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Review of Chinese Crop Production Forecasting and Estimation Methodology

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Review of Chinese Crop Production Forecasting and Estimation Methodology: Frederic A. Vogel, National Agricultural Statistics Service, U. S. Department of Agriculture, Miscellaneous Publication No. 1556.

Abstract

Since China is one of the world's largest grain producers, statistics about its grain production have a major role in assessing the current world supply and demand situation. This paper provides a detailed, in-depth view of the Chinese statistical system that provides that information. The methodology used by the National Bureau of Statistics and the Ministry of Agriculture are presented along with an evaluation of each.

Preface

This paper is the product of many sources. First were the many in-depth briefings by Chinese officials in the National Bureau of Statistics and the Ministry of Agriculture in Beijing, followed by more briefings and personal observations at every level of government from the Province to the Prefecture, county, township, and village levels. Most interesting were the opportunities to actually visit farm households and to meet with farm operations in three different provinces in China.

The USDA/NASS involvement in this activity was made possible by funding from the Emerging Markets Program, administered by the USDA Foreign Agricultural Service's Emerging Market's Office.

Statisticians in the National Bureau of Statistics have also presented papers at the biennial meetings of the International Statistical Institute, which were especially helpful in understanding the methodology used in the crop yield survey. Statisticians in the National Bureau of Statistics and the Ministry of Agriculture also shared some of their unpublished working papers, which also added to the understanding of their agricultural statistics system.

The Chinese officials at all levels of government were very open and candid about their procedures. The primary difficulty was that of translation. Considerable input to the contents of this paper was provided by Chuck Hudson, Carol House, and Larry Sivers, who shared many of the experiences in China contributing to the paper. Finally, the author is indebted to Karlyn McCutcheon and Michelle Sykes for the exemplary effort to prepare the many drafts of this paper.

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Introduction

China is not only the world's most populous country, it is also a world leader in the production of many agricultural commodities. China's agricultural production is a key factor as commodity markets have become more globally oriented.

Information about current supplies in China and prospects for the future are critical if world markets are to operate efficiently (Zhang XinMin, 1995). China has also recognized a need to improve its statistical system for agriculture as it becomes more active in the world markets.

The desire for the United States to obtain more timely and accurate statistics from China, and the Chinese desire to improve their statistical system led to the signing of a mutual letter of intent in February 1996 between the National Bureau of Statistics and the USDA. The purpose of this agreement was to provide the framework for a mutual exchange of information and statistical methodology. This 1996 letter of intent of agreement has led to an improved exchange of information and a spirit of cooperation on behalf of the Chinese to share their methodological procedures. Funding for the NASS collaboration with Chinese counterparts to improve the quality and dissemination of Chinese agricultural statistics was provided by the Emerging Markets Program. This funding, administered by the Emerging Markets Office of the Foreign Agricultural Service, USDA, was made available to NASS beginning in 1996.

A series of mutual exchanges between the National Bureau of Statistics and the USDA have taken place since the signing of the 1996 agreement. In May 1998, a similar agreement was signed with the Ministry of Agriculture, with similar exchanges taking place.

This paper provides a summary of the methodology used by the National Bureau of Statistics (NBS) and the Ministry of Agriculture (MOA) to produce forecasts and estimates of crop production in the People's Republic of China.

To a large extent, the Ministry of Agriculture and the National Bureau of Statistics have parallel systems in place. The forecasts and estimates prepared by the Ministry of Agriculture are primarily for their internal policy making purposes, and little information has been released for outside use. The National Bureau of Statistics coordinates China's governmental statistical system, which along with the information from the Ministry of Agriculture provides the basis for the official Agricultural Statistics.

A primary difference between the NBS and MOA systems is that the NBS, organizationally, has its own staff down to the county level. The MOA does not have the staff below the central level, but instead provides instructions and guidance to provincial and lower levels of government to obtain information required. (NBS Bulletin 1995.)

Both the NBS and the MOA still rely upon a complete reporting system patterned after the Soviet system that was implemented in the 1950's. These are basically accounting systems. In addition, the NBS and the MOA conduct sample surveys. The methodology of each system will be described in more detail below.

