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Nepal – Agriculture Census

National Agriculture Census 2011/12

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Abstract

Agriculture plays an important role in meeting the basic needs of the majority of people in developing countries and Nepal is no exception. Agriculture sector has more than one third contribution to total Gross Domestic Production (GDP) of Nepal. Central bureau of statistics (CBS) is a sole organization to collect and disseminate the agricultural statistics especially by conducting National Agriculture Census since 1961/62. The sixth, National Agriculture Census 2011/12 has followed the broad guideline of FAO document for World Programme for the Census of Agriculture 2010. A new element "community questionnaire" has also been administered to collect infrastructure data of community in each selected ward. The sampling design adopted for the census was a stratified two stage sampling with district as strata, either an individual ward or a sub-ward or a group of contiguous wards as the primary sampling units (PSUs), and agricultural holdings as the ultimate sampling units (USUs). Around 2500 staff comprising of District Agriculture officers, supervisors, enumerators and others were deployed to carry out the field work of census. AM/FM Radio, Television, Newspapers and others means of media were used for publicity in agricultural census. Stringent quality control measures were taken in every step of survey by trying to reduce sampling error and non sampling error, imparting of proper training, strict supervision at every stage of fieldwork, data entry and processing. The census questionnaire being highly technical and somewhat complex, extensive classroom and field-level training were imparted to all levels of staffs which were to take part in the census operation. Exchange of experience on issues that came up during the field level training was very helpful in resolving issues beforehand. Statistical reports of Agriculture census at national and district level shall be published by May, 2013.

1. Background

Nepal has an area of 147,181 square kilometers with three broad ecological belts running from east to west. The three belts are: Mountain, Hill and Tarai. Mountain belt covers mountainous areas of the country and lies in the north. Some parts of the Mountain belt which also includes the highest peak, the Mount Everest (8,848 meters) are covered with snow all year round. The Hill belt is located in between the Mountain in the north and Tarai belts in the south. These three eco-belts Mountain, Hill and Tarai comprise of 41%, 36% and 23% respectively of the total area. Administratively Nepal is divided into 75 districts. Each district is further divided into smaller areas, the Village Development Committees (VDCs) and Municipalities. There are 3914 VDCs and 58 municipalities in the country. Each VDC comprises 9 wards, whereas the number of wards of a municipality (urban area) varies from 9 to 35, depending on the size of the municipality. The smallest administrative units are wards.

Agriculture, like in most developing countries plays an important role in Nepal in meeting the basic needs of the majority of people. Agriculture sector has more than one third contribution to total Gross Domestic Production (GDP). In such scenario, having reliable agriculture statistics is very vital for better planning in the country. The Central Bureau of Statistics (CBS) has been conducting the National Sample Census of Agriculture since 1961/62 as per the guideline of the World Census of Agriculture (WCA)/FAO. The census year for Nepal were: first (1961/62), second (1971/72), third (1981/82), forth (1991/92), fifth (2001/02) and sixth (2011/12). The field work of sixth agricultural census has been completed and remaining works of editing, consistency check and data processing is underway.

2. Present status of agricultural statistics

Central Bureau of Statistics (CBS) is a sole organization responsible to collect and disseminate the basic agricultural statistics generated through the conduct of National Agriculture Census. The current agriculture statistics is obtained through the field reporting of the extension workers of the Ministry of Agriculture Development (MoAD). This information is primarily based on administrative records and subjective assessments of extension workers and some minor surveys like crop cuts. As such, these data can serve the purpose of monitor the performance and as inputs for early warning purpose. In the past CBS also used to collect current agricultural statistics through 'Crop and Livestock Survey'. However, due to lack of financial and human resources, CBS could not sustain 'Crop and Livestock Survey' to collect current agriculture.

Apart from census, CBS has also been conducting different agriculture surveys of fisheries, vegetable, orange, apple, milk and livestock on ad hoc basis.

