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Implementation of the Modular Approach in Mozambique for the 2010 World Census of Agriculture Program

Issues Challenges and Innovative Features of the Second Mozambique Census of Agriculture and Livestock

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Demand for Agriculture Data

The demand for statistical data and information about the agricultural sector has increased dramatically over the past few years because of the need for reliable statistics and reporting on the achievements and impacts of development policies and Programs such as the *Action Plan for the Reduction of Absolute Poverty* (PARPA I-II) and the recently adopted *National Strategic Development Plan* (NSDP) identifies the Government's priority agriculture data requirements.

Integrated Agriculture Statistics Systems

Beginning in 1950, the FAO World Program for the Census of Agriculture (WCA) has been helping countries to carry out their national agricultural census at least once every decade using standard international concepts, definitions and methodology.

The decennial World Census of Agriculture program is the most important regular global agricultural statistics event. For statistical offices, an agriculture census is also one of the most complex survey operations from a conceptual and organisational point of view and represents the key event for gathering information for agriculture[1].

Methodologies, concepts and definitions have evolved over time and for a number of decades FAO has prepared manuals highlighting the best and most successful practices and procedures. The document for the 2010 World Census Program is the fourth such report[2].

The Census of Agriculture should be part of an integrated multi-year program of a census of population, census of agriculture, annual surveys and administrative data from agricultural programs and markets information.[3] A census of agriculture has four primary objectives: 1) a list frame for subsequent sample surveys, 2) structural data of farms and agricultural activity, 3) data at the at the small geographic area level, and 4) benchmark national and provincial level estimates for coherent reliable official statistics for agriculture.

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[1] World Program for the Census of Agriculture 2010, Volume 1, Rome 2005
[2] Ibid.
[3] The World Program for the Census of Agriculture (FAO 2005) argues forcefully for the development of such integrated systems.

Integration means that all statistical operations are carried out as components of the national statistics system. In an integrated agricultural statistics system, the Census of Population is used to enumerate and identify agricultural households and the Census of Agriculture provides an integrated set of benchmark data on food and agriculture supporting the annual inter-censal survey program.

Agricultural censuses and agricultural surveys are closely related in that both involve the collection of agricultural data from agricultural production units. For WCA 2010, emphasis has been given to developing the agricultural census within the overall framework of a system of integrated agricultural censuses and surveys. This system has three main elements: 1) Census of Population, identification of agricultural households, 2) Census of Agriculture, which is the nucleus of the system, and 3) Annual agricultural sample surveys, based on the Census of Agriculture.

Modular Approach for the Agriculture Census

To help countries meet the need for a wider range of data from the agricultural census, while minimizing the costs, FAO now recommends that countries use a modular approach for the Census of Agriculture[4].

The modular approach for the Census of Agriculture proposes a *core census module* based on complete enumeration to collect key data, and a series of sample-based *supplementary modules* to collect more in-depth data.

A *core census module*, should, if at all possible, be undertaken on a complete enumeration basis.[5] The main objective of the *core module* is to provide key structural items and content similar to the conventional agricultural census of the past, but with a much more restricted range of items.

The most efficient procedure for collecting data for the *core module* is to add an agriculture module to the Census of Population, the country's largest household survey. Coordinating the Census of Agriculture with the much larger Census of Population operation, which with few exceptions is normally a complete enumeration of all households, allows the Census of Agriculture to benefit from the Census of Population cartography and provides an opportunity to obtain key information on agricultural activity from all households.

 Where possible, countries should plan their annual agricultural survey program prior to the Census of Agricultural to ensure that the Census programs can be designed to meet the sampling frame needs.

