

Agricultural Census and Improvement of Rural Statistics in China

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ABSTRACT: This paper provides the formation and characteristics of the traditional rural statistical system in China, then summarizes the preparations and practice of the agricultural census, describes some shortcomings existing in the rural statistical system and the reforms which have been made, and points out the direction of further reforms. Finally, the application and combination of various survey methods in order to improve the rural statistics in China is discussed.

Rural productive forces have been greatly liberated and developed with the practice of reform and open-door policies in China. It enables the rural community and economy to undergo an in-depth and historical change, so the rural statistics system faces more and more challenges and urgently needs to be reformed and improved. The success of the first National Agricultural Census conducted in 1997 has provided a good chance for further improving the rural statistics in China.

1. China's Rural Statistical Survey System

The current rural statistical survey system, i.e. the complete reporting system assisted by ad hoc, typical and sample surveys, was established and developed step-by-step in order to meet the demands of the planned economy system practiced in China. Since the rural household contract responsibility system linking the output was adopted in 1978 in China, the original rural statistics focusing on product economy in the planned economic system has been far from meeting the demands of decision-making of governments at various levels and research on rural development of commodity economy by economic administrations and social and scientific research institutions. Therefore, the rural statistics have been reformed in terms of survey methodology, scope and organization, etc., and gradually formed a system with the following characteristics.

- The statistical surveys cover all the activities related with rural economy, community, science and technology, of which the rural social economy is the basis. It includes not only agricultural (crop planting) economy, but also economic activities in secondary and tertiary industries in rural areas. It can basically reflect the rural socioeconomic development after the reform of the rural economic system. The transition from the agricultural (crop planting) indicator system prevailed before the reform of rural economic system to the new indicator system for rural social and economic statistics.
- The combination of sample surveys with the reporting system is the basic methodology, assisted by the ad hoc and typical surveys. The fields using sample surveys are more and more expanded and the role of sample surveys are becoming much more important. The annual complete reporting system still exists but its role is becoming less and less important, and much information collected by the complete reporting system is replaced by that from the sample surveys.
- The basic statistical organizational system is composed of the governmental integrated statistical offices administrated at various levels, the specialized statistical organizations within different departments, and the top-to-bottom survey system. All these statistical organizations have their own statistical channels and form their own system.

2. The Agricultural Census

Rural statistics in China have adopted the complete reporting system since the founding of the People's Republic of China (PRC). From the 1980s, China began to prepare its agricultural census. Some senior and middle ranking rural statistical leaders received a training course on agricultural census knowledge with the help of UN FAO in 1983. Then, SSB set up an organization and recruited some staff members to start agricultural census research. The Food and Agricultural Statistics Centre (FASC) was set up in 1988 assisted by the Italian government and UN FAO. It carried out an extensive and fruitful research on census strategy and methodology and did quite a lot of fundamental work as included in the following aspects.

- *Learning international experiences and training a large number of agricultural statisticians:* FASC edited and translated nearly 20 books and began to introduce and disseminate international agricultural census experiences. Many international seminars on agricultural census were held in Beijing. A large number of technicians and administrators were selected to go abroad to learn and study census methods and experiences. In the last decade, more than 180 specialists in the field of agricultural census designing and administration were trained abroad. All these activities enabled us to learn about up-to-date world agricultural census experience in a systematic way and made a sufficient preparation for defining the agricultural census strategy, designing the census programme and implementing the census activities.
- *In-depth understanding and studying the reality of China and the difference among regions, and widely collecting comments from agricultural data users:* During the period of designing the programme for the agricultural census in China, needs of census data have been solicited from the leaders of the related departments of the State Council, all provinces, part of prefectures (cities) and counties, and comments from the research institutions of rural development and policy have been collected.
- *Providing hardware for the pilot census and the training of the census staff members:* A lot of equipment and materials, such as computers, transportation vehicles, field measurement and audio-visual instruments, have been provided by the project on agricultural census supported by UN FAO and the Italian Government. This equipment ensures the smooth development of all the preparatory activities and census implementation, including research on strategy of agricultural census and methodology.
- *Conducting pilot censuses:* In order to well study census methodology, we have undertaken several rounds of pilot agricultural censuses, such as the pilot census in Weixian county, Hebei province; the censuses in 16 counties of 16 provinces in the first half year of 1995 and the 1997 Zhongshan city pilot census in Guangdong province.