3. Agriculture census 2011/12

Agricultural Census being a large undertaking, all precautions were taken to make it a success. Before, carry out the National Agricultural Census (NCA) in an effective manner, a pilot survey of NCA 2011 was conducted in five districts of three ecological belts in 2009/10. The findings of the pilot survey were incorporated in the final version of the questionnaire, instruction materials and sample design. National Agriculture Census 2011/12 has also followed the broad guideline of FAO document for World Programme for the Census of Agriculture 2010. It recognizes the need for international comparisons as well as the emerging needs of the countries to collect data on a variety of new subjects. Nepal has pursued 16 sets of key items as a Core Modules and 12 Themes included 89 data items under the Supplementary Module as recommend by WCA 2010 which forms a sound basis for preparation of schedules to be canvassed in the Agricultural Censuses. For the first time in census, production related questions of 27 major crops were introduced to collect the production statistics.

The census enumeration work was conducted from January to June 2012 with the reference period as January to December 2011. However, the census enumeration work was conducted in two phases similar to that of 2001/02 census. In the first phase (January to March 2012) enumeration was carried out in 59 districts in Tarai and Hill areas. The remaining 16 Mountain districts were enumerated during the April to June 2012 to avoid the harsh winter weather. Reference period in both the phases was January to December 2011. The data management work is under way.

3.1 Objectives

The followings are the objectives of agriculture census.

- To avail necessary statistics for the formulation of plans and policies at national and district level.
- To collect information related to agriculture holdings, structure and activities at national level.
- To provide sample frame for the annual agricultural surveys.

3.2 Scope

The Agriculture Census has covered broad topics of agriculture sector. Demographic information of agricultural holders and their family members, size of agricultural holdings, utilization of land, area under crop, irrigation, number of livestock, use of agricultural machinery, manpower involved in agricultural activities, agricultural credit, etc. are the major information collected in the census.

3.3 Sampling Design

The sampling design adopted in the survey was a stratified two stage sampling with district as strata, either an individual ward or a sub-ward or a group of contiguous wards as the primary sampling units (PSUs), and agricultural holdings as the ultimate sampling units (USUs). Each of the 75 districts was considered as a stratum. The first stage selection was done using probability proportional to size systematic sampling (PPS systematic) with number of holdings in USUs as the measures of size. Selection of agricultural holdings at the second stage was done using equal probability systematic sampling. The overall sampling design is self weighted within each district, provided number of households in every EA at the time of listing and those reported as in population census are same. Differences in these numbers, if any, were easily taken care of at the selection stage of number of agricultural holdings by adjusting holdings from 20 to 30.

3.4 Sources of Sampling Frames

There are two types of sampling frame used in sampling design for census 2011/12.

1. Frame for selection of PSUs, and
2. Frame for selection of holdings

The sampling frame was prepared from the list of enumeration areas (EAs) for PSUs from the 2011 Population Census. The frame contained listing of wards and blocks, along with the number of houses, households and agricultural households (holdings).

As in the previous agricultural censuses, an "agricultural holding" is the basic unit of data collection in the 2011/12 NCA. In order to prepare a frame for the agricultural holdings, systematic listing of agricultural households was carried out in each selected PSU.

Sampling Frame for Primary Sampling Units (PSUs)

Population Census 2011 project had prepared enumeration area (EA) maps for 44 municipalities of the country and village development committees (VDCs) of 12 district headquarters. Further, enumeration area (block) maps were also prepared for a few large VDCs in the country. EA of block maps was used in the field work of the 2011/12 NCA to reduce the burden of counting whole ward.

According to the 2011 Population Census, a ward in a VDC/municipality on average contained about 150 agricultural households, but there was a wide variation between wards. On the whole, there were almost 1,600 wards containing small numbers of agricultural households (less than 25). Information on agricultural households was transcribed from 36,022 wards of 3,960 VDCs and municipalities taken together. From these wards 36,257 PSUs were constructed after combination of small wards and segmentation of large wards. Out of 36,257 PSUs thus formed, 1,029 were combined PSUs and 396 PSUs were the segmented PSUs.