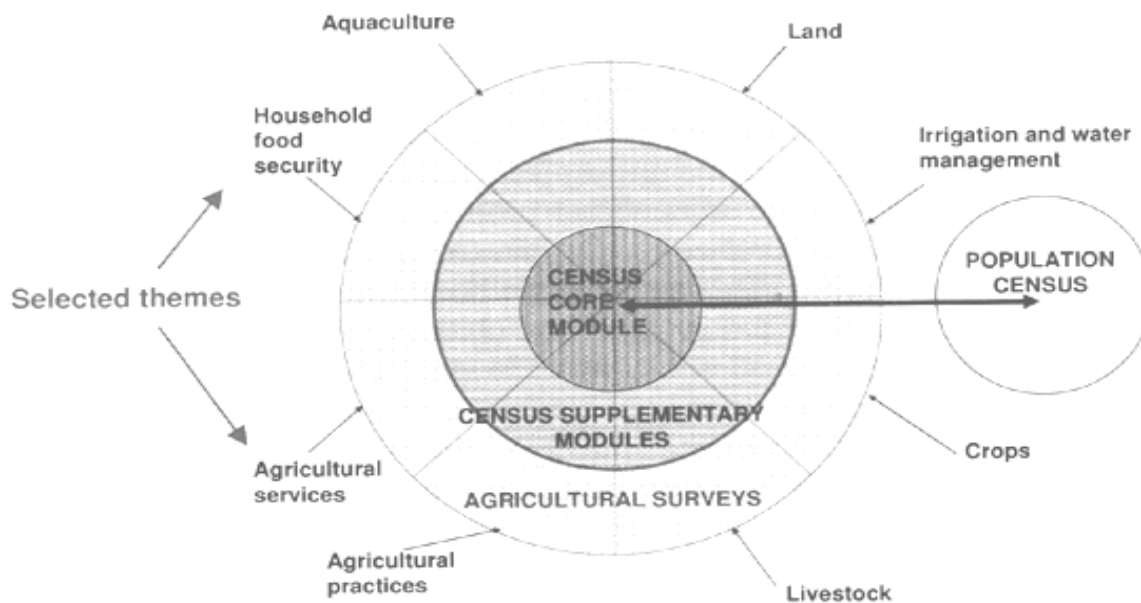[4] World Program for the Census of Agriculture 2010, Volume 1, Rome 2005, pp. 29-33.
[5] For countries where a complete enumeration is not possible, the core module can be conducted on a large sample basis.

Mozambique is fortunate as all but six of the sixteen *"Core Module Questions"* were asked on the 2007/2008 Census of Population and Housing which was a complete enumeration of the population.

Items recommended for the Core Module[6]
1) Identification and location of agricultural holding
2) Legal status of agricultural holder
3) Sex of agricultural holder
4) Age of agricultural holder
5) Household size
6) Main purpose of production
7) Land use types
8) Total area
9) Land tenure types
10) Presence of irrigation
11) Temporary crops
12) Permanent crops on the holding
13) Animal numbers by livestock type
14) Aquaculture
15) Forest and other wooded land
16) Other economic production activities

The Agricultural Census in the Framework of the System of Integrated Agricultural Censuses and Surveys

Source: World Program for the Census of Agriculture 2010, Volume 1, Rome 2005

[6] World Program for the Census of Agriculture 2010, Volume 1, Rome 2005, p.30.

Current Mozambique Agriculture Statistics System

The statistics of Mozambique are governed by the Statistical Master Plan (May 2007) and the Statistics Law (2005). In addition, the Government in consultation with Development Partners has identified the Census of Agriculture as second in priority to only the Census of Population.

The main source of agricultural information is the Ministry of Agriculture (MINAG). Apart from the Census of Agriculture and Livestock (*Censo Agro-Pecuário* – CAPI (*1999-2000)* and CAPII (2009-2010) which were undertaken by the National Institute of Statistics - *Instituto Nacional de Estatística* (INE) in close collaboration with MINAG, most agricultural data are produced by MINAG.

Within the Ministry of Agriculture the two main Directorates that produce agricultural statistics are the Directorate of Economics (DE) and the National Directorate of Agricultural Services (DNSA).

Within the Directorate of Economics the Department of Economics (DE) is responsible for the *Trabalho do Inquérito Agrícola (TIA)* as well as the Agricultural Market Information System (SIMA). The National Directorate of Agricultural Services provides forecasts and preliminary crop estimates, the Department of Early Warning undertakes a Crop Forecast Survey *Aviso Prévio.* The Directorate of Economics (DE) has the formal mandate to coordinate all the statistical activities within the Ministry of Agriculture and the subordinate institutions, but it is a challenge.

