

## **SOURCES OF DISCONTINUITY AND UNCERTAINTY IN CHINESE AGRICULTURE DATA**

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National governments have been collecting economic data series for centuries and using them for developing and implementing plans, policy analysis, program evaluation and justification. Statistical information, once made public, provides tremendous benefits to the economy because economic agents use the information to make better-informed investment, production, and consumption decisions. However, the benefits achieved from collecting and publishing economic statistics is directly proportional to the accuracy of that data. Inaccurate data may lead to poor political and private decision-making process, leaving some agents potentially worse off. Despite modern data collection practices, no country is immune to errors in the collection and reporting of economic statistical series. It is also true that the economic importance of a country in the global economy is positively related to the costs and benefits of generating accurate economic data.

China is the most populous and the third largest country in terms of physical land mass. It is likely that China will become one of the world leaders in generating economic value in the near future, and with China's entry to the WTO, China's influence on international markets can only be expected to increase. Since the introduction of economic reforms in China in the late 1970's, China's economy has become one the most dynamic and rapidly changing economies on the globe, increasing the difficulties associated with the collection of statistical data and the importance of generating accurate data. Given China's position in the global economy, it is of concern that the quality of economic data published by the Chinese National Bureau of Statistical (CNBS) and other government agencies has come under increasing scrutiny from researchers within China and in the international community. Initially, attention focused on agricultural land figures and livestock production and consumption statistics, but more recently questions have been raised about the accuracy of several macroeconomic indicators. Even Premier Zhu Rongji expressed concern about the veracity of China's official statistics in March 2000 at the National People's Congress (Parpart). The Chinese government recognizes these problems and has taken significant steps to improve the quality of official statistics. While the quality of data is improving, researchers and government analysts must understand and work with official data, which may still have quality problems.

The purpose of this paper is to provide a brief summary of recognized problems in China's agricultural statistics and to discuss the options open to researchers for

addressing these data discrepancies. Though data inaccuracies have a multitude of repercussions for analysis of China's economy and economic policies, the scope of this paper is limited to the implications for modeling and forecasting China's agricultural sector. By alerting researchers to potential difficulties in using China's published data, the authors hope to foster prudent use of Chinese statistics for agricultural research and analysis and to motivate others to devote intellectual energy to developing better methods for addressing China's data problems in the short to medium term. The remainder of the paper is divided into three sections. We begin by providing some relevant stylized facts about China's agricultural sector and by describing the data collection process in China. Next, we point to discrepancies in published statistics and suspected sources of the inaccuracies. Finally, we examine how these statistical discrepancies affect efforts to model and forecast China's agricultural production, consumption, and trade.

### **China's Agricultural Statistical System**

One of the most frequently cited facts concerning China's agricultural situation is that China has more than 20 percent of the world's population but only 7 percent of the world's arable land (FAO). Nevertheless, many countries have far less available arable land, measured by the number of people per hectare of arable land available for agriculture production. Table 1 displays the population per hectare of arable land for several countries. Australia, Argentina, United States, Brazil, and Thailand have a large amount of arable land to support their populations; consequently, these countries are significant exporters of various crops. China has 10.3 people per hectare of arable land, which is more than double the amount of arable land available in Egypt and almost three times more than in South Korea or Japan.

The development of China's agricultural production and marketing system over the last half century has greatly influenced the statistical collection process. In particular, the collectivization of agriculture facilitated the use of a statistical reporting system based on production units. The fact that the government controlled the marketing and distribution of most agricultural products also facilitated centralized collection of data regarding food sales in urban areas. However, as the basic unit of production changed from the work team to the household and food marketing moved increasingly into the hands of private traders, the

accuracy of data collected from the reporting system suffered, forcing a greater reliance on survey data.

