

Small Farmers and Agri-Food Market Restructuring: The Case of Fruit Sector in China

Phase I Report

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Summary

In this report, we seek to meet the specific objectives of the first phase of China's study. The key goal of this study in China is to prepare evidence-based policy advice concerning the implications and opportunities for fruit producers during a period of a boom in horticulture demand and a restructuring of downstream markets and commercialization. Hence, the research in Phase 1 concentrates on identifying the determinants and consequences of restructuring of the horticulture sector in China. The analysis is conducted on three levels: *macro* (the policy issues and the national business environment), *meso* (the different chain segments and villages) and *micro* (household level). Because of space limitation and timing of the research the linkages between the first two levels are analysed in this report. The micro study will be carried out during the upcoming phase.

The research for this report is structured into two parts: a.) the national-meso level and b.) the local-meso level. In part 1 key policy issues, broad fruit supply chain issues and key stakeholders are identified. This part is intended to set the stage for the analysis done in part 2 and the forthcoming household study. The goal of part 1 is to analyze the evolution of China's restructured supply chain at a national level over a period of the past 10 or more years. With this background, the objective of part 2 is to study in more depth the restructuring changes that are occurring inside China's rural communities and within the markets. It also will provide context for the forthcoming micro-level study. In particular, we primarily study how marketing supply chains are operating and evolving within villages; inside wholesale markets and inside supermarkets.

The main findings in this report are:

- Downstream segments of the marketing chain have evolved dramatically in the past 20 years. China has moved from a country with a food system based on rationing in the cities to one that was based on wet markets and small shops to one in which the supermarket and restaurant sectors are growing faster than anywhere else in the world. This has greatly increased the demand for horticulture commodities. Exports of horticultural commodities have also arisen. It should be noted, however, the retail sector is very competitive.
- In the midstream wholesale sector also is evolving in some fundamental ways, though less rapidly than the retail sector. While the number of wholesale markets have not risen very fast, their size is increasing, especially of key players. In other words, there is consolidation occurring. In addition, there is evidence of specialization and the emergence of markets that are focused on providing more high quality products. The nature of the actors is changing, also. From a market that is made up of mostly small traders to one with an emerging set of more permanent small and large wholesalers. Some of the large wholesalers have formal and informal ties with supermarket chains. However, it should be noted that even large wholesalers are relatively small and there are literally thousands of actors and markets are very competitive. On the buying side there has been much less change and most buying is still done directly from farmers by employees of the

small trading firms and wholesalers, by their agents or from farmers that bring their commodities to the markets.

- The main fundamental drivers of this evolution are rising incomes, urbanization, domestic market liberalization and international trade liberalization. Indeed, China's markets are being driven by rapidly rising demand in an unregulated environment that allows for easy entry at all levels of the marketing chain.
- At the village level we find that the production of fruits reflect national trends. They are rising rapidly. However, the meso-level data has let us identify the mechanism of rising production: most of the net increase in the production of our case study commodities, apple and grape, has come from both entry of new producers and the expansion of farm size of existing ones.
- Production is extremely small scale and most of the perceived production constraints are natural disaster, technologies, input quality and unprofitability and more lucrative options in the labor markets. There are few regulatory or institution or physical constraints. Despite these, we believe many of the constraints are related to the lack of farm associations that could play important roles to overcome major constraints that farmers are facing.
- Marketing is dominated by the sales of farmers to small traders and small wholesalers in fresh fruits such as apple and increasing in processed fruits such as grape (for wine). Consistent with the national meso study, there is no penetration of the new retailing institutions for fresh fruits. Buyers play no role in providing technology, inputs, technical advice or credit. There is no formal contracting in apple. Although the marketing channels of grape at farm procurement level has changed significantly, we also found that the ways of transactions occurred does not differ much with traditional procurement. This study also found that there are few constraints outside of poor information and high transaction costs that are in a large part associated with the small size of China's farms.
- In such an environment, small farmers dominate. We see that there is no real difference in the nature of constraints faced by the poor or remote in either production or market. In previous work (quoted in the paper), poor farmers benefit and horticultural crops contribute positively to the income of the poor.

Implications

In such an environment there are a number of things for policy makers to do. First, continued management of the market in the current hands-off way is appropriate. Markets at all level are competitive and food is being provided to the cities in an efficient and inexpensive way. Small farmers are participating.

Second, policy makers need to address the most critical aspects of the marketing constraints: how to get better information to farmers. This is not going to be easy. There should be more programs on cable TV and radio that seek to provide up to the date, extremely detailed and unbiased price data. Forecasting supply and making recommendations is going to be difficult if not impossible. In fact, farmers have complained about having apple become unprofitable due to over supply. More information, however, total area planted and year to year changes would be welcome and might help academics begin an annual update of the state of the economy for major commodities. Cooperatives will help in overcoming production technology and high transaction costs. Continued monitoring of markets for fairness of access is crucial.

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1. Introduction

1.1 Agriculture and the economy

Agricultural growth is one of the main accomplishments of China's development and national food security policies. Agricultural production grew at about 4.5 percent annually, which largely outpaced population growth (about 1.2 percent) in the past 3 decades (NSBC, 2006). Agriculture has made important contributions to national economic development, food security and poverty reduction. Successive transformations of China's economy have been based on agricultural growth (Nyberg and Rozelle, 1999).

Previous studies have shown that there are several sources that have contributed to agricultural growth. After 1978, decollectivization, price increases and the relaxation of trade restrictions on most agricultural products accompanied the take off of China's food economy. However, as the one-off efficiency gains from the shift to the household responsibility system were essentially reaped by the mid 1980s, the growth rate of the food and agriculture sectors decelerated (Huang, Otsuka and Rozelle, 2006). The declining trend was most pronounced for grain crops. While dropping below the rate of growth generated in both the pre-reform and early reform periods, production of rice, other grains, and cash crops has continued to expand after 1985. In the meantime, rapid economic growth, urbanization and food market development have boosted the demand for meats, fruits and other non-staple foods, changes that have stimulated sharp shifts in the structure of agriculture (Huang and Bouis, 1996; Huang and Rozelle, 1998). For example, the share of livestock output value more than doubled from 14 percent to 35 percent between 1970 and 2004 (Table 1). Aquatic products rose at an even more rapid rate. One of the most significant signs of structural changes in the agricultural sector is that the share of cropping in total agricultural output fell from 82 to 51 percent in 1970-2004.

Despite the rapid growth of agriculture, the even much faster growth of the industrial and service sectors has led to significant falling of its shares in the economy in terms of gross value added, employment, capital accumulation, urban welfare, and foreign exchange (Table 1). In 1970, agriculture contributed more than 40 percent of the nation's GDP and half of its export earnings. By the mid 1990s, the share of agriculture in the economy and the share of agricultural exports in total exports fell below 20 percent and 15 percent, respectively (Table 1). In 2004 agriculture's share of GDP was only 13 percent. The shifts in the economy can also be seen in employment. Agriculture employed 81 percent of labor in 1970, but 47 percent in 2004. Such a sharp change in the economy also shows China is shifting from a rural-based society to an urban-one. In addition, although the rate of growth of agricultural trade rose in the 1980s and remained high through the 2000s, it is still declining as a share of total trade (Huang, Otsuka and Rozelle, 2006). For example, the shares of food export (or import) in total export (or export) fell from 17 percent (or 15 percent) in 1980 to 2-3 percent in 2004 (Table 1).

The declining importance of agriculture is historically common to all developing economies. China is densely populated; farm sizes averaged less than one hectare as early as the 1950s. Population growth and limited land resources will shift China's comparative advantage from

land intensive economic activities like agriculture to labor intensive manufacturing and industrial activities (Anderson 1998).

1.2 Important agri-food sub sectors

While China's entire agricultural economy has performed well in terms of growth over the past two decades, we focus on the case of fruit sub-sector because of the particularly rapid growth. In response to rising demand by consumers and the new policy environment, China's producers responded in a way that would have been difficult to predict. The changes in sown area of fruit illustrate more than anything the responsiveness of producers (Table 2). Between 1990 and 2004 sown area increased by 4.4 million hectares, increased by 88 percent. In the late 1990s, although the growth of sown area slowed, farmers began to invest in upgrading their orchards through grafting, pulling and replanting and improved agronomic care. Despite China being known as a country that is short of land and that has had a mentality to plant grain ahead of all other crops, on a percentage basis, China has more than double the share of area (over 5 percent) allocated to fruit than other major countries (e.g., 2 percent in the US; 2 percent in the EU; etc.). Production increased even more, from 18.7 million tons in 1990 to 83.4 million tons, implying a significant rise in yield due to new and better land being used for fruit production and changes in technology.

However, the trend of production growth varied substantially among major type of fruits. For example, while the expansion of grape was small before middle 1990s, the area increased by nearly 3 times in the past 10 years (Table 2). On the other hand, the rapid growth of apple production in the early period had led to over supply and some farmers even started to cut apple tree due to the significant fall in apple prices (Wang, 2001). Correspondingly, after apple area reached 3 million hectares in the middle 1990s, it has been declining thereafter (Table 2). However, despite a decline in apple area in recent year, apple production continued to rise. It's production increased from 4.3 million tons in 1990 to 14, 20.4 and 24 million tons in 1995, 2000 and 2005, respectively (BSBC, 2006).

In addition to its rapid growth, there are several reasons to focus on the horticultural economy. First, it is part of the structural transformation that is occurring in rural China as the nation shifts its agriculture from one that is mostly grain-based to one that is more consistent with its comparative advantage. Second, the fruit sector is highly commercialized and it will be a good case study to examine the issues such as: To what extent are fruit systems changing and how? What are driving forces of the changes? To what extent have the penetration of markets into China's countryside occurred after decades of Socialism. Third, the restructuring of the downstream part of food economy will make it particularly interesting to examine the case of fruits. In the rest of the world, there is a lot of controversy over who will produce the emerging foods such as fruit, vegetable and dairy that will be sold to consumers in the new retail formats. Will it be the large, better off farmers or the smaller, poor farmers that benefit? Fourth, and related, studying China's fruit economy may allow us to look at changes in the mid-stream stages of the marketing supply chain—i.e., the wholesale market, since supplying urban horticultural needs may require a fair bit of bulking and breaking to get fruits from tens of millions of farmers to hundreds of millions of consumers.

1.3 The objectives of the study

Given the rapid and dynamic growth of horticulture crops in China's economy, as well as the importance in the portfolio of China's farmers, the place in China's export schedule and the

priority in consumer diets, the overall goal of this project to understand the process of commercialisation and the marketing supply chain of fruit from field to plate and assess the conditions that facilitate small farmer participation in a more globalized and urbanized food system. The study will prepare evidence-based policy advice concerning the implications and opportunities for fruit producers during a period of a boom in horticulture demand and a restructuring of markets. Hence, the research concentrates on identifying the determinants and consequences of restructuring of the horticulture sector in China. The analysis is conducted on three levels or parts: *macro* (the policy issues and the national business environment), *meso* (the different chain segments) and *micro* (household level). Because of space limitation and timing of the research the linkages between the first two levels are analysed in this report. The micro study will be carried out during the upcoming phase.

The research for this report is structured into two parts: a.) the national-meso level and b.) the local-meso level. In part 1 key policy issues, broad fruit supply chain issues and key stakeholders are identified. This part is intended to set the stage for the analysis done under parts 2 and 3. The goal of part 1 is to analyze the evolution of China's restructured supply chain at a national level over a period of the past 10 or more years. With this background, the objective of part 2 is to study in more depth the restructuring changes that are occurring inside China's rural communities (villages) and within the markets. Part 2 research also will provide context for the forthcoming micro-level study in part 3. In particular, in the research based on part 2 we primarily study how production has changed and how marketing supply chains are operating and evolving within villages and inside wholesale/retail markets.

The main questions answered in parts 1 and 2 in this survey of China's horticulture industry are: What is the nature of the restructuring of the food industry in general? How have changes affected the most-downstream (retail) segments? What is happening to middle segments of supply chains – the wholesale markets? Are most changes between traders in the wholesale markets and downstream actors or between traders in the wholesale markets and upstream actors? What are the drivers of these changes or forces that are keeping traditional institutions in place? What are the trends of farmers in their efforts to enter the production of horticulture and what constraints do they face? Are villages/rural areas integrating in commercialized agriculture? What are their marketing choices and have they changes overtime? Are their marketing constraints that are keeping farmers out of horticulture markets? What are the technological, managerial, and organizational practices/behaviour related to market channel choices of the farmers? What are the interactions between the market and production practice behaviour of producers and local food industry segments, labour, land and other inputs and financial services markets?