The Recenseamento Geral da População e Habitação and the substantive sample of the Censo Agro-Pecuário (CAPII), provide the country's best available baseline estimates for the agricultural sector. TIA can provide statistically sound annual inter-censal estimates of - harvested area, final yield, harvested production, and farm stocks of crops - but they will not be identical to those of the Censo Agro-Pecuário or always be able to provide the same level of quality data for the smaller geographic areas.

The timely, but statistically unsound early warning information from Aviso Prévio are the source of timely early-season preliminary estimates of crop area, yield and production. Aviso Prévio cannot however, provide estimates of harvested crop area, yield and production, a role for which it is currently poorly suited.

The Census of Agriculture and Livestock 2009-2010 (CAPII)

Core Module of CAPII
It has been almost ten years since the last Census of Agriculture. Despite the existence of on-going annual data collection activities, there are information gaps in the structure of Mozambican agriculture, more specifically the systems of production, the characteristics and typologies of the farms and the economic performance of the sector.

The 2007/2008 Census of Population and Housing list frame, a complete enumeration of all agriculture households has been of considerable value to the 2009-1010 Census of Agriculture. With under-coverage of the Census of Population and Housing estimated at less than 2 percent it has provided an opportunity to design and efficient Census of Agriculture sample.

Mozambique was also fortunate as all but six of the sixteen FAO recommended *"Core Module Census Questions"*[7] were asked on the 2007/2008 Census of Population and Housing. The Census of Agriculture was also not burdened with the need to collect demographic information, as it was all available in detail from the Census of Population and Housing, the basis of the *"Core Module"*.

The Census of Population and Housing questions on agriculture and aquaculture were accepted as the *"Core Module for the Census of Agriculture" (III RGPH, Seccao G: Actividade Agropecuaria e Piscicola* as defined in the 2010 World Program for the Census of Agriculture.

The sampling strategy for the Census of Agriculture and Livestock was essentially a supplementary sample for crops and a supplementary sample for Livestock to collect the six FAO recommended *"Core Questions"*, not included in the agriculture screening questions available from the Census of Population and Housing.

Supplementary Modules of CAPII
The number of *"Supplementary Modules"* and the questionnaire content was limited by budgetary constraints. Consequently, the *"Supplementary Module"* recommendations were based on the recommendations from the CAPI experiences, emerging data needs, data gaps, and recommendations given in the new FAO World Census of Agriculture (WCA2010).

As a result, Mozambique identified the following seven *"Supplementary Modules"* listed in the order of their importance:

1) *Crops Supplementary Module (FAO Theme 03- Crops)* Crops is a key module that collected data for the six missing Core items on the 2007/2008 Census of Population and Housing items:
    i. Area of holding according to land use types (FAO 0007)
    ii. Total area of holding (FAO 0008)
    iii. Land tenure types on the holding (FAO 0009)
    iv. Irrigation on the holding (FAO 0010)
    v. Forest and other wooded land on the holding (FAO 0015)
    vi. Other economic production of the holding (FAO 0016), and
    vii. The Crops Supplementary Modules should also likely include the information in the FAO *Theme 01- Land*.

2) *Livestock Supplementary Module (FAO Theme 04 - Livestock)* Livestock is the second most important module and had collect data for the six missing Core items

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[7] World Census of Agriculture 2010, Volume I, Chapter 4, FAO, Rome, 2005.

on the 2007/2008 Census of Population and Housing (items 007, 008, 009, 010, 015, 016), and had include the information for *Theme 01- Land.*

3) ***Irrigation and Water Management Supplementary Module*** *(FAO Theme 02 - Irrigation and Water Management)* Irrigation and water Management was a sub-sample of the Crops Supplementary Module.

4) ***Labour Supplementary Module*** *(FAO Theme 08 - Farm Labour)* Farm Labour was a sub-sample of the Crop and Livestock samples. *FAO Theme 12 Management of the Holding* could also be added to this Module.