Table 1. People per hectare of arable land

| Country        | People/Ha. | Country     | People/Ha. |
|----------------|------------|-------------|------------|
| Australia      | 0.4        | China       | 10.3       |
| Argentina      | 1.5        | Indonesia   | 11.6       |
| United States  | 1.6        | Vietnam     | 13.4       |
| Brazil         | 3.2        | Bangladesh  | 16.6       |
| Thailand       | 4.2        | Egypt       | 23.5       |
| European Union | 5.1        | South Korea | 27.3       |
| India          | 6.1        | Japan       | 28.2       |

Source: United Nations, FAO, Year 1999

### *China's Data Collection Procedures*

The Chinese National Bureau of Statistics (formerly called the State Statistical Bureau or SSB) is China's official statistical agency and is responsible for the release of all national statistics. The CNBS works closely with other ministries, such as the Ministry of Agriculture (MOA), by comparing and discussing statistics obtained from various institutions. The MOA collects more detailed statistics on agriculture and the rural economy than the CNBS. The major annual CNBS publications used by agricultural economists for conducting research are the *China Statistical Yearbook*, *Rural Statistical Yearbook*, and the *Rural Household Survey Yearbook*. The major annual MOA publication is the *Agriculture Yearbook*. In addition to this publication, there are a number of annual publications on different sectors of the agriculture economy, such as the livestock industry.

Several authors have outlined China's statistical process and how that process has evolved since the creation of Peoples Republic of China (PRC) as economic and political conditions have changed (Tuan and Crook; Barker, Sinha, and Rose; Vogel). The first official government data was published in the early 1950's. In the initial years of the PRC, collection and dissemination of statistical data was not well developed, especially at the national level. A national system for collection of statistics was established August 7, 1952 by the formation of the State Statistical Bureau (SSB). The SSB was intended to be the primary statistical agency in the PRC. The SSB collected data, analyzed statistics, and published official statistics.

Beginning with the first 5-year-plan for the years 1953 – 1957, China's economy was governed by state-planned system that continued until the late 1980's. Under the

central planning system government officials recognized the importance of obtaining agriculture data for planning and implemented statistical programs for agriculture early in the 1950s (Vogel). Agriculture was the largest sector of China's economy in early 1950's. Between 86 and 88 percent of the China's population lived in rural areas in the 1950s, and 31 percent of the total population was employed directly in agriculture (Crook, 1988; Colby, et al., 1992). The primary purpose of the government's statistical programs was to provide information to monitor how well the central government plans were being implemented at the national, provincial, prefecture, county, and commune levels. The plans implemented included 5 year, annual plans, and others based on special needs or sectors (Tuan and Crook). Village production teams were responsible to collect, compile and aggregate statistics before passing them up through the administrative levels from village to township, county, prefecture, province and finally to the national level (Vogel). This system was called the Complete Reporting System. A major change in this system occurred when economic reforms were introduced in the late 1970's. The new system, dubbed the Household Responsibility System (HRS), leased plots of land to individual households and allowed farmers to determine which crops to produce, as long as they could provide a minimum quantity of particular commodities to the government. De-collectivization and implementation of the HRS reduced the accuracy of the Complete Reporting System because the 5.6 million production teams were effectively replaced with over 200 million rural households as statistical reporting units (Vogel).

In addition to the hierarchical data collection through of the Complete Reporting System, the SSB conducted urban and rural household surveys to provide additional input for developing the government's five-year plans. The first household surveys were conducted in 1955 and 1956. The urban and rural household survey system, as well as the Complete Reporting System, was interrupted by the "Great Leap Forward" in the late 1950s and the Cultural Revolution. The last household surveys before the Cultural Revolution were conducted in 1965 (Fang, et al.). Urban and rural household surveys did not fully resume until 1980, although some initial survey work did begin in 1977-1978 (Bramall).

The next major change for the urban and rural household survey occurred when the Statistics law of the People's Republic of China was enacted in December 1983. The law was established to improve the statistical surveys and led to the formation of the Organization of Rural and Social Economic Survey within SSB. A similar organization was created for the urban surveys (Vogel). By end of 1985, both teams were operational.

The emphasis on data collection solely to facilitate government planning began to change in the mid 1980s.

