Implementation of World Census of Agriculture FAO Programme 2010 in Latin American Countries: Innovations, Issues, Challenges

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1. Introduction and backgroud.

This paper presents a brief update of the present situation in Latin America regarding the progress made to implement their Agricultural Censuses following the World Census of Agriculture Programme 2010 (WCA 2010) promoted by FAO which covers the agricultural censuses and related surveys undertaken during the period 2006-2015. The paper reviews the application of the new features of WCA 2010 by countries, lessons learned and possible suggestions to take into consideration for the next WCA. It also analyzes the new challenges vis-à-vis the implementation of the Global Strategy to Improve Agricultural and Rural Statistics in Latin America..

In Table 1 the situation of Latin America as far as far as the participation in the different agricultural census rounds (since 1950) is depicted.

Table 1: Participation of Latin American countries in the AC rounds (in number of countries)

TOTAL	Round							
	1950	1960	1970	1980	1990	2000	2010 (up to December)	2010 (Forecast)
19	16	18	14	11	9	10	10	15-17

The first observation is that, number of countries oscillates between a minimum of 9 in 1990 to a maximum of 18 during the 1960 round. A change in the tendency is observed during the last two rounds. Possible explanations for this behaviour are: 1. Up to 1970 the censuses were, in general, the only source of agricultural data, implementation of agricultural sampling surveys in Latin America began in the 70's mainly with USDA assistance first and FAO's afterwards; 2. The application of liberal policies in economy during the late 80's and 90's undermined public budgets and financial support to statistical activities declined (it could be seen an important decline both in the undertaking of agricultural censuses and agricultural surveys).

So far, 10 countries have undertaken or are ready to undertake agricultural censuses under the 2010 round. Most likely, at the end of the period (2015) 15 to 17 Latin American countries will have carried out their censuses of agriculture (Table 2).

Table 2: Situation of Latin American countries in the participation of the 2010 round (year)

Country	Last Agricultural Census	AC under the WCA 2010 Programme	Plans for next AC
Argentina	2008	2008	
Bolivia	1984		
Brazil	2006	2006	2012
Chile	2007	2007	
Colombia	2005		2015
Costa Rica	1984		2012
Cuba	1952		
Dominican Republic	1982		2012
Ecuador	2000		2012
El Salvador	2008	2008	
Guatemala	2003		2013
Honduras	1993		2013
Mexico	2007	2007	2012
Nicaragua	2001	2011	
Panama	2001	2011	
Paraguay	2008	2008	
Peru	1994		2012
Uruguay	2000	2011	
Venezuela	2008	2008	

The new FAO Programme (WCA 2010) presents the Census of Agriculture as an element of an integrated system of censuses and surveys. The new WCA2010 also incorporates several innovations: a) the modular approach; b) the integration of aquaculture activities; c) the recommendation to collect additional data on rural households; d) the concept of sub-holding aimed to capture information on farming activities conducted by women; e) closer links with the population census; f) the integration of community level surveys as part of the census operation. The following sections review the application of FAO recommendations by Latin American countries in the present round.

2. Main aspects of the WCA 2010 Programme.

2.1. Modular approach

The modular approach envisages 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 information. Items to include in the core module have been selected according to the following criteria:

- The items are the key items needed for agricultural policy-making and planning.
- Data for the items are required to be produced for small administrative units such as districts or villages, or in the form of detailed cross-tabulations. Such data could not be provided from an agricultural sample survey because of high sampling errors.
- The data involve the measurement of rare events, such as unusual crops or livestock, which would not be possible to estimate from a sample survey because of high sampling errors.
- The data are required to establish sampling frames.
- The data are required to make international comparisons.

The Programme establishes that in developing its census of agriculture, a country should include in the core census module the entire recommended census core items, plus additional items from the list of

supplementary items according to national requirements. Incorporation of too many additional items in the core module leads to lengthy non cost-efficient questionnaires increasing census budget often exceeding country possibilities.

Generally speaking, so far, Latin American countries have not adopted the modular approach, or, in other words: they incorporated so many items in the core module that there is little difference with the contents of census undertaking in previous programmes. In fact, strictly speaking, no one of the countries that undertook the Census of Agriculture in the present round or are very close to undertake it (10 countries) collected information of the supplementary modules by sampling.