5) ***Household Food Security Supplementary Module*** *(FAO Theme 09 – Household Food Security)* Food security of rural and urban households is an issue of particular interest to the Government of Mozambique and the Module was likely be a sub-sample of the Crops and Livestock Supplementary Modules.

6) ***Agricultural Practices and Services Supplementary Module*** *(FAO Themes - 05 Agricultural Practices and 06 Agricultural Services,* could be a sub-sample of the Crops and Livestock Supplementary Modules.

7) ***Aquaculture Supplementary Module*** *(FAO Theme 10 – Aquaculture)* This is a particularly area of importance for the Government but with the completion of the recent survey of fishing communities throughout the country for the Ministry of Fishing and the Institute on Fishing (IDPPE) and another survey planned this very specialized module that will divert valuable sample units away from crop and livestock farms should be left off the Census of Agriculture.

Sample Design and Selection Considerations
Sampling Frame
The frame for *Small and Medium Sized* farms was obtained from the list frame from the III Census of Population and Housing. The frame for the *Large and Commercial* farms will be a list of these farms from Agriculture Ministry and local authorities.

The smallest statistical unit is the individual survey record but when data from the Census of Agriculture and the Census of Population and Housing are combined, the smallest statistical unit is the *Enumeration Area*. Each rural *Enumeration Area* has about 100 households and in urban *Enumeration Areas*, about 150 households. The Census of Population and Housing does not have information to distinguish among households in an *Enumeration Area* that would allow an individual survey record from the Census of Agriculture to be matched to the corresponding Census of Population and Housing record.

Stratification of Farms by Size of Holdings
Small farm holdings in both the rural urban and peri-urban EA's were a one in ten sample (10% sample) in each selected EA. *Medium sized holdings* in the EA's were all enumerated. *Commercial and large farms* used the same list of farms and definitions as the annual Ministry of

Agriculture TIA survey and they were all enumerated. Large farms numbered less than 900 but make a significant contribution to production.

The sample for the Census of Agriculture was limited to those parts of Mozambique where the EA data from the Census of Population and Housing screening questions had indicated agriculture activity and intensity of activity.

The sample sizes for the various strata, sample allocation, selection, as well as computation of expansion factors and sampling errors was the subject of a specific study that had taken into consideration the variability within domains estimated from the data in the agriculture section of the 2007-2008 Census of Population and Housing and the most recent TIA (cv's). The objective was to optimise the Census sample design, with the available budget, to produce estimates of crops and livestock at the Province and District level that would be of an acceptable quality to be *"fit for use"*.

Most of the sample was allocated to the small and medium sized farms in the rural areas and that most of that was allocated to the Crop and Livestock Supplementary Modules. A classic two-stage stratified and cluster-sampling scheme was used sampling. The sample amounted to approximately 3,500 EA's, 35,000 small farms, plus approximately 5,000 medium and large farms.

The table below summarizes the planned and actual sample collected by Province, for the three size categories of agricultural holdings.

PROVÍNCIA	PLANO			REALIZAÇÃO					REALIZAÇÃO (%)		
	DISTRITO	AE	PE	DISTRITOS	AE	PE	ME	GE	DISTRITO	AE	PE
Niassa	16	296	2,960	16	296	2,954	69	6	100.0	100.0	99.8
C. Delgado	17	372	3,720	17	372	3,720	169	22	100.0	100.0	100.0
Nampula	21	611	6,110	21	611	6,103	194	35	100.0	100.0	99.9
Zambézia	17	546	5,460	17	546	5,445	86	47	100.0	99.8	99.7
Tete	13	324	3,240	13	324	3,226	729	96	100.0	100.0	99.6
Manica	10	239	2,390	10	239	2,389	339	51	100.0	100.0	100.0
Sofala	13	291	2,910	13	291	2,910	179	80	100.0	100.0	100.0
Inhambane	14	310	3,100	14	310	3,060	1744	65	100.0	100.0	98.7
Gaza	12	246	2,460	12	246	2,449	573	153	100.0	100.0	99.6
Maputo Província	8	166	1,660	8	166	1,645	307	255	100.0	100.0	99.1
Maputo Cidade	7	101	1,010	7	101	981	83	29	100.0	100.0	97.1
Total	148	3502	35,020	148	3,502	34,882	4,472	839	100.0	100.0	99.6

Coverage and Content
Coverage included all EA's where the census of Population and Housing reported agriculture activity, including urban, peri-urban and rural areas. All major crops and livestock were covered and consideration was given to allocate supplementary sample to the Crop and Livestock Modules for better District level estimates of the major crops and livestock. This was particularly

important for the livestock concentrated in specific geographic areas such as cattle, in the Provinces of Tete, Gaza, and Maputo.

