Appendix 4

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

by

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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.[1] 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 There is an excerpt of one such unpublished report as an annex to this document.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.

[1] 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.

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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.[2] 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.

[2] 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

In light of price needs for National Price Indices and the uncertainties regarding the MINAGRI price collection system, MINECOFIN established a nationwide price collection 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.[3] 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.

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

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:

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 1: 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[4]

The EICV was designed primarily to provide information for poverty assessment in both rural and urban households.[5] 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.

[4] 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.
[5] 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)