process. The objectives of the study are to:

- draw on existing experience to review the institutional arrangements for the collection of agricultural statistics;
- describe how information is collected and provided to meet macro and micro level policy requirements; and
- identify ways to make the process more efficient and effective.

We were asked to look at the system primarily from the data user and policy maker perspective, but also include observations from those involved in the data management process. Obtaining a policy analyst's or policy maker's view of the system through a desk study has not been easy as most of the available documentation has been written by those involved in the production of the data. To better develop the data user perspective, we have relied on email correspondence with key informants and our own experiences in using the various agricultural data bases for policy analysis. Many cases of data use are found in the grey literature on researchers' and policy makers' bookshelves, only sometimes available as electronic resources.

The report comprises a synthesis of findings drawing on results from the four country case studies and a series of four annexes that present the detailed country studies. The synthesis begins with a review of the key agricultural issues facing African countries today and what this implies for data needs. The rest of the synthesis is organized around a series of five questions that were posed in the study terms of reference:

- What are the key sources of information for agricultural policy making?
- Who does what?
- What data collection methodologies are used?
- What are the strengths and weaknesses of data and information provided?
- How could things be organized better?

In answering each question, we report the general tendencies across the four countries studied, making references to outlier situations that are elaborated in greater detail in the country-level annexes.

2. WHAT ARE THE DOMINANT AGRICULTURAL ISSUES AND DATA NEEDS?

Ensuring food security has been and continues to be the most important economic and political issue facing most African countries. The African context makes ensuring food security a particularly challenging responsibility due to rapid population growth coupled with secular declines in average yields, limited use of modern inputs, expansion of production to marginal lands, and soil degradation. Sharp inter-annual fluctuations in production due to droughts, floods, pests, and, in many cases, policy volatility contribute to food security problems. To identify and respond to potential food shortfalls governments and donors need access to reliable crop forecast estimates that require weather data and crop planting information, data on national and regional food stocks, and good estimates of prevailing consumption needs (including information on changing dietary patterns).

Recently, the challenge of implementing poverty reduction strategies (PRSP and follow-on programs) and meeting the Millennium Development Goals (MDGs) has increased the need for data to understand livelihood strategies and rural incomes (levels and sources). Solid analysis of what is needed to move households out of poverty often requires panel data where the same households are followed over time as this permits the analyst to isolate the factors contributing to poverty reduction and understand how the factors work over time.

The CAADP/NEPAD effort to increase both the level and the effectiveness of budget allocations to the agricultural sector has also increased the need to evaluate the benefits and costs of different types of investments (not only direct investments in agriculture but also investments in roads, education, and health) and their impact on the growth of agricultural gross domestic product (GDP.) To date, this is being done primarily with aggregate national data on budget expenditures. The decentralization of budgetary authority in many countries has, however, put pressure on the statistics system to provide budget numbers at more disaggregated local levels. Decentralization has also increased the demand for disaggregated agricultural statistics (i.e., those reflecting the crop and livestock production situation for local units of government) and for analytical capacity at the local level.

Globalization is another intervening factor, which has increased the need for information and analyses of national, regional, and worldwide demand and supply not only for Africa's traditional food and cash crops but also for a broad range of emerging market opportunities. In order to respond to emerging market opportunities as well as to maintain productivity for traditional crops there is a need for continued research and extension on cropping practices, variety improvement, and soil fertility. As Africans move toward increasing the domestic value added of their agricultural products, research and extension on processing techniques will also be in demand. These types of research results are not usually considered part of the agricultural statistics system per se, but they cannot be neglected when considering the needs of policy makers or private sector investors.

Finally, the agricultural sector is increasingly being called on to pay more attention to the environmental impacts of different production practices (e.g., environmental costs and benefits of irrigation schemes, pesticide use, inorganic fertilizer use) and identification of environmentally sustainable options in agricultural production and processing. This requires systematic monitoring and evaluation of trends in the agricultural sector and potential for environmental impacts, thus making the link between agriculture and the environment.

3. WHAT ARE THE SOURCES OF INFORMATION FOR AGRICULTURAL POLICY MAKING?

Without exception, the key sources of data for agricultural policy making are crop production estimates. These tend to be of two types (1) forecasts early in the cropping season for estimating food security needs and (2) definitive results established after the harvest is over. The crop forecast is based on information about area planted and predicted yields. The information is collected through formal farm surveys and/or information gathered by agricultural field agents. The end-of-season estimates of total production for principal crops are sometimes based on crop-cuts from farmers in the crop forecast survey and other times, based on farmer recall in response to questions posed by interviewers administering farm surveys.

The next most important sources of agricultural data are the market information systems that monitor and report on commodity prices and quantities traded in rural and urban markets. For this information to be useful for the private sector, it must be collected at regular intervals (at least once a week, if not daily) and transmitted to market participants very rapidly (the same day, if possible). For policy analysis, it must be systematically collected over both time and space, and maintained in a documented database, criteria not necessarily in conflict with private sector needs.

There are a variety of other data sources with relevance to agricultural policy analysts. Some are surveys conducted on a regular basis (e.g., collection of retail prices in urban markets for estimating the consumer price index) or national surveys conducted at unscheduled intervals (e.g., agricultural census, population and housing census, living standards surveys). The PRSP process has contributed to the development of a set of indicators often tracked regularly to measure progress in poverty reduction, but information available on these efforts suggests that the indicators of relevance to agriculture and the environment are few and, to date, poorly defined or measured.

Most countries have some experience with supplemental survey activities to collect information on particular topics (e.g., impact of HIV/AIDS on agricultural productivity, monitoring the impacts of an input subsidy program, examining the role of women in producer organizations, linkages between agricultural productivity growth and nutritional status). In some cases the sampling frame for the supplemental survey is linked to the annual crop forecast or production surveys (e.g., FRSP/MSU surveys in Zambia or the cotton company's surveys in the cotton zone of Mali), but in other cases the surveys are targeted to particular geographic areas or population groups making it difficult to integrate the supplementary survey data into the more general agricultural data base. Another issue is that most of the supplementary survey work identified is financed by projects or bilateral donors and therefore not likely to become a sustainable part of the agricultural statistics system. Despite these shortcomings, supplementary surveys often produce information of more direct relevance to agricultural planning and policy than the nationally representative surveys collecting crop production data or poverty indicators because they are able to collect more information on the underlying dynamics of the agricultural systems they are studying.

The periodicity of data collection remains an area for further work. In Mozambique and Zambia, large sample, extensive surveys have been conducted annually in recent years, at high cost. Given the relative scarcity of analysts capable of using these large datasets, the implementation of such annual surveys should be evaluated based on the need for annual surveys as opposed to less frequent surveys. Some of the key agricultural sector indicators

may change dramatically from year to year with weather and policy initiatives, necessitating such annual or seasonal data collection. For example, data on area planted and amounts harvested are probably needed every season or every year. Other variables of interest (household assets and demographics, for example) change very slowly over time, suggesting that some economies could be realized by not collecting these data every year. To respond to these differing needs and budgetary constraints, several countries have attempted to develop light seasonal and annual surveys that would have more extensive data collection to be conducted every three to five years, but the effort has been complicated by requests from donors and others to include a broad range of information with each survey, and systems are still developing. In general, it means a surfeit of unused data of unknown quality, since only a portion of the data can be analyzed.

To complement the above surveys and fill in recognized gaps, agricultural policy analysts also draw on the records of government services for information on weather (both the raw data on rainfall and various types of models forecasting weather impacts on crop production), trade in agricultural commodities and inputs, production statistics for fish and livestock, transportation costs, and price indices. In general, these various types of data and information are not consolidated and made available to analysts in a single data base or a well-designed set of complementary data bases.

Despite the long list of emerging data and information needs described in the previous section, we find that most agricultural statistics systems continue to put most of their resources into the production of data needed for food security analysis and estimates of agricultural GDP for the national accounts. Market information systems of some type generally exist, but the information flows are seldom reliable and timely. Countries working with the WB and the Food and Agriculture Organization of the United Nations (FAO) have often developed plans for more extensive survey work (e.g., a regularly conducted agricultural census) but most of these plans have not been realized due to inadequate funding. Efforts to collect household-level survey data permitting analyses of policies and investments conducive to agricultural productivity growth and poverty reduction in rural areas are very limited. In most cases the surveys are one-shot affairs covering limited geographic areas and they do not provide the type of panel data needed for longitudinal assessments of household incomes and livelihood strategies. Exceptions to this tendency exist in Zambia, Mozambique, and Kenya where donor funding has supported the development of panel data sets for nationally representative rural samples. The extent to which governments would be willing and able to continue these efforts in the absence of donor funding is not at all clear. However, in the Mozambique case, the panel dataset was incorporated into their regular household surveys and continues to be analyzed with local analysts, although the methodological challenges for analysis require advanced degree training, lacking for the few Ministry of Agriculture (MOA) analysts.

A major weakness given the recent push toward crop and income diversification in Africa is the availability of accurate data on the production, consumption, and trade of horticultural crops, fish and livestock. Weakness in these data also has serious implications for estimates of food security. Despite ample evidence that African diets are diversifying away from the almost exclusive reliance on staple cereals and tubers of the past, analysts continue to ignore the role played by horticultural, fish, and livestock products in food security estimates. Livestock and fish information for the national accounts tends to come from technical reports compiled by the fish and livestock services rather than sample surveys, although there have been efforts (e.g., Mali, Mozambique and Zambia) to include some information on these sectors in the crop production or other national surveys. Production statistics for some of the

basic horticultural crops (onions, tomatoes, mangos, bananas) are also being reported, but measurement errors are high. There are often irreconcilable differences between the production estimated from harvest data and production estimated from household and industry consumption. . In Rwanda, household consumption data collected during a living standards measurement survey (LSMS) were combined with information on industrial processing to develop a rough estimate of domestic production of key fruit and vegetable crops to help establish new baselines for national accounts, but this method is limited as the infrequent conduct of the LSMS does not permit annual monitoring of trends. It will also over-estimate production if there are unrecorded imports of the consumption goods, such as beans in Rwanda. There are both methodological and funding issues involved in collecting better data on these sectors.

4. WHO DOES WHAT?

The basic crop forecast and production surveys tend to be implemented by some combination of a central statistical service (based in the Ministry of Finance or Planning or attached to the President's Office) and/or a statistical unit in the Ministry of Agriculture.[3] The literature is replete with discussions about what institution has the comparative advantage for collecting these basic agricultural statistics (see Box 1).

A historical review of these statistics in the four case study countries shows that in each country there has been overlapping of efforts, with the MOA tending to use non-sampling methods to collect information for the early crop forecasting and the Central Statistics Office (CSO) using statistical sampling methods to develop definitive estimates of the total production for the national accounts. Strictly speaking, the multiple efforts are not duplicative because they use different methods and have different objectives, but the benefit to the overall system of having these multiple efforts is not clear given a general failure to synthesize and reconcile differences in estimates obtained from the different approaches.

Box 1
Perceived Strengths and Weaknesses of CSOs and MOAs for Collecting Agricultural Production Data

The usual arguments in favor of the central statistical office are that they use statistically rigorous procedures and professional enumeration staff and therefore get more accurate estimates by reducing sampling and non-sampling errors. The argument in favor of the MOA is that they are closer to the users of the data so they can better design the surveys to respond to their needs and more easily communicate the results. There is also the question of relevant skills among the staff. CSOs are staffed primarily by statisticians who have little knowledge of agriculture making it difficult for them to design appropriate methods, supervise data collection and evaluate the quality. On the other hand, the MOAs tend to be staffed by agronomists and economists who have inadequate statistical training to use appropriate sampling techniques and to understand the issues involved in sampling errors and related analysis.

When MOA collects data, there may be greater likelihood of MOA analysts using the data, as in Mozambique, but collaborative survey efforts as in Zambia, can also produce the same results. When there is insufficient staffing for analysis in MOA, it is clear that data analysis will be limited, for CSO rarely have the mandate for anything more than simple cross-tabulation analysis of the data. The allocation of analytical responsibility to MOA and participation of university research centers may be the best approach to getting both quality of analysis and contributions to policy decisions. In the absence of analytical capacity in MOA, CSO or Ministries of Planning may be able to ensure analysis.

Neither institution has any particular advantage regarding enumerators. In Zambia, the Provincial CSO hires enumerators on contract for a given survey among people available within the province. In Mozambique MOA does the same. Experience shows that it is the training and the supervision that makes a huge difference, and combining specialists in survey design and training with agricultural specialists is key. Problematic topics such as land area measurement and crop production recall or measurement are best dealt with using such a team approach.

[3] Each country has a different name for the central statistical office, for the Ministry that covers agriculture and for the statistical unit in this Ministry. To simplify the presentation, we use the acronym CSO (Central Statistical Office) to refer to any type of national statistical service that is not a sectoral subunit attached to the line ministries, and MOA (Ministry of Agriculture) to represent the various ministries with responsibility in the agricultural sector (e.g., Ministry of Rural Development, Ministry of Agriculture, Livestock and Fisheries, etc.), and ASU (agricultural statistics unit) to represent a unit within the MOA with responsibility for statistics. In addition, there are national (Famine) Early Warning Units which we term FEWU (famine early warning units)

In Mali, a decision was made in the mid-1980s (after multiple years of conflicting reports) to assign both tasks to the CSO. The CSO took the lead but worked closely with the MOA until 2004/05 when the lead role was transferred to the MOA following substantial investments by FAO and the WB in building MOA statistical capacity. The interesting result in Mali is that despite a lack of legislation clearly defining the roles of the CSO and the MOA, there has generally been very good collaboration between the two institutions, with CSO taking the lead on statistical issues and MOA taking the lead on the more technical agricultural issues. This collaboration appears to be the result of those charged with doing the work in the two institutions developing their own arrangements due to an absence of clear legislation. The existing legislation actually assigns many of the same tasks to both the CSO and the MOA and offers no discussion of how the two units should coordinate their work.

In Zambia, there is a different approach to CSO/MOA collaboration whereby the MOA contracts to CSO to conduct the final crop forecast and post harvest surveys. MOA staff from the Policy and Planning Branch participates in these surveys, particularly in the design stages, but the main responsibility for implementation, including field staff and data personnel, lies with CSO. MOA also conducts its own preliminary crop forecast using extension service personnel who collect information at the local level that is aggregated to the District, Province and National levels by the Famine Early Warning Unit (FEWU) in the MOA. The difficulties with crop forecasting will be discussed later, but a key issue is the weak links between the forecasting work with MOA staff and the CSO household survey results.

Despite the major role played by the MOA and/or the CSO, all countries have agricultural subsectors that are not well covered by the crop forecast and post harvest surveys. Most notably are sectors that are managed through special government services or private sector developers (e.g., the irrigated rice production systems and the cotton parastatal in Mali, the cotton and tobacco sectors in Zambia, the coffee and tea sectors in Rwanda and the cotton, sugar and cashew sectors in Mozambique). The agencies managing these sectors usually provide crop forecasts and/or definitive production statistics to the government that are combined with the survey data collected on other crops.

In general, the MOA and the CSO have no legal authority to impose any particular methodology on the offices reporting these production statistics, so in some cases (e.g., rice production estimates in the *Office du Niger* and Malian cotton company estimates of cereal produced by cotton farmers) the numbers are not considered reliable by the statistical services. In Mali, efforts have been underway to get the irrigated rice production zones to adopt the MOA sampling and crop estimation procedures. For cotton production data the MOA relies entirely on the cotton company but for production of other crops in the cotton zone the MOA does its own surveys and estimates. In Zambia, CSO attempts to incorporate large-scale commercial agriculture in the annual post-harvest surveys, but response rates to the long, detailed survey have been extremely low, and there are current efforts to modify this part of data collection. For plantation and estate crop production in Southern and Eastern Africa, there is often no link between either MOA or CSO for the production estimates. National accounts experts work directly with industry agencies for data, usually based on reporting by the large growers and processors, but the methods and quality of such data are variable. For example, in Mozambique, sugar cane production is based on estimates from the institute responsible for the promotion of commercial agriculture, formerly the Sugar Institute.

The greatest propensity for overlap, duplication of efforts, and conflicting results is with the crop forecasting and production estimates used to assess the food security situation. The competing actors at the data collection level are primarily the CSO and the MOA, but there are often government and donor assessment missions to hot-spots or vulnerable zones that also assemble information. In some countries (Mali, for example), there seems to be a reasonably good working relationship between the CSO and MOA and between them and the various services that conduct Famine Early Warning assessments, although this does not eliminate uncertainty over the estimates and their implications for food security interventions (e.g., the 2005 season characterized by local droughts and locust infestations). In Zambia, one sees less integration of MOA/CSO effort with two parallel data collection systems running with different methods and more frequent production of conflicting assessments, with the national Vulnerability Assessment Committee in recent years working to understand the differences and bring people to the table. In Rwanda, MOA has responsibility, with CSO input, to implement both crop forecasting and post-harvest surveys, but in the past the crop forecasting and resulting food balance sheet have been developed with poorly documented systems and a process that is not transparent, responding to pressure from policymakers and politicians to present results that meet their expectations. These numbers are often then used as official production figures and not reconciled with the later results from post-harvest surveys. However, there are recent efforts to overcome this difficulty.

The Mozambique case is unique in that the main coordination problems are within MOA, where there are two key units involved. First, the Department of Statistics (within the MOA Directorate of Economics) is charged with the responsibility for all agricultural statistics (in coordination with the CSO), and conducts the annual production surveys of smallholder agricultural. Second, the National Early Warning Unit (NEWU) (in the MOA National Directorate of Agriculture) is charged with crop forecasting. Part of the reason for the separate units has to do with technical assistance, for FAO project assistance was focused on early warning functions and food security, and so a separate unit was established in an overreaching directorate of MOA, rather than within the Department of Statistics. As a recent assessment of national agricultural statistics found (Kiregyera et al. 2007), there is very little connection between the two MOA units, and estimates can be dramatically different, especially at the provincial level. Methodologically, the Department of Statistics smallholder surveys respect statistical principles, with the ability to estimate sampling errors and distributions. The NEWU statistics were originally designed with such properties, but as of 2000/2001 season, NEWU does not have the resources to implement the prescribed data collection procedures. NEWU estimates are available earlier in the year and the production values are often higher than the survey-based production estimates of the Dept. of Statistics, something that politicians may find more acceptable as the data indicate progress. Until 2001, this combination of factors led the Government to use the NEWU data as the final production estimates for the eight commodities covered in NEWU. Since 2000/2001, the MOA Department of Statistics has improved the national smallholder survey both in terms of timeliness and accessibility, and these statistics now replace the NEWU forecasts as the standard reported production figures for many commodities in the national accounts.

Across the countries, we have not identified any particular type of institutional arrangement that fosters better coordination of efforts by CSO, MOA, and others involved in producing and analyzing agricultural statistics. An assessment of the legislation in Mali concerning the roles and responsibilities of CSO and MOA was highly critical, noting that different legislation assigned the same tasks to both institutions; yet the actual working relationship between the two institutions was praised and the collection of agricultural statistics considered to be much better managed than that for other sectors. The recent transfer of

responsibility from the CSO to the MOA in Mali was accompanied by an effort to render operational a number of committees that had previously been set up to coordinate statistical work; the MOA believes that more regular meetings of these committees has improved collaboration and the quality of the work.

In terms of institutional organization, there may be some benefits to organizing CSOs by subject matter area (e.g., health, agriculture, education as in Zambia) rather than by functional areas (monitoring and evaluation, methods and analysis, demographic statistics, annual statistics, computer sciences, as in Mali). For example, the new CSO in Rwanda, known as the National Institute of Statistics, was organized primarily on subject matter lines, based on evaluation of experience elsewhere. This type of organizational structure is particularly important when the CSO has major responsibility for conducting agricultural surveys. Even when the main focus of CSO activities is to generate information for the national accounts, having specialists in agricultural data is valuable. The subject matter form of organization permits CSO staff, comprised largely of statisticians, to develop expertise in skills of relevance to the agricultural sector. Such expertise contributes to better supervision of data collection efforts and greater ability to spot data problems (e.g., improbable results, inconsistencies among variables).

For the data and information produced by others (customs, Ministries of Commerce, meteorological services, national research centers, directorates of livestock and fisheries, and the non-agricultural surveys of the CSO), the problem is more one of coordination in managing the data systems to reduce the costs of gathering the data and information needed for specialized analyses. We found little evidence of any systematic effort to create and make available to analysts multi-year data files that consolidate for example, data on production, price, weather, trade, input use, output marketing and household characteristics (demography, assets, access to transport and communications infrastructure). In 2001, Mali's MOA published a compendium of 17 years of statistics of relevance to the agricultural sector (demography, crop production and yields, areas planted, rainfall, hydrology, input use, imports and exports of principal food products, livestock numbers and slaughtering, transport costs, crop and livestock prices) in both hard copy and CD formats. This was a useful document used and cited by many, but the CD was not designed in a manner to facilitate rapid transfer of the data to software for statistical analysis and the publication was a one-shot effort with no updates issued subsequently. Even those wishing to combine data from annual surveys to do multi-year analyses are challenged as there is little systematic effort to use the same variable names or the same file organization from year to year (e.g., the case of Mali's annual crop production surveys). The Food Security Research Project of Michigan State University (FSRP/MSU) in Zambia continues to work with CSO and MOA to develop comprehensive datasets from at least 1996 to the present, including panel data of smallholders' production, assets, and income; price data; climate data; information on soils and crop suitability regions; accessibility; and other factors used in policy analysis. Naming conventions, file organization and documentation are designed specifically to assist in combining datasets for analysis, but this effort has not yet been institutionalized in Zambia.

In Rwanda, first with the Ministry of Finance Department of Statistics and then later with the new CSO, the household budget and expenditure data were developed and documented using meta-databases, in which the range of datasets and the necessary documentation to use them are linked by design, but for agricultural statistics, the system is under development. Prior to the genocide in 1994, MOA in Rwanda did have a database and was known for the quality of its agricultural statistics, but since then, MOA has struggled to re-establish systems. With donor support and technical advice, systems were developed from 1999-2001, but lack of

continued donor funds created yet another gap in information. In 2005/2006, the system was re-started with a donor initiative linked to the establishment of the new CSO and efforts to revamp the system for national accounts, with systematic documentation of data, an ongoing process. One of the goals is to enable an agricultural statistical system to provide the data to the local level for decision-making.

5. WHAT DATA COLLECTION METHODOLOGIES ARE USED?

Final estimates of agricultural production are calculated in all four countries studied from farm survey data collected using nationally representative sampling frames. Information on areas planted and anticipated harvests (both needed for crop forecasts) is collected using a variety of methods, including farm surveys administered to the same farmers contacted for production estimates. Because of the need to get crop forecasts early in the season, many less statistically rigorous data collection methods are also used (key informant interviews, non-random sampling, random sampling using a frame based on agricultural production zones rather than administrative divisions, etc.). These diverse sources of data as well as the use of different assumptions in modeling weather data often contributes to conflicting crop forecast results (e.g., Zambia in 1998 and 2005, Mali in 2005). Resolving the problem of conflicting crop forecasts and food security assessments requires greater collaboration among the various actors. This includes continued efforts to decide what weight to give to the different sources of and methods for obtaining information as well as the establishment of institutional mechanisms to protect those collecting and analyzing data from political pressure generated by government and food aid donors. As participants at the Internationale Weiterbildung und Entwicklung (InWEnt) Workshop in Zambia indicated, problems arise more from how the results of different crop forecasts and ex-post estimates are used, than from the methods themselves (InWEnt 2007). Using a preliminary crop forecast as a final production number, rather than an indicator of possible production, led to serious debates and policy decision problems in Zambia in 2005.

A current methodological challenge is the need to produce statistically representative results for local administrative units due to the decentralization process. Sample size increases are critical to reliable results down to local levels and the human and financial resources for such sample increases are often lacking. Mali estimates that it needs a sample size of 5000 farms to produce reliable results at the *cercle* level (third level down: national, regional, *cercle*). Due to budgetary constraints, this has been accomplished only once. Zambia officially increased its crop forecasting sample size from about 6,000 to 14,000 farms to obtain more reliable results at the district level (also the third level down: national, provincial, district), but in implementing this plan the CSO was late in reporting the results and it is not clear if such a large sample size can also be used for the post-harvest surveys, given the length and breadth of the post-harvest surveys and the time and resources needed to implement. If the full, comprehensive post-harvest surveys are conducted once every few years but the production and area data are still collected annually after the harvest, this sample size might be feasible. There are recent developments in statistical approaches that combine census data with sample surveys to create small area estimates (see Simler and Nhate 2005 for a Mozambican example), but such approaches require advanced skills rarely available within national statistical systems.

A second methodological challenge is getting reliable crop production estimates for crops that are not uniformly produced throughout the country. These crops are of increasing economic importance as countries diversify their agriculture, but applying random sampling techniques to national sampling frames based on administrative districts that do not take into account agro-ecological differences does not produce reliable estimates for many of these important crops. Zambia has been dealing with this challenge by over-sampling producers of particular crops, but results are not yet entirely satisfactory. In situations where the production of a particular crop is managed by parastatals or private sector firms, countries tend to rely on these structures to collect crop production and other related data and feed it into the overall crop estimates made by the CSO or the MOA. In most cases these estimates

are considered reliable, but the CSO/MOA have little say in methods used to collect the data and the increasing use of commodity production or purchase contracts between government and these institutions can provide perverse incentives for the institutions to inflate or deflate their yield or production statistics (e.g., *Office du Niger* in Mali and Food Reserve Agency in Zambia).

Resolving the problem of reliable estimates for smaller administrative units and localized crops is both a methodological and a budgetary issue. Methodological progress has been made and several countries have done small scale tests of new methods to collect livestock and horticultural data. Mali, for example is collecting information on household slaughtering of livestock (considered to account for a substantial portion of Malian meat consumption) and the MOA has designed and tested new methods for collecting production data for horticultural crops. Zambia has been using supplemental household surveys based on the post-harvest sampling frame to collect more detailed information on livestock production and product sales, as well as the production and home consumption/sales of some horticultural crops. In both Mozambique and Zambia, there are attempts to get more systematic counts of livestock through district agricultural agents, which may be cost effective if the counts are systematic. Given current budgets, trying to expand the sample size and crop coverage may not be a realistic goal, although both changes are justified by the evolving needs of policy analysts. One clear lesson from Mozambique is that delegating budgetary authority to local levels for national survey implementation leads to many problems and cannot be recommended (Kiregyera et al. 2007). Nevertheless, there is a need to improve local linkages to national surveys.

Another initiative entails developing special light surveys for seasonal or annual crop production, which are then complemented every three to five years with more complete surveys, similar to the idea of supplemental surveys. This follows the pattern being used in poverty monitoring in Mali, for example, where a detailed budget/consumption study conducted in 2001 was followed by a lighter survey in 2003 that only looked at access to services. However, in the cases of Rwanda and Mozambique, the light surveys that were developed were often similar in content to the previous agricultural surveys and so not very light. There is a continued need to evaluate agricultural sector data collection to identify priorities for such annual or seasonal surveys. Many aspects shift gradually over time, including household demographics and assets, and are able to be collected every few years without a major loss of information, thus reducing needs for annual data collection. However, given current demand for measurement of MDGs and other goals, national governments may be reluctant to reduce the amount of information collected in what is a key sector of the economy in Sub-Saharan Africa.

Other surveys of relevance to agricultural policies include the LSMS and similar types of income/consumption studies. Examples are the *Enquête Malienne d'Evaluation de la Pauvreté* (EMEP) which collected detailed food consumption and household expenditure data in conjunction with PRSP monitoring activities. The consumption results of these studies are frequently used in combination with import/export and manufacturing data to develop rough estimates of domestic production of crops not well covered by the crop forecasting and harvest surveys. For example, the LSMS conducted in Rwanda and Mozambique collected detailed consumption data which has been used for indirect estimates of fruit and vegetable production. Where they attempted measurement of total production in LSMS, there were problems, for the analysts and statisticians were not adequately aware of the difficulties in measurement of agricultural production. The methods for collecting consumption data were carefully developed within the LSMS context and can provide more reliable information on

production for home consumption, a guideline for minimum production estimates. The estimates are rough and only recommended for use at the national level. They are also subject to error if there are substantial unrecorded imports of consumption goods that are produced locally as well. These surveys are also valuable in indicating new trends in food security and potentially in production, as households shift consumption and production with policy and prices.

We began this report noting that efforts to reduce poverty and meet the MDGs have put increased demands on national statistics systems to monitor key indicators of poverty and investments designed to reduce poverty. We found that most PRSP systems rely heavily on the CSO and Ministerial level data collection services for indicator reporting, although there are supplementary surveys that have been developed as part of the PRSP. These supplementary surveys tend to be conducted every few years to collect household level data on access to services (education, health, markets, transport) and perceptions of changes in well-being (e.g., Core Welfare Indicators Questionnaire (CWIQ) surveys in Mozambique and Rwanda or the *Enquête Légère Integré après des Ménage* in Mali). A review of Mali's PRSP M&E system notes that it continues to struggle with the definition of an appropriate set of agricultural and environmental indicators (CSLP 2005). At present the effort to keep the overall set of PRSP indicators reasonable and the heavy focus on health and education has resulted in the agricultural and environmental sector in Mali being monitored by four basic indicators:

- Cereal production (MOA drawing on own surveys for coarse grains and development agencies managing irrigated production for rice);
- Cotton production (MOA drawing on cotton parastatal data);
- Irrigated areas (MOA drawing on data from irrigation offices to track growth in irrigated areas under full water control); and
- Area reforested (from statistics on formal projects covered by Forestry Service so that informal efforts by individuals or Non-governmental organization (NGOs) are poorly documented).

In the case of Mozambique, the QWIC survey (known as QUIBB in Mozambique) of 14,500 households is conducted by the CSO in collaboration with the Ministry of Plan and Development, but agricultural production is not included. The CWIQ survey is only eight pages (compared to 30+ for the agricultural household surveys) and focuses more on general welfare indicators, such as literacy, access to medical care and education, assets and effect of recent disasters (floods), sources of energy, and other factors. Assets and overall ability to meet consumption needs, as well as proxies related to poverty and income, are useful for policy analysis and looking at poverty trends. The challenge is to link those trends to changes in the agricultural sector which are not captured in the CWIQ.

Other problems facing the PRSP include a lack of baseline data for numerous variables, poor measurement of and ability to link actual performance to investments or policies, reliability and coherence of data due to the multitude of sources, weak capacity in the various institutions that are contributing data and indicators, superficial analysis of data from PRSP surveys, and inadequate financing (CSLP 2005). While these problems exist across all sectors, the agricultural sector often performs better than others in reporting the current set of PRSP indicators and in terms of having an established baseline.

6. WHAT ARE THE STRENGTHS AND WEAKNESSES OF WHAT IS PROVIDED?

We answer this question by looking individually at four categories of data: production statistics for national accounts and monitoring economic growth, crop forecasts for food security monitoring, market information, and supplementary surveys.

Most countries do a reasonable job of reporting statistics on the production of traditional cash and food crops for use in national accounts and as indicators for monitoring economic growth and poverty reduction. Timeliness of these estimates does not seem to be a serious problem, although budgetary constraints can delay implementation with the consequence that crop forecast results may be used in national accounts because of delays in analyzing the sample-based production data.

Most countries are just beginning to expand their crop production reporting to cover diversification crops of growing importance. Reliability of these estimates is generally not good and countries continue to experiment to resolve both sampling and measurement issues.

Our four-country review of crop forecasting, Famine Early Warning Systems and food security assessments identified a number of problems across the countries studied:

- Multiple types of data collected with poorly established procedures for combining and weighting the different sources of information;
- Conflicting estimates due to different methods of data collection and analysis;
- Conflicting interpretations of food security implications due to political concerns;
- Lack of timeliness in reporting statistically reliable survey based data;
- Failure to take into account changing dietary patterns when estimating food needs; and
- Political maneuvering and contradictory interpretations by donors and/or governments, particularly in interpreting the food security implications of the results.

An FAO study of the FEW systems in nine African[4] countries noted similar problems:

> …early warning information is often criticized for lacking analytical rigour and for relying on one-shot assessments with no systematic monitoring of the food situation. Many users observe that analysis can be subject to political interference from both governments and donors, while information is often communicated with considerable delay and with minimal regard for users' priority information needs. The result is often increased reliance on information products of international technical partners and late responses to emergency situations as different stakeholders undertake independent assessments to corroborate or refute inadequate national early warning system (EWS) information. (Tefft, McGuire, and Maunder 2006, page 29).

Factors identified as contributing to poor performance and an over-reliance on food aid include:

> … a bias toward cereal availability, inadequate attention or capacity to analyze factors related to food access and utilization (e.g., incomes, markets trade, nutrition and health); failure to take into account diverse livelihoods (e.g., pastoralists) and coping strategies. (Tefft, McGuire, and Maunder 2006, page 29).

[4] Burkina Faso, Mauritania, Niger, Angola, Namibia, Zambia, Eritrea, Ethiopia, and Kenya.

The authors note that methods used in the more effective systems tend to be based on a livelihoods orientation and to incorporate both quantitative and qualitative aspects (i.e., triangulation). In the four countries covered for this study, a move toward a broader food security or livelihood approach in food security analysis is evident in Mali, Zambia, and Mozambique. Also, the FAO study found better performance was associated with external, technical support and financial commitment being provided in a longer-term, collaborative and integrated manner, rather than as a separate project with a limited duration. This finding is confirmed by the current study, which documented several problems of inadequate staff capacity and irregular funding for a range of statistical services because of the stop-go nature of project funding cycles.

Both the FAO study and our four-country review have identified a need for greater transparency and a more participatory approach to help the various actors reach consensus on the food situation and speed up decisions about remedial actions. The efforts at developing national Vulnerability Assessment Committees (VACs) as multi-stakeholder groups that can review and openly debate methods and results may help to improve coordination, however, the ability of these groups to be effective on technical issues may be limited by political considerations and debate. In Mozambique, bringing together the functions of forecasting and ex-post production assessments was recommended to ensure the linkage between the two, as well as introduce greater rigor to the crop forecasting exercise.

Market information systems (prices, flows of commodities) are variable across countries. In Mozambique the market information system (MIS), known as SIMA, represents a public system that systematically collects prices and supply information in selected markets throughout the country, reporting them on a weekly basis through a variety of diffusion channels, including newspaper, radio, internet, and television. It is a rare case of a public system that has consistently worked to develop a price database for policy analysis while responding to trader and producer needs with reliable and timely information. Sustainability remains a challenge for this system, because it is within a government bureaucracy. Administrative systems present constant blocks to innovation and initiative, increasing the risk of losing trained staff.

The MIS system in Mali demonstrates innovations that result in its ability to be more flexible and responsive to a whole range of stakeholders, including both public and private sector. Some of the key strengths of the MIS in Mali:

- high user confidence and support (farmers and traders have lobbied the government to fund the public goods aspects of the system on a regular basis);
- emphasis on diffusion, including local level diffusion, with timely and reliable data collection and basic analysis;
- flexibility of operation permitting the conduct of special studies on short notice (e.g. market assessments in conjunction with food security monitoring);
- generation of revenues for some operating expenses to help ensure longer term sustainability; and
- responsiveness to changing needs of users, from both the public and private sectors.

The institutional organization of the MIS in Mali is unusual. It is attached to the National Chamber of Agriculture (a non-governmental organization) and operates at the local level through collaborative arrangements with the decentralized regional and local chambers of agriculture. Based on a contract with the government, the system receives public sector funding for basic operations. Although a similar structure may not be appropriate or feasible

in other countries, the Malian example illustrates that it is possible to develop an alternative to the more common government-based and/or donor-funded MIS that are so often found lacking (Shepherd 1997).

A key challenge for MIS is that there are multiple users with very different needs, as documented in recent work (Weber et al. 2005). While some users are simply looking for a price database, similar to the price data collection of CSO in Zambia, farmers and traders may wish more strategic information and data lose value for every day delay in diffusion. While there is duplication of effort, the Zambian de facto approach of focusing MOA efforts on meeting private sector needs (rapid price and flow information) and CSO efforts to meet statistical needs (e.g., price indices) may be reasonable, if not particularly cost effective. Given the weakness of staffing and performance in the MOA system for MIS in Zambia, the Zambian National Farmers Union (ZNFU) is also working to meet farmer information needs using new communication technology. Having the MIS within a Statistical Department, as in Mozambique, makes for a constant struggle between producing information needed by statisticians and analysts versus information needed by the private sector (traders, processors, and farmers), but the system has been able to meet needs by remaining a special team within the statistics department. Mali's MIS has been able to meet the range of needs due to its flexibility, budgetary autonomy, and adaptability—aspects difficult to achieve within a Ministry setting.

Supplementary studies that add to the agricultural statistics data bases have been limited in the past, but are increasing in number. Analysts at Michigan State University are working with such datasets (most are panels) in Zambia, Kenya, and previously in Rwanda, while in Mozambique, MSU analyst are working with additional components that were included in the regular national agricultural surveys. The World Bank and other donors are supporter similar activities in Uganda, Malawi and elsewhere. In addition to supplementary surveys based on national sampling frames, there are other relevant studies funded by short-term projects or donors paying consultants for various types of agricultural sector assessments.

In general, there remains a need to develop a library of these studies or maintain copies of the data bases and documentation in a centralized location within MOA or CSO. In the case of Zambia, Rwanda, and Mozambique, USAID has funded projects that provide technical assistance for the development of agricultural statistics or policy analysis units. These projects often conduct supplementary studies using national agricultural sampling frames or subsets of them. These data often become part of the national data base, but access by analysts and researchers outside the projects is less likely. Use of the data by students working on academic papers seems more common than use by government policy analysts, except where expatriate analysts are working directly in collaboration with the policy analysts. While there are efforts to train public sector analysts in the development and use of these datasets to ensure that the policy debates benefit from analysis of the datasets, the public sector has a difficult time with staff retention once the analysts have the quantitative skills, and building human resources is a long term need. In other cases, project-funded work produces data bases that touch on agricultural issues (e.g., USAID-funded study of the Linkages between Child Nutrition and Agricultural Growth in Mali), but the sampling frames are project-specific and the data therefore difficult to use in combination with the more standard agricultural data bases. Nevertheless, it is our view that documenting these various types of data bases and making them available in a central location could contribute to improved agricultural policy analyses.

7. HOW COULD THINGS BE IMPROVED?

7.1. Institutional Structures and Relationships.

In general, we find no evidence that one institution is more appropriate than another for collecting and reporting basic agricultural statistics and food security assessments. Both CSOs and MOAs (or both working collaboratively) have demonstrated the ability to produce the necessary statistics when they have been given an adequate budget and staff for the assignment. This is not to say that institutional arrangements are not important! At present, we find a variety of institutions playing the lead role in the collection and analysis of one or more of the basic sets of agricultural data; CSO, MOA, and Food Security Offices attached to the President or Prime Minister's office are the most common. Each have certain strengths and weaknesses (see Box 1), but rather than arguing that a particular institution is better than another regardless of context, it is more appropriate to identify the factors that need to be present for an institution to fulfill its mission of providing agricultural statistics and information.

In the specific case of EWS, the following institutional characteristics tend to be associated with better system performance (Tefft, McGuire, and Maunder 2006, page 31):

- positioning that is conducive to a reciprocal flow of information with the primary decision-making bodies involved in emergency actions and food security programming;
- administrative ease to access primary and secondary data from the decentralized offices and line ministries;
- managerial independence and analytical autonomy that allows a EWS to independently carry our its mission with minimal bureaucratic obstruction or political interference;
- regular communication with, and input from, decision-makers;
- the ability to recruit and train a diverse group of food security analysts who can address the evolving nature of EWS work, particularly in terms of a multi-sector orientation; and
- the opportunity to procure sustainable sources of funding from the national budget.

While the above list was developed with EWS in mind, with minor modifications the key points are also relevant for the systems performing other agricultural statistical tasks.

