IPC/96-2
July 1996

1991 Census of Agriculture of the Philippines

a monograph by

Dr. Diana Lopez-Meisel
U.S. Bureau of the Census
Project Manager of BUCEN Technical Assistance

Ms. Josie Perez
Chief of the Income and Employment Statistics Division
National Statistics Office

U.S. Department of Commerce
Economics and Statistics Administration
BUREAU OF THE CENSUS

The U.S. Bureau of the Census would like to acknowledge the efforts of Tomas P. Africa, National Statistics Office (NSO) Administrator, and the NSO personnel whose dedication, professionalism and hard work resulted in the successful completion of the 1991 Census of Agriculture. Thanks also go to the NSO staff members who assisted in reviewing the report.

This report was made possible through support provided by USAID/Manila under the terms of Participating Agency Service Agreement number 492-0432-3100-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of USAID.

Summary

The 1991 Census of Agriculture (CA) was a large-scale government operation focused on the collection and compilation of statistics on the Philippines agriculture sector. The CA is the only data collection effort that produces small-area data on farms, farm households, livestock, and types of crops grown. It also serves as a sampling frame for the intercensal agricultural surveys which provide continuous data on agricultural and livestock production. The data will be used for years to come as a basis from which the government of the Philippines policymakers and planners evolve plans for the country's development.

The main data collection for the 1991 CA was conducted in February 1992, simultaneously listing all households and enumerating persons engaged in any agricultural activities in a sample of slightly more than half of the barangays in the Philippines. The undertaking was a very large operation enumerating approximately 4 million agricultural operators in the sample barangays. The National Statistics Office (NSO) of the Philippines constructed detailed plans and trained staff with help from the United States Agency for International Development (USAID) which provided funding and support through the Technical Resources Project Number 492-0432 for training and technical assistance by the United States Bureau of the Census, International Statistical Programs Center (ISPC).

NSO successfully completed the CA with project highlights that include:

- Decentralized computer processing in the 14 regional centers and 78 provincial offices of the NSO throughout the Philippines as well as in the office in Manila, making excellent use of the 318 microcomputers that were procured and installed to process the 1990 Census of Population and Housing (CPH).
- Approximately 4 million CA forms were processed entirely on microcomputers.
- Field staff in the regional and provincial offices used their microcomputers as data analysis and management tools as well as for the census and survey processing tasks. During the CPH the staff were trained to use the

microcomputers for data processing operations. They brought these basic skills to the processing of the CA and were given specific training for the CA processing.

- Data dissemination tools were developed for the CA, and were distributed through seminars and workshops. The NSO continues in its commitment to disseminate data collected for use by government and private industry.
- The Bureau of Agriculture Statistics (BAS) used the CA results to construct a sampling frame for specialized post-census surveys.
- The NSO used sophisticated data analysis techniques to measure the accuracy of the CA data with an evaluation survey. They also gained experience in using microcomputer software for tabulating measures of precision for the sample estimates from the CA data.

Background

The 1991 CA is the fourth decennial census of agriculture undertaken by the NSO. The previous census was undertaken in 1981 with 1980 as the reference period. Prior to the 1980 census were the 1971 and 1960 CAs. On a limited scale, the CA's was conducted in 1903, 1918, 1939, and 1948 together with the census of population. However, only the postwar census results are available.

The 1991 CA was envisioned with the following objectives:

- to determine the structure and characteristics of holdings, e.g., variation in size, tenure of holdings, land utilization, and area planted in crops;
- to provide data for improving reliability of current estimates;
- to provide a sampling frame for other statistical undertakings; and
- to provide basic data for use in national and local development planning.

The planning and preparation of the 1991 CA were done at the NSO Central Office in consultation with the NSO Advisory Committee on Censuses led by the NSO Administrator and Deputy Administrator and in collaboration with the Inter-Agency Committee (IAC) and the Technical Working Group (TWG) on the Census of Agriculture, which became the linkage between the NSO and other government agencies. The IAC and TWG made several recommendations for the improvement of the plans intended for the CA. The TWG helped in identifying the data items to be included in the CA and suggested ways to improve the design of the listing sheet, questionnaire, and other forms, as well as the CA sample design. The NSO field personnel were also consulted regarding the field operation of the 1991 CA. The subject-matter division in charge of the 1991 CA performed all the tasks from the preparatory phase to the publication of the results.