As government policies were enacted that moved the system away from a command economy toward a socialist market economy, the importance of particular statistics also shifted. For example, instead of focusing heavily on agricultural production statistics, greater importance was placed on statistics that provided a better understanding of the changing economy and rural and socio-economic development. Up to 1993, the major contents of the rural household survey were comprehensive indicators such as: household size and location, use of electricity, population, labor force, land, housing, major fixed productive assets, agricultural production and sales, grain balances of rural households, income and expenditures, per capita food consumption, and the number of durable consumer goods owned (Fang, et al.). Since 1993 both urban and rural household surveys have been substantially amended to include numerous variables in the survey questionnaire. From 1993 through 1998 an additional 400 variables were added the rural household survey to capture information about the changing economy that is useful to the government in understanding these changes.

Operating independent of the CNBS, the Ministry of Agriculture (MOA) also collects rural and agriculture data. The MOA also utilizes the Complete Reporting System and household survey to develop agricultural data, but the MOA does not have authority to release rural statistical data. In 1993 the government stated that the MOA is the decision making body for rural economic policies and the SSB is responsible for collection, supervision, and release of rural statistical information (Cao). In addition to the CNBS and MOA, numerous other agencies also collect statistical information on the rural sector, which leads to significant overlap. The major difference between the MOA and CNBS statistical systems is that the MOA does not have its own personnel located at the different government levels, thus wielding less control over these government units. It should be noted that even though CNBS has official responsibility for release of official government statistics, both CNBS and MOA compare their collected statistics, and they communicate with each other prior to the release of official government statistics. Nevertheless, the CNBS has the final decision over the numbers.

### **Examples of China's Data Problems**

The quality of Chinese statistics and the reasons for inconsistency have varied over time. Some agriculture statistics have a long history of inaccuracies, while others have developed more recently. Some statistical

inaccuracy is caused by the statistical procedures used, but more important reasons depend on economic incentives and rent seeking. The source of many of China's statistical quality problems lies in the structure of institutional arrangements and the administrative system. Under the Complete Reporting System, there are opportunities for manipulation or exaggeration of the data at each governmental level to achieve personal gain or appease superiors at the next level. This is particularly true when high-level officials use statistical data as an evaluation tool for determining the promotion of lower level officials. The statistical inflation most likely occurs because of administrative pressure and is more likely to occur in the poorest and less developed regions as local level officials seek to meet official goals (Cai).

### *Macroeconomic Data Issues*

The primary macro economic variables used in agriculture economic models are gross domestic product, consumer and producer price indexes, and demographics variables, including total population and the break down of population into rural and urban components. Depending upon the research objective, employment, labor migration, exchange rates, and other variables may be included. Because of the prominent role played by income in determining consumption, GDP growth is often the most important macroeconomic variable in agricultural models. Recently, China's GDP figures have been called into question. In China the sum of the parts can be greater than the whole—at least when it comes to the growth of the economy. For several years economists have observed that almost all provincial GDP growth figures are higher than the national growth (Parpart). For example, every principal administrative region, except one, reported economic growth rates of 8% or greater in 1998, while the national economic growth rate was 7.8% (Cao). In February of 2002, China released a GDP growth rate of 7.3 percent, which was lower than the economic growth rates declared by all provinces except Yunnan (The Economist). CNBS sample surveys for GDP growth in 1995 indicated that the national rate was 3 percent less than the rate derived from provincial GDP growth (The Economist). The difference lies in the fact that the series are collected by two different agencies using different methods. Recent research indicates that both sets of GDP level and growth rates do not appear to be accurate. According to Rawski (2001), national cumulative GDP growth from 1997 to 2001 was no more than one-third the level published by CNBS.

Inaccurate GDP levels and growth rates at both the provincial and national level have large implications for determining the level of unemployment and labor

migration within China, especially because potential improvements in income is a major cause for migration. The veracity of these economic variables have also been questioned in the past decade and a substantial amount of research literature now exists which indicate improvements are needed.

