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Livestock Production and Feed Use by Rural Households in China: A Survey Report

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Abstract

This report documents data and other information gathered from a survey of rural households in China. The survey was conducted as part of a research project aimed at assessing the potential for meat and feed grain exports to China. Responses to the survey questions provide information about grain and livestock production practices, costs of production, animal inventories, and feeding practices. The report describes the survey and collection process, summarizes selected data from the survey, and provides anecdotal information about livestock production and marketing in Chongqing, Sichuan, Shandong, and Jilin provinces.

Key words: China, cost of production, feed use, livestock marketing, livestock production, surveys.

LIVESTOCK PRODUCTION AND FEED USE BY RURAL HOUSEHOLDS IN CHINA: A SURVEY REPORT

Introduction

This report documents data and other information gathered from a survey of rural households in China. The survey was conducted in 1999 as part of a research project aimed at assessing the potential for meat and feed grain exports to China. This research was funded by the United States Department of Agriculture (USDA) through the National Research Initiative Competitive Grants Program (NRICGP). A primary objective of the research proposal was to construct a consistent time series for meat production and consumption in China. More accurate estimates of historical meat production and consumption growth would enable researchers to better model and evaluate the potential for U.S. meat and feed exports to China.

The purpose of the survey of rural households was to collect primary data that could be used to address the problems related to the obvious discrepancies between China's livestock production and consumption data (Fuller, Hayes, and Smith 2000; Colby, Zhong, and Giordano 1999; Aubert 1998). Three key areas of uncertainty in the data were investigated in the survey. First, Zhong (1997) and others have conjectured that the household food consumption survey data collected by the National Statistical Bureau (NSB, formerly the State Statistical Bureau) in China underestimates actual food intake, because it does not adequately capture food consumed away from home. Several questions in the rural household survey were directed at food consumption in and out of the home to determine whether the NSB data does, indeed, underestimate food consumption. The household consumption data are not discussed in this report but are described in a companion report (Huang, Ma, and Fuller forthcoming). Second, several survey questions

targeted the change in animal inventories, production, and slaughter weights over the period from 1992 to 1997. The objective was to obtain information that would be helpful in evaluating the growth in animal inventories and meat production reported by the NSB. Third, questions were asked about animal rations and feed use. The purpose of these questions was to establish average feeding practices for backyard producers that would provide a basis for assessing past and future feed use in China. Moreover, a better understanding of feeding practices would enable researchers to check the plausibility of historical feed use estimates, given current livestock statistics.

The remainder of this report is organized as follows. The next section describes the survey and the collection process in greater detail. The description of the survey is followed by a brief summary of selected data for the swine sector. These summary statistics are followed by several anecdotal accounts gathered through conversations with officials, farmers, and participants in the livestock product marketing chain during the data collection process. These anecdotes provide additional evidence that has a bearing on the project objectives. The report concludes with remarks that place the survey data in the context of ongoing research.

Survey Description

Survey Scope and Implementation

The survey was conducted as a joint effort between researchers at the Center for Agricultural and Rural Development (CARD) at Iowa State University and researchers at the Chinese Center for Agricultural Policy (CCAP) in Beijing, China. The rural household survey was one of four surveys conducted by CARD and CCAP staff as part of the NRI project previously described. Other surveys collected data about urban food consumption, markets for livestock products, and village and township agricultural production data. The data collected in the rural household survey were concentrated in

five major areas: household demographics, household food consumption, livestock production and costs, feed use, and marketing practices.

Researchers at CARD and CCAP constructed a preliminary survey form in the summer of 1998. A survey team from CCAP tested this form in Henan province in October 1998. The form did not perform as well as hoped, so substantial revisions were made during the spring of 1999. The revised survey form is included in the Appendix. A six-person survey team from CCAP¹ used the revised survey form to collect data from 235 rural households in Sichuan, Chongqing, Shangdong, and Jilin provinces. The data was collected from April through June 1999.

Concurrent with the administration of the rural household survey, several interviews were conducted with officials in the county and provincial offices of the State Statistical Bureau, Agricultural Bureau, Grain Bureau, Animal Husbandry Bureau, Price Bureau, and Commerce Bureau. The purpose of these interviews was to obtain information about the data collection process and the possible reasons for the discrepancies between reported livestock product output and per capita consumption. In addition, questions were posed about livestock and grain production policies, the scale and organization of livestock production, product prices, distribution channels, tax policy and collection, and trade in grains and livestock products. Observations from these interviews are discussed next.

The Survey Sample

Livestock production in China can be separated into at least three major regions that correspond to primary cropping patterns: the corn belt in northern China, the wheat area in the middle of China, and the rice area in the South of China. These three areas have distinct feeding patterns and household production patterns. In order to capture these differences, household samples were selected from each of these three major producing areas.

The total number of households sampled was 235: 60 households in Jilin province, 66 households in Shangdong province, 30 households in Chongqing province, and 79 house-

holds in Sichuan province. In each county selected in a survey province, three townships, three villages in each township, and ten households in each village were selected at random. The survey team attempted to interview the head of each household selected; however, when the head of household was not available, the spouse was interviewed.

All of the survey households were selected from the list of households that participated in the NSB household survey. Households were selected from the NSB survey panel because the NSB collects data from each household for five consecutive years before rotating the household out of the sample. Thus, it is possible to use NSB records to augment and check the accuracy of the data collected in this survey.

Jilin: Corn Belt of Northern China. Households were selected from two counties in Jilin: Gong Zhu Ling and An Tu. Jilin province lies directly below Heilongjiang, China's northernmost province, and constitutes most of China's border with North Korea. With a population of 26.7 million in 1997, Jilin is sparsely populated relative to many provinces in China. Rural households cultivate 4.7 Chinese mu (0.31 hectares) on average, more than twice the amount for rural households in China as a whole. Per capita income for rural households in Jilin was ¥2,186 in 1997, slightly above the national average. In the same year Jilin accounted for 2.6 percent of total sown area in China, with 60.3 percent of Jilin's area planted to corn. Jilin ranked first among China's provinces in corn production, with output for the province accounting for 12.1 percent of China's total corn production. With such abundant grain feed resources, more than 6.2 million hogs were slaughtered in Jilin in 1997, yielding 649 thousand metric tons (tmt) of pork. Farmers in Jilin also produced 166 tmt of beef and 665 tmt of eggs.

Shandong: Wheat Country in Central China. Surveys were administered to households in Fei Xian and Zhu Cheng counties in Shandong province. Shandong lies on the eastern coast of Central China, directly west of South Korea across the Yellow Sea. Shandong is in the heart of China's wheat country. Roughly 40 percent of Shandong's

10.9 million hectares (mha) of sown area is planted to wheat. Corn accounts for 24 percent of total sown area and oilseeds account for 12 percent, predominately peanuts and soybeans. In 1997, farmers in Shandong produced 1,993 tmt of pork, 445 tmt of beef, and 3,888 tmt of eggs. Shandong is part of the Zhongyuan beef belt of China, and ranks fourth in poultry production per household. A considerable share of Shandong's poultry production is exported to Japan and other Asian countries.

Sichuan and Chongqing: Rice Region in South China. Households in Leshan and Jiange counties of Sichuan province and Jiangjing county in Chongqing province were selected for the survey of producers in China's southern rice region. In this part of China the weather is warm for the majority of the year and rainfall is plentiful. Sichuan and Chongqing combined accounted for over 11 percent of China's rice production in 1997 and between 6 and 8 percent of wheat, corn, and oilseed production. Sichuan is the number one pork-producing province in China, reporting more than 11 percent of China's total hog slaughter. Compared to Shandong and Jilin, grain feed resources in Sichuan and Chongqing are scarce, and households typically use substantial quantities of green feeds to supplement swine diets. Gathering these feed resources is labor intensive, but limited opportunities for obtaining off-farm income keeps the opportunity cost of labor low enough to sustain the profitability of these traditional production methods.

Summary of the Survey Data

General Household Characteristics

In this section, a few summary statistics from the survey are presented to provide a brief overview of the household sample characteristics and responses to production, cost, and feed use questions. The data are arranged in tables according to the major sections of the survey: household characteristics and income, land resources, crop production, and livestock production. In addition, average pork production costs and daily feed rations are

also provided. Although the survey queried respondents about production of all livestock, the largest percentage of households surveyed raised pigs, and the information presented below focuses on swine production.

The survey sample contained 235 households located in four provinces in the north-eastern, central eastern, and south-central western regions of China. Table 1 displays the information about average household characteristics on a provincial basis. Households generally consisted of a mother, father, and one or two children. The male head of household was usually in his early forties, with five to seven years of education. Female spouses were also in their early forties, but they only had four to six years of schooling. The average age of children ranged from 14 in Sichuan to 19 in Chongqing, and average education levels ranged from five to seven years.

Roughly 52 percent of the male heads of household were engaged in off-farm work in 1997, working an average of six months. The vast majority (82 percent) of those employed off the farm were employed on another farm. Of the remaining 18 percent, 16

TABLE 1. General household and income information

	Units	Chongqing	Sichuan	Shandong	Jilin
Observations		30.0	79.0	66.0	60.0
Household size	Persons	3.7	3.7	3.9	3.9
Age	Years	35.3	30.7	32.7	32.4
Education	Years	5.3	4.8	5.7	6.4
Off-farm employment					
1992	Months	2.0	4.2	5.3	2.2
1997	Months	6.7	8.4	11.1	3.7
Off-farm income					
1992	Yuan	437	1,423	1,507	635
1997	Yuan	2,836	3,549	5,569	1,739
Net household income					
1992	Yuan	3,590	5,893	7,506	6,295
1997	Yuan	8,824	11,341	17,093	10,193

percent were employed by factories and 2 percent by private businesses. The average annual income for these men was ¥2,983. Nearly 18 percent of the female spouses and 23 percent of the children in the sample households were employed off farm in 1997. Off-farm employment for the women of the household followed patterns that were very similar to the males. The women were engaged in off-farm activities an average of seven months of the year, with 69 percent employed as farm labor and 23 percent employed in factories. The average annual income for these women in 1997 was ¥2,243. The children spent an average of 9.5 months employed off farm, primarily in factories (67 percent), and earned an average of ¥4,288 per year.

It is clear from Table 1 that in nominal terms, incomes have risen rapidly in rural areas, increasing on average for the sample by 100 percent in five years. In real terms, however, incomes have only risen 7.9 percent (1.5 percent annually) from 1992 to 1995. All of this growth has been the result of increased off-farm employment. Real net farm income decreased 6.5 percent over the five-year period. Consequently, the share of household income coming from off-farms activities rose from 14.1 percent in 1992 to 22.2 percent in 1997.