Combination of small wards – Since the average number of agricultural households (holdings) to be enumerated in each ward was set at 25 there would be problem if the ward contained less than 25 holdings. To avoid this problem, a small ward was grouped with one or more neighboring ward(s) of the same VDC, so that the combined total exceeded 25 agricultural households. Whenever such a combined PSU of wards is selected, all the wards were taken for second stage listing (listing of holdings).

Segmentation of large wards - In the case of very large wards, it was subjected to segment for making sizable PSUs. For such wards, the block maps prepared during the 2011 population census were used.

3.5 Sample size

The tentative sample size for the census is estimated at 130,000 agricultural households (holdings) distributed over 5,200 PSUs across the entire country. The number of PSUs allocated for each district was determined on the basis of the total area under 9 major crops in the district (X_d). Average area of 9 major crops (for the last three years) published by the Ministry of Agriculture Development (MoAD) was the measure of size for the allocation. The number of PSUs (n_d) selected from a district was based on the following "compromise power" allocation:

$$n_d \propto (X_d)^{0.4}$$

In each selected PSUs, a list of agricultural households (holdings) has prepared. The list contained the following information: name of holder, total area of operational holding, number of livestock, and number of poultry birds. Consequently, this list was the frame for the selection of agricultural holdings.

3.5.1 Selection of Primary Sampling Units (PSUs)

Prior selection, data was arranged in each district, so that PSUs were arranged VDC-wise alternately in ascending and descending order of the size measure of agricultural holdings of PSUs. This ensures implicit stratification and increases the efficiency of PPS (Probability Proportion to Size) systematic sampling. After arranging the data in this way, selection was done using SPSS 16(Statistical Package for Social Science) software package.

3.5.2 Selection of Ultimate Sampling Units (USUs)

Selection of USUs (agricultural households) was carried out in the field. The selection was done by using usual equal probability linear systematic sampling. However, before selection, an implicit stratification for Tarai and Hill/Mountain were used by making four implicit strata as follows:

- Less than 1 Bigha(0.68Ha)/10 Ropani(0.51Ha)
- 1 to 3 Bigha(0.68 to 2.03 Ha) /10 to 20 Ropani(0.51 to 1.01 Ha)
- More than 3 Bigha (2.03 Ha) / 20 Ropani (1.01 Ha)
- Only having livestock

This stratification is changed in comparison to 2001/02 NCA due to declining holding sizes. The implicit stratification has got partial advantages of stratification without making strata explicitly and going for independent selections within each stratum.

3.6 Human Resource

A large number of skilled manpower was needed to carry out Agricultural census. The required manpower was managed from two sources. The main source of census staffs was the regular staff working in CBS Central office and Branch Statistical Offices in the districts. The other sources were short term contract basis recruitment. There was altogether around 2500 manpower employed to carry out the census, comprising of enumerators (1600), supervisors (500), district agriculture officers (75) and other staffs (325).

3.7 Media Campaigning

The main objective of publicity was to encourage the agricultural holders and the public to provide correct information by propagating the importance of agricultural census. Moreover, it was equally important to assure the respondents that the information collected in agricultural census is kept confidential. AM/FM Radio, Television, Newspapers and others (Poster, Pamphlet, Leaflet, Folder, Banner, Miking, etc) means of media were used for publicity of agricultural Census 2011/12.

3.8 Quality Control

Quality control is one of the major challenging tasks to maintain in every step of survey, starting from drafting of questionnaire to analysis stage. If the quality is not maintained properly in any steps then definitely it leads the wastage of time and money. The National Agriculture Census 2011/12 has been very much concern about the quality control of data by initiating various mechanism to reduce the non sampling error as far as possible. Sampling error was minimized through the modification of design of previous agriculture sample census. Training, supervision, control forms, verification, consistency check are the quality control mechanism for data.