Appendix A provides an overview of the official statistical system for agricultural statistics in China. The official statistical system is in reality two systems. One is the governmental statistical system, the National Bureau of Statistics, which is the central statistical organization for China. In addition, each of the various departments in the Chinese government has a statistical system to provide information to support its policy making activities. For agriculture, the Ministry of Agriculture relies upon its Department of Markets and Information to provide data for its internal policy needs.

Information from the NBS and the MOA are the basis for the final "Official" statistics about agriculture. However, the NBS and the MOA each operate independent statistical systems. Even though the systems operate independently, the methodology used is very similar.

In 1997, the NBS also conducted a Census of Agriculture. The purpose of the Census was to provide a benchmark of cropland by crop, and livestock inventories. The other purpose was to obtain information about the structure of the farm household/farms that could be used as a basis to improve sample survey methods.

1.0 Overview of the National Bureau of Statistics

China began implementing an operational agricultural statistics program in the early 1950's. (Sun Chuanzhong, 1995) The primary purpose was to provide information for the planning of agricultural production and then to check on the results of those plans. The State Statistical Bureau, now the National Bureau of Statistics was established on August 7, 1952.

The basic statistical units or reporting units at that time were the village production teams. The village production team reports were compiled to the village level. Village data were aggregated to the township level, then from the county to prefecture, to the provincial, and to national levels. This was an administrative reporting system and was called the "Complete Reporting System." This was a successful reporting system for the era; the results were reliable and satisfied the planning needs.

In 1978, China initiated economic reform in the rural areas. Families became the basic agricultural production unit replacing the production teams. According to Zhu Xiangdong (1998) the statistical reporting units went from 5.6 million production teams to over 200 million rural households. Along with the economic reform, rural town and township enterprises were being established. The Complete Reporting System has remained in place through the economic reform, which shifted responsibility to individual farmers and the growth of joint enterprises. Now the village heads provide estimates for each village, with results still moving step by step up the layers of government. The quality of the data has declined as the village heads know less and less about what each household is doing. Furthermore, there is opportunity for errors to occur at each level of reporting up the governmental system. The reporting unit is the village while the production unit is an individual household, which severely limits analysis at that level.

Because of the inherent problems with the Complete Reporting System and the need to improve the accuracy of the statistical reports, the "Statistics Law of the People's Republic of China" was enacted in December 1983. The law stipulates the management of statistical surveys, and dictates that statistical surveys be conducted in a planned manner. This led to the formation within the NBS of the General Organization of Rural and Social Economic Surveys (GORSES). This organization within the NBS has the responsibility for conducting sample surveys of individual farm households on items such as grain production, household income and expenses, and the labor force.

GORSES has survey teams in 30 provinces, 10 cities, and 857 selected counties. Overall, 18,000 administrative villages within the 857 counties (21 villages per sampled county) have been selected for the crop yield survey, with 5-10 plots per sample field finally selected. The sample of counties was selected

in 1988 and has been fixed since that time. Samples of villages within counties do change over time (Gong Jianyao, 1989). The following sections describe the complete reporting system and the sample surveys in more detail.

1.1 Complete Reporting System

China contains 22 provinces (States), 5 antonomous regions, and 3 municipalities, over 2,400 counties, and over 43,000 townships. Each of these towns and townships is further subdivided into over 740,000 administrative villages. Because of China's vast geographic area and huge population, each of these levels of government has a system in place to provide information for decision making purposes. All counties have local funding to obtain county-level statistics which are gathered through a series of reports from each village. Each county, on average, contains about 90,000 farm households. The information collected from the villages includes data about number of households, labor force, crop acres planted, crop yields, and livestock numbers. The general statistical system begins with each village reporting the village-level data to its township. Each township combines all of the data from each village and sends it forward to the county. Each county combines all of the township-level data to county totals and sends county-level totals to its province which is again aggregated to provincial totals and national totals. This reporting system "step by step all the way to the top" is still in place and is referred to as the "Complete Reporting System." Each unit is responsible for the quality and accuracy of the data it sends forward. The provincial-level summary data are dependent upon the accuracy of each village's report to its township, the accuracy of each township's report to its county. No individual farm or village data are available for the county or province to evaluate.

The Complete Reporting System is a relatively traditional method of statistical surveying characterized by its long history of application and wide coverage. Complete sets of statistical data by provinces, prefectures, counties, and townships can be obtained by this method, which meets the requirements of governments at all levels and business departments in managing the economy. It has played an important role in managing agriculture and the rural economy by the various levels of government during the past several decades.