The number of people working off farm increased 123 percent from 1992 to 1997. The most dramatic growth has been in the number of women and children with off-farm employment. Only 15 women and 12 children in the sample reported earning income from activities outside of the household farming operation in 1992. Those numbers increased to 41 and 83 in 1997 for women and children, respectively. The increase in off-farm employment among women and children certainly reflects an increase in employment opportunities, particularly given that women and children are more likely to work in factories and private businesses than are men. However, the bulk of the growth in employment for this segment of the population is more likely due to changes in household responsibilities as children mature and become more independent. Thus, it is more likely that the 23 percent increase in the number of males working outside of the farm operation, though a low estimate, is a better indicator of the trend growth in off-farm employment.

Land Resources and Cropping Patterns

Chinese household farms are typically a multi-product crop and livestock operation. According to government policy, rural households are given rights to grow crops or livestock on a specified quantity of land. The actual quantity of land allocated to a household depends on the number of family members in the household and the total arable land under the village's jurisdiction. In more populated areas, household plots decrease in size. Average land resources, utilization, and crop supply and use for the sample are shown in Tables 2 and 3. With the exception of households in Jilin, most households in the survey sample farmed less than 0.5 hectares. Generally, a household's share of irrigated land reflects the importance of rice production in the farm's crop mix. Farmers in Chongqing and Sichuan typically grow sweet potatoes, corn, and wheat in rotation, often double

TABLE 2. Household average land resources and utilization

	Chongqing	Sichuan	Shandong	Jilin
1997		(Chinese Mu ^a)		
Cultivated area	4.3	3.7	6.0	20.4
Irrigated	3.1	2.4	0.1	5.5
Non-irrigated	1.3	1.3	5.8	14.2
Hillsides	0.1	2.0	0.1	0.7
Grain area	4.9	5.7	9.1	17.4
Other crop area	0.6	0.8	1.7	3.3
Pond area	0.2	0.2	0.0	0.0
1992				
Cultivated area	3.9	3.8	5.5	20.5
Irrigated	2.8	2.6	0.1	5.4
Non-irrigated	1.1	1.3	5.3	14.4
Hillsides	0.1	1.9	0.1	0.8
Grain area	4.3	5.8	8.4	19.1
Other crop area	0.2	0.7	1.2	1.7
Pond area	0.1	0.1	0.1	0.0
Multi-cropping index (crops per year)				
1997	1.4	1.7	1.9	1.0
1992	1.2	1.5	1.8	1.0

^a15 Chinese mu are equivalent to 1 hectare.

TABLE 3. Household crop production and utilization in 1997

	Planted Area (Chinese Mu ^a)	Production (kg)	Household Use (kg)	Feed Use (kg)	Sales (kg)	Stock Change (kg)
Rice						
Chongqing	2.8	1390.9	824.2	131.2	300.7	152.6
Sichuan	2.4	1066.8	748.2	81.1	162.2	66.5
Shandong	0.0	0.0	0.0	0.0	0.0	0.0
Jilin	5.4	2314.8	576.0	67.3	1248.3	234.4
Wheat						
Chongqing	0.7	117.2	21.7	2.5	98.3	-0.9
Sichuan	1.4	342.2	185.3	44.3	74.5	7.0
Shandong	3.5	1319.9	703.3	0.4	294.3	259.2
Jilin	0.3	28.7	24.5	0.0	0.0	4.8
Corn						
Chongqing	0.7	280.4	2.4	257.9	12.6	15.4
Sichuan	0.9	291.3	14.6	257.1	28.0	10.1
Shandong	3.0	852.3	33.6	480.0	425.7	-11.2
Jilin	9.4	3611.3	48.8	1004.0	2376.3	202.9
Soybeans						
Chongqing	0.1	11.1	4.4	6.3	0.5	0.6
Sichuan	0.0	5.8	3.1	0.6	0.9	-0.5
Shandong	1.0	67.9	29.3	13.6	13.0	8.0
Jilin	1.9	223.6	148.3	0.0	48.8	17.7

^a15 Chinese mu are equivalent to 1 hectare.

cropping with hybrid varieties of middle indica rice. Shandong is in a traditional wheat-growing region, and much of the average household's area in this province is devoted to wheat and corn production. The growing season in Shandong is sufficiently long to allow farmers to double-crop wheat with corn and soybeans. Peanuts are also an important crop in Shandong. In Jilin, the households surveyed devoted roughly half of their area on average to corn production. Another quarter of their area is planted to hybrid varieties of late indica rice. Soybeans and potatoes are the most common crops grown on the household's remaining land.

Except in Jilin, total household area has increased on average for the surveyed households. Both grain area and other-crop area increased in Chongqing and Shandong, while households in Sichuan shift a small amount of grain area into production of other crops. In Chongqing, Sichuan, and Shandong, the multi-cropping index increased slightly.

Swine Production

Most households included in the survey raised swine. Table 4 provides the provincial averages for some basic swine herd characteristics. Just over 85 percent of the households in the survey sample reported activities related to swine production. Most households raise pigs for their own household consumption and as a means of generating fertilizer or a little additional income. Inventories are generally quite small, averaging less than 10 hogs per household. More than 80 percent of the households that reported swine produc-

TABLE 4. Average swine herd characteristics in 1997

	Units	Chongqing	Sichuan	Shandong	Jilin
Age in January	Months	7.4	5.1	3.7	1.1
January inventory	Number	2.5	3.5	1.2	1.3
Weight	Kilograms	80.0	52.2	35.3	13.5
Purchases	Number	1.7	3.1	3.2	1.6
Pigs per litter	Number	8.9	8.2	8.9	9.0
Sales	Number	3.8	6.4	5.8	6.7
Home consumption	Kilograms	73.8	44.2	5.4	22.6
Weight when sold					
Feeder pigs	Kilograms	28.5	25.3	42.0	22.7
Fed pigs	Kilograms	136.9	89.5	118.8	93.3
Sale price					
Feeder pigs	Yuan/Head	250.75	196.92	367.27	284.94
Fed pigs	Yuan/Head	914.47	555.98	931.72	690.47
Annual production ^a	Kilograms	244.5	394.6	376.3	307.8

^a Animal production is measured as total live weight gain. Live weight is computed as the change in the total weight of the swine inventory plus purchases and births and less animals sold or slaughtered.

tion purchased pigs to feed. The other 20 percent had a sow that gave birth to a litter in 1997. The average number of pigs per litter is nine, and farmers typically keep two or three of the piglets to raise themselves. Of the farmers reporting swine births, 67 percent reported sales of feeder pigs, averaging between six and nine pigs marketed. Feeder pigs range between 22 and 42 kilos when marketed, with the pigs in Shandong tending to be heavier than those marketed in Chongqing, Sichuan, and Jilin. Average prices for feeder pigs were ¥7-9/kg in Chongqing, Sichuan, and Shandong and ¥12.58/kg in Jilin. Fed pigs in Shandong and Chongqing achieve heavier weights before sale or slaughter, but per kilogram prices for slaughter hogs are generally comparable in all four provinces. Producers in Jilin and Shandong receive slightly higher prices than producers in Sichuan and Chongqing, averaging ¥0.5-1.5/kg higher.

Table 5 displays average cost and revenue information for swine producers in the four provinces. Feed costs are the largest component of swine production costs, followed closely by the cost of feeder pigs. These costs together account for about 65 percent of the total, which is similar to production cost shares in the United States. Unlike U.S. producers, capital costs are very low in China, but labor cost shares are several times higher than in the United States. The cost breakdown illustrates the labor intensity of Chinese household swine production methods relative to more modern practices.

Producers in Chongqing have the lowest cost per animal and the lowest cost per kilogram live weight of the four provinces. Producers in Sichuan have the second lowest cost of production on a per animal basis, but they have a slightly higher cost per kilogram than do producers in Shandong because productivity per animal is low. Total revenues less operating costs are greatest in Jilin, largely due to the fact that revenue per animal is higher there. Likewise, higher pork prices and heavier slaughter weights raise net returns in Shandong over the levels observed in Sichuan and Chongqing, but more expensive feeder pigs keep net revenues below the level in Jilin. Using the data reported for wages

TABLE 5. Average swine producer revenues and costs in 1997

	Chongqing	Sichuan	Shandong	Jilin
Operating costs (percentage of total cost)				
Feed	40.96	49.22	43.14	42.31
Animal inputs	17.23	18.51	32.93	18.22
Veterinary and immunization	4.31	1.59	0.48	0.64
Insurance	0.00	0.05	0.00	0.00
Management	0.37	0.04	0.00	0.00
Utilities	5.50	0.45	0.04	0.10
Allocated overhead				
Unpaid labor	30.63	28.06	22.64	35.52
Capital depreciation	1.01	2.08	0.78	3.20
Revenues and costs (Yuan per head)				
Output value	506.15	630.71	849.27	896.26
Total cost	654.56	826.29	947.49	1109.61
Operating cost	447.46	577.26	725.60	679.93
Output value less operating costs	58.69	53.45	123.67	216.33

and time spent raising hogs, we can include the opportunity cost of unpaid labor and capital depreciation in the production cost calculation. Adding these costs causes net revenues to become negative in all four provinces. Producers in Chongqing, Sichuan, Shandong, and Jilin lost an average of ¥1.09/kg, ¥2.19/kg, ¥0.83/kg, and ¥2.29/kg, respectively.

As shown in Table 6, feed expenditures account for more than 40 percent of the total cost of production in all four provinces. Feeding practices vary greatly from region to region depending on the availability of grain and other feed resources. In Shandong and Jilin, the share of grain in feed rations exceeds 20 percent, and oilseed meal and compound feeds together account for an additional 16.4 and 6.6 percent in Shandong and Jilin, respectively. Swine producers in Sichuan and Chongqing use less than 8 percent unprocessed grain feed and less than 5 percent oilseed meal and compound feed. Produc-

TABLE 6. Daily feed rations for swine

	Chongqing	Sichuan	Shandong	Jilin
Ration (percentage of total feed)				
Grain	7.97	7.90	24.58	20.75
Oilseed meal	0.00	0.03	15.20	3.52
Compound feed	1.84	4.74	1.22	3.13
Bran	9.69	8.69	1.31	22.43
Potatoes	2.64	0.00	30.60	0.00
Forages and green feeds	75.50	73.75	27.09	49.87
By-products	2.35	4.89	0.00	0.30
Total feed (kg/head)	9.80	8.88	4.33	6.63

ers in these provinces use bran (typically rice bran) and restaurant and industrial by-products to increase the protein content of swine diets. In addition, more than 70 percent of the animal diets consists of vegetables and other green feeds that are collected by the household. Green feeds are generally low in energy and digestible protein and increase the time it takes to raise an animal to slaughter weight. In Chongqing and Sichuan, the average rate of gain² is 0.38 kg/day and 0.34 kg/day, respectively. Although potatoes and vegetables and other green feeds constitute 50 percent or more of daily feed rations in Shandong and Jilin, the average daily rates of gain in these provinces are 0.47 kg and 0.43 kg, respectively, which are 12 to 29 percent higher than in the other two provinces.