1.4 Organization of the report

In the next (second) section, we describe the sources of our data, sampling, survey, interviewing techniques and selection of commonites. The third section has three sub-sections. The first sub-section, based on information from national statistical compendium and interviews, presents general information on China's food marketing restructuring, in general, and tries to understand the way that fruits fit into the overall commercialisation and marketing equation. The second sub-section, based on the meso-level surveys in Beijing wholesale markets and supermarkets; Shandong wholesale markets and information on marketing from the village focus groups, seeks to sketch a detailed picture of marketing channels in Greater Beijing (one of China's major municipalities) and Shandong Province (it is number one horticulture producing province). The third sub-section briefly discusses the

drivers of these changes. The fourth sub-section, also based on the village-level surveys, examines four elements: a.) trends in apple and grape production; b.) constraints that producers face in producing apple and grape; c.) trends in marketing from the farmer's point of view; and d.) constraints that farmers face in trying to market their apple and grape. The last sub-section is devoted to discussing the implications of our findings.

2. Methodologies and Data

2.1 Data Sets and Surveys

The data for this study come from five sources, four of them were collected by the project team. The only data source that are from published statistics are those used for building a sketch of national supply chains over the past two decades. Most of these data are published in Chinese in statistical compendia that are available to the public.

Under the meso part of the study, we collected four sets of data, three of which relied on surveys and one of which relied on interviews. In August and September of 2006, members of the project team visited 6 supermarket chains and interviewed managers of the fruit and vegetable procurement divisions. In the interviews, we asked the interviewees about the way that they sourced their fruit and vegetables in general and apple and grape in particular. Since we conducted these interviews after the three meso-level studies had been done and analyzed, we were able to confront procurement managers with the data from our studies and demonstrated to them that we understood the marketing channels in Beijing and Shandong. In the past, when we did not have such information, typically managers for whatever reason would tell us that most of the produce came from their own farms. During this time, however, when we broke out the marketing channels, we discovered that in fact they had only very few of their own production bases but would buy from the wholesale markets. They were able to tell us, however, the different types of wholesalers from whom they bought.

In the Beijing area, we conducted a wholesale market survey in order to try to track the flows of fruit and vegetables, in general, and apple and grape, in particular, into and out of Beijing. We began to select the sample by creating a map of all of the wholesale markets in the Greater Beijing Area (Figure 1). This map was created from interviews of traders in a number of markets that we visited on a pre-survey trip. We also supplemented this information with expert opinion from the Beijing marketing bureau. After creating the map, we checked back with our respondents and when we were unable to identify any additional markets, we considered the map complete.

During the pretest, we also collected information on whether or not the markets were large or small. We discovered that in Beijing there were one super-size wholesale market, Xinfadi (accounting for 85 percent of all volume traded in wholesale market in Beijing) and 2 large wholesale markets (together accounting for 5 percent). Because marketing structure and products in these 3 markets are similar, we interviewed Xinfadi market and used it to represent the above 3 markets. There are also 37 small wholesale markets (accounting for 10 percent of all fruits traded in the greater Beijing area). Of the small markets, we divided them into two groups: those inside the fifth ring road (or in the city center or *small urban wholesale markets*); and those outside the fifth ring road (or in the *suburbs*). We discovered that although there were more small urban wholesale markets (22 of them), their sales volumes were relatively small. In contrast, compared to small urban markets, the small suburban markets had greater volumes. On the basis of this information, we were able to estimate that

the smaller suburban wholesale markets accounted for 6 percent of the sales volume in Beijing and the smaller urban wholesale markets accounted for only 4 percent of the overall sales volume. Therefore, when we construct totals for Beijing our weights are 90 percent for large wholesale markets; 6 percent for small suburban wholesale markets; and 4 percent for small urban wholesale markets. With these weights established, we then took a list of each of the two types of small wholesale markets and randomly chose one of them for inclusion into our survey.

After choosing the sample markets, our project team enumerators then visited each market and randomly chose a subset of traders for interviewing. In Xinfadi, the market is divided by 2 zones, Jingpin (high quality) zone and Putong (regular quality) zone. The wholesalers in Jingpin zone have fixed shops, cooling/frozing facilities for storage, and more employees, while wholesalers in Putong zone are family based, without fixed shops and storage facility. Jingpin zone accounts for about 30 percent of fruits traded in the market and the rest 70 percent are traded in Putong zone. In each zone, we randomly chose 15 wholesalers (5 for apple and 10 for grape), so interviewed a total of 30 wholesalers in Xinfadi market.¹ In the smaller wholesale markets (suburban and urban ones) we surveyed 20 wholesalers (10 markets in each market), 10 apple wholesalers and 10 grape wholesalers. During the survey, we asked the wholesalers primarily about the sources of their purchases and the destination of their sales. In addition, we collected information about the nature of their transactions: who purchased for them (their own firm members; agents; or on spot markets from traders); the terms of payment (credit; cash; etc.); and whether or not there was any contract.

In Shandong, we conducted two separate, but coordinated, meso-level surveys, village survey and focused group survey. The Shandong village survey, is a provincial representative sample of apple and grape growing villages in China's main horticulture-producing province. The first step in conducting the survey involved creating two sampling frames of county-level apple production and county-level grape production in order to choose the five sample counties per crop (Figure 2). With knowledge of the total production environment in Shandong for each crop, we ranked counties by the level of the crop area per capita. We then divided the counties in Shandong into 3 groups: high production; medium production and low production counties. In our sample, one high production county was randomly selected from the counties in the top quintile; the other high production county was randomly selected from the second quintiles. The two medium production counties were randomly chosen from the third and fourth quintiles. There was only one low production county chosen. After eliminating the five percent of the counties with the lowest production, the low production county was randomly chosen from the lowest quintile. In the end for each crop there were 2 counties in the high production set of counties; 2 counties in the medium production set of countries and 1 county in the low production set of counties. The total level of apple and grape areas in each set of countries provided data for our weighting system (which is used to create point estimates for provincial averages of each of our variables).

After the sample counties were chosen, a relatively similar process was used to select townships. The number of towns, however, differed by the type of county. Specifically, in the high production counties, five townships were selected (two high production townships; two medium ones; and one small one). In the medium production counties, three townships were selected (one high production township; one medium and one low). In the low

¹ Because there are large variations among grape wholesalers in terms of traded volume and seasons, we selected more grape wholesalers than apple wholesalers for interviews.

production county, only two townships were selected (one high production township; one low one). In total for each crop, the survey teams visited 10 townships.

Finally, after the sample townships were selected, a similar process was used to select villages. In the high production county and high production township, three villages were selected (one a high production village; one a medium one and one a low one). In the high production county medium township and the medium production county high and medium production townships and the low production county high production township we chose two sample villages (one high and one low). In the all of the counties, we only chose one village in the low production township. There in total for each crop (for the five counties and 10 townships), we interview in 35 villages (22 in high production counties; 10 in medium production counties; and 3 in low production counties). Since we collected area data on all village, townships and counties in the sample we are able to construct area-based weights in order to be able to create point estimates of our variable that are provincial representative. A schematic depiction of the county, township and village samples for each crop are in Appendix Figure 1.

After choosing the villages the enumeration team then visited each community and ran two data collection activities. One enumerator conducted a two-hour, sit-down survey with the village leader, village accountant and an experienced farmer with fruit production experience. In this survey, information on the village's farming and general economic characteristics were enumerated. The respondents also provided information on the village's horticulture producing history as well as recounted previous policy and other government-initiated efforts to extend fruit into the village. A profile of local markets and neighboring marketing venues were also part of the survey. In general, the main task of the village survey was to create a set of data that describe the production and marketing environment within which the village's farmers operated. As a check on the other part of the survey in the village, we also ask the village leader and accountant (who typically was a farmer himself—though not always a horticulture-producing farmers) as well as the fruit producer about the production technology and marketing channels of apple and grape. These data were primary used as a check against which the focus group data (described in the next paragraph) were compared.

In 20 of 35 selected sample villages for each crop (Appendix Figure 1), we also conducted a focus group survey to elicit information and opinions from farmers. This group composed of 7-8 individual who were chosen randomly from the farmers engaged in apple or grape production. Since most horticulture-producing household live and work most of their hours in the village, the attrition rate between sample selection and participation in the focus group was low (less than 10 percent).

During the focus group, survey team discussion leaders elicited a wide array of production, technology, marketing and constraints information from the respondents that was recorded by second members of the focus group organizing teams. Using a semi-structured set of interview questions (to ensure each group provided information on the same set of topics), the focus group process provided detailed information on the history of apple (grape) production in the village; marketing history; technology choice; and information on interaction with buyers and input suppliers. In particular, intensive questions were asked about marketing channels of the produce. To the extent possible, we tried to get the groups of farmers to tell us the typical way in which farmers in the village marketed their output and to whom that buyer sold. This information was asked for 2000 and 2005 (in some case for past 15 years), to allow us to understand the direction of change (if any) of horticulture marketing at the

village level. A set of directed questions were also asked of both producers of apple (grape) and those that did not produce about constraints to participation in the horticulture sector.

2.2 Selection of Commodities

Our choice of fruits is a natural one. After 1990, as China's economy began to grow rapidly and the policy environment became less rigid (see section 3.5 for more details on drivers of the changes), the fruit sector increased rapidly. During the 1990s, the area planted to fruits increased from 5.2 to 8.9 million hectares (Table 2, column 2). During this time, the share of fruit area in total cropped area also rose significantly, from 2.3 percent to 5.7 percent. After 2000 similar trends continued. Production increased even much more than area expansion. In 1990, total fruit production was only 18.7 million tons. The production raised by about 4.5 times in 1990-2004, with annual growth rate of 11.2 percent.

Because the fruit sector includes so many different varieties, we decided to focus on two commodities, apple and grape. Their choice was based on three criteria. First, the production of apple and grape ranks number one and sixth in fruit sector in China. Second, production of both apple and grape increased significantly in the past 15 years, their growths were higher than the average fruit production growth (Table 2). Apple production increased by 5.5 times (from 4.3 to 23.7 million tons) and grape production even increased more (from 0.86 to 5.68 million tons) in 1990-2004. Third, growth patterns differ between apple and grape. Apple expanded most rapidly in the early period, while grape continued to experience rapid growth through entire period after 1990 (Table 2). Interestingly, after the middle 1990s, apple area expansion slowed down and even declined. One factor is the emergence of competing fruits, the demand for which has risen as incomes have increased. Second, China started to promote apple production through area expansion by allowing farmers to shift from other crop production to apple and introducing new varieties in the 1980s (Zhang, 2005). This promotion program had increased apple production by nearly 4 times in 1990-1996 (Table 2). Its share in total fruit production also rose from 23 to 37 percent with 7 years. The sharp rise of apple production in such short period immediately led to a substantial fall in its prices. For example, prices of 2 major varieties, Hongfushi and Guoguang, Shandong province dropped respectively from 3.6-4.0 yuan/kg and 1.4-1.6 yuan/kg in 1994 to 1.8-2.0 yuan/kg and 0.8-1.0 yuan/kg in 1997 (Ji and Yue, 1999).

Regionally, we choose Shandong province basically for the following 2 reasons. First, among 31 provinces, Shandong is the largest fruit production province in China. In the past 15 years, the province accounted for about 10 percent of the nation's fruit area and its apple (21 percent) and apple (13 percent) area shares in China were even large (NSBC, 2006). Because of higher yield, Shandong produced 28 percent of apple and 14 percent of grape in China in 2005 (NSBC, 2006). Second, Shandong is a central market for apple and fruits. It is perceived that the dynamic nature of fruit markets in Shandong will soon or late be followed in many other regions in China.

3. Changes in the National and Regional Food Systems in China

As has happened in so many other sectors in China, during the past one to two decades or so great changes have taken place in the downstream segments of the fruit marketing chain. The changes can be most succinctly summarized by changes in the number and size of marketing venues and by shifts in the composition of the different formats. We look at two sets of data:

national data from published sources and regional data for two municipalities/provinces from our meso-level surveys

3.1 Evolution of China's Markets: A National Picture

After 30 years of an economic development strategy based on planning (1950 to 1980), during the first 10 years of the reform era (launched by Deng Xiaoping in the early 1980s), China's economic landscape was transformed by an explosion of market activity. Wet markets (or markets that are frequented by consumers buying from farmers directly or from small traders) rose rapidly between 1980 and 1990 (Table 3, column 4). During the 1980s, the total number of marketing venues nearly doubled (from around 40,000 in 1980 to around 75,000 in 1990). Since the total value of exchange transactions rose even faster (by nearly 10 times, from 23.2 billion in 1980 to 213.2 billion in 1990 (Table 4, column 4, rows 1 to 3), the average value of transactions (in real terms) also rose. The number of markets and value of exchange transactions increase rapidly in both rural and urban markets (Tables 3 and 4, columns 5 and 6).

Although wet markets continued to grow in both number and size terms during the 1990s, the pace of the rise decelerated (Tables 3 and 4, columns 4 to 6). In their place, the data show that there was a clear emergence of other marketing formats. During the 1990s, wholesale markets more than tripled in number (Table 3, columns 1 to 3). Moreover, as in the case of wet markets in the 1980s, their size also rose, since the value of exchange transactions rose at an even faster pace than the number of markets (rising by 30 times from \$11.4 billion to \$331.1 billion (column 1, rows 3 to 13)).

The 1990s also saw the emergence of supermarkets (Table 3, column 7). In fact, China's very first supermarket was built in 1990. In total during that year, it was the only one. However, by the mid-1990s, the dam on the supermarket flood burst. By 2000 there were more than 32,000 supermarkets and they were growing at an accelerating rate. The volume of sales rose at an even faster pace (Table 4, column 7). This means that not only was the number of the supermarket rising, the average size of the store was increasing, too.