Our four country studies have shown that the two greatest challenges are getting the right mix of expertise among the staff of whatever institution is charged with a particular task and obtaining an adequate budget. To collect and report reliable agricultural statistics, one needs a combination of statistical and subject matter expertise. This can be obtained by having CSO organized by subject matter areas and either hiring a mix of statistical and subject matter expertise or offering subject matter training to statisticians operating at all levels of the system. It can also be obtained by giving the task to the MOA and improving the statistical capacity of their staff. A third option is concentrating statistical expertise in the CSO and subject matter expertise in the MOA while developing collaborative protocols to make sure that the appropriate mix of skills is available for the various tasks (e.g., more agricultural skills for training interviewers to measure variables correctly and to identify data points that do not make agronomic sense; more statistical skills for designing the sampling frame and weights and conducting statistical analyses). In the latter case, better collaboration will probably occur if the staff of each institution has some training in both subject matter and

statistical topics. To obtain the right mix of staff and a budget for them to perform their duties, the first and fourth points mentioned in the bullets above are important: favorable positioning of the institution *vis à vis* its decision-making clients and regular communication with these clients. Improvements in these areas will contribute to making the collection and analysis of agricultural statistics more demand-driven. As the systems become more responsive to user needs, they will build the stakeholder support necessary to obtain reliable support from the government budget.

There is also the question of whether there should be institutional specialization in macro vs. micro data. For the most part, the underlying data for macro level analyses (e.g., crop, livestock, and fisheries production data and prices for calculating agricultural GDP) are coming from household-level surveys conducted by either CSOs and/or MOAs or from MOA internal reports, with a unit of the CSO responsible for using the data to calculate the macro indicators. We have not found any serious critiques of this distribution of responsibilities. On the other hand, there is very little evidence in the four countries studied that much data analysis (either macro or micro) is being done beyond the production of the standard set of annual statistics. In our view this lack of *value-adding* activity represents a serious weakness which needs to be addressed if policy making is to improve. Macro analyses using aggregate national data that involve agricultural statistics as well as other types of data might best be conducted by analysts in the Ministry of Planning (or equivalent Ministry) or in CSO where they have access to a full range of data across the various sectors of the economy and are trained in the use of Computable General Equilibrium (CGE) and other modeling techniques (e.g., the types of analyses and modeling that CAADP/NEPAD are proposing).

Micro analyses to better understand farm-level dynamics and local agricultural markets might best be done by multi-disciplinary analysis units in the MOA. In some cases, university research institutes may be developed independently from MOA (e.g., Zambia) or within an agricultural research institute (e.g., Senegal, where there is an agricultural policy analysis unit in the NARS and also in the MOA). One of the challenges in many countries is generating demand for microeconomic analysis if there is no strong history of using such information. An agricultural policy analysis unit with strong demand from the Minister, the Legislature, and other stakeholders can only develop where capacity is built and output generated that gains the respect of policymakers over time. Donor funding for such units over a relatively long period of time (8-15 years) has been important in several countries due to the time lag between investments in capacity building and ability to collect and analyze data. We have noticed that some of these units created with donor support 10-15 years ago are now experiencing staffing problems as those initially trained approach retirement, leave for international and nongovernmental organizations, or become victims of HIV/AIDS and other illnesses. Capacity building for specialized skills in data collection and policy analysis may be an area of donor investment that will be needed for several generations.

7.2. Coordinating Mechanisms

The FAO assessment of the EWS noted a need for developing linkages between EWS information and analysis and that used for long-term development in an effort to address the underlying structural factors contributing to food insecurity. The PRSP process also needs to coordinate actors across multiple ministries and services as it relies heavily on data from line ministries for its indicators. In countries where the CSO and the MOA are both directly involved in the collection and analysis of agricultural statistics there have been a variety of efforts to establish coordinating committees, many in connection with particular projects or

FAO/WB recommendations, such as the VACs. To date, most of these committees do not get high marks. They meet infrequently, they tend to act as rubber-stamps, and their responsibilities are not clearly defined or are overlapping with those of other institutions. A problem with some of these committees is that in an effort to be all-inclusive (e.g., including representatives of civil society from women's and youth groups) many committee members lack the competence to discuss the survey and statistical issues being presented for approval. Although these committees are generally not functioning well, it is clear that there is a need for inter-institutional coordination. More thought needs to go into the design of the various committees and the assignment of responsibilities. Perhaps more and smaller committees with narrowly defined roles rather than large committees that meet once or twice a year and are expected to fulfill all the coordinating needs of the various actors and stakeholders.

7.3. Capacity Building

There is a need for capacity building among those producing the data and analyses as well as among the intended users (e.g., donors, policy makers), as indicated earlier. Most statistical units, whether in the MOA or the CSO, are understaffed, under-funded for operational activities, and underpaid, causing good personnel leave for better paying jobs. The result can be unmotivated staff without the skills to deal with complicated sampling issues. Statistical units have often developed staffing plans that include the upgrading of skills for existing personnel and hiring new personnel; few of these plans have received the funding necessary for implementation. As decentralization efforts spread, the need for statistical skills at the decentralized level is likely to increase.

In addition to the problems of capacity building among staff responsible for the collection and analysis of agricultural data, we have found that a major constraint to increasing use of and confidence in statistical data on agriculture is a weak understanding among agricultural policy makers of how sampling works (how the results differ from non-sampling approaches) and how to interpret survey results. The problem is exacerbated in some cases when sampling and or weighting problems produce questionable results and the source of the problem is not understood by users (the case of Zambia, for example). This highlights a need for developing an appreciation of statistical methods among the potential users of the data as well as the need to resolve sampling and weighting problems rapidly so users do not lose confidence.

7.4. Budgets for Agricultural Statistics.

We have not done any type of systematic analysis of funding for agricultural statistics in the four countries covered, yet there is ample circumstantial evidence that funding levels fluctuate significantly from year to year (forcing changes in sample sizes and methods that are not always appropriate). Furthermore, funding has been far from adequate to cover the improvements being sought in most countries (e.g., representative results at lower levels of administrative disaggregation, a wider range of products covered, more information on sub-sets of the population of particular importance for policy such as women and the poor). Funding for most statistical efforts is a combination of donor and national resources. It is not clear if the relative share of government versus donor funding has any impact on the adequacy and the reliability of the funding stream. In Mali, the government picks up a much larger share of the statistical work for agriculture than for other statistical work (generally about 80% of the annual agricultural survey versus only 17% to 24% for poverty assessments surveys such as the *Enquête Malienne d'Evaluation de la Pauvreté* (EMEP). Donors tend to

support capacity building and efforts to improve data collection methods, while the GOM supports the costs of implementing surveys. In recent years, this has meant numerous studies and trials to improve statistics on the horticultural and livestock sectors, but no funds to begin implementing on a regular basis the new methods. Another common issue is the timing of operational funds for implementing surveys. Frequently the Ministry of Finance does not disburse funds when requested, and CSO and MOA scramble to pull together activities to avoid access problems or to mitigate problems with extended recall. In the end, the data collection is delayed, as are the results, making it even more likely that government officials will use forecasted agricultural estimates, rather than the more accurate ex-post survey estimates.

8. CONCLUSIONS

The agricultural statistics systems in the four countries studied (Mali, Zambia, Mozambique, and Rwanda) are more solid in terms of data quality and more relevant to the policy process than the systems that were in place in the 1970s and 1980s. This said, the study has identified many areas that need continued improvement. In general, the weaknesses observed in the agricultural statistics systems appear to be more a function of inadequate budgets than institutional organization. It is noted, however, that in some cases different types of institutional arrangements may contribute to building greater stakeholder involvement, which can lead to increased budgetary support.

Progress has been made in terms of the timeliness and the reliability of the annual crop and livestock production statistics for all four countries, although there are still major problems regarding sampling and measurement in some cases. Crop forecasting and food security assessments are also improved, but continue to exhibit some problems due to inadequate coordination among the multitude of actors, conflicting methods and results, and some political interference. Results are mixed across countries in terms of market information systems, with strong performance in Mali, relatively good performance in Mozambique, and weaker performance in the other two countries. Institutional arrangements have contributed to Mali's relative success in this particular area of agricultural statistics. In terms of monitoring economic growth and poverty indicators for the PRSP, the agricultural sector appears to be performing better than other sectors in terms of basic reporting. It must be noted, however, that the demands on the agricultural sector in terms of number of indicators are less than for key social services sectors such as health and education. The appropriateness of the agriculture and environment indicators being monitored has been questioned, however, due to the limited number of indicators and a poor understanding of the relationship between poverty and the indicators being used.

A weakness in all systems is their ability to respond to the demand for more disaggregated data (e.g., statistics that are representative for increasingly smaller administrative districts and for target groups of interest such as women and youth). Another weakness is the inability to produce reliable statistics on the increasingly wide range of agricultural production activities that generate income for rural households (e.g., livestock and horticultural products).

The conduct of supplementary surveys dealing with particular issues of relevance to the agricultural sector (e.g., HIV/AIDS, links between agricultural productivity growth and poverty reduction) has resulted in the development of panel datasets that can inform key policy debates. However, the lack of incorporation of such surveys into a national strategy and the lack of analysis by government analysts and other local institutions represents a lost opportunity. This lack of analysis spreads across the entire agricultural statistical system, calling to question the relevance of these statistics to the policy process. This is further exacerbated by a poor understanding of statistical methods and the benefits of sampling versus informal surveys on the part of decision makers.

In moving forward, the most critical institutional issue is mobilizing funding to build and maintain capacity and to conduct the larger and more complex data collection and analysis activities being requested by stakeholders in the agricultural statistics system. Instead of focusing on questions about which institutions (e.g., national statistical offices or ministries of agriculture) are the appropriate ones for delivering statistical services, there is a need to develop a joint strategy among all the actors in the agricultural statistics system to fund (a) the foundation work involved in collecting the basic data, documenting it, and issuing annual

reports of descriptive statistics and (b) the policy analysis that adds value to the foundation data through supplementary analyses and/or surveys.

The key institutional actors in the foundation work will normally be some combination of the national statistics office and the ministry of agriculture. To the extent that stakeholders are asking for the expansion of the foundation data to include new products and new levels of disaggregation, they should be expected to contribute to the increased funding needed to accomplish these goals. The potential institutional actors for the policy analysis and supplemental survey work are numerous, including the NARS, universities, planning units in the ministry of agriculture or other relevant ministries (plan, environment, finance, etc.), or donor-funded projects as well as those institutions building the foundation data bases. To date, there are few examples of successful collaboration among all these institutions that has resulted in the regular production of policy relevant analyses and reports; most efforts in this area have been through donor-funded projects that fail to develop independent funding mechanisms. It is our view that the central statistics offices and statistical units in the ministry of agriculture should not be expected to be the only actors conducting policy analysis. The primary role of these two institutions should be making sure that there is a reliable set of basic agricultural data available and well enough documented for others to use. A reliable stream of funding for both the foundation work and the supplementary surveys and analyses will become available only when the foundation data are made available to others and used by a wide range of institutions for more in-depth analyses that contribute to ongoing policy debates.

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APPENDIX 1: AGRICULTURAL STATISTICS IN ZAMBIA

Appendix 1

Agricultural Statistics in Zambia: Institutional Arrangements for their Production and Use

by

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LIST OF ACRONYMS

ACF	Agricultural Consultative Forum
AMIC	Agricultural Market Information Center
AMIS	Agricultural Market Information System
ASIP	Agricultural Sector Investment Program
ASMIS	Agricultural Statistics Management's Information System
CFS	Crop Forecast Survey
CPI	Consumer Price Index
CSA	Census Supervisory Areas
CSO	Central Statistical Office
DRC	Democratic Republic of the Congo
FANR	Food, Agriculture and Natural Resources
FAO	Food and Agriculture Organization of the United Nations
FBS	Food Balance Sheet
FEWSNET	Famine Early Warning System Network
FHANIS	Food, Health and Nutrition Information System
FNDP	Fifth National Development Plan
FRA	Food Reserve Agency
FSRP/MSU	Food Security Research Project/Michigan State University
GART	Golden Valley Agricultural Research Trust
GOZ	Government of Zambia
HIV/AIDS	Human Immunodeficiency Virus/ Acquired ImmunoDeficiency Syndrome
IMF	International Monetary Fund
INESOR	Institute of Economic and Social Research
InWEnt	*Internationale Weiterbildung und Entwicklung gGmbH* (German Capacity Building Center)
IRIN	Humanitarian news and analysis service of the UN Office for the Coordination of Humanitarian Affairs
LCMS	Living Conditions Monitoring Surveys
M&E	Monitoring and evaluation
MACO	Ministry of Agriculture and Cooperatives (formerly MAFF)
MAFF	Ministry of Agriculture, Forestry and Fisheries (now MACO)
MIS	Market Information System
MOA	Ministry of Agriculture
NEPAD	New Partnership for Africa's Development
NEWU	National Early Warning Unit
PHS	Post-Harvest Survey
SADC	Southern Africa Development Community
SARCOF	Southern African Regional Climate Outlook Forum
SEA	Standard Enumeration Areas
SS	Supplementary Survey to the Post-Harvest Survey
USAID	United States Agency for International Development
WFP	World Food Program
ZARI	Zambian Agricultural Research Institute
ZMD	Zambian Meteorological Department
ZNFU	Zambian National Farmers Union
ZVAC	Zambia Vulnerability Assessment Committee

1. INTRODUCTION: AN OVERVIEW OF WHO DOES WHAT AND HOW THEY ARE ORGANIZED

There are two key sources of agricultural statistics in Zambia: The Central Statistical Office (CSO) and the Ministry of Agriculture and Cooperatives (MACO)[5]. In addition, there are a number of actors who collect data and provide information to CSO and/or MACO for use in various types of reports and analyses; many of these actors are also users of statistics produced by CSO and MACO. This group of main actors includes the:

- Zambian Meteorological Department;
- Zambian National Farmers Union (ZNFU);
- Food Security Research Project managed by Michigan State University (FSRP/MSU);
- Agricultural Market Information Center (AMIC);
- Zambia Vulnerability Assessment Committee (ZVAC);
- Food Reserve Agency (FRA);
- The Cotton Development Trust and the Tobacco Association of Zambia; and
- Export Board of Zambia.

Since independence in 1964, Zambia has had a centralized statistical service with responsibility for a wide range of national statistical needs. The CSO is now headquartered in the Planning Division, which is attached to the Office of the President, and maintains a staff of statisticians at the Provincial level as well. CSO's mission is to "provide for a comprehensive National Statistical Database yielding timely, relevant and high quality statistical information to institutions of the Government, private sector and the wider national and international community" (CSO 2007a).

In 1993, CSO created three subject matter branches, one of which focuses on agriculture and the environment; the other two cover economic statistics and social statistics, and there is a technical branch for over-reaching technical issues, such as mapping. When agricultural statistics are viewed in a narrow sense (primarily crop production and food security), the Agriculture and Environment Branch bears the primary responsibility for data collection and reporting. It is the Branch that conducts the two most important annual surveys: the Crop Forecast Survey (CFS) and the Post-Harvest Survey (PHS). Since 1996 and the establishment of the Agricultural Sector Investment Programme (ASIP), CSO does this work under contract to MACO each year. This annual contract arrangement provides MACO with an opportunity to interact with CSO and jointly make decisions about survey content, sampling, and implementation issues. The economic and social branches also produce statistics of relevance to the agricultural sector (e.g., the national census, the economic census, poverty assessments, living standards studies, etc.).

The Policy and Planning Department of MACO is the key actor in terms of determining what types of data and information are collected in the annual surveys conducted by CSO. They also have a major responsibility for collecting supplemental information through the monitoring and evaluation activities of the extension service, and for policy analysis and dissemination of results. Both the Policy and Statistics and the Program Planning, Monitoring and Evaluation branches of MACO are involved. The Policy and Statistics branch includes three units: Agricultural Statistics, Early Warning, and Policy Formulation.

[5] Formerly the Ministry of Agriculture, Forestry and Fisheries (MAFF).

Table 1 presents a list of seven types of surveys of direct relevance to the agricultural sector that have been conducted during the previous 30 years by CSO and/or the Ministry. In addition to the annual CFS and PHS, there has been a series of supplemental surveys attached to the PHS conducted in conjunction with the Food Security Research Project (FSRP) of Michigan State University (MSU), Living Conditions Monitoring Surveys (LCMS), Food Health and Nutrition Information System (FHANIS) monitoring, a Census of Agriculture, and the general Census of Population and Housing. In a new activity, an Economic Census is planned for 2007 and will include an agricultural component. The table summarizes information on the time periods covered by the surveys, changes over time, crops and other agricultural activities covered by each, type of farms covered (small, medium, or large scale), types of information collected, and key characteristics of the sample design.[6]

The next section of the report presents more details on these survey efforts; but we do want to signal here that the CFS has proven to be the most difficult to manage institutionally and politically. The existence of many actors other than CSO who are collecting information and using it to make preliminary crop forecasts before the official CSO results become available contributes to the management difficulties. Although there is one official CFS coming from the CSO (there were two until 1989/1990: one preliminary in December and one final in March), MACO's field staff continue to conduct monthly monitoring of local livestock and crop development trends using non-survey techniques. MACO National Early Warning Unit (NEWU) combines this information with data and analyses from the Meteorological Department to develop MACO preliminary forecasts that are released before the CFS becomes available. ZNFU also collects data and makes a preliminary crop forecast that is focused on maize. In addition, when there are potential crises, the ZVAC, with strong support from regional and international collaborators, conducts surveys using mixed methods, including CSO-developed household surveys, but usually limited to selected areas of the country (Tango International 2005). When all these actors work together to develop a joint preliminary forecast and this forecast is in line with the CSO forecast, all is well. When there is a lack of coordination or different results due to different methods of data collection being used, the danger of political interference increases as well as the danger of inappropriate policy decisions made by the Government and donors. Zambia experienced problems of this nature in 1998/1999 and more recently in 2005 (see Box 1).

Although the field of participants in Zambian agricultural statistics is broader than the CSO and MACO, these two institutions are presently the key agents for developing a combined strategy for a solid agricultural statistics program, so the rest of this report focuses heavily on their activities and how they link to those of others. Section 2 assesses the strengths and weaknesses of the full range of actors involved, what they contribute in terms of data and analyses, the methods they use, and how they coordinate with other actors. Section 3 addresses staffing, budget, and information dissemination issues for CSO and MACO. Section 4 summarizes the principle problems identified and makes recommendations for improvements. Section 5 considers the relevance of the Zambian experience for other agricultural statistics systems in Africa, with particular attention to the institutional organization of the system and how it affects (1) access to resources and (2) interactions with policy makers.

[6] There are other examples of CSO work that have some relevance to agriculture and rural development in general that are not mentioned in Table 1. Recent examples include: Employment and Earnings Inquiry Report January 2006; National Accounts Statistics Bulletin No.9 2005; Selected Socio-Economic Indicators 2004 – 2005; Labour-Force Survey Report 2005; and Zambia Sexual Behaviour Survey 2005.

Box 1

Political and Economic Fallout from Incorrect Crop Forecasting

For the cropping year 1997/1998, there were early predictions of widespread drought due to indications of a strong El Nino effect, similar to the events in 1991/1992 when crop production was dramatically reduced throughout Southern Africa. With the threat of drought and the fear of famine conditions due to production shortfalls, the Southern Africa Development Community (SADC) invested in the Southern African Regional Climate Outlook Forum.

As the season progressed, the predicted effects did not materialize, as seen in the remote sensing analysis (Kafuli et al. 1999). However, as Kafuli et al, documented, the CSO Crop Forecast came out with 7.1 Million bags of maize produced, compared to the 1992-97 average of 11.5 million bags. ZNFU polled its members and then estimated 6.8 million bags. Due to the earlier predictions of possible disaster, an FAO Mission was called in during late April-early May, and their forecast was even less, 6.1 million bags, due to reduced planted area and reduced yields in drought areas.

Having taken to heart the predictions of crop failure from the early climate models, Zambian politicians and donors in the food aid community arranged for large food aid supplies to avoid disaster, but they failed to review their decisions in light of the official CSO CFS results, which in hindsight proved to be fairly accurate. The failure to rely on them led to excess imports of food aid, but the debates delayed the decision-making such that the food aid was still arriving during the following good harvest. The food aid donors and government were blamed for difficulties in the market (low producer prices in particular) due to the unnecessary supplies made available. "What stands out most is that the 1997/98 crop forecasting system failed to send clear, time-bound messages needed to formulate an appropriate response….the 1997/98 forecasting exercise was marked by confusing and often contradictory reports, late delivery of essential information and little attention to important methodological issues" (Kafuli et al. 1999, p.75).

In 2004/2005, Mwanaumo et al. (2005) document the missteps and miscalculations that led the government to a situation of conflict with the private sector and donors. Once again, the crop forecasting results were questioned and various actors developed different estimates. The debate delayed decisions and, as in 1998, there were repercussions for farmers, traders and consumers.

Table 1. Agricultural Data Available in Zambia

	MACO Preliminary Crop Forecast Survey (CFS)	**CSO Crop Forecast Survey (CSO CFS)**	**Post Harvest Survey (PHS)**	**Post Harvest Survey (PHS)**	**Supplemental Surveys to the Post-Harvest Survey**	**Price Information:** **CSO**	**Price Information:** **MACO**	**Census of Agriculture**
Time Frame	1970/71 to present, conducted in Feb-March	1970/71 to present. Ministry of Agriculture, Forestry and Fisheries (MAFF) & CSO started conducting a joint CFS in 1989/90 through to present day. Previously there were two "crop forecasts". One from CSO and another from MAFF. Ideally conducted in March-May each year, but variable w/ funding	Annually following 1970/71 Agricultural Census, with the exception of the 1977/78 to 1982/83. Following 1990/92 Census, new sample frame with annual surveys.	Annually following 1970/71 Agricultural Census, with the exception of the 1977/78 to 1982/83. Following 1990/92 Census, new sample frame with annual surveys.	2000 and 2004. Panel data following the households from the 1999/2000 PHS sample.	Monthly monitoring in provincial capitals, 1994 – present	Data are collected weekly in each district center in country, but AMIC only reports data in two week intervals,	Census of Agriculture 1970/71 and 1990/92; Ag sector portion of Economic Census 2007 will considered new Ag Census
Crops Covered & other Agricultural activities	Eight main crops: Maize, rice, sorghum, millet, wheat , sweet and Irish potatoes, and cassava	Maize, rice, sorghum, millet, sunflower, groundnuts, soyabeans, seed cotton, Irish potatoes, Virginia tobacco, Burley tobacco, mixed beans, velvet beans, Bambara nuts, cowpeas, cassava, sweet potatoes, paprika, castor beans, coffee, kenaf, cashew nuts, pineapples. Wheat is added to the list for Large-scale producers only	Maize, rice, sorghum, millet, sunflower, groundnuts, soyabeans, seed cotton, Irish potatoes, Virginia tobacco, Burley tobacco, mixed beans, velvet beans, Bambara nuts, cassava, sweet potatoes, paprika. In 1999/2000, vegetables and fruits were included Livestock & poultry	Maize, rice, sorghum, millet, sunflower, groundnuts, soyabeans, seed cotton, Irish potatoes, Virginia tobacco, Burley tobacco, mixed beans, velvet beans, Bambara nuts, cassava, sweet potatoes, paprika. In 1999/2000, vegetables and fruits were included Livestock & poultry	All crops included in PHS, plus more information on cropping practices at field level; production and income from livestock products, fruits, vegetables	Maize, and maize meals, wheat, sorghum, millet, rice, bread flour, beans, cassava, Irish and sweet potatoes, soybeans, groundnuts Also, maize hammermilling costs, fertilizers and seeds for maize, groundnuts, sunflower, soybeans	Maize, and maize meals, wheat, sorghum, millet, rice, bread flour, beans, cassava, Irish and sweet potatoes, soybeans, groundnuts Also fertilizers and seeds for maize, groundnuts, sunflower, soybeans	All crops and livestock covered, as well as fisheries

	MACO Preliminary Crop Forecast Survey (CFS)	CSO Crop Forecast Survey (CSO CFS)	Post Harvest Survey (PHS)	Post Harvest Survey (PHS)	Supplemental Surveys to the Post-Harvest Survey	Price Information: CSO	Price Information: MACO	Census of Agriculture
Sectors Covered	Small, medium and large scale production	Large scale, medium scale & small scale	Medium scale and small scale with one survey instrument; large scale with separate survey instrument	Medium scale and small scale with one survey instrument; large scale with separate survey instrument	Medium scale and small scale	Private sector trader prices	Public market prices	Ag households only
Types of Information	Estimates of land cultivated, total production and yields	Content has evolved. Generally crop production, projected sales, retention. fertilizer and seed source in 2004/2005; input use and tillage added in 2005/2006. Detailed cassava processing and marketing components added in 2005/2006.	Crop production, sales, retention, purchase & sales of input, labor input by crop	Crop production, sales, retention, purchase & sales of input, labor input by crop	PHS information, plus demographic characteristics, migration, education, income generating activities, asset ownership, access to services	Retail prices	Retail, wholesale prices (into-mill prices until 2000)	Production and area for all crops; land use; stock of livestock as well as use, loss, and acquisition numbers (using PHS instruments)
Sampling Design	Statistical sampling not used., rather estimates made from District Agricultural Coordinating Officers (DACOs), based on their expert assessment and administrative records of producers	Through 2002/2003, approximately 8,000 households stratified into small, & medium scale, with full enumeration for large scale. In 2004, 14,000 small and medium scale households.	Approximately 8,000 households stratified into small and medium scale; full enumeration for large-scale	Approximately 8,000 households stratified into small and medium scale; full enumeration for large-scale	Panel data based on 1999/2000 PHS sample, about 8,000 households. In 2004 SS, about 6,400 households (overall attrition of 17% from 2000 SS sample)	identified formal sector agents in provincial capitals	Identified public markets in district centers, (but only provincial capitals maintained in database)	Sample for 2007 is projected to be 40,000 hhs

Source: Authors' table, based upon Zulu, Ballard, J.J. Nijhoff, T.S. Jayne, and Asfaw Negassa. 2000. Is the Glass Half-Empty or Half Full? An Analysis of Agricultural Production Trends in Zambia. FSRP Working Paper No. 3. Lusaka: Food Security Research Project (FSRP), Michigan State University.

Table 1 Agricultural Data Available in Zambia (continued)

	Census of Population and Housing	Living Conditions Monitoring Survey (LCMS)	Food Health & Nutrition Information System (FHANIS)
Time Frame	2000; next one programmed in 2010	LCMS III (2002/2003); LCMS II (1998), the LCMS I (1996), as well as Social Dimensions of Adjustment Priority Surveys in 1991 (PS I) and 1993 (PS II)	Variable: Bimonthly and Quarterly (but discontinued 1999/2003, re-started in 2004) (funding dependent and not regular)
Crops Covered & other Agricultural activities	Small section, with yes/no "practice" on a set of 19 food and cash crops and on 6 types of livestock/poultry, as well as fish farming	Cassava, millet, maize, sorghum. Livestock and poultry	None
Sectors Covered	Demographics, Assets, income activities, agriculture (small)	Rural and urban household level-subdivisions of small, medium & large scale although considered only for rural households is not used in the reporting	Rural and urban households for consumption and expenditure

	Census of Population and Housing	**Living Conditions Monitoring Survey (LCMS)**	**Food Health & Nutrition Information System (FHANIS)**
Types of Information	Basic population and housing data, ag sector participation, income activities, migration, fertility, mortality, education	Food production, demographic characteristics, migration, education, health, income generating activities	Monitoring of Household Food Security, Health and Nutrition in Urban and Rural Areas: employment, expenditures, food prices, house ownership and mobility, savings, food consumption, water & sanitation, health, nutrition,
Sampling Design	Full enumeration census, all households in country, urban and rural	16,710 households (8487 rural & 8223 urban)	Urban and rural households (sample numbers variable)

Source: Authors' table, based upon Zulu et al. 2000, with additions from Mayaka 2002.

2. STRENGTHS AND WEAKNESSES OF KEY AGRICULTURAL STATISTICS PRODUCERS AND PRODUCTS

This section takes on the ambitious task of describing the key actors in Zambia's agricultural statistics system, describing the types of data and information they produce, and assessing the general strengths and weaknesses of the actors and their products. The section begins with a discussion of the CSO census work that underlies all other statistical work in Zambia. It then describes MACO monitoring and evaluation activities, which are used primarily for preliminary crop assessments prior to the release of the official CFS results. The joint MACO/CSO effort on the CFS and the PHS is addressed next as it is closely related to the MACO Monitoring and Evaluation (M&E) in terms of content and use. This is followed by a discussion of the multiple actors mentioned in the introduction who are involved in crop forecasts and food security assessments. The remaining sections look at actors involved in supplemental activities in MACO that are not yet permanent components of the system (FSRP/MSU and Agricultural Consultative Forum , ACF) and key actors from other government services, research institutes, or the private sector who provide and/or use statistics of relevance to agriculture.

2.1. Agriculture Coverage in National Census Data

There are three national census of relevance to the agricultural sector:

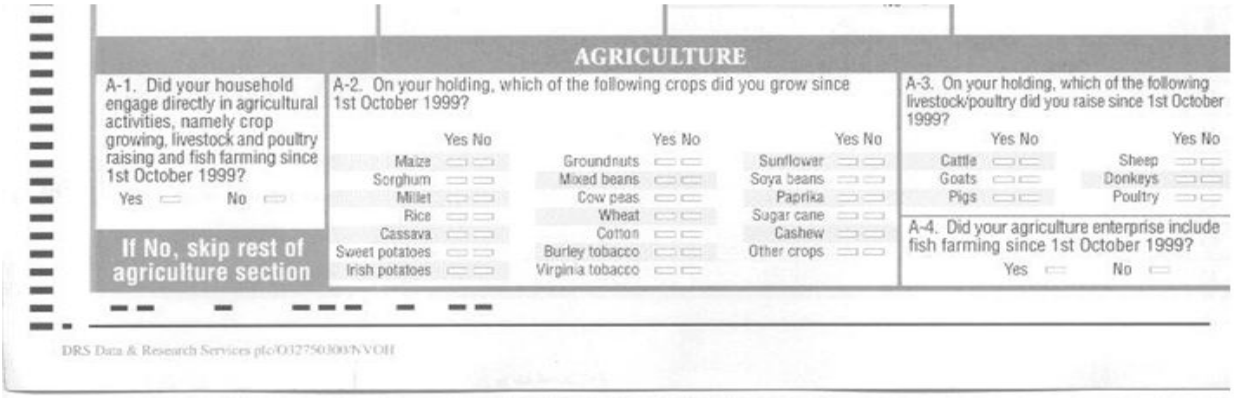
- Population and Housing Census
- Census of Agriculture
- Economic Census

The most recent general census of Population and Housing was conducted in 2000 and was a full enumeration census. This general Census included basic agriculture indicators, used to establish a new sample frame to provide more accurate estimates of agricultural and livestock production in Zambia (Megill 2003) and the specifically agricultural content is indicated in Figure 1.

There has been no specific Census of Agriculture since 1990/92; the plan is to use the Economic Census of 2007 to fill the gap. The Economic Census of 2007 is a new survey proposed to cover each basic economic sector. It is designed to establish the new benchmarks for economic activities to be assessed against the goals in the Fifth National Development Plan (FNDP). According to the May 2007 Bulletin of CSO (page 1), the specific objectives of the Economic Census are:

a. "To measure the full value added (GDP) of the Zambian economy;
b. To provide data which will enable the CSO to compile a full set of national accounts (input-output tables, Gross Fixed Capital formation, Investment, etc);
c. To measure the true extent of investment in Zambia, both foreign and domestic;
d. To provide a basis for setting up Balance of Payments statistics;
e. To provide a basis for the production of different kinds of Economic Statistics (Producer Price Index, Index of Industrial Production, etc.); and
f. To provide a comprehensive frame of establishments for all economic surveys."

Figure 1. Zambia Census of Population and Housing 2000: Agriculture Section (Page 2)



AGRICULTURE

A-1. Did your household engage directly in agricultural activities, namely crop growing, livestock and poultry raising and fish farming since 1st October 1999?

Yes ☐ No ☐

If No, skip rest of agriculture section

A-2. On your holding, which of the following crops did you grow since 1st October 1999?

	Yes	No		Yes	No		Yes	No
Maize	☐	☐	Groundnuts	☐	☐	Sunflower	☐	☐
Sorghum	☐	☐	Mixed beans	☐	☐	Soya beans	☐	☐
Millet	☐	☐	Cow peas	☐	☐	Paprika	☐	☐
Rice	☐	☐	Wheat	☐	☐	Sugar cane	☐	☐
Cassava	☐	☐	Cotton	☐	☐	Cashew	☐	☐
Sweet potatoes	☐	☐	Burley tobacco	☐	☐	Other crops	☐	☐
Irish potatoes	☐	☐	Virginia tobacco	☐	☐			

A-3. On your holding, which of the following livestock/poultry did you raise since 1st October 1999?

	Yes	No		Yes	No
Cattle	☐	☐	Sheep	☐	☐
Goats	☐	☐	Donkeys	☐	☐
Pigs	☐	☐	Poultry	☐	☐

A-4. Did your agriculture enterprise include fish farming since 1st October 1999?

Yes ☐ No ☐

DRS Data & Research Services plc/0327503003/VOH

In looking forward to the monitoring and evaluation that will be required for the FNDP, participants at a 2007 workshop expressed concern about the capacity of the current MACO/CSO system for data collection and analyses to meet the challenge:

> "The fragmented efforts by the different institutions for data collection must be joined together in a methodologically harmonized and cohesive system. This means that common definitions and classifications should be applied, preferably in line with the requirements of the FNDP and the recommendations for MDG indicators" (InWent 2007).

The workshop report also recommended:

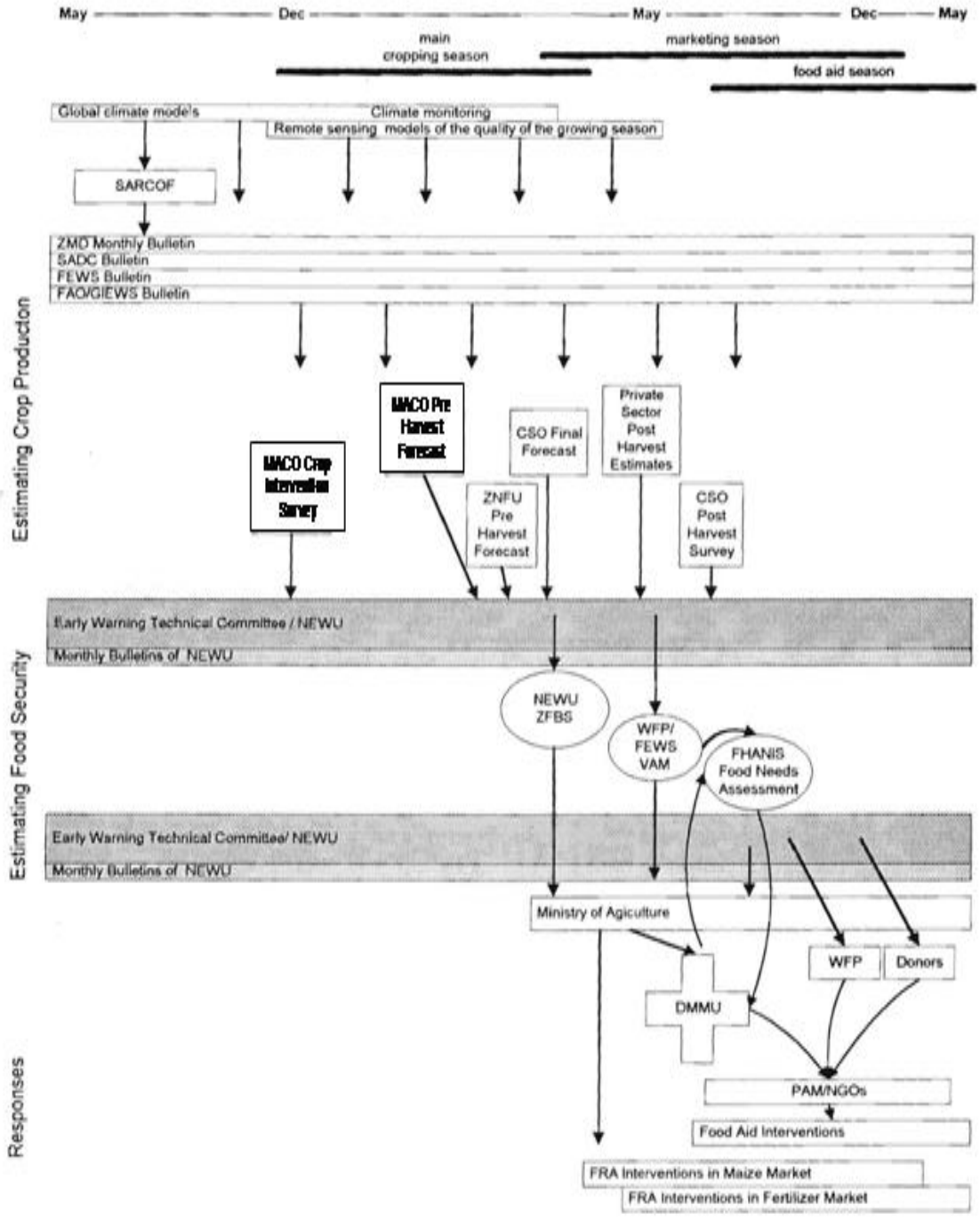
> …the establishment of a Sub-committee on FNDP Indicator Monitoring that would ensure the coordination between MACO and CSO to develop an information system that could respond to the need for the measurement of indicators for FNDP" (InWent 2007).

For the agricultural sector, the Proposal for the Economic Census indicates that there may be a new Post-Harvest Survey (PHS) conducted, with up to 40,000 households (PHS is currently 8,000, with possible expansion to 14,000). The results of this larger sample will be considered the Census of Agriculture and will be used to update the numbers from the previous Agricultural Census. The data collection will cover the crops in the PHS (see list in Table 1) and add more horticultural and fruit crops, as well as additional livestock products, in order to have a full agricultural sector baseline.

2.2. MACO Institutional Arrangements for Crop and Livestock Monitoring

The MACO extension system manages crop and livestock monitoring. It collects information needed for crop forecasting in a more rapid but less statistically rigorous manner than the surveys conducted by the CSO and described in the next section. The NEWU, assisted by the National Early Warning Technical Committee comprising a range of actors in the agricultural

Figure 2. Diagram of Major Flows of Information in the Zambian Crop Forecasting System



Source: Kafuli, D., T.J. Cusack, J.C. Keyser, G. Olesh, and J. Wright. 1999. Final Report of the MAFF/USAID Crop Forecasting Study: Understanding the Impact of Crop Forecasting on Public and Private Sector Decision-Making, and Improving Crop Forecasting Capacity in Zambia. Washington, DC: Associates in Rural Development RAISE Consortium.

sector and in disaster management, coordinates the field information to develop what is commonly referred to as the MACO Crop Forecast.[7] The results of the monitoring are expected in February-March and the NEWU uses it to establish a preliminary forecast. It is this forecast that appears in the Food Balance Sheets (FBS) until CSO's survey-based numbers from the CFS and later the PHS are available. Figure 2 diagrams the flows of information and helps one understand how the Ministry M&E activities fit into the general information channeling that occurs with the Zambian crop forecasting and food security system. MACO's Policy and Planning Department has the ultimate responsibility to bring all this information together to advise the Minister, the President, and Parliament. The system is evolving and currently, MACO intends to have CSO conduct a CFS in March each year with a sample of 14,000 households and the first such exercise was completed for 2006/2007.

In the 1980s, the field monitoring by MACO staff was to cover all farm households (full enumeration), but by 1990 it was clear that such a system was not workable. Staff were taking shortcuts that resulted in unreliable reporting. MACO shifted to sampling methods for the monitoring, but evaluators in 1998 were unable to assess how these were being applied in the field (Kafuli et al. 1999). The Food and Agriculture Organization of the United Nations (FAO) supported monthly field monitoring from 1998-2003, but it has been irregular since then.