Interviews and Anecdotes

In each survey region, interviews were conducted with local officials from the Livestock Bureau, State Statistical Bureau, and provincial and county governments, as well as with various livestock producers, butchers, slaughterhouses, and markets. The information presented in this section is a compilation of the more notable comments and anecdotes taken from the notes recorded by Dr. Dinghuan Hu during these interviews.

The information is grouped into the following categories: livestock production practices, meat processing and distribution, and collection of livestock statistics.

Livestock Production Practices

Pork Production. Swine production is a traditional agricultural endeavor for many farm households in China. In Sichuan and Chongqing, the structure of traditional agricultural production is geared toward grain and pork production. This region has a surplus of pork but a shortage of feed grains needed to feed the swine. Consequently, pork-producing households in this region depend on feeds imported from other provinces and upon the revenues from pork exported to other regions of China. When the survey was conducted in the spring of 1998, pork prices were at the lowest level in several years. Because of the importance of pork production in the farm economy of Sichuan, farm incomes in the region were dramatically lower than in recent years. According to Cheng Xi Fei, a researcher in the Chongqing Animal Husbandry Bureau, farmers in this region can make a profit of ¥180-200 per head when the price of pork is ¥9 per kilogram. The break-even price for swine farmers in Chongqing is approximately ¥3.8 per kilogram; however, the price of pork at the time of the interview was ¥2.7–2.8 per kilogram.

Despite low pork prices, most producers in the region continued to raise swine. When asked why farmers raised pigs in the face of low prices, Cheng pointed to two primary reasons. First, the abundance of green feeds in the area allows farmers to substitute sweet potato vines, vegetables, and grass for grain feed. Likewise, grain by-products, such as rice and wheat bran, are also used for swine feed. These resources would not be fully utilized if they were not fed to swine. Second, farmers in the region have few alternative sources of income. Despite accruing losses from the sale of pork, the farmers are able to reduce their cost of grain production by using pig manure in the place of more costly chemical fertilizers.

Local and county officials encourage farm households to raise pigs because it is an important source of tax revenues. Taxes are collected at the time of slaughter, but the amount varies by county and province. For example, in Jian Ge township in the North of Sichuan province, the local slaughter tax is ¥20/head. There is an additional ¥20 tax collected for the state, a ¥15 organizational fee, and other fees of ¥7. Thus, the total tax collected for the slaughter of one animal is ¥62. In Le Shan county in the South of Sichuan, the local tax for slaughtering pigs is ¥38 but the total tax and fee burden reaches ¥80. If pork production and slaughter decline, local tax revenues are negatively impacted. Consequently, pork production is used as an indicator of productivity for local and county officials.

With agricultural prices at the lowest level in 16 years, farm incomes in Sichuan and other regions of China have declined significantly. County officials in Chongqing province would like to improve farm incomes by developing a free market economy; reforming the local government structure to reduce the number of government employees and administration costs; reducing the unemployment rate; and changing the structure of livestock production to increase the proportion of livestock products in the total mix of agricultural products, to increase the lean-pork share of total pork production, and to increase the growth rate of production for other livestock products.

The county government plans to improve the genetics of livestock herds in the region as a means of increasing pork production and profitability. Using a hybrid breed of pigs developed by the provincial university, the government plans to use village breeding stations to disseminate the genetic material to farmers and eventually eliminate the use of local breeds.

In Sichuan, pork is mainly produced by farm households that raise a few pigs, many of which are consumed on the farm. With the low prices at the time of the survey, many of the larger operations in the survey region had gone out of business.

In the Lin Yi region of Shandong province, more modern intensive production methodologies are used. Lin Yi is a leader in pork production in Shandong, generating roughly 15 percent of all the pork produced in Shandong. Great emphasis has been placed on improving swine genetics and veterinary practices in the region. Moreover, pork production has become increasingly integrated through contracts between slaughter facilities and farm households. The 15 largest pork producers in the region slaughter more than 15,000 hogs per year. Despite the advanced nature of pork production in Lin Yi, low prices have taken their toll on pork producers. Since 1997, live hog prices have fallen from ¥8/kg to roughly ¥4/kg. Pork production in 1998 is 50 percent lower than in the previous year.

An example of the type of integration and production technology used in the pork industry in Lin Yi is the Hua Shen Farm, which is a subsidiary of the Hua Shen Company. This farm was established in 1994 on the site of an old brick factory. The farm occupies 26.7 hectares of land, and the total investment in the farm is ¥31 million. In the summer of 1998, the farm had 26,000 head of hogs. In 1997 the Hua Shen Farm slaughtered 60,000 hogs. Live hogs are often sent to Shanghai where the price in 1998 was ¥6.8–7/kg, nearly ¥3/kg more than in Lin Yi. However, the cost of selling in Shanghai is higher because of the transportation cost.

The farm purchases its feed from the Hua Shen Feed Mill. Rations typically contain 50 percent corn, 18 percent soybean meal, 18 percent wheat bran, and 14 percent rice bran. The feed-to-live weight conversion ratio is about 3.0. Feed costs total ¥5/kg live weight, and other production costs add another ¥1.6/kg. The hogs take about 180 days to reach a slaughter weight of 110–120 kg. From an age of 45 to 90 days the pigs are fed 0.5 kg of feed per day. After 90 days, the feed quantity increases to 1.25 kg/day. In the final finishing stage, the hogs are fed 2.5 kg of feed daily. The death rate averaged over pigs of all ages is between 10 and 12 percent. The farm employs 98 laborers and pays them a

wage of ¥500/month. The farm also has 12 managers who receive a salary of ¥700/month.

The Hua Shen Farm has a contract with a large sausage factory, which is also a subsidiary of the Hua Shen Company. The farmers believe that the quality of their pork is very good, so they try to sell their pork in the Shanghai and Beijing markets where prices are higher. The farm buys fat pork from local farmers to fulfill their contract obligation with the sausage factory. The sausage factory has a very large slaughtering line, which is capable of slaughtering 3,000–6,000 hogs per day. The processing facility sells the lean pork to the Shanghai market and grinds the fatty parts of the hog for sausage. The marketing chain for the Hua Shen Farm is shown in Figure 1.

According to Li Zhi Yi, a food company manager in Chang Cheng city in Jilin, pork production in Jilin can be separated into two periods. Before 1990 most farmers in the region raised a local variety of black pigs. These animals were 75–100 kg at slaughter and had a live-to-carass weight conversion of about 68 percent. During this period, the

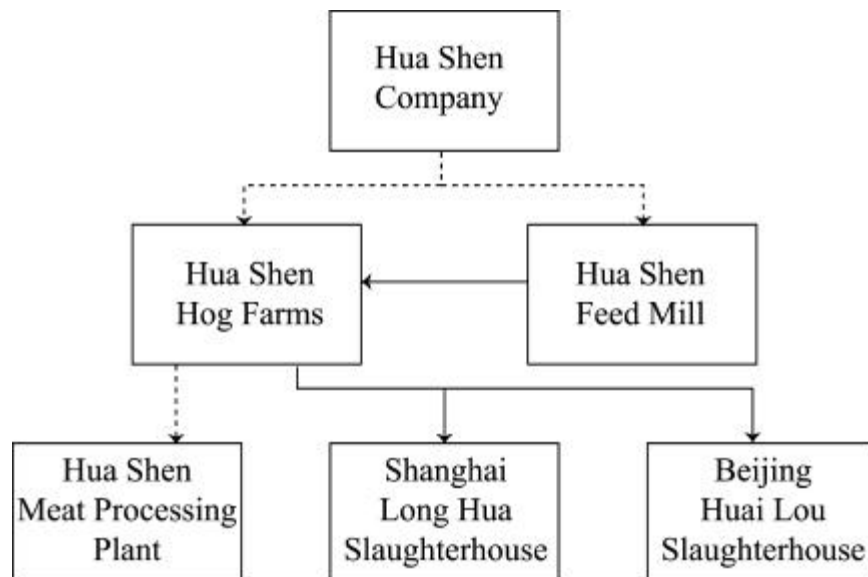


FIGURE 1. Hua Shen hog marketing chain

local supply was insufficient to meet the growing demand, and slaughter hogs were imported from Sichuan. After 1990, most farmers switched to Chang Bei hogs, which is a hybrid variety. These animals have a slaughter weight of 90–110 kg. Swine production developed rapidly in Jilin in the early 1990s, and there is no longer a need to import swine from Sichuan.

In the survey counties in Jilin, farm households grow corn, soybeans, and wheat. Corn and soybeans are raised for household feed use and for sale in the local market, but wheat is produced primarily for household consumption. Because the province is less densely populated than Sichuan and Shandong, farm sizes are generally larger than the national average. For example, in Gong Zhu Lin county, farm households have an average of 1 hectare of land. Each household must sell about 3 tons of corn to the state, and the rest can be consumed by the household or sold on the free market. Sales of corn typically generate ¥3,000–¥4,000 of income for the household. If the farm raises livestock in addition to crop production, annual household income rises to ¥8,000–¥9,000.

Li Dong Yung is a farmer in An Tu county in Jilin. At the time of the survey, Li had one female pig and seven piglets. He planned to sell five of the piglets and keep two of the males. He expected to feed the male piglets corn, rice bran, soybean meal, and some feed concentrates for about four months. At the end of the feeding period, the pigs should weigh around 90 kg and could be sold for ¥7.2/kg. Li inoculates his animals twice a year at a cost of ¥1 per shot.