The number of people employed in agriculture, number of migrant agriculture workers, population living in rural and urban areas are quite important and especially the rate of change for these variables over the past decade. Official Chinese data for the number of farm workers may be greatly overstated with a margin of error exceeding 100 million workers (Rawski and Mead). The research also indicates that population of farm laborers has decreased at a faster rate and at a larger scale transferred in to non-agriculture occupations. By overstating the population of farm labor, research on agriculture productivity will be inaccurate and may be understated because labor intensity is actually less. Other research areas, which may be affected by inaccurate data on number of farm workers, are studies on income distribution, labor migration, changing consumption patterns in rural areas, and poverty alleviation in rural areas.

Another area of major concern by researchers is the accuracy of reported trade data. This problem exists not only with developing countries, but also developed and even United States and Canada. In 1996, the US reported a trade deficit of \$39.5 billion with China while China data reported the deficit to be \$10.5 billion, a difference of \$29 billion. The major reason for the large difference is how commodity origins were identified when they transshipped through Hong Kong from China to US and from the US to China through Hong Kong (Feenstra, et al.). Also results using trade data in analyzing competitiveness and changes in trading patterns can be quite difficult, and may lead to misleading results.

It is important to note that the government of China recognizes the statistical methodology can be improved and are working toward this. It is also important for researchers using Chinese official statistical data series to understand China is a country under going a fast rate of change with respect to many aspects of their economy, political institution, sociological conditions, and adoption of new technology. Research by Ravallion and Chen shows that the government methods for obtaining data through surveys has not kept pace with changes and structural transformation occurring in the rural economies. However, the authors note that the quality of the raw data from China's Rural Household Survey is quite good.

### *Crop Area Data Issues*

Crook (1991) and Smil note that reported production levels appear near actual amounts, but appear to be based on underreported area. Researchers in China and abroad have generally believed cultivated area in China was underreported. From an economic point of view, there are numerous reasons why Chinese landowners, farmers, and officials might underreport the land area available to them for cultivation (Smil). Farmers have historically underreported cultivated area since ancient times to reduce taxes paid to the local government. Similarly, local officials have misreported tillable land to create a more equitable distribution of taxes paid on land area. Recognizing the variation in land quality, the cultivated area reported by local officials may be based on actual area, but may reflect the productive equivalent area in terms of a standard land quality. For example, if a farmer had 1.3 mu (15 mu = 1 hectare) of poor quality land, which was as productive as 1 mu of good quality land in that region, then the farmer's 1.3 mu would be officially recorder as 1 mu. Therefore, the area was underreported by 23 percent. This practice also increases all the yields to the levels of good or high quality land, overstating actual yields. The common multiples used were between 1.25 to 1.5 mu of poor quality land to 1 mu of good quality land. Under the communal farming system, communes might want to reduce reported area cultivated in order to reduce their state production quota. With a lower quota, less of the commune's grain is sold to the government purchase stations and taxes are lower. At the same time, commune leaders might want to match and surpass state-planning production levels in order to receive recognition; therefore, yields might be inflated.

Based on surveys conducted at the time, inconsistencies in China's cultivated area were first documented in the 1930s. The surveys also indicated that yields were overreported (Crook 1993). A number of different surveys and studies using satellite imagery were conducted from 1980 to the present. Several of these studies were reviewed by Smil. The estimated farmland from studies conducted by satellite images and survey vary from the lowest estimate at 131.1 million hectares (mha) to the largest at 143.6 mha, which is a difference of 12.5 mha or about 9 percent. All of the land area estimates are much larger than the official statistics for cultivated area. Government statistics place China's cultivated area at 99.3 mha in 1980 and 94.7 mha in 1995.

Additional evidence of China's underreporting of cultivated area was documented by Wang Tong. He estimated that cultivated land was underreported by

about 31 percent. Interestingly, poor mountainous regions and areas where the main rural economic activity is crop cultivation were observed to exhibit the largest underreporting of cultivated area.