The field operation of the 1991 Census of Agriculture was a product of a cooperative effort of the NSO and different government agencies such as the Department of Agriculture (DA), Bureau of Agricultural Statistics (BAS), National Statistical Coordination Board (NSCB), and Statistical Research and Training Center (SRTC). The NSO served as

the lead agency during the 1991 CA. The DA and BAS, the major data users of the CA, provided the facilities and manpower for the successful implementation of the CA field operation. Selected NSCB and SRTC staff also acted as trainers and supervisors during the field operation.

The U.S. Bureau of the Census provided expert technical assistance and training support to improve NSO's capability to evaluate and analyze high quality data in a timely fashion. NSO specialists were trained later by the U.S. Bureau of the Census in statistical sampling, estimation procedures, calculating standard errors, data editing and imputation, evaluation techniques, basic census mapping, data processing using specialized computer software, and the application of microcomputer technology for processing the CA.

Institutional and systematic changes have taken place at NSO as a result of the USAID/U.S. Bureau of the Census project. The fundamental management and operational changes represent a significant departure from previous agricultural censuses, especially in data processing and evaluation. This is a trend that NSO will continue in its future activities because they have found a more timely and practical way of doing some tasks.

Conducting the 1991 Census of Agriculture

The main census was conducted from February 13 to March 31, 1992, with the year 1991 as the reference period. The enumeration of corporate/large farms was conducted separately from the main census. This operation was done from October 1 to November 15, 1992, for all the provinces.

The CA covered slightly more than 50 percent of all barangays for each municipality in all provinces except for Batanes wherein all barangays were enumerated. The barangay with the largest agricultural area (according to the 1980 CA) in each municipality was covered with certainty, and a 50 percent sample of the remaining barangays was enumerated during the main CA data collection. The National Capital Region (NCR) was a special case with only 10 percent of the noncertainty barangays in each municipality taken as a sample in the census.

There were four provinces, namely: Isabela, Laguna, Marinduque, and Bukidnon which, in effect, had 100 percent coverage for the CA. In these provinces, an advance census was conducted on October 1, 1991, for the first

sample of slightly more than 50 percent of the barangays while the remaining barangays were covered during the main census operation.

The sampling frame for the 1991 CA in each of the 73 provinces of the Philippines was constructed by integrating the 1990 Census of Population and Housing barangay lists with the 1980 CA data on total farm area. Each of the 1,690 municipalities of the country was treated as a separate stratum and the primary sampling units were the barangays. Within each municipality, the barangays were ordered by total farm area and the barangay with the largest total farm area was included in the sample with certainty; a 50 percent sample was selected systematically from the remaining barangays. In the case of the NCR, the certainty barangays were identified based on both total farm area and the number of animals, and a 10 percent sample was selected from the remaining barangays. Within each sample barangay, all of the farm operators were enumerated for the CA.

The concepts and definitions in the 1991 CA were the ones used in the 1971 and 1980 Census of Agriculture. The definitions were adopted primarily from the Food and Agriculture Organization (FAO) recommendations.

The following were considered as basic agricultural activities in the 1991 CA:

- growing of temporary crops like palay, corn, sugarcane, camote, string beans, cabbage, etc.
- raising of permanent crops like coconut, santol, mango, guava, grapes, etc.
- tending of livestock and poultry
- culture of mushrooms, honeybees, earthworms, silkworms, etc.
- cultivation of ornamental and flowering plants for sale
- management of above activities including planning, supervising, marketing of produce, purchasing inputs, and record-keeping

All households from the sampled barangays were listed to determine whether any member of the household was engaged in any agricultural activity during the reference period. The listing served as the frame for the census by identifying the agricultural operators. During this field operation, not only were the households listed but the agricultural operators were then interviewed and the following information was obtained from them:

a. legal status of the holder

b. farming population characteristics

c. location and size of the farm/holding

d. land utilization

e. tenurial status of the farm parcel(s)

f. main irrigation system

g. temporary and permanent crops planted

h. area planted in temporary and permanent crops

i. selected agricultural activities

j. equipment and facilities used

k. livestock and poultry reared or tended

l. selected agricultural practices

m. availability of credit

n. membership in farmer's organization

o. availability of extension services

p. main source of income

The CA data were manually edited and checked at the provincial offices. Data entry and minor machine editing were done at the regional centers. Tabulations and consistency checks were performed at the central office.