Since 1994, the government in Jilin has made disease prevention a priority. The livestock stations at the village and township levels have the responsibility of carrying out the disease prevention program, and the success of the local disease prevention program is one criterion for judging the performance of county officials. Each year the provincial government evaluates the county directors and officials at lower levels on a 200-point

basis, covering 18 areas. Disease prevention accounts for 40 points. If officials have not received 160 points on their evaluations, they can lose their jobs.

In An Tu county, every household that raises livestock has a disease prevention card. An official from the Animal Husbandry Bureau goes out to the households periodically to check for compliance. Swine are supposed to receive vaccinations for foot-and-mouth disease twice a year. About 15-20 percent of the households have discrepancies on their cards. Some farm households do not give their animals the correct number of inoculations in order to save money. When animals are brought to the designated slaughter stations, they are checked for diseases before they are slaughtered. Farmers must pay a fee to have their animals checked that is separate from the usual slaughtering fee and tax.

Poultry Production. Shandong province is a leading region for poultry production, particularly broiler production. Broiler producers in the region have adopted several modern production and management practices that have enabled output and profits in the poultry sector to rise rapidly. The technology transfer and capital investment for production has been enhanced by joint ventures between foreign and Chinese firms. One such firm is the Zhu Cheng Foreign Trade Company (ZCFTC) in Zhu Cheng county.

The ZCFTC was established in 1976 as a joint venture between private Chinese investors and the township. For the first eight years the broiler farms started by this company were very small. In 1985, the director of the company went to Thailand to study broiler production from a subsidiary of the Charoen Pokphand (C.P.) Group of Companies. After returning, the ZCFTC set up a feed company, a breeding farm, and a broiler processing plant. The ZCFTC imported their original genetics from Arbor Acres Farms in the United States. Every year they produce roughly 2 million breeding birds and 60 million commercial broilers. The company raises 600,000 broilers on their own farms, and the rest of the birds are raised on contract with about 3,000 farm households. The ZCFTC produces about 100,000 tons of frozen poultry, about 40,000 tons of which is exported.

The ZCFTC has strong connections to Japanese firms that facilitate the company's exports of broiler meat to Japan, and they also exported breast meat to the European Union (EU) until 1996. With the onset of the Asian financial crisis, exports of broiler meat from Thailand reduced demand for ZCFTC exports in Japan and the EU. In 1995, ZCFTC breast meat sold for \$2,250/mt on international markets, and leg meat sold for \$2,195/mt. In 1998, prices had fallen to \$1,300/mt and \$1,630/mt for breast meat and leg meat respectively. Feed cost increased substantially during the period from 1995 to 1998, and the company manager estimates that they lost ¥2,640/mt (\$319/mt) on exported product. Table 7 summarizes the FTC's production and exports from 1990–1997.

The ZCFTC contracts with households in several villages in Zhu Zhen county. One village in Hua Shen township has 25 households that raise chickens for the ZCFTC. These farmers had to provide the money to build their chicken coops the ZCFTC lends the farmers feed and chicks. The farmers feed the chicks for 55 days and then sell them back to the ZCFTC. Most households raise 1,000–2,000 birds at a time. After the cost of the chicks and feed has been subtracted, the household earns a net revenue of ¥2–¥4/bird. However, this return is not without risk. If the birds contract a disease, the farmer must bear the losses.

TABLE 7. Zhu Cheng Foreign Trade Company production and exports

Year	Birds Slaughtered (Millions)	Exports (Metric Tons)
1990	10.12	6,241
1991	12.94	9,747
1992	21.07	18,445
1993	22.26	20,300
1994	27.77	27,458
1995	36.94	27,691
1996	46.32	33,703
1997	51.97	31,372

Yang Jia Cun is another village with households that contract with the ZCFTC. In 1987 about 47 households raised broilers for the ZCFTC, averaging 2,000 birds per cycle. In 1998 only three households in the village continued to contract with the ZCFTC. The primary reason for the decline in the number of contracting households is the risk involved in the contract. The three households in this village that continue to raise broilers for the ZCFTC feed the birds for 58 days. The farmers receive 2,000 birds each cycle and 2 additional birds for every 100. The feed rations for each bird are split into four growing periods. In the initial period the bird receives 0.9 kg, followed by 1.8 kg in the second stage. Feed quantities taper down to 1.5–1.7 kg during the third stage and decline further to 1.0–1.1 kg for the final feeding period. When the birds are fully grown, they are sold back to the ZCFTC for ¥11.6/kg, yielding the farmers in this village about ¥2/bird.

Gao Lui Xiun is a farmer in Huang Hua township, which had about 25,000 broilers in 1998. Gao started raising broilers for the ZCFTC during the winter of 1997. He raises 2,040 birds in each cycle, and he has had three cycles since he started. He provided the land, coops, and other equipment himself, but the feed and the chicks are provided by the ZCFTC. Gao's village guarantees the ZCFTC that they will be able to provide feed and chicks on contract to households in the village for two years. The ZCFTC keeps 3 percent of the farmer's net revenues as part of this guarantee, but this money is returned to the farmer at a later date. The ZCFTC provides veterinary services to Gao as needed. A service person comes to the village on Mondays, Wednesdays, and Fridays, and Gao can ask the service person to come to his farm. If Gao runs out of feed, he must buy more feed from the ZCFTC. So far, Gao has made about ¥3.5/bird in net revenues, and he plans to continue contracting with the ZCFTC.

Raising birds on contract with the ZCFTC has not been a positive experience for all households. Zhu Yao You is a farmer in Chang Zhang village in Du Guo township, and he has contracted with the ZCFTC since 1995. Zhu has raised 14 cycles of birds with 2,000

birds in each cycle. He receives roughly ¥1/bird in net revenue on average. However, he has lost a substantial amount of money twice. The first time, he lost more than ¥10,000, and the second time he lost ¥2,000. He also raised four cycles of birds, for which he made almost no revenue over his costs. For example, he only made ¥0.3/bird on his last cycle. The ZCFTC retains 3 percent of his revenue over cost as guarantee, but at the time of the interview they had not returned any of his guarantee money. Zhu has an outstanding loan of ¥1,000 from the ZCFTC, and he is afraid that if he stops raising birds for the ZCFTC they will not return any of his guarantee money. In the past, as many as 20 households in Chang Zhang village raised broilers for the ZCFTC, but now only two households continue to contract with the ZCFTC.

Wang Xi Gong is the director of one of the ZCFTC's own farms in Zhu Cheng county. The farm can raise 130,000 birds each year in five cycles. The chicken houses are left empty for one month each year while they receive a thorough cleaning. In 1996 the farm was operating at over 90 percent of capacity, but in 1997 capacity utilization dropped to 76 percent. Estimated production costs for the farm are shown in Table 8. The farm receives about ¥13.5/kg live weight for the birds they deliver to the ZCFTC. The farm has 2 full-time and 60 part-time employees. The farm director is paid ¥800/month and the part-time workers receive ¥700/month. Just as with the contract farms, the

TABLE 8. Zhu Cheng company farm costs

Item	Cost in Yuan per Bird	Item	Cost in Yuan per Bird
Chicks	3.7	Management	0.1
Feed mix	10.8	Labor	0.6
Medicine	0.7	Housing	0.1
Electric and water	0.1	Feed waste	0.1
Heat	0.4	Interest charges	0.23
Bedding	0.15	Risk fee	0.05
		Total	17.03

ZCFTC withholds 3 percent of the employees' pay until the end of the year. If the farm has not lost money, the ZCFTC will return the withheld wages to the farm employees.

Wei Fang Mei Cheng Broiler Ltd. Co. (WFMC) is another joint-venture company in Shandong's broiler industry. This company has partners in Japan and the United States and raises broilers primarily for export. In 1993 the company exported 2,000 tons of chicken to the EU and Japan. Their exports increased by 2,000 mt each year in 1994 and 1995, but they fell slightly in 1996 and 1997. Despite the EU ban on Chinese chicken imports and stiff competition from Thailand, this company has continued to export in the first half of 1998 by switching from fresh and frozen products to value-added products, such as fried and barbequed chicken. During the first six months of 1998, they exported 3,000 tons of value-added products.

The WFMC raises their own birds, feeding them to a weight of about 2.5 kg. After slaughter, the carcass weight is about 85 percent of the live weight. The legs account for about 16 percent of the carcass weight, the breast for 18 percent, and the wings for 5 percent. This company lost about ¥6 million in 1997, and it expects to lose another ¥1.8–¥1.9 million in 1998.

Losses by this company and others prompted one official at the Foreign Trade Bureau in Wei Fang city to conjecture that the government will have to initiate new policies to protect the interest of chicken farmers. One realistic option, in his opinion, would be the introduction of an export quota system, similar to the swine export quota to Hong Kong. Under this plan, the Economic and Trade department in the Chinese government should set an annual export quota that would be allocated to the provinces. The provincial government would then allocate the provincial export quota to specific firms within the province. These firms would be required to record their exports with the Foreign Trade Bureau. Although this official thought that this is a reasonable action for the government to take, no such plans were being discussed.

The survey team also visited a large-scale specialized household layer operation in Jiangqing county in Chongqing. The operation was owned by Xu Xi Mao. Xu came to Jiangqing in 1988. He started a business slaughtering chickens in the local market with an initial investment of ¥850. Business went well, and he was eventually able to employ four people to help him with his slaughtering operation. In 1993 the Jiangqing state-owned layer farm went out of business, and Xu purchased the operation. The first year of operation, Xu fed 3,800 hens and received a net gain of ¥40,000-¥50,000. In 1994 he took out a loan for ¥250,000 to build three more coops. He continued to make profits, and by 1996, his operation had grown to 60,000 layers. Xu bought another farm with a 10,000 hen capacity in 1996, and he earned ¥1 million in net revenues by the end of the year. In 1997 the egg price dropped rapidly, and Xu lost ¥600,000 that year. In 1998 he scaled his operation back to 40,000 hens.

According to Xu, the dramatic fall in the price of eggs in Chongqing was caused by an excess supply on the market. In addition to the rapid growth in local production, producers in Beijing sent 60 rail cars of eggs to Chongqing. In response to the collapse of the market in 1997, the Chongqing government provided a small subsidy of ¥0.6/hen to egg farmers. They also organized an association of chicken farmers in Jiangqing. The association consists of 15 farm households. The household with the largest capacity has 60,000 hens, and the smallest producer has 1,000 hens. The association members collude to set the same price for eggs sold in Jiangqing. They contract with the retailers in town to enable them to be the sole supplier of eggs to the retailers. The association rewards the retailers for purchasing eggs from association producers by paying the retailer ¥0.1 for each kilogram of eggs purchased from the association.