3.8.1 Training Programmes

Effective training was conducted at three levels in different locations of Nepal. Master trainers, districts census officers, and supervisors and enumerators training were conducted.

Training of Master Trainers- The basic objective of the "Training of Master Trainers" (TMT), was to ensure that the future trainers are "skilled and confident" to train the field staff (including the interviewers, the supervisors and the district census officers) who were involved in the National Census of Agriculture (NCA). Hence, the training was focussed on developing "skilled, confident, and competent" trainers to implement effectively the "main training" scheduled for the month of December 2011. Duration of TMT was eight working days, from November 17 to November 24, 2011. This training was organized for the senior officials of the CBS and core team members of the Agriculture Statistics Section. Some of them were involved in the previous censuses. In each session, the lead discussant would present the subject matter with the help of "PowerPoint presentations" and lead the discussions.

Training of District Census Officers- According to the organizational structure of the census, a district census office was established in each of the 75 districts of the country. District census officers were responsible to carry out the census field operations along with overall managerial role in their respective district. The training was organized for the heads of 33 Branch Statistics Offices and other officials of the CBS. Concepts and definitions of census schedules and procedures of field enumeration were thoroughly explained to the trainees. The methods of training was included with study of the questionnaire and the reference manual, classroom sessions, class exercise sessions, mock interviews and field practices and discussions. .

Training of Supervisors- Supervisors were trained in two different places – at the centre level and at the respective districts. One or two supervisors for each district were trained at the centre (CBS) by the master trainers. Rest of the supervisors was trained at the district head quarters by the district census officer and the supervisor who was already trained at the centre.

Training of Enumerators- Training of enumerators was given high priority as the whole outcome of the census depended on how well they were trained. The training of the enumerators was organized at the respective district census office. The aim of training was to develop their capacity to motivate the respondents in collecting accurate and complete answers. This training was focus on study of the questionnaire and the reference manual, reading maps, class exercises, mock interviews and field practices and discussions with the help of "PowerPoint presentations" and flip charts.

Other Trainings- A training of coding, editing and consistency check was imparted to 15 supervisors from July 30 to August 3, 2012. The main objective of this training is to check the filled questionnaire to ensure their consistent and completeness. At last, Data entry training is conducted prior to data entry which will be begun by first week of November 2012.

3.8.2 Supervision

The success of agricultural census ultimately depends on the performance of the field staff. Primarily, the enumerators who are in close association with the respondents and the supervisors who guide, coordinate and control the activities of the enumerators are the key role players. Undoubtedly, there is an important role of the supervisors to maintain the quality of the data collection in agricultural census. The supervisor performs cross checking of the data collection by filling up some holders'

information to motivate enumerators to fill the questionnaire more accurately and unbiased. There were three levels of supervision:

- Central level officers was deployed to supervise the performance of District Agricultural Census Officers (DACOs);
- The DACOs were responsible for supervise, control and evaluate the activities of field; and
- The field supervisors were to supervise all the work being done by the enumerators under their control.

A District Agricultural Census Coordination Committee was formed in each district to assist all aspects of the census undertaking. Moreover, the committee was also to supervise the field enumeration and advise CBS if any corrective measures were to be taken. The supervisor are to check whether the enumeration was carried out in accordance with the instructions, complete work within stipulated time and solves problems raised during enumeration. Apart from supervision, field supervisor had to fill two questionnaires in each enumeration area (EA) of same holdings where the enumerator has already interviewed as to perform a cross-check.

3.8.3 Consistency Check

The filled-in questionnaires are checked for consistency by the Consistency Check team members in the central office. After coding, editing and consistency check of the questionnaire by the central level supervisors the questionnaire are then sent for data entry.

The consistency check application programme is developed in Census and Survey Processing System (CSPro), which captures inconsistencies, out of range and error during data entry. These inconsistencies and errors are corrected manually by data entry supervisor or operator. In addition, error occurred by data entry will be verified by sample data entry system. For this purpose, 3 % of filled-in questionnaires will be subjected for re-entry and then verified with previous entry. Less than 5 % data entry error shall be accepted. Thus the clean data will be made available for further process and tabulation.