In the case of **Brazil**, the Personal Digital Assistants (PDA) were programmed in such a way that additional information was collected for all farms that meet certain criteria. This procedure is close to the use of supplementary modules, but farms were not sampled.

El Salvador covered small holdings and backyard production in urban areas by sampling, so the sampled modules referred to the type of holding and not to the type of variable to investigate.

Similarly, **Nicaragua** is using the National Household Sample Survey to cover backyard production in urban areas.

There are different explanations for this phenomenon:

1. Tradition: in many cases the previous census questionnaire is the basis for designing the new one and there is a strong resistance to eliminate items or estimate previous complete enumerated items through a sample;

2. Decision makers and other users claim for detailed geographic data for too many items;

3. Lack of capacity to implement sampling in the census operation also when PDAs were used: **Brazil** 2006, **Mexico** 2007, **Venezuela** 2008 and, in the previous round, **Colombia** 2005 used PDAs but information was collected on complete enumeration basis.

This is a great handicap in census taking because of excessive costs of the operation. The need of performing detailed analysis of costs vis-à-vis outputs for the different alternatives should be emphasized.

As far as the implementation of sampling during the census operation is concerned, countries in general do not have experience in how to perform it and technical assistance is needed. It also poses practical problems in the field when using paper questionnaires. For example, census enumerators would have to select one every five holdings, say, with irrigation to apply an in-depth questionnaire about water management and, perhaps, at the same time, they would have to apply another detailed questionnaire, to one every three pig raisers. The alternative is, to interview pre-selected farms during a second visit which increases the field costs of the operation. Situation is completely different when PDAs are used. Sample selection can be automatically performed in the field and additional questionnaires selected without intervention of the enumerator. A proper implementation of the modular approach will be achieved by extending the use of PDAs for census taking.

2.2. Scope and coverage

The WCA 2010 recommends that the scope of the agricultural census remains the same as in previous programmes but recognizes that aquaculture is increasingly important in many countries so in that cases, countries are encouraged to conduct an aquaculture census in conjunction with the agricultural census. Therefore the agricultural census should cover ISIC groups 011, 012 and 013 (ISIC Rev 3.1) and in the case of complementing the exercise with an aquaculture census, the class 0502 (aquaculture) must be covered.

In Latin American countries, the traditional scope has been covered in all cases. Only two countries (**Brazil and El Salvador**) conducted an **aquaculture** census along with the agricultural one. However quite detailed information of aquacultural activities performed along with the production of the agricultural holding was added in five censuses in the region. **Forestry** censuses were conducted in coordination with the census of agriculture in four countries (**Brazil, Chile, Mexico and Uruguay**).

With respect to the coverage, the WCA 2010 establishes: "*Ideally, an agricultural census should cover all agricultural activity in a country …. In the past, many countries have applied a minimum size limit for inclusion of units in the census or excluded certain areas such as urban centres. This is justified on the grounds that there are usually a large number of very small holdings making little contribution to total agricultural production and it is not cost-effective to include them in the agricultural census. However in many countries, small-scale agriculture makes a significant contribution to household food supplies and is often an important source of supplementary household income… The inclusion of small holdings is also important to reflect women's participation in agricultural work*".

As far as the establishment of thresholds and/or some area of the country excluded from the census of agriculture and the treatment of excluded holdings is concerned: three out of the 10 countries established some **cut off limit** (**Argentina and Uruguay in area and Paraguay in area and livestock**). Two countries excluded some area: **Argentina**, urban areas and **Brazi**l gardens in residential areas. None of the above mentioned countries made provisions to estimate agricultural production in the excluded holdings. As said before, El Salvador, Brazil and Nicaragua took care of the small household production: Brazil taking basic information for them, El Salvador using a specific sampling survey and Nicaragua through the National Household Survey.

The need of covering all the agricultural production should be emphasized. National Household Surveys, ad-hoc sampling surveys, screening forms used to determine when a complete census questionnaire should be applied and procedures like the one used in Brazil (to take basic information through the PDA and deepen it for larger holdings) are all valid instruments that countries should apply in order to not lose useful information to assess household food security, domestic survival strategies and contribution of women to household well-being.