Beef Production. Cattle production in China has traditionally occurred in the northern and western regions of the country, though some beef production occurs in every province. The most common traditional breed is the Yan Ban Yellow cattle. This vari-

ety is preferred in many regions because they are good draught animals and work well in mountainous regions. In many regions, the local and provincial governments have initiated genetic improvement programs for the beef sector. In An Tu county in Jilin, the genetic improvement program began in the 1960s. In the 1970s, the county purchased refrigerators to freeze and store semen for artificial insemination (AI). Over the last two decades, genetic material from Simmenthaler, Helfert, and Limousin breeds have been introduced. Throughout the 1970s and 1980s, the genetic improvement program in An Tu was supported by funds from the provincial government, but funding was removed in the 1990s. The county government does not have sufficient funds to continue the program, so the program has essentially ceased.

Beef producers in An Tu still prefer to raise Yan Ban cattle. Many people in An Tu have Korean heritage, so they prefer beef. The director of the Animal Husbandry Bureau in An Tu believes that beef consumption in the region has increased since the initiation of economic reforms in the late 1970s. He also expects beef consumption to continue to rise in the future, and producers should respond to the demand by adopting more productive croNSBred cattle. However, the county would like to preserve the purity of the Yan Ban variety, and they plan to designate an area in the county for purebred Yan Ban cattle.

Through the experience gained from the genetic improvement program, cattle breeders in An Tu have found that Yan Ban cattle improved with Limousin genetics outperform other croNSBreeds in their region. The price for improved heifers runs between ¥4,000 and ¥5,000 per head. The improved calves sell for ¥900 per head shortly after birth and ¥1,800 at six months of age.

Unfortunately, improvement of the breeding herd has been difficult since provincial funding for the genetic improvement program was eliminated. Insemination of a cow was free in the 1980s, but now farmers have to pay ¥30 per insemination. Consequently, many farmers no longer use AI. Even for those who continue to use AI, it is difficult to

successfully inseminate a cow because some of the technicians performing the insemination are not well educated in the process. New genetic material is not being introduced, and the improved bull stock is aging, thus reducing the quality of the semen. Matters are further complicated by the fact that farm households are often located 30 to 50 km from the village. Some farmers cannot tell when the cows are ready for insemination, and they are reluctant to bring their cattle into the animal husbandry station because of the time involved.

Yan Ban cattle grow slowly, reaching a weight of 350–400 kg after four or five years. Raising beef cattle is not very lucrative using the traditional production methods. Farmers often do not have enough straw and silage to feed in the winter months, and they are reluctant to use grain for cattle feed. At the time of the survey, no feedlots were in operation in An Tu county.

Jing Ming Hai farms is located in Jin Cheng village in An Tu county. Jing has Korean ancestry, and he raises cattle. In 1992 he had just two head of cattle, but by 1994 he had eight head. In 1998 he also had eight head of cattle, and he stated that the number of cattle he raises in a given year does not depend greatly on the market price. Jing feeds his cattle near his house until May, when he sends them up into the mountains to graze. At the end of September, he brings his cattle back down to the village and feeds them near his house. While the cattle are in the village, he feeds his animals grass and rice straw, but he supplements their rations with some soybean meal and corn when they are used as draught animals. In Jing's village all the cattle are Yan Ban cattle. Jing said it is difficult to get a croNSBred animal because the AI station has difficulties using the technology. Although farmers know they can get more money from a croNSBred animal, the success rate for AI is very low. The Yan Ban cattle are small, reaching only 150-200 kg after three or four years. Jing does not earn much from his cattle. He usually sells two

animals each year. The current price for live cattle is ¥16.1/kg, so he gets about ¥2,000 per animal.

Similar cattle production systems were found in Shandong and Sichuan. In Yang Zhou township in Zhu Zhen county in Shandong, farm households frequently have a cow, primarily for draught purposes. One farmer in this township started raising cattle in 1984. He has one cow now and it has a calf every year. The farmer sells the calf for ¥700 in a nearby market. He usually feeds his cow corn stalks, grass, and wheat bran. This is a typical feed ration for this area.

Meat Processing and Distribution

Slaughtering practices and meat processing varies greatly across regions in China. In more remote regions, the private butcher still plays a major role in the slaughter and distribution of meat. In more developed regions, only certified slaughter facilities have the ability to slaughter animals to ensure orderly collection of taxes and promote safer slaughtering practices. The regions where the household survey was conducted included both informal and regulated slaughterhouses. The following discussion is organized by region and describes the slaughtering and processing practices for pigs and cattle and the associated distribution networks.

Chongqing. In April of 1998 the survey team visited Chongqing. In general, the market for agricultural products was in a situation of excess supply, and there were several unemployed workers in the food industry. The second largest meat processing plant in China was established in Chongqing in 1960. The plant slaughtered swine for the local area and for export to Russia in the 1960s and 1970s. After the implementation of economic reform policies in the late 1970s, this factory failed to develop its own distribution chain. Instead, it relied on the Commerce Department for distribution of its products. As free markets began to play a greater role in the distribution of meat products, the factory found that it could not sell as much of its products as it would like. In 1998 the factory was only

open for three or four days because the low market prices for pork did not enable the factory to cover its operating costs. The plant was purchasing live pigs for ¥7/kg and the market price for pork was ¥9/kg. The plant needed a price of at least ¥10/kg to cover its cost. Consequently, the plant was sold to a Chongqing beer manufacturer. The manager of this slaughterhouse explained that many other large slaughtering facilities in the Chongqing area were also reducing or stopping production because of the low meat prices.

The survey team also visited a small slaughterhouse in the Chongqing area that is run by a group of farm households. A pig buyer goes out to the farm households in the area and purchases pigs. Every afternoon the buyer sends pigs to the slaughterhouse. In the middle of the night, local butchers slaughter the pigs for a wage of ¥3 per pig. The slaughterhouse has no equipment or refrigeration units, so the costs are low. In the morning, local retailers come to the slaughterhouse and purchase the fresh meat. Despite the low cost of slaughter, the operators of this slaughter facility claim that they are having difficulties making a profit with the low market prices for pork.

Sichuan. According to the director of the Commerce Bureau in Jian Ge county in Sichuan, the county used to sell pork to Beijing, Balading, Shanghai, Guangzhou, and to cities in Jilin and Heilongjiang. At the time of the interview, these exports had stopped because the pork markets in these regions were saturated. Pork buyers in the region were paying farm households about ¥3.6/kg live weight for the pigs they purchased, which was generally less than the value of the grain fed to the pigs per kilogram of grain. The hog buyers could receive ¥4.7/kg for the animals from the slaughterhouses and food companies. The carcass yield in this region was about 60 percent, and the wholesale price for pork was ¥8.7/kg.

The survey team spoke with a representative from the Jian Ge Food Company about its slaughter operations. The representative said that the factory did well from 1992 until 1996 because pork prices were at profitable levels. However, with the decline in pork prices in 1998, they virtually stopped all slaughtering. Their costs are high because they have significant fixed costs to cover. The value of their investment in equipment is ¥10 million and

the interest on their outstanding debt is about ¥2 million per year. In addition, 24 retired workers from the factory draw a pension of ¥14,000–¥15,000 per year. At the time of the interview, the factory was not operating but was lending its equipment to a butcher from Mian Yong. This butcher slaughters hogs in the factory and pays a fee of ¥20 per hog for the use of the equipment. The food company representative said Jian Ge is unable to compete with the local butchers because the factory's capital costs and overhead are much higher. Figure 2 shows the pork marketing channel in Jian Ge county in Sichuan.

Shu Shi Yuong is a cattle buyer in Lau Gong village in Jian Ge county in Sichuan. On the day that the survey team arrived in Lau Gong, Shu was playing Mahjong and talking with a 60-year-old man. They were discussing an animal that the older man owned and wanted to sell to Shu. According to the custom in this area, a person wanting to sell cattle must first go to the buyer's house and take the buyer to see the cattle. Dr. Hu

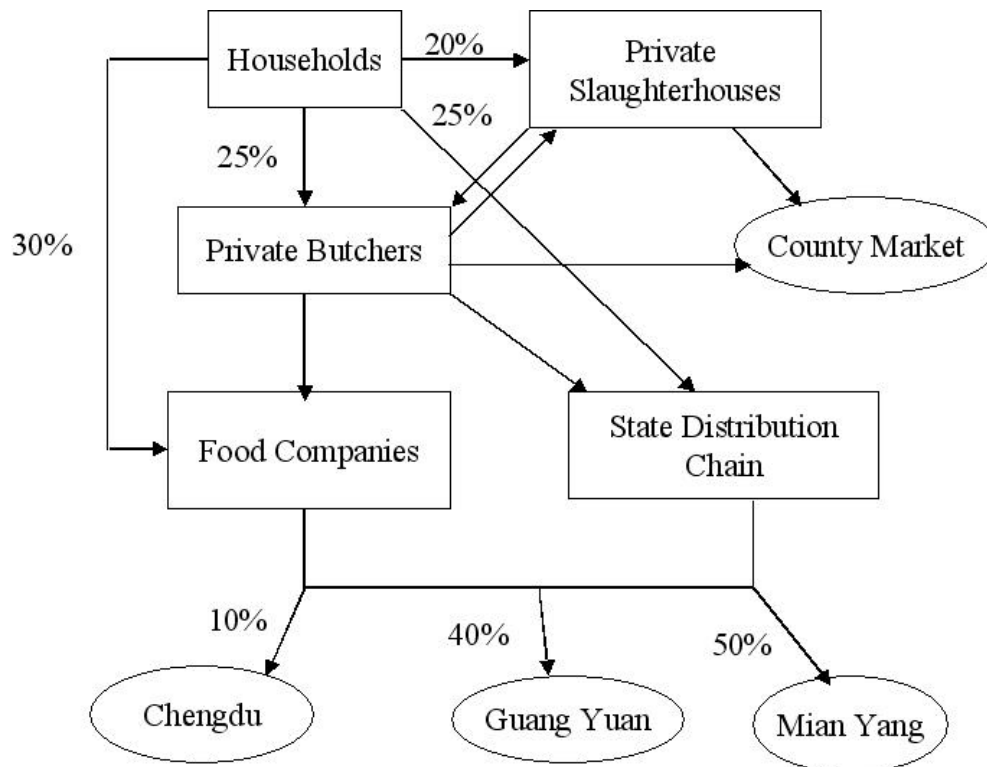


FIGURE 2. Pork market channel in Jian Ge county

Dinghuan from the survey team accompanied Shu and the old man to witness the transaction. The animal was on a hill about 40 minutes from Shu's house by foot. It was a buffalo that weighed about 600 kg. The buffalo had a swollen back leg, indicating that it was not a healthy animal. Shu counted the animal's teeth, and then stated that he believed the animal would yield about 150 kg of meat. He offered the farmer ¥1,400 for the animal. The farmer asked for a higher price, and the two bartered for some time before settling at ¥1,500 (¥10/kg of meat). The farmer indicated that he needed a replacement for his animal, and Shu agreed to an exchange.