3.8.4 Data Entry/ Processing

Data entry of individual form (Questionnaire Form 2) was contracted out to private firm in the last census. However, it is intended that data entry will be carried out at the Bureau using its own manpower. If necessary additional manpower shall be obtained through secondment. This approach allows CBS to keep strong vigilance over the work in progress. If at all the work has to be contracted out, agencies for data entry shall be selected on the basis of their experience and technical capability. Preferences are given to those agencies which have taken part in census data entry in earlier censuses.

3.9 Estimation of Totals

Sample weights

Sampling weights are utilized for developing the estimates for various parameters. The estimating parameters like population total or mean, the estimates for such parameters are also linear in nature with sample observations suitably weighted with appropriate sampling weights. The weighting procedure is essentially based on Base weights, and Non-response adjustments.

Base weights

Base weights are the inverse of selection probabilities for individual holdings which are the units of observation. The final weights are the product of base weight and non-response adjustment.

Non-response adjustment

The sampling weights described above are based on the planned sample sizes. However, invariably, there is some amount of non-response in every survey, which leads to disturb the weights. Therefore,

there is a requirement for adjusting non-response. Normally, the non-response adjustments are done within each EA.

Estimation of Error

Estimation of standard errors for the estimated parameters is an important component of estimation process. It measures the reliability of estimates and provides a measure of confidence in the estimates. It also provides an insight into the inherent variability in the population and helps in planning of future surveys. For this purpose, SPSS version 16 software will be used to calculate standard errors, CVs, confidence interval as well as design effect.

4. Community questionnaire

In the World Programme for the Census of Agriculture (WCA) 2010, a provision is made for the collection of infrastructure data at the community level. This "new element" recommended by the WCA 2010 was accommodated in the 2011/12 Agriculture Census of Nepal.
The community questionnaire was administered to collect information at the ward (PSU) level. The items included in the questionnaire were - information on socio-economic conditions, community infrastructure and services and development projects.

5. Publication/Dissemination

National, Regions and District level statistical reports of census will be published as per schedule by May 2013 with explanatory text. In addition, CBS intend to publish two more publications: monograph of agriculture and report on reliability of data. The publications of the agriculture census results will be disseminate at the regional and district level through workshop and seminars. Furthermore, the results will be distributed through hard copy, CDs and websites to the users.

6. Weaknesses/Problems

Some weakness/problems were observed while conducting the national agriculture census. The problems are as follows:

- The enumerators and supervisors found agriculture census questionnaire complex and rather too technical.
- Lack of qualified manpower available especially in Mountain region.
- In mountain region, the enumeration period and Agriculture farming season coincided making it inconvenient for enumerator and farmer.
- Being a long and complicate questionnaire, some respondent was reluctant to provide the required time to provide information in the questionnaire.
- Insufficient transportation expenses and training allowance.
- Respondent were unaware and scared to provide real data on area of agriculture land due to tax and government policy.

7. Recommendation

There are some important recommendations drawn from experience of agriculture census 2011/12, which are utilized for avoiding any weakness in future census.

- Enumerator training period should be increased and more time should be devoted to extensive field test, discussion and exchange of experience from field test.
- Time gap between the population census and agriculture census should be extended to more than one year. Staffs employed for agriculture census get less benefit than those got by population census staffs.
- Census operation should be held all over the country at once preferably in April to June.

- Coding, editing and consistency check of filled questionnaire should be carried out by CBS to maintain the quality of data. Out sourcing agencies are unable to provide the quality data as compare to highly skilled human resources in Bureau.
- Data entry and processing of individual form questionnaire was contracted out in the previous census. However, this time data entry and processing should be under taken in Bureau for maintaining better quality and economy. The associated cost will be reduced by using logistics, Computers, Server, Furniture, and Generator etc from recently completed Population census.

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