The extension system that collects the M&E information is hierarchically and geographically organized. Information flows from camps (about 1500 nationally) which are grouped into blocks (ten camps to a block) that are located within administrative Districts (about six blocks per District). A camp officer is assigned to each camp. They report to Block Supervisors, who report to the District and the Provincial Agricultural Officers. These officers are jointly responsible for field monitoring all agricultural activities in their areas, and conducting rapid appraisals when needed. M&E information is gradually aggregated and reported at the District and/or Provincial levels. At the District and above, the administrative organization is comparable to that used for CSO and other data collection systems. Below the District level, however, the camps and blocks do not correspond to the Census Supervisory Areas (CSA) and Standard Enumeration Areas (SEA) used in CSO data collection systems and it is unclear what, if any, weighting system is used to aggregate the M&E data coming from the camps. We mention this because it may be a source of differences between CSO survey results and MACO M&E results (Tango International 2005). The extension system camps and blocks are selected to reflect homogeneous agricultural production areas whereas the CSA and SEA are selected to represent administrative sub-divisions.

The costs of the monitoring are fairly low, since this is conducted by local officials as a part of their job responsibilities; however in a recent workshop, participants from MACO and elsewhere indicated that the livestock sector was not adequately addressed. One critique was that crop specialists rather than livestock specialists reported the livestock numbers, resulting in questionable estimates (InWEnt 2007). Although the system lacks statistical rigor, it incorporates the knowledge of local specialists with a good grasp of changes over time. One of the issues noted in the recent workshop was that the data are not always available on a timely basis (InWEnt 2007), even though this system theoretically should produce timely results.

[7] MACO was formerly MAFF. The MAFF/MACO Crop Forecast should not be confused with the CSO Crop Forecast which is based on household surveys.

2.3. MACO/CSO Surveys: Crop Forecast and Post Harvest

2.3.1. Objectives and Types of Data Collected for CFS and PHS

MACO contracts the Crop Forecasting Survey (CFS) and the Post Harvest Survey (PHS) to CSO. Although sampling procedures for the two surveys are similar, sample sizes differ and the data collected with the CFS is designed to be collected in March with production estimates available by April or May for use in food security monitoring, while the PHS data are only available at the end of the season and sometimes not until the end of the year. The combined systems of CFS and PHS ideally meets the following objectives (CSO 1999):

> (i) provide annual agricultural data that helps to facilitate comprehensive analysis of the agricultural sector's contribution to the national economy, on an annual basis;
> (ii) develop the Agricultural Statistics Management's Information System (ASMIS) to a level such that it accommodates advances in information technology; and
> (iii) provide annual agricultural data that is useful for the generation of performance indicators to facilitate interventions.

Crops and activities covered by the CFS and PHS have expanded during the past decade. Prior to 1998, CFS collected data on maize, sorghum, paddy rice, millet, sunflowers, groundnuts, soybeans and mixed beans. Nonfood cash crops (cotton, burley tobacco, Virginia tobacco, paprika) were added in 1998, along with castor beans, bambara nuts, cowpeas, velvet beans, with wheat and barley for large-scale farmers only. Then in 1999, Irish potato, sweet potato and cassava were added. In the most recent CFS, coffee, kenaf, cashew, and pineapples were added. The PHS for small and medium scale farmers currently covers all the crops by the CFS in 1999 except wheat and barley (covered for large-scale farmers only); in addition, the PHS covers livestock and poultry.

CSO has also experimented with different field work approaches to collecting the CFS data in an effort to realize economies in resources and time. Beginning in 1997/98, the CFS for a coming year was timed to take place concurrently with the previous season's Post-Harvest Survey (PHS). Three implementation systems have been used: 1) CFS and PHS are separate exercises; 2) CFS is conducted at the same time that the listing is developed for the PHS; and 3) the CFS was conducted as a section of the PHS for the previous season, but the CFS was given priority for data entry and analysis over the PHS data. Currently, the timing of each survey is based on statistical and agronomic criteria, not on any link in activities. The CFS is conducted in March because it is viewed as the best time in the growing season prior to harvest in which a fairly good production estimate can be obtained. The PHS is conducted in August-September because the harvest is generally complete and the next season has not yet begun. The first two implementation systems noted above were the result of budget problems and timing of resource availability to conduct the surveys, and were seen as second-best options.

Figure 2 showed the two MACO/CSO forecasting surveys (preliminary in December and final in March) that MACO contracted CSO to conduct during most of the 1990s. Following problems with an inaccurate preliminary forecast during the 1998/1999 season (see Box 1), MACO and CSO moved to a single CSO Crop Forecasting Survey (CFS) that corresponds to

the final (March) Crop Forecast in Figure 2. MACO continues to conduct its own monitoring work to develop a preliminary forecast (here indicated as the MACO preliminary CFS), but that is not linked to the CSO CFS. Figure 2 also identifies a number of other actors in the crop forecasting process: The Meteorological Department, the National Early Warning Unit, the Food Reserves Agency, and the Vulnerability Assessment Committee. MACO/CSO work closely with most of these actors, whose individual roles are described in Section 2.4.

Given the objectives for the PHS, a core set of data has been collected through time, including production and area of food and cash crops, as well as livestock herds.[8] In most years, input use and quantities purchased were also included, sometimes at a field/crop level, but often at a general household level. Other information covered include crop management practices, household assets, and household demographics. The PHS instrument has been modified over time to respond to specific information needs. For example in 1997/98 and 1998/1999, a few questions were added concerning accessibility and use of the Rural Investment Funds.

"Prior to 2006, the Crop Forecasting data produced by CSO for the 12 major crops were used in National Accounts estimates produced by the CSO Economic Statistics Department, at least in part due to the more timely availability of the estimates. CFS numbers will continue to be used for initial estimates but the PHS numbers are now taken into account for the final results on the following crops: Maize, Sorghum, Rice, Sunflower, Soybeans, Groundnuts, Millet, Mixed Beans, Wheat, Cotton, Burley Tobacco and Virginia Tobacco" (CSO 2007b, p.4.)

2.3.2. Sampling and Data Quality Issues for CFS and PHS

In 1990 CSO moved to stratified, clustered sampling techniques for small and medium scale households for both the CFS and the PHS, significantly improving the statistical quality of the surveys. Prior estimates were based primarily on area and production estimates made by local MACO staff (Jayne et al. 2007). Improvements in sampling and data collection methods continued with the Agricultural Structural Adjustment Programme in the late 1990s and ASIP, both of which increased investments in agricultural information systems, providing more resources for the CSO Post-Harvest and Crop Forecasting systems.

The sampling focus of both CFS and PHS surveys is on the small and medium scale farmers. A full enumeration of large scale, commercial farmers is done separately and supplemented with information provided by the commercial farm sector. As noted by Mayaka (2002), the response rate has not been good and the results are not considered reliable. Changes were made in the data instrument to simplify the questions and the large-scale producer system is still undergoing changes to increase the response rate, through links with the private sector. It remains to be seen of the efforts will be successful as the system is still under development.

The sample frame for the small and medium farms was based on the 1990 Census through 2001/2002. Since 19992/93, the CFS and PHS sampling strategies have been similar in each period, although not the households. A continuing issue is the shifting sampling frame due to changes in administrative districts (increased from 57 to 72 following the 2000 census),

[8] Selected PHS survey instruments and modified *synthetic* instruments are available at http://www.aec.msu.edu/fs2/zambia/index.htm.

frequent changes in sampling strategies, and adjustments to get reliable population estimates. In 1995/96, for example, the CSA and SEA were both chosen with probability proportional to size while in other years they were selected randomly. For the 1999/2000 PHS, non-agricultural households were excluded at the listing stage rather than maintaining them in the sample, but then getting no agricultural information and terminating the interview on the first page. While results from the population census in 2000 permitted an updated sampling frame for the 2002/2003 season, several problems were encountered in the transition. The 2003 frame was based on the population estimates from the preliminary Census mapping rather than the final Census results, producing overestimates of the population (Megill 2005). Also, the subsequent classification of CSA and SEA as urban or rural in the CFS and PHS has not been consistent with the Census classifications, contributing to additional problems with population estimates. Furthermore, the frame is still being modified in an effort to obtain more robust estimates for crops that are important but grown in narrow geographic areas (see Box 2 for more details). In 2005/2006, the CFS sample was expanded from 6,000 to 14,000 households in order to respond to needs for district level information; the PHS stayed at 6,000 households. While the increased CFS sample size is intended to improve the accuracy of estimates, it has also increased the amount of time and resources needed to collect and analyze the data. Consequently, CSO has had trouble meeting their reporting deadlines; in 2007 this resulted in late reporting for not only the CFS but other reports such as the Food Balance Sheets and vulnerability assessments that depend on the CFS data.

Efforts to expand the crop coverage and the level of disaggregation for which the data are relevant are understandable given the need for this information in policy discussions and for monitoring agricultural productivity growth; nevertheless, the results to date lead one to ask if MACO/CSO are trying to do too much with the resources at hand and ultimately taking a step backwards in terms of data quality, timeliness of reporting, and user confidence.

Not surprisingly, the technical debates on the statistical validity of the CSO small and medium farm results filter to the public and undermine confidence in the numbers. This is particularly true for crop forecasting, which raises questions among users when the CSO CFS differs from preliminary forecasts made by MACO (see Box 1). The problem is often compounded by late reporting of the CFS because this leaves policy makers with only the MACO forecasts for guidance at the time that key food aid decisions must be made. In both 1998/99 (Kafuli 1999) and 2005 (Mwanaumo et al. 2005) food aid decisions gave more weight to MACO preliminary results than to the CSO CFS results; in both years there was excess maize on the market and farmers suffered from lower producer prices than usual. Although MACO Preliminary CFS methods based on extension service M&E activities are criticized by some for lack of statistical rigor and possible political manipulation (Kafuli 1999), government and donors both seem comfortable using them to make food aid program decisions. These problems of confidence in survey results are not unique to crop forecasting. At the InWEnt (2007) workshop, participants indicated that MACO staff were not using the PHS and Supplemental Survey data due to inadequate understanding of the sampling issues and the implications for the statistical validity of the results. Overall, resolving the sampling and weighting issues of the CSO agricultural surveys is critical to building demand for and confidence in the CFS and PHS results.

Box 2
Overview of Current CSO Sampling Procedures and Problems for Agricultural Surveys

Zambia is administratively divided into 9 Provinces and 70 districts. Each district was divided into Census Supervisory Areas (CSA), the area which one supervisor could reasonably cover during a survey. Each CSA was then divided into Standard Enumeration Areas (SEAs), an area considered reasonable for a single enumerator to cover during a household survey, based on population (about 100 households) and area. There were approximately 12,000 SEAs in the country at the time of the 2000 Census. For each District, CSAs were chosen using probability proportionate to size and then in a second stage, one SEA per CSA was selected. Within each SEA, all the households were listed and information was collected on total land area and livestock holdings. Based on land and livestock, each household was classified as small scale (<5 hectares and fewer than 50 cattle, 20 pigs, 30 goats, or 50 chickens) or medium scale (5-<20 hectares or livestock amounting to any of the following: 50 or more cattle; 20 or more pigs; 30 or more goats; or 50 or more chickens). The medium–scale households were over sampled, with up to 5 per SEA selected randomly among them; the remaining cases per SEA were randomly selected from the small-scale households, up to 20 cases per SEA. Large-scale farms were included in a separate full enumeration survey.

Analysis in 2003 (Megill 2003) revealed a very wide range in the confidence intervals for eight important crops: sorghum, rice, cotton, Burley tobacco, Virginia tobacco, sunflower, soyabeans and paprika. These crops tend to be limited to narrow geographic areas and are not generalized among the farmers. In 2003/2004, the final sampling stage was modified to over-sample households that cultivated these crops. The new sampling was expected to increase the number of farmers with those crops included in the sample, such that the estimates of production would be more reliable. Subsequent work has demonstrated that there may be difficulties with the weights used to extrapolate out to population level in the various CFS and PHS surveys; efforts continue to resolve these problems, which tend to raise questions among policy makers and other users about the reliability of the survey data.

In addition, some analysts are inclined to push for a more integrated system between MACO's preliminary CFS and other monitoring activities and the two CSO survey activities, highlighting the best use of each type of information and ensuring that information is available on a timely basis (Kafuli 1999).

Generally unsatisfactory results (low response rates) from the enumeration of large-scale commercial farmers within the PHS has resulted in MACO/CSO drawing on additional sources of information provided by ZNFU, the Cotton Development Trust and the Tobacco Association of Zambia to improve their CFS and PHS estimates. The data collection systems are separate, such that the PHS data available with FSRP do not include the large-scale commercial farmers.

ZNFU collects production statistics each year for selected crops, particularly those grown by the large scale commercial farmers, such as wheat and soyabeans, but also maize. Wheat is almost exclusively a large farm crop in Zambia, while soyabeans and maize are also included in CFS and PHS surveys, such that the commercial farm data can be merged with the small-medium farm data. At various times, ZNFU has questioned the MACO announced production numbers on the basis of underestimation of commercial sector production, both in MACO Crop Monitoring and in MACO/CSO surveys. The controversy has made it into the news in recent years since the public sector estimates on production are published in the Food

Balance Sheets and used to justify government import and export policy, as well as the Food Reserve Agency purchasing and sales, all of which affect the private sector's markets (see Box 1).

The Cotton Development Trust and the Tobacco Association of Zambia are commodity-based organizations that report on the production of those cash crops. While these crops are included in the CFS and PHS, large commercial farm production has been largely absent, due to problems with design and administration of the large farm surveys, so the industry information is critical for a full estimate.

2.4. Other Key Actors Contributing to Crop Forecast and Food Security Analyses

2.4.1. The Zambian Meteorological Department Supplies Climate Information

The Zambia Meteorological Department (ZMD) uses remote sensing as the agricultural season develops to understand potential problems and to assist with crop forecasting. The National Early Warning Unit (NEWU) in MACO is responsible for pulling the information into the crop production forecasts. ZMD collaborates with the Southern Africa Regional Climate Outlook Forum (SARCOF), an agency within the Southern African Development Community (SADC) that works with global climate models to provide regional climate forecasts.

The ZMD collects rainfall, wind and other data from weather stations throughout the country, in addition to coordinating the information from other data sources, including SARCOF (Kafuli et al. 1999). The critical role played by meteorological data in the overall crop forecast process is underscored by Figure 2, which placed all the weather modeling at the top of the information flow chart from where it is fed into all the other analyses. According to a recent assessment, "only 36 stations out of 72 currently function, making it difficult to monitor rainfall with great accuracy", and this is coupled with the lack of a remote sensing data analyst (Tango International 2005).

2.4.2. The National Early Warning Unit Coordinates the Food Balance Sheet Estimates

This unit, located within MACO, coordinates the estimates reported in the national FBS, using FAO methods (ZVAC 2003 and ZVAC 2005). As part of its task, NEWU oversees the crop and livestock monitoring done by the extension system and synthesizes the results, which feed into the early versions of the FBS before CSO data are available. The basic FBS table covers maize, rice, wheat, sorghum/millet, sweet and Irish potatoes and cassava. For these foods, analysts estimate the production, trade for the coming marketing year, losses, and consumption demand. Losses are a combination of quantities lost to pests and diseases, as well as non-human food consumption uses, such as animal rations. Crop production is converted into maize energy equivalents and then the availability of kilocalories is compared to the district populations and energy needs per person, to identify the districts in potential production deficit. The FBS is the most widely circulated use of agricultural statistics in the country and used extensively by policy makers when looking at subsidies, import/export regulations, and key food security issues. A sample FBS for 2007/2008 is presented in Table 2.

2.4.3. The Zambia Vulnerability Assessment Committee (ZVAC) Conducts Rapid Vulnerability Assessments

This Committee, based in the Disaster Management and Mitigation Unit in the Office of the President, is responsible for evaluating food security and conducting vulnerability assessments using a multi-agency approach. They also helped coordinate a recent assessment of the Food Balance Sheets and data needs (ZVAC 2005). ZVAC draws on CFS and FBS data and, when indicated, conducts site visits to assess potentially vulnerable areas.

A recent review of the ZVAC methodology revealed challenges in the determination of quantities produced and consumption needs, as well as issues relating to substitutability of commodities in consumption (Tango International 2005). Normally, ZVAC would use CFS estimates in making decisions about site visits and rapid assessment needs. In March 2005 (before CFS was available), however, ZVAC had already selected and visited districts in five provinces considered most affected by erratic rainfall, drought, and flooding (ZVAC 2005). Late arrival of the CFS data hampers their usefulness for and the timeliness of the FBS and vulnerability assessments. The publication of the 2007 FBS did not occur until June when it is usually requested by decision-makers in May.

ZVAC is also active in regional efforts on Food Security through the SADC Food, Agriculture and Natural Resources (FANR) Vulnerability Assessment Committee.

2.4.4. The Food Reserve Agency (FRA) Manages Food Reserves and Reporting

In the 1980s, producer prices for the main agricultural commodities were controlled by the government through the national FRA. Since the mid-1990s, FRA's primary objectives have been to:

- administer the national food reserve; and
- establish and operate a market information system for agricultural food commodities and agricultural inputs.

In its current form, the FRA purchases substantial quantities of maize and other selected commodities (soyabeans, cassava, beans) at publicly announced prices, for the food reserve. It then sells the commodities domestically or for export when harvests are good. FRA publishes a monthly bulletin on their basic activities (FRA, 2007), including information on their retained stocks, imports and exports of maize. They are not involved in the AMIC market information system based at MACO and described below. Instead, the FRA is a key user of production and input information produced by MACO and CSO.

In addition to their food marketing responsibilities, FRA had a temporary mandate from the mid-to-late 1990s to supply fertilizers at subsidized prices and report input market information. This distribution represented the major part of the public sector input program, which supplied fertilizer quantities estimated to have a value of approximately $16 million in 1998 (Kafuli et al. 1999). Currently the FRA has no responsibilities for fertilizer supplies and thus does not provide input market information.

Table 2: Food Balance Sheet for 2007/2008 Agricultural Marketing Season

			Maize	Paddy rice	Wheat	Sorghum/ Millet	Sweet and Irish Potatoes	Cassava flour	Total (maize meal equivalent) /12
A.	**Availability**								
	i) Opening stocks (1st May 2007)	1/	433,031	931	0	4,712	0	4,459	398,614
	ii) Total Production (2006/2007)	2/	1,366,158	18,317	115,843	34,480	75,664	1,185,600	2,476,734
	Total Availability		1,799,188	19,248	115,843	39,192	75,664	1,190,059	2,875,349
B.	**Requirements**								
	i) Staple food requirements								
	Human Consumption	3/	1,132,880	30,332	132,708	35,468	71,880	700,442	1,837,314
	Food Reserve Stocks	4/	250,000	0	0	1,000	0	2,949	228,609
	ii) Industrial requirements								
	Stockfeed	5/	65,000	0	0	0	0	0	58,500
	Breweries	6/	15,000	0	0	0	0	0	13,500
	Seed	7/	18,000	0	1,500	1,000	0	0	18,183
	iii) Losses	8/	68,308	916	5,792	1,724	3,783	23,712	90,846
	Total requirements		1,549,188	31,248	140,000	39,192	75,664	727,104	2,246,952
C.	**Surplus/deficit (A-B)**	9/	250,000	-12,000	-24,157	0	0	462,956	628,396
D.	**Commercial requirements**	10/	12,000	24,157					
E.	**Food aid import requirements**	11/							

Source: CSO, The Monthly, Vol 51 (June) 2007, page 16.

Notes:

1. Stocks expected to be held by commodity traders, millers, Food Reserve Agency and commercial farmers as at 1st May 2007, including stocks held by small-scale farmers in rural areas.
2. Production estimates from Ministry of Agriculture and Cooperatives/Central Statistical Office (MACO/CSO). Cassava production is based on the total area under cassava, using an annual yield figure of 11.7 tonnes per hectare (MAFF Root and Tuber Improvement Programme 1996). A flour extraction rate of 25% is used. Other tubers are sweet potatoes and Irish potatoes.
3. Staple foods are assumed to represent 70% (1,421 KCal/person/day) of total diet (2,030 KCal/person/day), converted to crop requirements for the national 2007/2008 population of 12.1 million people.
4. Locally purchased FRA stocks expected to be carried over into the next season. (This does not indicate total FRA purchases on the local market nor imports)
5. Estimated requirements by major stock feed producers.
6. Estimated requirements by industrial breweries.
7. Estimated seed crop grown for seed companies.
8. Post harvest losses are estimated at 5% for grains and sweet potatoes in line with estimates from other Southern African Development Communities (SADC) and 2% for cassava.
9. Expected surpluses or deficits that arise after meeting minimum overall staple human consumption requirements as well as industrial requirements. Cassava and maize may be substitutable with other crops and may result in different exportable volumes than the ones indicated here. The total is expressed as maize meal equivalent using energy values. The rice deficit is based on what is known to be imported each year, as indicated under D.
The wheat deficit is based on the estimated market size as indicated in B, less availability as indicated in A.
The maize meal equivalent and cassava flour surplus represents an overall surplus of staple foods. Cross-substitution may make this surplus partly available in the form of other crops.
10. Imports required to be made by the private sector to meet the commercial market demands.
11. Total estimated requirement for food relief among vulnerable groups, to be imported. This could be met with maize or other grains.
12. Total maize meal equivalent refers to all crops being converted to kilocalories that are equal to the corresponding kilocalories in maize meal form.

In 2007, given the strategic importance of maize in the Zambian economy, the Minister of Agriculture created the Maize Stock Monitoring Committee and gave them the task of evaluating stocks in the public domain as well as in the hands of processors and other private sector agents. It will be responsible for assessing FRA stocks, but it remains to be seen how this committee will operate and the functions that it will fulfill.

2.5. FSRP/MSU Supplemental Agricultural Surveys, Panel Data, and Policy Analysis

FSRP/MSU is designed to play multiple roles in the agricultural statistics program in Zambia: capacity building of MACO staff through on-the-job collaborative research, expanding the agricultural data base through supplementary survey work, and creating demand for empirically based policy analysis, within MACO, legislative bodies, and civil society in general.

In 2001 and 2004, the FSRP/MSU with CSO and MACO designed and implemented two Supplemental Surveys on Rural Incomes and Livelihoods, (SS01 and SS04). The objective of the Supplemental Surveys was to help design appropriate policies and programs in response to crop marketing, food security and HIV/AIDS challenges. Greater information on the use of productivity enhancing inputs also contributed to understanding potential food security enhancements through greater production efficiency. The sample frame for SS01 was the same as that used for the 1999/2000 PHS, and 94% of the agricultural households from PHS 1999/2000 were visited for SS01. To develop a panel data set, the same sample frame of households was used in SS04. Given panel attrition and the lack of inclusion of new households,

SS04 is not representative nationally, but the panel provides data offering a unique opportunity to evaluate changes over time as well as to analyze household dynamics while controlling for unobservable household characteristics.

SS01 and SS04 covered the topics in the PHS surveys and then added sections to cover morbidity and mortality, off-farm income, including business activities and remittances, income from sales of livestock products, forestry products, and fisheries. Each Supplementary Survey to the Post-Harvest Survey (SS) also had special sections related to specific research issues, such as the relationship that cotton farmers have to ginners, or farm household access to land and services. The Survey instruments are available on the FSRP/MSU website (http://www.aec.msu.edu/fs2/zambia/index.htm).

It is important to note that there are various types of agricultural data that are only covered in the Supplemental Surveys, which are not a scheduled regular part of the agricultural statistics system in Zambia. FSRP/MSU works with CSO and MACO to design these surveys and has successfully obtained funding for them from donors. The supplemental surveys collect information on fruit and vegetable production and marketing, as well as production and marketing of various livestock products not incorporated into the PHS, such as eggs. As noted in the InWEnt workshop (2007), CSO and MACO will need to review the importance of this survey and either incorporate selected parts of the SS into the annual planning or change the components of the PHS in order to capture this information.

In addition to conducting the SS, FSRP/MSU has contributed to a wide range of policy analyses and reports produced collaboratively with MACO staff, ACF, and others. This work combines the SS data with CSF and/or PHS data to exam policy issues confronting the

Government of Zambia (GOZ). The project has helped MACO organize workshops and seminars to present the results of different analyses and in a number of cases there is concrete evidence that the work has brought about favorable policy changes. Zambian journalists, for example, picked up on recent work by FSRP with MACO and ACF on changes in the value added tax structure and agricultural sector expenditures to highlight potential food price increases as a result of policies, and the ZNFU has been using the work to lobby government for changes in trade policies and food security programs. PHS and SS analysis on mortality has been used in debates on appropriate intervention strategies with HIV/AIDS (IRIN 2005).

A recent example of the type of analysis done by combining secondary data with survey data is the FSRP/MSU effort to monitor public sector spending in agriculture. Monitoring agricultural expenditures has become an important component of the New Partnership for Africa's Development (NEPAD) agricultural growth strategy following African governments' agreement to allocate a minimum of 10% of public sector spending to the agricultural sector (AU/NEPAD 2006). In collaboration with MACO and the ACF, FSRP/MSU pulled together data from a range of sources in order to assess progress in attaining the 10% goal (Govereh et al. 2007). The authors demonstrated the need to look at more disaggregated investment data to assess how investments were being made within agriculture and also noted the difficulties of tracking allocated versus spent funds, due to the time lag in reporting actual expenditures (see Box 3 for details). The report noted that "serious effort is needed to internalize monitoring and evaluation systems to enable MACO to monitor and evaluate the impacts of various public expenditures and to set future investment priorities to achieve policy objectives. Such a system contributes to accountability, efficiency, and decision making" (Govereh et al. 2006, p.19).

Despite the efforts of FSRP/MSU with MACO and CSO, Zambia's agricultural databases remain under-analyzed and the results under-utilized. Insufficient staff at MACO has been a major impediment in building capacity for this type of work. Now that Zambia has qualified for debt relief under the HIPC, the Government may be able to reconsider the allocation of budgets that results in insufficient resources for staffing and operational funds for research highlighted in the expenditure analysis by Govereh et al. (2006). Another impediment to generating demand for statistically based policy analyses is the lack of understanding of and confidence in statistical survey methods by non-specialists, particularly evident in the debates over crop forecasting, but also a result of on-going debates among statisticians on how to resolve some of the CFS and PHS sampling and weighting issues discussed above.

2.6. Market Information and Price Data Systems

There are three sources of price data for agricultural commodities in Zambia:

- CSO, which collects retail data to produce the consumer price index;
- AMIC, which collects producer, wholesale and retail price data for commodities sold at rural markets; the information is intended for use by traders and farmers; and
- ZNFU, which operates a new small exchange designed to link buyers and sellers

For the estimates of the Consumer Prices Indices (CPI), the Bank of Zambia has commissioned CSO to provide monthly prices for a whole range of consumer and producer goods in the provincial capitals. This price collection system is based on monthly trips by CSO headquarters staff to the cities concerned, where retail establishments (not public markets) are visited to obtain prices. The database is used by international agencies such as the Famine Early Warning System Network (FEWS Net) for tracking price movements. It is

not designed to supply market information to the private sector, as it is only collected once a month, not available immediately, and not systematically published for general diffusion. It is thought to be the most reliable price collection system in the country, but it does not meet all needs. For example, a recent International Monetary Fund mission noted that there is no comparable collection of wholesale prices in the CSO system such that wholesale price indicators cannot be systematically estimated. CPI components had to be used throughout their analyses to convert nominal prices over time to real prices (IMF 2007, p.57).

The Agricultural Market Information Centre of MACO has been operating the Agricultural Market Information System (AMIS) since the early 1990s. Originally established with substantial funding and technical assistance from the Dutch Government through FAO, AMIC has gone through periods of variable performance. In theory, the system collects weekly or bi-weekly observations on key commodities throughout the country, in all the provincial capitals and in the districts, at producer, wholesale, and retail (public market) levels. In practice, AMIC is struggling to meet needs.

AMIC has suffered from staffing problems since the government restructuring in the late 1990s as well as after the withdrawal of donor financing through FAO. It is receiving limited technical assistance from MSU, although the staffing shortages continue to plague operations. The system was designed as a public service system and has demonstrated many of the weaknesses of public systems, as described in the literature (see Shepherd 1997). Capable staff members have been transferred to other programs or left government service; communications with field staff have been problematic, and timely production of bulletins has been undermined by a shortage of materials, late communications, and inadequate staff. Funding is sporadic, contributing to lack of communication between field and headquarters. Policy makers in recent years rarely rely on AMIC for their information.

Comparisons of the CSO and AMIC price data must be done with caution. Although AMIC may have resource and data quality problems, the objectives and data collection methods of AMIC are intentionally different than those of the CSO and likely to produce different price estimates. Among the key differences are the periodicity of data collection (monthly vs weekly), the locations surveyed (public markets vs. commercial establishments and district locations as well as provincial), and the unit sizes of transactions enumerated (generally smaller for the market transactions). Both price collection systems have a place in an agricultural statistics data base, but this requires adequate resources to correctly implement both systems.

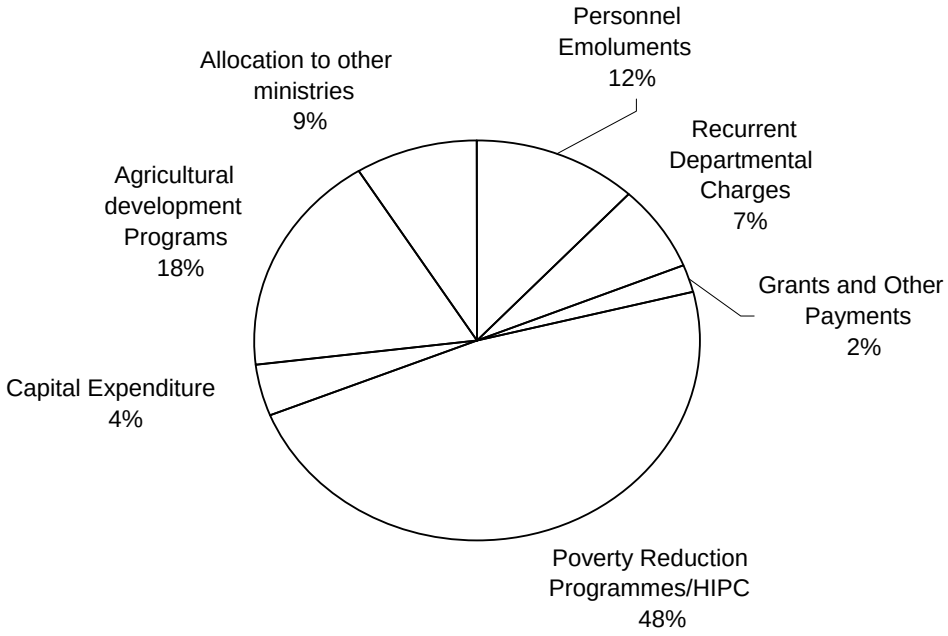
ZNFU recently established a market information exchange designed to provide information about buyers of selected agricultural commodities to potential sellers of the commodities, using a website (www.farmprices.co.zm) and text messaging system (SMS). As of June 2007, information is available on maize, soyabeans, groundnuts, beef and goats. The system collects information from the buyers of commodities on the quantity, quality and price for each commodity that they would like to purchase in the current week. That information is immediately posted to an automated system linked to SMS messaging. Those wishing to sell can then visit the website or send a text message to get the contact details for each buyer of a selected commodity. Information is organized by region and price. The system is relatively new and undergoing an evaluation. According to ZNFU staff and developers, there are controls in place to minimize cases of fraudulent postings and the prices recorded can be used to reflect market conditions, although commodities and locations are relatively limited.

Box 3
Agricultural Budgets and the Importance of Data on Allocation of Resources

While data collection efforts in agriculture focus on sector performance and monitoring impacts changes in the sector, the NEPAD agreements on agricultural development strategy call for an increase in public sector investments. In Zambia, by 2006, the government stood at 6.3% of the national budget allocated to agriculture, well below the 10% figure recommended by NEPAD and well below the 15-22% allocated in the 1980s. With collaborators in MACO and ACF, FSRP/MSU analyzed budget allocations from 1981 to the present.

Figure 3 shows the six major public agricultural sector budget items: 1) personnel emoluments, 2) recurrent departmental operational charges, 3) poverty reduction programs, 4) capital expenditure, 5) agricultural development programs, and 6) agricultural spending allocated through other ministries (e.g., infrastructure and other public payments). During the period analyzed, Zambia spent 48% of its agricultural budget on poverty reduction through support for input subsidies and producer price supports administered by the Food Reserve Agency, as well as on subsidized maize imports. At the same time, capital expenditures were low (4% on average) and declining, such that that facilities and equipment are becoming obsolete or unusable and are not being replaced. Low recurrent charges (7%), which provide the operational funds for research and extension, further compromise the ability of MACO staff to function. (Govereh et al. 2006).

Figure 3: Zambia: Average Share Allocated to Agriculture Budget Items in Real Prices, 2001-2006



Source: Govereh et al. 2006

Given its very specific objectives, not all commodities are observed in all markets and there may be price variability due to conditions of quality or location, minimum quantity to be delivered, or other aspects. Currently the website and messaging just sends the information for the current week, but a database is maintained and may be available for analysts in the future. The extent to which information from the exchange might complement the CSO and AMIC systems has not yet been examined, nor the comparability of prices reported in the three systems.

2.7. Agricultural Trade Statistics

Formal trade statistics are available from the Export Board of Zambia, which is a statutory body established in 1985 to promote Zambian exports, especially non-traditional (non-metal) exports. They work with CSO who maintains the database of exports as a way to measure progress as well as to inform potential and existing traders about current trade patterns. The CSO Monthly, a monthly bulletin usually reports major trade statistics. The Ministry of Agriculture issues import and export permits for commercial trade of agricultural goods, however there is no systematic cross-checking of permits with realized trade. Occasional trade bans are instituted by the Ministry of Agriculture for specific commodities as with the 2005 ban on maize exports, imposed when a shortfall in maize production was predicted.

Informal trade in agricultural commodities was unregistered until a recent initiative of FEWS NET with the World Food Program (WFP) and others to look at regional food security issues including informal trade. Selected border points were chosen for observation by a monitor who counts every large bag or other unit that crosses the border informally, whether by bicycle, by foot or by other means. A monthly report is released for Zambia and another for the region as a whole. Maize, beans, and rice are the three most important commodities for informal trade between Zambia and its neighbors, especially beans to the Democratic Republic of Congo (DRC) (FEWS NET and WFP 2007). Trade depends heavily on the relative supplies and prices in the neighboring countries; maize trade may go in either direction, for example, with imports from Tanzania or exports to Malawi. The selection of sites for monitoring is based on a rapid appraisal and the assessment is an attempt to at least have a minimum estimate of such trade. This effort is additional to formal sector import and exports and only covers trade that is unregistered at the borders. As a large country with porous boarders, it would be difficult to ensure 100% coverage of such exports and imports. As yet, the informal trade statistics are not known to be included in official estimates.

There has been discussion about inclusion of the informal trade information when estimating the National Food Balance Sheets, but it is controversial and as yet not used. However, the information is used in regional discussions. The information is critical to inform policy discussions. Zambia is a country that frequently applies import or export bans in maize and other basic foods, and without this information, the effect of the bans and related policies cannot be assessed. For the present, the informal import and export information is used by the donors and international agencies, as well as ZNFU and others locally to assess potential food shortages and food aid needs.

2.8. Other Complementary Agricultural Data and Analyses

2.8.1. 2000 Census Mapping Data

With improvements in Geographic Information System technologies there will be pressure for Zambia to use these tools to improve its collection and reporting of agricultural data. CSO maintains the mapping from the 2000 Census and it is often made available to others for specialized analyses. For example, data on the location of tarred roads was used by a CSO researcher to associate each of the 1999/2000 PHS SEAs with a distance from tarred road and then used as an indicator of farmer access to transportation and markets (FSRP, 2003). We have not been able to document other uses of this data, but believe it has unexploited potential.

2.8.2. Soil and Technology Mapping

This is another area that has potential but has been superficially exploited to date. In an extension of earlier crop suitability work by Veldkamp (1987), FSRP/MSU and the Zambian Agricultural Research Institute (ZARI) developed maps showing locations where the soils are particularly well adapted for growing maize. The maps are designed to assist in the allocation of farm and research resources, incorporating financial as well as agronomic information. The effort involved the combination of data from soil sampling, experimental trials, and other secondary data to evaluate returns to two levels of input investment (high and low) (FSRP 2003).

2.8.3. Crop and Farm Budgets

Crop and farm budgets are an important tool used in economic analyses of agricultural productivity and farm management. Understanding farm economics will become increasingly important as more Zambian farmers begin to operate their farms as a business. Such budgets cannot be developed from the standard set of data collected by the CFS and the PHS so some type of supplementary survey or research trial data collection is needed. The Golden Valley Agricultural Trust is a private research trust that has developed some crop budgets, for small scale and commercial agriculture but the collection and analysis of the data could be improved. Recordkeeping is based on simple spreadsheets and no coherent database is established. Labor data from the budgets are particularly weak, and with small plots, extrapolation to per hectare amounts means large potential non-sampling errors. Other farm data and budgets come from research station or on-farm trials in the early 1990s when the research system had more donor funding. The recent InWEnt workshop identified the need for crop budget information as an important one and recommended selecting a set of key farmers from which crop and farm budget data could be collected each season. Both ZARI and the Golden Valley Agricultural research Trust (GART) are working to establish a consistent database of information to meet this need.

2.9. Important Users of Agricultural Statistics

In addition to the Government and donors, there are two organizations of note that use agricultural statistics and contribute additional analyses: the Institute of Economic and Social Research (INESOR) and the Agricultural Consultative Forum.

INESOR is the multi-disciplinary research wing that was incorporated into the University of Zambia in 1965. There are six main research programs: Economics and Business, Agriculture and Rural development, Health, Urban development, Governance, and Constitutional Reform. Researchers at INESOR often use the CSO-generated agricultural data to assess public sector performance and to inform on macro-economic issues, including poverty reduction efforts. They are a key analytical user. When the Agricultural Sector Investment Programme was developed, analysis of sector performance was the responsibility of INESOR, using CSO data (Mayaka 2002).

ACF is a nonprofit organization whose objective is to bring together the various stakeholders, including private and public sector agents, in debates on policy issues in agriculture. ACF collaborates with MACO and FSRP/MSU in policy analysis, and makes frequent use of the agricultural statistics generated through CSO. ACF contributes to the definition of policy issues for evaluation, thus helping to guide the development of special sections in the PHS and the SS, as well as providing general guidance for MACO and FSRP/MSU analyses.

3. STAFFING, BUDGET AND DISSEMINATION OF PUBLICATIONS AND DATA

3.1. CSO Staffing and Budget Situation

CSO faces serious staffing problems due to attrition of existing staff without replacement and heavy reliance on various types of temporary contracts for 80% of their workforce, many of whom have been working for CSO for 10 years or more. The budget situation is more difficult to evaluate as much of the work conducted by CSO is funded through special contracts and we were unable to find a consolidated budget covering all CSO activities. The typical CSO budget (personnel emollients and recurrent charges) covered by Government sources is quite limited (e.g., $1,000,000 in 1998) and most likely contributes to the staffing problems.

Staffing is a critical issue in the Zambian public sector in general. Contributing factors include losses due to HIV/AIDS and the brain drain of skilled staff to jobs outside the public sector and to other countries (InWEnt 2007). This has left the CSO with an aging cadre of senior statisticians and very few younger statisticians to replace them. The most recent personnel numbers found show a total 2001 workforce of 1,446, of which only 282 were actual members of the civil service. Statisticians figure prominently among the permanent staff. At the Lusaka headquarters, each of the three main branches has an Assistant Director and every Division within each branch is headed by a senior statistician. At the Provincial level, the Provincial Statistical Officer is a trained statistician as is the Deputy Provincial Officer. Given the survey-intensive nature of the CSO work, there are heavy demands for large teams to conduct surveys and analyze the data. For the 8000-household Supplementary Survey in 2001 CSO estimated a need for 24 Statisticians (including 4 regional statisticians), 5 programmers, 20 data entry clerks, 49 supervisors and over 200 enumerators; most of these positions were filled by temporary hires.