The region around Lau Gong is mountainous, and transportation is poor. Households do not sell their animals directly to the cattle market in Chengdu, and information about prices does not travel well in the region. Consequently, farmers rely on the cattle buyers to market their animals. Shu indicated on the way back to the village that the buffalo he just purchased would probably yield 175 kg of meat instead of the 150 kg he quoted to the farmer. Moreover, he expected to receive ¥13-¥14/kg for the meat in the livestock market in Chengdu. Once he has purchased an animal, Shu usually keeps the animal at his house for a month and feeds it grain and medicines to increase the weight by 15-20 kg. Then he sells the animal in the Chengdu market. If the animal is sick, he slaughters it at his household and freezes the meat before selling it in the market. Shu said his net revenue is usually about ¥200 for each animal he buys and sells.

Shandong. In Lin Yi county in Shandong, there is a law governing the slaughter of livestock requiring all animals to be slaughtered at approved locations. This enables the government to regulate the quality of the animals killed by inspecting them for diseases before slaughter. According to the director of the Price Bureau, about 20 percent of the animals slaughtered in Lin Yi county in 1998 were slaughtered at state-owned slaughterhouses. The state-owned slaughterhouses have a capacity of 15,000 mt per year and a freezing capacity of 1,000 mt. Twenty years ago the state-owned slaughterhouses were

the most important source of income for the regional government, but they no longer generate enough income.

The Fei Xian meat processing factory is a state-owned slaughterhouse in Fei Xian county. The factory employs 270 workers, has a freezing capacity of 1,000 mt, and can slaughter between 700 and 800 animals a day. Since demand for pork declined in the local market and meat prices fell, the factory has virtually shut down its production lines. The factory was having cash flow problems because the banks had stopped lending them money. The manager said that he had heard that a private slaughterhouse called Jin Rou was able to get loans from the bank because it was a private firm. The Jin Rou factory was paying ¥0.2/kg live weight above the market price for slaughter hogs, so farmers preferred to sell to them. Consequently, the Fei Xian factory was also having difficulties procuring inputs.

In the local market in Fei Xian there were four local butchers selling pork. The local government only allows butchers that work for the Commerce Bureau to sell in the market. The meat offered for sale on the day of the interview was very fat, having 3 to 4 inches of back fat. The butchers explained that the meat was so fat because the farmers in this rural area eat meat very rarely, and when they do, they prefer fat pork. The feeder pigs that sell in the area are larger than usual (about 50 kg) and sell for about ¥300-¥400. The farmers feed these pigs to more than 100 kg before slaughtering them because they believe it is more profitable.

In Zhu Cheng county, slaughter is controlled by the food companies because they are the only ones legally authorized to slaughter animals. There are private, joint-venture, and state-owned processing factories in the area, and they are concentrated in certain areas to facilitate inspection by the local authorities. The private slaughterhouses are required to pay a fee of ¥2,000 per year and provide information to authorities about every animal they slaughter. Production in state-owned plants has declined significantly

since 1994, and much of the 5,000 mt of freezing capacity goes unused. The Commercial Bureau in Zhu Cheng estimates the value of the unused capacity in the state-owned slaughterhouses at ¥37 million in 1997. Table 9 shows the breakdown of hog slaughter in Zhu Cheng by state-owned and private companies.

Jilin. The Min Chu Food Company is a state-owned firm in Chang Cheng city. The company opened its slaughterhouse in 1980. At that time, most of the cattle it slaughtered were small yellow cattle raised in Inner Mongolia. Through the genetic improvement program in Jilin, the “Jilin red” variety was developed. The red cattle yield about 400 kg of meat, but not very many farmers raise red cattle. After 1990, market reforms in the area enabled private slaughterhouses to begin slaughtering cattle. In 1997 there were some problems with meat from diseased animals entering the food supply and with water being added to meat. Consequently, slaughter is more strictly controlled and only approved slaughterhouses can legally kill animals.

The Min Chu slaughterhouse kills about 100 animals each day. Private livestock buyers purchase cattle from households in the region and bring them to the slaughterhouse for processing. The cattle buyers take the meat after slaughter and sell it in the local market. The slaughterhouse also purchases cattle for slaughter and sells the meat in

TABLE 9. Hog slaughter in Zhu Cheng County

Year	State-Owned Slaughter	Private Slaughter
1998	36,000	30,000
1997	21,000	80,000
1996	24,000	100,000
1995	27,000	80,000
1994	60,000	80,000
1993	60,000	80,000
1992	80,000	70,000
1991	80,000	70,000
1990	100,000	50,000

six or seven retail shops that it owns. The company also buys frozen beef and mutton from Inner Mongolia and Shaanxi province for its retail shops.

With the weak meat demand and low prices in 1998, the slaughterhouse was losing money when it bought cattle for slaughter and sold the meat. At the time of the interview, Min Chu was processing only animals brought to it by the local cattle buyers. The slaughterhouse has to pay a higher price than do cattle buyers for the animals it purchases because the farmer must transport the animal to the slaughterhouse. Because both the cattle buyer and the slaughterhouse receive the same price for meat in the market, the slaughterhouse receives less revenue above cost than do cattle buyers. Figure 3 displays the beef marketing channel for the Min Chu Food Company.

Zhang En Fu is a local butcher who sells pork in Chang Cheng city in Jilin. Zhang goes to a nearby livestock market early in the morning and buys a fattened pig and then sells it to the local slaughterhouse. When he buys the animal, he pays ¥4 for a disease test. The cost of

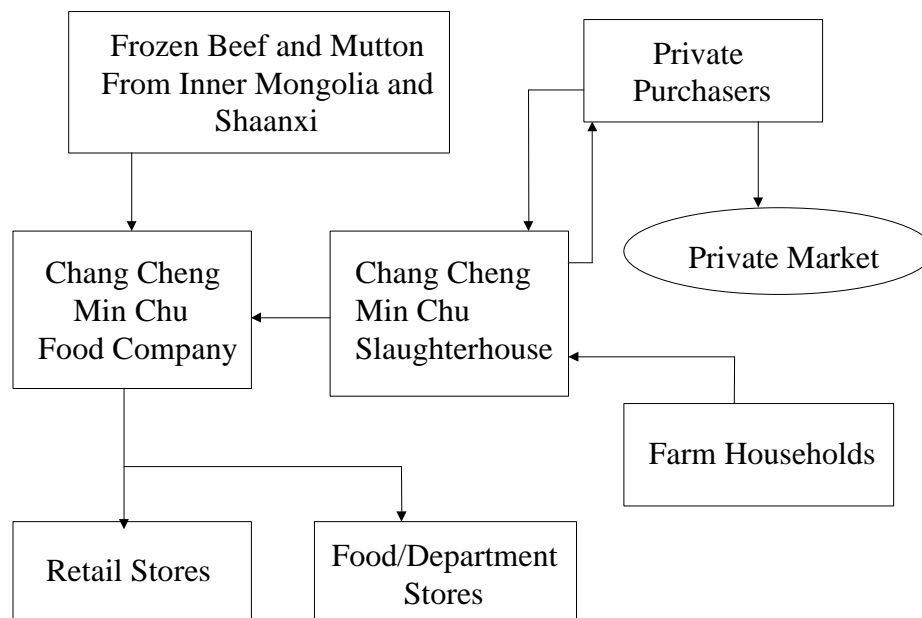


FIGURE 3. Beef market channel in Chang Cheng

transporting the hog to the slaughterhouse is ¥150 pre-truckload, but the truck usually is shared by several swine dealers. At the slaughterhouse, Zhang pays ¥15 for the slaughter tax, ¥10 for a disease inspection, and ¥20 in local taxes. He sells the meat from the pig in the local market. On the day of the interview, he was charging ¥11/kg for ham, ¥10/kg for the fore shank, ¥12/kg for loin, ¥8/kg for the feet, and ¥4/kg for the bones. If Zhang is unable to sell all of the meat he has to offer on a given day, he can store the meat in a refrigerator at the slaughterhouse. Zhang said his net revenue is usually ¥10–¥20 per pig.

The survey team interviewed a local butcher in the Er Dao Kou market in Chang Cheng city. The butcher goes to the livestock market in Wu Ke Shu, a suburb of Chang Cheng city, at about 12:30 a.m. At the market he buys animals and sends them to the slaughterhouse. He pays about ¥80 to transport the animal to the slaughterhouse and ¥20 for someone to take care of the animals until the slaughterhouse opens at 2:30 a.m. At the slaughterhouse, a Muslim butcher sticks a knife directly into the heart of the animal to kill it. The local butcher then skins the animal and removes the entrails, head, and feet. He sells the entrails, head, and feet to the slaughterhouse for about ¥90. He is able to sell the hide for ¥150. Average yellow cattle of about three to four years of age yield about 140 kg of meat, which the butcher sells for ¥13/kg, and 30 kg of bones, which he sells for ¥0.6/kg. The butcher sells the meat at the market in the morning. It costs about ¥15 to transport the meat from the slaughterhouse to the market. He also has to pay ¥30 per animal for the slaughter tax and ¥14 for the disease inspection tax. Once a month he pays the city ¥60 for his stall in the market, ¥270 for commerce taxes and other levies, and ¥30 for cleaning and maintenance at the market. After the morning market closes, he goes to his own shop. He must pay the same taxes and fees to operate his shop. For an average animal, the butcher pays ¥2,000 and receives ¥2,600 in revenues. Once taxes and fees are figured in, his net return is ¥30/animal. His monthly income is about ¥900, which is above the ¥500 average in his area.

Collection of Livestock Statistics

One objective for conducting the rural household survey was to provide evidence that would support or disprove conjectures about the accuracy of China's livestock statistics. As the survey was conducted, several questions were put to officials in the Animal Husbandry Bureau and the National Statistical Bureau to try to assemble a fairly accurate picture of the flow of livestock data. The information collected from these interviews points toward the possibility that the process of transferring and approving livestock statistics from one level of government to the next may provide incentives and scope for over-reporting animal inventories and meat production.