Finally it is important to highlight that in previous rounds, countries were forced to exclude regions because of security reasons, mainly in Central America. It is remarkable that the present peaceful situation in Latin America leads to no need of regional exclusions for security reasons.

2.3. Collecting additional data in rural households

A substantial part of agricultural production in the developing world is obtained by households operated holdings. In fact more than 90% of the agricultural holdings in Latin America are operated by households. Usually they are rural households. But the concept of rural household goes beyond agricultural activities alone. A rural household, according to the WCA 2010 Programme is a household living in an area designated as a rural area often determined from a population census. The FAO Programme establishes that in widening the scope of the agricultural census, some countries may wish to carry out a census of rural households. Another way to widen the scope of the census is to cover all households containing one member at least employed in agriculture. Finally, a third way of widening the concept, according to the Programme is to cover all households which main source of income is agriculture.

In the case of Latin American countries, no one used any of the above concept and extended scope of the agricultural census. Nevertheless it has been noted that some countries collected rural household data and their connection with agriculture in the population censuses. This point is more developed in Sub section 2.5 below.

2.4. Determination of sub-holdings.

One innovation of the WCA 2010 Programme is the concept of sub-holding and the related concept of sub-holder in order to better measure the role of household members in the management of the holding, especially women. The point is that the concept of the holder as the major decision-maker for the holding not always provides a realistic picture of the often complex decision-making processes of the holding. Often different members of the household, mainly women, carry out specific activities such as cultivate a plot of land or raise some animals.

The Programme introduced the following definitions: *"A sub-holding is defined as a single agricultural activity or group of activities managed by a particular person or group of persons in the holder's household, on behalf of the agricultural holder". "A sub-holder is a person responsible for managing a sub-holding on the holder's behalf".*

From the practical point of view specific questions should be incorporated in the census questionnaires to identify sub-holdings. For example: "Who in the household takes care for backyard production and or kitchen gardens?" or "Sex and age of household member responsible for such and such activities?" etc. That information is not easy to collect, for that reason, perhaps, despite its importance is not taken into consideration in the majority of researched censuses in Latin America. In fact, only in one case (**Nicaragua**) a question aimed to that end is asked: "In this household who is responsible for: backyard animals / kitchen garden?" "Sex and age".

The absence of questions aimed to determine sub-holdings could be explained by:

a. Tradition. It did not appear in previous programmes and, as it was said, last census questionnaires are the usual source for designing the new ones, therefore, new concepts are omitted.

b. Related with the previous explanation is the lack of awareness of the importance of distinguishing agricultural activities performed by household members other than the holder.

c. Lack of adequate discussion with specialists in specific issues (like gender issues) during the planning stage of the census and in developing the census instruments.

2.5. Links with the population censuses

Both the FAO Programme and the UN Principles and Recommendations for Population and Housing Censuses (Rev 2) advocate for a stronger coordination between the two censuses:

– using common concepts, definitions and classifications;
– sharing field materials;
– using the population census as a household frame for the agricultural census;
– making use of agriculture-related data from the population census;
– collecting additional agriculture-related data in the population census;
– linking data from the two censuses;
– conducting the two censuses as a joint field operation.

Latin America experiences show that concepts, definitions and classifications are usually taken in common in both censuses not as a result of a strong coordination between offices in charge of each exercise but mainly because they use the international standards.

The most common link is by means of the use of the same cartography. Actually five out of the ten analyzed countries used the population census cartography in the agricultural census during the present round. More related links can be seen in the case of **Brazil** that took a population counting along with the 2006 Census of Agriculture and **El Salvador** that in a first stage built the census frame for agriculture in a common listing of dwellings for both censuses and in a second stage used lists from the population census to obtain the samples for surveying urban areas.

A few countries collected agricultural related data in the population censuses. It is important to note that all Latin American countries undertook one population census in the last decade. Out of the 19 countries only three obtained additional agricultural related data. Besides the usual data collected in population censuses about economic activity, occupation and industry and status in employment of household members, they also collected information on: Agricultural activities (**Colombia** 2005 where the agricultural census was undertaken in a unique operation with the population census); Identification of agricultural holdings managed by household members (**Costa Rica** 2011) and identification of household holdings, area with crops and livestock (**Dominican Republic** 2010).

