

# Linking Population and Housing Censuses to Agricultural Censuses

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## *Select Topics in International Censuses*

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### **INTRODUCTION**

In many countries, agriculture is among the most vital and dominant sectors of the economy. While most countries with a substantial agricultural sector try to undertake an agricultural census (AC) periodically, the tremendous fiscal and resource burden required to conduct the population and housing censuses (PHC) force compromises to the periodicity of an AC. Given that agriculture is a dominant sector engaging most of the population in many low- and middle-income countries, the lack of timely agricultural statistics inhibits development, affects food supply, and prevents policymakers from addressing the infrastructure needs of farmers. Historically, it has been argued that the PHC and the AC cannot be linked because their units of enumeration are different—households compared with farm holdings. But recent evidence from ACs show that most of the agriculture is household-based in countries that have a substantial agricultural sector (FAO, 2012). Thus, since the 2010 round of censuses, the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Population Fund (UNFPA), among other UN organizations, recommended linking PHCs with ACs to maximize synergies to benefit both efforts.

Coordinating the two types of censuses is an improved strategy that maximizes efficiency in costs and improves data quality and analysis. The challenges of cost and periodicity can be addressed through good planning, questionnaire content, and advances in technology.

In addition, linking the two provides an opportunity for a wider range of analyses.

This *Select Topics in International Censuses* (STIC) draws from the *Guidelines for Linking Population and Housing Censuses with Agricultural Censuses* (FAO, 2012) and the *World Programme for Census of Agriculture 2010 and 2020* (FAO, 2021; FAO, 2018) to describe the benefits of linking the PHC and AC and highlights the practical ways that one leverages the other more seamlessly.

### **ADVANTAGES OF LINKING THE POPULATION AND HOUSING CENSUS TO THE AGRICULTURAL CENSUS**

Both the PHC and the AC involve data collection covering the entire country. Any national exercise that requires the universe of data at the lowest levels of geographies implies a tremendous cost in terms of planning, organization, logistics, implementation of the mapping, fieldwork, data collection, data processing, analysis, and dissemination. The irony is that it is often in countries that are resource constrained that the need for both censuses is the greatest. Thus, in an environment where the government must choose, it is often the periodicity/regularity of the AC that suffers, or a few questions are added to the PHC to capture a limited amount of agricultural data. In Africa, less than half of the countries conducted an AC during the 2010 round (Table 1).

Table 1.

**Number of Countries Conducting Agricultural Census**

Region	Rounds of WCA <sup>1</sup>						
	Total countries	1960	1970	1980	1990	2000	2010
<b>Total countries . . . . .</b>	<b>197</b>	<b>100</b>	<b>111</b>	<b>103</b>	<b>94</b>	<b>122</b>	<b>127</b>
Africa . . . . .	55	29	25	21	23	25	22
America . . . . .	36	29	33	28	23	22	28
Asia . . . . .	48	20	20	21	14	31	29
Europe . . . . .	39	17	24	22	21	33	36
Oceania . . . . .	19	5	9	11	13	11	12

<sup>1</sup> World Programme for the Census of Agriculture (WCA).  
Source: Castano and Keita, 2020.

The World Programme for Census of Agriculture (WCA) (FAO, 2020) discusses four modalities for ACs:

- The classical approach: a single, one-off field operation usually carried out on a complete enumeration.
- The modular approach: comprising a core module carried out on a complete enumeration, in conjunction with sample-based census supplementary module(s) to provide more in-depth data.
- The integrated census and survey modality: involving a census core module carried out on a complete enumeration basis followed by rotating sample-based modules in the years between two censuses.
- The use of registers as a source of census data: using administrative records to partly or completely replace census field data collection.

The first approach is the most expensive, while the last is rarely possible in resource-poor countries due to the lack of administrative data. There is an increase of recognition among experts at FAO and UNFPA that linking the PHC with the AC (using either the modular or the integrated approach) may be the most advantageous solution. Some countries have saved as much as 50 percent on costs with the implementation of either of these approaches (FAO, 2012).