Interviews were conducted in each of the survey provinces, and though some differences appear to exist across provinces, the general picture of the flow of data and the incentive structure in the process was remarkably consistent. There are at least two aspects of the existing statistical system that create incentives and opportunity for misreporting livestock production and inventory figures. First, an annual agricultural production target or plan is drawn up at various levels of government. These production targets are used in various ways to measure the effectiveness of government administrators. This process also creates an incentive for these officials to misreport agricultural production to improve their evaluation. Second, the statistics collected by the national statistics system and by the Animal Husbandry Bureau are subject to the approval of government administrators at every level of the data collection. The fact that the national statistical system is not independent of government administrators means that these administrators potentially have the ability to influence data as it is transmitted from one level of government to the next.

Figure 4 illustrates the flow of livestock data from the household to the central government. Every month the village accountant reports livestock statistics for the village to the township Animal Husbandry Bureau. The township Animal Husbandry Bureau collects

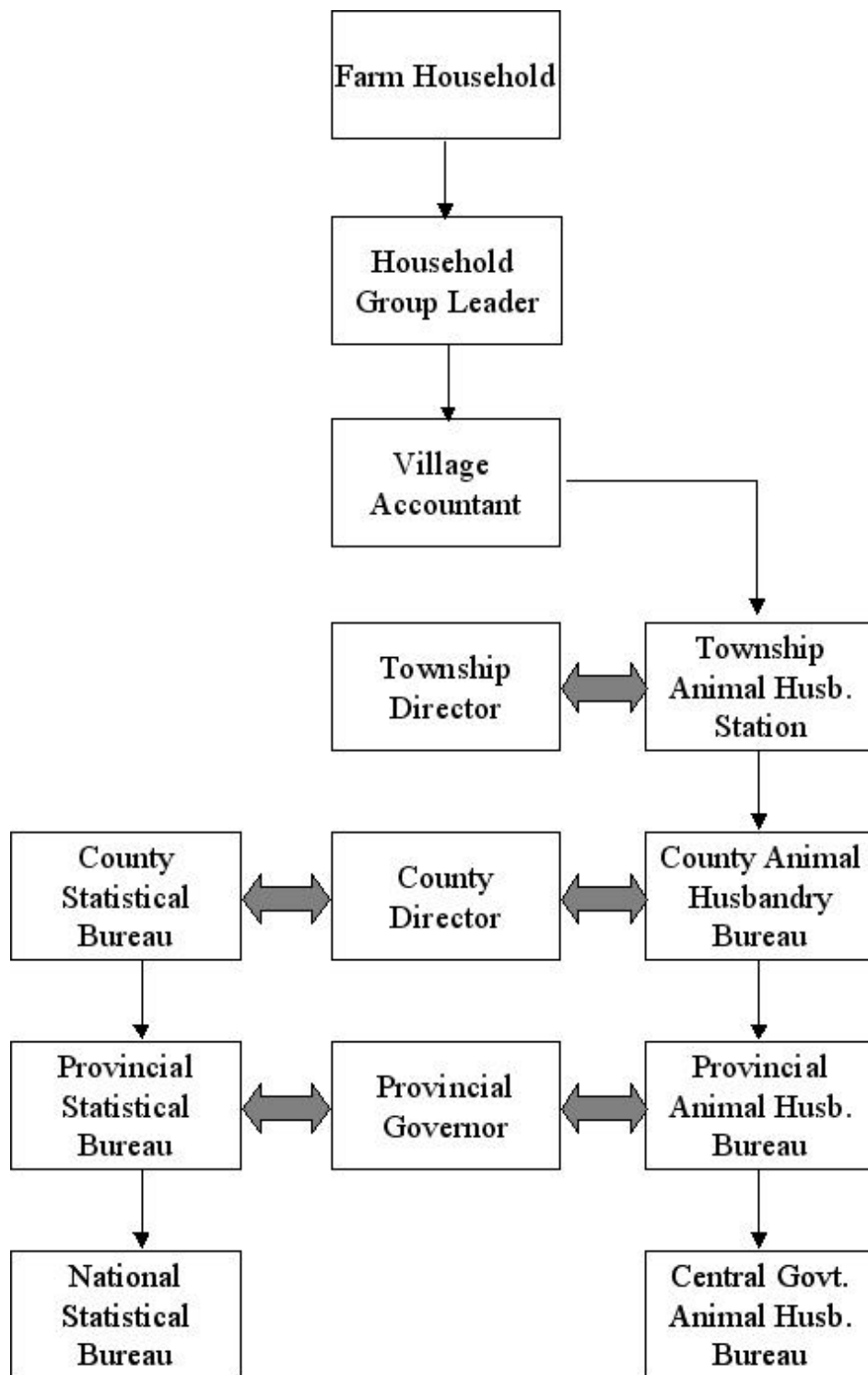


FIGURE 4. Flow of Chinese livestock statistics

the data from all the villages in its jurisdiction and reports this information to the county Animal Husbandry Bureau. However, before the report is forwarded, the director of the township must approve the report. The county Animal Husbandry Bureau provides livestock statistics for the townships in its area to the county office of the National Statistical Bureau and to the provincial Animal Husbandry Bureau. Before these numbers are forwarded to the next level, the director of the county must approve them. The same process occurs at the provincial level before the statistics are tabulated at the national level.

According to officials who were interviewed in the survey provinces, an agricultural production plan is formulated at every level of government at the beginning of the year. The plan is first formulated at the highest levels of government, and it is communicated down to lower levels of government. At each stage, the production plan is formulated to be consistent with the level above it. Every year agricultural production is projected to increase. One township official indicated that the rate of growth in agricultural production should approach the rate of growth projected for national gross domestic product. As the year progresses, government administrators are evaluated to some extent by their ability to meet the planned growth in output. If, for example, the data reported up from the townships to the county director does not meet the production plan, the county director may communicate subtly to the township director that these numbers need to be checked. Though one official does not explicitly ask another to misreport the data, the message is communicated indirectly. The same sort of leverage can be exercised above and below the county level. One official explained that this leverage is made possible by the fact that the person in charge of agricultural statistics at each level is under the management of the government administrator. Consequently, the government directors frequently choose people they believe will be loyal to them.

One official in the Animal Husbandry Bureau stated that he believed the livestock data in his county was overreported by 20 to 40 percent as the numbers moved from the

village to the county level. Most of the data inflation occurs between the township and county level, roughly a 20 percent increase. Between the village and the township level, data was overreported by about 10 percent. From the county to the provincial level, he thought the data could be increased an additional 5 to 10 percent. For example, he estimated that the number of swine in his county were overreported at the provincial level by 70,000 head, about 8 percent higher than the number reported by the county.

Ongoing Research

This report provides information about the production components of the household survey conducted in China by CCAP and CARD in 1999. As mentioned in the introduction, one of the primary purposes of conducting the survey was to uncover information that would be helpful in accessing the quality of China's livestock production and consumption data. It is apparent from the anecdotal information collected during the household survey that there is potential for significant overreporting of livestock production at the lower levels of the statistical reporting system. An initial reconciliation of China's livestock statistics undertaken by Fuller, Hayes, and Smith (2000) concluded that China's pork production is overestimated by up to 65 percent.

However, as the data collected by the survey described in this report have been processed, additional information, particularly regarding away-from-home consumption, has become available. The companion report documenting the results of the consumption survey in both urban and rural areas and a second assessment of livestock statistics is currently being written. In addition, the feed use data collected as part of the household survey are being analyzed to better understand the determinants of feed rations in the swine sector. In particular, a study is currently underway that investigates the trade-offs associated with using green feeds in household swine production. Despite these ongoing explorations of the data, the household survey data remains a rich source of information

about livestock production and consumption patterns in rural China that has not been fully exploited. In the future, the cost of production data and marketing preferences collected in the survey may be examined to increase our understanding of the role of household production in China's rapidly changing food markets.

Endnotes

¹The survey team was headed by Dr. Dinghuan Hu. The team members included Yuying Wang, Jun Song, Yanmei Lu, QiuJun, Jingxia Wang, and Yumei Zhang. In each province, two members of the local household survey team of the National Statistical Bureau accompanied the Chinese Center for Agricultural Policy (CCAP) survey team. The CCAP survey team was joined by Dr. Frank Fuller from the Center for Agricultural and Rural Development for four days in Chengdu and Leshan in Sichuan.

²The average rate of gain was computed as the slaughter weight divided by the age of the animal slaughtered.

Appendix

Chinese Farm Household Production and Consumption Survey

Farm Household and Interview Information

Province	
County	
NSB County Code	
Village	
NSB Village Code	
Household name	
CCAP Household Code	
Interviewer	
Interview Date	

1. Basic Household Information (1998)

1	2	3	4	5	6	7	8
Person code	Sex	Relation	At-home Consumption	Age	Race	Education	Employment Code
	Male Female	1. Father 2. Spouse 3. Child 4. Grandchild 5. Grandparent 6. Other	Number of months the person was present for meals at home	Years	Han, Li, Miao, Huai, Bu Yi, Zhuan, Other	Years of study	1. Farmer 2. Factory labor 3. Private business 4. Student 5. Other
1							
2							
3							
4							
5							
6							
7							
8							

2. Household Land Utilization

	1	2	3	4	5	6	7
Year	Cultivated Area (mu) (1=2+3)	Irrigated Area (mu)	Un-irrigated Area (mu)	Hillsides (mu)	Total Grain Area (mu)	Other Crop Area (mu)	Pond Area (mu)
1997							
1992							

3. Household Farm Labor

Person Code	1997		1992	
	Hours worked	Gross Income (Yuan)	Hours worked	Gross Income (Yuan)

4. Suppose you did not work on the farm during the last 5 years, estimate your potential employment and earnings.

Person Code	1997		1992	
	Hours worked	Gross Income (Yuan)	Hours worked	Gross Income (Yuan)

5. Annual Net Income

Net Income(Yuan/year)	1997	1992
Income Approach*		
Expenditure Approach**		

Notes: *Calculated as: Agricultural income + Non-agricultural income + Other income.