After 2000 China's rapidly shifting vegetable market entered a new phase. After a constant rise in the number of markets between 1980 and 2000, after 2000 the number of wet markets began to decline. The number of wet markets in China actually began to decline after 2000 and the value of sales transactions stagnated (especially in rural areas). In their place, wholesale markets (as measured by value of sales) continued to rise and supermarkets have continued to explode in numbers and sales value. Clearly, according to official statistics, a fundamental shift is underway in the downstream segment of China's horticulture markets.

Despite the rapid rise of China's supermarket sector, at least through the first period of expansion (the 1990s and early 2000s), there is little evidence of consolidation. According to the data from the top 90 supermarket chains in China (CFFA, 2003), the total sales from these largest enterprises only accounts for about 3 percent of total urban food sales. The consolidation rate was rising a bit between 2001 and 2002. However, like so many other sectors in China's service and commerce sectors, relatively low barriers to entry mean that there are literally thousands of firms competing across the nation and hundreds of firms within each city. Moreover, also the number of wetmarkets is falling in China, they have not disappeared. Therefore, across the entire supermarket landscape competition is fierce not only among supermarket chains, but between supermarkets and wet markets.

When looking at a country as big as China, it is important to remember that changes in the downstream segments of the supply chain are happening at different rates (Table 5). When looking at data for 2001 and 2002 for the 90 top supermarket chains (the only data available on a by province basis), it is clear that the emergence of supermarkets started earlier and is growing at a faster pace (in absolute terms) in the richer coastal areas. In 2001 and 2002, more than 80 percent of the sales of the top supermarkets are concentrated in coastal regions. However, it needs to be remembered that the growth rates in the central and western regions are also quite high (45 percent in Central China; 26 percent in Western China). Moreover, since 2002, there have been many reports from large supermarket chains that they are beginning to expand their operations inland. In short, through 2000 the supermarket revolution that we are discussing was still mostly a coastal phenomenon; there is no reason to believe that the same pattern will not occur in inland area. Indeed, they already are—especially there has been a rise of smaller supermarkets throughout most of China’s cities.

Fruit is mainly consumed as fresh fruits. Although there is considerable activity in the processing sector, during a time that the horticultural economy is rising so fast, the total number of processing firms is relatively stagnant (Table 3, column 8). Regular consumption of juices and wine from fruits in Chinese diet was more recent phenomenon, which was mostly started in 1980s and rose with changes in food consumption pattern as income and urbanization expanded. Urban per capita expenditure for food on average has been relatively stagnant during the past 5 years, the composition of the food basket has evolved. Grain consumption has fallen precipitously in urban areas, while the consumption of animal products has risen (Huang and Rozelle 1998; Ma et al., 2006). One of the main drivers of this trend is the vast array of restaurants that have opened in China’s cities during the last decade. As a result, the share of food consumed at home has trended downward. At the same time, the share household food expenditures spent on food away from home (FAFH) has increased (Ma et al., 2006). In addition, surveys of food consumed in restaurants also show that those that eat out consume a large volume of juices and wine made from various fruits. These trends may be important in the way that markets change. But even fruit juice consumption has been increasing, we estimate, for example, total apple used in processing is less than 20 percent of total apple production in China. Because of the difficulties in accessing data systematically in food processing, in the rest of our report we focus on the dominant fresh fruit sector.

3.2 Changing Markets within Consuming and Producing Regions

Although data from national sources show that the composition of market venues were changing (from wet markets towards supermarkets), the meso data demonstrate even more convincingly that downstream markets themselves (not just their relative share in total production or consumption) are dynamic and their nature is shifting, too. Using data from the Beijing statistical bureau and from our own wholesale market surveys and interviews, an examination of trends at the meso level (in this case, Greater Beijing) shows that there are several trends that are occurring. First, in a large municipality of like Beijing there is consolidation going on in markets. According to data collected by the Beijing statistical bureau, the number of market sites (in this case a combination of large wet markets and wholesale markets) is falling (Table 6, column 1). This is happening in both urban and suburban areas (columns 2 and 3). Yet this is happening at the same time that the demand for

horticulture products is rising. This means that the average size of market is increasing in Beijing.²

In fact, although our interviews also suggest that most of the remaining markets are growing over time, the real shift is the tremendous rise in the importance of Xinfadi, Beijing's primary horticulture market. While large in the early 1990s, it did not provide more than one-third of Beijing's fruit (which was a relatively smaller volume than is consumed today). By 2005, on a typical day more than 6000 tons of fruit flowed through Xinfadi, a volume that makes Xinfadi the largest wholesale market in Asia. In fact, the sales volume of Xinfadi is equivalent to 80 percent of fruits consumed by Beijing residents in a single day. Given the large rise of Xinfadi, it is not surprising to find that many smaller wholesale markets (those that did not close) were finding their volume dropping (especially the small urban wholesale markets).

Based on information from our wholesalers survey in Beijing wholesale markets, it can also be seen that the destination of sales from Beijing's wholesale markets are evolving in response to changing retailing patterns by China's consumers (Table 7). In 2000 by far that largest volume of sales by wholesale traders went to traditional buyers—small retailers (47.1 percent) and small traders (16.9 percent). Only 14.2 percent (9.4+4.8) were sold to supermarkets or restaurants. Between 2000 and 2005, however, Beijing wholesale traders reduced their sales to small retailers and small trader from 64 percent to 36.3 percent. In its place, supermarkets and restaurants raised their share to 40.2% (34.3+5.9). Clearly the new ways that Beijing residents are buying and consuming their food is changing the directions towards which wholesale market traders are selling fruits.

The responses from wholesale markets to retail pattern changes have also been occurring in wholesale restructuring. For example, in response to radial marketing changes, Xinfadi market has divided its whole spaces into 2 distinguish sub-markets, Jingpin and Putong zones, since 2004. Normally, the fruits traded in Jingpin zone, comparing with those in Putong zone, have the following characteristics: higher quality, more varieties in any given time (due to storage facility), better sourced and packed. It is also interesting that most wholesalers in Jingpin zone are from distant coastal provinces in southern China such as Guangdong and Fujian provinces, while wholesalers in Putong zone are from the northern provinces near Beijing. Table 7 shows that the wholesalers in Xinfadi's Jingpin zone are becoming special suppliers for supermarkets. In 2005, Jingpin zone sold 61.3 percent of fruits to supermarkets (column 6), while the corresponding figure was only 26.8 percent in Putong zone (column 4).

Importantly, however, consolidation and specialization at the wholesale market level in China does not mean that markets are becoming any less competitive. In fact, China's wholesale markets have remained remarkably competitive trader level. To see this one only has to examine the nature of firms that operate in China's wholesale markets. In Xinfadi, for example, although the daily level of sales from the market is more than 6000 tons per day, the largest single trader only moves 25-30 tons per day. When taken in terms of trucks per day, this means that the largest trader in the market only buys and sells about 4-5 large trucks of fruits today. When one visits the market, however, it is clear that there are more than 1000 trucks moving in and out of the market each day. On average, according to our survey, each trader does only 1-2 tons of fruits trading in a day, an amount that is less than one large truck per day. This low volume means that there are more than 1000 traders that operate in this

² Note that the 40 markets in Figure 1 are included in the number of markets in Table 6; 23 of the urban markets in 2004 are wholesale markets; 17 of the suburban markets are wholesale markets.

single market for fruits (and the other 1000 more for vegetables). Such a scenario is in stark contrast to many fruit and vegetable markets in the US in recent years that have been increasingly dominated by two or three extremely large enterprises.

A profile of the typical trading company in Beijing's wholesale is consistent with the small volume of sales. In fact, almost all of the traders we met were small family- or friend-based firms of 2 to 6 people. In a typical way of doing business for a 6 person firm, two to three team members man the wholesale market slots in the urban wholesale markets (e.g., they are the ones that occupy the space in a Xinfadi market). In some cases, especially for more established ones such as those in Jingpin zone, their space is permanent. For smaller ones, they may have a space one day, but not for the next several days. For these smaller traders, after they empty their truck or sell their lot of fruits they leave the market. The rest of the firm's members are out purchasing fruits from China's farmers in the surrounding villages or from wholesale markets in other parts of the country (e.g., one person from a Xinfadi wholesale firm may be in a Shandong wholesale market). Sometimes the wholesale buyer enters villages and purchases directly from farmers. Sometimes he/she will purchase a load of fruits from independent small traders, who are buying from farmers and selling to the wholesaler. When the buyer has purchased sufficient quantities to fill up a truck, the load is ship to Xinfadi from where it is resold to all of the different buyers that come from Beijing (e.g., small retailers; supermarkets; restaurant owners; etc.).

Hence, from our research we see that it is the nature of wholesale markets in China that is shielding farmers from experiencing the radical shifts that are occurring in the downstream retail sector. Although wholesale markets themselves are getting bigger; moving to the suburbs; consolidating and specializing, China's wholesale markets are still made up of tens of thousands of individual traders in thousands of trading firms. This picture is consistent with the findings of Dong et al. (2006) which find using household data that China's horticulture economy is dominated by thousands of small traders that come to the village to procure fruits and vegetables from the farmers themselves. Farmers also told us in Beijing that if they went to the local market to sell their fruits and vegetables they were also selling to small traders. Since there are really no large traders in even the largest wholesale market in Asia, this story is consistent.

In our wholesalers' survey, the other most notable finding is that almost all supplies of the wholesalers are either between wholesalers themselves and farmers (75%) or between wholesalers and their agents (3%, who themselves are just small traders that procured directly from farmers). According to our interviews, almost all transaction between those in the wholesale markets and farmers were done without contract on a spot market, fruits for cash basis. The rest 22% of supply of Beijing wholesale markets is from other wholesale markets.

3.3 Supermarket Procurement

The picture drawn according to the wholesaler interviews differs dramatically from the story that most were telling: the rise of supermarkets was leading to a situation in which supermarkets are using contractual arrangements to directly purchase from farmers. In fact, there are a number of pieces of evidence that suggests that this is not the case. First, although it is difficult to verify the share of each day's total fruit sales that pass through supermarkets, a conservative guess is around 40-45 percent in Beijing.³ So where does this amount come

³ For vegetable, it is about 15 percent (Huang et al., 2006).

from. According to our data (Table 7, column 2, row 6) in 2005 Beijing wholesale markets sell 34.3 percent of their fruits to supermarkets. Therefore one plausible story is that supermarkets get about 4/5th of their fruits from local wholesale markets and 1/5th from other sources.

In the rest of this section, we want to try to examine any evidence that can help us answer two questions. First, is it plausible that 4/5th come from purchases in local wholesale markets (or is it more or less?). Second, besides local wholesale markets, where else does the supply of fruits come from?

Perhaps the most compelling evidence about the dependence on supermarkets on local wholesale markets comes from the supermarkets themselves. In fact, we found that according to one interview of a procurement manager of a Beijing supermarket chain that at first glance the reported sales that move directly from the wholesale market to the supermarket (reported from the supermarket point of view) is remarkable consistent with the results of the wholesaling survey (reported in Table 7). According to the interviewees from Beijing supermarkets, more than 80 percent of their fruits are procured directly from small wholesalers or small product delivery companies (who are just wholesalers that rent an office in or around the wholesale market such as Jingpin zone in Xinfadi) in Beijing wholesale markets by supermarket procurement agents. Although such information was sometimes only grudgingly given (it is not perceived as being “modern”), we were told that supermarkets had no option except to rely on wholesale market if they wanted to remain competitive. In other words, during the interviews it was discovered that, in fact, supermarkets depend mostly upon wholesale markets to supply their fruits needs. In some instances, we were told buyers often just buy in the wholesale market itself. Frequently, these purchases are made in the part of the market that has evolved to supply relatively high quality fruits. While the new section of the market (e.g., Jingpin zone) is evolving towards a specialty of handling high quality produce, it should be noted that the structure of the market in terms of the size and nature of the trading firms is nearly the same. Like traditional wholesale markets, the quality part of the market is dominated by small and private firms that procure from farmers and have agents procuring from them. They also told us that there, in fact, was rarely any problem in procuring sufficient quantities or qualities of fruits that they wanted.

While more than 80 percent of procurement of supermarkets is directly from wholesale markets, this is not to say that markets are stagnant. In fact, our interviews support evidence of a steady evolution of China’s markets, especially in the downstream segment. In particular, we were told that, a large share of fruits is procured from Large Farm Product Delivery Companies (about 25 percent) who are mostly located in wholesale markets. These firms differ from traditional wholesalers (and Small Farm Product Delivery Companies) in several fundamental ways. First, they are larger, having around 20 to 25 employees, on average. Second, often have a more high-profile shop-front in the market. They also have formal contractual relations with supermarkets, although it was difficult during our interviews to understand the exact nature of the arrangements. Several times it appeared as if even though the contractual jargon was about contracting over a fairly long term of the basis of quantities and qualities, in fact, most relationships were run on the basis of an established relationship and were flexible. In other words, prices were frequently spot market prices and quantities and qualities were established on a rolling basis, depending on the daily and weekly needs of the supermarkets and availability in the wholesale markets. In other words, Large Farm Product Delivery Companies often appeared as if they were acting as an in-the-wholesale-market buying agent for the supermarkets. Perhaps the most fundamental

difference is that many of the transactions between the Large Farm Product Delivery Companies and supermarkets were on a credit basis, which gave the supermarkets some degree of leverage (during negotiations) over the delivery companies. Clearly, however, the emergence of Large Farm Product Delivery Companies represents an evolution in Beijing's wholesale markets.