1.2 NBS National Agricultural Yield Survey

To provide data with greater accuracy and timeliness than provided by the Complete Reporting System, in 1980 the National Bureau of Statistics implemented a National Agricultural Yield Survey that is directly under its control. Independent crop yield samples are selected and surveys conducted for winter wheat, corn, rice, sorghum, soybeans, cotton, and sweet potatoes. The National Agricultural Yield Survey sample was selected in several stages. The first stage of selection was a sample of 857 counties out of the over 2,400 in the country. This original sample of counties has remained the same, without rotation, since it was first selected. Within the 857 counties, about 18,000 villages were selected. (Within some counties, there was an intermediate selection of townships, and then villages within townships. However, in most counties, villages were selected directly.) The sample of villages has usually been rotated every 4 years. Within each village, a sample of fields is selected annually and crop cutting samples are taken from each chosen field. Data from the complete reporting system described above were used at each stage of sample selection.

1.21 Sample for Crop Yield Surveys

County Sample. Data from the Complete Reporting System were used to determine the number of counties to select and to develop the selection process within the county . The overall goal was to have a crop production estimate with a sampling error of less than 2 percent. More specific details are described by Li Ting Jun (1995), Gong Jianyao, (1989) and Zude Xian (1997).

Using data from the Complete Reporting System, the counties were listed in ascending order based on 3-year average grain production for target crops. A sampling interval (k) was determined by dividing the accumulated grain production across counties by the number of counties to be selected. This sampling interval was used in a systematic sampling process to, in effect, select the sample counties with probabilities proportionate to their size in measure of grain production. Because the sample of counties is also used for a Rural Household Survey, the selected sample was then compared with the "complete reporting system" for estimates of per capita income. In some provinces the county sample was redrawn based on a sort by per capita income.

The initial sample of counties was selected in 1984 -- the sample of 857 selected counties has remained fixed since then. The National Bureau of Statistics has a permanent staff of 7-9 people in each of these sample counties, with offices and living space provided. The NBS county staff is responsible for carrying out the remaining levels of sampling and supervising the data collection at the village and field levels for the national crop yield survey. The NBS county staff also works closely with the county government staff involved in the collection of data from the townships under the "Complete Reporting System." Counties included in the National Agricultural Yield Survey sample in effect have two statistical systems in place -- their own and the NBS. In addition to the 857 counties officially included in the national sample, many other counties have independently funded village/field samples for the yield survey. The counties typically follow national procedures for sampling villages and fields, and for data collection. However, information from these ancillary samples are not used in the summary for the national survey. Instead they are used as input into the complete reporting system for determining village, township, county and province yields.

Even though separate samples and surveys are conducted for each of the targeted crops, the same fixed sample of 857 counties is used. Again, this is also under the direct leadership of the National Bureau of Statistics, contrasted to the Complete Reporting System which is subject to the control of each level of government.

Village sample within the selected counties. An independent sample of villages is selected for each of the targeted crops included in each county's survey program. The selection procedure is the same for each crop and relies upon data from the complete survey program. The list of villages within each sampled county is arrayed in ascending order based upon its previous 3-year average grain production. The recorded area of the crop of interest in each village from the complete survey is used as the basis for selection. A systematic sampling process is followed such that villages are selected with probabilities proportionate to the mu (1/15 hectare) planted to the crop of interest. Between 18 and 30 villages are selected in each sample county.

Each selected village remains in the sample for 4 years, with the entire sample rotated at one time. A villager is recruited by the county staff to do the village-level data collection. The villager enumerator works under the supervision of the county NBS staff.

Field sample within selected villages. A part-time enumerator in each sampled village is responsible for the final stages of sample selection and doing the crop cutting. The first step is to identify all fields in the village planted to the targeted crop. Every field planted to that crop is measured to get the field's size. In some areas the traditional mu may differ from a standard mu, or the farmer may not have a good concept of area.

About 10 days to 2 weeks prior to crop maturity, the enumerator and other village participants estimate the yield for every field in the village planted to the crop of interest. This estimated yield (actually a forecast) is used for two purposes:

- It is submitted to the county and provincial levels for decision making purposes. This yield forecast is not released to the public.