The building of an updated agricultural census frame is paramount for proper census organization and coverage. It is very simple to add a few questions to the population census and along with a right coordination between offices to obtain not only a census frame but also relevant information cross-tabulated with the population census results. The lack of proper coordination between many National Statistical Offices and Ministries of Agriculture in the continent is a strong limitation for a better use of information and implementation of cost-effective procedures.

2.6. Community level surveys.

Along with the field work of the census of agriculture, the WCA 2010 Programme introduces the possibility that countries undertake a survey of rural communities. The rationale of such recommendation is that *"A community-level data collection, often at the village or the commune level, can be useful for examining the infrastructure and services available to holdings. Data on whether the community is prone to natural disasters or subject to seasonal food shortages can be of interest for food security analysis. A community survey may cover agriculture-related data not able to be collected from holdings, such as the area of communal land. Often, the community-level data complements the holding-level data; for example, community-level data on the existence of farmers' associations may complement data on participation in those associations collected from each agricultural holding"*.

The Programme also establishes that *"community level data are of statistical interest for three main reasons:*

1. *data are of interest in their own right in analyzing the characteristics of communities;*
2. *data can be useful for analysis in relation to holding-level data;*
3. *data from a community survey may be of interest for checking holding-level data collected in the agricultural census"*.

It has several methodological and practical implications:

- The statistical unit is no longer the agricultural holding but the community;
- Community information is not always collected by the same institution or office and sometimes it must rely on personal opinions of the informant (for example: "how long it takes to reach the municipal main city by bus in winter?" or "which are the main ways of waste disposal in the community?".)
- The community involves many agricultural holders, it is necessary to link each holding with the respective community in order to take full advantage of the community survey. Usually it is difficult to do it because community borders are not clearly established or the community has more than one name accepted by its inhabitants or there is not an official recognition of the community, etc.
- When established, not always the region inside the community borders comprises complete census enumeration areas. In such cases is not possible to link data at enumeration area level with those at community level.
- Community survey enumerators would be the agricultural census supervisors because they are responsible for larger field areas than census enumerators, but it increases the supervisors' workload and cost of enumeration.

From the review of the Latin America situation it is clear that community surveys were not seen as an important source of information because only two out of the ten countries (**Nicaragua and Venezuela**) collected information at community level during the agricultural census. Mexico collected community level data during the population census 2007. Reasons of such behaviour perhaps are related to the above mentioned issues and also of a lack of awareness on its objectives and outputs.

2.7. Frames

The census frame, as defined by the WCA 2010 *"is the means by which the statistical units to be enumerated in the collection are identified"*. Population censuses, pre-listing of units, administrative

registers and cartography are the usual ways countries build their census frames and a combination of them is used.

In the case of Latin American countries, the above mentioned lack of coordination with the population census, the time lag between the two censuses (with information becoming out of date) and budget considerations lead to the use of cartography as the main type of census frame. It means that once the territory is divided in census enumeration areas (sometimes the same as the population census ones), each area is canvassed and agricultural holdings identified. In fact, eight out of the ten analyzed countries canvassed the enumeration areas identifying agricultural holdings to enumerate. In seven out the eight cases the identification of holdings and the collection of census information were performed in the same field operation. **Mexico** proceeded in two phases: first phase, frame building by canvassing the enumeration areas and second phase collection of information on the identified units. The other two (**Chile and El Salvador**) used administrative registers (updated for the census) as main source of frame building.

A good frame is paramount for the success of the agricultural census. Organization of the field work, management of census field personnel and materials and, over all, checking for adequate census coverage depends on a proper census frame. Canvassing enumeration areas and taking the information in a unique field operation is not a good way for frame building. Maps not always are updated, interpretation of maps not always follow straightforward, areas inside the enumeration sector can be uncovered, enumerators are not the best personnel to undertake such task, etc.

The importance of complete, updated census frames should be emphasized. Again a good coordination with the population census, the incorporation of a few questions related to agriculture in it, assignation of resources in the census budget specifically for frame building are crucial aspects to obtain the desired results.