Although the emergence of long term, quasi-contractual relationships between supermarkets and Large Farm Product Delivery Companies appears to be indicative of changes occurring among downstream actors, our interviews with supermarkets confirm the hypothesis that the competitive nature of wholesale markets in China shield upstream markets from these changes (at least so far). Most poignantly, when examining the procurement practices of Large Farm Product Delivery Companies, we found that by far most of the purchases are done through conventional channels. Employees of the companies and agents of the companies (who are just freelance small traders) all purchase fruits directly from farmers in ways that are indistinguishable from those of the employees and agents of traditional (small) wholesalers. In other words, from the farmer's point of view, regardless of whether his/her buyer is from a wholesaler, a Small Farm Product Delivery Company or a Large Farm Product Delivery company, the terms and nature of the procurement transaction is the same. In other words, in most upstream segments of China's fruit markets there is little evidence that markets are evolving. The same is true for the case when supermarkets send their own employees of agents directly to buy from farmers (about 15 percent).

That is not to say that there is absolutely no experimentation going on. Whether for window dressing or due to true desire to understand alternative (future) sources of supply, we can find that a small minority of fruits in China's supermarket come of novel sources. For example, in of about 5% of total purchases, Large Farm Product Delivery Companies procure vegetables from their production bases. In some cases, the companies actually control production. However, in others a production base is a village in which there is a long term relationship between the Large Farm Product Delivery Company and the villagers wherein the villagers supply a certain product in return for preferential treatment in terms of reliability of procurement and sometimes price premium. In addition, according to our interviews, less than 5 percent of the fruits in Beijing's supermarkets are either from farmers with contractual relationships with supermarkets or from the supermarket's own production base (1 percent). Although these are interesting (and often what is talked about in the press and observed by visitors that are escorted or introduced by supermarkets), it must be remember that of the total volume of vegetables this is very small.

Therefore, in summary of our analysis from the view point of supermarkets, China's supply chains are evolving. This picture also is consistent with the wholesale market data. However, the evolution is uneven. There are changes in the downstream sector. The changes are twofold. First, we see changes in the composition of sales. These composition changes are being driven by shifts in demand due to the rise of supermarkets and restaurants. Second, we see the relationships between new retail institutional actors, such as supermarkets, and wholesale markets are changing. The best example is the emergence of Large Farm Product Delivery Companies. However, both our supermarket interviews and wholesale market data also show that most of the changes in China's markets (at least in Beijing) are stopping at the wholesale market. From the farmer's point of view, most purchases still are done by small traders and employees and agents of wholesalers and large and small delivery companies who, to the farmers, are indistinguishable from one another. Regardless who is making the procurement, the terms are the same and the nature of the relationship is the same (that is, the

transaction is made on a spot market basis, without credit and with little other strings attached). Clearly, the story of China, at least according to our Beijing meso-level survey, is one of three tales—one at the far downstream end (where there is a lot going on at the retail level); one at the nearer segment of the downstream end (where, while most business is the same as usual, there is noticeable and measurable changes occurring) and one at the upstream end (where there is little change and traditional marketing channels are nearly universal).

3.4 Commodity Specific Marketing Channels: The Cases of Apple and Grape

Above all, the results of the commodity specific wholesale studies on apple and grape supply chains in Beijing support the findings of the analysis that was based on all fruits (previous sub-section). In general, supply to traditional channels has dominated but also experienced significant decline in recent years, but the extent of changes varies substantially among fruits (Tables 8 and 9).

In response the rises in supermarkets, restaurants and other forces, the composition of sales of the wholesale markets are changing. This is particular true for apple. In 2000, apple sold to supermarkets, restaurants, special suppliers and exporters accounted for 15.8 percent only ($8.3+5.5+0.7+1.3$, column 1 in Table 8). This share has been increased substantially and reached 46.4 percent in 2005 (column 2, Table 8). Among these, the purchases from supermarkets increased most significantly, from 8.3 percent only in 2000 to 35 percent in 2005. However, much less evolution was also observed in grape sector. Over the same 5 years period, grape in wholesale markets sold to supermarkets increased by 4 percent only. It even lost its marketing shares to special suppliers by about 8 percent (row 4, Table 9). The difference between apple and grape marketing channels in wholesale markets may be partially due to more perishable of grape than apple – the small retails are more flexible and timely than supermarkets in changing commodity prices during transactions.

When mapped into a schematic chart form (Figures 3, 4, 5a/b and 6a/b) it is easy to see the main trends in China's fruit market evolution. While the downstream markets (as described in the previous paragraphs) are shifting, the nature of China's markets shielded farmers from the shifts. In fact, as seen in the left hand side of the charts in Figures 3 and 4 (a region focused on consumers), through wholesaler oneself or by their agencies, wholesalers purchased more than 90 percent of their apple and grape from farmers directly. These shares for apple even increased in the period of 2000-2005. Although grape wholesalers declined their direct purchase of grape from farmers, the share still kept more than 90 percent in 2005 (Figure 4). The small decline in wholesale procurement from farmers is mainly explained by rapid expansion of wine firms that have increased their direct procurement from farmers in production regions (Figures 6a and 6b). Clearly, the small trading firms that make up China's wholesale markets are small enough that they are able and find it profitable to either send an agent to procure from China's small apple and grape farmers or go themselves (the Beijing mode) or purchase from farmers that come to the wholesale markets (the Shandong mode).

In addition to this general finding, our village (or community) survey in fruit production province shows that the apple and grape marketing trends are dynamic. First, markets in Shandong, one of China's main production areas, are acting predominantly as wholesale markets, while those in Beijing are more connected with local consumers. This is sign that markets in China have become specialized (unlike the self-sufficiency movements of the 1970s). In addition, our field interviews revealed that because of the density of markets or the rise of fruit production, there are more markets in more townships and districts in Shandong

when compared to Beijing. Most likely because of this, the patterns of procurement by wholesalers change. In Beijing, most wholesalers travel to local villages and buy from the farmer. In Shandong's wholesale markets, many farmers harvest and haul their vegetables to markets.

In addition, there are signs that markets in Shandong, one of the nation's main production areas, are becoming increasingly specialized. In particular, when we were in Shandong, traders told us because of the relatively high brand name of Shandong's fruits and vegetables, traders from other provinces would ship their fruits and vegetables to Shandong from which they would be re-sold. In part, this could be a trading strategy by Shandong traders to make sure that they always had enough produce for their customers, even if the supply needed to be brought in from other provinces.

4. Production and Marketing Changes in China's Villages

In this section, we turn our attention to China's villages and examine the state of horticulture production and marketing from view point of the farmer. To do so we begin in the first subsection by using our meso-level data to demonstrate the nature of our study sites (showing how they compare to the typical village in China and Shandong. In the second subsection we examine trends in production (area and yields) and inputs (including seeds, fertilizer and extension services). Relying on information from our surveys of village leaders and focus groups of farmers, we then seek to identify the major constraints faced by farmers that are growing apple and grapes (which are keeping them from expanding more or becoming more profitable). In the third subsection we examine marketing behaviour of farmers, first establishing where to whom farmers sell and under what terms, and then second trying to identify an additional set of marketing constraints that are affecting the decisions and profitability of apple and grape farmers.

4.1 Nature of the Study sites

The data from our study demonstrate that the typical village in our apple and grape villages, while highly representative of China and Shandong as a whole, have characteristics of what would be expected of villages that produce horticulture crops (Table 10). For example, on the one hand, the size of the village in terms of its population, number of households and family size clearly fall within the range of villages that are found across China and Shandong (rows 1 to 3). However, while all Shandong villages are smaller in terms of total land area and average farm size than the rest of China, the grape villages in Shandong are mostly larger than the average Shandong village (rows 4 and 5). In contrast, the land quality in terms of irrigated area in Shandong is higher than the rest of China (62% of cultivated land is irrigated in Shandong compared to only 42% in China as a whole) and the level of irrigation in our apple and grape villages is even higher (over 65 percent in the apple villages and 84 percent in the grape villages—row 6).

In terms of income and economic structure, our villages are shown to be a bit above average (even for Shandong) in per capita income terms, while even further above the China average (Table 10, row 7). This income advantage somewhat surprisingly emerges despite the fact that a higher percent of households in the study villages are involved in agriculture (than in the rest of China) and less are in the off farm sector (than in the rest of China or Shandong—rows 8 and 9). There are several (in some ways) competing hypotheses that can explain these trends. One is that horticultural crops are being planted by relatively well off farmers, an observation that is made throughout the literature. Second, it could be that horticulture farmers were

initially poor and because of horticulture production moved into the relatively well off category. This finding would be consistent with findings from research on horticultural producers in the Greater Beijing area done previously by the authors. Finally, it is possible that farmers in these villages are relatively well-off (because of other income sources), but that horticulture farmers are not above average (which is possible since, as seen before, even in the horticulture villages large shares of households do not participate). Unfortunately, the meso-level study can not address these issues. However, these are clearly questions that want to be addressed in the coming household study.

Interestingly, while there are relatively more farmers in cooperatives (called Farmer Professional Associations or FPA in China) than in the rest of China, the number is still very low. Moreover, according to the work by Shen et al. (2006), in many villages that nominally have FPAs, the actual amount of collective action is quite low. In other words, China's farmers, on the whole, are making production and marketing decisions mostly on their own (or are relying on at most informal associations within their villages).

4.2 Production and input trends and constraints in the production environment

Changing production structure

The trends in production, according to our village-level data show the structural changes in cropping that is occurring (Tables 11 to 13). Using information from the village level surveys and focus groups, fruit production in the apple villages are rising over time (Tables 11, rows 1 to 3). For example, the share of cultivated land devoted to fruits for our typical sample apple village raised from 14.4 to 19.0 percent between 1995 and 2005 (Table 11, column 2). The share planted to apples also increased and the rise was mainly from production expansion in the cultivated land. In the sample grape villages, on the average the land that is moving into fruits, in general, and apple, in particular, is coming at the expense of soybean, rapeseed and cotton land. Clearly, this represents a shift in cropping structure that would be expected in an economy that is marketizing—a shift toward more labor intensive horticulture and away from more land intensive crops. However, the structure changes differ among locations. For example, in high production counties (higher level of per capita production), apple and other horticulture expansion was mainly from the other land intensive crops, grain (column 1). In low production counties, total fruits area and apple areas have been declined slightly since 1995 (the last 3 rows). This is mainly due to the trend that fruit production has been moving to more comparative advantage areas as the sector is becoming more competitive.

The shifts in the grape village differ from those in the apple village and are, if anything, even sharper (Table 12). Grape production villages are often also major fruit production bases in Shandong. Moreover, grape productions are mainly concentrated in few major counties and few major villages within a county. For example, in 35 grape villages surveyed, more than half of land was located to fruit production in the past 15 years and its land shares have stabilized at about 53 percent (column 2, Table 12). In low grape production counties (including 3 sample villages), farmers located more than 90 percent land to fruit production (mainly apple and cherry) in 1995. In these villages, farmers adjusted its cropping patterns by reducing apple and raising grape and cherry production in the mountain areas. The farmers claimed that cheery and grape is more profitable than apple as apple price has fallen more than the prices of other fruits produced locally. The land allocated to grape production increased from 0.2 percent in 1995 to 5 percent in 2005 in low production counties. In high and medium grape production counties, fruits in general and grape in particular have been

expanding its areas as market demand for grape increased. Unlike low grape production counties where adjustment was made mainly within fruit sector, the rises of fruits and grape productions have been coming from grain crops in high grape production counties.

Production trends based on data that account for the number of households that cultivate apple and grape in each of the sample villages also shows that fruit area is expanding, but that the main way the area is expanding differs between crops and among villages. For example, for average grape village, its expansion came from both new producers and expanding farm size in 1995-2005 (rows 1-3, Table 13), while for average apple village its expansion was not from expanding farm size. Between 1995 and 2005, the share of households producing grape has nearly tripled (from 1.6 percent to 4.2 percent) and average grape area per households planting the crop increased by 5.5 times (from 0.04 to 0.22 hectare, last column, Table 13). These changes were much less significant in apple sector (rows 1-3).

Discussion with the members of the focus groups also clearly showed that in addition to area expanding, yields of apple and grape also have risen significantly. For example, during the focus groups, farmers in 70 percent of apple villages and about half of sample grape villages claimed that their yields had increased significantly. The most commonly cited factors are farmers were access to new seeds, better farm management, and increase in inputs, especially fertilizer and pesticides.