Data Processing of the Census of Agriculture

The completed CA questionnaires were submitted to the 73 Provincial Census Offices and the National Capital Region office where they were organized, checked for completeness of households in sample barangays, and manually processed. It is at this stage where the preliminary counts were made. The questionnaires were then submitted to the 14 Regional Census Offices for further manual processing and keying.

- Questionnaires were keyed at the regional offices into the microcomputers supplied by USAID for the Census of Population and Housing now being used for the CA. The 281 data entry microcomputers were IBM XT compatibles with 640KB of RAM memory, 2 diskette drives (720KB capacity), and no hard disks. Keying was accomplished in two 8 hour

shifts, working around frequent power outages. Keying required from 4 to 6 months, depending on the size of the region.

- Before leaving the regional offices, geographic ID validation was performed and the data were consolidated on 28 USAID-supplied IBM AT compatibles, with 40 MB hard disks. They were then transferred to tape cartridge and forwarded to NSO's central office in Manila.

- The data were transferred from tape streamer to 640MB hard disks at the central office. There they were edited to identify and remove inconsistencies, and then tabulated to produce the final publication-quality tables.

- The data were processed using the U.S. Bureau of the Census software designed specifically for census and survey processing called the Integrated Microcomputer Processing System (IMPS). It was developed to run on IBM and compatible microcomputers, and to be as user-friendly as possible. NSO used it for the CA to cover all the fundamental areas of census processing: operational control (CENTRACK), data entry (CENTRY), data editing (CONCOR), tabulation (CENTS), and variances (CENVAR).

Evaluating the Results of the Census of Agriculture

The Census of Agriculture Evaluation Survey (CAES) was conducted to measure both the coverage error and content error in the CA data, as part of the overall CA evaluation. The NSO has a valuable tradition of evaluating its data collection efforts in order to assist the data users in qualifying the appropriate uses of the results, and to learn how future data collection efforts can be improved. Following the 1990 Census of Population and Housing (CPH), the NSO conducted the Census Evaluation Survey (CES), to evaluate the coverage and content of the CPH data. The U.S. Bureau of the Census had also provided the NSO with some technical assistance on the CES, under the Population Census Support Project. The CAES was based on a similar methodology, although it was considerably more complex than the CES, given the greater difficulties of identifying agricultural

operations and measuring agricultural characteristics.

An important aspect of the CAES methodology was the independence between the CA and CAES operations. For this reason, the NSO assigned the responsibility of planning and conducting the CAES to the Industry and Trade Statistics Division (ITSD). The ITSD staff was able to successfully plan and conduct the CAES, and analyze the results, with appropriate technical assistance from the U.S. Bureau of the Census during critical survey activities. An important output from this technical assistance was the technology transfer during all phases of the CAES operations. A computerized sampling frame was developed for the CAES, and the sample was selected electronically. The NSO staff gained experience in maintaining the sampling frame electronically so that the weights (expansion factors) could be calculated accurately and efficiently by microcomputer; a computer file with the final weights was provided directly to the data processing staff to produce the CAES tabulations. The NSO will be using similar automated sampling and estimation procedures for their future surveys. The NSO staff also gained experience in the use of state-of-the-art dual system estimation in producing the CAES results on coverage error.

Although previous agricultural censuses at NSO were also conducted on a sample basis, the NSO did not calculate corresponding sampling errors to measure the reliability of the results. The U.S. Bureau of the Census assisted the NSO staff in using the software package CENVAR, a component of IMPS, to calculate measures of precision (standard errors, coefficients of variation, 95 percent confidence intervals and design effects) for some of the most important estimates from the 1991 CA data.