There are tangible benefits to linking the two censuses that result in strengthening both projects. Among them are the following:

- Cost and resource efficiencies.
- Reducing the scope of the AC.
- Frame development for the AC.
- Optimizing the sample design.
- Wider range of analyses.
- Improved periodicity for both PHC and AC.
- Better designing of the AC coverage.

The following section lays out some of the opportunities presented in the National Statistical System (NSS) to attain these benefits.

## OPPORTUNITIES TO COORDINATE PHC WITH THE AC

In most countries, the department or ministry that is responsible for the PHC is different from the department or ministry in charge of agriculture. However, both censuses are generally conducted by the National Statistics Office (NSO). In fact, this is one of the underlying assumptions to maximize efficiencies between PHC and the AC. Advances in technologies related to mapping and data collection have become a major driver of the opportunities for linking the two, but they are not the only contributing factors. Various operations of the PHC can be leveraged to address the needs of the AC, while reducing cost and enhancing the data quality of both.

Coordination between the two censuses should happen at various stages of the PHC—pre-enumeration, enumeration, and post-enumeration. This section highlights the practical steps the NSS can take to make the linking a success.

### Pre-Enumeration Stage

The pre-enumeration stage is the preparation stage for the PHC and provides some of the most significant opportunities for synergies. A plan to link the AC with the PHC requires the concerned departments or ministries to work collaboratively with the NSO on the following operations during this stage:

**Planning.** The concerned departments should plan jointly for: the organizational structure and responsibilities of the collaboration, decisions on technology and methods to be used, the allocation of resources and budgeting, coordination between the PHC and the AC calendars, harmonizing concepts and definitions to be used, analysis of the work breakdown structures (where collaboration between experts will be key to success), developing a joint risk and mitigation matrix, and advocacy campaigns for the censuses.

**Mapping.** Advances in georeferenced mapping with satellite imagery allow for more accurate maps that identify houses, other buildings, green spaces, and infrastructure without the need for street addresses.

Demarcating boundaries of enumeration areas (EA) and administrative geographies are also more efficient. The opportunity at this stage is twofold—first, to make sure that the maps and listing exercise captures both households and farm holdings, and second, it is relatively easy to update if there is a time gap between the PHC and AC. For instance, in the Kenya 2019 PHC, they asked questions on agricultural activities conducted by the households during the mapping operation. Like many other countries in the 2020 round of censuses, all households (including those with own-account agricultural production) were georeferenced and all EAs and village maps digitized.

**Dissemination plan.** Experts from the two departments involved should highlight how the data collected can enhance analyses made possible by linking households and individuals to the agricultural information. Dissemination plans should include these innovative tables and products, as they can help advocate for supporting the AC.

**Questionnaire content.** At a minimum, if the two questionnaires are linked successfully, many of the demographic and housing questions can be skipped in the AC. Though many PHCs ask some questions in the employment, occupation, and industry section that relate to agriculture, the questions that are asked are often not adequate to inform the AC frame. There are other countries that ask about whether the household is engaged in agricultural activities, and collect some details on major crops and animals that can be used for creating the frame for the AC.

To enable effective linking, FAO and UNFPA have emphasized harmonization of concepts and recommend including the following topics in a PHC—some are fundamental, and others (like activities by gender) enrich the linking (FAO, 2012; FAO, 2018; FAO, 2021).

- 1. Agricultural holding.** A common topic in all countries is the identification of farm households. This is the most fundamental item in a PHC that helps with linking it to the AC. However, there may be a mismatch of concepts and definitions related to households and farm holdings that make it difficult to link the data sets. The WCA 2010 standard definition by FAO (2012) should be used (Box 1).

Where agricultural holders are identified, countries should ensure that this information is linked to the demographic questions on the main PHC questionnaire so that the agricultural holder's demographic characteristics, such as sex and age, can be analyzed.

- 2. Type of land.** The concepts of agricultural land, arable land, and cropland need to be carefully considered in designing questions related to crop area in the PHC. Under FAO's classification of land use (FAO, 2005), arable land is land under temporary

### Box 1. Two Types of Agricultural Holdings

The World Programme for the Census of Agriculture (WCA) 2010 defines two types of agricultural holding:

- Holdings in the household sector: agricultural activities are undertaken and managed by household members.
- Holdings in the non-household sector: such as corporations and government institutions.