- The expected yield for each field is used to array the fields from low to high yields. A sample of 7 to 15 fields is selected based on the number of fields in the village planted to the crop of interest. Generally speaking, approximately seven fields would be selected in villages in northern China, where the fields tend to be larger. In the southern part of the country, approximately 15 smaller fields would likely be included in the sample. A systematic sampling process using the measured field areas is followed, which results in the fields being selected with probabilities proportionate to their size.

Plot size within sampled fields. The final stage of sampling is to locate sample plots to be harvested. The number of plots depends on the field size. Eight plot locations are determined for fields less than 1 mu in size and 16 for fields between 1 and 2 mu.

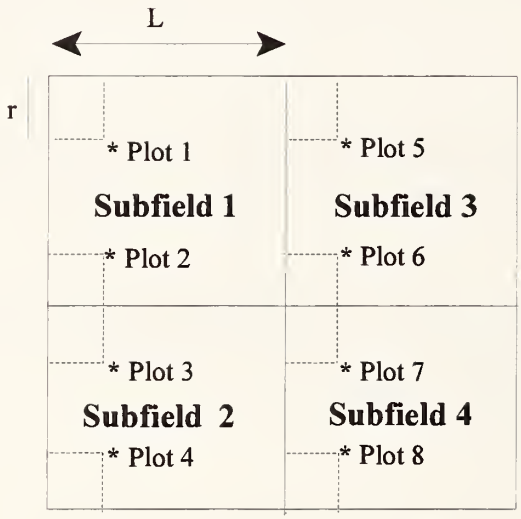
To locate plots within the field:

The field is broken into equal sized subfields, the number of subfields equal to ½ of the total number of plots to be located within the field. Thus if there are 8 plots to be located in the field, 4 equal-sized subfields would be identified, and two plots would be located within each subfield. The outside length, L, of a subfield is determined, and a random number, r, is selected such that $0 < r < L$.

The first plot is located a distance of "r" from the field corner in both directions (along the edge of the field and into the field). The second plot is located in the same subfield, the same distance, r, along the edge of the field, and a distance L-r into the field. Thus plots 1 and 2 are in the same subfield, at adjoining corners of that subfield. In a square subfield, this gives all locations within the subfield a chance to have a plot fall within it.

The next two plots are located within the second subfield in a similar manner as the first two plots were located within the first subfield. This process continues for all subfields and plots.

Example with 8 plots per field.



The plot size is determined by a metal frame that forms a circle of 1.11 square meters and is used for crops such as wheat. The plot for row crops is 3.33 meters in length. All plants within the plot are cut, dried, harvested, and weighed.

The average grain weight from wheat from the sample plots is multiplied by 600 to get a yield per mu. The 1.11-square-meter plot size is 1/600 of a mu. The sampled field production is estimated by multiplying its measured field size by the estimated yield.

The grain production for the village, however, is based on the village records of area planted to the crop, not the measured area. The village registered area is used to avoid disputes with the farmers and local authorities.

The yield per measured mu is converted to a yield per village registered mu by dividing the total estimated production of the sample fields by the registered mu of the sample fields. The yield per

registered mu is then multiplied by the number of registered mu in the village planted in the crop of interest. The registered mu are what the village would have reported for the "Complete Reporting System."

The sample village production data are then used to derive the county's production -- again using the county-level crop area as reported by all villages in the county. Provincial estimates of production are derived in a similar fashion using reported county crop areas.

The National Agricultural Yield Sample Survey primarily provides a measure of yield. The production estimates from the village up to the provincial level are based on acreage estimates as reported by the villages under the complete reporting system.

Estimation. After the crop cutting results have been compiled, the directors of the prefectures (cities governing 4-6 counties) and agricultural experts review the data. If results for a county appear unreasonable, they are reviewed in more depth.

When the provincial data are submitted to Beijing, the results are sent back to the local governments in the province and also released to the public.

If the Beijing office questions the provincial data, a team will be sent to the province to review all data in detail and to make sure computations were correct.

There is no pre-determined date for publication. The results are released when completed and may be delayed if weather affects the crop cutting timing.

The provincial offices make early-season forecasts using mathematical models based on weather and crop moisture and conditions reported by the Ministry of Agriculture.

Issues about NBS National Yield Survey. Three points came out in discussing the sample and survey procedure with NBS officials at the province level.

- It is difficult to determine the actual planted area. There is the issue of the traditional mu vs. the standard mu. Li Ting Jun (1995) also reviews these difficulties.