The above-mentioned preparatory work has laid a solid foundation for conducting the first national agricultural census. In October 29, 1994, a decree was promulgated by the State Council of PRC, in which the first national agricultural census was decided to be conducted in 1997. The prologue of the agricultural census was opened.

The objectives of the first national agricultural census in China were: 1) to understand the basic resources of agriculture and rural areas to provide accurate information for decision-makers, and 2) to provide basic information to set up a new system for rural statistics.

To meet the above objectives, the following rural basic information was collected in the first national agricultural census in China:

- number, size and structure of agricultural holdings,
- land distribution and utilization (including cultivated land and garden plot, etc.),
- number, structure and migration of actual rural labors,
- amount, structure and utilization of agricultural fixed assets, and
- economic development of rural organic towns.

The census objects were all the agricultural holdings, rural households, township and town enterprises, administrative villages and towns and townships within the whole nation. The questionnaires for agricultural census included 38 sections and 687 items, which could be divided into six questionnaires, such as a questionnaire for rural household holdings, a questionnaire for non-household holdings, a questionnaire for administrative villages, a questionnaire for townships and towns, a card for non-agricultural enterprises and a card for agricultural land.

The national census of agriculture was carried out under the leadership of the State Council and various levels of local governments. The leading organs and their offices were set up under the State Council, provincial, prefecture and county governments. In the township and town governments, the census offices were set up. In the village boards, the agricultural census groups were set up. All these organizations were responsible for organization and implementation of the agricultural census.

The time reference for point items was zero hour of January 1, 1997, and the time reference for period items was from January 1 to December 31, 1996. The census was generally conducted by enumerators to interview directly each agricultural holding and fill the questionnaire item by item. Field enumeration was carried out according to enumeration districts and subdistricts. Generally, one enumeration district referred to an area under a village board's jurisdiction with one supervisor. One subdistrict referred to an area under a village group's jurisdiction with an enumerator. In January 1997, the field enumeration started at the same time in whole country, and involved more than 7240 thousand census staff members, 214 million rural households, 740 thousand administrative villages, 43 thousand towns and townships, 1,400 thousand town and township enterprises. The card for agricultural land was filled out by the census offices and the land administration offices at the county and township levels. The field enumeration and quality check were completed before January 31, 1997.

The post-enumeration survey (PES) was conducted strictly according to the methods stipulated by the national census office. All the samples in PES were enumerated, and tabulated in order to evaluate the quality of the census. Post-enumeration was completed by March 5, 1997.

In order to issue the results of the census as soon as possible, the national census office selected 68 indicators for manual tabulation, and all the items were entered by the Optical Character Recognition (OCR) techniques and tabulated by computers. All the data processing work will be finished in 1998 as scheduled.

According to the manual tabulation results and what we know, the basic resources of agriculture and rural economy have been clarified, a large amount of scientific, reliable and valuable basic information has been collected, and the operation of rural socioeconomy has been further understood in the first

national agricultural census of China. It could be summarized in the following six forms of information:

- number and structure of agricultural and rural holdings,
- number, quality, industrial and geographic distribution of rural persons engaged in agriculture,
- amount and quality of main agricultural machinery and equipment,
- amount, quality and structure of cultivated land,
- rural community environment and infrastructure, and
- scale and socioeconomic conditions of organic towns.

In order to verify the quality of the census data after the field enumeration, the national agricultural census office organized a nationwide post-enumeration survey (PES) in accordance with prevalent international methods. Using random start point with systematic and stratified sample selection, 201 counties (cities), 870 subdistricts, 40,576 household holdings were selected. The result of PES shows that the error rates are within the confidence intervals, accurate and reliable.