To obtain information of urban and peri-urban agriculture EA's from all major cities, were surveyed. These cities were believed to account for a significant share of horticulture and vegetable production as well as chickens, pigs and goats. Urban based agricultural households did however present some additional challenges as many have their "farms" and plots of land far from their urban residence.

Listing Activity
Field work needed for validating and updating the 2007/2008 Census of Population and Housing list frame and cartography was undertaken as part of the "listing exercise" undertaken by the enumerators upon their arrival at a selected Enumeration Area (EA).

Listing was done using the community or village based approach. Local knowledge was the key to boundary identification and although GPS equipment and digitised EA cartography from the Census of Population helped, boundary identification remained a challenging task.

The identification of the EA boundaries as a challenge even with good maps and good identification of the EA's by the Census of Population and Housing cartographers. EA enumeration still remains largely community or village based. This was not necessarily a weakness, for as an approach it has been proven to be a statistically sound means of identifying and enumerating the households/holdings in an EA.

Data Collection Methods
Data collection methods had combined interviews of farmers with objective measurement. Objective measurement was used for estimate crop and total farmland area, in addition to the farmer's declared estimate. Area measurement was made using GPS in order to minimize time spent on this activity and to improve accuracy on the plot measurements. The GPS brought a reliable technology to geo-reference data.

Data Collection
The field data collection was done by enumerators visiting the households in the survey one time only. If a household has been selected for more than one *"Supplementary Module"* the enumerator had collected the data for all the required modules at the same visit. There should not be two or more separate visits.

Data Capture and Processing
Interviewers entered the data in the field at the time of the interview using computer assisted personal interview (CAPI) software programs, installed on small notebook computers with 10 inch screens and long life batteries. The computers performed well, were easy to transport, use and, recharge in difficult conditions.

Data entry at the time of the interview offered clear advantages and proved less difficult than was originally anticipated. The main advantages were reduced costs and improved data quality. Data entry in the field eliminated the need for a separate data entry operation at the INE Headquarters

and provided interviewers and supervisors with almost immediate access to the micro data for data checks and editing.

Electrical power to the computers was supplied by power inverters and adapters connected to the auxiliary power supply in the vehicles. Very few interviews were ever delayed because a lack of power even in the most remote parts of the country.

The notebook data entry software included a backup system for all data files and interviewers were each provided with "two memory sticks" and encouraged to back-up their data files after every interview to ensure that no data were ever lost or misplaced.

A 3G modem connected to the computers was used to transfer the data files to the central processing operation at the INE Headquarters and the supervisors and controllers in Headquarters received the data as an email attachment. In places where the technology 3G was available the process went very well, however where there was no 3G service, the data transmission was not accomplished as quickly as planned.

Despite the challenges the data management and file transfers proved to be, more reliable, much quicker and less problematic than previous survey experiences of moving and tracking large volumes of paper questionnaires and control documents from numerous field locations to a central processing centre.

Data Transmission

Inquiridor 1   Lap

Contacto

Inquiridor 2   Lap

Contacto

Inquiridor 3   Lap

Contacto

Controlador recolhe todos
os dados dos inquiridores
via Flash Drive

Controlador

NControladorXX.dadoscap@ine.gov.mz

Lap

Controlador envia dados
para INE CENTRAL, após
conclusão da AE (2 Dias)

Supervisor DPINE's
recolhe todos os dados
dos controladores via flash

Via INTERNET

Supervisor DPINE's

Lap

Supervisor DPINE's envia
dados para INE CENTRAL
apos recolha nos
controladores (7 dias)

NSupervisorDPINEXX.dadoscap@ine.gov.mz

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10