The variety of surveys conducted by CSO and the heavy reliance on temporary staff (particularly teachers and urban residents) have raised questions about non-sample bias being introduced in agricultural statistics by enumerators and supervisors who may not have the skills needed for agricultural surveys (e.g., plot measurement, judging reliability of production estimates) (INESOR 1998). FSRP experience with CSO/MACO surveys indicates that more intensive training and supervision improves the quality of data collection, particularly when subject matter specialists are in the field working collaboratively with the statisticians and enumerators.

The recurrent budget mentioned above gives an incorrect impression of the overall CSO portfolio as it does not include contract work that is frequently paid for by outside funding. For example, the 2001 SS described in the previous paragraph was covered by a $240,000 payment from FRSP/MSU project funds. Another example is the National Census of 2000 with a price tag of approximately $20 million, much of it paid for by donors. FSRP/MSU, for example, paid $83,000 for the small section on agriculture found in Figure 1. This relatively small expenditure permitted CSO/MACO to develop a new sampling frame for the CFS and PHS without having to undertake a very expensive, stand-alone Agricultural Census. Although CSO/MACO are still trying to iron out some of the problems with the new sampling frame, the collaborative effort with the Census is generally viewed as a positive move in terms of managing resources.

3.2. MACO Staffing and Budget Situation

On the MACO side, staffing is also not sufficient. In theory, there are six positions in NEWU, including a Principal Economist supported by a Senior Agricultural Economist and another senior social economist, then an Economist, a Sociologist and a Statistical Clerk. There are no senior Statistical Officers associated with the Unit. Of the six positions, two have staff members present, two staff members are on study leave, and two positions are yet to be hired. The Agricultural Statistics Unit also has six positions headed by a Principal Statistician who is theoretically supported by a Senior Statistician, Senior Systems Analyst, Statistician, Economist and a Statistical Officer. There is one person employed in this unit but away on study leave; the additional staff are still to be recruited. In reality, the two staff members present in the NEWU are trying to do the work that was designed for a team of twelve people. One can ask whether MACO really needs the high level of statistical expertise prescribed for their Agricultural Statistics Unit given that they are currently functioning with just one person and that the CSO also employs a large number of statisticians in their Agriculture and Environment Branch. Since both CSO and MACO suffer from serious under-staffing at present, some specialization in staffing and improved inter-institutional collaboration to get the necessary mix of statistical and agricultural expertise might be in order; but it is difficult to fully understand the staffing issues of both institutions with the documentation available.

MACO faces two major budget issues: (1) a complex, poorly timed budget process, and (2) inadequate and irregular funding. In spite of consultative processes on spending for agriculture, including agricultural statistics, the budget for the Ministry of Agriculture is controlled through the Ministry of Finance. Funds are disbursed based on public sector revenues (Govereh et al. 2006). The statistical work is covered by agricultural sector funding for staff and operations, which has not been stable during the recent past. This contributes to the staffing problems at MACO. Liquidity problems also occur since "the budget cycle does not match the crop growing season" and thus resources are not always available for the surveys at the time when those surveys should be conducted (InWEnt 2007). Procurement regulations, which require centralized purchasing of computers and other equipment, also limit MACO's ability to get its work done in a timely manner.

3.3. Dissemination of Publications and Data

CSO has the authority and responsibility to publish information from the national surveys. CSO maintains a website (http://www.zamstats.gov.zm/) from which some data and a limited number of publications are directly available (e.g., the CSO monthly bulletin, which includes some agricultural data, and the FBS) . The Agricultural Report from the 2000 Census is also available on line, but the CFS and PHS results are not. There have been annual reports completed, with basic tables, for selected PHS small and medium scale surveys, including 1999/2000, 2002/2003 and 2003/4. The PHS Reports for 1996/97 and 1997/8 are available electronically on the FSRP website noted below. The results of the 1990/1992 Census of Agriculture are also available in printed form, although not electronically. The CSO Monthly, a regular monthly bulletin, publishes summary statistics on a wide range of subjects, including Consumer Price Indices, Trade Statistics, Exchange Rates, Food Balance Sheets, Crop Forecasting, Health, and other topics for which CSO is active. The Monthly is available electronically, starting with the April 2003 edition.

There is currently no functioning MACO website or other systematic method of disseminating MACO survey results and analyses. The FSRP/MSU website (http://www.aec.msu.edu/fs2/zambia/index.htm) compensates for this to some extent as it contains a series of reports, policy syntheses and presentations, many of which are joint with MACO staff members. Given the severe understaffing of the Policy and Planning Department at MACO, reliance on the MSU website provides an interim solution for MACO but it is not a sustainable approach. The Market Information System has a website set up and maintained currently by FSRP/MSU, but production of regular bulletins is lagging, so there is very little current information. In short, MACO outreach via publications and the Internet is almost entirely dependent on transitory project funding.

Data documentation and dissemination is an area of weakness for both CSO and MACO. MACO does not make original data available, instead releasing summary reports, such as the FBS, and referring potential users to CSO and FSRP/MSU. CSO does release their data files; however, the limited nature of analyses conducted by CSO means that only basic cleaning has been completed and the data often have inconsistencies. With the large sample surveys, there are also delays of a year or more before release.

FSRP/MSU collaboration with MACO and CSO has contributed to better data dissemination in some cases. All three institutions work with the PHS and CFS datasets. FSRP/MSU maintains a website with copies of survey instruments, although most of the instruments are modified from the original format to a synthetic format that follows the data base organization and facilitates analysis, rather than the original instrument as implemented with farmers. FSRP/MSU also has PHS and SS datasets that are made available to students and other researchers, but that occurs with a delay, as FSRP/MSU researchers work with the data and often interact with MACO and CSO to correct mistakes and provide adequate documentation prior to release. The SS surveys were funded through FSRP/MSU by the United States Agency for International Development (USAID) and so are not managed by CSO after the data entry and basic cleaning are completed.

There is a need for greater coordination in data dissemination and the documentation that accompanies it. For example, FSRP/MSU is now using a revised set of weights that were developed to correct problems with the population weights and estimates of the standard errors. To date, these weights have not been systematically incorporated into the CSO data systems. It is anticipated that the adjusted weights will eventually be adopted by all users and included in data files shared with others. In the meantime, there is a danger of multiple users of the data bases obtaining differing results due to weighting errors.

4. SUMMARY OF KEY POINTS AND LESSONS OF GENERAL RELEVANCE

By way of conclusion, we offer a series of questions that were listed in our terms of reference followed by short responses based on the detailed discussion presented above.

4.1. What Are the Sources of Information for Agricultural Policy Making and Who Does What?

MACO and CSO are the primary sources of data through the MACO M&E effort and the joint MACO/CSO CFS and PHS surveys. It is noteworthy that the ZARI, the national agricultural research center, is not involved in the collection or analysis of the primary data bases used in policy analysis. The University intervenes occasionally through INESOR with specialized policy studies as does the non-profit ACF and the FSRP/MSU attached to the Policy and Planning Branch of MACO. In addition, there are a multitude of smaller actors who contribute directly or indirectly the crop forecast estimates. These crop forecast contributions are coordinated by NEWU in MACO.

Supplementary information often used in policy analysis comes from AMIC which collects price information on agricultural commodities, CSO which collects price data and estimates the consumer price index, and the Export Board with CSO to provide trade statistics.

4.2. What Are the Linkages, Overlaps, Duplications, Conflicts?

MACO and CSO are linked through an annual contracting arrangement whereby MACO contracts with CSO to conduct the CFS and PHS. There is overlap as they both collect data for crop forecasts and have a history of producing conflicting estimates. MACO produces a preliminary forecast based on non-statistical M&E efforts which is subject to potential political pressure, and CSO produces a statistically-based final forecast (often at a date that is considered too late for food aid planning purposes). Given the different methods used, the efforts are not necessarily duplicative but mechanisms for combining the different sources of information into a coherent whole are weak and result in confusion. Generally, the PHS, a large sample household survey with statistically accepted methods, would resolve the final question, but there are doubts about the accuracy of the sample frame and weighting for the PHS. As a result, MACO staff and policy makers prefer to use MACO M&E data and information rather than PHS survey results.

4.3. What Are the General Types of Data Collection Methodologies Used?

CSO uses sample-based statistical methods for collecting data in the CFS and the PHS. MACO uses their extension agents to implement M&E surveys that are not statistically based but designed to capture key indicators needed to forecast crop production and food availability for the upcoming season. CSO data is collected using CSA and SEA established as subdivisions of national administrative divisions (Provinces, Districts). MACO data is collected using camps and blocks that reflect different types of agricultural production zones rather than administrative sub-divisions. Policy analysts tend to use the statistically based CSO data and statistically based supplemental surveys conducted jointly by MACO/CSO and FSRP/MSU, in spite of policymakers focus on the MACO M&E results.

4.4. Do Different Methods Used by Different Institutions Produce Different Results?

YES. This was a major issue in 1998 and 2005, with the preliminary crop forecast by MACO suggesting a need for large food aid imports and the final crop forecast by CSO suggesting a much less serious food security problem. Factors contributing to the differences are thought to include (1) timing of the forecasts, (2) use of statistical vs. non-statistical sampling, (3) use of different types of enumeration areas (CSA/SEA vs. camps/blocks), and (4) political interference. Analysts have suggested a need for more collaboration between MACO and CSO to develop better methods of combining the various sources of crop forecasting data that are available; to date the problem remains.

4.5. Where Are the Methods Stretched and Objectives Unrealistic?

Recent efforts to decentralize government decision making and budgets has led to requests for statistically valid information at the District level. This required a significant increase in sample size for the CFS (from approximately 6000 to 14000 households) and has contributed to delays in reporting because staff and resources are not adequate to handle such a large sample size.

The number of crops covered by both the CFS and PHS has been expanding and this too is stretching resources as well as raising questions about the statistical validity of some of the estimates, which are difficult to obtain through a random sample because of the geographic concentration of the production.

Another issue is serious understaffing at both CSO and MACO. This has been a major constraint to the capacity building activities of the FSRP/MSU program as efforts to build capacity through on the job training are not productive when there are 2 individuals available to do the work anticipated for a staff of 12.

4.6. What Is the Timeliness and Reliability of Data Collection, Analysis, and Publication?

Timeliness and reliability have been hampered in recent years as efforts are made to expand the crops covered in regular surveys and to make them representative at the District level. Timeliness is particularly critical for the CFS results as late reporting leads to major decisions being made on preliminary forecasts. Reliability of the statistical sampling data produced by CSO has increasingly been questioned due to problems encountered in adjusting to the new sampling frame developed after the 2000 Census (population estimates are often incorrect) and trying to get accurate estimates of important crops that are grown in relatively small geographic areas. Publications are a very weak point for MACO, which relies almost entirely on the FSRP/MSU program for policy analysis and dissemination of results through workshops and posting of documents on the MSU website. CSO does do annual reports on the CFS and PHS surveys, but these are limited to preliminary descriptive statistics rather than policy analysis.

4.7. What Needs Are Well Met and Poorly Met for Key Users of Statistics?

In a recent workshop on food security and poverty, a key conclusion was that “Zambia’s agricultural information system must be adapted from the current version, which was originally

designed to address the colonial government's needs. For example, the current system tells us plenty about the maize crop but very little about the cassava crop, and yet this latter is a vital contributor to food security in many areas. By the same token, we know much more about Irish potato, which in Zambia is a luxury vegetable, than about the sweet potato crop, which is a staple" (Chilangwa and Cromwell 2004, p.25). While the system struggles to meet the new demands, we do find that many needs are addressed. The contracting between MACO and CSO successfully motivates MACO staff to participate and guide the development of the survey instrument, to ensure that key policy issues can be assessed.

Regarding central government needs, PHS serves them well for National Accounts and monitoring production trends for major crops although there are still unresolved issues on the use of weights to extrapolate to population and national production numbers. There have been improvements to reduce the problems with large variations in estimates for geographically concentrated crops, with new sampling strategies as of the 2003/2004 PHS and more recently with the expanded sample size of the 2006/2007 CFS. For price collection, the CSO price collection for the CPI has the confidence of users but price data for the wholesale level is inadequate, only available for a limited number of crops and locations with AMIC. FSRP successfully obtained funding and developed panel data sets which are supplemental to the PHS. While MACO participates in the work and FSRP contracts CSO for implementation, these supplemental surveys are not incorporated into the Zambian agricultural statistical system. These datasets are very valuable for looking into dynamics of agricultural production and rural incomes,

As in other countries, the crop forecasts continue to be in the spotlight of controversy. The combination of undocumented methods, reliance on key informants for early forecasts, and possible interference of politicians may all play a role. There is no clear answer on how to combine statistical and non-statistical data. Advanced remote sensing analysis may assist in getting early crop forecasts that are more reliable. Clearer messages on the reliability of qualitative estimates may help the early forecasts to be used more appropriately as indicators rather than firm production numbers. There is a clear challenge in having good early estimates for food security analysis, yet retaining flexibility to respond to updated information.

In general, the efforts of CSO with FSRP to clean and document the data sets into a coherent database will help to increase the value added of the data, for it will enable scholars and other analysts to use the data with more confidence. The lack of a reliable market information system causes problems for the private sector as well as the public sector. Investing in an Market Information System (MIS) that can respond to a range of needs is critical for a market system. The ZNFU system may provide for some needs, but the system is too young to evaluate sustainability and the extent to which it may satisfy more information needs as time goes on.

Currently, the agricultural statistics system is only partially meeting the needs of the private sector. The linkages between the MACO and farmers, traders, and investors is weak, especially the MIS, with infrequent bulletins and inconsistent market coverage. The data on imports and exports is also incomplete and insufficient to meet private sector needs.

4.8. Could the System Be Organized Better? If so, How?

In Zambia the funding and human resource issues are critical in both CSO and MACO. Both institutions are pushing for greater numbers of trained statisticians, in particular. It may be

more cost effective to ensure the statisticians for CSO, with only one or two statisticians at the Ministry of Agriculture (MOA). Similarly, reinforcing MOA analytical capacity is key, investing in the human resources to make use of the agricultural data. Both CSO and MOA staff need to be cognizant of the key aspects of the domain of the other. MOA and CSO will be able to work efficiently together if there is reinforcement of statistical understanding in MOA and of economic analysis in CSO without substantial numbers of additional dedicated specialists. Maintaining two sets of agricultural statisticians and analysts is unrealistic given limited resources. In the recent InWEnt conference, a recommendation was put forth to increase the CSO responsibility for analysis, but MACO policy makers are more likely to rely on in-house analytical results than those from an external unit. Both MACO and CSO will need to work with FSRP and others to incorporate the supplemental surveys into the system.

As indicated earlier, the MOA MIS is currently not serving its role and there is a need to reconsider the establishment of the system in the public sector. The Malian case provides a basis for discussions with ZNFU and other groups to identify a way forward. CSO is not the right institution to operate an MIS for the private sector, and currently collects prices to fill a gap for the Bank of Rwanda and national government for simple price statistics.

4.9. Are There Relevant Funding Issues to Be Addressed?

There are several key funding issues to be addressed. First is the issue of funding rural income surveys. Currently donor funding is obtained in order to fund the supplemental surveys which capture rural incomes and demographics, as well as other special topics. MOA and CSO will need to work together to identify the key components of the supplemental surveys, the information needs, and how to arrange funding to sustain the data collection. The panel data efforts are beginning to pay off with more sophisticated analysis of smallholder marketing behavior and incomes, but finding national (rather than donor) funding for the work remains a challenge.

Another key funding issue is the need to reinvest in permanent staff. MOA and CSO have lost substantial numbers of staff in recent years, due to retirement and staff moves to private sector jobs, but also due to HIV/AIDS. Both statisticians for CSO and analysts for MOA are needed, and part of the challenge is to find funding for advanced formal training elsewhere in Africa, as well as in the North America, Europe and elsewhere. The aging cadre at CSO and the diminished numbers at MOA will force more work to be done through donor-funded expatriate specialists, when Zambian staff can be recruited and trained for a long term approach.

4.10. Are There Important Lessons from the Zambia Experience of Relevance to Other Countries?

Zambia provides an example of collaborative arrangement between CSO and MACO that uses the skills of each to collect basic agricultural statistics, and it is functioning for the narrow range of traditional production statistics. Agents from both agencies are in the field for data collection, and the analysts are knowledgeable on how the data are collected. This is a positive development. These strong ties between CSO and MOA enabled the inclusion of a small agricultural section in the general population census that was used to develop an agricultural sample frame. This efficient organization of efforts saved the central government substantial sums of money, avoiding the need for a full agricultural census before 2007. The ad hoc

nature of the supplemental surveys with panel data needs to be addressed, given the strength of the panel data in answering questions on change over time.

As with Mozambique, there are problems with the linkages between the MACO preliminary crop forecast from monitoring and the CSO CFS from surveys. These problems may be as much in the interpretation and use, rather than in the methods (InWEnt 2007), but the published differences result in confusion, as in 2005 (Mwanaumo et al. 2005) and demonstrate the need to develop reliable crop forecasting methods.

In Zambia, due to the relative lack of analysis, various weaknesses in data collection methods has resulted in data which are often not useful for the types of analysis for which they are used. Land area measurement and cassava production are two aspects in which the data collected may have large measurement error. Large animal estimates are frequently questioned, but survey sampling experts recognize that collection of geographically concentrated elements will have problems in these large sample surveys. Also, the population expansion numbers become unreliable as the length of time from the base period census grows. FSRP and CSO are still working to develop appropriate population weights for the series of PHS since 1996. All systems face this problem, and training on survey sampling strategies and resulting weighting strategies is needed.

As is occurring in other countries, decentralization of government budgets and services has resulted in a major challenge to meet the demand for locally representative and accessible statistics. CSO efforts to achieve this demonstrate the over-stretching of budgets and human resources that occurs due to having the expand sample sizes. The high costs and reliance of external funding for part of the survey effort undermine the sustainability of the system, placing continued importance on the search for efficiency in designing a system of surveys.

In Zambia, legislators, journalists, private sector agents and their lobbying organizations are beginning to use agricultural statistics and analytical output. As analysis gets increasingly into the public domain, the value of agricultural statistics increases dramatically. The quality of the debate on agricultural sector policies improves with reliance on empirical analysis rather than simple logic. The debate surrounding agricultural crop transport levies is one example of how analysis and public sector research can be used by the private sector to lobby for change. The sustainability of the system may depend on its perceived usefulness, especially within the public sector budgeting process. The efforts to tie on journalists and legislators are valuable in creating demand for data and analysis. Greater analytical capacity within the public sector, the university and non-governmental organizations such as ACF is still needed, especially to take advantage of the panel datasets with FSRP.

The Zambian public sector MIS in MOA is an example of the difficulties of a public system. Multiple efforts to establish and reinforce the public MIS for agriculture demonstrate that the government cannot be without such information in their agricultural statistical system. It is a also a key market facilitation activity valued by producers. The price collection by the statistical agency CSO does not meet the needs for policy analysis nor for the private sector traders or producers, although the Ministry of Finance and others rely on the prices for macro-economic analysis. AMIC demonstrates what occurs when there is a lack of political will in the development of an MIS. Collection and dissemination of price and other market information in a way useful to the private sector may best be done by an agency or association within the private sector or with strong private sector linkages.

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APPENDIX 2: AGRICULTURAL STATISTICS IN MALI

Appendix 2

Agricultural Statistics in Mali:

Institutional Organization and Performance

by

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LIST OF ACRONYMS

AFRISTAT	Economic and Statistical Observatory of Sub-Saharan Africa
AGRHYMET	*Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle*/Regional Center for Training and Applications in Agrometeorology and Applied Hydrology
APCAM	*Assemblée permanente des Chambres d'Agriculture du Mali*/Permanent Assembly of Malian Chambers of Agriculture
BCRA	*Bureau Central de Recensement Agricole*
CCSI	*Comité de Coordination Statistique et Informatique*/Coordination Committee for Statistics and Computer Sciences
CMDT	*Companie Malienne pour le Développement des Textiles*/Malian Company for the Development of Textiles
CPI	Consumer price index
CPS	*Cellule de Planification et de Statistique*/Planning and Statistical Unit
CSA	*Commissariat à la Sécurité Alimentaire*/Food Security Commission
DNAMR	*Direction National de l'Appui au Monde Rural*
DNSI	*Direction Nationale de la Statistique et de l'Informatique*/National Directorate of Statistics and Computer Sciences
EAC	*Enquête Agricole de la Conjuncture*/Agricultural Situation Report
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GOM	Government of Mali
IER	*Institut d'Economie Rurale*/Institute of Rural Economy—the national agricultural research institute
MIS	Market Information System
MOA/CPS	See CPS
MSU	Michigan State University
OHVN	*Office de la Haute Vallée du Niger*/Agricultural Development Office for the Upper Valley of the Niger
OMA	*Observatoire des Marchés Agricoles*/Agricultural Market Information System
OPAM	*Office des Produits Alimentaires du Mali*/Malian Cereal Marketing Board
PASIDMA	*Projet d'Appui au Système d'Information Décentralisé du Marché Agricole*/Support Project for a Decentralized Agricultural Market Information System
PRMC	*Programme de restructuration des marchés céréaliers*/Program for cereal market liberalization
RGA	*Recessement Agricole Générale*
SAP	*Système d'Alerte Précoce*/Early Warning system
SDS	*Schèma Directeur statistique/*National Statistics Strategy
SSN	*Système de Statistique National*
WB	World Bank

1. INTRODUCTION

This report on agricultural statistics in Mali is a desk study that describes how the agricultural statistics system relates to the national statistical system, how agricultural data are collected and analyzed, and how the statistics and information produced are disseminated and used. The traditional view of agricultural statistics in Mali has included three broad categories of information: rough estimates of cereal production early in the season for food security projections, more reliable food staple and cash crop production estimates for national accounts, and price information for valuing production and monitoring market trends that influence farm incomes and consumer access to basic foods. There is now an expanding view of needs that calls for more types of data and analyses, including but not limited to:

- Production information on emerging agricultural sectors such as horticulture, livestock and poultry;
- Indicators for monitoring progress on the Millennium Development Goals (MDG) and poverty reduction in rural areas;
- Information to improve planning and evaluation of alternative public and private investments;
- Monitoring productivity and trade trends and analyses to identify the determinants of those trends.

The focus of this study is the institutional organization of the statistical system (identification of key institutional actors and their assigned responsibilities) and its performance in meeting the statistical information needs of the government, the private sector, and development partners. The report deals primarily with the supply and use of data to meet the traditional needs, while noting changes that are taking place to make the system more responsive to the expanding demands identified above. The study draws on published and unpublished reports, personal communications with key actors, and the personal experience of the authors. Section 2 presents an overview, showing how agricultural statistics fit into Mali's national statistical system (*Système de Statistique National* or *SSN*). Section 3 describes the major data systems used to collect agricultural statistics, presenting information on the strengths and weaknesses of data collection, analysis, and dissemination activities. Section 4 examines budget and staffing issues. Section 5 synthesizes the key findings and lessons of general relevance to other countries.

2. OVERVIEW OF THE MALIAN NATIONAL STATISTICAL SYSTEM

A 2004 evaluation of the Malian *SSN* describes it as a hybrid system with a centralized national structure having multi-sectoral responsibilities functioning along side a multiplicity of sector level institutions with no formal links to the centralized structure.[9] The report notes that it is not the existence of the many sector level institutions that causes a problem but the lack of explicit legislation encouraging coordination of activities across institutions. The SSN can be broken down into five institutional components, all of which play some role in agricultural statistics:

1. The *Direction Nationale de la Statistique et de l'Informatique* (DNSI)[10] is the central statistical agency. It is located in the *Ministère de Plan et de l'Amenagement du Territoire*[11] and charged with the design of a national policy for statistics and computer applications;
    a. DNSI relies on nine regional planning and statistics offices (*Direction Régionales de la Planificiation, de la Statistique et de l'Informatique, de l'Aménagement du Territoire et de la Population* or DRPSIAP) for the implementation of data collection activities ;
    b. DNSI is comprised of a directorate (director and deputy director), a documentation center and 5 functional divisions (*Synthèse et suivi, Méthode et analyse, Statistiques démographiques, Statistiques courantes,* and *Informatique*)[12] ;
2. Six *Cellules de Planification et de Statistique* (CPS or planning and statistics units) were created during the 1990s to increase capacity within line ministries for analysis of development policies and programs, monitoring and evaluation of projects, and the design and management of statistical data bases. The creation of these CPS was an effort to compensate for perceived shortcomings of DNSI;[13]
3. Four *observatories* (observation units) are charged with data collection and/or analysis for narrowly defined topics (e.g. employment, transport, human development, and agricultural market information);
4. A variety of statistical services are provided by technical departments located in various ministries (e.g., livestock vaccination services and the *Bureau Statistique et Suivi Evaluation*[14] in the Direction of Agriculture); and
5. The major Government development agencies in the agricultural sector (e.g. four for irrigated rice, one for sugar, two for cotton)[15] are generally the major source of agricultural statistics for their sectors of intervention.

[9] The evaluation was conducted in 2004. This report draws heavily on the following two documents prepared as part of the evaluation: *Projet de reforme des cellules de planification et de statistique (CPS), (Ministère du Plan et de l'Aménagement du Territoire, August 2005); Schéma directeur statistique, (DNSI Novembre 2005). A report by PARIS21 (2005)* also provided insights about Mali's national statistical system in general.
[10] National Directorate for Statistics and Computer Sciences.
[11] Ministry of Planning and Management.
[12] Monitoring and Synthesis, Methods and Analysis, Demographic Statistics, Annual Statistics, and Computer Sciences.
[13] Limited expertise among DNSI staff in agronomy or livestock production, for example, often raised questions about their ability to accurately measure agricultural variables and interpret the data they collected.
[14] Office of Statistics, Monitoring, and Evaluation.
[15] These offices include the *Office du Niger* (irrigated rice), *Compagnie Malienne de Développement Textile* (cotton), *Office de la Haute Vallée du Niger* (cotton and some diversification crops), *Office des Périmètres irrigués de Baguineda* (irrigated rice and horticultural production), *Office Riz Mopti* (rice), *Office Riz Ségou* (rice), *Office de Développement Rural Sélingué* (rice and other irrigated crops) among others.

Legislation describing DNSI's mission states that the Directorate is responsible for developing methods for data collection and analysis of national surveys, setting statistical norms, collecting and analyzing administrative statistics, coordinating the SSN and approving requests for official surveys, statistical and computer science training, promoting cooperation with national and international statistical services, publishing statistical information, developing computer applications, developing and supervising the implementation of a national plan for statistical and computer services, and harmonizing standards for computer technologies and software.[16] DNSI's internal organizational structure based on functional areas (those listed in point 1.b above) means that statistics of relevance to agriculture are collected and analyzed in a variety of divisions. For example, the *Synthèse et suivi* division uses agricultural production data to prepare the national accounts while the *Méthode et Analyse* division is involved in the agricultural surveys that collect the production data, and the *Statistiques courrantes* division develops the consumer price index. While this permits DNSI staff to focus on particular areas of statistical expertise, it does not build subject matter expertise as staff often have to apply their skills to diverse sectors.

Complementary legislation[17] created a consultative body, the *Comité de Coordination Statistique et Informatique* (CCSI or Coordination Committee for Statistics and Computer Sciences), under the supervision of the Ministry of Plan. This consultative body is to meet at least once a year to advise the Ministry with the definition, coordination, and planning for all surveys, studies, and statistical work conducted by public services (see Box 1 for more details). The CCSI role appears to be limited to one of providing perfunctory approval to programs that are presented to it. Evaluators noted, for example, that the committee is convened when DNSI wants to present a program for implementing a special operation. On these occasions, the discussion tends to touch on a mixture of technical and methodological issues that are often beyond the grasp of many committee members, thus reducing the coordinating role that the committee is able to play.

Box 1
Comité de Coordination Statistique et Informatique

The committee is to ensure cooperation among the various producers and users of statistical information in both the public and private sector. The committee is composed of representatives from all government services producing or using statistics and from 16 clearly specified organizations representing civil society (chamber of commerce, chamber of agriculture, unions, women's associations, NGOs, etc. etc.). The CCSI has four sub-committees designed to advise on statistical issues for different sectors: demography and social issues; agriculture, livestock, fishing, and natural resources; economics and finance (covering commerce, industry, energy, water, tourism and hotels); and computer sciences. Source: *Decret No*. 05267/P-RM of 14 June 2005

Legislation creating the various CPS made no mention of DNSI or of the CCSI, while appearing to give to the CPS some of functions already assigned to DNSI and the CCSI.[18] The main statistics and information tasks assigned to the CPS were to identify and express basic statistical needs and to assure the coordination of the production and diffusion of statistical information and basic studies. The 1992 legislation created five CPS with thematic areas that corresponded to the 1992 configuration of ministries:

- Agriculture, livestock, and environment;
- Transport, public works, and housing;
- Education;
- Mines, water and energy; and
- Public health, social action, and promotion of women.

[16] *Ordonnnce No*. 04008/P-RM of 25 March 2004.
[17] *Decret* No. 05267/P-RM of 14 June 2005.
[18] *Ordonnance* No 92-052 / P-CTSP of 5 June 1992.

A sixth CPS, industry and commerce, was added at a later date.

As Mali has revised the number and functional areas of its ministries, the assignment of CPS to specific ministries creates challenges for those wanting to ensure continuity of data collection and reporting. For example, the Ministry of Rural Development, which had responsibility for the CPS covering agriculture, livestock and environment, has now been divided into one ministry for agriculture, another for livestock and fishing, and responsibilities for environment have been combined with those for sanitation. Following the creation of the new ministries a decision was made to maintain a single CPS in the Ministry of Agriculture to cover agriculture, livestock, and fishing; this has maintained continuity for most of the previous statistical programs concerning the agricultural sector.

The CPS legislation also called for the creation of advisory committees (composed of Ministry officials and other actors in the sector) to orient and evaluate the statistical programs proposed by each CPS. These committees had not been officially established at the time of the 2004 assessment.

The overarching problems identified by the 2004 SSN evaluation were the total absence of formal links between the different institutions with a role in the production and use of national statistics, inadequate budgets to accomplished assigned tasks, and inappropriate configurations of personnel in the various institutions. Although the CPS were created to compensate for perceived weaknesses in the centralized DNSI system, the CPS evaluation found these units generally coming up short (see Box 2). Given that our primary interest is in agricultural statistics, it is encouraging to note that the CPS evaluation singled out three CPS as the better performers: agriculture, education, and health. All three have developed a structured information system based on a *Schéma Directeur* (Master Plan), all possess adequate computer hardware and software, and all of their data bases draw on sector-level surveys and studies, usually conducted with substantial CPS involvement.

Box 2
Evaluation Results for Ministry-based Planning and Statistics Units (CPS)

In general, all CPS were found lacking in capacity for economic and financial analysis of projects and in the mastery of software for project management. CPS monitoring and evaluation activities were poorly performed, generally due to a lack of financial resources to conduct field work. In terms of the specific statistical tasks undertaken, few CPS were actively involved in identifying needs for data or information. While they all attempted to collect data to diagnose and monitor the socio-economic situation, most systems had time gaps and tended to be missing critical pieces of information. In some cases, the statistical validity of the information available was also questionable. Analysis of data rarely went beyond simple descriptive statistics. Dissemination of data and reports rarely went beyond the administration and donors and rarely presented information at a more disaggregated level than the Region (the largest administrative subdivision). Source: *Ministère du Plan et de l'Aménagement du Territoire* August 2005

3. PRINCIPAL COMPONENTS OF MALI'S AGRICULTURAL STATISTICS SYSTEM: STRENGTHS AND WEAKNESSES

To synthesize the salient characteristics of Mali's agricultural statistics system, we describe the major agricultural data bases and the institutions involved in producing and analyzing them.

In the early post-independence period agricultural statistics were used to support Mali's centralized approach to agricultural sector development planning, to estimate agricultural gross domestic product (GDP) for national accounts, and to monitor the impacts of government programs. After the major droughts in the early 1970s, the driving force behind the production of agricultural statistics in Mali became food security monitoring. Beginning in the second half of the 1980s, a market information system was added to report commodity prices and flows in an effort to monitor impacts of market liberalization. The market information also served as an indicator of potential supply problems affecting food security. Recent interest in understanding how agricultural productivity growth is transformed into poverty reduction is putting new demands on the agricultural statistical system.

Table 1 provides a list of the key data collection systems used in Mali to monitor rural development in general and the agricultural sector in particular. They are organized into five categories: agricultural production (both crop and livestock), rural living conditions and incomes, market information, trade, and general census information. In the following paragraphs we describe the institutional arrangements for the data collection and analyses of each of the key systems, pointing out their strengths and weaknesses.

3.1. The *Enquête Agricole de Conjoncture*

3.1.1. Overview

Until the late 1980s Mali had two uncoordinated sources of agricultural production data (see Box 3). Since 1988, the centerpiece of Mali's agricultural statistics production system has been the annual *Enquête Agricole de Conjoncture* (EAC or Agricultural Outlook Survey), which provides data for crop forecasts in May and final estimates of crop production by the end of the year for use in national accounts. The EAC also collects information on livestock ownership, farm assets, input use, and demography of farm households, but the exact nature and quality of these data vary from year to year. From 1988 to 2004, the EAC was conducted jointly by DNSI and the CPS for agriculture, with DNSI playing the lead role in managing the survey and producing the annual report. In 2004, following several years of the Food and Agriculture Organization of the United Nations (FAO) and World Bank training and capacity building efforts at CPS and simultaneous with the implementation of the first *Recensement Générale de l'Agriculture* (RGA or General Census of Agriculture), the CPS assumed the lead role. DNSI continues to collaborate with the CPS, providing primarily technical support on statistical and sampling issues, while CPS implements the annual survey and carries out the analyses.

Box 3
Historical Perspective: Merging Two Systems into One

Prior to the late 1980s Mali had two separate agricultural statistics reporting systems, one run by DNSI using statistically rigorous sampling methods and data collection procedures to estimate annual production at the end of the season and one run by the National Direction of Agriculture to produce rapid estimates of the food situation early in the production season and take remedial action if necessary. The estimates from the two sources were often different, leading to major decision-making bottlenecks. Beginning in 1988, DNSI's more rigorous sampling and statistical methods were kept in place, but procedures and resources were added that permitted DNSI to use the same data base to do crop forecasts and the final production estimates that feed into national accounts (also a DNSI responsibility). Source: *Office Statistique des Communautes Europeennes, Statistiques de Base Agriculture Élevage* 1988, Bamako.

3.1.2. Sampling

Until 2004, the EAC sampling frame was based on the 1998 national census, with an annual random selection of 400 to 500 rural enumeration units (geographic areas comprising a population ranging from 800 to 1000 people) followed by a random selection of 5 households from each enumeration unit. Total sample size ranged from 2000 to 2500 households per year[19]; funding considerations were a key factor in determining the sample size. A sample size in this range is considered adequate for producing statistics that are representative at the *Région* level.[20] A new sample was drawn each year so there is no panel with several years of data for the same households.

In 2004, the sampling frame was updated and modified in conjunction with the conduct of the first *RGA*; the modified frame, still based on the 1998 census, added two new categories: urban farm households and modern farms. The establishment of the new frame was accompanied by the establishment of a new goal: the production of results that would be representative at the *Cercle* level (one level down from the *Région*). To accomplish this, the sample needs to cover 1000 enumeration units and 5000 households. This goal was surpassed for the 2004 RGA (9834 households covered), but the CPS has had difficulty meeting the goal with subsequent EAC (only 4300 households covered in 2005/2006 and just 2232 in 2006/07).

3.1.3. Coordination and Organization

According to the CPS, DNSI has continued to provide technical expertise and assistance (particularly with sampling issues) and DNSI staff participate in a variety of meetings and committees concerning agricultural statistics that are convened by the CPS. Since the transfer of the lead role for EAC to the CPS there has been a greater effort to convene the various statistical committees described in section 2 and involve them in planning and decision making. The committees meet at least twice a year (October and March when major results become available) and bringing together individuals from a variety of institutions. In the past, these committees met only on an *ad hoc* basis when DNSI wanted to make a change in survey procedures and CPS participation was not the rule.

[19] Strictly speaking, Mali interviews *exploitations* or farm production units, which can include several households (e.g., a father and his married sons) that join together to operate a single production unit where the factors of production (land, agricultural equipment, and labor) are managed by the patriarch of the family. We use the term household in English to reflect this concept of *exploitation*.

[20] The *Région* is the 1st administrative level after national. Administratively Mali is divided into 9 regions. and 49 *Cercles.* The *Cercles* have also been grouped by agro-ecological zone, based on the *Inventaire des Ressources Terrestres* (inventory of land resources) conducted in the early 1990s.

Table 1. Data Bases Available for Agricultural Productivity and Policy Analyses

Type	Survey/Data Set Name	Institutions Involved	Frequency	Survey description (information collected, sample section, dates covered)
Agricultural Production (crops and livestock)	ECA: Enquête Agricole de Conjoncture	Before 1986: 2 separate, duplicative systems with conflicting results. 1986 to 2004 DNSI with MinAg/CPS assistance. Since 2004/05 CPS in lead with DNSI assistance.	Annual but combined with RGA in 2004/05.	Uses household survey to collect basic info on "traditional sector" for area planted to key crops, total production, and yields. Uses crop cuts to estimate yields. Supplemental information on household demographics collected every year. Varies from year to year for information on livestock holdings, input use, and productive assets (animal traction equipment). Sample has been representative at national and regional level; since RGA in 2004/05 sample is supposed to be representative at "*cercle"* level. Crops include principal cereals (millet, sorghum, maize, traditional rice, fonio, wheat), pulses (peanuts, cowpeas, bambara nuts), and some diversification crops (sesame, tobacco). Excludes "modern/industrial" sectors (primarily irrigated rice and sugar
	RGA: Recensement Générale de l'Agriculture	CPS with DNSI assistance	2001/02 migratory and nomadic livestock herd census. 2004/05 household RGA combined with ECA into a single survey	New sampling frame for RGA includes urban and rural farmers (to capture expansion of peri-urban horticultural production) and modern and traditional farms. RGA covers livestock, rainy and dry season crop production, irrigated agriculture, horticultural production (urban and rural), and tree production. This responds to gaps in ECA which focused only on "traditional" sector and rural farmers. Preference would be to have the RGA replace the ECA, but financial resources have not been adequate.
	EAP: Enquête Agricole Permanente, CMDT	IER/CMDT since early 1990s	Annual	Provides data on variables of interest to agricultural productivity in the CMDT cotton zones for a sample of 750 to 1000 households in 50 villages. Used as official estimates for national cotton production by DNSI/CPS. Other data used to analyze impacts of policies and investments on production and productivity. Often complemented with surveys on special themes of interest to the cotton sector (impact of anti-erosion practices, changes in costs of production over time, role of women in farmer associations, etc.). Only agricultural data series in Mali that is managed for longitudinal analyses. CD available with data from 1994/95 through 2000/01 aggregated to regional
	Commodity Production Statistics	Irrigated rice development agencies (ON, ORS, ORM, OHVN, etc.)	Annual	Individual agricultural development agencies provide information on aggregate production, area planted, and yields for their pricipal crops (irrigated rice, cotton, tobacco, and some horticultural products). This information is used by DNSI and CPS to complement similar data collected for the "traditional sector".
Living Conditions, Income, Expenditure	Budget/Consommation	DNSI	Conducted nationally in 1987	Collected detailed expenditure data for use in assessing incomes (proxied by expenditure) and well being. Many problems encountered in analysis of the data base. Reports were very late and questions about quality were frequent.
	EMEP:Enquête Malienne d'Evaluation de la Pauvreté	DNSI in collaboration with CSLP; primarily WB funding	Baseline collected in 2001; Update planned for 2006	Detailed expenditure and food consumption data to evaluate trends in incomes and poverty. Representative at the national and regional levels.
	ELIM: Enquête Légère Integré après des Ménages	DNSI in collaboration with CSLP; WB funding	periodic; 1st=1996/97; most recent = 2002/03	Expenditure and living condtions data. Urban (4020 hh)/rural (4707 hh) strata; results representative at provincial, regional (N. C. S), and urban/rural levels; ag content varies by year (high in 1996/97, low in 2002/03)
	EDS: Enquête Demographique et Santé	DNSI with USAID funding		Detailed health and reproductive information on women and anthropometric measures for children; useful for looking at differences in health status across different regions and agricultural systems.
Market Information	MIS: Market information system	OMA, attached to APCAM; primarily GOM funding with donor supplements.	Since 1989, weekly data collection and radio announcements followed by monthly synthesis reports.	OMA collects price and quanty data for transactions at markets throughout the country using non-survey, key informant interview techniques. Products covered includedcereals and selected horticultural products. OMA collaborates with other government services to report price and quantity data on livestock transactions. Data files are available in various configurations upon request and payment of appropriate fees.
	CPI: Consumer price index	DNSI	Monthly data collection; infrequent publication of results	CPI is estimated for Bamako. Data are also collected in regional capitals but there is no nationally applicable index.
Trade	Import/export data	Customs services and Min of Commerce with analyses by DNSI	Transactions data	Customs data are problematic as there is a general sense that they do not reflect (1) actual amounts that cross official borders due to negotiations to reduce taxes paid and (2) goods crossing informally where there is no customs post or in small quantities that are not captured by customs records.
General Census	RGPH: Recensement Générale de Population et Habitat	DNSI	Last conducted in 1998.	Official national census which serves to develop sampling frames for other surveys

3.1.4. Reporting and other Uses of the Data

Prior to turning the lead role for the EAC over to the CPS, DNSI had established a policy of publishing three annual reports for each agricultural campaign:

- A provisional forecast of expected harvests due in October;
- A report of the final harvest results for rainy season production and provisional estimate of cereal balances for the coming months due in March; and
- A report of the entire year (all rainy season and dry season production) due in June.