** Calculated as: Cost of daily articles + Food + Education + Housing + Change in savings + Other expenses

6. Crop Production and Utilization

	1997					
	I	II	III	IV	V	VI
Crop Code	1					
Planted area (mu)						
1. Production (kg)*						
2. Beginning stocks (kg)						
3. Home consumption (kg)						
4. Feed use (kg)						
5. Ending Stocks (kg)						
6. Seed use (kg)						
7. Waste/loss (kg)						
8. Quantity sold (kg)						
Sale price (Yuan/kg)						
9. Quantity purchased (kg)						
Purchase price (Yuan/kg)						
10. On-farm processing (kg)						
Fresh straw production (kg)						
Fresh straw feed use (kg)						
Fresh straw stored (silage) (kg)						
Ammoniated straw (kg)						

Notes: Crop Codes: 1=Sweet potatoes (yams), 2=Maize, 3=Wheat, 4=Early indica rice, 5=Hybrid early indica rice, 6=Middle indica rice, 7=Hybrid middle indica rice, 8=Late indica rice, 9=Hybrid late indica rice, 10=Japonica rice, 11=Sorghum, 12=Barley, 13=Soybean, 14=Rapeseed, 15=Peanuts, 16=Potato, 17=Other

Supply and utilization balance equation: 1+2-3-4-5-6-7-8+9-10=0

7. Crop Cost and Returns for Primary Crops

Crop Code*	(1)			(2)		
	Yield/mu (kg)	Production (kg)	Price (Yuan/kg)	Yield/mu (kg)	Production (kg)	Price (Yuan/kg)
	1997	1997	1997	1997	1997	1997
Sold for procurement						
Sold to the market						
By-products sold for procurement						
By-products sold to the market						
Marketing cost**						
	Use/mu (kg)	Total Use (kg)	Price (Yuan/kg)	Use/mu (kg)	Total Use (kg)	Price (Yuan/kg)
Seed						
Urea						
Potassium						
Ammonium						
Phosphate						
Potash						
Compound Fertilizer						
Pesticide						
Herbicide						
		Total Cost (Yuan)	Price (Yuan/mu)		Total Cost (Yuan)	Price (Yuan/mu)
Irrigation						
Tilling						
Harvesting						
Taxes						
	Days/mu	Total labor (Days)	Daily wage (Yuan)	Days/mu	Total labor (Days)	Daily wage (Yuan)
Household Labor						
Labor	Cash					
Ex-change	For goods					
Hired	Cash					
	For goods					
Other 1 _____						
Other 2 _____						
Other 3 _____						

Notes: *Crop Codes: 1=Sweet potatoes (yams), 2=Maize, 3=Wheat, 4=Early indica rice, 5=Hybrid early indica rice, 6=Middle indica rice, 7=Hybrid middle indica rice, 8=Late indica rice, 9=Hybrid late indica rice, 10=Japonica rice, 11=Sorghum, 12=Barley, 13=Soybean, 14=Rapeseed, 15=Peanuts, 16=Potato, 17=Other

** Marketing costs vary seasonally and include: transportation, labor, and other costs.

8. Livestock Inventory Balance (1998)

		Mo.	Age	Number	Weight	Price	Mo.	Age	Number	Weight	Price
Livestock Code		Mos.	Mos.	Head	Kg/ head	Yuan/ head	Mos.	Mos.	Head	Kg/ head	Yuan/ head
1998 Beginning Inventory		1									
		1									
		1									
		1									
Growth	Pur- chases										
	Births										
	Gifts received										
	Other (Ex- plain)										
Decline	Sales*										
	Death or Loss**										
	House- hold Use										
	Given away										
	Other 1										
	Other 2										
Current Inven- tory											

Notes: *If part of the slaughtered animal is consumed by the household, include only the part sold for money.

** If not sold, price is zero

Livestock Code: 1. Market hogs, 2. Sows, 3. Boars, 4. Cows, 5. Bulls, 6. Steers, 7. Dairy cows, 8. Male Buffaloes, 9. Female Buffaloes, 10. Sheep, 11. Goats, 12. Other large animals, 13. Broilers, 14. Layers, 15. Local chickens, 16. Geese, 17. Ducks, 18. Other.

9. Livestock Inventory Balance (1997)

		Mo.	Age	Number	Weight	Price	Mo.	Age	Number	Weight	Price
Livestock Code		Mos.	Mos.	Head	Kg/head	Yuan/head	Mos.	Mos.	Head	Kg/head	Yuan/head
1997 Beginning Inventory		1									
		1									
		1									
		1									
Growth	Purchases										
	Births										
	Gifts received										
	Other (Explain)										
Decline	Sales*										
	Death or Loss**										
	Household Use										
	Given away										
	Other 1										
	Other 2										
1997 Ending Inventory											

Notes: *If part of the slaughtered animal is consumed by the household, include only the part sold for money.

** If not sold, price is zero

Livestock Code: 1. Market hogs, 2. Sows, 3. Boars, 4. Cows, 5. Bulls, 6. Steers, 7. Dairy cows, 8. Male Buffaloes, 9. Female Buffaloes, 10. Sheep, 11. Goats, 12. Other large animals, 13. Broilers, 14. Layers, 15. Local chickens, 16. Geese, 17. Ducks, 18. Other.

10. What was your household livestock production 5 years ago?

	1992			
	Swine	Cattle	Sheep & Goats	Poultry
Sales & Use (head)				
Average weight (head/kg)				
Price (Yuan/kg)				

11. In the next 5 years do you plan to increase, decrease, or maintain your level of livestock production? What are your reasons?

Swine		Cattle		Dairy Cattle		Broilers	
Plan*	Reason**	Plan*	Reason**	Plan*	Reason**	Plan*	Reason**
Layers		Local Chickens		Sheep & Goats		Aquaculture	
Plan*	Reason**	Plan*	Reason**	Plan*	Reason**	Plan*	Reason**

Notes: *Plan: 1. Increase, 2. Decrease, 3. Maintain current level.

**Reason: 1. Increase income, 2. Full use of household labor, 3. Full use of grain, 4. Full use of crop byproducts (straw & green feeds), 5. Increase manure production, 6. Low profitability, 7. Marketing difficulties, 8. Lack of feed, 9. Lack of space, 10. Taxes too high, 11. Lack of labor, 12. Other

12. Egg Production, Consumption, and Sales

	Eggs		
	98 (1 st 6 months)	1997	1992
Production (kg)			
Sales (kg)			
Home Consumption(kg)			
Price (Yuan/kg)			

13. Aquatic Product Output, Consumption, and Sales

	Aquatic Products		
	98 (1 st 6 months)	1997	1992
Production (kg)			
Sales (kg)			
Home Consumption(kg)			
Price (Yuan/kg)			

14. Average Non-feed Livestock Production Costs and Revenues (Per Head)

Livestock Code*	1997	1997	1992	1992	1997	1992
Major product output (kg)						
Quantity Sold(kg)						
Sale Price (Yuan/kg)						
By-product Output (kg)						
By-products Sold (kg)						
By-product Price (Yuan/kg)						
Marketing Costs (Yuan/head)**						
Labor Days						
Daily Wage (Yuan)						
Veterinary Costs (Yuan/head)						
Vaccinations (Yuan/head)						
Insurance (Yuan/head)						
Capital Depreciation (Yuan/head)						
Management Costs (Yuan/head)						
Utilities (Yuan/head)						
Animal Input Costs (Yuan/head)						
Other 1_____						
Other 2_____						
Other 3_____						

Notes: *Livestock Code: 1.Swine, 2.Beef Cattle, 3.Dairy Cattle, 4.Sheep & Goats, 5.Broilers, 6.Layers, 7.Other.

** Marketing costs vary seasonally and include: transportation, labor, and other costs.

15. Feed Used for Livestock (Previous Day)

				Self-produced		Purchased			Other	
	Time	Livestock Code*	Number (head)	Feed Code	Quantity (kg)**	Feed Code	Quantity (kg)	Price (Yuan/kg)	Feed Code	Quantity (kg)
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Notes: *Livestock Code: 1.Swine, 2.Beef Cattle, 3.Dairy Cattle, 4.Sheep & Goats, 5.Chicken, 6.Ducks, 7.Geese, 8.Fish. **by weight

Grain Feed Codes	Oilseed Cake Codes	Manufactured Feeds	Forages	Green Feeds	By-product Feeds
1.1 Wheat bran 1.2 Rice bran 1.3 Fresh sweet potatoes 1.4 Dried sweet potatoes 1.5 Maize 1.6 Wheat 1.7 Rice 1.8 Millet 1.9 Soybeans 1.10 Millet gruel 1.11 Barley 1.12 Sorghum 1.13 Potatoes 1.14 Rapeseed 1.15 Other	2.1 Soybean cake 2.2 Cottonseed cake 2.3 Rapeseed cake 2.4 Cottonseed cake (duplicate) 2.5 Peanut cake 2.6 Other	3.1 Imported compound 3.2 Domestic compound 3.3 Purchased mixes 3.4 Concentrates 3.5 Fish meal 3.6 Other	4.1 Maize stalks 4.2 Wheat straw 4.3 Rice straw 4.4 Ammoniated straw 4.5 Maize silage	5.1 Sweet potato vines 5.2 Vegetables 5.3 Roots 5.4 Collected greens 5.5 Tree leaves 5.6 Other	6.1 Household waste 6.2 Restaurant waste 6.3 Beer by-products 6.4 Wine by-products 6.5 Industrial by-products 6.6 Other

16. Annual Feed Use per Head

Livestock code*						
Feed Code**	1997	1997	1997	1997	1997	1997

Notes: *Livestock Code: 1.Swine, 2.Beef Cattle, 3.Dairy Cattle, 4.Sheep & Goats, 5.Chicken, 6.Ducks, 7.Geese, 8.Fish.

**by weight

17. For each type of animal you raise, please indicate your top 3 preferred locations to market live-stock products. List your reasons.

Swine		Beef Cattle		Dairy Cattle		Broilers	
Market Place	Reason	Market Place	Reason	Market Place	Reason	Market Place	Reason
Eggs		Local Chickens		Sheep & Goats			
Market Place	Reason	Market Place	Reason	Market Place	Reason		

Notes: Market Places: 1. From household, 2. Village market, 3. Township market, 4. County market, 5. Outside county, 6. Meat processor, 7. Government procurement station, 8. Feed lot, 9. Other.

Reasons: 1. Good prices, 2. Easy, 3. Fair, 4. Lower taxes, 5. Preferred by village officials, 6. Other.

18. Where do you get your market price information?

1. Go to market yourself, 2. Neighbors, friends, or family, 3. Village officials, 4. Public media, 5. Other

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