Releasing the Results of the Census of Agriculture

As is the case with any census, the sooner results are released, the more timely and meaningful they are to policy planners. The release of the results of a census, however, is not a single event, but rather a series of events stretching over many months. NSO made available simple but important tabulations quickly and followed these with more complex and detailed tabulations later. Following are some highlights of NSO's release of the 1990 CA.

- February 1993. There was a special release of the number of agricultural operators and area of farms drawn from summary sheets at the regional level and based on the residence of the operator. Only selected farm characteristics were presented, namely, total physical area of farms and area planted to palay and corn. The number of agricultural operators included those with parcel(s) of land used for cultivating crops and other agricultural purposes as of 1991, regardless of size. It covered both farm and non-farm households. It did not include agricultural operators of corporate farms and agricultural estates.

- In 1994, other items such as number of productive coconut trees and banana hills, inventory of livestock and poultry, and other agricultural activities were the subject of special releases.

- February - October 1994. NSO conducted regional data dissemination workshops to familiarize local users with available CA data products and presented highlights of the CA results for the region.

- March 1995. After the long and tedious process of data editing, tabulation, and meticulous checking, NSO completed the core set of CA tables. Each table is tabulated by either province or municipality.

Results From the Census of Agriculture

The 1991 Census of Agriculture results were tabulated in two ways: (1) by the geographic location of the farm operators; and (2) by the location of the farm(s)/household(s). These results were published in four volumes, namely:

a. Volume I - Final Report by the Residence of the Farm Operators

b. Volume II - Final Report by Location of the Farm(s)

c. Volume III - Farming Population and Characteristics

d. Volume IV - Nonfarm Households

The 1991 Census of Agriculture yielded important information on the structure and principal characteristics of agriculture in the Philippines in terms of the number and area of farms, the tenure of farm holdings, land utilization, and the hectarage of most crops grown in the Philippines by region.

- **Number of Farms by Farm Size**
  Almost 91 percent of the farms in the Philippines are less than 5 hectares in size, 5 percent are 5 to 7 hectares, and 5 percent are 7 hectares or larger. Very small farms of less than half a hectare are very common and make up almost 20 percent of all farms. Approximately 19 percent of farms are between a half to less than 1 hectare in size. Twenty-eight percent of farms are 1 to less than 2 hectares, and 25 percent are 2 to less than 5 hectares in size.

Number and Percentage of Farms by Size of Farm

Farm size (Hectares)	**Number of farms** (000)	**Percentage**
All farms	4,770	100.0
<.500	923	19.3
.500-.999	888	18.6
1.000-1.999	1,340	28.1
2.000-2.999	662	13.9
3.000-4.999	526	11.0
5.000-7.000	242	5.1
7.001-9.999	83	1.7
10.000-24.999	94	2.0
25.000+	13	0.2

Source: Philippines 1991 Census of Agriculture (by location of the farms) final results.

Regional Distribution of Farms

The region of South Tagalog has the highest number of farms in the Philippines with 561,538 farms. Central and Western Visayas follow in second and third places with 435,826 and 428,397 farms, respectively. Southern Mindanao ranks a close fourth with 424,275 farms. All other regions in the Philippines have fewer than 400,000 farms each.

Number of Farms by Region

Region	Number of farms
Southern Tagalog	561,538
Central Visayas	435,826
Western Visayas	428,397
Southern Mindanao	424,275
Bicol	394,897
Northern Mindanao	389,493
Central Luzon	351,365
Eastern Visayas	330,374
Ilocos	324,812
Cagayan	297,979
Western Mindanao	260,054
Central Mindanao	233,657
Autonomous Region of Muslim Mindanao	214,356
Cordillera Administrative Region	110,481
National Capital Area	12,667

Source: Philippines 1991 Census of Agriculture (by location of the farms) final results.