The first two annual reports are used extensively by Mali's Famine Early Warning Unit (*Système d'Alerte Précoce*) and the Food Security Office (*Commissariate à la Sécurité Alimentaire*) in assessing the food security situation, developing food balance sheets, and designing food aid interventions if necessary (see 3.5. below). The different reports present aggregate data (national and regional) on area, production, and yields for the most important crops. The reports also include statistics on the modern sector for irrigated rice and cotton (using data from the specialized agencies managing these production systems (see 3.3. below) and information on factors affecting crop production (rainfall patterns, pests, input use, equipment ownership, etc.). Reports became increasingly late and some stopped entirely in the early 2000s. Even when the reports were being published regularly, they frequently did not provide full descriptive statistics on all the data collected by the EAC and they rarely presented any type of time series analyses (the maximum was usually a comparison of the current year with the previous year or two). Since CPS has taken over, there has been an improvement in the regularity of the reports (see, for example, CPS Agriculture 2007, March) and some catching up on reports that had not been issued in the past (although the third report summarizing the entire year has not been issued since 2003). CPS has accomplished more regular reporting of supplementary information on topics such as market prices, trade, access to credit, production of gathered and secondary products (a variety of pulses, wild nuts and fruit, and watermelon). A longer time perspective has also been added by comparing current results with a 5-year average of past performance for the principal cereal crops.

The only other publication of results from the EAC identified by this study is a March 2001 publication by CPS that was a compendium of not only agricultural production data from the EAC but also other information of relevance to agricultural policy analysts.[21] Most of the statistical series included in the document covered the period 1984 to 2000. This excellent document combined demographic, crop and livestock production, transport, price, trade and other types of information of relevance to agricultural sector analysis. The report was disseminated in hard copy and electronic (CD) formats. Although a good step forward, the electronic format did not allow for a simple way to transfer the data to software permitting additional analyses (it could be done through cutting and pasting different tables from the CD into a spreadsheet). Another weakness is that the publication has not been updated since being issued in 2001.

Use of EAC data in policy analysis, other than citing the aggregate national and regional statistics in various reports, appears limited. In conjunction with the World Bank's preparation of a Country Economic Memorandum (CEM) in 2005, the consultants involved used the EAC household level data sets available from 1995 through 2003 in an effort to model the determinants of agricultural productivity.[22] DNSI gets high marks for the rapidity

[21] This 2001 publication refers to an earlier compendium of a similar nature, but we were unable to locate a copy or find out more about what it covered.
[22] The principal author of this document was one of the consultants involved in the CEM analyses.

with which they provided access to data sets and for their assistance in helping the consultants use it (particularly parts that were not well documented). The effort did not produce what could be considered reliable estimates of the determinants of agricultural productivity, but it did provide a number of insights about weaknesses in the data base for this type of analysis. First, there are weaknesses in terms of data management:

- there is no official documentation and there has been little effort to standardize variable names and value labels from one year to the next;
- the data for each year are stored in a variety of sub-files that must be joined together to get the complete household picture for any given year; and
- the files with the data and calculations used for estimating plot sizes can be difficult to follow if one wants to understand the calculations and decisions about values to keep and values to reject (but it is not too difficult to find DNSI's final estimate of plot size).

Among the data quality issues are:

- year to year changes in the data collected, particularly for factors such as input use and access to equipment that affect productivity, making longitudinal analyses very difficult;
- collection of input use data at the household level rather than at the plot level (i.e., unable to link fertilizer use to crops/plots on which it was used and to specific yield estimates);
- collection of input use data in terms of expenditure rather than quantities (a problem because it is difficult to figure out if the expenditure includes costs of credit, transport, etc.); and
- large numbers of yields in the data base with questionable values.[23]

3.1.5. Strengths and Weaknesses of the EAC

The 2004 SSN evaluation identified collaboration between DNSI and the CPS of agriculture as one of four success stories for DNSI in terms of inter-institutional collaboration in statistical analysis, so the informal mechanisms in place to encourage DNSI-CPS collaboration appear to have been much more effective in the agricultural sector than elsewhere even though there continues to be no legally defined relationship between the two institutions. In general, DNSI provided statistical expertise (sample design and analyses) while CPS provided the technical knowledge needed to train enumerators and interpret the results.

Despite the relatively good inter-institutional collaboration, the 2004 evaluation noted the following shortcomings of the EAC:

- Financial resources allocated to the EAC often take time to mobilize and cause delays in data collection;

[23] Recent discussions with the current head of the CPS reveal that getting reliable yield estimates continues to be a challenge. There is substantial secondary evidence that yields are increasing for some crops, but this is not being captured in the EAC data. Efforts are underway to better supervise the yield data collection methods and review analysis procedures (particularly the identification of outliers) to reconcile the different sources of information.

- The shortage of human resources handicaps the collection of data; the survey relies on an existing team of permanent interviewers who are getting old, dwindling in numbers, and lacking in motivation;
- Data entry and cleaning takes more and more time because there is not a clearly defined system in place to move from one step to the next;
- Publication of final results is often late; and
- There is a need for the survey to pay more attention to producing statistics disaggregated by gender to satisfy growing demand.

It was also noted that the sampling frame for the EAC had not been respected several years prior to the 2004/2005 season, that some crop forecasts had been contested and subsequently revised (this was again evident in 2005 when there were locust problems combined with location-specific droughts), and that annual reports were no longer issued regularly. Recommendations for improvements included:

- Developing a new sampling frame (subsequently addressed in conjunction with the implementation of the RGA the following season);
- Revising the objectives of the EAC to take into account the need to produce indicators for monitoring poverty; and
- A transition from reliance on a permanent staff of interviewers to use of literate farmers for data collection.

In terms of the broader integration of agricultural statistics into other indicators of economic and social development, it is worth noting a fairly long list of critiques of the current production of economic statistics that was contained in the *Schèma Directeur statistique* or National Statistics Strategy (SDS). Most of these points have some relevance for how well the agricultural sector is represented in economic and social statistics:

- Reporting on national accounts is often delayed because data feeding into the system is late or of questionable validity.
- The consumer price index is available and estimated using methods that are compatible with estimates for other UEMOA countries but the index is only valid for Bamako and its base is 1996. There is a need for a nationally representative index with a more recent base.
- A new base for the national accounts was adopted in 1997 to follow the principles of SCN93 (*Système des comptes nationaux* or National accounting system published in 1993). Using the new methods, the accounts were recalculated for 1997, 1998, and 1999 and the period 1980 – 1996 was adjusted. These revised numbers are available at DNSI but have not yet been published. Use of the new software (ERETES) has caused problems and delays the work. AFRISTAT (Economic and statistical Observatory of Sub-Saharan Africa) has been assisting.
- The experience with ERETES suggests a need to develop software for more rapid production of the national accounts so that the data are available to decision makers when needed.
- Government decentralization has raised the need for accounting methods appropriate for decentralized accounting; there is not a certified method for this type of accounting.
- No consolidated data base exists where all the economic, financial, and monetary statistics needed for national accounts and policy making are available.

- Demand is strong for measuring women's contribution to the economy yet there is no established methodology for doing this and including it in national accounts.

In addition to the above critiques, we would also add that Mali is failing to fully capitalize on the investment being made in the EAC data base because of its relatively limited use for policy purposes other than food security assessments and national accounts. The need to create a consolidated data base for agricultural statistics was noted in the SDS assessment of the SSN. At present, there is no standard distribution system for making the EAC base data files (household level and plot level) available to others. Presently, anyone wanting to do agricultural policy analyses needs to go to a multitude of offices (DNSI, CPS, meteorological services, customs, etc.) to collect the basic data needed. Greater efforts to encourage use by others could lead to user feedback and gradual improvements in the data base and also contribute to building stakeholder support capable of lobbying government for more regular funding.

The SDS report identified 13 steps thought to be essential if Mali's agricultural and livestock statistics were to meet needs and future expectations:

- Implement the RGA household survey and do the descriptive analyses;
- Revision of the EAC methods: improve definition of households, better sampling, frame and techniques, improved data collection procedures;
- Conduct the EAC regularly;
- Publish EAC reports for 2001 to present;
- Develop and implement an annual horticultural survey;
- Complete the analysis of the RGA on migratory and nomadic livestock herds;
- Develop and implement on a periodic basis a survey of livestock herds;
- Conduct a survey on domestic livestock slaughtering;
- Improve statistics on commercial livestock slaughtering;
- Improve existing surveys of livestock markets;
- Develop a table of uses of livestock products;
- Create a general data base for agricultural statistics; and
- Provide training to CPS professionals to improve their skills in survey data analysis.

Since these recommendations were initially drafted in 2004, some progress has been made in almost all areas, but for many points the methodological work has not been followed up by funding for regular implementation. The census of migratory and nomadic herds was conducted in 2001 and results published in 2002. The RGA was conducted at the household level in 2004/2005 and preliminary results published in 2006 (including some gender analysis and data on access to services that was not previously available). A method for collecting horticultural data was tested but implementation has not started. This year (2007/2008) the CPS conducted its first assessment of informal animal slaughtering. Many of these advances were facilitated by funding and capacity building efforts associated with the RGA, which is discussed in the next section.

3.2. The *Recensement Général de l'Agriculture*

3.2.1. Overview

Since the late 1990s, the FAO and the World Bank have been supporting the Development of Food and Agriculture Statistics project. This project provided much of the capacity building at the CPS of Agriculture that permitted the unit to take over the direction of the EAC from DNSI and to implement the two modules of the RGA that have been conducted to date:

- A census of migratory (transhumant) and nomadic livestock herds in 2001/2002; and
- A full-scale RGA of almost 10,000 agricultural production enterprises in 2004/2005.

The Government of Mali (GOM) has had trouble getting the program fully funded, hence the implementation of only two modules of the overall RGA program.

As noted above, two objectives of the RGA were to improve the agricultural survey sampling frame and increase the sample size. A third objective was to increase the breadth of information collected and develop data collection techniques for these new categories of data. The RGA conducted in 2004/05 covered livestock, rainy and dry season agriculture, irrigated agriculture, horticultural production (urban and rural), and tree production. The general types of data collected were similar to that of the EAC (household demographics; area, production, and yield for products covered; input use); but more attention was given to disaggregation of the data by gender and to information on access to services (extension, credit, farmer organizations).

3.2.2. Sampling

The new sampling frame developed for the RGA and used on all subsequent EAC has been described in section 3.1. It includes both urban and rural locations as well as modern and traditional farms. The sample size far surpasses the number of production units (5000) needed to get representative results at the *Cercle* level. For the 2004/2005 RGA, CPS managed to collect data on 9834 of the 10460 production units anticipated, with the lowest rates of coverage success in Bamako (61%) and the northern regions (82% for Gao and 89% for Kidal). There appears to be general satisfaction with the new sampling frame as we have heard no criticisms of it.

3.2.3. Institutional and Coordination Issues

In creating the RGA, there is evidence that the key actors tried to resolve some of the inter-institutional coordination problems noted in the earlier discussion of the 2004 assessment of the national statistical system. According to a government website (www.maliagriculture.org/securi_a/rga.html) and a preliminary report on the 2004 RGA (BCRA 2006), the *Comité Technique National du RGA* (CTN or National Technical Committee for the Agricultural Census) was formed to provide technical advice to the implementing agents. The CTN includes the members of the CCSI[24] sub-committee for agriculture and livestock, the *Comité National de Coordination Statistique* (National

[24] *Comité de Coordination Statistique et Informatique* or Coordination Committee for Statistics and Computer Sciences.

Statistics Coordination Committee), and "all other national structures concerned with the operation". The CPS has the overall responsibility for implementing the entire RGA project. A *Bureau Central de Recensement Agricole* (BCRA or Central Office for the Agricultural Census) was formed to act as the implementing structure within the CPS of agriculture. BCRA has responsibilities for methods, field work, data entry and cleaning, analysis, and dissemination of results. The BCRA includes personnel from DNSI, *Direction National de l'Appui au Monde Rural* (DNAMR, which is the GOM extension service), *l'Office Malien du Bétail et de Viande* (Malian government office for livestock and meat), and the CPS of agriculture. Regional branches of the BCRA implement the field operations and there is a *Comité Technique Régional* (Regional Technical Committee) headed by the Governor of each Region and consisting of regional representatives of the relevant technical services. All these offices and committees were created by a Government decision[25] following the Government's 1998 acceptance of the RGA project. We have been unable to determine the extent to which these institutions have become permanent institutions within the Malian statistical system or remain temporary ones dependent on continued donor funding. Their role does appear to be limited to questions directly relating to RGA surveys, with no official responsibilities for the conduct of the annual EAC surveys.

3.2.4. Reporting and other Uses of the Data

To date, there have been three reports issued by the CPS related to the two RGA surveys, one on methods for the livestock survey and the other two on survey results:

- *Recensement National du Cheptel Transhumant et Nomade, Volume 1, Rapport Final. Méthodologies et Cartes thématiques*, May 2002.
- *Recensement National du Cheptel Transhumant et Nomade, Volume 2, Rapport Final. Résulats bruts*, May 2002.
- *Recensement Général de l'Agriculture 2004, Résultats Préliminaires*, August 2006.

The report on the 2004 RGA is one of five initially planned. The reports do not go beyond descriptive statistics, but as indicated above, the data analyzed do cover a broader range of topics than prior reports issued on only the EAC, with some gender analysis of access to services (primarily for female vs. male household heads).

Discussions with CPS revealed that they are developing a consolidated file of the RGA data that would contain a single observation per household that contained all the variables available from the RGA conducted in 2004. A file of this nature would be a big step forward in encouraging additional analyses of the data and use by policy analysts. This work is under way but is advancing slowly as the same people working on this must also work on the annual EAC and other routine reporting activities.

3.2.5. Strengths and Weaknesses of the RGA

Investments made in connection with the RGA to improve CPS survey implementation and analytical capacity have resulted in a shift of responsibility for the annual EAC survey from DNSI to CPS, the use of an updated sampling frame, more regular EAC reporting, and more

[25] Decision 0189/MDR-SG of 23 April 2001.

clearly defined roles for the various actors and committees – these are all positive contributions to the overall agricultural statistics program in Mali.

The stated goals of the RGA respond well to the growing demand for covering a broader range of agricultural products and disaggregating results by location and type of farmer. In terms of disaggregated analyses, those involved in women's programs would like to have production statistics disaggregated by gender. Those monitoring poverty would like to have data stratified by different indicators of poverty. Those involved in government decentralization would like to have agricultural statistics that are representative at the *Commune* level (one level down from the *Cercle*), where development planning is now taking place.

Also, there is interest in expanding the types of data collected for all agricultural production activities. In addition to quantities produced, those making decisions about agricultural investment programs or providing extension advice to farmers would benefit from having better information on income derived from different activities, inputs used, and investments made. The provision of this type of information requires not only an expansion of data collected but also moving toward more complex levels of analysis.

The CPS and DNSI have moved forward in developing improved capacity and methods for addressing many of these expressed needs, but in general the funding needed to implement the new methods on a regular basis is not yet forthcoming. It is also not clear to us which improvements should be implemented as part of the RGA and which should be incorporated into the annual EAC. Moving forward, there is a need for greater realism about what can and cannot be done by the EAC and the RGA with the resources available. Plans for supplementary surveys to cover emerging sectors have not been funded. Reporting on the two modules of the RGA that have been conducted is slow and thus far relatively superficial. We are unaware of the use of the RGA data for policy analyses. Additional budget and personnel will be needed to implement the RGA program as currently envisioned.

3.3. Contribution of the Agricultural Development Agencies and NARS

Specialized agricultural development agencies (often reformed parastatals) often provide production statistics for their zones and, in some cases, conduct supplementary surveys in collaboration with Mali's national agricultural research system led by the *Institut d'Economie Rural*e (Institute of Rural Economy).

3.3.1. Production Statistics

The EAC does not collect data for cotton or for rice grown in formal irrigation schemes. These data are supplied by the agencies (*offices*) that manage these production systems: *Office du Niger, Office Riz Ségou, Office Riz Mopti, Office de Développement Rural Sélingué*, and *Office des Périmètres irrigués de Baguineda* for rice and the *Companie Malienne pour le Développement des Textiles* and the *Office de la Haute Vallée du Niger* for cotton. The 2004 SSN evaluation noted potential sampling and other methodological problems raised by having multiple data collection systems. As there is no formal relationship between DNSI and/or CPS and the various agricultural agencies, the statistical services have no authority to influence how the agencies collect their data or make their production estimates. Nevertheless, the CPS has been working with the various agencies in the rice sector to ensure that the methods used are consistent with estimates produced by CPS for the rice produced in

other zones. CPS is generally satisfied with the progress, but believes that there is still room for improvement in the *Office du Niger*.[26] Cotton data continues to be provided entirely by the *Companie Malienne pour le Développement des Textiles (*CMDT*)* and the *Office de la Haute Vallée du Niger* (OHVN); CPS does not see a problem with this. All production data for other crops in the cotton zone come from the EAC survey.

3.3.2. Supplemental Surveys

The CMDT has conducted a sample-based annual survey since the early 1990s (*Enquête Agricole Permante*) to collect key information at the village, household and plot level on crop productivity, assets, farming practices, etc. The annual surveys are often complemented by thematic surveys on topics such as the role of women in village associations, adoption and impacts of anti-erosion practices, diversification crops, etc. The sample has remained relatively stable over time in terms of the villages included (approximately 50 or about 1% of the villages in the cotton zone), but the households interviewed (10-15 per village) appear to change frequently so it is not clear that the data set provides a true panel. The *Institut d'Economie Rurale/Companie Malienne pour le Développement des Textiles* (IER/CMDT) teams have issued a wide range of reports based on this data set. The reports have improved the quality of policy discussions on cotton sector reforms and investments. While these data are considered the property of the CMDT, the summary statistics (not the base data) are generally available to others working in the sector. Financial support for this work has come from CMDT and donors. With the move toward liberalization of the cotton sector, it is not clear if there will be continued funding for this type of data collection and analysis. The *Office du Niger* has collaborated with IER on a wide range of agronomic and socio-economic studies of the irrigated rice sector (impact of the CFA Franc devaluation on incomes and productivity, prevalence of malaria, variety improvement, introduction of diversification crops, returns to investments in different levels of irrigation infrastructure investment, etc.). Most of these supplemental surveys are funded through donor contributions and there is no effort to carefully document the data bases and make them available to others. In several cases, the data have been lost due to computer failures.

3.4. Rural Living Conditions and Income

We began this report noting that efforts to reduce poverty and meet the MDG have put increased demands on national statistics systems to monitor key indicators of poverty. The *Cadre Strategique pour la Lutte contre la Pauvreté* (CSLP or Strategic Framework for Poverty Reduction) officially adopted by the GOM in May 2002 relies heavily on DNSI and the various CPS (not just agriculture) for reporting of poverty indicators. At present there are two national surveys used to collect living standards data (1) the *Enquête Malienne d'Evaluation de la Pauvreté* (EMEP or Malian Survey for Poverty Evaluation) and the (2) *Enquête Légère Integré après des Ménages* (ELIM or Light, integrated household survey). DNSI is responsible for the implementation and analysis of both surveys. The EMEP was first conducted in 2001 and is viewed as the baseline data for monitoring progress with the CSLP; the initial report of descriptive results was published in 2004. The survey objectives include:

[26] Personal communication from B.S. Ba, CPS.

- evaluating household consumption patterns in a manner permitting inter-regional comparisons, comparisons among major socioeconomic groups, and different poverty groups;
- evaluating consumption of home-produced goods;
- determining the nutrient quality (calories, proteins, vitamins, minerals) of foods consumed;
- measuring the nutritional status of children less than 2 years of age;
- describing the income distribution of households using expenditures as a proxy; and
- identifying the principal groups in the population who are poor or disadvantaged using a well defined poverty cut off point and proposing indicators for permanent monitoring of these groups.

A second round of the EMEP was planned for March of 2006. The ELIM survey is supposed to be conducted every two years to collect household level data on access to services (education, health, markets, transport) and perceptions of changes in well-being (this information is also collected as part of the EMEP). The first ELIM was conducted at the end of 2003.

A review of Mali's poverty M&E system notes that it continues to struggle with the definition of an appropriate set of agricultural and environmental indicators (CSLP 2005). At present the effort to keep the overall set of poverty indicators reasonable and the heavy focus on health and education has resulted in the agricultural and environmental sector in Mali being monitored by four basic indicators:

- Cereal production (MOA/CPS drawing on own surveys and irrigation offices for rice);
- Cotton production (MOA drawing on the CMDT cotton parastal data);
- Irrigated areas (MOA drawing on data from irrigation offices); and
- Area reforested (from statistics on formal projects covered by the Forestry Service).

Other problems facing the poverty analysts include a lack of baseline data for numerous variables, poor measurement of and ability to link actual performance to investments or policies, reliability and coherence of data due to the multitude of sources, weak capacity in the various institutions that are contributing data and indicators, superficial analysis of data from poverty surveys, and inadequate financing (CSLP 2005). While these problems exist across all sectors, the agricultural sector often performs better than others in reporting the current set of poverty indicators and in terms of having an established baseline.

Another source of information on rural well being is the *Enquête Démographique et de Santé* (Health and Demographic Survey) conducted intermittently (1987, 1995/96, 2001, 2006). The results can be used to develop indicators of health and nutritional status of the general population, women, and children in different regions of Mali; because the same study has been conducted several times, the entire data base provides a longitudinal profile of changes in health status. A special research project in the early 2000s used a subsample of the EDS survey to study the links between agricultural productivity growth and the nutritional status of children under five years of age.[27] A key study objective was to identify policy options capable of improving the health and nutritional impacts of agricultural growth and increases

[27] Mali Agricultural Growth and Nutrition Project (LICNAG), implemented jointly by Michigan State University and the Sahel Institute. For more details and publications see: http://www.aec.msu.edu/fs2/mali_nut/index.htm.

in rural incomes. This is one of the few examples we have found of researchers trying to collect health and detailed agricultural and expenditure data simultaneously to better understand the linkages between agricultural growth, income growth and some of the standard health and poverty indicators.

3.5. Institutional Reform in the Agricultural Market Information System

3.5.1. Overview

After the EAC, the next most important agricultural data base in Mali is the market information system (MIS) currently managed by the *Observatoire des Marchés Agricoles* (OMA or Agricultural Market Information System). OMA's mission is to collect, process, and disseminate statistical, regulatory, and all other types of information that can influence the formation of agricultural prices. OMA collects and disseminates price and product flow data for cereals (millet, sorghum, maize, and rice) and other key agricultural products (e.g., cowpeas, fruits and vegetables, and fish products sold in major markets). OMA collaborates with the *Direction Nationale des Productions et des Industries Animales* for statistics concerning livestock and poultry. It has also expanded coverage to include inputs (fertilizers, pesticides, and seeds).

3.5.2. Institutional Evolution of OMA

Mali's market information system has gone through a variety of institutional restructurings since its initial start in 1989 as a donor-funded unit located in the *Office des Produits Alimentaires du Mali*, (OPAM, the cereal marketing board which manages food security stocks and, prior to liberalization, set official cereal prices). The initial role was to collect price information as a means of monitoring the impacts of Mali's cereal market liberalization program. In 1998, USAID funded a program (PASIDMA, *Projet d'Appui au Système d'Information Décentralisé du Marché Agricole* or Project for the support of a decentralized agricultural market information system) implemented by Michigan State University that was designed to significantly reduce the MIS's reliance on donor funding, increase funding from domestic sources, and ensure the financial sustainability and high quality of the information produced. The project began with user surveys to assess information needs and how well the current MIS was responding to them: farmers, processors, traders, consumers and policy-makers were contacted. At the time, Mali was undergoing a democratic transition that saw farmers' organizations becoming more engaged and influential. As farmers are one of the key beneficiaries of market information, their organizations became important allies of the MIS in lobbying the government for financial support as well as an important source of feedback on information and restructuring needs.

Survey results were presented at a December 1998 workshop on the topic of restructuring the MIS. The workshop, presided by the Prime Minister, recommended that the OMA be created and attached to the *Assemblée permanente des Chambres d'agriculture du Mali* (APCAM), the national umbrella organization of the *Chambres Régionales d'Agriculture (Système d'information du marché céréalier (SIM) 1998).* This transfer gave the users of the MIS data a direct stake in the system and also gave the OMA management team more administrative flexibility and direct authority to manage their personnel (under the former system hiring and firing of staff required approval of the OPAM administration). The workshop also recommended that the government finance the public good activities of OMA through the

national budget and that the OMA be authorized to carry out specialized analyses for private firms and other organizations on a user-fee basis. These recommendations were adopted by the GOM.

Because APCAM is a national organization representing individual regional offices throughout the country, OMA's affiliation with APCAM also facilitated the decentralization of data collection and dissemination. This decentralization contributed to reduced costs and ensured that market information collected in each region responded to the expressed needs of APCAM regional offices. Through OMA's sustained efforts to satisfy its clients' information needs and strengthen their capacity to use market information more effectively, both farmers and traders have taken a sense of ownership of OMA. This has resulted in them putting more pressure on OMA to produce the information they want and to establish better links with neighboring countries' market information systems to help foster regional information flows that promote regional trade. The private sector's political support for OMA through the Chambers of Agriculture and Commerce ensures the continuation of government funding today.[28]

At present, funding from the Government continues to cover OMA's operating budget but not its capital budget, which is supported by donors. OMA also generates a small amount of revenue by doing analyses or creating special data bases in response to client requests. The National Coordination of OMA is now appointed by APCAM and can be revoked by the APCAM Board of Directors. In practice, APCAM has provided OMA with general oversight of a nature that allows OMA considerable administrative flexibility.

3.5.3. Reporting and Use of the Data

The OMA webpage lists six public service activities performed by OMA (http://www.oma.gov.ml/presentation.html) :

- Management of a data base on agricultural markets
- Production and distribution of situation reports when conditions call for it
- Production and distribution of a monthly report « Le Reflet ».
- Production and diffusion of market information throughout the country via local radio broadcasts
- Production of special radio and TV programs of interest to different agricultural sub-sectors and actors, in collaboration with professionals in the communications industry.
- Provision of data and information to government services responsible for agricultural and food security policy.

OMA posts its monthly reports and any situation reports it produces on its website. A check of the website in early April 2007 showed that it was being updated regularly with the February monthly report as well as a situation report on a February mission to the Kaye region both available.[29] OMA's data is regularly used in *Système d'Alerte Précoce* (SAP) and CSA food security assessments (see section 3.5.) and OMA staff are often called on to

[28] See Dembele, Tefft, and Staatz (2000) and Deme (2002) for more details about OMA institutional innovations and performance and PASIDMA project reports for implementation details (available at http://www.aec.msu.edu/fs2/mali_pasidma/ppr9899progress.pdf)

[29] It was interesting to note that of all the agricultural statistics services with websites, only OMA had a truly up-to-date, active website. We interpret this as evidence that what they do is truly driven by a need to satisfy their clients.

participate in food security assessment missions. OMA has also made its data available to regional MIS systems such as the *Réseau des Systèmes d'Information des Marchés en Afrique de l'Ouest* (http://www.resimao.org/html) and provides a variety of links from its website to other related services and data bases. OMA charges a fee for access to their established data bases, but unlike DNSI's system with the EAC, OMA will put the data in specific formats requested by the client rather than leaving the potential user on their own to figure out how to manipulate the data and create different series. The website lists the following data bases and instructs users to email OMA to learn more about the contents of the data bases and the conditions for access:

- Average national consumer and producer prices;
- Average regional consumer and producer prices;
- Average producer and consumer prices for a market of choice;
- Wholesale purchase and sales prices for Bamako wholesale markets;
- Quantities sold by producers at rural production markets;
- Quantities sold at consolidation markets (marches de regroupement);
- Quantities entering urban wholesale markets in regional capitals; and
- Consumer prices for horticultural products in Bamako markets.

3.5.4. Strengths and Weaknesses of Mali's MIS

While the Malian market information system (both OMA and its predecessor agency) have a reputation for being one of the best, if not the best agricultural market information system in West Africa, it should be noted that OMA has had some trouble in recent years keeping its reporting up to date. For the past two years, USAID funding to support the Malian *Commissariat à la Sécurité Alimentaire* (Food Security Commission) provided for technical assistance and equipment renewal that has gotten OMA back on track. The need for this assistance does raise questions about how adequate OMA staffing and funding is as it tries to expand its coverage to a wider range of products.

Despite the growing pains, the institutional model used by Mali's OMA is unique in Africa and should be carefully considered by other countries wanting to improve their MIS. Most MIS tend to be located in government offices or national research centers and suffer from bureaucratic blockages characteristic of such institutions. Mali's OMA seems to have developed institutional arrangements that foster stakeholder involvement and ensure access to both government and donor budget support while maintaining the administrative autonomy and flexibility needed to respond quickly to emerging market situations and private sector requests for special analyses.

3.6. Reinforcing the Food Security Side of Agricultural Statistics

Two other institutions merit mention here because they are key players in food security monitoring and coordination but do not figure officially in the SSN: the *Système d'Alerte Précose* (SAP, Famine Early Warning System) and the *Commissariat à la Sécurité Alimentaire* (CSA, Food Security Administration).

3.6.1. SAP Role and Responsibilities

SAP is an institution funded jointly by government and donors to collect and analyze information on crop forecasts, satellite imagery, price trends, potential threats due to climate or pests, etc. in order to provide early warnings of impending food crises and make recommendations for actions to ameliorate the situation. In addition, SAP conducts on the ground assessments of potential food security hot spots, with a focus on high-risk areas in northern Mali above 14 degrees latitude. SAP generally relies on existing sources of data for production estimates (e.g., the provisional EAC report in particular), rainfall, pests, and so forth; but they do conduct light surveys on infant nutritional status and population migrations to collect qualitative information for food deficit zones. SAP is the key official source of information and analysis provided to the GOM for food security decision making. SAP also compiles an annual report that feeds into a regional CILSS assessment of food security needs in the Sahel. Results of the assessment are used to make recommendations about policies to encourage commercial trade flows that would get stocks to where they are needed and for determining food aid needs.

3.6.2. SAP Strengths and Weaknesses

The Malian SAP exhibits some characteristics of effective Early Warning Systems noted in a recent FAO study of Food Security Early Warning Systems in Sub-Saharan Africa (Tefft, McGuire, and Maunder 2006):

- Location that is conducive to a reciprocal flow of information with primary decision making bodies (i.e., affiliation with the CSA that is attached to the Presidency);
- Administrative ease of access to primary and secondary data through relationships developed with line ministries, decentralized government units, donor projects, and NGOs; and
- Movement toward a livelihoods approach to analyze food security and the integration of both quantitative and qualitative data.

On the other hand, it is not immune from some of the weaknesses noted in the same FAO report:

- Political pressure when recommendations do not conform to politicians' views[30]; and
- Heavy reliance on data and information collected by donors or donor-funded activities[31].

3.6.3. CSA Role and Responsibilities

The CSA has overall responsibility for coordinating food security matters across a broad spectrum of actors. In this role the CSA is both a user and a producer of data and information needed to monitor food security. Following several years of trying to manage the multi-sector nature of food security concerns through a department in the Ministry of Agriculture and

[30] This was evident during the 2005 season, characterized by localized droughts and insect infestations, when Mali was extremely late in submitting their food security assessment to CILSS because of disagreements about the results among various actors.

[31] We do not have budget information for the SAP, but our impression is that donors provide the bulk of the funding.

Livestock, the GOM made a decision to create the CSA as a special office attached to the presidency. The CSA has a broad mandate to coordinate food security activities across all the relevant ministries (agriculture, commerce, livestock, health, education, etc.). According to the CSA website, two key institutions involved in collecting and analyzing agricultural statistics are considered part of the overall CSA family structure: SAP and OMA. This puts SAP and OMA in the unusual situation of having no formal ties to either DNSI or the CPS of agriculture, the institutions with the primary responsibility for producing, disseminating, and analyzing agricultural statistics. In Mali, however, good relationships between these various institutions prevail and the institutional structure does not appear to impede the different actors from collaborating in a manner that helps all to accomplish their missions.

3.6.4. CSA Data Management Activities

The CSA, in collaboration with OPAM and SAP, analyzes information on national cereal stocks, regional cereal trade and other information of relevance to food security analyses. In addition to the more traditional food security information management tasks, the CSA has been assisting local units of government at the C*ommune* level (next level below the *Cercle*) to develop and manage their own food security plans. These food security plans are available on the Internet and can be used by donors or development agencies to identify the priority needs of each commune as they attempt to reduce food security risk and dependence on food aid. The plans also include information on demography, local infrastructure and other resources (e.g., livestock herd numbers, irrigated areas) as well as summarizing existing sources of development assistance. The Food Security Plans, in combination with the more general local development plans, provide a wealth of information of relevance to the design of agricultural support and investment programs. The local commune plans are also being consolidated and coordinated at the *Cercle* and Regional levels.

3.7. Technical Services in Ministries, Weather Information, and Trade

Other sources of agricultural statistics are the directions of different ministries which report administrative statistics on the forestry, fishing, and livestock sectors (e.g., estimates of trees planted, animals vaccinated, or fish farming activities launched). We have no information on how these statistics are collected, but they appear to feed into the national accounts developed by DNSI and indicators used for poverty assessment.

An important player who seems to be outside the general SSN framework is the meteorological service, which tracks climate data. The quality of the data and geographic coverage appear to be good, but access is not always easy. This service has instituted a policy of selling its data, although institutions or individuals with good connections appear to be able to get access without paying. The agricultural development agencies and SAP include rainfall statistics in their annual and monthly reports, but an analyst who needs a particular series of rainfall data to examine a productivity problem will need to spend a bit of time tracking down the data and getting access. Metéo-Mali does not appear to have a public access website that would help analysts identify and order appropriate data series. The OMA website provides links to other sites for weather information (FAO/*Système mondial d'information et d'alerte rapide sur l'alimentation et l'agriculture,* AGRHYMET (*Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle*), but theses sites tend to be regional sites that report assessments of current situations rather than rainfall data *per se*.

Another actor is the *Direction du Commerce et de la Competitivité* (Directorate of Trade and Competitiveness). It is responsible for trade statistics and price information on processed commodities such as milk, sugar, fertilizer and seeds.

3.8. National Census

The underlying foundation of all the sample-based surveys in Mali that are considered representative at the national, regional or *cercle* levels is the national census of population and housing. The last full census was conducted in 1998. DNSI has the responsibility for implementing the census, analyzing the data, and helping the CPS in various ministries use the results for the design of their own sector-specific sampling frames. As noted above, the 1998 census data was used to develop the sampling frame for the EAC and RGA but in 2004 modifications were made to improve the coverage of urban agriculture and modern farms. The plan is to conduct one full census every ten years. The extent to which funding is available for the regular implementation of the national census can have an impact on the quality of the sampling frame used for agricultural data collection, thus it is an important part of the overall agricultural statistics system.

4. STAFFING AND BUDGET ISSUES

In our view, staffing and budget are the major constraints in the two institutions fulfilling the most important roles in agricultural statistics collection and analysis: DNSI and the CPS.

4.1. Staffing

For the CPS, the 2004 evaluation found that the official personnel plan did not adequately reflect current responsibilities of the unit either in numbers or in types of employees needed. Of the 44 professional staff, three had statistician/planner qualifications and two were economists, leaving many individuals with good technical qualifications in various agricultural fields in positions requiring statistics, planning, and analysis skills for which they lacked the necessary qualifications. In addition, CPS had 44 professional staff working but only 29 in officially recommended positions, thus using budget for salaries that was initially intended for operating expenses.

In connection with the 2004/2005 transfer of responsibility for the EAC from DNSI to CPS an effort was made to build CPS staff capacity and the results have been evident in terms of more regular reporting of EAC survey results. Continuation of timely reporting may be threatened, however, as low salaries are making it difficult for CPS to maintain its analytical staff. At present there is only one person with strong analytical skills and he spends much of his time on the general supervision of the entire CPS unit. Continued weakness in this area is illustrated by the fact that only one of five planned reports drawing on the 2004/2005 RGA survey data has been published to date.

For DNSI, we do not have staffing information that can be broken out for agricultural statistics as DNSI is organized along broad functional lines. Globally, the 2004 evaluation recommended that DNSI revise its official list of personnel needs from 92 to 130 professionals. In addition, the report noted that current staffing was (1) strong in terms of statisticians, (2) weak in terms of computer scientists, (3) and too heavily weighted toward senior rather than junior and mid-level professionals. There were no comments concerning strengths and weaknesses in terms of subject matter expertise (health, agriculture, etc.). Given that much of this expertise comes from the various CPS, the issue may not have been considered in the evaluation. Nevertheless, DNSI's ability to perform its agricultural survey functions would seem to depend on the availability of subject matter expertise (whether supplied by DNSI or CPS) so, in our view, the topic should have been covered in the DNSI staff assessment.

Although there have been few problems with maintaining staff at OMA since the institutional changes that removed its personnel from the civil service rosters, it is not clear that there is a plan in place to train lower level staff to move into the leadership positions when the current leaders of the unit begin to think about retirement options. Some forward planning will be needed to ensure continuity in the provision of the existing services, including rapid response to private sector requests for data and analyses.

4.2. Budget

In terms of budget for the EAC and RGA surveys, the agricultural sector has managed to cover a larger share of its major data collection efforts through Government funding (i.e., less

reliance on donors) than other sectors. Major surveys such as the national census, the demographic and health survey, and the *Enquête Malienne d'Evaluation de la Pauvreté* (EMEP) get from 17% to 24% of their funding from the GOM while the EAC from 1999/2000 to 2005/2006 (including the RGA in 2001 and 2004/2005) covered 80% of costs with GOM funding. Despite the GOM support, funding for the ambitious RGA remains very problematic. Funding for the EAC is made available every year by the GOM but the amount changes and it is often announced late in the season; this can have a negative impact on the quality of the data. During the recent past, inter-annual budget changes have been substantial; 200 million FCFA for the 2007/08 EAC compared to only 120 million for 2006/07. To conduct an EAC for a 5000 household sample (the sample size needed for representative results at the *Cercle* level) the budget should be about 400 million FCFA (Personal communication, B.S. Ba, CPS).

GOM budget for OMA's year to year operations has been more predictable, but the capital budget remains donor-dependent and appeared to be at least partially responsible for a slowdown in reporting.