Inputs and Other Services

Apple and grape farmers in our sample villages adopted 3-4 varieties in a given time (Table 14). Replacement of new varieties was less than in apple villages than in grape villages. The focus group discussion revealed that this is due to the fact that more replacement was occurred before 2000 in apple villages. During 2000-2005, when new varieties were introduced, old varieties also were being dropped (row 4). Importantly for this study, in most villages (which is provincial representative) farmers purchased their new seeds from small private horticulture seed peddlers (row 5). Farmers also saved their own seeds to expand their production. Farmers in apple villages did not access any of their new varieties from buyers (as is the practice in other places in the world—row 6). Interestingly, as wine firms expanded and their direct procurement from farmers increased, in grape villages, the shares of grape farmers who had received seeds from buyers increased from zero in 2000 to 5 percent in 2005 (the last column). This is what we should expect as firms require special varieties for wine production.

In fact, the absence of major role of the actors in the output marketing chain in the input provision to farmers is a characteristic of Shandong's horticulture economy. In the same way as buyers played little role in the provision of new seeds, buyers also are not involved in the provision of fertilizer (Table 14). Likewise, except for one grape village that sold its products to wine firms, villages buyers also are less involved in the provision of extension services or provision of technical advice, either for a fee (which only occurs in one village or 5 percent of sample village) or without a fee (in the villages in which there is technical advice given it is provided either by friends or neighbors or the local government extension agent, not by any buyer).

Finally, buyers also are not involved in the provision of any credit (Table 14). However, even though the output marketing chain provides no credit, during the focus groups a large share of the villages reported that apple and grape producers were gaining access to credit from rural

credit cooperatives (RCCs—24 percent of apple producing villages and 45 percent of grape producing villages), informal credit channels (which typically means loans from family and friends—48 percent of apple producing villages and 25 percent of grape producing villages), and input suppliers (14 percent for both apple and grape villages). Although the large share of producers gaining access to credit from the rural credit cooperatives may signal a shift in government policy that seeks to provide better liquidity for farmers, this, in fact, may only be a characteristic of Shandong province (or other coastal provinces), which is a relative well-off province, and may not be typical of other, poorer parts of China. However, the finding is consistent with earlier findings by Wang and Park that found that liquidity in China's agricultural areas, especially in better off areas, was sufficient to provide China's labor-intensive agriculture with enough capital to keep it from becoming a major constraint.

Production Constraints

Despite the rapid rise of fruit production in Shandong province, farmers were able to identify a number of factors that were limiting their production. Three sets of constraints were identified. First, farmers that were producing apple and grape told enumerators what factors were limiting the expansion of their production. In asking these questions, we asked for both the single most binding constraint and the top three. Second, they also identified factors that limited yields (of their existing area). Finally, farmers in the focus group that did not produce apple and grape explained why they did not.

Constraints limiting expansion of horticulture producers. When asked for their number one constraint, farmers in our sample clearly identified natural disaster or the lack of better technology or quality of inputs as the main limiting constraint (Table 15, columns 1 and 2). Nearly 30 percent of apple farmers and 40 percent of grape farmers choose the category of "natural disaster." Main types of natural disasters frequently mentioned by farmers are hail, heavy rain, frosts, drought, and cold current. Farmers also stated that current the yields of current varieties were low, the quality of the apple and grape inferior, the varieties were not resistant to enough pests, and farm managements were relatively backward.

When dividing farmers between high and low income, technology was a bigger problem for poor grape farmers (44%) than richer ones (18%). After nature disaster and technology, poorer farmers believed the their inputs (especially pesticides) were poor quality. While no richer farmer believed the credit is the most constraint to their production, about 10 percent of poorer farmers considered this is the top constraint to their production though the number is much less than one would expect.

When asked about the top three constraints, both apple and grape farmers also identified technology, occurrence of natural disasters and quality of input and as the most important constraints (Table 15, columns 3 and 4). In all of China's farming areas the extremely large number of insecticides and pesticides that are available on the market make it difficult for farmers to choose the appropriate types of pesticides. In some cases, the quality of the manufacturing is low (farmers call this phenomenon, "fake pesticides"). In other cases they are sold a pesticide that was not suitable for the purpose that the farmer originally bought it for.

There were several factors that deserve mention for *not* being a major constraint (Table 15). Many of the focus groups in poor counties believed credit was a binding constraint. The emergence of government lending programs in recent years and the existence of traditional

informal credit networks in rural areas appears to have eliminated credit as a binding constraint. In addition, only a very few focus groups identified either lack of appropriate seed or the price of inputs as important constraints to expanding production. In China's agricultural economy, the numerous traders make almost all inputs readily available (however, as seen above, sometimes the quality is not high).

Farmers in China expect the government to address these constraints and many have not considered that the private sector might play this role. By far, when asked about solving pest problems, improving technologies and increasing the quality of inputs, farmers believed the extension service would have to solve the problems. This response is perhaps to be expected, given the results of the source of input supply which came almost exclusively from the private sector purchased on free markets from small traders. In addition, as will be seen in the next section, almost all of the buyers of apple and grape are small traders, small wholesalers or agents of wholesalers and have little means or interest in providing technology, credit or extension services to farmers.

Yield constraints. In addition to constraints to expanding area (for fruit producers) and for not wanting to enter into production in the first place (for non-producers), focus groups also identified several constraints to yields. By far, disease and insect pests and farm field management were cited as the most serious problems. Some farmers complained of the expense of using manure (which was disappearing due to the fall in the number of hogs being raised—at least relative to the area of fruits). Farmers in some villages thought that the fertilizers were sometime poor quality and at other times did not provide the exact mix of nutrients.

Constraints limiting entry into horticulture production. Finally, an entirely different set of constraints emerged when we asked farmers that were not engaged in fruit production why they were not (Table 16). By far the most common two responses were that off farm work was more lucrative and that the family would have been short of labor had they tried to produce apple and grape (rows 1 and 2). Since hiring labor in agriculture is always difficult (except for the most repetitive tasks that do not require care or attention) and since off farm labor opportunities in China (and especially in Shandong) were available for most farmers who were willing and able to go to the city, the availability of family labor that is not able to work in other activities is by far the largest constraint keeping more households from entering the production of horticultural crops.

Even for those with enough labor to be engaged in apple and grape production, many believed that there were other activities (cropping or livestock) that were more profitable (Table 16, row 3). About 25 percent of apple villages and 30 percent in grape villages stated that they either believed that it was either more profitable to plant an alternative crop or that it was unprofitable to plant apple or grape. Hence, the top three answers are ones that are really constraints that have been imposed by the values (or prices) that markets have generated; either labor markets raise the opportunity cost so high, or output markets make the relatively profitably so low, that non-producing household had decided that they do not want to produce apple or grape. This is important since one interpretation is that it is really the market that is the primary determinant of who is producing and who is not—not some policy barriers or institutional or resource constraint. Importantly, in contrast to the market-based constraints, the absence of land markets and other physical constraints play much less of the role (Table 16, rows 4 and 5).

4.3 Marketing Channels in the Fruit Economy: Incentives, Institutions, Infrastructure and Constraints.

Significant Changes in Procurement Channels

While not as radical changes as the upstream, and retail segment of the market, and the wholesale marketing link in supply chain, the downstream segment in China's apple and grape procurement channels have also experienced significant changes. If it is assumed that farmers are selling to small traders if they sell their produce in the village and if it is assumed that they are selling to small traders who are operating in wholesale markets (as we showed in section 3.2 above—which we call small wholesalers), then in 2000, about 90 percent of apple producers and 46 percent of grape producers sold their output to small traders (Table 17, rows 1 and 2). In other words, the small traders played significant roles in procured fruits from farmers in the early time period. However, procurement channels have been changed since 2000, which differs from those we found in vegetable farm procurement in the same province and the same period (small traders procured more than 90 percent of vegetables from farmers in both 2000 and 2005, Huang et al., 2006).

Evolution in the first link of the marketing chain differs among fruit crops. More significant change has been occurred in grape than apple. From Table 17, we can see that in the case of apple, there are only slightly less villages in which farmers sold their apple to the small traders and small wholesalers in 2005 (83 percent, 27+56, Table 17, row 1), compared to 2000 (90 percent, 31+59). However, the grape village farmers reported that while their grape sold to the small traders increased by 3 percent (from 8 to 11 percent) in 2000-2005, their grape sold to the small wholesalers declined by 24 percent (from 38 to 12 percent) over the same years. Declining shares of the small wholesalers in farm procurement were taken over by significant increase of procurement from special suppliers (from 11 to 22 percent) and processing firms (from 41 percent to 52 percent).

Far Less significant Changes in the Characteristics of Procurements

However, what is indisputable is that changes in the ways that fruits are procured at the farm gate are far less than the changes in the downstream segments of the market and marketing channels of the upstream segment. Although there are changes in the of the actors in wholesale markets, the wholesale markets are still dominated by thousands of traders, most of which are small, and the agents, almost all of which are even smaller. There also is very little present of the upstream retailers direct participation (Table 17). There are little supermarkets.

One of the most poignant characteristics of China's horticultural sector is its *laize faire* nature. There are almost no taxes levied on farmers. Since around 2000 or 2001, the government eliminated the Special Products Tax that original was collected from some farmers in horticulture producing regions. In addition, small traders are untaxed. And, wholesalers, which are assessed a fee for their use of marketing facilities (including stall space), are typically paying only a small flat fee. Furthermore, except for the largest of the transactions between Large Farm Product Delivery Companies and their largest buyers, horticultural crops, including apple and grape, are seldom assessed the value added tax (VAT). When the lack of licensing and regulation in the trade of fruits and vegetables is considered in conjunction with the tax environment (or more precisely the "absence of tax" environment), it can be seen why there has been so much entry and why there is so much competition in apple and grape markets.

The absence of contracting and no or less services provided by buyers when some kinds of contracts are presented are significant characteristics of China's fruit marketing (Table 18). In our sample apple regions, there was no (0%) formal and oral contracting. That is, in no case did a buying agency have a formal written contract regarding the production or marketing of apple. Although there are about 20 percent of grape villages where some farmers did make contracts with buyers to purchase the output of the farmers, after further inquiry, however, even in the villages that had the formal contracts there was near no input service provided by buyers. In other words, it is just as easy to say that in fact there was no contract and even there was contract that this was in fact just a long run business relationship in which there was an expectation that the farmers in the village would sell to the buyer, who would be expected to buy from them.

Improvements in Marketing Infrastructure

Table 19 demonstrates in a number of ways the reasons that China's apple and grape production has expanded so fast and why it is possible for markets to operate so competitively. By a number of indicators, the infrastructure that helps markets work better has improved. For example, the distance of the average village to the nearest county road (which in Shandong is typically an all-weather, paved asphalt road) is only about 1-3 kilometers (row 1). In addition, between 2000 and 2004 there has been an significant improvement in access by farmers in the sample apple and grape producing villages to the nearest highway (major road to county seat, prefectural capital or regional commercial center) and to markets). Communications have improved even more rapidly. Farmers with access to land-line or cell phones and cable television, important sources of market information, have improved dramatically (rows 5 and 6). In fact, when asking them explicitly about the rise of communication technologies, most of apple and grape producing villages reported that the emergence of cell phones and other communication facilities have improved their ability to market their horticulture crops significantly.

Given this set of marketing channels, rising infrastructure and the predominance of markets and small traders, it is unsurprising that the farmer main sources of information are diversified. Major sources of marketing information are the market itself, their neighbors (who get most of their information from the market), traders and media (Table 20).

Marketing Constraints

Despite the rise of communication technology and the increased density of markets, the focus groups in the sample villages identified lack of markets and price variability as the most severe marketing constraints (Table 21, columns 1 and 2, rows 1 and 2). Other constraints that are identified, in fact, are closely related. While the "lack of a market" in some cases meant there were high transaction costs because farmers had to travel a long way to market their produce (row 2), in some cases since they rely on markets for information, this also means that they were lacking information. In addition, some farmers also said "unfair transaction". This may be explained by the lack of farm associations and cooperatives in rural China.

In some cases in poorer area, it appears that farmers believe at times they are not able to negotiate fairly with buyers. In these villages farmers reported that they were "cheated" during the sales transaction (Table 21). In part, this might be a symptom of poor information.

It also may be a function of the nature of markets. Although we have conjectured because of the number of actors on the buying side and their small nature markets are competitive, in the villages that cite this as a constraint, it would appear that there was a lack of competition.

The constraints analysis that asked for the top three constraints is consistent with the analysis of the top constraint (Table 21, columns 3 and 4). Clearly constraints that have to do with high transaction costs and poor information are cited the most frequently.