The results of manual tabulation on the first agricultural census show that data collected by current rural statistics is generally reliable, but some differences exist when comparing census with annual statistics. The main items are: cultivated land, non-agricultural enterprises, agricultural machinery, and inventory and sales of cattle, sheep and hogs. The reasons of such differences are:

- the sensitivity of these items. Under the condition of forceful target administration, the local governments interfere with the statistical annual reports and cause the over-estimation which favors their own local interests.
- the weakness and backwardness of statistical techniques. The sources of many information items were missing, so the only way is to guess based on the available information, which negatively affects the accuracy of the annual statistics.
- historic and social reasons, which cause inaccuracy of the annual statistics.

To those items which have large differences between census results and annual statistics, some measures need to be taken in order to reconcile census results with annual statistics. The reconciliation needs to follow the following principles:

- to take the census results as criteria to adjust the annual statistics,
- to focus on the study of the items with large differences and strong effects,
- to be careful to avoid confusion on recognition
- to organize reconciliation work to ensure consistency at all levels in a scientific way, and
- to reform related annual statistical methods to avoid recurrence in the future.

3. Improving the Rural Statistics System

3.1 Challenges

The results of the agricultural census have shown that the present rural statistical system of China plays an important role in administration and decision-making for the whole national economy and rural social-economy. It cannot be denied that the following challenges are still being faced.

3.1.1 Lack of reliable information source

The complete reporting system was suitable for the rural commune system, which could accurately and timely collect data from the grassroots agricultural production teams. After reform of the rural economic system, due to the adoption of the household responsibility system linked to the output, basic agricultural holdings have increased from 5600 thousand production teams to over 200 million rural households. The data collection using the annual reporting system has lost its statistical basis. The statistical staff is unable to directly collect data from agricultural holdings, so the complete annual reporting information is based on estimation at the village, and even township, level. The reported information lacks reliable sources, so its accuracy is seriously affected.

3.1.2 Incomplete agricultural socioeconomic data

After reform of the rural economic system, great changes have taken place. The sole public ownership has been changed into various kinds of ownership, sole industry has become diversified, self-sufficient and semi-self-sufficient economy has been transformed to commodity economy, and traditional agriculture is changing into modern agriculture. The rural economic activities are becoming more and more complicated, which requires more and more complete statistical information; however, the complete reporting system cannot meet the changes and cannot collect many important data, e.g. characteristics of agricultural holdings, complete information and distribution on labor force, agricultural machinery and distribution, medium input, etc. All these seriously affect rural economic management and decision-making.

3.1.3 Uncontrollable interference with statistical data

A feature of the complete reporting system is that the statistical data are reported by administrative divisions as requested at higher levels. Some figures are related to the performance of the leaders, e.g. output, family planning items, sown area, etc., and some other figures are related to state taxation, e.g. cultivated land and agricultural taxation. Therefore, these figures are often interfered with by administrations. In particular, for some key statistical data it is difficult to avoid the influence by some leaders or persons focusing on their own regional or department interests.

3.1.4 No reliable sampling frame for further sample surveys

As a result of the above-mentioned problems in the complete reporting system, it is difficult to ensure the collection of accurate and reliable statistics, which causes many problems for sample surveys. The role of sample surveys is restricted due to shortage of sampling frames, so the sample surveys which should be used in many fields cannot be used and have to be replaced by other survey methods. Due to the lack of accurate and systematic, complete reporting information, the choices of sampling techniques are affected. Some of the sample surveys can only choose some characteristics with no or little relationship with survey items for arranging the sampling units. Thus, some comparatively advanced

sampling techniques such as systematic and stratified sampling cannot be used, which causes large sampling errors.

3.1.5 Multiple statistical organizations

The current rural statistical system is composed of the integrated statistical department, the general organization of rural socioeconomic survey and the statistical offices in various specialized ministries and departments. Due to their specific formats, there are large differences in approach and method for data collection. This causes duplication in different departments and prevents full use of the limited statistical resources on one hand. In particular, some of the reporting forms are duplicated with complicated items, which increases the tasks for the grassroots-level statistical staff members; it causes too much loss of information and too many conflicts between the statistics collected.