5. SUMMARY OF KEY POINTS AND LESSONS OF GENERAL RELEVANCE

By way of conclusion, we offer a series of questions that were listed in our terms of reference followed by short responses based on the detailed discussion presented above.

5.1. Sources of Information for Agricultural Policy: Who Does What?

5.1.1. Sources

The primary sources of information used for agricultural policy making in Mali are the preliminary and definitive crop production statistics coming from the *Enquête Agricole de la Conjoncture*, (EAC) market information (prices and flows), livestock herd and consumption data, location-specific food security assessments, and meteorological and hydrological data and modeling results. Additional information that contributes to the agricultural statistics data base or can be used by agricultural policy analysts includes:

- national census surveys;
- national consumption/expenditure surveys;
- national poverty assessments and indicators;
- national budget numbers on investments of relevance to the agricultural sector (irrigation infrastructure, roads, markets);
- agricultural research on improved technologies and practices;
- project related benefit/cost analyses or monitoring and evaluation results; and
- trade statistics.

5.1.2. Who Does What?

Until 2004, the central statistics office (DNSI), working in collaboration with the statistical unit at the Ministry of Agriculture (CPS), was the primary source of data collected for crop forecasts, final crop production statistics, and livestock numbers. Since 2004, the CPS has taken on the lead role for conducting the annual agricultural survey (EAC) that provides base data for crop estimates and livestock monitoring and for a variety of other surveys conducted as part of a new agricultural census program (RGA) to improve Mali's agricultural statistics. The RGA program includes supplementary surveys to improve statistics on livestock numbers and meat consumption, improved methods for collecting horticultural production data, and more data on farmers' gender and access to services. DNSI/CPS do not collect their own data for estimates of irrigated rice and cotton production but rely on statistics provided by seven government agencies that manage these sectors.

In addition, there are other actors, most notably the CSA and SAP, who conduct analyses of the food security situation using both the DNSI/CPS data, secondary data (e.g., meteorological information) and the results of their own field assessments (often funded by donors in crisis situations). The Ministry of Agriculture is responsible for the food balance sheets produced each year; they use the DNSI/CPS data as well as other sources of information (e.g., trade statistics produced by the Ministry of Commerce and OPAM stock numbers). DNSI also has responsibility for calculating the Consumer Price Index (CPI) (using their own survey data collected in Bamako) and agricultural GDP for the national accounts (using the DNSI/CPS crop production estimates) – both the CPI and the GDP

estimates are used in general agricultural policy analysis. All the actors mentioned here and in the previous paragraph are government services staffed largely by civil servants.

The next most important agricultural data base in Mali is the OMA-managed market information system which reports weekly prices on the radio for a large number of agricultural commodities (including inputs) and publishes a monthly situation report on market trends (volumes as well as prices). OMA's distinctive characteristic is that it is not a government service but attached to the national association of chambers of agriculture (APCAM). This provides them with flexibility in personnel arrangements and makes them accountable to their clients.

Among the additional sources of policy information listed in the bullets above, DNSI is the key producer of census data, poverty assessments, and consumption studies. Through their efforts to produce the national accounts, they are also a source of GOM budget data for various investments that influence the agricultural sector. While these data sets are available, we found no evidence that they were being integrated with other sources of agricultural data for regular use in policy analyses. A complicating factor may be that agricultural policy analysis is often best done using agro-ecological zones rather than the administrative districts that form the basis of the DNSI sampling frame for these studies.

The *Institut d'Economie Rurale* (IER) is Mali's national agricultural research center. Their research focuses on the identification of improved technologies and practices; but they do conduct some research of direct policy relevance (e.g., subsector analyses, crop budget analyses for particular technologies, and, in collaboration with the cotton company (CMDT), IER researchers conduct a regular monitoring and evaluation program on cotton productivity and farm incomes). Most of the IER policy research is project-related and funded by donors; as a result, it is not systematically integrated into any type of generalized agricultural data base. The same can be said of project-related cost-benefit and subsector analyses. Some recent examples include studies conducted in conjunction with the design phase of the Millennium Challenge Corporation investments (expansion of the irrigation infrastructure in the Office du Niger, improvements in airport infrastructure to facilitate exports of agricultural products, and the development of an industrial zone near the airport that would include facilities for processing agricultural products).

Trade statistics in Mali come primarily from customs records and are available from the Ministry of Commerce.

5.2. What Are the Linkages, Overlaps, Duplications, Conflicts?

Since the late 1980s, there has been good collaboration between the central statistics office (DNSI) and the ministry of agriculture (CPS) in collecting crop forecast and production data. The roles of each partner have changed, with DNSI recently turning the lead role over to the CPS. The transition was implemented over time and included a substantial investment (funded by the FAO and the WB) in capacity building at CPS to ensure a smooth transition. Linkages between the two institutions have been strengthened through the RGA process, which has established a number of committees to ensure user and stakeholder input into the survey planning and result reporting processes. We found no duplication of effort in the basic EAC and RGA activities as currently designed and implemented.

5.3. What Are the General Types of Data Collection Methodologies Used?

The EAC and the RGA use sample-based statistical methods for collecting data. Although the current sampling frame is based on the 1998 census, it was recently revised to better reflect the full range of agricultural producers, including urban and large-scale commercial producers. Statistics are generally reported by administrative units, but some results are also reported for Mali's 12 agro-ecological zones. Data is collected through the use of questionnaires that are administered by a combination of full and part-time field workers. EAC preliminary crop forecasts are based on information about area planted to different crops, rainfall and pest patterns, and farmers' expectations. Final crop production numbers are obtained from crop-cuts conducted for a sub-set of the sample farms and a sub-set of fields on those farms.

OMA has developed and refined its methods for collecting market information during the past 20 years. Data collection is not based on a rigorous statistical sampling technique. Interviewers are instructed to stratify the traders present on a market day into categories by the size of their typical transactions (e.g., 50 kg sacks, 10 kg sacks, small cups or bowls) and then to randomly select at least 5 traders for each category to be interviewed. The trained agents collect information using both market observation techniques and key informant interviews. Data is collected weekly and transmitted via solar powered radios to the central office for analysis and reporting.[32] It is also sent to local radio stations for same-day transmission. There is regular updating of products and markets covered in response to user needs and some adjustments made in approaches used for collecting the data when new products are added.

5.4. Do Different Methods Used by Different Institutions Produce Different Results?

Although Mali's official agricultural statistics are collected using a single method that eliminates the possibility of obtaining conflicting results, there is some evidence of political influence in how EAC results and other food security assessments are interpreted. This tends to happen when preliminary production forecasts are lower than average (i.e., politicians prefer to err on the side of building more food security stocks than needed and early distribution of food aid); but in general the collaborative effort among the key technical actors at CPS, DNSI, SAP, and OMA plus the *Programme de restructuration des marchés céréaliers* (PRMC) structure that has been supported by a consortium of donors since the mid 1980s has prevented a political take-over of the process. The challenge is in (1) sorting out the different types of forecasts that come from the nationally representative DNSI/CPS sample surveys and the more targeted hot-spot analyses conducted by SAP and donors and (2) encouraging politicians to consider policy options other than food aid (e.g., reduced import tariffs, as was done in 2005).

There may be some issues of different methods and results for reporting the prices of agricultural products in urban areas as both DNSI (for the consumer price index) and OMA collect such data. OMA informed us that for cereal prices (their traditional area of specialization), DNSI does not collect their own data but uses OMA prices for the consumer price index; for some of the newer products monitored by OMA (such as onions, tomatoes,

[32] OMA is currently introducing a new way of transmitting information via SMS-computer devices to improve the efficiency and speed of the data transmission.

meat and fish products), DNSI is probably continuing to use their own data. The two institutions are planning to meet to assess ways of improving the complementarities of the two systems and reducing duplication, if it exists.

5.5. Where Are the Methods Stretched and Objectives Unrealistic?

The ambitious program outlined in the context of the RGA has not been implemented in full. It calls for substantial improvements in the quality of livestock and horticultural data, annual production of statistics that are representative at the *Cercle* level in addition to the Regional level (Mali has 9 Regions divided into 49 *Cercles*), and more disaggregation of the data to facilitate both gender and poverty analyses. At present, the constraint appears to be more budgetary in nature than methodological, but it is possible that there are methodological issues that have not been documented in writing or mentioned during interviews with key statistics personnel. The only methodological problem raised by CPS/DNSI staff was lack of confidence in current yield estimates, but work is underway to improve on this. There is also a problem of regularly delivering on the promise of representative statistics at the *Cercle* level. Our understanding is that it is a budgetary problem that has prevented CPS from conducting the EAC on a large enough sample (5000 farm units) to provide the *Cercle* level analyses every year. There has also been work on improved methods for estimating vegetable production and livestock production and consumption, but inadequate funding has kept CPS from using these methods on a regular basis.

Data collection methods used by OMA for cereals have been developed and refined over a long period of time and are considered reliable. Demands to expand the products covered (e.g., horticultural and livestock products and inputs) have required some revisions in methods; we have not found assessments of the quality of the data provided for these diversification products.

5.6. What Is the Timeliness and Reliability of Data Collection, Analysis, and Publication?

Timeliness and reliability of reporting on the EAC have improved in recent years, but the current level of staffing at CPS is not adequate to simultaneously produce all the anticipated RGA reports and maintain the regular production of the EAC results. EAC is given precedence, hence only one of five reports anticipated for the RGA 2004 survey have been completed. Even with the priority given to EAC, one of the three planned EAC reports (the final synthesis) has not been published since 2003.

A 2002 assessment of OMA data reporting performance found that roughly 75% of the planned reports, radio broadcasts, etc. were effectively implemented by field personnel, suggesting room for improvement. Having only one agent assigned per zone was cited as a cause of some of the gaps as illness or travel for training led to gaps in data collection and transmission. Since the 2002 assessment, OMA has made improvements in this area.

5.7. What Needs Are Well Met and Poorly Met for Key Users of Statistics?

The agricultural statistics system in Mali is currently meeting the need for national and regional statistics on basic crop forecasts and final crop production statistics in a timely manner and user confidence in the results of the EAC is good. The key users of these data

are the food security analysts and those producing the national accounts. Efforts are underway to improve EAC statistics on livestock and horticultural products, but much remains to be done. Users needing disaggregated results at the *Cercle* level or below are not yet well served by the EAC because funding has been inadequate to conduct large enough surveys to obtain statistically significant results at this level on a regular basis.

There is general satisfaction with the market information data produced by the OMA, particularly the improved regularity of reporting in the recent past and OMA's efforts to be responsive to its clients by expanding the product coverage. These data are used not only by government services and donors but also by private sector operators (farmers, traders, processors) trying to make investment or marketing decisions.

A weakness for those interested in macro-economic analyses is the failure of DNSI to completely convert all prior data on the national accounts to the new system adopted in 1996. This had led to confusion about what data to use (particularly for short-term consultants) and the circulation of reports containing different numbers depending on the system used.[33]

The major weakness in terms of micro-economic analyses is the lack of a single, longitudinal data base that would permit policy analysts to easily conduct time series analyses on the EAC or RGA data using household level observations. At a minimum, the various data bases should be organized in a manner that facilitates combining data from different years or surveys (e.g., OMA price data and EAC production estimates from multiple years). Documentation of the data bases is also an issue. Policy analysts or scholars wanting to work with the EAC data will generally need assistance from DNSI/CPS staff to understand the files.

One area of weakness in the overall system is a failure to make maximum use of the Internet. Most services producing statistics of relevance to the agricultural sector have websites, but few are maintaining the websites. DNSI, for example, has detailed information on the CPI for the early 2000s, and then it stops abruptly in 2004. The MOA (http://www.maliagriculture.org) is now providing information collected by the CPS on the current agricultural campaign of 2007/08 (e.g., production estimates, rainfall and pest situation, input use, area planted), but there is no electronic access to past reports. OMA is the most up-to-date and complete with access to monthly reports that are unusually posted within 4-6 weeks of the end of the reporting period. In addition, they have an email system available from their website for ordering specific data series. The desire to recover data collection costs through fees for access to data sets (the OMA and meteorological service approach) and the sale of publications is understandable. On the other hand, making agricultural data more available to stakeholders, analysts, and potential investors via the Internet may have a greater payoff in the long run. Some benefit/cost analyses of different approaches to distribution of reports and data sets would be useful, particularly given how expensive it is in Mali to produce hard copies of documents and the limited number of users that get access.

[33] This was a particular problem with the WB Country Economic Memorandum when consultants in Mali were using the new system and economists based in Washington continued to use the old system.

5.8. Could the System Be Organized Better? If so, How?

At present the issues of funding and staffing appear to be greater constraints than the institutional organization *per se*. We find the main institutional weakness of the EAC and RGA to be its inability to obtain the funds necessary to implement its full data collection and analysis program. This suggests that the CPS may need to develop institutional linkages such as those developed by OMA whereby the users of the data produced lobby the government for adequate funding. Given the limited distribution of published reports and the relatively superficial analyses that are conducted on the data to date, it is understandable that the users of the data are limited and primarily in government and donor offices. We believe that with minor adjustments in the way data are collected and managed there would be good potential for the EAC and the RGA results to be subject to more in-depth micro-economic analyses that would provide important insights about returns to agricultural investments poverty reduction.

5.9. Are there Relevant Funding Issues to Be Addressed?

The combination of GOM and donor funding available for the currently proposed agricultural statistics program is inadequate. Because the program has been designed in consultation with users who have demanded more geographically disaggregated results and gender analysis as well as greater coverage of diversification activities, one would expect the funding to follow but this has not happened. Given that the GOM is carrying a much larger share of the cost of agricultural statistics (about 80%) than it does for other sectors (usually under 30%), one is led to ask why there is not more donor support. Donors, particularly the WB and the FAO, have been strong supporters of capacity building efforts and the development of improved methods, but they have been reluctant to support most of the recurrent costs for survey implementation, analysis, and reporting. This is the area that needs increased and more reliable levels of funding.

5.10. Are there Lessons from Mali of Relevance to Other Countries?

Given the focus of this study on institutional arrangements for agricultural statistics systems, we find the lessons from Mali's approach to its market information system to be the most interesting. The decision to transform the earlier, government-managed MIS into a private sector entity officially tied to a national farmers' organization was a pivotal decision. It ensured that the information produced would evolve over time to remain relevant to stakeholders, thereby creating the necessary support and political pressure to ensure an adequate level of government funding for the public goods aspects of the MIS work. There is general agreement among Malians consulted that had the MIS remained a government service it would not have had the administrative authority needed to reduce costs nor the flexibility needed to respond rapidly to emerging market situations and changing stakeholder needs. While other countries may not find it appropriate to administratively link their MIS with a farmers' organization, the general process (survey of needs, conceptualization of alternative institutional arrangements, consultations with government and stakeholders, decentralization of activities to reduce costs, etc.) by which the earlier MIS was transferred from government to private sector control should be of relevance to other countries who have government operated MIS that are not performing as well as desired.

Lessons concerning institutional arrangements for the basic agricultural production and agricultural census data are less clear. We do not find evidence that either the National Statistical Service (DNSI) or the Ministry of Agriculture provides a better home for this type of work. Their staffs have different configurations of skills that are generally complementary, with DNSI being strong in statistical skills (particularly sampling and working with software for statistical analyses) and the line ministries having the complementary subject matter knowledge that is essential for properly designing questionnaires, implementing surveys, supervising field work, and interpreting the results.[34] Recently FAO and WB funding have gone to building more statistical and analytical capacity in the Ministry of Agriculture (CPS); this led to a transfer of the lead responsibility for the agricultural surveys (from conceptualization all the way through the analyses and reporting) to the CPS. It is still too soon to know if this is a sustainable solution as CPS remains understaffed and under-budgeted for the tasks at hand and is having trouble retaining personnel that have improved their skills. CPS argues that they have been able to produce annual reports in a timelier manner than DNSI had been doing, that they can provide better supervision of the data collection process, and that they have better links to the users of agricultural statistics. On the other hand, they are very cognizant of inadequate (though improved) capacity for data analysis and reporting (evident in the slow pace of publishing reports for the 2004/2005 RGA and the lack of supplementary analyses of the annual EAC data).

A recurrent message in all the documentation that we reviewed and from discussions with key actors at DNSI and CPS was that informal collaboration between the two institutions is as important, if not more important, than decisions about where the key responsibility for the statistical reporting activities is located. Unfortunately, we were not able to explore this more fully to better understand what factors are driving this positive inter-institutional collaboration and to what extent it can be improved or replicated by different actors and institutions.

Another point is that budget and staff capacity is probably more important than the particular institutional structure selected for managing agricultural statistics. Both DNSI and CPS have mentioned budget constraints faced in implementing the EAC and conducting the analyses. Improving the analytical capacity of CPS without ensuring an adequate budget to retain the staff with improved skills is not a sustainable approach. It may be in the interests of both institutions to consider how they can build stakeholder support for their services as OMA did and use stakeholders to help them increase their budget allocations. This may mean some changes in data collection and reporting to make it more timely and relevant to different stakeholders.

[34] We suspect that the functional area structure of DNSI (versus a sector-based structure used in other countries) may weaken its ability to develop staff expertise in particular subject matter areas, but we were not able to confirm this.

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CSA	www.csa-mali.org
DNSI	www.dnsi.gov.ml
FEWSNET	www.fews.net
MOA	www.maliagriculture.org
MSU/FSIII	http://www.aec.msu.edu/fs2
OMA	www.oma.gov.ml
PARIS21	www.paris21.org
SAP	www.sap.gov.ml

APPENDIX 3: AGRICULTURAL STATISTICS IN MOZAMBIQUE

Appendix 3

Agricultural Statistics in Mozambique: Institutional Organization and Performance

by

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LIST OF ACRONYMS

AP	*Aviso Previo* (see EWS)
CAP	*Censo Agro-Pecuario* (Agricultural and Livestock Census)
CEPAGRI	Center for the Promotion of Agriculture (previously GPSCA)
CSO	Central Statistical Office (generic term for INE)
CWIQ	Core Welfare Indicator Questionnaires (CWIQ)
DE	*Direcção de Economia* (Directorate of Economics)
DEST	Department of Statistics
DFID	Department for International Development
DHS	Demographic and Health Survey
DNSA	*Direcção Nacional de Serviços Agrícolas* (National Directorate of Agricultural Services)
DP	*Departamento de Politicas* (Policy Department, previously known as Policy Analysis Department DAP)
EU	European Union
EWS	Early Warning System (also known as *Aviso Previo* in Portuguese)
FAO	Food and Agriculture Organization
FBS	Food Balance Sheet
GAV	*Grupo de Avaliação de Vulnerabilidade* (Vulnerability Assessment Group)
GDP	Gross Domestic Product
GOM	Government of Mozambique
GPS	Global Positioning System
GPSCA	*Gabinete de Promoção do Sector Comercial Agrário* (now CEPAGRI)
IAF	*Inquérito aos Agregados Familiares* (household budget/consumption survey)
IFPRI	International Food Policy Research Institute
IIAM	*Instituto de Investigação Agrária de Moçambique* (National Agricultral Research Institute)
INE	*Instituto Nacional de Estatísticas* (National Statistics Institute)
INFOCOM	Information System of the Ministry of Commerce and Industry
IOF	*Inquérito ao Orçamento Familiar* (household budget survey)
MADER	*Ministério da Agricultura e de Desenvolvimento Rural* (Ministry of Agriculture and Rural Development, previous name of MINAG)
MDG	Millennium Development Goals
MINAG	*Ministério da Agricultura* (Ministry of Agriculture)
MINCOM	*Minstério da Industria e Comércio* (Ministry of Industry and Commerce)
MOA	Ministry of Agriculture (generic term for MINAG, MADER)
MPF	*Ministério de Plan e Finanças* (Ministry of Planning and Finance)
NGO	Non-governmental organization
PARPA	*Plano de Acção para a Redução da Pobreza Absoluta* (Action Plan for the Reduction of Absolute Poverty)
PDA	Personal Digital Assistants
PES	*Plano Económico e Social* (Economic and Social Plan)
ProAgri	Agricultural Sector Public Expenditure Program
QUIBB	*Questionário de Indicadores Básicos de Bem-Estar* (same as CWIQ in English)
RGPH	*Recenseamento Geral da População e Habitação* (Population/Housing Census)
SETSAN	*Secretariado Técnico de Segurança Alimentar e Nutrição* (Technical Secretariat for Food Security and Nutrition)

SIDA	Swedish International Development Cooperation Agency
SIMA	*Sistema de Informação de Mercados Agrícolas* (Agricultural Market Information System)
SISTAFE	*Sistema de Administração e Financeira do Estado* (Administrative and Financial Information System of the State)
TIA	*Trabalho do Inquérito Agrícola (rural household production surveys)*
UEM	University of Eduardo Mondlane
USAID	United States Agency for International Development
VAC	Vulnerability Assessment Committee (general term for GAV)
WFP	World Food Programme

Agricultural Statistics in Mozambique

1. INTRODUCTION

This report on agricultural statistics in Mozambique is a desk study that describes how the agricultural statistics system relates to the national statistical system, how agricultural data are collected and analyzed, and how the statistics and information produced are disseminated and used. The growing concern about poverty reduction in Africa, leads us to view *agricultural* statistics broadly, including statistics about the living conditions and total incomes of rural households because such statistics can serve as indicators of how well agricultural productivity growth is being translated into poverty reduction. The focus of the study is the institutional organization of the system (identification of key institutional actors and their assigned responsibilities) and how well the system is meeting the statistical information needs of the Mozambique government and its development partners. The study draws on published and unpublished reports, personal communications with key actors, and the personal experience of the authors.

Section 2 presents a brief overview of Mozambique's national statistical system. Section 3 describes the agricultural statistics system in terms of institutional actors and coordination among actors in data collection activities. Section 4 describes how data are used in terms of analysis and dissemination. Section 5 identifies the gaps, difficulties, and opportunities, and Section 6 draws lessons from Mozambique of general relevance.

2. OVERVIEW OF THE MOZAMBIQUE NATIONAL STATISTICAL SYSTEM

The country gained independence in 1975 with no public statistical system, and then struggled through a prolonged civil war to emerge in 1992 with the Peace Accords. It took several years to rebuild basic infrastructure and establish a central government with effective systems. Relative to other countries covered in this multi-country study, the Government of Mozambique (GOM) and its statistical systems are relatively young. The National Statistics Institute (INE) was established in 1996, with legal responsibility for producing and reporting official statistics for the public sector. The INE was initially under the authority of the Council of Ministers, directly under the Presidency, but in 2005 came under the direction of the Ministry of Planning and Finance. INE is organized into three areas: 1) horizontal functions, 2) economic and finance statistics (including agriculture), and 3) socio-demographic statistics. INE operates with a staff of 388 employees as of 2005, from which 29% are professionals. Of that professional staff, 41% are based in the headquarters office in Maputo and the remaining in Provincial level offices. The 2006 budget allocation was about $1.2 million. INE receives strong support with technical assistance and funds from the Scandinavian countries and other donors, and is involved in efforts to revamp the national accounts system.

When founded in 1996, INE was charged with responsibility for collecting and disseminating all official statistics for the country. In 1998, the INE was allowed to delegate some of the data collection and dissemination responsibilities to the Ministries of Health, Fisheries, and Labour. For agricultural statistics, the Ministry of Agriculture (MOA[35]) was only authorized by legal decrees in 1999 to collect and develop agricultural statistics. Note that prior to 1999, MOA had been collecting agricultural sector data, but did not have a specific mandate. INE remains as the agency responsible for ensuring data quality, consistency and coordination among all the sectors and ministries.

The current master sample frame from INE is based on the National Population and Housing Census (known as the RGPH), which was conducted by INE in 1997. RGPH 1997 covered a range of topics: population in general, fertility, mortality, migration, marital status, households, work force, education, language, nationality, race/origin, religion, physical and mental disability, and housing. As will be discussed more fully later, the master sample frame developed with RGPH 1997 was used for developing the frame for the agricultural census (CAP) which in turn serves as the master sample frame for the agricultural household surveys.

A new Census of the Population was implemented in August 2007. It covers education, fertility, mortality (infant, maternal and adult), the work force, religion, disability, poverty, migration and the distribution of the population, housing, and water and sanitation. A small agricultural section was included under the economic activities to assess the number of households involved in production of a list of agricultural commodities, as well as livestock assets. As recommended in a recent report (Kiregyera et al. 2007), the new Census will serve as the basis for the master sample frame for all other national population-based surveys, including agricultural sector surveys.

The INE also has authority to and a mechanism for vetting survey design and survey instruments developed by other institutions such as the MOA, but there is little evidence that

[35] While the Ministry of Agriculture is known as MINAG in Mozambique, to be consistent with the cross-country overview paper, we use MOA in this document.

they are doing this in a systematic way. Each of the key ministries has developed surveys for their sector, such as the Demographic and Health Surveys (DHS) from the Ministry of Health, and the and Household Budget Surveys, known as IAF (*Inquérito aos Agregados Familiares*). As with MOA, the surveys are conducted in collaboration with INE. Given government budget constraints, funding is usually obtained from donors, who fund the contribution of international agencies such as the US Bureau of the Census and consultants including Macro International.

In 1999, the government and the donors collaborated to develop ProAgri, the National Agricultural Sector Support Program, a comprehensive sector-wide development program. In ProAgri I (1999-2004) and ProAgri II (2005-9), the participating donors placed the majority of the agricultural development funds into a common pool of resources, such that the Mozambican government could then invest those funds according to their development strategy. Agricultural statistics were needed to report investment performance to the donor group of ProAgri to keep the funds flowing. Donors initially included the European Community (EU), the Department for International Development, DFID (United Kingdom), the Swedish International Development Cooperation Agency, SIDA (Sweden), and the United States Agency for International Development (USAID), although the composition has changed with time. While ProAgri I focused on the Institutional Development Component and relied on the Ministry's management information system for budget allocations, personnel data, etc., both ProAgri I and ProAgri II have relied on household surveys.

In addition to ProAgri, in 1999, the government released the preliminary Action Plan for the Reduction of Absolute Poverty (PARPA) for 1999-2000 and then in 2001 released the final PARPA 2001-2005 strategy document (Council of Ministers 2001). The PARPA objectives were incorporated into the annual Economic and Social Plan (known as PES), which is the planning tool for the annual public sector budget for Mozambique, and various indicators are tracked for performance (*República de Moçambique* 2007). Agricultural development, particularly for the smallholder sector, plays a strong role in this action plan. As stated in the 2001 final Strategy document, "the principal objective of rural development is to increase income generating opportunities, especially for the family sector" (Council of Ministers 2001, p.4). Both the PARPA and the PES will be discussed in greater detail in Section 4, Use of Data, given the high importance of these two national planning documents.

The University of Eduardo Mondlane (UEM) participates in some national surveys, as with the 1996 IAF. In 2004, UEM began a new four-year degree program in statistics, from which the first graduates will be finishing in 2008, a potential source for new staff in public institutions. Higher level students at UEM and elsewhere conduct very small scale surveys as well, which must be approved through the INE system, but are not subject to rigorous evaluation unless dealing with human health issues. Students have also used the Rural Household Production Survey (TIA, or *Trabalho do Inquérito Agricola*) and IAF, among other surveys, for their degree research. Non-governmental organizations (NGOs) in Mozambique conduct their own monitoring and evaluation surveys, maintaining records, but these are not integrated into any general framework and are generally not rigorous in sampling strategies.

In 2001, the Technical Secretariat for Food Security and Nutrition (known as SETSAN) was formed as an inter-ministerial body to coordinate information and analysis between agriculture, health and other sectors. It is currently attached to the Ministry of Agriculture and given the mission of coordinating vulnerability assessments and actions across multiple ministries (Agriculture, Health, Commerce and Industry). Within SETSAN, there are various

working groups and the Vulnerability Assessment Group (known as the GAV) coordinated the development of a Vulnerability Baseline Survey in 2006 (De Matteis et al. 2006) which will be discussed further below.

One other actor in agricultural statistics is the Ministry of Industry and Commerce (MINCOM). For the past ten years it has worked with Food and Agricultural Organization of the United Nations (FAO) technical assistance to estimate the National Food Balance Sheets (FBS), one of the key tools in food security assessment. While almost all of the information in the Food Balance Sheet is obtained from the Ministry of Agriculture's Early Warning Unit or through customs authorities, MINCOM collects information on manufacturing and stocks that are then used as components of the FBS. As in other countries of the region, the FBS is one of the most circulated uses of agricultural statistics and one that remains controversial for its role in policy making, both for GOM and for donors.

For national poverty assessments and the monitoring and evaluation associated with the PARPA and the Millennium Development Goals, the Ministry of Finance and Planning (MPF) has taken the lead. They develop the IAF household budget surveys, with tech0nical support from the International Food Policy Research Institute (IFPRI) to the Poverty Observatory (MPF/UEM/IFPRI 1998). As with the MOA surveys, INE participated in sample design and survey execution. The most recent IAF was in 2002/2003 and currently the Core Welfare Indicators Questionnaires (CWIQ) (*Questionário de Indicadores Básicos de Bem-Estar*, known as QUIBB in Mozambique) are used to assess consumption and poverty changes. They do not currently have any panel dataset.

3. DATA COLLECTION SYSTEMS: ACTORS AND ACTIVITIES

We now turn to a description of the major agricultural data bases and the roles and relationships among the institutions involved in generating the data. Table 1 lists the data collection systems that are of relevance to the agricultural sector, dividing them into five data categories: production, living conditions, market information, trade, and census. In cases where a survey system provides several types of data, it is listed in the category of its most important contribution, with comments about secondary contributions. The next several paragraphs provide descriptions of the surveys used to collect these five types of data and the institutional arrangements for data collection.

3.1. Production Data

There are four principal sources of agricultural production data: CAP (Agricultural and Livestock Census); TIA (*Trabalho do Inquérito Agricola*), AP (*Aviso Prévio*, early warning system), and data produced by specialized commodity institutes for more industrial crops such as sugar, cashew and cotton. The Ministry of Agriculture is a key actor, with the Directorate of Economics (DE) Department of Statistics (DEST) designing and administering the household level TIA survey that produces the production numbers used in the national accounts for the principal non-industrial crops (maize, sorghum, millet, rice, cassava, beans and groundnuts). DE/DEST also assists INE with the CAP surveys, to be discussed below. The National Directorate of Agriculture in the MOA complements these efforts with their early warning activities and some administrative data collection on livestock. The IAF is primarily a living conditions survey (see next section), but it does provide some information that is used to estimate the value of production that is not well covered by the principal production surveys. INE maintains a database on their website which combines information from the various sources on basic commodity production and livestock numbers, disaggregated to the provincial level. In recent years (2002 to present) TIA data form the basis for agricultural production numbers on this official government site (INE 2007b).

Table 1. Recurrent Survey Systems in Mozambique

RECURRENT SURVEY SYSTEMS

Type	Survey Name	Institutions Involved	Frequency	Survey description (information collected, sample section, dates covered)
Agricultural Production (crops and livestock)	TIA: Trabalho do Inquérito Agricola	MINAG/DE/DP with some INE involvement	periodic; 1993,94,96, 2002,03,05, 06 light	Household- and plot-level production data, with additional information on land area and use, assets, inputs use, demographics, selected food security indicators, use of extension/services, income (2002, 2005), morbidity/mortality (2002, 2003, 2005): Provides estimates of crop production after harvest for use in national accounts and....Sample based on 1999/2000 CAP; from 20 to 94 of 128 districts, depending on year; from 4,300 to 6,400 Households; panel of same hh available for 2002/2005; results representative at provincial and national levels, and for three agro-ecological zones; also representative for each of the three regions (north, center, south)
	CAP:Censo Agro-Pecuario	INE with MinAg/DE/DPP	1999/2000; projected 2009/2010	Household-level benchmark data on crop production and area, land use, agricultural cropping methods, individual characteristics of smallholders, assets (including livestock holdings and agricultural production assets). Survey sampling based on RGPH listing data for non-urban districts, stratification based on district, province, farm size and representative for provincial and agro-ecological regions; 136 non-urban districts covered.
	EWS/AP: Aviso Previo	MINAG (Nat. Directorate)/ FAO/INAM/ FEWSNET Drawing on SADC AgroMet	1980 to present?	Provides estimates of crop area and yields prior to harvest and assembles other relevant data on factors affecting crop/livestock production. No organizational/collaborative link to TIA. To 1997/98 sampled three districts/province, 24 hh distributed over 6 communities = 72 observations per province; Now only doing rapid appraisals. New system proposed in 2006 (FAO) but not funded adequately for full implementation.
	Commodity Production Statistics	Sugar, Cashew, and Cotton Institutes	Annual	Commodity-based Institutes provide data on their crop areas and production; information is based on product received into processing facilties for all such facilities. In the case of cotton, area estimated based on seed distribution. For other commodities, extrapolation from production to area or in the case of tress crops, into number of trees.

RECURRENT SURVEY SYSTEMS (continued)

Type	Survey Name	Institutions Involved	Frequency	Survey description (information collected, sample section, dates covered)
Living Conditions, Income, Expenditure	SETSAN Vulner-ability baseline	SETSAN, WFP, FEWSNET, Ministries of Ag, Health, Commerce and Industry	2006 baseline	In early years (2003,2004), small sample surveys in selected areas of country based on crisis identification. 2006 Vulnerability baseline including demographics and education, agricultural production, belongings and welfare, household income, household expenditures, participation in local organizations and social support, food consumption, shocks and strategies, chronic illness and mortality, maternal and child health and nutritional status. Nationally representative sample based on INE-identified sample frame using RGPH 1997, of rural and semi-rural inhabitants, for provincial level representativeness. Proposed as the first in a series of household vulnerability surveys.
	IAF: Inquérito dos	INE with Min Plan/Fin. (GOM + Den,	periodic; 1st=1996/97 ; most	Expenditure and living condtions data. Urban (4020 hh)/rural (4707 hh) strata; results representative at provincial, regional (N. C. S), and urban/rural levels; ag content varies by year (high in 1996/97, low in 2002/03)
	QUIBB: Question-ário de	INE	Oct 2000 to May 2001	Basic indictors survey covers HH composition, employment or labor allocation by sector, education, access to services (water, energy, etc.); energy uses, . 14,000 hh covered nationally, urbana nd rural.
Market Information	SIMA: Sistema de Informação de Mercados Agricolas	Minag/DE/ DAP	Weekly since 1991	27 markets and 25 products (both domestic and imported); producer, consumer, and wholesale prices and available; transport costs for key commodity transport routes/
	CPI surveys	INE	Monthly	Retail prices for the CPI are collected in three urban area: Maputo, Beira and Nampula; basket of goods and weights in CPI estimates are based on IAF, and calculated for the three cities as well as nationally; CPI for Maputo includes 208 products, the CPI for Beira 186 products, and the CPI for Nampula 170 products; monthly data collection.
	INFOCOM	MINCOM	2004 to present	Weekly price information from markets and formal sector establishments in three cities: Maputo, Beira, and Nampula. Supermarket data available for Maputo. 20 Food items are covered: sugar, maze, wheat, rice, beans, groundnuts, eggs, potatoes, onions, edible oil, chicken and fish. Supermarket retail prices collected in Maputo, Beira and Nampula for sugar, maize and wheat flours, rice, edible oil, potatoes, rice, fish and frozen chickens. International prices for maize, wheat, soy, rice, and sorghum (metric ton volumes).

RECURRENT SURVEY SYSTEMS (continued)

Type	Survey Name	Institutions Involved	Frequency	Survey description (information collected, sample section, dates covered)
Trade	Customs Records	Alfandegas (Customs) Office		Officially recorded statistics from the border points and ports.
	Cross-Border Trade	FEWS NET/ WFP	2004 to present	Daily data on quantity of maize, beans, and rice that crosses borders in region; 24 border points of between Mozambique, Zambia, Malawi, Tanzania, and Zimbabwe.
Census	Recense-amento Geral da População e Habitação	INE	1997; 2007	Official national census which serves to develop sampling frames for other surveys. 2007 Census asked household member occupation, age, schooling; household assets, deaths in past 12 months. Agriculture: If active in own farm crop production, fishing; possession of coconut trees, cashew trees,; possession of cattle/cows, goats, sheep, pigs, ducks, chickens
	Arrola-mento (Livestock)	Directorate of Veterinary Services (Ministry of Agriculture)		Listing of Livestock counts conducted at the district level, focused on cattle currently; used to program disease control activities; not done in all districts.

3.1.1. National Census of Agriculture and Livestock (CAP)

In the post-war period, policymakers and analysts recognized the paucity of information about the agricultural sector and designed the CAP to gather information needed to understand rural households and agricultural and livestock production in Mozambique. With a varied set of potential users (including Ministry of Agriculture policymakers and other staff, staff of other Ministries, the Presidency, donors, and researchers), these data are designed to provide a baseline for the agricultural sector. Performance of the agricultural sector is judged on the basis of change from the baseline. As detailed in Kiregyera et al.,

> …the CAP collects comprehensive data from both small and large-scale holdings on the following: household characteristics, holding characteristics, agricultural inputs, crops, fruit trees, livestock, agricultural practices, marketing, storage, membership to associations and agricultural credit. The indicators include land utilization, agricultural practices (e.g. animal traction, irrigation, etc.), agricultural implements and machinery, agricultural labour, storage facilities and extension services, as well as the starting point for some indicators that change more frequently and which are also included in the more frequent TIA. (Kiregyera et al. 2007, pp. 13-14)

The CAP 1999/2000 was conducted by INE in close collaboration with MOA. It was not a full enumeration census, but included a sample of villages within the districts and had a relatively large sample size of 23,000 households.[36] CAP was based on mapping and population numbers of the most recent general population census (*Recenseamento Geral da População e Habitação* or RGPH) of 1997 (Megill 2002a). Two years elapsed between RGPH and CAP, so when the listings were done for CAP, the population numbers had already changed. The CAP used segments of the RGPH designated enumeration areas, but identified the administrative boundaries which contained the selected enumeration areas to determine villages within each district for the sample (Megill 2002a). For an agricultural sample, the CAP sample is more appropriate, according to technical staff (DE 2002), than the RGPH, which is based strictly on mapped enumeration areas from INE. With INE support, MOA used the CAP frame to then develop supplemental sampling frames used for additional agricultural surveys, such as the TIA. CAP data have been used to validate results from these smaller samples, as well as the basis for evaluating change over time. A new CAP is anticipated for 2009/2010. The recent 2007 RGPH data will be used to develop a new master sample for the future agricultural surveys, including TIA.

3.1.2. TIA (Trabalho do Inquérito Agrícola)

Agricultural household sample surveys (known as TIA) have been conducted in Mozambique since 1993 with the main objective to assess smallholder agriculture, including agricultural production, planted area, and livestock herds, as well as respond to the need for poverty assessments and measurement of progress on poverty reduction and economic growth. Anticipated uses of the data include agricultural policy analysis, poverty analysis, and evaluation of economic growth. More recently, the private sector has also sought information on production areas and quantities, as well as landholdings, in order to develop investment plans. With the CAP showing less than 2% of cultivated land in the hands of large scale

[36] The CAP sampling was based on the frame of the enumeration areas of the RGPH, with all districts classified as rural included and sampling PPS of the segments of the enumeration areas.

commercial farmers, the smallholder focus of the TIA means that it captures the vast majority of people, production, and cultivated land in the country. Attempts have been made to include large scale farming in the TIA, using full listings of large-scale farms and ideally including them with 100% probability in the TIA sampling; however, as detailed by Kiregyera et al. (2007), the listings are not complete and the numbers included are insufficient for analysis. This is an area for improvement. For now, the commodity institutes provide the information on selected commercially cropped commodities, maize being the significant crop outside that system.

Prior to 1996, rural household surveys were limited. Two initial TIA were conducted in 1993 and 1994, but the results are considered unreliable, especially due to the small sample (20 districts in 1993 and 30 districts in 1994, out of 128 districts nationally). In 1996 major methodological improvements were introduced into the TIA survey sampling, with support from USAID and Michigan State University. These improvements increased sample size (3,889 households in 1996) and district coverage (61 of the 128 districts nationally), with the capability to report data at the provincial level and by the three main agro-ecological zones.