Most China researchers believe that official China statistics on land used for cultivated area was under reported by about 30 percent prior to 1997. This belief was supported by the 1997 National Agriculture Census. Prior the release of the 1997 agriculture census data, land used for cultivated area was reported at approximately 95 mha. This number was changed to 130 mha for 1996 following the census. With the revision of the area data, the CNBS stopped updating the cultivated area figures published annually in the *China Statistical Yearbook*. Recent editions of the *China Statistical Yearbook* report cultivated area for the year 1996 by national total and by province.

Sown area for a number of major crops is used by most agricultural economists in modeling China's agriculture. With the release of the 1997 National Agricultural Census data, the Chinese government did not revise the area sown to agriculture commodities. Sown area has gradually increased but no major revisions have occurred in this data series. In 1996 total sown area was 152 million hectares and by the year 2000 sown area had increased 2.5 percent to 156 million hectares. Some researchers are suspicious of the quality of the official statistics for sown area because they were not revised at the national aggregate level or for individual crops when new information from the agriculture census was made available. The sown area is larger than cultivate area because climatic conditions in many regions of China support cropping practices that yield multiple crops in one year. An increase in cultivated area but with identical sown area implicitly decreases the multi-cropping index.

#### *Livestock Data Issues*

Compared to the research on China's underreported cultivated, discussion of discrepancies in China's livestock inventories, production, and consumption data is quite recent. As late as 1993, researchers believed that stakeholders in the livestock industry had fewer incentives to misreport livestock data because free markets played a larger in the sector (Crook, 1993). In the mid 1990s the USDA Foreign Agriculture Service (FAS) Attaché Office in Beijing began receiving numerous questions about the reliability of published statistics for Chinese meat production. In 1997, Zhong noted that there was growing evidence of significant disparities between meat and egg consumption data derived from Comprehensive Reporting System and statistics generated from household survey data. Zhong

suggested that the data collected by the CNBS in its annual household surveys underreported meat consumption because it did not take into account food consumed away from home, nor did adequately account for the increased consumption of livestock products by migrant workers in urban areas. Fuller et al. also pointed out that the meat production statistics reported by the CNBS were inconsistent with price movements, livestock trade, and feed use estimates.

Aubert and Fuller et al. both made early attempts to reconcile the difference between meat production estimates generated by the statistical reporting system and production implied from household survey data. Both studies developed their estimates based on the premise that CNBS household survey data was the most reliable estimate for livestock product consumption in China. Therefore, consistent production estimates could be derived from the survey data by correcting for underreporting. Both studies found that there was potentially significant overreporting (20-60 percent or more) of livestock production in the Comprehensive Reporting System.

A 1998 USDA-FASonline (1998) article written by a Chinese scholar echoes the sentiment that there was significant overreporting of meat production in China. The author suggested that inflation in the data was driven by the desire of local and regional officials to improve their standing with their political superiors. The report suggested that data inflation was possible for livestock products after 1985 because meat procurement ceased and statistical checks on the output claims by local officials were minimal. Moreover, the government's increased emphasis on the growth in livestock output after 1985 meant that local officials were evaluated, in part, on their ability to meet proscribed production targets.

Colby, et al. (1999) study of China's meat statistics pointed out that meat production in the early 1980s was slightly underreported. At that time the government relied on livestock data collected from various levels of state government and from the state meat distribution system, so the increasing amount of meat slaughtered by private slaughter houses as a consequence of marketing reforms was not captured by the state reporting system. Colby et al. (1999) used data from the Ministry of Commerce to estimate food consumption away from home. These estimates were employed in constructing a third set of revised statistics that suggested overreporting was generally between 25-35 percent (except for beef and mutton). The authors also use their revised data to in a policy analysis model to examine the impacts of the data revisions on meat production and feed use. This exercise highlighted the interaction

between the level of the production data, feed coefficients, carcass conversion factors, and price response.

It was hoped that the 1997 National Agricultural Census would put to rest questions about China's livestock numbers, but the census generated nearly as many questions as answers. The census showed clearly that China's reported livestock inventories and meat production were exaggerated, but there was some disagreement about the accuracy of the census results. The CNBS did revise down animal inventory data for 1996 by 21-22 percent and red meat production data for 1996 and 1997 by 22-28 percent (FAS, 1999). However, the CNBS did not revise data for earlier years, so the new numbers create a break in the data series. The CNBS also did not make any revisions to poultry and egg statistics, which exhibited significant overreporting in data studies. Equally problematic is the fact that meat production and livestock inventories rebounded back to pre-revision levels by 1998, raising suspicions that data inflation is still a serious problem.