3.2 Developments

The above shortcomings arose a long time ago and gradually accumulated as the economic system continued to change. During this period, the Chinese rural statistical system was changed and developed to meet the new needs of the economic development.

3.2.1 Promotion of sample survey methodology

Since the rural reform, sampling surveys are widely used in the rural socioeconomic statistical work. At present, information such as rural household income and expenses, production, consumption, and accumulation, grain production, uses and migration of rural labor forces, rural fixed assets and rural tertiary industry, is collected in a unified program for agricultural sample survey.

The current national rural sample survey network is selected in a way of balanced systematic sample with multiple stages and random start. Taking the province as a population, counties are selected according to a unified program. In total, 857 counties are selected. In the selected counties, 9000 administrative villages are selected, and then altogether 70,000 rural households are selected for household surveys. In the 18,000 selected administrative villages (most of them also involved in household surveys), a crop yield survey is conducted. In over 3500 towns (townships), a township and village economic survey is undertaken. In order to ensure the smooth execution of rural surveys, there is a General Organization of Rural Socio-Economic Survey (GORSSES) which was set up in SSB in 1984 and approved by the State Council. There are survey teams in all the 30 provinces, regions and municipalities, 10 cities with direct planning by the central government, and 857 selected counties, altogether with 8250 permanent staff members, and 27 thousand temporary assistant interviewers.

3.2.2 Improving complete reporting forms

The complete reporting forms used for many years consisted of two parts — annual and periodic reporting forms. In recent years, SSB adopted a new system with a set of rural grassroots reporting forms which reflect a further step in our statistical reform, as the previous reporting forms only focused on product economy which could not meet the demands of various governments, social research institutions and economic administrations. The new forms take the agricultural statistics as their focus, but are also involved with the scope of rural socioeconomic. They include commodity items but also product prices, by which the commodity value can be calculated. The overestimation of some value items (mainly agricultural gross output value and gross rural social output value) can be controlled to some extent.

3.2.3 Full use of ad hoc and typical surveys

In addition to the uses of sample surveys and complete reporting forms, the data collection for rural socioeconomy, sometimes consisting of ad hoc or typical surveys, could be used in parts of counties, townships or rural households with some emphasis on different characteristics according to the needs of research on some socioeconomic issues. In recent years, a survey on towns or townships with an output value of over 100 million yuan, a survey on farmers' burdens, a survey on intention of crop planting, a survey on demands of production and living means by farmers, a follow-up survey on rural policies, and so on, were conducted in this way. These data collection methods turn out to be really good in practice.

3.3 Further Improvements

No doubt, the reform measures are timely and positive, but they cannot overcome the malpractice existing in present rural statistics completely. The results from the agricultural census shows that the reform of the agricultural economic system in China creates a strong impact on the agricultural statistics. In order to thoroughly reform the Chinese rural statistics, it is necessary to change our frame of mind and adopt a new statistical system. Taking the periodic census as a basis, the current sample surveys are used as our core, assisted by statistical reporting forms, combined with ad hoc and typical surveys and scientific inferences.

3.3.1 Establishing an agricultural census system

Agricultural census is one of the most important statistical methods in the collection of rural socioeconomic information, which can be used to understand the resources of agriculture and rural economy. It is a government-sponsored activity to collect information for macro decision-making. Moreover, in the integrated system for food and agricultural statistics, all the methods for agricultural data collection, such as current sample surveys and ad hoc surveys, must be based on the frames prepared from the census information. Therefore, the agricultural census plays an essential role in the system of statistical methods. Based on the rural economic development in China, it was decided to conduct the first national agricultural census in 1997 and the censuses are to be undertaken every ten years in the future. It is necessary to fully understand the importance of the agricultural census in order to set up the periodic agricultural census system.

3.3.2 Strengthening the principal role of the sample surveys

After the reforms and the open-door policy were adopted in China, the sample surveys were first implemented in the field of rural statistics in 1983. More than ten years of experience show that the data collected through the sample surveys for crop yields and farmers' net income, etc., are authoritative figures. The survey method with less cost, more efficiency, anti-interference and higher quality is worthwhile to be widely used. In order to ensure the success of the agricultural census and better meet the demands for decision-makers, the sample surveys must be promoted in the rural statistics, including: 1) more survey items, such as animal husbandry, aquaculture, cash crops and labor force; 2) more use of sample surveys in future agricultural censuses; and 3) further improvements to current sampling surveys, to overcome the insufficient use and non-flexibility of the sampling survey network, size and aging of samples, etc.