Currently, the TIA surveys collect data at the household and community levels on:

- Household size and structure;
- Production, consumption, sales and area planted to all food and cash crops cultivated in the smallholder sector;
- Total farm size, including area in fallow, pasture or under perennial crops;
- Fruit tree stocks and new plantings;
- Prices received by smallholders for marketed production;
- Livestock holdings, consumption and sale;
- Farm implements and machinery used in smallholder agriculture; and
- Inputs used including seed, fertilizer and pesticides as well as manure.

There have been sections added to different TIA in order to cover special topics, such as adult mortality and morbidity, and off-farm income and remittances. The collection of income data has been intensified with the 2002 and 2005 TIA in order to respond to needs for poverty and economic growth analysis.

TIA surveys have been conducted often, but not every year: 1993, 1994, 1996, 2002, 2003, 2005 and a light version in 2006. There was no TIA in 2004 due to the national elections. In general, each year a new sample of households is drawn for the TIA and the sample has been expanded over time, with 94 districts covered in 2005 when 5,122 small-scale and 1,027 medium-scale households were interviewed. A clustered, stratified sample was used, requiring the use of complex survey sampling methods to adjust the estimates and the errors.

Beginning with TIA 2002, the sampling is based on the *Censo Agropecuario* (CAP) conducted between October 2000 and March 2001. As noted previously, the CAP sampling was roughly based on the RGPH of 1997. The TIA 2005 survey data were designed to be representative at the provincial and national levels. The same households from the 80 districts in TIA 2002 were revisited in 2005, creating the first rural household panel at a national level in Mozambique. There was an attrition rate of 17%, leaving over 4,000 households from the TAI 2002. The TIA 2005 added new households and districts to improve the reliability of the aggregate estimates and ensure continued representativity.

The TIA is known to have some weaknesses which have been partially addressed by increasing the sample size (adding new districts) and improving measurements for items such as root crops and land area. Livestock specialists find that for large animals, the TIA does not seem to give accurate numbers and so analysts are looking for alternatives, including more intensive implementation and use of the district-level livestock surveys (see *arrolamento* census below).

In addition to efforts to reduce the sampling errors, the TIA survey methods have also been changing over time, responding to identified weaknesses and adopting new technology when appropriate. For TIA 2002, the survey instrument was modified to improve land area measurement and crop production measurement. More intensive training and supervising of enumerators also helped to reduce non-sampling errors. Additional improvements in 2005 to the present include the use of Global Positioning Systems (GPS) for land area measurement and the introduction of field-based data entry systems to reduce data entry time and to improve accuracy of data collection and entry. New systems were introduced to deal with intercropped fields, common in smallholder agriculture in Mozambique, with a training video developed to help ensure enumerator understanding of the *bean game* for proportions of land allocated to crops. These improvements contributed to the adoption of TIA data for use in National Accounts, given greater reliability and timeliness.

Funding for the TIA comes from the national government, from a consortium of donors through the PROAGRI mechanism, and from some bilateral funding. Funding delays and uncertainty occur each year, and questions on the need for a full household income and production survey each year have been raised. In response to criticisms about the high cost relative to utility of implementing a full household income and production survey each year, the government implemented a TIA-light in 2006. There will be an evaluation of the usefulness of the TIA light approach. Other ways to streamline the TIA system and lower cost as well as time delays include field based data entry systems and more fully automated data entry programs. Field-based data entry was tried first in a few provinces in 2005 and then adopted in all provinces for 2006.

Recent years of TIA data are available on CD, with the documentation necessary to use them. Researchers, students, and other users can receive the CD at no charge by simply submitting a letter of request to DE. As with most household datasets, the data require statistical and computer skills which implicitly limits access to a relatively small group. With the new statistical program at the University of Eduardo Mondlane in Maputo, it is hoped that an increasing number of Mozambican analysts will be able to use the data. Aggregate TIA data are available on the INE website for production and area statistics, and DE staff is working to develop annual reports based on TIA. Web access to more information and reports is in the DE work plan, however the overall MOA website has yet to function fully, a constraint throughout the Ministry.

3.1.3. National Early Warning System: Conducted by the Ministry of Agriculture, National Directorate of Agricultural Services (DNSA), Department of Early Warning

The Early Warning System (EWS, also known as *Aviso Previo*) has evolved since 1980, but has remained independent of the newer TIA and CAP data collection efforts. EWS is based in the National Directorate for Agriculture, (whereas TIA is based in the Economics Directorate and CAP at INE), and has traditionally benefited from FAO financial and technical support. The objective of the EWS is to “provide timely information on the production of principal

food crops in the country, contributing to the completion of the Food Balance Sheets and the determination of the food and nutritional security situation of the country" (*Departamento de Cultura e Aviso Previo* 2006, authors' translation). EWS estimates the production, area and yields for approximately the same set of crops as the TIA: maize, sorghum, millet, rice, cassava, cowpeas, and beans.[37] The production estimates of the EWS are the basis for the Annual Food Balance Sheets prepared by the Ministry of Commerce and Industry in collaboration with FAO. They are also used by the National Disaster Management Unit to identify need for interventions to ensure food security in potential disaster zones.

As described by Kiregyera et al. (2007), there are various estimates made by EWS during the cropping season, with early forecasts around planting period in October-December, additional forecasts in January, and the Final Forecast prepared during April and May and available by June. Annex 2 presents the seasonal calendar for Mozambican agriculture. Timeliness is a key feature of the system, as the final estimates should be available by June at the latest, in time for annual assessment and planning purposes.

The early forecasts are based on rainfall predictions and estimates. Currently, the EWS system uses information from the SADC weather monitoring with AgroMet (SADC 2007) and the Mozambican National Meteorological Institute. They have used a water balance model to estimate impact on production, based on calculating the Water Requirement Satisfaction Index (WRSI). The January estimates are based on the rainfall modeling combined with revised information on area planted from the districts, and a selected sampling of farm plots in the districts.

For the final forecast, the system was designed to include a stratified random survey of smallholder fields throughout the country, selecting a total of 720 farms. The primary data collected through field work are crop areas and yields (Detry and Chilengue 2002; Kiregyera et al. 2007). Although there are guidelines for doing this field work (coverage of three districts in each province, with 24 households randomly selected over 6 communities yielding approximately 4 households per community for a total of 72 observations per province), this system has not been fully functional since 1997/98 due to inadequate funding and human resources (Kiregyera et al. 2007). Even when the data were collected, only a small percentage was actually entered into the computers and used in estimates. In 1999/2000, decentralization of funding associated with PROAGRI resulted in the original data collection system breaking down entirely. Now, the principal sources of EWS area and yield estimates are rapid appraisals and projections from previous estimates.

The EWS system was set up with the technical assistance of FAO and with funding from various donors through the years. As indicated above, EWS was not located in the Directorate of Economics, but in a separate directorate and there were no design links with the TIA or other data efforts.[38] The CAP data were used to develop the original sample frame as well as the baseline numbers, from which projections could be made. From 1993/94 through 1998/1999 there were annual training programs associated with EWS, designed to ensure quality and consistency of information, but that training and the supervision involved has been paralyzed by lack of resources since the 1999/2000 season, when major FAO support ended. In September of 2006, the EWS proposed a revised set of activities for collecting reliable information, based on the work of the mid-1990s with some modifications *(Departmento de Cultura e Aviso Prévio* 2006). This proposed new system would cost almost US $200,000 per year including training, monitoring, district level activities,

[37] TIA covers groundnuts rather than cowpeas, but all other crops are the same.
[38] The comparability and linkages (and lack thereof) between TIA and EWS estimates and systems will be discussed later in this document.

provincial level activities, and supervision of field staff. However, the proposal did not move forward.

As of March 2007, there were 6 staff members at the central level and supervisors at each provincial office who are trained in Early Warning methods, which is considered adequate for the central level, provided skills are maintained. When Kiregyera and colleagues (2007) conducted a review of EWS and other agricultural data systems, they identified major constraints in the system. A key issue stems from decentralization of planning and budgeting that occurred under PROAGRI. With the decentralization of funding and decision-making, the proposed annual provincial training seminars have not occurred and the field activities of EWS have been compromised by lack of resources.

3.1.4. Commodity Institute Statistics

The Sugar, Cotton and Cashew Institutes are parastatal units that produce area and production estimates for the National Accounts, based on information from the private sector processors. In the case of sugar, with institutional reform, the Sugar Institute was incorporated into *Gabinete de Promoção do Sector Comercial Agrário* (GPSCA), and then in 2006 became CEPAGRI, Center for the Promotion of Agriculture, with a broader mandate than just sugar. Both GAPSCA and now CEPAGRI are autonomous agencies of the Ministry of Agriculture. Since sugar production is mostly processed by the four large mills in Mozambique, the CEPAGRI statistic captures that sector reasonably well, although CEPAGRI data systems appear to be less detailed than with the Sugar Institute. These commercial crop statistics are not linked to the MOA statistical systems, and for these commercial crops, the MOA systems may under-record large-scale production. The main users are National Accounts staff and they often need to discuss the discrepancies with MOA. They often use production quantities calculated from trend lines rather than estimates from MOA or the commodity institutes, if there are large discrepancies.

3.1.5. Household Budget Surveys, Inquérito dos Agregados Familiares (IAF) 2002/2003: Conducted by the National Institute of Statistics, with Ministry of Plan and Finance

The principal objective of the IAF is to measure expenditures of households and other socio-economic characteristics of individuals in the households to estimate the incidence of poverty and other human development indicators of households in Mozambique.

The specific objectives of IAF are the following:

a) Provide the basis for re-estimating the basket of consumer goods and services used to establish the Consumer Price Index;
b) Provide the basis for updating the National Accounts;
c) Obtain current information on households concerning their housing, other durable assets, health, employment, education and crime; and
d) Develop national capacity to develop and implement household surveys (INE 2002).

Coverage of agricultural topics varied between IAF 1996/97 and IAF 2002/2003, Both IAF tracked consumption from own production for 19 agricultural and livestock commodities[39]. IAF 1996 also obtained information on land ownership, agricultural production by commodity, possession of livestock and of trees (fruit and cash crops such as copra) by type. In addition, households were asked about the use of purchased agricultural inputs. All of these agriculturally-related questions about production and inputs were dropped in IAF 2002/2003. Instead, questions were posed in an effort to collect information needed to estimate revenue earned from each of the following broad economic sectors: 1) agricultural commodities; 2) wood and charcoal; 3) fish, shrimp and other fisheries products; 4) honey and other wild gathered products; 5) processed foods and beverages; 6) clothing, 7) construction materials (such as bricks); 8) livestock products and 9) artisanal products (baskets, etc.). The details of the type of agricultural commodity or livestock product were not collected in 2002/3.

Anticipated uses of data include monitoring of welfare and poverty trends related to the PARPA and the Millennium Development Goals (MDG). As indicated in Annex Table 1, Mozambican capacity to monitor the MDGs is highly variable. IAF provided the data for the IFPRI-supported poverty and wellbeing analyses done in 1996/97 and then again in 2002/2003. Financing for these surveys came from the GOM and Scandinavian donors (Denmark, Norway and Sweden). There was a QUIBB (Core Welfare Indicators Questionnaire, see below) in 2000/2001, as well which uses a subset of the IAF questions. In 2008/2009, a new Household Budget Survey (*Inquérito ao Orçamento Familiar*, IOF) will be implemented, to replace the IAF as a survey to evaluate welfare and poverty trends.

While there have been two IAF surveys; it is not a household panel survey. IAF 2002/2003, based on a sample frame from the 1997 population census, used a three stage stratified, clustered sampling frame: 1) primary sampling units; 2) enumeration areas and 3) households within the enumeration areas. The 2002/2003 IAF sample was stratified by urban versus rural zones. A total of 8,727 households were interviewed, with 4,020 in urban and 4,707 in rural areas. This sample permits reliable estimates at the national, provincial, residential area (rural versus urban) and regional (North, Center, South) levels. The field work was conducted in 26 two-week periods over a 12 month period, with two weeks in each enumeration area. Rather than the TIA single visit to each household, with the IAF survey, each household was visited three times over a ten-day period and each enumerator covered nine rural households (or 12 urban households) in each of the 26 periods during the year. While the rotating sample will increase the households in the tails of the distribution (high income, low income) due to seasonality, it does provide an accurate measure of the population means, enables aggregate assessment of seasonality, and reduces the costs and time for the administration of the survey compared to repeat visit surveys. Recall for each household covers a relatively brief period and may reduce measurement error.

In 2002/2003, three separate survey instruments were used: 1) individual household member data; 2) daily household expenditures; and 3) household assets, expenditures (not daily) and income. Types of data collected include demographic characteristics, consumption expenditures, education, health, employment, housing, poverty indicators, and victimization (crime). Some parts of the data base also contribute to estimates of production for products not well covered by TIA and CAP. For example, wood and charcoal value of sales is recorded in the IAF, and that value is used in national accounts as a contribution to gross

[39] Commodities are maize, sorghum, millet, rice, fresh cassava, dried cassava, sweet potato, tomato, groundnut, cashews, leaves (cassava, mango, sweet potato, pigeon pea and squash), common beans, pigeon peas, chicken, eggs, and beef.

domestic produce (GDP). Consumption from own production for vegetables is another area in which the estimates are evaluated for the national accounts. The data have been compared to other national surveys such as TIA, as will be discussed later in this document, a valuable exercise.

3.1.6. Census of Livestock (Arrolamento) and Livestock Services

While livestock numbers can be derived from the TIA, analysis indicates that the TIA sampling frame does not adequately capture large animal stocks, due to their geographic specificity and the relatively small numbers of farmers with larger herds. Thus, the Directorate of Veterinary Services in MOA has retained an administrative data collection system known as the *arrolamento*. As described by Kiregyera et al. (2007), veterinary staff in selected districts with cattle maintains records of services and collect annual headcount data for cattle which the district uses for programming and operations such as disease control. The information is assembled by the Directorate of Veterinary Services. The objective is to understand the spatial distribution of livestock by type, critical for developing the program of activities in public sector veterinary services.

These numbers can then be compared to CAP numbers and total numbers of large animal stocks can be projected for each year, across all districts. Since small animals are more geographically dispersed in the country and more commonly held among smallholder households, the TIA small animal (poultry, goats, etc.) estimates are considered reliable by experts (Kiregyera at al. 2007). With the new RGPH 2007, baseline livestock numbers can be determined with greater accuracy for the nation, and the information will be useful for developing a future TIA sample frame that can more accurately capture the large animal stocks. The new 2007 stock numbers will also assist in assessing the accuracy of the *arrolamento* exercise as an alternative to more investment in the TIA to meet large animal stock information needs.

3.1.7. SETSAN/WFP/FEWS NET Vulnerability Baseline (2006)

SETSAN (Technical Secretariat for Food Security and Nutrition), WFP (World Food Programme), FAO, and FEWS NET combined forces in 2006 to develop a vulnerability base line. Within SETSAN, the Vulnerability Assessment Group (GAV) identified the need for a nationally representative survey on the welfare of Mozambican households that could highlight needs and outcomes regarding food security and nutrition. There have been smaller vulnerability surveys conducted in 2002, 2003, and 2004, but the surveys were conducted only in areas thought to have food insecurity and so are not representative nationally (SETSAN 2005).

The key objective of the 2006 Vulnerability Survey was to develop a nationally representative baseline which could be used in future years to understand the impact of drought, floods, and other potential disasters on household livelihoods, while identifying the key strategies used by households to address crises. As the survey report by De Matteis and others (2006) state, “The SETSAN will solicit approval from the National Institute for Statistics (INE) that baseline data will be validated and integrated as a key national dataset for a variety of activities including poverty monitoring” (p. 8). Thus, the anticipated use of the data is as a baseline for monitoring poverty and movement toward the MDG. The year 2005/2006 was a relatively good year, with a few areas of drought, but no major crises in the country, so it would serve well as a baseline for the most common strategies used by

households to ensure their food security and livelihood. This baseline effort was the first under this collaborative partnership.

The baseline study combined anthropometric measurements common with Demographic and Health Surveys, with income, poverty and consumption measures found in IAF surveys. For agriculture, the vulnerability baseline survey collected information on land area (lowland and upland), and total annual production for twelve main crops: maize, rice, sorghum, millet, large groundnuts, small groundnuts, beans, cowpeas, bambara nuts, pigeon peas, common beans, and fresh green beans. For other crops, including cassava, sweet potatoes, Irish potatoes, vegetable crops and cash crops, the survey simply asked if the crop was grown or not. Fruit trees were assessed by category (1-10 trees, 22-50 trees, or more than 50 trees). Households also indicated how many of each type of animal they had at the time of the interview for 10 types of animals, including cattle, goats, pigs, and poultry. The main focus was on food consumption, food access, and anthropometric measurements to look at nutritional status.

The sampling design was developed by INE based on the 1997 Census, and was a clustered stratified design, using urban and rural strata, with all provinces included. There were a total of 320 clusters (of 22 households each), and the final sample included 6763 households in 315 clusters (De Matteis 2006). For the anthropometric data, 4,865 children between 6 and 59 months were included, as well as age, weight and height of their mothers.

The measurements of production for the twelve main crops are based on a simple recall of total production for the year with an indication of the unit. This method for collecting agricultural production data is unlikely to yield accurate estimates for these twelve food crops. For cassava, a critical crop in food security in most of Mozambique, there was no attempt to get area or production numbers, just a simple yes/no for cultivation. Given the measurement issues for the all the crops, the production data are unlikely to be used for agricultural analysis. There were other problems in the execution of the baseline, particularly the field use of personal digital assistants (PDAs) and use of separate teams for the anthropometrics and the socio-economic parts of the surveys (De Matteis et al. 2006). A high proportion of the data could not be matched between anthropometric data and the other household data, and there are questions regarding the lumpiness[40] of observed measures in the anthropometric data, such that care must be used to link vulnerability, nutritional status, and agricultural production activities.

While SETSAN is currently based in offices in MOA, this survey was not conducted through the MOA Department of Statistics. Input was sought from them, but the administration of the survey was contracted by SETSAN and partners with Ministry of Health personnel for the anthropometrics and INE staff for the rest of the survey. As mentioned, previous Vulnerability Assessments had been conducted but not on a national scale, only for selected highly vulnerable districts after times of drought or floods. While the need for such a nationally representative baseline exists, the SETSAN Baseline might best be viewed as a learning experience. With the new 2007 RGPH, a new sample with improved data collection could be used for further vulnerability surveys. However, for efficient use of resources, as will be noted, linking vulnerability analysis to other survey efforts, including IAF, TIA, and the DHS, may be the way forward.

[40] *Lumpiness* refers to rounded ages for children, with high frequency on the integers; with heights and weights, a tendency to be in integer units around 5 and 10, eg. 15, 20, 25, etc. De Matteis et al. (2006) only briefly mention the problem, but it was demonstrated at a presentation of the results in December 2006.

3.2. Systems Used to Collect Market Information Data

MOA DE is again the key actor in collecting market information for agricultural products (both domestic and imports) while INE does the CPI surveys and MINCOM provides some supplementary market information on regional and international markets as well as prices for supermarkets and other formal sector selling units.

3.2.1. SIMA: Sistema de Informação de Mercados Agrícolas (SIMA, the Agricultural Market Information System): Conducted by the Ministry of Agriculture, Directorate of Economics, Department of Statistics

The SIMA was established in MOA with multiple objectives. A primary objective is to provide price information to facilitate market transparency and enable farmers and traders to efficiently negotiate. A second objective is to provide a database for policy analysis on the agricultural sector, to be tied into the household surveys, but also for other analysis on price trends, vulnerability, etc. A third objective, linked to the database as well, is to provide a service to the private sector on price trends for commodities.

The primary users of SIMA include MOA policymakers, researchers both within the public sector and elsewhere, donors, food aid authorities, students, and the private sector (traders and farmers). A range of diffusion efforts provide information to all these users.

The SIMA has been in operation since 1991 collecting weekly prices on an expanding set of agricultural commodities (both domestic production and imported) and markets. In 2007, SIMA collected information in 27 markets throughout the country (in the provincial capitals and other selected markets). The prices are collected at producer, wholesale and retail levels. There are 25 products covered, although not all markets and market levels cover all 25 products. Key agricultural products covered by SIMA are maize grain and flours, rice, groundnuts, and several types of beans (see Annex 3 for a full list). As of May 2007, SIMA had produced 618 weekly bulletins, with price tables, analysis and some additional information on transport costs, regional commodity prices and exchange rates. SIMA maintains a database accessible to the public upon request and there are plans to put the SIMA data up on a publicly available website. SIMA has revised data collection systems over time to increase reliability, but the data must be used with care for the quality of products is not always identical between markets (e.g., rice quality is highly variable) and nonstandard units for sales in small quantities introduce potential for imprecise measurement.

SIMA also conducts special studies to understand market dynamics and to complement the database. Each year during the early part of the marketing period, SIMA staff with collaborators from other agencies (such as FEWS NET) travel the main trading routes conducting interviews with traders and farmers. The selection of people is opportunistic, such that the results provide more of a qualitative view of the field perspective on the coming marketing season (SIMA 2007). Given the difficulties with crop forecasting, this research provides a check on the estimates of surpluses or deficits of key commodities.

SIMA data are disseminated in various ways. The weekly bulletin is circulated by email and hard copy, and posted on a website (http://www.sima.minag.org.mz/), and contain prices for the current week and previous week for maize grain and flour, rice, beans, groundnuts at wholesale and retail levels, maize grain and beans at producer level, as well as selected costs of transport between markets, prices in futures markets, and brief analysis of key changes in

the markets. Radio broadcasts have been spotty, depending largely on availability of donor funding to pay for the programs. The largest selling national daily newspaper, *Noticias*, prints a SIMA price data table in the weekly Economic Supplement, read by traders and others. SIMA staff also organizes marketing outlook presentations and seminars and appear occasionally in the weekly business and marketing program on national TV.

SIMA price data are used in a variety of others ways, as well. They are compared to prices collected by INE for the estimation of the CPI, filling in gaps where they exist. The rapid appraisals conducted by SIMA staff at the beginning of the marketing season for agricultural commodities contribute to the formation of expectations on the upcoming marketing season. The SIMA data are also used to value commodities in the analysis of TIA data. FEWS NET uses SIMA data when looking at food security trends, both in terms of prices for producers linked to income analysis and prices for consumers linked to livelihoods and food access.

SIMA is a public sector MIS that is functioning efficiently and providing a valuable service. That the media seek SIMA contributions to their programming is one indicator of success, and key to this success is the professionalism and dedication of the SIMA staff. There are key challenges to sustainability of the system within the public sector. Retention of trained, dedicated staff will be discussed below, as it is a broader concern in the public sector. SIMA staff constantly faces constraints to innovation, as the bureaucratic structures are not as flexible as needed. SIMA must respond to the private sector needs rapidly and consistently over time, something that does not necessarily fit into a government Department of Statistics. SIMA has struggled with MOA's lack of reliable cash flow for the day-to-day activities critical to the system, as well as the need to go through a strict hierarchy to plan all activities. The lack of budgetary and administrative autonomy of the SIMA undermines its ability to respond.

3.2.2. INE CPI Surveys

INE collects retail price data for the Consumer Price Index, which is used in National Accounts, GDP estimates and a range of economic applications, for the public and private sector. Currently there is no data collection for a producer price index. The retail price data are collected for 245 articles, including a range of basic consumption goods and services, as identified in the IAF analysis on the basic consumption basket. Fresh produce prices are collected weekly in a total of thirty markets between Maputo, Beira, and Nampula. Prices for less perishable items are collected monthly, and cost of service data collected periodically (unspecified periods) during the year (INE 2007a). The monthly CPI estimates are available on the INE website by city and month since 2004, but not the underlying price series from which they are derived.

3.2.3. Ministry of Industry and Commerce (MINCOM) INFOCOM

MINCOM established the Market and Commercial Sector Information System (*Informação Comercial e de Mercados*, known as INFOCOM) in 1998, under the auspices of an FAO project in MINCOM. The objective of the system is to provide strategic information for private sector market development. The intended users are national policymakers, traders, producers, processors and consumers. INFOCOM focuses on data collection in the formal sector, supermarkets and large stores/warehouses, as well as more information on internationally traded commodities and exchange rates. The INFOCOM staff also develops

the Food Balance Sheets, with FAO technical support; FAO technical support was scheduled to end in mid-2007. INFOCOM collects retail price data on a weekly basis in formal sector establishments and supermarkets in the provincial capitals for consumption goods, both domestically produced and imported. The products include sugar, maize grain and flour, wheat flour, rice, beans, groundnuts, Irish potato, onions, edible oil, eggs, frozen whole chickens, and various types of fish. There is some duplication with the SIMA data, since in some cities, public markets are included. Supermarkets are solely collected by INFOCOM. The INFOCOM weekly bulletin also includes price data for selected products on international markets, along with commentary on special events. Some of the INFOCOM weekly bulletins are available on the MINCOM website (www.mic.gov.mz), although new bulletins have not been added to the website since August 2007. Otherwise the bulletin is distributed by email and in hard copy. The special bulletin with the FBS is the most widely used, especially among donors and government.

3.3. Systems Used to Collect Trade Data

3.3.1. Customs Records

Since 1997, Crown Agents of the United Kingdom has been contracted to work with the Customs Agency to improve information systems, and this has included computerizing border posts and ensuring the use of standardized commodity codes. While the data are not available to the public, they are used in National Accounts and the Food Balance Sheets, as well as other policy uses. Previously, researchers went to the port to collect data from actual port documents, in order to determine the actual amount of food that arrived in the form of food aid on ships. Customs statistics did not always reflect actual quantities, and were sometimes based simply on the projected quantity or the amount for which a permit was issued.

3.3.2. FEWS NET/WFP Cross-border Trade Study for Informal Trade in Selected Commodities

This system began under USAID funding in 2004, based on successful implementation in Kenya and its border areas in Eastern and Central Africa. Given the potential importance of cross-border trade in terms of food supply and incomes from agricultural commodities, FEWS NET and WFP combined efforts to quantify the informal, unregistered trade between countries in southern Africa. The system captures informal trade in maize, rice, beans and also collects price information at the border points. Initially established with twenty border points in the region, as of March 2007, there were 24 border points for data collection between Malawi, Mozambique, South Africa, Zimbabwe, Zambia and Tanzania, of which 15 border points are between Mozambique and its neighbors.

There are many reasons for trade not being registered. For example, trade in small volumes is legally permitted between Mozambique and South Africa, such that individuals can transport a 50 kilogram bag of maize flour or a dozen eggs without any border records. In northern Mozambique, the *bicycle trade* in commodities into Malawi became highly important, as traders learned that they could drive a truck from Mozambican production areas, offload onto bicycles that would cross the border in small loads, and then re-group the maize onto trucks on the Malawi side of the border. This was done to avoid taxation and

border permits with larger quantities. FEWS NET maintains the cross-border study reports on its website and distributes them widely through email communication.

In theory these data complement the official trade statistics and can contribute to making the FBS a more accurate assessment of scarcity and surplus. They are currently used with the FBS in Mozambique. In addition to the FBS, the data have been used by NGOs and donors in evaluating trade opportunities and livelihoods. WFP uses the information to help develop its strategy for food aid purchases in Mozambique. FEWSNET uses the information in its assessment of food security threats and early warning, combined with the various MOA production figures. Regional organizations such as SADC and COMESA use the cross border data to look at trade flows and possible policy implications. SIMA staff also use the cross-border study to understand price dynamics, especially in northern and central Mozambique, where informal trade with Malawi can have major impacts on local prices. The cross-border data system is still a project funded through donors, and has had difficulty in becoming institutionalized in a regional organization or other entity, so its future remains in doubt.

3.4. Periodic/complementary Surveys of Relevance to Agriculture

3.4.1. Directorate of Economics with Michigan State University Special Surveys

The Department of Policy Analysis jointly with the Department of Statistics and the Food Security Project of Michigan State University (MSU), funded by USAID, has implemented several other household surveys to meet specific needs. In 1996, MSU with the University of Arizona and the Ministry of Agriculture conducted the Socio-Economic Survey of the Smallholder Sector in the Province of Nampula (MOA/MSU/UA 1999) to look at agriculture and related aspects of rural household food security. This was an intensive effort following households over 12 months, capturing data on consumption, expenditures, agricultural production and marketing. The survey covered only Nampula Province in the north. There were also surveys on maize traders (1992-4), cotton sector (2000), cashew (1998), micro and small-enterprise (1996, see Benfica 1998), fertilizer use and efficiency, and sustainable nutrition focused on sweet potato in Zambezia Province (2002-5; see Low et al. 2005).

While conducted jointly with the Directorate of Economics, these surveys are not a regular part of the data collection activities of the Economics Directorate. The special surveys are undertaken when an issue is identified by MSU researchers or their counterparts and undertaken with graduate students at MSU (both Mozambican and US students) who used the data collected for their graduate research papers. This research guides the contents of the surveys.

The data collected do not form part of the Ministry of Agriculture (MINAG) agricultural statistics data system, but are retained by MSU researchers for analysis.[41] The outputs of the research, however, are published first in the joint MSU/MINAG publication series, which is used by many researchers and policymakers. These surveys have been extremely useful both for the research output and the survey experience for the Mozambican students and analysts involved, and are considered an integral part of the MSU project.

[41] It is important to note that the panel data of TIA are part of the MINAG systems and available on CD for students and researchers.

3.4.2. QUIBB: Questionário de Indicadores Básicos de Bem-Estar (Core Welfare Indicators)

QUIBB was the first step for INE in implementing a strategy to develop an integrated set of household surveys in Mozambique with rational use of the limited resources available to the government. These household surveys are used to evaluate progress on the MDGs and the PARPA, regarding economic growth and poverty reduction. As described by Mattiassen and Roll-Hansen (2007) "the basic idea is to utilize the information in an expenditure survey to identify a smaller set of household variables (indicators) that can be collected annually between two budget surveys" thus lowering the annual costs of monitoring progress. The first QUIBB in 2000/2001 covered almost 14,000 households nationally. It was designed to capture information on household composition, employment, education, and access to services. As such, there is some overlap with data collected in the IAF, but the QUIBB approach was less resource intensive. Thus far the QUIBB has been implemented only once (October 2000 through May 2001); plans for additional surveys have not been publicized. With respect to agriculture, it collected only very general information on labor allocation by sector, finding that approximately 77% of the economically active population dedicated itself to agriculture and the forestry sector as the primary activity (INE 2001).

3.4.3. Administrative Data: SISTAFE

In 2002, the government began investing in an administrative information system for the public sector known as SISTAFE (*Sistema de Administração e Financeira do Estado*) with a goal of making the budgetary process more transparent. While it is not easy to track past public sector spending on the agricultural sector, SISTAFE will enable future work on allocations, which can be compared to performance by sector. Results for each trimester are published and available on the Ministry of Finance website (*Ministério de Finanças, Direcção Nacional de Orçamento* 2007).

The Customs Department, under the Ministry of Finance, collects daily exchange rate information for the US dollar, South African rand and thirty-two other currencies, as well as a dollar/rand conversion rate (*Alfândegas de Moçambique* 2007), and makes the information available on the web.

3.4.4. Non-Governmental Organization (NGO) Monitoring and Evaluation

Increasingly, NGOs conducting emergency or development activities in Mozambique are required to conduct surveys and maintain systematic records on the populations involved in their programs. The surveys are designed to assess program impact, especially production, income, and health indicators. For some of the USAID NGOs, MSU with assistance of analysts from MOA/DE used the TIA data to develop a system of proxy indicators to estimate the income impact of their programs (Walker et al. 2004). The surveys are not always based on systematic sampling methods, but are informative for the populations of interest when conducted systematically.

4. USE OF THE DATA

Mozambique's agricultural data is used for a variety of economic analyses, development planning, and policy purposes. In the previous section we have described the anticipated uses of the different data collection systems in broad terms. In the following paragraphs, we describe how the data are actually used for recurrent annual reports (e.g., national accounts, food balance sheets, PES) and for a variety of agricultural policy analyses capable of contributing to improved agricultural performance, economic growth and poverty reduction. We discuss the analytical capability of the key actors using the data, the dissemination systems in place, and constraints that place limits on realizing the full potential of the data.

4.1. Recurrent Annual Reports

4.1.1. Poverty Reduction Action Plan (PARPA) and the Economic and Social Plan (PES)

The monitoring of the PARPA and the PES are evolving systems, and as of 2007, the PARPA indicators have been included in developing and monitoring the PES. The current system adapts to the information available, and there are efforts to identify gaps in the data collection system and alternatives. The most recent PARPA and PES evaluations mainly used a combination of IAF, EWS, and TIA data, with minor sources filling in a few gaps for the agricultural sector. To understand this, it is best to look at PES 2008.

Looking at PES 2008, performance indicators were set in May-August and published in September 2007 for the coming fiscal year. We find that production and area indicators are established based on the predicted values from the EWS, using regional weather data (*República de Moçambique* 2007). The PES focuses on the following smallholder crops: maize, millet, sorghum, rice, groundnuts, beans, and cassava. For large-scale commercial agriculture and family sector cash crops, the PES sets goals for cashew nut, coconut, sugarcane, tobacco, tea, cotton, soy, groundnuts, beans, citric fruits, and horticultural crops. The percentage of family sector farmers selling agricultural commodities is also estimated as a goal, by crop. The PES contains indicators for livestock herds and livestock products (cows' milk, eggs, etc.) as well as forest products. Stemming from the political drive to implement a Green Revolution in Mozambique, there are indicators for varietal adoption, use of new technological practices for productivity improvements and for soil conservation, expansion in irrigated area, in addition to adoption of improved planting materials and improved handling of germplasm. Specific goals of improved seed production are established by crop and by province, along with highly specific goals for animal protection, including vaccination programs.

Monitoring progress on the PARPA relies heavily on the national household budget surveys (IAF), using the 1996 IAF and poverty analysis as a baseline. However, the national agricultural surveys (CAP and TIA), also contribute to analysis of progress with the PARPA for rural households, especially the TIA surveys with income components in 2002 and 2005. The use of consumption/expenditure data (as in the IAF) rather than production and income data (as in TIA) for poverty assessments is a debate in the literature (Boughton et al. 2006). Mozambique fortunately has both types of large sample data sets, as well as a panel dataset with TIA, and so can use them to evaluate different estimates, although only the TIA data are easily available to researchers and students. While the differences are controversial, the debate is valuable (Hanlon 2008).

4.1.2. National Accounts: Ag Sector Components of GDP

Various sources of agricultural production data are used to develop estimates of agricultural GDP because there is no single survey or system of surveys that covers all the agricultural production activities in the primary sector. The National Accounts staff, located in INE, is responsible for developing the estimates using the available information and their knowledge of the agricultural sector. The annual GDP results are released in July of the following year, and so data availability for estimates will influence the data being used.

EWS data were used until 2000/2001 for maize, rice, beans, groundnuts, millet, sorghum, cassava and other tubers (commodities covered in the EWS). Between 2000/2001 and 2004, the EWS data were not used directly but rather were adjusted based on trends and other insights by the National Accounts staff. They did not have confidence in the EWS data of the period. By 2004, when TIA data were available earlier in the year, the National Accounts system adopted them as the standard for all annual crops, with the exception of fruits and horticultural commodities. National Accounts staff members still take time to look at trends and other indicators that may mean adjustments, when they are unsure about the information from TIA or have information from other sources. The horticultural commodities and fruits pose special challenges for the national accounts staff. Both sets of commodities are mostly consumed on farm and harvested in small quantities, and TIA data collection may underestimate production using annual recall, although improvements are made with each TIA. The IAF short-term recall system on home consumption of production may more accurately capture the totals for fruits and vegetables. National accounts staff compares the estimates of production for fruits and vegetables based on TIA production numbers and also those imputed from IAF consumption numbers and use their own judgment and past information to determine the production estimates to use. Note that coconut production estimated from the TIA is also considered problematic (under-estimated), from the National Accounts point of view, and industry estimates are obtained to adjust the production numbers.

For commodities not presently covered (or not adequately covered) by TIA, the National Accounts staff relies on the commodity institutes for the production information, including the Sugar Institute, Cashew Institute, and the Cotton Institute. Another gap is in forest and forest-related products, which are generally not covered under the TIA. In the most recent IAF, household sales of forestry products (wood and charcoal jointly) were valued, and that was used for the national accounts. When there is not an IAF (as in 2005 and 2006), earlier estimates from IAF are extrapolated.

Some commodities (such as rice and large animal livestock) are based in limited, geographically-concentrated areas, such that the sample selection of the TIA and IAF will not be able to accurately estimate production, unless sampling methods specifically address these commodities by increasing sample size in these areas (Megill 2002a). Megill demonstrated the very wide confidence intervals for these estimates and in a recent USAID report the authors made a plea: “The National Statistics Institute should make a concerted effort to improve the accuracy and reliability of the National accounts data on agriculture.” (USAID 2004, p.230).

4.1.3. Food Balance Sheets (FBS)

The FBS are developed by the MINCOM National Trade Directorate, by the staff of INFOCOM in collaboration with the staff of the EWS. This arrangement arises from the FAO technical assistance to both INFOCOM and EWS, for the FAO is the international agency that has developed the FBS approach. The objective of the FBS is to identify possible difficulties in meeting human food consumption needs in the coming year, as estimated during the harvest. To accomplish this, the FBS evaluates annual production and stocks and compares the total available for human consumption to estimates of quantities needed for human consumption. The main users of the FBS are the national policymakers formulating food aid, trade, and other policies, and the international donors making decisions on food aid, local purchases of stocks. Private sector users might also seek the information as an input into decisions on import/export or intra-market trade.

As mentioned, the FBS in Mozambique evaluates production and projected total supplies of cereals, tubers, beans and groundnuts. The cereals included are maize, rice, wheat, sorghum and millet. For each of these commodities they use the EWS production estimates. Consumption is not measured, but rather estimated based on an average consumption amount multiplied by the population. Trade numbers are for the formal sector (official trade statistics) and the informal trade, based on estimates from the cross-border studies. The FBS is estimated first for each of the three geographical regions (North, Center and South) and then nationally. The results are published annually, but we know of no attempt to update the FBS *ex post* with potentially more accurate data.

4.2. Other Uses and Reporting

4.2.1. Policy Analysis: MOA Directorate of Economics, Department of Policy (DP, Formerly DAP)

Formed in the early 1990s within the Directorate of Economics, DP (then known as the Department of Policy Analysis or DAP) began developing research and providing analysis of key policy issues. The TIA and SIMA data were a major input in the analyses, and the technical assistance of Michigan State University in training analysts and supporting improvements in methodology combined with investments in Ministry personnel to ensure the research inputs. Since TIA and SIMA were also based in the Directorate of Economics and receiving technical support from MSU, linkages were established between statisticians and agricultural analysts on a regular basis. DP analysts participate in the TIA each year, better equipping them for TIA analysis, but also enabling them to contribute to TIA development. For some issues, special surveys were conducted as with the cotton area survey discussed earlier. A list of the outputs of DE, especially DP, are available at the MSU website for the MSU/MOA collaborative research (found at http://www.aec.msu.edu/fs2/mozambique/index.htm), and the range of topics can be viewed. There are over 60 research reports, 50 policy syntheses (known as Flash), as well as student theses and other research publications. With MSU technical assistance, the TIA data are now available each year on a CD, with complete documentation.

Since 1991, a core team of policy analysts has been recruited and trained by MSU for DP, with in-service training of recent university graduates and with formal graduate training at MSU and elsewhere, including several MS and PhD level analysts in agricultural economics. Unfortunately, MOA has had difficulty retaining trained staff, as they leave for other jobs in Mozambique, reflecting the high demand for such analysts elsewhere in the economy and the

difficulties with MOA staff incentives and working environment.[42] There are two key consequences of this: 1) the quality of the data collection is not assessed through use and thus problems/improvements are not necessarily identified; and 2) demand for the results is limited by lack of knowledge of the power of the available datasets to answer key questions. DP analysts are generally limited to meeting short term demands of the Ministry, a firefighting mode, leaving little time for developing research products with a broader development perspective.