In most countries, agricultural production is in the household sector. For the household sector, there is usually a one-to-one correspondence between an agricultural holding and a household with own-account agricultural production activities; these own-account agricultural activities by members of a given household are usually undertaken under single management. Therefore, in many countries the agricultural holding is defined to be equivalent to a household with own-account agricultural production.

Source: Food and Agriculture Organization of the United Nations, 2012 Guidelines for Linking Population and Housing Census with Agricultural Census, p. 15.

crops, temporary meadows, or temporarily fallow. Cropland is arable land plus land under permanent crops. Agricultural land is cropland plus permanent meadows/pastures. Therefore, it is important to clarify what concept of crop area will be obtained when asking the question related to area in the PHC. In most cases, crop area refers to the concept of cropland.

- 3. Agricultural production.** There are also differences in how countries treat agricultural production. In some countries, agricultural production for own consumption is not included in the definition. Countries should ensure that all agricultural production activities are covered.
- 4. Livestock.** The reference period for the collection of livestock data may also need clarification. Livestock data should always be reported in respect of a single point of time, usually the day of enumeration.
- 5. Gender.** Specific questions about male and female agricultural activities may not be appropriate to include in the PHC for the purposes of gender analysis, but the inclusion of control questions may help to measure women's agricultural role, as illustrated by the 2007 Population and Household Census of Swaziland (Box 2).

**6. Identification Variable (ID).** Using the same IDs across the PHC, Post-Enumeration Survey (PES), and the AC is important for linking.

**Core Agricultural Module.** If a country decides to include a core agricultural module along with the PHC, then the WCA 2010 recommends 16 questions. Some of the questions overlap with the PHC, thus reducing the scope of the core module (Table 2).

**Data collection instrument capacity building.** Another area of potential coordination is building the staff capacity from the two agencies at the same time for the data collection instrument, especially if using digital data collection methods. The format, menu, and ID codes could be coordinated for more efficient data collection and linkages.

**Fieldwork recruitment and training.** Enumerators and supervisors recruited and trained for the PHC can be deployed to collect the AC. This results in economies of scale and efficiency as the enumerators are only required to be recruited once, trained in interviewing skills, and are knowledgeable and familiar with the enumeration area. Transportation, training venues, and other logistical infrastructure can also be shared. The timing of the two censuses is crucial for this. Doing the AC directly after the PHC helps staff pivot with minimum disruption and cost.

**Pre-census listing operation.** If a country does a separate listing exercise, it is another opportunity to capture information to help with frame development for the AC for the household sector. The listing questionnaire can collect information on whether the household has crops, live-stock, aquaculture, etc.

## Enumeration Stage

During the enumeration stage, coordinating the fieldwork for both censuses can be carried out in two ways:

### Box 2. Gender and Agricultural Work

The 2007 Population and Household Census of Swaziland asked whether the person worked at least 1 hour during the past 7 days and, if not, why he/she did not work. To those that were economically inactive, the following question was asked:

*Did [NAME] do one of the following activities during the last seven days? The alternatives were:*

1. *farming/rearing animals/fishing;*
2. *production/services/selling;*
3. *homeworker at someone's home;*
4. *homeworker at own house;*
5. *none.*

If the reply was (1), (2), or (3) the person was classed as economically active. This type of question may not completely solve the problem of measuring female labour force participation in agriculture, but it could substantially improve its measurement and analysis.

Source: Food and Agriculture Organization of the United Nations, 2012 Guidelines for Linking Population and Housing Census with Agricultural Census, p. 17.

- **Single field operation.** Performing the whole enumeration for both censuses as a single field operation.
- **PHC with core agricultural module.** Enumerating the core AC module (or selected key data items) at the same time as the PHC.

Table 2.