5. Summary and Implications

The main findings in this report are:

- Downstream segments of the marketing chain have evolved dramatically in the past 20 years. China has moved from a country with a food system based on rationing in the cities to one that was based on wet markets and small shops to one in which the supermarket and restaurant sectors are growing faster than anywhere else in the world. This has greatly increased the demand for horticulture commodities. Exports of horticultural commodities have also arisen. It should be noted, however, the retail sector is very competitive.
- In the midstream wholesale sector also is evolving in some fundamental ways, though less rapidly than the retail sector. While the number of wholesale markets have not risen very fast, their size is increasing, especially of key players. In other words, there is consolidation occurring. In addition, there is evidence of specialization and the emergence of markets that are focused on providing more high quality products. The nature of the actors is changing, also. From a market that is made up of mostly small traders to one with an emerging set of more permanent small and large wholesalers. Some of the large wholesalers have formal and informal ties with supermarket chains. However, it should be noted that even large wholesalers are relatively small and there are literally thousands of actors and markets are very competitive. On the buying side there has been much less change and most buying is still done directly from farmers by employees of the small trading firms and wholesalers, by their agents or from farmers that bring their commodities to the markets.
- The main fundamental drivers of this evolution are rising incomes, urbanization, domestic market liberalization and international trade liberalization. Indeed, China's markets are being driven by rapidly rising demand in an unregulated environment that allows for easy entry at all levels of the marketing chain.
- At the village level we find that the production of fruits reflect national trends. They are rising rapidly. However, the meso-level data has let us identify the mechanism of rising production: most of the net increase in the production of our case study commodities, apple and grape, has come from both entry of new producers and the expansion of farm size of existing ones.
- Production is extremely small scale and most of the perceived production constraints are natural disaster, technologies, input quality and unprofitability and more lucrative options in the labor markets. There are few regulatory or institution or physical constraints. Despite these, we believe many of the constraints are related to the lack of farm associations that could play important roles to overcome major constraints that farmers are facing.
- Marketing is dominated by the sales of farmers to small traders and small wholesalers in fresh fruits such as apple and increasing in processed fruits such as grape (for wine). Consistent with the national meso study, there is no penetration of the new retailing

institutions for fresh fruits. Buyers play no role in providing technology, inputs, technical advice or credit. There is no formal contracting in apple. Although the marketing channels of grape at farm procurement level has changed significantly, we also found that the ways of transactions occurred does not differ much with traditional procurement. To what extent the penetration into grape production and how this penetration could have impacts on farmers need further investigation in the forthcoming household study. This study also found that there are few constraints outside of poor information and high transaction costs that are in a large part associated with the small size of China's farms.

- In such an environment, small farmers dominate. We see that there is no real difference in the nature of constraints faced by the poor or remote in either production or market. In previous work (quoted in the paper), poor farmers benefit and horticultural crops contribute positively to the income of the poor.

Implications

In such an environment there are a number of things for policy makers to do. First, continued management of the market in the current hands-off way is appropriate. Markets at all level are competitive and food is being provided to the cities in an efficient and inexpensive way. Small farmers are participating.

Second, policy makers need to address the most critical aspects of the marketing constraints: how to get better information to farmers. This is not going to be easy. There should be more programs on cable TV and radio that seek to provide up to the date, extremely detailed and unbiased price data. Forecasting supply and making recommendations is going to be difficult if not impossible. In fact, farmers have complained about having apple become unprofitable due to over supply. More information, however, total area planted and year to year changes would be welcome and might help academics begin an annual update of the state of the economy for major commodities. Cooperatives will help in overcoming production technology and high transaction costs. Continued monitoring of markets for fairness of access is crucial.

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Table 1. Changes in structure (%) of China's economy, 1970-2004.

	1970	1980	1985	1990	1995	2000	2004
Share in GDP							
Agriculture	40	30	28	27	20	15	13
Industry	46	49	43	41	47	46	46
Services	13	21	29	32	33	39	41
Share in employment							
Agriculture	81	69	62	60	52	50	47
Industry	10	18	21	21	23	22	22
Services	9	13	17	19	25	28	31
Trade to GDP ratio	Na	12	23	30	40	44	70
Export/GDP	Na	6	9	16	21	23	36
Import/GDP	Na	6	14	14	19	21	34
Share in export							
Primary Products	Na	50	51	26	14	10	7
Foods	Na	17	14	11	7	5	3
Share in import							
Primary Products	Na	35	13	19	18	21	21
Foods	Na	15	4	6	5	2	2
Share of rural population	83	81	76	74	71	64	58
Share of agricultural output							
Crop	82	76	69	65	58	56	51
Livestock	14	18	22	26	30	30	35
Fishery	2	2	3	5	8	11	10
Forestry	2	4	5	4	3	4	4

Source: National Statistical Bureau, China Statistical Yearbook, various issues; and China Rural Statistical Yearbook, various issues.

Table 2. Fruit production in China, 1990-2004

	Production (million tons)			Area (million hectares)			Share in total crop areas (%)		
	Fruit	Apple	Grape	Fruit	Apple	Grape	Fruit	Apple	Grape
1990	18.7	4.3	0.86	5.2	1.6	0.12	2.3	0.7	0.06
1991	21.8	4.5	0.92	5.3	1.7	0.11	2.4	0.7	0.05
1992	24.4	6.6	1.13	5.8	1.9	0.14	3.9	1.3	0.09
1993	30.1	9.1	1.36	6.4	2.2	0.14	4.4	1.5	0.10
1994	35.0	11.1	1.52	7.3	2.7	0.15	4.9	1.8	0.10
1995	42.1	14.0	1.74	8.1	3.0	0.15	5.4	2.0	0.10
1996	46.5	17.0	1.88	8.6	3.0	0.15	5.6	2.0	0.10
1997	50.9	17.2	2.03	8.6	2.8	0.16	5.6	1.8	0.10
1998	54.5	19.5	2.36	8.5	2.6	0.18	5.5	1.7	0.11
1999	62.4	20.8	2.71	8.7	2.4	0.22	5.5	1.6	0.14
2000	62.3	20.4	3.28	8.9	2.3	0.28	5.7	1.4	0.18
2001	65.6	20.0	3.68	9.2	2.1	0.33	5.9	1.3	0.21
2002	69.5	19.2	4.48	9.1	1.9	0.39	5.9	1.3	0.25
2003	75.5	21.1	5.18	9.4	1.9	0.42	6.2	1.2	0.28
2004	84.0	23.7	5.68	9.8	1.9	0.41	6.4	1.2	0.27

Sources: NSBC, various 2006; MOA, China Agricultural Statistics Yearbooks, various years

Table 3: Numbers of markets and food processing enterprises in China, 1980-2004

	Wholesale			Wet markets			Super-market	Food processing ¹
	Total	Rural	Urban	Total	Rural	Urban		
1980	-	-	-	40809	37890	2919	0	-
1985	-	-	-	61337	53324	8013	0	-
1990	1340	795	545	72579	59473	13106	1	-
1991	1509	-	-	74675	60784	13891	-	-
1992	1858	1101	757	79188	64678	14510	-	-
1993	2081	1229	852	83001	66551	16450	-	-
1994	2471	1530	941	84463	66569	17894	2500	-
1995	3517	2100	1417	82892	63000	19892	6000	-
1996	3844	2299	1545	85391	64559	20832	10000	-
1997	4038	2311	1727	87105	64753	22352	15000	-
1998	4243	2363	1880	89177	65050	24127	21000	15726
1999	4249	2393	1856	88576	63593	24983	26000	14810
2000	4532	2578	1954	88811	62416	26395	32000	14085
2001	4351	-	-	86454	59755	26699	40500	13688
2002	-	-	-	82498	55969	26529	53100	13700
2003	-	-	-	81017	54011	27006	-	14386
2004	-	-	-	-	-	-	-	15576

¹ Food processing includes both food processing and beverage manufacturing

Sources: NSBC, Market Statistical Yearbook of China, various years; China Yearbook, various years; Yu, 2003; Zhou, 2001; Hu, et.al., 2004

Table 4. Value of Marketing Transactions in China's Markets, 1980 to 2003 (billion yuan, real terms).

	Wholesale			Wet market			Supermarket
	Total	Rural	Urban	Total	Rural	Urban	
1980	-	-	-	23.2	20.9	2.3	0
1985	-	-	-	62.5	50.6	11.9	0
1990	11.4	-	-	214.2	131.4	82.8	-
1991	15.2	-	-	259.1	152.5	106.6	-
1992	22.0	8.0	14.0	348.8	192.4	156.4	-
1993	34.3	13.5	20.8	528.0	274.8	253.2	-
1994	67.4	26.2	41.2	887.5	436.0	451.5	3.4
1995	140.6	50.9	89.7	1145.3	535.0	610.3	8.3
1996	188.3	65.8	122.5	1452.1	673.1	779.0	29.5
1997	230.6	78.7	152.0	1721.8	786.2	935.7	41.8
1998	283.6	94.4	189.2	1960.1	868.9	1091.2	99.2
1999	268.3	87.7	180.5	2145.1	927.1	1218.0	148.4
2000	331.1	105.5	225.6	2399.1	1035.5	1363.6	217.3
2001	337.9	-	-	2465.4	1050.4	1415.0	304.3
2002	-	-	-	2566.8	1070.8	1496.0	451.9
2003	-	-	-	2618.4	1091.9	1526.5	-

Note: Trade values are measured in 2003 prices, deflated by consumer price index

Source: NSBC, Market Statistical Yearbook of China, various years; Hu, et.al., 2004

Table 5. The sales and number of stores units of the top 90 Chinese supermarket chains in the Eastern, Central and Western regions of China, 2001 and 2002.

	2001		2002	
	Sales (billion US\$)	No .of stores	Sales (billion US\$)	No .of stores
Eastern China	11.0	6246	15.2	9822
Central China	2.2	1146	3.0	1658
Western China	0.2	253	0.3	319
Total	13.4	7645	18.5	11799

Note: Eastern China: Beijing, Tianjin, Shandong, Jiangsu, Liaoning, Shanghai, Zhejiang, Fujian, Guangdong provinces. Central China: Heilongjiang, Jilin, Hebei, Henan, Shanxi, Anhua, Jiangxi, Hubei, Hunan, Sichuan, Chongqing, Yunnan, Guizhou provinces.

Western China: Shanxi, Ningxia, Gansu, Qinghai, Tibet, Xinjiang and Inner Mongolia.

Source: CCFA, 2002 and 2003

Table 6. Number of Wholesale and Wet Markets in Beijing, 2000-2004.

	Total	Urban	Suburbs
2000	386	69	317
2001	356	60	296
2002	327	56	271
2003	321	53	268
2004	324	-	-

Source: NSBC, Beijing Statistical Yearbook, various years

Table 7. Wholesale fruit market channels in selected markets in Beijing, 2000 and 2005.

Buyers	Total		Xinfadi				Baliqiao		Dongjiao	
			Putong zone		Jingpin zone ¹					
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Small traders	16.9	7.1	26.2	11.0	1.4	0.4	0	0.6	0	0.3
Small retailers	47.1	29.2	47.4	33.3	46.0	11.7	62.5	70.2	25.6	21.2
Wholesalers	8.4	14.0	10.7	19.5	5.5	6.1	0	0	4.5	2.0
Special suppliers	4.2	2.9	6.7	4.6	0	0	0	0	0	0
Processing firms	0.19	0.06	0.3	0.07	0	0	0.2	0.2	0	0
Exporters	1.1	1.2	0	0	4.1	4.4	0	0	0	0
Supermarkets	9.4	34.3	6.5	26.8	18.3	61.3	6.6	14.6	0.1	0.6
Consumers	3.6	2.9	0.6	0.1	1.9	0.3	5.2	3.2	61.1	62.5
Restaurants	4.8	5.9	1.3	4.4	13.7	10.1	1.0	2.5	4.2	7.0
Group purchasing ²	4.3	2.3	0.3	0.1	9.1	5.5	24.5	8.6	4.6	6.3

1. Because Jingpin zone was established in 2004, the data in 2000 column are market channels in 2000 for the wholesalers who are currently located in Jingpin zone.

2. Group purchasing includes government units, enterprises, etc. (mostly purchasing for special occasions in which employees are given boxes of fruit as an in-kind bonus).

Source: Author's survey

Table 8. Wholesale apple market channels in selected markets in Beijing, 2000 and 2005.

Buyers	Total		Xinfadi				Baliqiao		Dongjiao	
			Putong zone		Jingpin zone ¹					
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Small traders	23.3	7.1	36.3	11.0	1.4	0.3	0	0.8	0	0.4
Small retailers	49.4	29.6	48.9	34.1	52.6	12.5	55.2	64.1	26.9	22.2
Wholesalers	2.7	11.6	4.3	18.4	0	0	0	0	0	0
Special suppliers	0.7	2.8	1.2	4.5	0	0	0	0	0	0
Processing firms	0.2	0.05	0.4	0.1	0	0	0	0	0	0
Exporters	1.3	1.4	0	0	4.8	5.3	0	0	0	0
Supermarkets	8.3	35.9	6.6	27.3	13.8	64.9	7.1	18.4	0.2	0.7
Consumers	3.7	2.7	0.4	0.07	1.9	0	5.7	2.4	63.6	63.0
Restaurants	5.5	6.3	1.8	4.6	15.2	11.2	0.5	2.4	4.5	6.9
Group purchasing	4.8	2.6	0	0	10.2	5.9	31.5	11.9	4.9	6.9

1. Because Jingpin zone was established in 2004, the data in 2000 column are market channels in 2000 for the wholesalers who are currently located in Jingpin zone.