3.3.3 Simplifying and improving the complete reporting system

The reporting forms can obtain data by regions to meet the decision-makers' needs and provide guidance for the various governments. Since the reform, the basis on which the reporting forms are built has been changed quite a lot. Therefore, it is necessary to narrow the coverage of their use. Those items related to agricultural productivity and land area which do not change appreciably over the years, e.g. rural grassroots organizations, rural labor force, composition of land area, number, size and structure of fixed assets, can be collected by agricultural census.

4. Improving the Agricultural Census

The success of the first national agricultural census in China provides a sound basis for implementing the reform model mentioned above. However, any kind of survey method has its own advantages and disadvantages. Therefore, it is very important for rural statistical reform to improve the various survey methods and to coordinate the relationships among them.

First of all, all surveys should be integrated to be carried out uniformly in different years. One kind of survey may utilize the manpower and resources of another one. For example, any sample survey, specific survey and other surveys conducted in a non-census year may continue to use the resources of the last census.

Secondly, in practice, the contents of different survey methods should be coordinated well. In particular, the contents and indicators of current surveys and agricultural census should be linked carefully on the basis of adjustments in the census. Agricultural census pays more attention to the indicators of productive structure and agricultural organization, while the current agricultural surveys mainly focus on production and other items. The contents of agricultural census should reflect basic information on agricultural production resources and conditions, rural production elements and agricultural holdings which do not change much. Time point indicators and stock indicators are crucial, few periodic indicators and flow indicators being necessary as auxiliaries. The output and other indicators on planting, forestry, animal husbandry and fisheries are not suitable to be included in the census, and should possibly be contained in sample surveys. The complete reporting system has its special advantages in meeting the needs of policymaking and management for governments at all levels, but can only be used for those few statistical units and items having good administrative records.

Therefore, the improvement of rural statistics in China must be started with optimizing and coordinating the utilization of all kinds of survey methods. The experiences of the first national agricultural census show that, under the circumstances of market economy, census is the most efficient survey method for overall data collection from decentralized holdings. However, the census is an important survey on national conditions and strengths. It involves huge workloads and heavy tasks, needs a great amount of manpower, materials and funds, and is impossible to be conducted often. Consequently, in the reform of the rural statistical system of China, too many items and too much workload should be avoided. All existing statistical resources should be used fully, and with regard to different survey contents, a corresponding survey method should be applied. In addition, in order to overcome the shortcomings resulting from the census, China should use sample survey methods on a large scale in the future agricultural census.

4.1 Sample enumeration

In future censuses, only sample holdings will be enumerated, according to sample principles, instead of complete enumeration. Because the quantities of enumeration units decrease, a great deal of expense will be saved in the field of staff training, data collection and processing. The time needed for field work and data processing will be shortened, and the census results can be released in a more timely fashion. On the other hand, since the quantities of census staff decrease, there are better possibilities to recruit highly qualified staff who may receive much better training. Moreover, due to a reduced workload of organizing and coordinating, it is conducive to the reduction of survey errors. Therefore, the sample enumeration is suitable for poor nations or regions, in which there is a shortage of funds, qualified enumerators, and data processing equipment, and where survey objects include respondents of poor quality.

The selection of enumeration method is related to the development level of the national economy. When the national economy is well-advanced, commodity economy will acquire sufficient promotion. Scale operation of agriculture will be conducted and the size of an agricultural holding will be enlarged, while the total number of holdings will be very much reduced; therefore, it is favorable for the use of complete enumeration. In addition, a developed economy enables a nation to provide enough funds for a complete enumeration census to obtain a corresponding economic effect.