### World Programme for the Census of Agriculture Core Agricultural Questions

Number	Item	Already in PHC
1	Identification and location of agricultural holding . . . . .	PHC
2	Legal status of agricultural holder . . . . .	
3	Sex of agricultural holder . . . . .	PHC
4	Age of agricultural holder. . . . .	PHC
5	Household size . . . . .	PHC
6	Main purpose of production of the holding . . . . .	
7	Area of holding according to land use types. . . . .	
8	Total area of holding . . . . .	
9	Land tenure types on the holding . . . . .	
10	Presence of irrigation on the holding. . . . .	
11	Types of temporary crops on the holding . . . . .	
12	Types of permanent crops on the holding and whether in compact plantations . . . . .	
13	Number of animals on the holding for each livestock type . . . . .	
14	Presence of aquaculture on the holding . . . . .	
15	Presence of forest and other wooded land on the holding . . . . .	
16	Other economic production activities of the holding's enterprise. . . . .	

Source: Food and Agriculture Organization of the United Nations, 2021 World Programme for the Census of Agriculture 2010, A1.1.

## Post-Enumeration Stage

In the post-enumeration stage, coordination and linking can happen through the following four operations if the AC is conducted soon after the PHC.

**Frame development.** One major innovation of the WCA 2010 is its recommendation that a complete enumeration of a very small number of data items (16 items) be conducted as a core agricultural module, with sampling used to collect more detailed data in specific and country-relevant modules. To draw the sample, an updated frame is critical. Since in many developing countries agriculture is mainly done in the household sector, the PHC data can be used to inform the development of the frame for the AC.

**AC instrument.** The PHC data collection instrument can be adapted to collect AC data if it was not already developed simultaneously in the pre-enumeration stage.

**Analytical reports.** Linking allows for more complex analysis, since a host of individual- and household-level data can inform and predict agricultural outcomes. Using combined data sets for analytical reports with greater context and nuance will help policymakers make better decisions on resource allocation or development programs.

**Dissemination.** New technologies in dissemination provide attractive options for both products and an integrated dashboard. Similarly, the use of interactive outputs and Web-based data (tables, graphs, maps), as well as access to anonymized microdata, has brought new opportunities for census dissemination. User-friendly dissemination tools support informed decision-making, unleash analytical creativity of users, and elevate the value of census data that can be applied to research and business, making agricultural policy purposes, and typical statistical uses.

## CHALLENGES

It is important to recognize that linking the two censuses successfully will not be without challenges. Listing the major challenges will help address ways to overcome them or mitigate risks in linking. These are some of the major challenges that countries may encounter as they undertake the linking:

- 1. Legal environment on the NSS coordination.** The legal environment should be amenable to such coordination.
- 2. Different departments/ministries/agencies responsible for content.** Failure to coordinate between the agencies in charge of the two censuses is perhaps most detrimental to the success of linking. Both parties should agree on how resources, content, staffing, authority, and products will be coordinated. Clear delineation of responsibilities, as well as mechanisms for sharing of resources, should be in place for the process to be smooth.

- 3. Unit of enumeration.** This is one of the main reasons for conducting the censuses separately. The unit of enumeration in a PHC is the household, while the unit of enumeration in an AC is the farm. However, in most countries where the agricultural sector is dominant, the farms are largely owned and run by the households. Thus, it makes sense to use the PHC listing to draw the frame for the AC.
- 4. Timing of the two censuses.** Another issue may be the timing of the two censuses. To link the two, they must be either simultaneous or the AC must be conducted soon after the PHC.
- 5. Overburdening the questionnaire.** It is important that a minimum set of questions on agriculture be included in the PHC to make the linking possible. A core agricultural module may also be included. However, it is important not to burden the PHC questionnaire such that respondents refuse to answer either.
- 6. Risks to the periodicity of the PHC.** The linking of the two censuses may impact the periodicity of the PHC if there are problems with buy-in from the government or donor groups. Thus, it is important to solicit interest and commitment in a timely manner before planning and budgeting so that the periodicity of the PHC is not jeopardized.

## CONCLUSION

In many countries, the lack of sufficient funding impacts the periodicity of the collection of agricultural data to the detriment of the country's development. Linking the AC with the PHC is one way of ensuring that the AC is conducted more regularly. This STIC has highlighted some of the recommendations of the FAO, in collaboration with UNFPA, on the advantages of census linking. Further, it highlights all the operations where coordination is possible through the PHC lifecycle, focusing on the phases of pre-enumeration, enumeration, and post-enumeration.

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