4.2.2. Use of SIMA and TIA Data by other Analysts

The TIA and SIMA data are increasingly used by researchers in the Universities and elsewhere. Recent work by MSU researchers with analysts at the National Agricultural Research Institute (*Instituto de Investigação Agrária de Moçambique*, IIAM) used the TIA data with SIMA prices to evaluate agricultural research priority setting in the light of poverty reduction objectives (Walker et al. 2006). World Bank researchers used the TIA data in their analysis of poverty trends in Mozambique (World Bank 2007).

[42] Two of these trainees are World Bank/Mozambique staff members as of 2007.

5. GAPS, DIFFICULTIES AND OPPORTUNITIES

The combination of efforts in Mozambique provides a wealth of information, but it is not without gaps and difficulties, some of which have been cited earlier in this document. Kiregyera at al. (2007) provide the most recent summary of the challenges with recommendations on the way forward, although they confine themselves to the narrow range of agricultural statistics, rather than the broader range needed for PARPA, PES, and MDG assessments. It was in 1999 that the donors and the government of Mozambique agreed to establish and fund the Agricultural Sector Public Expenditure Program (PROAGRI), a program that would have strong impacts on agricultural data collection systems and analysis, due to the information needs and performance measurement. Combining this with the PARPA and later PES indicators, the system has been challenged while at the same time, received greater attention and resources. In this section we will include and extend the Kiregyera et al. 2007 assessment with a view to these wider considerations.

Related to the institutional design of the various systems is the disconnect between the EWS in the National Directorate of Agriculture and the other data collection efforts of the Department of Statistics in the Economics Directorate, both within MOA. Kiregyera et al. (2007) provide an excellent diagnostic of the difficulties and confusion that this combination has caused. As they demonstrate for 2005, the differences in production and area estimates at the provincial level for main food crops reaches as high as 48% for the main crop, maize, in the highest producing province (Zambezia), and overall for 2005, EWS estimated 1268 thousand tons compared to 942 thousand tons estimated through TIA. For such an important crop for food security, this range is a problem. Given the lack of transparency in the EWS numbers, TIA numbers are considered more reliable. Ideally, EWS numbers would be estimated with greater transparency, used in the period before TIA numbers are available, and then final production numbers would be based on TIA, with adjustments for special cases. At the very least, as recommended by Kiregyera et al. (2007), EWS and TIA efforts should be housed in the same unit in MOA, and they should complement each other.

Timeliness is often cited as the reason for using the EWS data as the national production statistics in the national accounts and the PES. However, at the National Accounts office, they rejected using the more timely EWS indicating that the numbers were not credible, and beginning in 2004, they preferred to use the TIA estimates, with adjustments and additional information. The delays in getting TIA data did not prevent them from being useful, but certainly faster availability would be a plus. Data systems are in place for field based data entry and more automated data entry and cleaning, but if statistical and analytical capacity in MOA is not reinforced, those systems can easily break down.

Livestock data, especially cattle data, and selected agricultural production data in the TIA large sample survey system have problems due to geographic specificity in production and relatively few households with cattle or selected crops. Megill (2002b) has made recommendations to enhance the reliability of TIA estimates through changes in survey sampling, but additional improvements may be needed to fully address the problems for estimates of large animals and fruits and vegetables. Continued analysis using both consumption and production/income data are needed to determine the reliability of estimates and develop new systems for data collection.

To ensure and improve agricultural statistics, analysis provides the checks on data quality and confirmation on usefulness. The lack of analysis of the agricultural statistics means that potential data issues do not arise and systems cannot be improved. In addition, the relative lack of demand for policy analysis means that the data that exist are under-utilized, an efficiency loss of potentially high magnitude given the costs involved. Earlier analytical

work within MOA's DE has demonstrated the value of agricultural statistics, as with the analysis of the impacts of open borders for maize trade (Tschirley et al. 2005) and the analysis on the tobacco tax (Benfica et al. 2004), in both cases responding to policy needs. The combination of both statistical capacity (DEST) (with TIA and SIMA efforts) and analysis (DP) in the Directorate of Economics (DE) in MOA facilitated data enhancements, corrections and analysis.

Recent debates on poverty measurements have highlighted the need to use both production/income data and consumption/expenditure data to measure poverty and poverty dynamics (Hanlon 2007, Hanlon 2008, and Arndt 2008). With the first large household-level panel data set for Mozambique, MOA is leading the curve on data collection, but now needs to invest in analysis. USAID continues to support efforts on policy analysis with the MSU project, and PROAGRI donors support greater analysis. MOA with a new director in DE and a new Minister have the potential to develop human resources for agricultural policy analysis. Support for agricultural sector policy analysis in the Ministry of Planning and Development will also contribute to using the wealth of currently available agricultural sector data to understand the dynamics of this critical sector in the Mozambican economy.

Current technical assistance through donor projects is often not used in training new professional staff. There is a delicate balancing act for foreign technical assistance, as it tries to ensure training of local professional staff at the same time that it works with local analysts to use the data. Without direct technical assistance participation in the activities, the quality of the data may be compromised when there are too few national staff members to conduct the work. There are two difficulties. First, when the technical assistance partners leave, there are too few national staff members to complete the work. Secondly, given the existing stock of data, now is a key period to invest in training and analysis, demonstrating the value of the data collection effort. Technical assistance should focus on the analytical side, but the Ministries will need to recruit and retain new national staff.

With the push for decentralization of government decision-making and budgetary allocations, there are two key difficulties. First, local administrators need statistics at the district level. Currently the TIA agricultural statistics are collected to be representative at the provincial and agro-ecological zone levels (separately) but not down to district levels. The sample size would need to be at least doubled to meet the district level needs for the most basic statistics, and it is not clear where the additional funds would come from. Even if the statistics were developed down to district level, large investments in district level analytical capacity are needed to exploit such data, something that will take years. Secondly, decentralizing agricultural statistics data collection responsibilities and budgets even down to the provincial level (including budgetary authority at the provincial level) was found to be mistake, due to delays and other problems in implementation that threaten the national validity of the TIA as a whole (Kiregyera et al. 2007). As of 2007, the TIA will once again be afforded a national level budget for coordination and execution.

In Mozambique, the government has made substantial investments in the TIA and other data collection efforts. However, as for most of the public sector budget in Mozambique, funding for the efforts comes from donors. The PROAGRI consortium of donors, along with some bilateral funding, has contributed to the relative abundance of agricultural statistics, but funding delays and uncertainty occur each year. Questions on the need for a full household income and production survey each year have been raised. MOA is working to reduce the costs of annual data collection with the TIA light, but these surveys are still costly in Mozambique, costing more than $100 per household in 2006 (Kiregyera et al. 2007).

In the area of market information, SIMA demonstrates that a public system can be responsive and efficient in providing a range of services to both public and private sectors. SIMA started as a project with MOA and Michigan State University, with heavy involvement of expatriate analysts. Given the resources over 10 years, it has been fully institutionalized and works fully funded and operated by the government. The initial project years gave it the reliable systems and staff development that enabled the transition to occur. In other cases, public MIS have collapsed after the reduction of expatriate resources. Yes, with almost 700 continuous weekly bulletins over more than 15 years, SIMA has become recognized regionally as a valuable example of MIS development. However, SIMA staff recognizes the need to innovate and adapt to increasing demands from the private sector as agents respond to new market opportunities and new information and communication technologies. Innovations tend to be stifled within the large bureaucratic environment in MOA, and the need for greater autonomy in budget and activities is evident. SIMA also suffers from the difficulties of providing staff incentives in the public sector, as noted below.

Public sector staffing remains a key constraint to development of data systems and analysis. MOA suffers from a lack of trained professional staff, a consequence of low professional salaries and challenging working conditions (late salary payments, problematic access to resources to conduct the work, lack of MOA recognition of the importance of the work, among other factors). Retention of capable staff is difficult until the professional cadre are recognized and rewarded.

6. LESSONS OF RELEVANCE FOR AGRICULTURAL STATISTICS SYSTEMS ELSEWHERE IN AFRICA

There are several areas in which the Mozambican experience provides lessons for agricultural statistics systems elsewhere. Here we will address both the positive experiences, such as SIMA, combined statistical/analytical capacity within a single unit. Methodological improvements, and the more difficult experiences as with staff retention and the development of crop forecasting systems.

With SIMA, MOA demonstrates that a publicly-based MIS with skilled staff and a minimum of resources can operate and provide services. Starting from a project base and evolving into a Mozambican national system takes medium to long term commitments from those who fund the system, as well as those who guide the system. In the case of SIMA, it was fully institutionalized after about twelve years of external support, although the shift occurred gradually during the twelve year period. However, in the increasingly dynamic environment of markets and technology, innovation and response to user needs require greater autonomy over the longer run. A government Department of Statistics may not be able to sustain the effort needed, without strong political support and vision.

The Ministry of Agriculture in Mozambique has developed skills and experience in the design, implementation and analysis of agricultural statistics. It demonstrated how agricultural surveys are improved when the Analytical Unit is based within the same overall unit (Directorate of Economics) as the Statistical Unit. (The EWS suffers from being isolated in another unit of MOA.) That interplay has been successful in integrating new design and implementation aspects. The relationship also facilitates the incorporation of selected new topics into the surveys.

The lack of staff retention however has weakened that linkage, both on the survey side and on the analytical side. Without the investment in analysis, MOA and others cannot capitalize on investments in methodological improvements. Methodological and technological improvements worth implementing in other environments include the use of GPS and field-based data entry, both of which have made valuable contributions to data timeliness and quality. The experience with PDAs, however, was less favorable and highlights the care needed with technological improvements. Areas still needing improvements include livestock and commercial farmers, as is true for other countries in the region.

Mozambican policymakers recently invested with donors in assessing crop forecasts, acknowledging it as an area of problems within the agricultural statistical system. Different administrative departments are responsible for related aspects of agricultural statistics, as is the case with DEST and EWS. This is an inefficient use of scarce skilled labor and resources. One of the problems may arise from the nature of technical assistance. FAO technical assistance focused on the National Directorate for Agriculture with its Early Warning Unit and leadership of SETSAN, thus the emphasis on EWS and on the SETSAN Vulnerability Assessment. USAID with Michigan State University was involved in policy analysis with the Directorate of Economics and hence the capacity was developed there for the household surveys. The TIA and EWS staff members did not coordinate or discuss the increasing differences in their estimates until the 2005 disconnect captured the attention of policymakers and donors alike. In 2005, the differences in production estimates from the two systems resulted in confusing messages to policymakers, duplication of efforts, and sometimes misguided efforts. Both national policymakers and foreign technical assistance failed to make the needed linkages in the systems.

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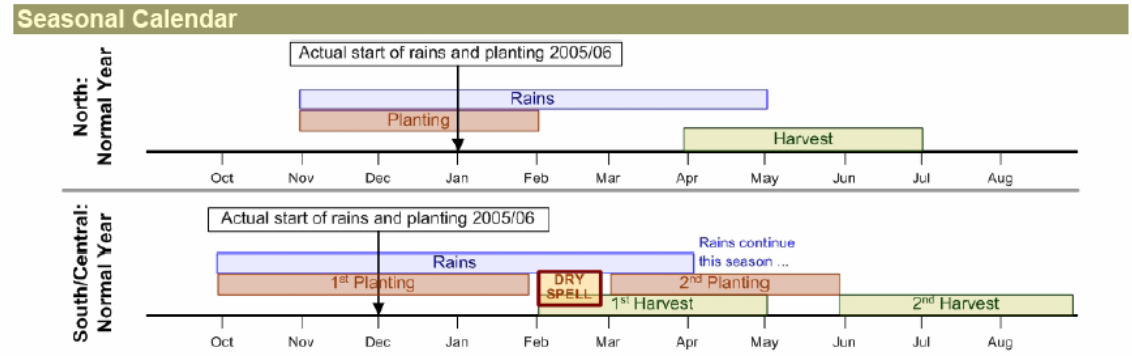
Annex 1. Seasonal Calendar of Agricultural Activities



Source: FEWSNET, Mozambique Food Security Update, April 2006.

Annex 2. Mozambican Capacity to Monitor and Evaluate MDGs

Table 1.2 Capacity to monitor and evaluate the MDGs

OBJECTIVE	EXISTING CAPACITY FOR Gathering data	Statistical follow-up	Statistical analysis	Integration of statistics into policies	Assessment of annual progress required
Extreme Poverty	Strong	Strong	Fair	Fair	Fair
Hunger	Fair	Fair	Fair	Weak	Weak
Universal Primary Education	Strong	Fair	Fair	Fair	Fair
Gender Equality	Fair	Strong	Strong	Weak	Weak
Child Mortality	Strong	Strong	Strong	Fair	Fair
Maternal Health	Fair	Fair	Fair	Weak	Weak
HIV and AIDS	Fair	Fair	Fair	Fair	Fair
Malaria and other Diseases	Fair	Weak	Fair	Fair	Fair
Environmental Sustainability	Weak	Weak	Weak	Weak	Weak

Source UN & GoM (2005). Relatório sobre os Objectivos de Desenvolvimento do Milénio (Report on the Millennium Development Goals)

Source United Nations Development Programme (UNDP). 2006. Mozambique National Human Development Report 2005: Human Development to 2015, Reaching for the Millennium Development Goals. Maputo: UNDP, p.9.

Annex 3. SIMA Products

List of SIMA products

Code	
1	White maize grain- national
2	White maize grain- donated
3	White maize grain- imported
4	White maize flour - w/o germ, imported
5	White maize flour - w/o germ, national
6	White maize flour - w/o germ, *grits*
7	White maize flour - with germ
8	Yellow maize grain
9	Yellow maize flour -w/o germ, imported
10	Yellow maize flour - w/o germ, processed
11	Yellow maize flour - w/o germ, national
12	Yellow maize flour - w/o germ, *grits*
13	Yellow maize flour - with germ
14	Cassava flour
15	Wheat flour- national
16	Wheat flour- imported
17	Cow peas
18	Common beans
19	Pigeon peas
20	Rice - ordinary
21	Rice – parboiled
24	Edible oil - bulk – national
25	Edible oil - bulk – imported
26	Groundnuts – small
27	Groundnuts – large
28	Cassava - dried chips
29	Cassava – fresh
32	Millet
33	Sorghum
34	Sunflower seeds
35	Sesame seeds
37	Cashew nuts
40	Brown sugar- national
41	Brown sugar- imported
50	White maize flour - w/o germ, national Second quality
51	White maize flour – First Quality w/o germ, national
120	Paddy rice
126	Groundnuts- small, unshelled
127	Groundnuts- large, unshelled
180	Common beans, imported

Appendix 4: Agricultural Statistics in Rwanda

Appendix 4

Agricultural Statistics in Rwanda: Key Aspects of Institutional Organization and Performance

by

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October 2008

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FOREWORD

This appendix differs from the three earlier appendices in that it does not enter into as much detail on the data systems. The Rwanda National Institute of Statistics (NISR) was established in 2004 to respond to the need for public sector cross-sectoral statistics which meet international standards and provide the information base for policy decisions. One of the goals of the INSR was to provide coherence in all national data systems, including for the agricultural sector. With this effort, the systems are still in flux. This makes it difficult to describe the current situation adequately through a desk study.[43] Thus, this appendix will focus on key elements of the system in the past and the lessons learned from experience, without the level of detail on current statistics as the other country studies. With the Oxford Policy Management Project associated with the establishment of the new NISR, many reports and memos were generated which are internal to the project. There is an excerpt of one such unpublished report as an annex to this document. Wherever possible, valuable documents and their web site availability are indicated in the document. All errors in the report are the responsibility of the author.

[43] Although in-country travel was not covered by the contract supporting this work, the authors had several opportunities to visit Mali, Mozambique, and Zambia while writing the case studies and synthesis paper. There were no opportunities for travel to Rwanda during this time.

TABLE OF CONTENTS FOR APPENDIX 4: AGRICULTURAL STATISTICS IN RWANDA

ACRONYMS

BRSS	Baseline Rural Sector Survey
DAI	Development Alternatives International
DFID	Department for International Development (UK)
DSA	Division of Agricultural Statistics
EA	Enumeration Area
EDPRS	Economic Development and Poverty reduction Strategy
EICV	*Enquete Integrale sur les Conditions de Vie des Menages* (Integrated household living conditions survey)
EU	European Union
FEWS NET	Famine Early Warning Systems Network
FSRP	Food Security Research Project (MSU and MINAGRI)
GPS	Global Positioning Systems
LRSS	Light Rural Sector Survey
MINAGRI	Ministry of Agriculture, Livestock, and Forestry
MINECOFIN	Ministry of Finance and Economic Planning
MIS	Projet Market Information System
MSU	Michigan State University
NIS	National Institute of Statistics
OPM	Oxford Policy Management
PASAR	*Programme d'Appui à la Securité Alimentaire au Rwanda* (Rwanda Food Security Support Programme)
RGPH	A full enumeration population census
USAID	United States Agency for International Development
WFP	World Food Programme
ZD	*Zone de denombrement* (enumeration area)

RWANDAN AGRICULTURAL STATISTICS

1. HISTORICAL EVOLUTION OF AGRICULTURAL STATISTICS

During the 1980s and early 1990s, Rwanda developed systems for collecting and analyzing agricultural statistics based on statistical norms and providing information for macroeconomic performance (Donovan and McKay 2004). With the genocide in 1994, the systems fell apart, with a lack of funds and lack of human resources. Gradually, the government has developed new systems, within the Ministry of Agriculture (MINAGRI), the Ministry of Commerce and Finance (MINECOFIN), and most recently within the National Institute of Statistics of Rwanda (NISR), an autonomous facility attached to MINECOFIN.

Prior to the establishment of the new NISR, MINECOFIN Department of Statistics was a key actor in public statistics in the country. The Department led a major effort to design a new Strategic Plan for Statistics (MINECOFIN 2002b). Three teams were formed: 1) poverty and wellbeing assessments; 2) Macroeconomic and sectoral statistics; and 3) institutional aspects. The second group includes agricultural, along with national accounts, public finance, industry, and other components of the economy. DFID contracted with Oxford Policy Management to provide guidance to the MINECOFIN team on the development of this strategic plan as well as the implementation. It was during the situation analysis for benchmarking national accounts that the difficulties with agricultural production statistics were highlighted and efforts put into place to develop a system to address the conflicting estimates and gaps in information (EREBS 2003). Across the various sectors, the system design evaluated the strengths and weaknesses of statistics generated by the line ministries, as well as their capacity to conduct surveys and analysis.

2. CURRENT ACTORS

Currently, NISR is divided into five directorates, of which the Directorate of Economic Statistics houses the Department of Agricultural and Rural Statistics and the four other Departments in the Directorate: 1) National Accounts, 2) Price Statistics and Informal Statistics; 3) Construction, Transport, and Energy Statistics; and 4) Finance, Business and Monetary Statistics. There is another thematic directorate, that of Demographic and Social Statistics. Finally, NISR has three other multisectoral directorates organized around institutional questions: 1) Research and Capacity Building (RCB); 2) Management Information Systems (MIS); and 3) Administration and Finance (AF).

The NISR Department of Agricultural and Rural Statistics works in close collaboration with MINAGRI's Department of Capacity Building, Policy, and

MINECOFIN led the two national household budget and expenditure surveys known as the *Enquête Integrale sur les Conditions de Vie des Ménages* (EICV). These surveys are used to understand poverty and wellbeing in Rwanda. Similar to other Household Living Conditions Surveys, the EICV collects a range of data. MINECOFIN worked to establish a meta-database for the EICV surveys, such that researchers would have access to full documentation as well as data from those surveys.

3. KEY DATA COLLECTION ACTIVITIES: STRENGTHS AND WEAKNESSES

A full enumeration population census (known as RGPH) was conducted in 2002 and serves as the basis of new surveys, including agricultural and budget and expenditure surveys. Donovan and McKay (2004) provides a brief summary of the history of agricultural household surveys in Rwanda.[44] As described there, prior to the genocide, Rwanda's Ministry of Agriculture (MINAGRI) had one of the more developed systems for agricultural statistics in the region, with a baseline household survey in 1984 followed by small-sample seasonal surveys which could be validated using the baseline from 1986 to 1992 (MINAGRI 1992). For system development and analysis, United States Agency for International Development (USAID) funded Michigan State University (MSU) for technical assistance for agricultural policy. This MINAGRI system broke down at the time of the genocide in 1994, and was replaced with small-sample household surveys under the MINAGRI's renewed collaboration with Michigan State University's Food Security Research Project (FSRP) in 1999 through 2002. USAID funded the FSRP effort but funding was no longer available in 2003. The lack of a post-genocide baseline and the probability of major shifts in population and production undermined the perception of validity of the small-sample surveys during this period. The lack of MINAGRI statistical and analytical staff at the time also limited integration of the systems.

In the agricultural sector, debates surround the relative roles of the National Institute of Statistics (NIS) and MINAGRI with agricultural statistics. Following the recommendations of Oxford Policy Management (OPM) experts, based on earlier experience in MINAGRI with household surveys and analysis, the decision was made for NIS to provide technical support to MINAGRI for the collection and elaboration of agricultural statistics, which could be combined with the EICV surveys for selected gaps or deficiencies in the MINAGRI data collection (Donovan and McKay 2004).

However, in 2005, national accounts analysts still relied on the MINAGRI crop production forecasts as the official production numbers (NISR 2007), due to the continued development of systems. As Loveridge, Orr and Murekezi (2007) explain in detail, there are gaps or weaknesses in the MINAGRI household surveys such that the EICV along with private sector processing data may provide the best base for national accounts, a type of hybrid system.

Prices for agricultural commodities have been collected under project support to MINAGRI from the European Union (EU), with the exception of 2004/2005 when there was no funding available. The price collection system involves daily price collection of 47 commodities in 41 markets throughout the country (Project Market Information System 2007). While initially intended as a full system for providing critical information for private sector traders and producers, the system specializes in price recording and reporting. Analysis and reports have focused on twelve key consumption commodities: maize, sorghum, Irish potatoes, sweet potatoes, cassava, cooking bananas, beans, garden peas, groundnuts, cabbages, tomato and onion. The data have primarily been used for analytical purposes in the public sector, rather than for private sector needs.

In light of price needs for National Price Indices and the uncertainties regarding the MINAGRI price collection system, MINECOFIN established a nationwide price collection

[44] Since the Donovan and McKay (2004) document was not published, at the end of this appendix, selected sections of the document are extracted and included. MSU scanned many of the pre-genocide documents on agricultural statistics, including MINAGRI 1992, and they can be found at the MSU website http://www.aec.msu.edu/agecon/fs2/rwanda/pre1994/index.htm#fsrp/dsa

system in key cities for the main goods and services in the Consumer Price Index. The National Bank of Rwanda also collected retail prices in the city of Kigali for evaluation of inflation, but with statistical reform, collaboration between MINECOFIN and BNR combined into a single nationwide system managed by ISNR for National Accounts. Prices are collected in thirteen communities across the country. The commodities vary by community and are based on consumption baskets from the 2001 EICV survey.[45] Loveridge, Orr and Murekezi (2007) provide an analysis of the use of the EICV for production estimates as compared to the Agricultural Surveys (Light Rural Sector Surveys - LRSS). This follows on from earlier work with EREBS and Donovan and McKay (2004). As discussed in Loveridge, Orr and Murekezi (2007), there are two approaches to estimating production from the EICV surveys. First, EICV enumerators asked respondents about their annual household production directly, with recall. Secondly, households were asked about their consumption from own production and from purchased sources for a two week period, and amounts were aggregated to get provincial and national totals, summing across time. The shorter recall period of the EICV consumption data is considered to be more accurate for crops which are harvested in small quantities for home consumption during the season, such as sweet potatoes. The LRSS agricultural surveys, using more frequent visits and a farm diary are considered accurate for the commodities which are harvested during a confined period (such as maize) or for market sales in bulk.

After analysis of the earlier surveys, the government adopted a strategy of a Light Rural Sector Survey, conducted by MINAGRI with MINECOFIN and NIS technical support to be conducted two annually, to capture production statistics for the main agricultural systems. The new 2006 light Surveys (twice annually, based on agricultural cropping seasons) contain the following subject matter: demographic characteristics of farm households; identification and characteristics of each field of the household; cropped areas, harvested quantities, and marketed quantities for all crops; livestock inventory; use of purchased inputs; fishing and fish breeding activities; beekeeping; and forestry (MINAGRI and National Institute of Statistics/MINECOFIN 2007). There is a recognized need to conduct a large sample baseline rural sector survey (known as a BRSS).

The MINAGRI/FSRP datasets from 1999-2002 were fully documented and left with MINAGRI and have been used for various studies and analysis since then. The earlier datasets from 1984-1992 are only partially available, as the datasets had to be reconstructed from researchers backup files after the genocide, when much of the original documentation was lost. The documentation of the surveys can be found at the MSU/FSRP website and the data is available on CD upon request from MINAGRI.

DFID has invested in statistical systems in Rwanda, agricultural and otherwise, in part to improve the macroeconomic estimates. DFID reports have noted the following problems:

1) Insufficient information collected in household surveys for National Accounts
2) Differences between crop forecasting and household surveys
3) Household survey previously done through MINECOFIN gave results based on consumption which did not compare well with MINAGRI production estimates.

For the last problem mentioned, there was a tendency to believe that the problem was with the measurement in agricultural surveys rather than a problem with uncounted imports; many working in the sector, however, are not sure which is the greater source of error.

Among the many questions that specialists continue to debate about the collection and use of agricultural statistics in Rwanda, the following tend to get the most attention:

[45] See NISR 2007 for further information on the construction of the CPI.

1. Can the household expenditure data provide more accurate estimates of vegetable and fruit production, when coupled with industrial processing use?
2. Given the costs of household data collection, can bi-annual agricultural surveys be conducted correctly in Rwanda?
3. Should there be a distinction between the role of NIS and MINAGRI, with NIS responsible for data collection and MINAGRI using those data for analysis?

4. SYNTHESIS OF KEY FINDINGS

This section of key findings on Rwanda is organized around the questions that we were asked to address in our terms of reference for the overall study.

4.1. Who Are the Principal Sources of Information for Agricultural Policy?

The primary source of agricultural information is the Ministry of Agriculture and Livestock (MINAGRI) with its seasonal agricultural surveys, known as the Light Rural Sector Surveys. Additional information comes from the national household budget and expenditure surveys (EICV). When the National Statistics Institute of Rwanda (NISR) came into being in 2002, both MINAGRI and MINECOFIN began collaboration with NISR in data collection efforts. Additional sources of information include MINAGRI price data collection, NISR price collection, MINAGRI crop forecasting in collaboration with FAO, and processing industry data from MINECOFIN, now with NISR collaboration.

4.2. Who Does What?

Prior to the establishment of NISR, projects associated with MINAGRI operated the household rural surveys, the price collection, and the crop forecasting, with MINAGRI staff participation. The official production statistics for the key crops came from the crop forecasting exercise.

MINECOFIN, to estimate national accounts, relied on the crop forecasting for production estimates, but complemented those estimates with information from the private sector on processing. In addition, they used EICV 1 and EICV 2 to estimate farm producton of crops not in the crop forecast, including most fruits and vegetables. While the EICV methods for crop production are problematic due to the measurement issues in the EICV, the consumption estimates are considered more reliable, based on a short recall. For commodities that are mostly use for home consumption rather than market sales, analysts used home consumption as a method for determining production.

4.3. What Are the Linkages, Overlaps, Duplications, and Conflicts?

One of the key questions is the relationship between the MINAGRI-based agricultural surveys and the EICV consumption data for production estimates. Crop forecasting numbers are seen as unreliable as they are not based on a statistically accepted system, and yet they have formed the basis for the national accounts for the commodities included. Through the years, MINAGRI has depended heavily on donor projects to develop and implement surveys, as well as to analyze agricultural statistics, such that internal capacity for survey research needs to be developed. There is a strong sense that the agricultural survey work should be based in MINAGRI, not NISR, given the strength of systems in the decade prior to the genocide.

4.4. What Are the General Types of Data Collected Methodologies Used?

Both the MINAGRI household agricultural surveys and the EICV are based on clustered, stratified sampling design. There, the similarities disappear. The agricultural surveys are based on repeat visits to farm households throughout the year, covering the two main agricultural seasons. Farmer diaries are used for harvest with standardized buckets given to each household for measurement of quantities. The EICV are based on a rotating sample, with each household visited several times during a two week period only, using a short-period recall of consumption.

The methodology used for the crop forecasting data is not transparent, in spite of the use of these data in national accounts and in key policy decisions. Famine Early Warning System Network (FEWS NET) participates with MINAGRI and FAO staff on the seasonal crop assessment missions. During the missions, there are documented systems for using crop cuts to estimate yields, but not all crops lend themselves to crop cutting for yields, and it is not clear that crop cutting is always executed during the missions. Generally, missions talk to local officials and extension agents to assess the crop year.

4.5. Do Methods Used by Different Institutions Produce Different Results?

As examined in detail by Loveridge, Orr, and Murekezi, the differing methods result in differing production estimates. Current systems are working to use the data in a complementary fashion. The crop forecasting system will need revisions as it lacks transparency in methods.

4.6. Where Are the Methods Stretched and Objectives Unrealistic?

Clearly for crop forecasting there are issues on the methods used.

4.7. What is the Record for Timeliness and Reliability?

As in other countries, the crop forecasting data are available before any others, and thus are more timely. The problems come in when they are used as the final crop production statistics for the key crops involved in that monitoring.

4.8. What Needs Are Well Met or Poorly Met for Key Users?

FEWS NET and World Food Programme (WFP) are two important users of the agricultural production data, as they work to understand the dynamics of food insecurity in Rwanda. The variable quality of the crop forecasting data makes their job difficult.

4.9. Could the System Be Organized Better?

The system is undergoing changes now. Key in this is the discussion about the relative value of using ECV and LRSS data for final production estimates. NISR works well in a

coordinating role for some aspects and more directly as an agent in surveys, as with the latest surveys on informal activities.

4.10. Are There Funding Issues?

Yes, there are funding issues. The price collection system, while not costly, shutdown for two years due to a gap of funding. The dependence on donor funding is high, as with funding from the Netherlands for the agricultural surveys and from several donors for the EICV. Crop forecasting relies on external funding.

4.11. Are There Lessons from Rwanda of Relevance to Other Countries?

The discussion and analysis on EICV/LRSS/Crop Forecasting is extremely valuable for other countries facing constraints and challenges in funding, human resources, and timing. The problems have not yet been fully resolved, but the discussions are informative and of relevance to other countries.

Through the years, Rwandan statisticians and analysts have worked with different methods for land area measurement and harvest estimates. These methods will be of relevance to countries with similar terrain (hillside production) and cropping systems.

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APPENDIX A: EXCERPTS FROM DONOVAN AND MCKAY 2004

"Historically Rwanda has a strong tradition of collecting high quality agricultural data. In the 1980s, skilled professionals led data collection efforts for the agricultural sector with the Division of Agricultural Statistics (DSA) at the Ministry of Agriculture. With technical support from the US Bureau of the Census, Development Alternatives International (DAI) and Michigan State University (MSU), DSA collected and analyzed a wide range of agricultural and rural household data to help provide policy makers with the information and analysis that was needed. An example of this is the bean and sorghum research. Contrary to common belief at the time, research showed that Rwanda was not self-sufficient in beans and sorghum, and that the poorest producers are the least likely to be self-sufficient and the most likely to need to purchase those staples in the market. After discussion of research results with officials, the proposed imposition of fixed minimum price levels for beans and sorghum was rejected (Loveridge 1988). That agricultural data system, however, suffered dislocations in the early 1990s and then disappeared with the war in 1994, as staff was forced to leave and facilities and equipment were damaged.

In the period after 1994, changes were occurring in rural areas of Rwanda, but there was no systematic way to document and understand what was happening. The previously existing systems for data collection were disabled during the war and very little information was available. To respond to the needs of policy makers, MINECOFIN and MINAGRI requested donor assistance to conduct rural surveys, as the establishment of the new National Institute of Statistics is debated in Parliament (MINECOFIN 2002b). The Household Living Conditions Survey (*Enquête Intégrale sur les Conditions de Vie des ménages* EICV) was developed in 1997/98 and urban data collection began in 1999 (MINECOFIN 2002a). Rural data collection began later in July 2000, continuing through July 2001. EICV was a standard multipurpose household survey designed to inform on issues of poverty. This included the collection of some agricultural data.

In the meantime, MINAGRI, with the financial support of USAID and technical support from the Bureau of Census and Michigan State University, began to reconstitute agricultural statistics data collection, based on a sub-sample of the households in the EICV sample and data were collected seasonally for 3 years. In 2003, the support given to the DSA at MINAGRI was ended, although the human resource development was not achieved to leave the system operational, so no further round of those agricultural surveys has been conducted." (Donovan and McKay 2004, pp. 2-3).

A1.1. Introduction to the Surveys[46]

The EICV was designed primarily to provide information for poverty assessment in both rural and urban households.[47] As indicated in Scott's design document, the EICV would capture data on many aspects of households' living conditions, including income and expenditures, over time as well as space (geography) (Scott 1997). Regarding agriculture, the survey asked about agricultural production, agricultural sales, assets (land, livestock etc.), processing activities and consumption of own production at the individual crop level.

[46] This section is not designed to give a detailed description for each survey. For more information see Nyarwaya et al. 2003 and Megill 1999 for FSRP/DSA; MINECOFIN 2002 and Scott 1997 for EICV.
[47] For a more detailed description of the sampling and other methodological considerations, see MINECOFIN 2002 and Scott 1997.

The FSRP/DSA survey that we will be referring to here is the main agricultural production survey conducted twice annually for the A and B seasons from 1999 – 2002. There were various special FSRP/DSA surveys conducted, including the demographic survey of 2001 and the input use survey in 2000, but we will be focused on the production and land use surveys here.

A1.2. Methodological Issues

This section will evaluate issues that may be specific to one survey or the other, but are not fundamental to either. For example, land area measurement problems were found in both surveys. The EICV approach was to ask the farmer the cropping area for each block, which may be difficult given irregular plots and other considerations. The FSRP/DSA's method was to pace off the sides of the field and then use computers to calculate the area. While the FSRP/DSA's method is considered to be more accurate, it is fairly costly in terms of the time it takes to complete the measurement, and there are problems of accuracy in measurement. Adopting the FSRP land measurement methodology into the EICV is an option to have greater accuracy, but the advantages and disadvantages of each must be evaluated, and there are other options available.

The EICV sample design included 5,280 rural households in a nationally representative frame, designed by Scott (1997) and revisited by Megill (1999) for the agricultural sector work. As was indicated earlier, the FSRP/DSA sample was a subsample of the EICV sample drawn in 1999. Due to various problems, the original 1495 households drawn from the sample were reduced 1395 usable cases in the FSRP/DSA dataset and were further reduced to 1369 in the common sample with EICV, through complications with substitutions and departure of households from the sample.

A1.3. Measurement Methods for Agricultural Production

Each survey had its way to measure production quantities. In the EICV, for products harvested during a single main harvest season, a 12 month recall was completed, included maize, rice, and other grains. The production data were measured in most cases in non-standard units, however, there were problems with implementation of the non-standard units questionnaire, and simple conversions from nonstandard weights to kilograms is not possible in most cases. Therefore the EICV production data is only available as the estimated value of harvested production, a direct question posed to farmers. This is not without problems, as in some instances, the estimated value of the harvest is less than the estimated value of sales, though this is a small minority of cases. Researchers have also used the value of sales plus the value of consumption of own production to estimate value of total production. Prices are then used to determine quantities, though valuation issues. The use of sales plus consumption generally gives higher production values, sometimes substantially so, than the declared value of harvest.

The FSRP method for collecting production information was based on experience from the earlier surveys. Households were given buckets to be used to measure their harvest. They were also given data recording sheets, to write down how many buckets with each harvest. Bananas were recorded in stalks of three basic sizes for which conversion factors had been developed. The enumerators were to visit the households every month at the very least to work with the data sheets and record information, but the lack of supervision meant that the

farmers were visited in some places with less frequency. Based on that experience, Mpyisi (2002) developed guidelines to obtain more accurate production and harvest information for those commodities, which should be helpful for future data collection.

For both surveys, tubers present unique problems, both in terms of measurement of harvest or consumption quantities (bulky product) and in terms of piecemeal small harvests rather than a single peak harvest season. For those commodities as well as fruits and vegetables, EICV enumerators used a two weeks consumption recall of sales and consumption. That frequent recall during a shirt period may be more effective at measuring small quantities, however, that any given household was visited just once during the survey results in problems for interpreting household level production. In the aggregate, the rotating sample does not pose a problem, but evaluating at the household level, it will either under or over estimate consumption/production, depending on the season of the visit. In the FSRP, production amounts were estimated from nonstandard units, declared by the farmer for each season, as with the other products, with seasonal recall.

One important difference between the surveys is the recall period used for reporting of production data. In the FSRP survey, households were visited each season, and reported production levels over the past season, regardless of type of crop. In the EICV survey individual households were only visited over a single two-week period, meaning that a recall period of a year was used for much of the production data except for tubers and other products harvested continuously where a two week recall period was used and then extrapolated to the yearly estimation. In the FSRP survey, households were visited each season, and reported production levels over the past season. For crops that are harvested in a single main seasonal harvest, the FSRP recall is seasonal, rather than the annual recall of the EICV.

A1.4. Fundamental Differences

While each survey could adopt better measurement systems for agricultural production measurement, the more fundamental difference between the surveys stem from the differing objectives of each. EICV was not designed for household analysis of agricultural productivity, particularly land productivity, and was not originally designed to provide the production and marketing for national accounts. Indeed it is widely recognized that conventional multipurpose household surveys are not the most appropriate way of collecting reliable agricultural data (Reardon 2000). The FSRP/DSA survey was designed more specifically with agricultural production analysis, comparing seasonal estimates, at both household and more aggregated levels. Pre-1994 experience had demonstrated the challenges involved in agricultural data collection (Loveridge, Megill, and Munyanesa 1992).

The FSRP/DSA surveys were designed to be collected on a continued seasonal basis, with changes in sample every few years to avoid respondent fatigue. The panel data set enables a more dynamic look at the agricultural sector. Given that 80% of the Rwandan population is engaged in agriculture and that agricultural production can vary dramatically with climate, soil fertility, technology, incentives, and other factors, seasonal data collection on a regular basis is the most appropriate way to have accurate information on production.

EICV was designed as a one-year very intensive survey that might be conducted every few years, due to costs, and the logistics of collection and analysis. Commonly such surveys are conducted every five years or so. EICV used a cyclic rotating system in which clusters of

households in rural areas were visited for 16 days and then the enumerators moved to another set of clusters for 16 days. That continued throughout the period of the survey, from July 2000 to July 2001. No households were followed throughout the period. Seasonal components were estimated by surveying groups of households in all provinces throughout the year. However, household analysis of crops consumed piecemeal will not be valid due to seasonality in consumption and lack of visits across seasons to the same household.

While the FSRP/DSA was a sub-sample of the EICV rural population, FSRP/DSA followed the same households through the three years, obtaining seasonal agricultural data through periodic visits to the households. Regular visits by the enumerators captured production information on a seasonal basis. In this way, the survey could be used to evaluate trends within households, on a seasonal level. Long recall periods were avoided for production data.

Land use analysis and productivity (particularly land productivity, i.e. yields) are very important for agricultural policymakers and thus the FSRP/DSA surveys were designed to capture them, in spite of the measurement problems with land areas, intercropping, and different cropping calendars for different crops. The EICV did not deal with such aspects. The intense work entailed in measuring land area accurately and then estimating land area to each crop required special methods, particularly with the small plots and high percentage of plots that are intercropped. New technology with Global Positioning Systems (GPS) may make land area measurement much more accurate and less time consuming to collect, and Rwanda's investment in the national system is a valuable opportunity to enhance systems.

The panel data aspect of the FSRP data set is also potentially very important in developing an understanding of the dynamics of living conditions (which in rural areas fundamentally reflect production levels) over time. This may be particularly valuable in future in being able to monitor the impact of agricultural commercialization policies and poverty reduction strategies in agriculture. (Donovan and McKay 2004, pp. 4-5)

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