2.8. Quality of agricultural census data.

Ascertaining of the quality of the census is another important aspect in the agricultural census. Information about census coverage and quality of census data is very important for users for proper interpretation of census results. Unfortunately, in Latin American census publications, in general, there is no information about quality of the census. Except for **El Salvador and Nicaragua** no other census publication mentions after census field checks such as Post Enumeration Surveys (PES) advocated by FAO.

The publication of such assessments contributes also to transparency. The incorporation of a PES or another type of post census quality check in early stages of census planning will largely contribute to a proper use of census data.

3. The agricultural census and the on-going statistical system.

One of the main objectives of the census of agriculture is to provide a sampling frame for the agricultural sample surveys. Despite the long history in census taking in many Latin American countries it has been noted a decline in the use of probabilistic methods of estimation for the current agricultural variables such as sown area, harvested area and yield, production of crops and dynamics of livestock. Several countries that adopted such methods during the 70's and 80´s abandoned them for lack of resources. Around one half of the 19 Latin American countries rely on subjective (non-probabilistic) methods of estimation. This is quite dramatic taking into consideration that great producers like Brazil, Mexico and Argentina are in the list. Countries are aware of this handicap and at present strong efforts are being done to introduce sample surveys based on results of the last agricultural censuses.

As far as the main sampling designs used are concerned, list frames, area frames and multiple frames (a combination of list and area frames) are, or were, used. The problem is that many times the sampling design and also sample selection were performed but surveys were not implemented (cases of Costa Rica, Peru, Bolivia, Mexico).

The present census round along with the implementation of the Global Strategy to Improve Agricultural and Rural Statistics that indicates as a crucial element the building of a master sampling frame for agricultural and rural statistics is a unique opportunity to advance towards that end.

4. Use of new technologies PDAs

The use of new technologies for census taking will change the previous panorama. The possibility to have several links and short cuts for different census questionnaires automatically delivered to enumerators according to pre-established rules opens a still unexplored way. Four Latin American countries (three during the present round) used PDAs for their agricultural censuses (**Colombia 2005, Brazil 2006, Mexico 2007 and Venezuela 2008**).

Brazilian experience deserves some comments because of its innovative procedures and national development. In first place, the PDAs were integrated with Global Position System (GPS) to achieve geo-referenced information on all of the approximately five million farms in the country, covering 8,514,877 km² in 5,564 municipalities.This is crucial for sampling designs and presentation of special data at agricultural and economic planning. In second place, real-time edits and automatic jumps performed during enumeration phase ensured a faster and more reliable interview. In third place, the PDA allowed direct data transmission to NSO's central mainframe by each of the seventy thousand enumerators on a weekly basis eliminating the cost and time of transporting, scanning or keying data from paper questionnaires and allowed supervisors to immediately address problems while data are being collected. Final results were obtained in around 10 months after the end of the field work.

Several problems needed to be solved during the implementation of the new technology, for example:

- Transfer of software and information about each enumeration area to the 82,000 PDAs upon their first connection overloaded the system slowing down the start of the field operation;
- Poor quality of some telephone lines and antennas installed for internet broad-bands did not function properly and technical support was overloaded and alternative processes of transmission were put in place.
- Too many checks in the filling of the questionnaire not only slowed down the interview but also lead enumerators to navigate to the next screen as the data entry program was still processing the data and the program froze needing the rebooting of the PDA.
- Various software versions were released during the data collection period, forcing enumerators to return to computer-equipped data collection centers to update their software, and each new version of the software increased the anxiety of the field staff.
- Delays in updating data on management system to perform data edits, and process that data simultaneously with administrative information. Problems encountered in transmitting the data from the field to headquarters resulted in long delays in updating the system, preventing the management system to be used as a real-time management tool.

Several improvements were made for the on-going census operations. Those improvements were facilitated because all software and hardware was nationally owned. For example the 2010 population census showed an impressive improvement in the use of the new technologies substituting previous PDA devices by smart-phones. As a matter of fact, UNESCO awarded Brazil the prize as one of the 10 more promised innovations as a result of the undertaking the population census covering almost 200 million people in a fully automated manner. Brazil is planning to take a new agricultural census in the present round (2012) and the improved technology will apply.