The most recent, and perhaps most thorough, revision of China's livestock statistics was developed by Ma et al. This work employed provincial-level data collected during China's National Agricultural Census and information about away-from-home consumption patterns gathered in surveys in 1998. Like previous authors, Ma generates a revised data series for meat and egg production and consumption from 1980 onward. Their estimates are slightly lower than figures computed by Colby et al. (1999), implying a larger degree of data inflation.

The recent research into China's livestock statistic discrepancies provides the following guidelines to modelers and forecasters who use Chinese livestock data. First, the production data generated by the statistical reporting system includes significant inflation, particularly from 1985 onward, so supply elasticities, growth trends, and productivity growth rates generated by this data are biased. Second, household consumption data collected through CNBS household surveys are generally more reliable, but they ignore food consumed away from home. Consequently, demand estimation based on this data is really an estimation of demand for food consumed at home. Increased urbanization and rising incomes have prompted significant growth in away-from-home consumption, and that trend is likely to continue. This fact should be considered in forecasts. Third, revised data series can have some value for modelers who are seeking to ascertain general trends in supply and productivity growth. Unfortunately, the deterministic nature of the process used to construct the revised data series renders them unsuitable for

estimation. In addition, they are one-time revisions that are not compatible with updates generated by the CNBS or any other statistical agency. Consequently, they may not present a viable data alternative for modelers in the medium to long term.

### **Data Problems and China Models:**

In the post-reform period, China has become the world's largest producer and consumer of many agriculture commodities including: rice, wheat, cotton, tobacco, pork, honey, land-based aquaculture, and some specific types of vegetables and fruit. China is also the world's second largest producer and consumer of corn, poultry, and soybeans. According to statistics published by the Food and Agriculture Organization (FAO) for 1999, China share of global production and consumption is staggering for some commodities. For example, China's production of pork, rice, wheat, and corn account for 45.7, 32.8, 19.3, and 21.2 percent of the world total, respectively. China's enormous domestic production and decades of self-sufficiency oriented policies have limited China's historical trade in agriculture commodities to a fraction of total domestic consumption. Nevertheless, China's large population and agriculture production implies that very small changes in supply or demand can have large impacts on world agricultural trade and international prices.

Given the importance of Chinese agricultural markets and their potential influence on international trade, a number of agriculture economic models of China have been built and consistently maintained by both public and private institutions in different countries. The various models differ considerably as a consequence of their intended use, the individual modelers' knowledge of Chinese markets, and access to data and labor resources. A few of the models are computable general equilibrium (CGE) models based on the framework and database developed through the Global Trade Analysis Project (GTAP) (Hertel and Tsigas). CGE models have the advantage of incorporating the complete macro economy, allowing them to capture inter-industry resource flows. However, the cost of this additional information is a higher degree of commodity aggregation. Most models of China's agricultural sector are partial-equilibrium models that provide a great deal of commodity-specific information but treat other sectors of the economy as exogenous (For a comparison of China agricultural sector models see Hjort or Fan and Agcaoili-Sombilla).

Government officials and commodity organizations often use projections from these models to analyze the impacts of various domestic agricultural and trade policies and conduct research on food security for

specific countries and regions. Policy analysis using partial equilibrium models often shapes discussions in the policy formation process. The data problems discussed above raise a number of issues that modelers must consider when generating forecasts with partial equilibrium models or when evaluating the projections generated by other researchers. Failure to exercise appropriate care with the data can have enormous implications. Lester Brown's doomsday projection of China's agricultural situation is a poignant example of how simplistic projections based on questionable data can skew policy debate and research efforts around the globe.