- Parcels are small in terraced areas -- it is difficult to verify the presence of all of them.

- Independent samples of villages are selected within the sample counties for each crop and also for household and rural economic surveys. The NBS would like to learn how to select one sample of villages to meet all survey requirements.

- It is not clear how the sample data are weighted to obtain the county and then the provincial production estimates. If each level of the sample is selected with probabilities proportional to size, the average yields could be self-weighting. However, the production estimates still depend upon the village-level acreage data.

Evaluation of NBS National Yield Survey. The number of sample plots harvested in each field is excessive. Given the small field sizes and their uniformity, 2 plots may be sufficient.

The measured field areas used in the sample selection and used to derive the yield per mu should be used to estimate the harvested acres. This could be done by using the ratio of measured mu to registered mu to adjust the county-level estimates of reported acres.

Sampled County Estimated Acres $\hat{Y}$ in wheat

Measured village wheat area yi (M villages)

Registered village wheat area $\varkappa i$

Registered county crop area X

$$\hat{Y} = \frac{\sum_{m} yi}{\sum_{m} \varkappa i} X$$

A similar ratio could be used to adjust the reported provincial area by the ratio of the sampled county's adjusted areas to their reported areas. The question still remains about the weights to use to combine village acres to the county, and county acres to the province.

Consideration needs to be given to rotating the sample counties. The presence of the survey team for such a long time may have resulted in the 857 sample counties no longer being representative.

An analysis of variance needs to be done to evaluate the relative distribution between the number of counties and sampling within counties. It could be that a larger sample of counties is needed.

An area sample using point sampling needs to be considered.

2.0 Ministry of Agriculture

The Ministry of Agriculture's (MOA) Department of Market and Information has a statistical system that is operated independently of that run by the NBS. The MOA has an "overall survey" which, like NBS's "Complete Reporting System," is an accounting system from the village step by step up the line. The MOA has also implemented a sample survey again following the NBS approach of selecting counties, villages within counties, etc. One primary difference between the NBS and the MOA systems is the amount of control each has over the various procedures. The MOA has administrative control over the

provincial and lower level offices and gives them the data requirements and methodology. However, each governmental unit has considerable autonomy in how they carry out the work for the MOA.

2.1 MOA Overall Survey

The MOA sends several reporting forms each year to the provincial agricultural offices. Each province sends the forms, instructions, etc., to the prefectures, which in turn send them to counties, counties to townships, and townships to villages. At each step, additional items for local use may be added. The survey content is seasonal -- fall-winter crop planted area, spring-sown area, summer grain and oil crop sown area and production, spring wheat production. Two surveys are usually made for each item, the first to obtain a projected figure, the second the final figures. The MOA also utilizes one reporting form (Rural Data Card) which it sends directly to counties, bypassing the layers of government in between. Since the "overall survey" system only provides aggregated data up to the next level, the MOA uses the Rural Data Card to analyze conditions at the county level. Counties provide this information directly back to the MOA. The information includes: population, labor force, arable land, rural income and expenditures, value of production, machinery inventories, and animal and fishery data.

Appendix B shows the schedule of reports by month for the "overall survey" as well as their sample survey. It is clear that both systems are in place for internal policy making purposes. The early- season forecasts have not been released to the public. Other data (non-forecast) are released to the public, but not on a scheduled basis.

The MOA experienced problems with its "overall survey" that paralled those the NBS encountered with its "Complete Reporting System." For example, no household data were available for analysis. A more serious problem was that as the data passed through each bureaucratic level, there was a risk of interference with the data if they did not agree with previously prepared plans. Accuracy with the village system also suffers because village leaders have difficulty compiling data from individual households. There is also concern the local governments interfere with the annual reports to favor local interests. This can lead to an over-estimation. In spite of these problems and inefficiencies, the "overall survey" -- like the "Complete Reporting System" -- continues to be used.

2.2 MOA Sample Survey System

Details about the sample design follow. However, one point of concern is that while procedures are in place at each level, each level does its own sample selection. Each province selects the counties. The selected county selects the villages (Note: a visit to Hubei Province revealed that the county selected the township, which in turn selected the villages). For the sample village, an enumerator (investigator) is hired. This investigator selects the sample households within the village. The investigator is selected by the village leader and must have a middle high school education.