- **Number of Farms by Tenurial Status**
  More than a third of the farms in the Philippines are fully owned and another 10 percent are partly owned. Fifteen percent are tenanted, 6 percent are farmed rent free, and 3 percent are leased. Almost one-third of the farms are held under more than one type of tenurial status; that is, they are partially owned and partially rented, leased, or farmed under other forms of tenancy.

Number of Farms by Tenurial Status

Tenurial status	Number of farms (000)	Percentage
All tenures	4,770	100.0
Fully owned	1,647	34.5
Partly owned	491	10.3[1]
Tenanted	718	15.1
Leased	133	2.8
Rent free	277	5.8
Other forms	39	0.8
More than one form of tenure	1,465	30.7

Source: Philippines 1991 Census of Agriculture (by location of the farms) final results.

[1]Includes land which is still being paid under the operation of land transfer (CLT).

Area by Main Land Utilization

The majority of farmland (95 percent) is planted in crops, 53 percent is in temporary crops, and 42 percent is in permanent crops. Only 5 percent of the farmland in the Philippines is utilized in other ways: 1 percent is in permanent meadows and pastures; and less than 1 percent each is in homelot, temporary meadows and pastures, woodland and forest, temporarily fallow, and other uses.

Area by Main Land Utilization

Main land utilization	Hectares (000)	Percentage
All farms	9,975	100.0
Homelot	63	0.6
Temporary crops	5,332	53.5
Permanent crops	4,173	41.8
Temporarily fallow	71	0.7
Temporary meadows and pastures	84	0.8
Permanent meadows and pastures	131	1.3
Woodland and forest	70	0.7
Other	51	0.5

Source: Philippines 1991 Census of Agriculture (by location of the farms) final results.

- **Principal Temporary and Permanent Crops**
  The most important temporary crops in terms of hectarage planted are palay planted in 4 million hectares, followed by corn planted in 2.7 million hectares. Sugarcane, cassava, and pineapple are important temporary crops but each has less than 300,000 hectares planted. The most important permanent crop in terms of hectarage in compact plantation is coconut planted in more than 2 million hectares. All other permanent crops in compact plantation are each planted in less than 300,000 hectares.

Top Five Temporary and Permanent Crops With Hectares Planted

Temporary crops	Hectares (000)	Permanent crops in compact plantation	Hectares (000)
Palay	4,009	Coconut	2,211
Corn	2,737	Banana	299
Sugarcane	297	Rubber	78
Cassava	114	Mango	72
Pineapple	58	Abaca	56

Source: Philippines 1991 Census of Agriculture (by location of the farms) final results.

Lessons Learned

- The NSO built upon the successful data processing experience of the 1990 Census of Population and Housing by setting up a decentralized data processing system for the CA using the Integrated Microcomputer Processing System (IMPS) software package. At the time of this writing, the Philippines is the largest country in the world to process their agricultural census entirely on microcomputers.

- For the first time the NSO calculated sampling errors to quantify the reliability of the CA sample results, using the CENVAR software. The NSO can use this experience in tabulating measures of precision for future agricultural and other surveys.

- The evaluation techniques learned from the CAES will be useful to the NSO in evaluating the data from future agricultural and other censuses. The results from the CAES are also important in planning future agricultural censuses and surveys. The study of differential coverage errors will assist in identifying subgroups of farm operators which are more difficult to enumerate, and the study of content errors will help improve the questionnaires and manuals.

- For the first time, several organizations worked together toward the goal of conducting the CA. The main two government agencies, NSO and the BAS, worked together from development of the CA through data collection, with consultations from universities and other data user organizations. Collaborating organizations were also involved in conducting the CAES, such as the Philippine Social Science Commission (PSSC), which contracted the services of local universities to collect the CAES data, and the University of the Philippines at Los Baños (UPLB), where the CAES data were entered on microcomputers. The U.S. Bureau of the Census collaborated with these organizations and often acted as a catalyst in refining communication between cooperating organizations and in implementing state-of-the-art methodologies that undoubtedly will also be used by these groups in the future.

- Working with other agencies and potential users of agricultural census data, the NSO can assure that the definition of a farm in future agricultural censuses meets the analytical and planning needs of policy makers and is flexible enough to be used for historical comparisons and current priorities.