The revolution that the use of the new data collection/processing technologies implies, should encourage a wider use of those devices. South-South cooperation (with and Brazil and Mexico, perhaps leading it in Latin America) would be a cost-effective way to implement them in years to come.

5. WCA2010 within the framework of the Global Strategy to Improve Agricultural and Rural Statistics.

In September 2010 the World Bank and FAO released the document "Global Strategy to Improve Agricultural and Rural Statistics". It is the output of a long process initiated with the 2007 ISI International Conference on Agricultural Statistics in Beijing that lead to the formation of a working group in 2008 for drafting a strategic plan to improve the agricultural and rural statistics. The Global Strategy establishes a new conceptual framework widening the scope of agricultural statistics to cover the traditional economic dimension, the environmental dimension and the social dimension (broadening the scope to cover rural statistics).

Despite the fact that WCA 2010 Programme includes several aspects taken by the Global Strategy - actually they were worked out together - the implementation of the Global Strategy poses new challenges to the agricultural statistics in general and the taking of agricultural censuses in particular.

The need to cover the statistical information for producing, at least, the core set of data items advocated in the Global Strategy implies a necessary effort of liaison inside the different statistical offices in the country. In implementing the Global Strategy strongly advocates for an integrated census and survey framework with coordination between population and agricultural censuses or household surveys and current agricultural surveys.

Latin America countries must prepare to fulfil the requirements of the Global Strategy and because of the present situation above depicted, it has a long way to go. Several inputs in Technical Assistance, Training and Research will be needed to accomplish a cost-efficient implementation of the Global Strategy.

6. Main conclusions and recommendations

From the previous assessment a first conclusion is that the general panorama shows that there are still many challenges in applying WCA2010 recommendations in Latin American countries:

a) The modular approach is not being extensively adopted;
b) Countries are not estimating the small household holdings production either in urban areas or below the threshold;
c) No country has taken a census of rural households;
d) Sub-holdings are not identified;
e) Links with the population census are weak and agricultural related questions aimed to provide a frame for the census of agriculture were not common in population censuses;
f) Community level surveys have been taken in only two out of the ten analyzed cases;
g) Assessments about the quality of the census data, if any, are not reported;
h) An integrated system of censuses and surveys is long to be established in the major part of Latin American countries.

Lessons learnt should be considered in the formulation of the next census programme as follow:

1) Countries should plan their agricultural statistical activities in the framework of the National Strategies for Statistical Development (NSDS) and the Sectoral Strategies for Development of Agricultural Statistics (SSDAS) as advocated in the Global Strategy;
2) Countries should work towards the building of a master sample frame for agricultural and rural statistics as recommended in the Global Strategy;
3) The present decade will be the decade where traditional methods of census/survey taking will be replaced by PDAs and similar electronic devices;
4) Technical assistance, capacity building through training and extensive research will be essential components for the implementation of the Global Strategy.

From country experiences and that lessons learned the following recommendations arise:

1) Maintain the modular approach that should be driven by the generalization in the use of PDAs.
2) Review the contents of the core module because of the incorporation of the new dimensions in agricultural and rural statistics in the framework of the Global Strategy.
3) Incorporate "Forestry" in the new FAO programme at the same level as aquaculture (recommending to widen the scope of the census to cover Groups 021, 022 and 023 of ISIC (Rev 4))
4) Promote South-South cooperation to expand good experiences in countries of the region taking advantage of the strengths of the potential cooperative countries;
5) Stress in the need of collecting information on backyard and small household holdings production;
6) In the framework of the NSDS each country should define what statistical instruments are more efficient to collect information on rural households and at community level;
7) Along with the extension in the use of PDAs strongly promote the geo reference of agricultural holdings an parcels as advocated in the Global Strategy;
8) The new FAO Programme should precise how to identify sub-holdings with examples of country practices and results. The participation of specialists in gender at early stages of census preparation should be stressed;
9) The need of ascertain the quality of census/survey data should be emphasized;
10) FAO should update the publication about undertaking agricultural censuses of 1996 at the light of the new developments and country practices.

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