2.21 Selection of Counties within the Province

- Counties are arranged in ascending order based on the last 3-year-average grain production.

- Sampling interval is determined so that 20-30 percent of the counties are selected. "Equal distant" sampling method is used beginning with a random start (systematic sampling). Currently 667 counties are designated as sample counties. This is similar to the method described by Zude Xian (1997).

- Selected counties are identified on a map. If counties are clustered, alternate counties are selected going (plus) or (minus) the sampling internal until the provincial statisticians are happy with the sample.

- The same sample of counties is used for 10 years. However, each year statisticians re-compute a new 3-year average and examine the "representativeness" of the sample. They will add and delete sample counties using this process.

- There is no coordination with NBS in selecting the sample counties. There will be some overlap between MOA and NBS sample counties. In other words, some counties have survey teams for both the NBS and MOA.

2.22 Selection of Villages Within County and Sample Households

Each county selects a prescribed percentage of its villages following the procedures described above. The 3-year-average production is used to array villages in ascending order, then, using a systematic selection process, the sample of villages is selected. This is followed by a review of "representativeness."

2.23 Selection of Sample Households

Households are listed by the enumerator (investigator) with no ordering. A systematic sample is selected. A sample household can remain in the sample for 10 years. (Note: a sample household visited in Hubei Province had been in the survey 9 years.)

2.24 Yield Forecast/Estimates for Sample Household

The county has a choice of four methods and can choose the method which fits the situation.

1) Theoretical Estimate - Five plots/spots are observed in the field and heads/ears are counted. A standard head/ear weight is applied.

2) On-the-Spot Cutting - This method is used for final pre-harvest yield estimates. Procedures follow NBS crop cutting methods.

3) Experienced Farmer Estimates - An "older" village resident visits the sampled household fields and estimates a yield for each crop.

4) Farmer Conference - The same as #3, except it involves several farmers.

Acreage data from the household samples are not used to estimate the village acres. Village records of crop acreage are used instead. The same holds true as village yield moves up to township, township to county, etc.

This method of estimation relying on village records of crop areas is the same as that followed by the NBS.

2.3 Evaluation of MOA Methodology

The overall survey suffers from the same inadequacies in the NBS "Complete Reporting System." The overall survey results are also subject to manipulation at each layer of government.

A major weakness is that no individual household information is available and that village totals can be subject to considerable error. The reliance on village records for crop area presents a serious problem.

The MOA lacks overall control over methodology followed by each layer of government in the operation of the sample survey of counties.

3.0 Review of NBS and MOA System

The agricultural statistical system in China contains duplication between the NBS, the MOA, and the many layers of government from household to the national level. This prevents the optimal use of the limited statistical resources and results in more than one set of production numbers at the different levels of government. Both organizations see a need to improve their systems and are requesting assistance from the USDA.

Although the NBS and MOA have both implemented sampling methodology, they both depend upon the village estimates of crop area to determine crop production. While both the NBS and MOA have implemented procedures to more accurately measure crop yields, they both rely upon village cropland data despite recognized shortcomings. The crop yield sample survey is an improvement over the Complete Reporting System, but it includes only selected crops.

The recently completed Census of Agriculture provides the foundation to integrate statistical requirements for all levels of government and to implement a unified program of surveys and estimates.

4.0 Recommendations for the Future

With resources for agricultural statistics becoming more scarce, many efficiencies could be gained by removing the duplicate activities between the different departments at national and other levels of government.

The U.S. and Canada at one time had a system where State and Provincial Governments, respectively, duplicated statistical services of the national government. Starting in 1917, the USDA began forming cooperative agreements (Vogel, 1995) with State departments of agriculture to combine statistical resources and, most importantly, to agree on one set of official statistics for each State. A similar step was

taken in Canada with the enactment of the 1918 Statistics Act (Trant, 1998).