The rural commodity production in China is still in an initial stage. For rural households, the size of holdings is rather small, the average amount of cultivated land being only half a hectare. The types of rural households in most parts of China are very similar, but the number is huge -- there are more than 200 million rural households in the whole nation. Basic information can be obtained by selecting an adequate sampling method and conducting enumeration on a part of the holdings in a region. In many regions with low population density and poor economic conditions, the selection of sample enumeration may decrease the workload of field survey and data processing considerably, which saves input and improves data quality.

China is a large agricultural country with a great variety of conditions, so the sample enumeration does not prevent selection of a complete one. As for some rural areas, complete enumeration should be chosen because of developed commodity economy and large differences among holdings. For agricultural holdings of a large size, for example the state and collective farms, as well as the family-operated farms engaged in large-scale agricultural production, complete enumeration may be most appropriate.

There are more than 2400 counties in China, and each county has an average population of 400,000 and a land area of near 4000 square kilometers. The county economies are playing a very important role in the development of the national economy. The nation has been paying much attention to county development, so the census data must be representative at the county level. All counties should be used as a sample population, so that the census results are available to be provided to all governments at county, prefecture, provincial and central levels, to meet their needs of economic management.

4.2 A part of the contents of census questionnaires (long list) is collected by sample survey

This method means that some important basic indicators are put into the short list and must be filled out by all holdings, while others are set up in the long list and answered by a part of selected holdings. Furthermore, some important local indicators related to economic development may be added.

This enumeration method is quite flexible, and especially suitable to a big, complex nation like China. In China, the development levels of different regions are unbalanced, and there are great differences in physical and geographical conditions, agriculture systems and cultivation methods, and farmers' educational levels, as well as in local governments' needs for agricultural statistics. Therefore, the short list is stipulated by the central government to be filled out by all regions, and some regions are selected according to practical situation to answer the long list. Subsequently, the national results are estimated on the basis of the data of those regions.

The use of the long list can reduce the workload of data collection and increase the accuracy of the census, because the sampling ratio can be reduced for some difficult to answer questions so that highly qualified enumerators are available to be assigned to undertake field work better. Moreover, since the census contents can be enlarged according to local needs, the census can truly meet the demands of the whole society, and the initiative of local people involved is easily brought into play.

4.3 A part of the holdings is selected for quality evaluation

The agricultural census is a great system engineering project. In order to avoid systematic survey errors, to adjust the representatives of census and to control census quality, a certain proportion of agricultural holdings is selected after field enumeration, and re-interviewed by highly qualified staff. The results acquired are compared with the original census data.

4.4 Modifying the list frame

Because the gap between two successive census years is rather big and the changes in holdings are also considerable, data from sample surveys obtained during the time gap may be used to modify and supplement the previous list frame.

5. Concluding Remarks

The sampling survey is a statistical method used widely and early in the rural statistical reformation in China. GORSES was established in 1984. After that, sampling survey methods were used in some major survey projects, including grain output, rural household income, etc. The data collected from sampling surveys are basically accurate. Because the sampling frames for the current sampling surveys were used continuously for more than 10 years, or absorbed data mainly from complete reporting systems, the current sampling frames are not reliable and accurate. Through the primary results of the first national agricultural census, we find that accurate data on all agricultural holdings can now be obtained from agricultural census. Agricultural census will provide the following data:

- essential structure data for subdistrict (village, administrative unit and agricultural ecosystem),
- a sampling frame for surveys on special groups with different characteristics (self-sufficient agricultural households, holdings operated by women), and
- a wide range of data from various groups according to different indicators.

These data are convenient and applicable for sampling frames. Meanwhile, because agricultural census will be conducted every 5 to 10 years, the data in the sampling frames can be replaced by new census data. Samples can be alternated according to new frames. Following the first agricultural census, the current sampling surveys will be adjusted and improved as soon as possible to seize this opportunity. The domain of sampling surveys will be expanded widely also. Thus, sampling surveys will really play a key role in the regular statistical work.

The first successful agricultural census not only provided us with a good opportunity for improving the rural statistical system, but also raised the requirements for rural statisticians. In the future, it is imperative for rural statistics to combine various survey methods and develop available data resources according to the needs of market economy mechanisms.