Source: Author's survey

Table 9. Wholesale grape market channels in selected markets in Beijing, 2000 and 2005.

Buyers	Total		Xinfadi				Baliqiao		Dongjiao	
			Putong zone		Jingpin zone ¹					
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Small traders	1.1	7.0	1.1	10.8	1.5	0.7	0	0	0	0
Small retailers	37.3	18.1	43.6	14.7	6.4	8.2	88.2	86.6	68.4	35.4
Wholesalers	27.0	41.0	26.4	49.1	38.4	37.3	0	0	0	0
Special suppliers	12.9	4.8	20.5	7.5	0	0	0	0	0	0
Processing firms	0.06	0.05	0	0	0	0	0.9	0.8	0	0
Supermarkets	16.3	20.3	6.3	13.1	44.8	43.5	4.7	4.4	0	0
Consumers	2.5	4.0	1.0	1.3	1.7	2.1	3.3	5.5	30.8	57.1
Restaurants	1.5	1.7	0	0	4.7	4.6	2.9	2.7	0.8	7.5
Group purchasing	1.4	3.1	1.1	3.4	2.6	3.6	0	0	0	0

1. Because Jingpin zone was established in 2004, the data in 2000 column are market channels in 2000 for the wholesalers who are currently located in Jingpin zone.

Source: Author's survey

Table 10. Characteristics of Typical Villages in China, Shandong and Sample Apple and Grape Sites.

	China average 2004	Shandong average 2004	Apple villages		Grape villages	
			2000	2005	2000	2005
Population (persons/village)	1444	818	730	712	1101	1107
Households (hhs/village)	383	238	225	235	359	373
Family size (persons/hh)	3.8	3.4	3.0	2.9	3.1	3.0
Cultivated land (hectares/village)	199	89	64	63	108	105
Farm size (ha)	0.35	0.25	0.27	0.27	0.32	0.31
Irrigated area share (%)	42	62	63	65	81	84
Per capita income (yuan)	2936	3507	2739	3548	2958	4070
Share of agricultural income (%)	47.6	48.0	73.7	70.9	65.2	61.7
Off-farm employment (%)	34	34	26.7	31.5	30.6	33.8
Share of farmers participate in FPAs	4	-	7.4	7.8	4.1	4.8

Source: NSBC, China Statistical Yearbook, 2005; Authors' survey. Information on "share of farmers that participate in FPAs" in all of China from Zhang et al., 2005.

Table 11. Crop production structure (all in percent of the village's total cultivated area) in sample apple villages in Shandong, 1995-2005.

Type of Village ^a	Grain	Fruit				
		Total fruits	All apples	Apple in cultivated land	Apple in non-cultivate land	Other crops
Average						
1995	57.0	14.4	11.4	10.1	1.3	28.6
2000	56.8	16.1	11.9	11.2	0.7	27.1
2005	66.1	19.0	13.2	12.5	0.7	14.9
High production counties						
1995	49.1	32.3	26.1	24.8	1.3	18.6
2000	38.9	38.9	31.6	30.3	1.3	22.2
2005	32.5	44.4	36.6	35.0	1.6	23.1
Medium production counties						
1995	69.3	20.7	14.7	11.8	2.9	10.0
2000	63.3	25.2	16.1	14.6	1.5	11.5
2005	67.2	28.3	17.2	15.9	1.3	4.5
Low production counties						
1995	48.4	6.0	6.0	6.0	0.0	45.6
2000	55.0	5.4	5.4	5.4	0.0	39.6
2005	70.7	5.2	5.2	5.2	0.0	24.1

^a Grouping counties into high, medium and low production categories are based on average per capita production; average is a weighted average of all sample villages.

Source: Author's survey

Table 12. Crop production structure (all in percent of the village's total cultivated area) in sample grape villages in Shandong, 1995-2005.

Type of Village ^a	Grain	Fruit				Other crops
		Total fruits	All grape	Grape in cultivated land	Grape in non-cultivate land	
Average						
1995	43.3	52.7	1.1	1.0	0.1	4.0
2000	41.9	53.0	5.0	3.8	1.2	5.1
2005	40.6	52.4	5.4	3.0	2.4	7.0
High production counties						
1995	61.4	23.8	4.6	4.4	0.2	14.8
2000	49.1	32.1	8.8	8.6	0.2	18.8
2005	44.1	35.8	10.8	10.7	0.1	20.1
Medium production counties						
1995	90.3	2.2	1.7	1.7	0.0	7.5
2000	84.7	9.5	4.2	4.2	0.0	5.8
2005	92.2	4.6	4.6	4.6	0.0	3.2
Low production counties						
1995	9.3	90.7	0.2	0.0	0.2	0
2000	9.5	88.5	4.8	2.6	2.2	2.0
2005	7.0	85.6	5.0	0.7	4.3	7.4

^a Grouping counties into high, medium and low production categories are based on average per capita production; average is a weighted average of all sample villages.

Source: Author's survey

Table 13. Production structure (all in percent of the village's total number of households) in sampled of apple and grape study villages in Shandong, 1995-2005.

Type of Village ^a	Apple			Grape		
	Average area per household (ha)	Share of hhs planting the crop (%)	Area per household planting the crops (ha)	Average area per household (ha)	Share of hhs planting the crop (%)	Area per household planting the crops (ha)
Average						
1995	0.029	18.2	0.22	0.002	1.6	0.04
2000	0.028	17.2	0.20	0.006	5.3	0.20
2005	0.032	18.5	0.21	0.007	4.2	0.22
High county						
1995	0.072	41.7	0.28	0.012	9.8	0.20
2000	0.072	40.6	0.21	0.023	11.4	0.44
2005	0.077	41.3	0.23	0.027	14.2	0.27
Medium county						
1995	0.053	39.9	0.15	0.004	1.8	0.33
2000	0.052	36.8	0.14	0.009	2.9	0.20
2005	0.070	45.1	0.15	0.010	3.1	0.29
Low county						
1995	0.014	6.7	0.24	0.0003	1.0	0.03
2000	0.013	6.5	0.24	0.004	5.8	0.18
2005	0.012	5.1	0.25	0.005	4.0	0.20

^a Grouping counties into high, medium and low production categories are based on average per capita production; average is a weighted average of all sample villages.

Source: Author's survey

Table 14. New varieties, seed, fertilizer and extension and credit services in sample apple and grape villages in Shandong, 2000 and 2005.

	Apple	Grape
Number of varieties per village in 2000	3.0	3.8
Number of varieties per village in 2005	2.9	4.1
New varieties introduced in 2000-2005	0.2	0.7
Varieties withdrew in 2000-2005	0.3	0.3
Sources of seed (%):		
Purchased seeds	86	55
Farmer saved seeds	0	20
Supplied by buyers	0	5
Supplied by government	10	5
Provided by relatives/friends in nearby villages	0	10
Sources of fertilizer (%):		
Purchased fertilizer	100	95
Supplied by government	0	5
Supplied by buyers	0	0
Extension “for fee” service (%)	5	5
Extension technicians	5	5
Buyers	0	0
Technical “for no-fee” service (%)	90	90
Relatives or friends	33	30
Extension technicians	86	50
Government	14	10
Farmer association	5	0
Buyers	0	5
Seed companies	0	10
University and college	0	5
Access to credit (yes or no) (%)	76	70
If yes, sources of credit (%):		
Relatives or friends	48	25
Rural Credit Cooperatives	24	45
Bank	0	0
National Special Loan	5	0
Input suppliers	14	10

Source: Author’s survey

Table 15. Production constraints identified by farmers in apple and grape in sample villages in Shandong, 2005.

	Top one constraint (%)		Top constraints up to 3 (%)	
	Apple	Grape	Apple	Grape
Average:				
Quality of inputs	19	15	52	40
Price of inputs	19	0	29	15
Credit (high fixed input)	5	5	24	20
Technology	24	30	62	50
Natural disasters	29	40	62	60
Lack of labor	0	5	0	5
Others	5	0	5	0
Income above average:				
Quality of inputs	45	9	73	55
Price of inputs	9	9	27	36
Credit (high fixed input)	0	0	18	27
Technology	18	18	73	27
Natural disasters	27	45	64	64
Lack of labor	0	9	0	9
Income below average:				
Quality of inputs	40	11	70	33
Price of inputs	10	0	30	0
Credit (high fixed input)	0	11	20	11
Technology	20	44	70	67
Natural disasters	30	33	70	56

Note: The sum of the percentages for the top constraint (columns 1 and 2) does not always equal 100, because there are some villages that reported they did not face any major constraints. The sum of the percentages for the top three constraints (columns 3 and 4) exceeds 100 because villages provided up to three answers.

Sources: Author's survey.

Table 16. Constraints to farmers limiting their entry into cultivating apples and grape in sample villages in Shandong, 2005.

	Apple	Grape
Off-farm income makes vegetable production unattractive	40	55
Not enough labor	55	70
Planting other crops more profitable or unprofitable to plant apple/grape	25	30
Not enough land	15	5
Soil quality and climate is unsuitable	0	5

Note: The sum of the percentages exceeds 100 because villagers were able to provide more than one answer. The question we asked is “why other farmers in your villages do not plant apple or grape?”

Sources: Author’s survey

Table 17. Procurement channels at the farmgate: the buyer to whom apple and grape producers sold their produce in Shandong sample villages, 2000 and 2005 (all in percents) .

	Apple villages		Grape villages	
	2000	2005	2000	2005
Small traders	31	27	8	11
Wholesalers	59	56	38	14
Special suppliers	5	7	11	22
Processing firms	2	3	41	52
Associations	--	--	--	0.3
Consumers	2	8	2	1

Note: Data are from question posed to the farmers in the focus group: To whom did you sale your apple (grape)?

Source: Authors’ survey.

Table 18. Contracting arrangements in the apple and grape producing sample villages in Shandong, 2005 (all figures in percent).

	Apple villages			Grape villages		
	Formal contracts	Oral contracts	No contract	Formal contracts	Oral contracts	No contract
Shares by different contracts	0	0	100	24	5	85
Services provided by buyers						
Seed	0	0	0	10	0	0
Fertilizer	0	0	0	0	0	0
Credit	0	0	0	0	0	0
Extension	0	0	0	5	0	0

Source: Authors' survey.

Table 19. Marketing infrastructure in apple and grape producing villages in Shandong, 2000 and 2005

	Apple villages		Grape villages	
	2000	2005	2000	2005
Distance from nearest high way (km)	49.2	14.4	52.9	18.4
Distance from nearest county road (km)	1.7	1.4	2.9	2.8
Distance from nearest wet market (km)	5.7	4.3	7.8	7.4
Distance from nearest wholesale market (km)	17.4	13.9	10.3	10.3
Share of farmers that own land-line telephone or cell phone (%)	47.0	76.4	52.8	83.1
Share of farmers have cable television (%)	48.4	71.7	61.3	65.7

Source: Author's survey

Table 20. Sources of marketing information of apple and grape producers in sample villages in Shandong, 2005

	Apple villages	Grape villages
Local markets	23	38
Neighbors	50	76
Media	18	14
Buyers	45	57
Brokers	5	24

Source: Authors' survey

Table 21. Marketing constraints identified by farmers in apple and grape producing villages in Shandong, 2005.

	Top one constraint (%)		Top constraints up to 3 (%)	
	Apple	Grape	Apple	Grape
Average:				
Price variability	45	20	50	25
Lack of markets	30	55	40	55
Insufficient information	10	5	20	10
“Unfair transaction”	5	10	10	15
Small production scale	0	5	5	15
Local admin intervention	5	0	20	5
Transportation	5	0	5	0
No good varieties	0	0	5	0
Others	0	0	5	0
Income above average:		0	0	0
Price variability	20	26	25	35
Lack of markets	15	53	20	61
Insufficient information	5	9	15	9
“Unfair transaction”	0	0	5	9
Small production scale	0	0	0	0
Local admin intervention	5	0	0	0
Transportation	5	0	5	0
No good varieties	0	0	0	0
Others	0	0	5	0
Income below average:		0	0	0
Price variability	25	12	25	12
Lack of markets	15	58	20	70
Insufficient information	5	0	5	12
“Unfair transaction”	5	23	5	23
Small production scale	0	12	5	12
Local admin intervention	0	0	5	12
Transportation	0	0	0	0
No good varieties	0	0	5	0
Others	0	0	0	0

Note: “Unfair transactions” means farmers believed that they had been cheated during their sales transaction. The sum of the percentages for the top constraint (columns 1 and 2) does not always equal 100, because there are some villages that reported they did not face any major constraints. The sum of the percentages for the top three constraints (columns 3 and 4) exceeds 100 because villages provided up to three answers.