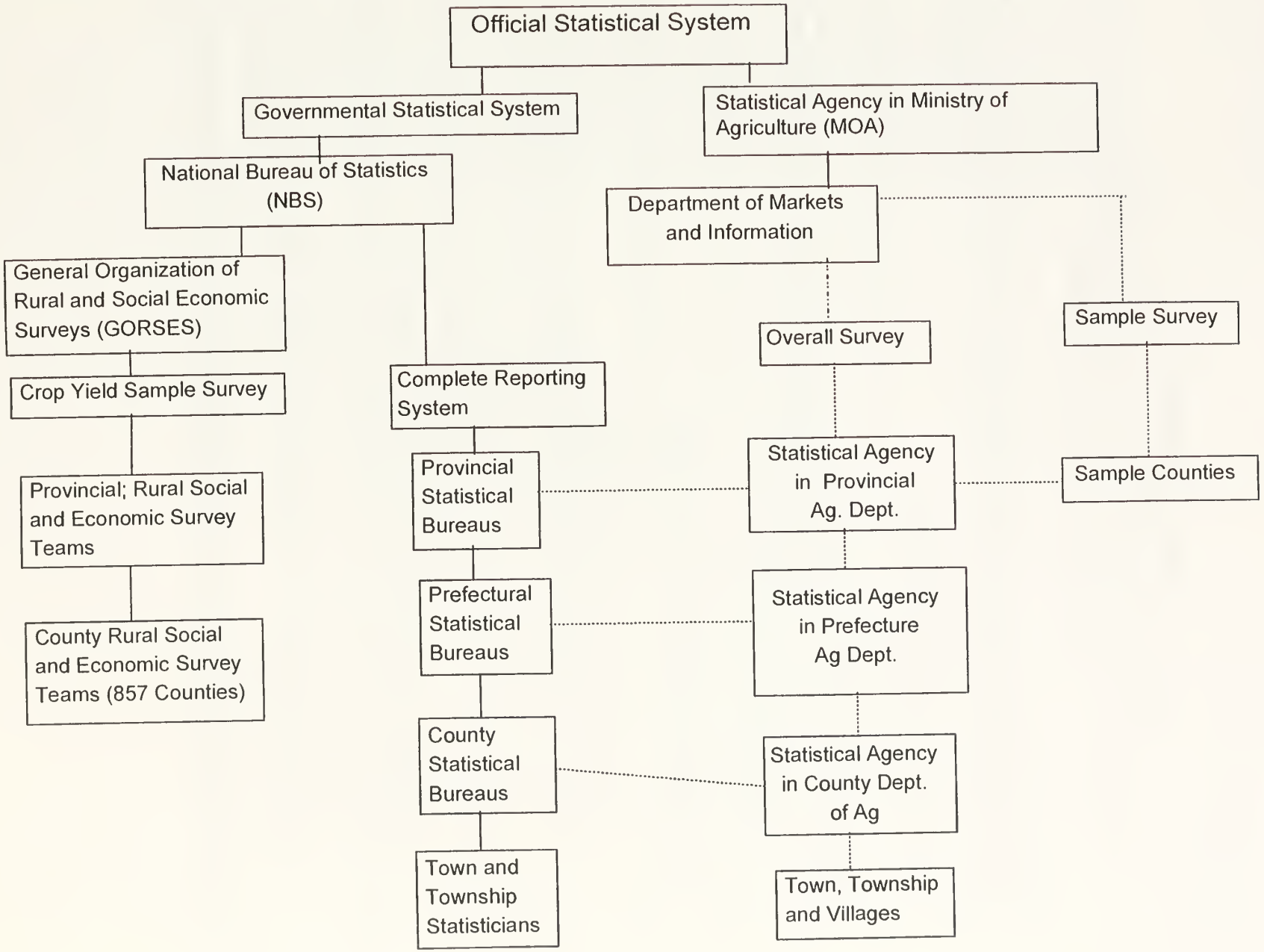
China is a large, complex country with a wide range of needs for agricultural statistics. One need is for early-season, national-level measures of crop area and potential production to make efficient use of world markets. On the other hand, China also needs micro-level data about the structure of the farms and the welfare of the rural households for sound policy making purposes. These two data uses present the need for two well-coordinated statistical systems and methodologies.

- National Area Frame Sample Survey. Carfagna (1998) points out many alternative area frame sample designs that could efficiently provide rapid estimates of area under crop production. Optimally, the sample should be designed ignoring provincial boundaries. The purpose should be to provide national-level estimates only, as early in the season as possible and as quickly as possible. A well-designed area frame will provide efficient measures of change, and is robust to the effects of agriculture's rapidly changing structure.