The quality of macroeconomic data is very important for agricultural sector models because income growth is the primary driving force in consumption over the medium and long term. Inflated GDP figures will tend to dampen income elasticities derived from that data. On the other hand, using inflated GDP data in conjunction with accurate income elasticity estimates will cause forecasts of demand growth to exceed likely realizations. Modelers should evaluate whether their macroeconomic growth projections reflect the GDP inflation of the late 1990s and consider appropriate adjustments to income elasticities or consumption projections.

Problems with China's area data have a bearing on a number of important features in China agricultural models. Perhaps the most important issue is the effect that underreported area has on estimates of yield growth potential. As mentioned above, underreporting area would tend to inflate yields. If analysts factor reported yields into their assessment of yield growth potential, underreporting area would tend to bias yield growth potential downward. On the other hand, if estimates of sown area are much more accurate than cultivated area statistics, as Smil suggests, then yields may be reasonably accurate. Modelers should use other data sources to corroborate their yield estimates.

If sown area is indeed reasonably accurate, then the underreporting of cultivated area will inflate the multi-cropping index. The combination of trends in cultivated area, multi-cropping, and yields summarize the growth of output. Mixing reliable production data with less reliable area or yield data will cause one of the three components to exhibit questionable and perhaps untenable properties. When a model explicitly accounts for multi-cropping and cultivated area, researchers must examine the congruity and feasibility of their assumptions regarding the projected path for cultivated area, multi-cropping, and yields to determine whether projected output levels (or growth rates) are viable. Often some compromise between yield growth, multi-cropping trends, and loss of cultivated area needs to be

achieved to generate forecasts that reflect both the underlying trends in agricultural labor movements and technological change while yielding plausible outcomes.

Finally, problems with the China's livestock statistics create the most difficult obstacles to overcome because the data issues affect both the livestock and the grain sector. Modelers can use revised data series to assess the trend growth in meat consumption and productivity over the last decade, but the revised data is not suitable for data estimation. Consequently, demand elasticities should be derived from household survey data. One way to improve consumption forecasts is to explicitly account for away-from-home consumption. Studies are currently under way that should yield demand parameters that will be useful for this task. Good estimates of livestock product supply elasticities are not currently available, so modelers will have to continue to rely on revised data trends and good judgment in the short run. Production studies that utilize survey data are needed.

Feed demand estimates are also greatly influenced by the inflation in China's livestock statistics. Modelers have often used unrealistically low feed conversion rates for Chinese livestock because little was known about actual conversion rates. Moreover, feed demand estimates using more conventional conversion rates were not consistent observed feed use. Recent research has shed much light on feed conversion rates in China, providing more guidance for modelers (Fuller et al.; Wailes et al.). However, using more accurate feed conversion rates with inflated production or inventory data will generate implausible forecasts for feed use. As with area and yields, modelers must assess their livestock production data, feed conversion parameters, and productivity growth rates as a whole to determine the mix that is most consistent with underlying structural change in China's livestock sector, known feed conversion, and realistic future outcomes.

## Summary

China's transition from a command economy to a market-oriented economy has altered the importance of economic statistics collected and published by China's National Bureau of Statistics. Data collection methods that were appropriate for a centrally-planned economy have not evolved rapidly enough to accommodate changing economic and political incentives. Consequently, several inconsistencies have appeared in China's macroeconomic and agricultural data. In this paper we briefly summarized the body of research that has developed over the last two decades to understand the nature of the data discrepancies, particularly discrepancies in GDP, cultivated area, livestock product

output. Users of Chinese statistical data need to be aware of the quality issues and the impacts the discrepancies will have on their analysis and forecasts. The discussion above points to some of the pitfalls that analysts may encounter in using China's published statistics and to ways to address or adapt to particular issues. In the short run, additional research is needed to develop better data estimates and techniques for handling existing data discrepancies. The only viable long-run solution, however, is for the CNBS to eliminate the discrepancies at the source. Fortunately, great strides have already been made to this end. Cooperative efforts between the Chinese government and several organizations in the international community hold great promise for continued progress toward developing methodologies that generate accurate data for China's economy.

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