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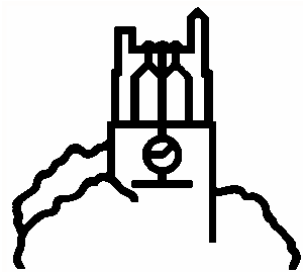
Agricultural Statistics in Sub-Saharan Africa: Differences in Institutional Arrangements and their Impacts on Agricultural Statistics Systems

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]

October 2008

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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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