- Annual Sample Census. The recently completed Census of Agriculture should be used as the foundation for an annual sample survey of households that would provide an annual inventory of land use, crop production, livestock inventories, and farm household characteristics. As the farm economy develops, there needs to be means to update the census list of farms as holdings are consolidated and the growth of joint enterprises leads to large-scale production. Full consideration should be given to making the first stage of selection at the township or village rather than at the county level. There are many approaches to a design for a sample census; David (1998) describes what has been done in the Philippines.

China's agricultural statistics program could be significantly improved by phasing out the Complete Reporting and overall Survey Systems because of the inadequacies pointed out by Zhu (1998), Gong (1989), and Zhang (1996).

Appendix A: Overview of National Bureau of Statistics and Ministry of Agriculture Organizational Structure for Agricultural Statistics



Appendix B

People's Republic of China
Ministry of Agriculture Report on Crop Production

Department of Market and Information

Time	Content of Survey	Methods of Survey
January	Estimated Planting Intentions of Sown Area of Crops	Sampling Survey
February	Agriculture Statistics Annual Report Coarse Cereals Production Vegetable Production	Overall Survey Overall Survey Overall Survey
March	Survey on Households' Production Input Survey on Production, Marketing & Stocks of Grain	Sampling Survey Sampling Survey
May	Production of Summer Grain and Oil Crops Survey on Spring Sown Area	Sampling Survey Overall Survey
June	Production of Summer Grain and Oil Crops Production of Early Rice and Spring Wheat	Overall Survey Sampling Survey
July	Estimated Crop Sown Area for the Whole Year Production of Early Rice and Spring Wheat Survey on Aftermath of Crop for the First Half of the Year	Sampling Survey Overall Survey Overall Survey
August	Estimated Crop Sown Area for the Whole Year	Overall Survey
September	Estimated Yield of Major Cash Crops and Early Rice Production of Autumn Grain and Oil Crops Output	Sampling Survey Sampling Survey
October	Estimated Yield of Crops in Northern China for the Whole Year Production of Autumn Grain and Oil Crops Area	Overall Survey Sampling Survey
November	Estimated Yield of Crops in Southern China for the Whole Year Estimated Autumn and Winter Crop Sown Area in Northern China Estimated Autumn and Winter Crop Sown area in Southern China Aftermath of Crops	Overall Survey Overall Survey Sampling Survey Overall Survey
December	Autumn and Winter Crop Sown Area in Southern China	Overall Survey

References

Carfagna, Elisabetta (1998). Area Frame Sample Designs: A Comparison with MARS Project. Paper presented at "Agricultural Statistics 2000," an International Conference on Agricultural Statistics, Washington, D.C., USA

David, I.P. (1998). Sampling Strategy fro Agricultural Censuses and Surveys in Developing Countries. Paper presented at "Agricultural Statistics 2000," and International Conference on Agricultural Statistics, Washington, D.C., USA

Gong Jianyao (1989). China's Crop Yield Survey and its Methodology. Invited Paper presented at the 47th session of the International Statistical Institute, Paris, France

Li Ting Jun (1995). Practice and Research on crop cutting surveys. Paper presented at the 50th session of the International Statistical Institute Beijing, People's Republic of China.

National Bureau of Statistics (1995). A Guide to Statistical System in China. National Bureau of Statistics, Beijing, PRC

Sun Chuanzhong and Xu Zhiquan (1995). Unpublished paper, Food and Agricultural Statistics Center, National Bureau of Statistics, Beijing, PRC

Trant, Michael and Whitridge, Patricia (1998). Integration of Administrative Data with Survey and Census Data. Paper presented at "Agricultural Statistics 2000," and International Conference on Agricultural Statistics, Washington, D.C., USA

Zhang Xinmin (1996). Present situation and trends of Chinese Agricultural Development. Proceedings of U.S. Department of Agricultural Outlook Forum, Washington, D.C., USA

Zhu Xiangdong (1998). Agricultural Census and Improvement of Rural Statistics in China. Paper presented at "Agricultural Statistics 2000," and International Conference on Agricultural Statistics, Washington, D.C., USA

Zude Xian (1997). Illustration of Balanced Systematic Sampling. General Organization of Rural Social-Economic Survey, National Bureau of Statistics, Beijing, PRC

Vogel, Fred A. (1995). The Evolution and Development of Agricultural Statistics at the United States Department of Agriculture. Journal of Official Statistics, Vol. 11, No. 2, 1995, pp 161-180.

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