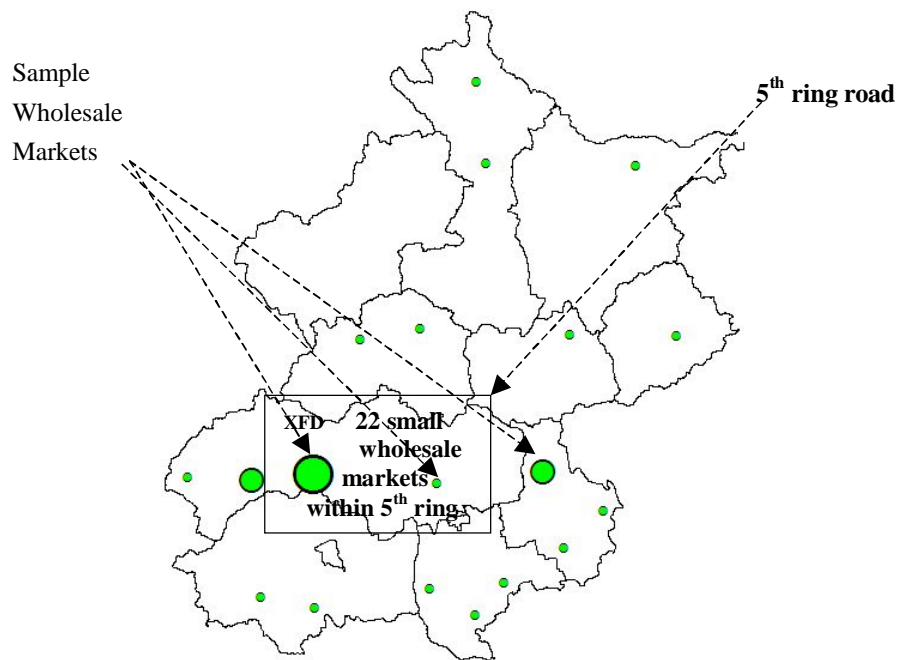


Figure 1. The distribution of agri-product wholesale markets in Greater Beijing, 2005

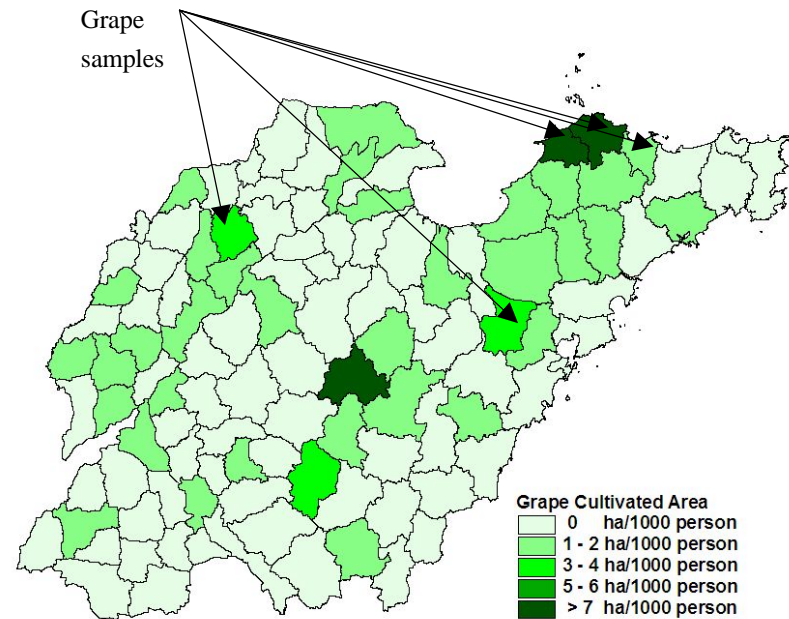
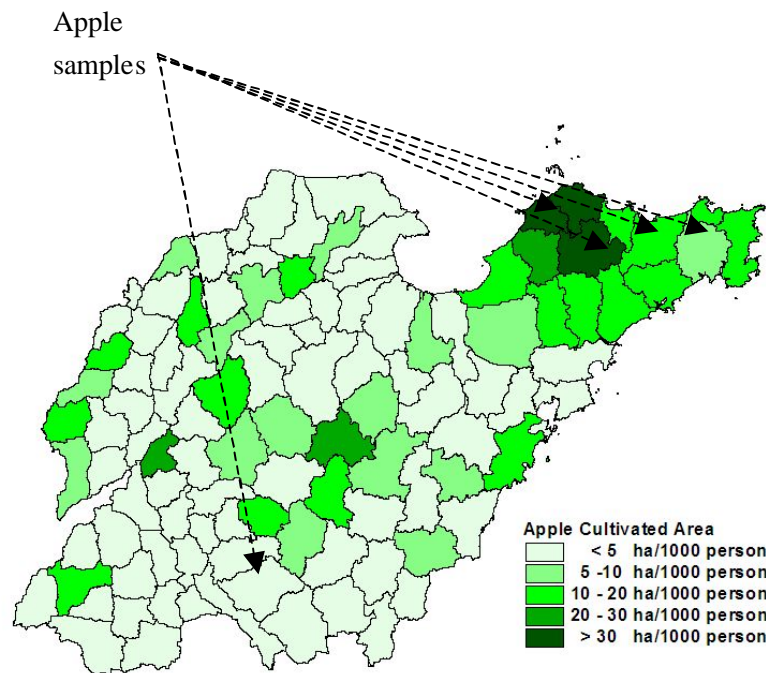


Figure 2. Per capita areas of apple and grape by county in Shandong, 2005

Data source: Provided to the authors by the Shandong Agricultural Bureau, Jinan, China.

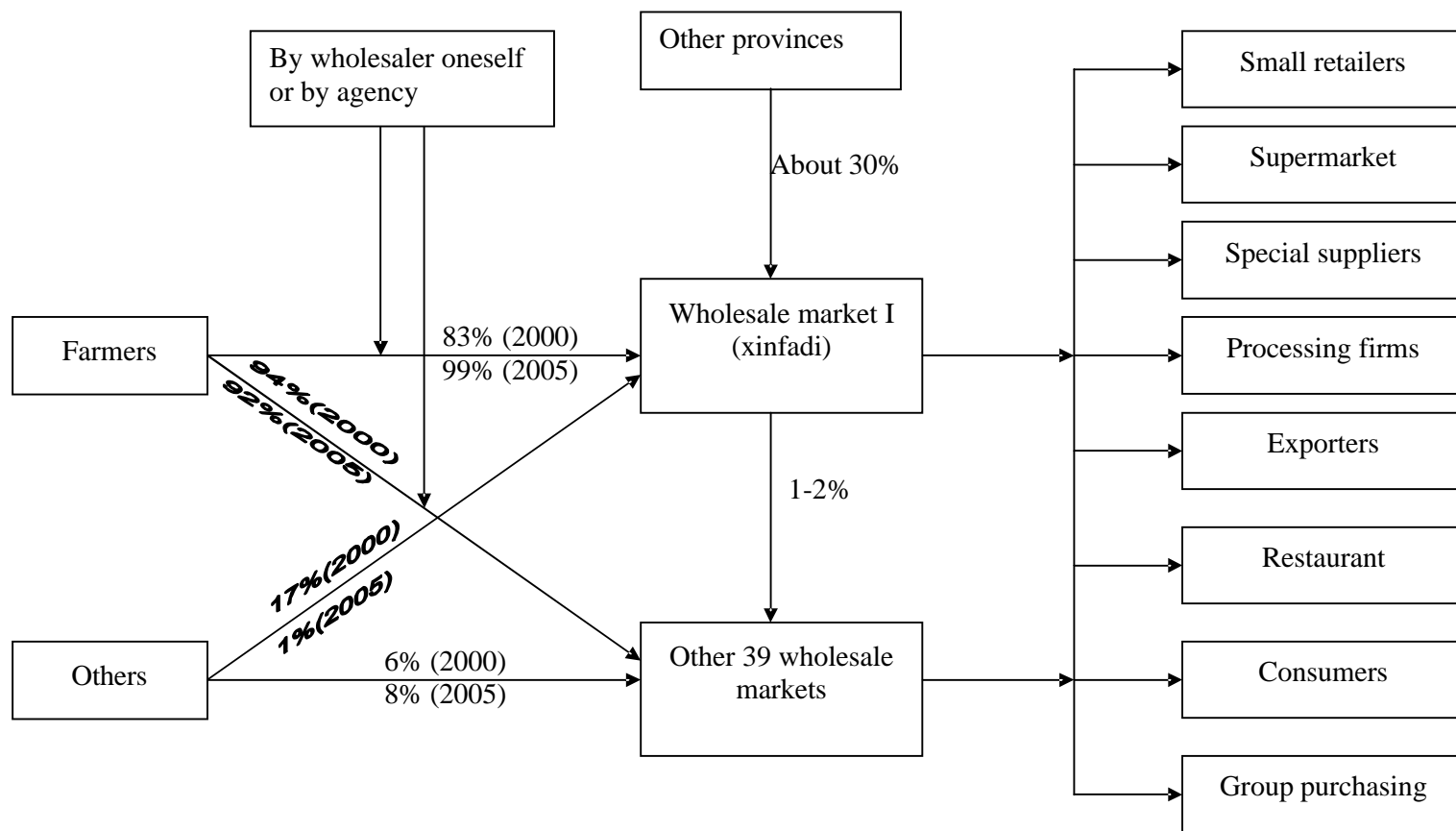


Figure 3. Apple marketing chains in Beijing wholesale market in 2000 and 2005.

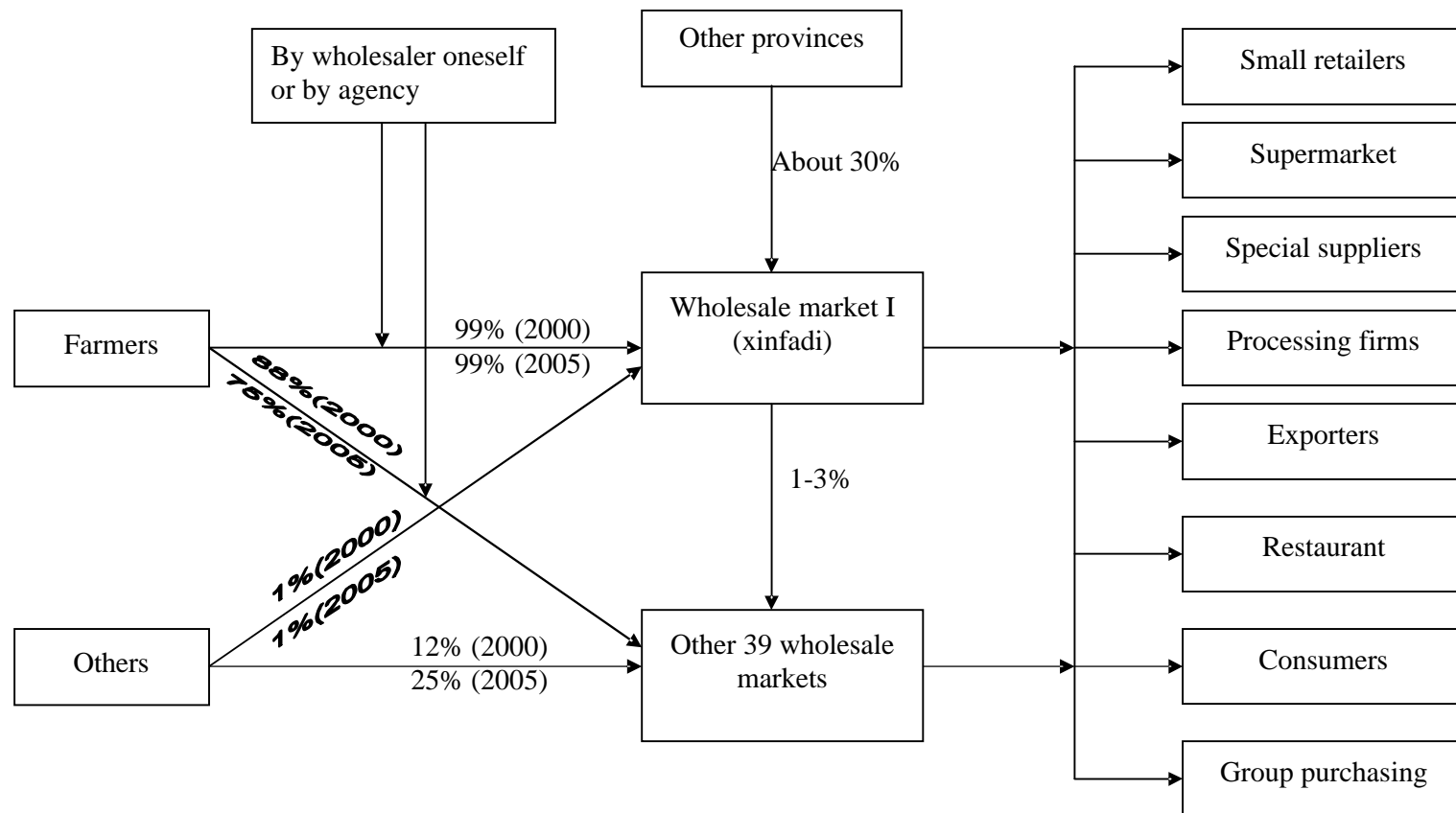


Figure 4. Grape marketing chains in Beijing wholesale market in 2000 and 2005.

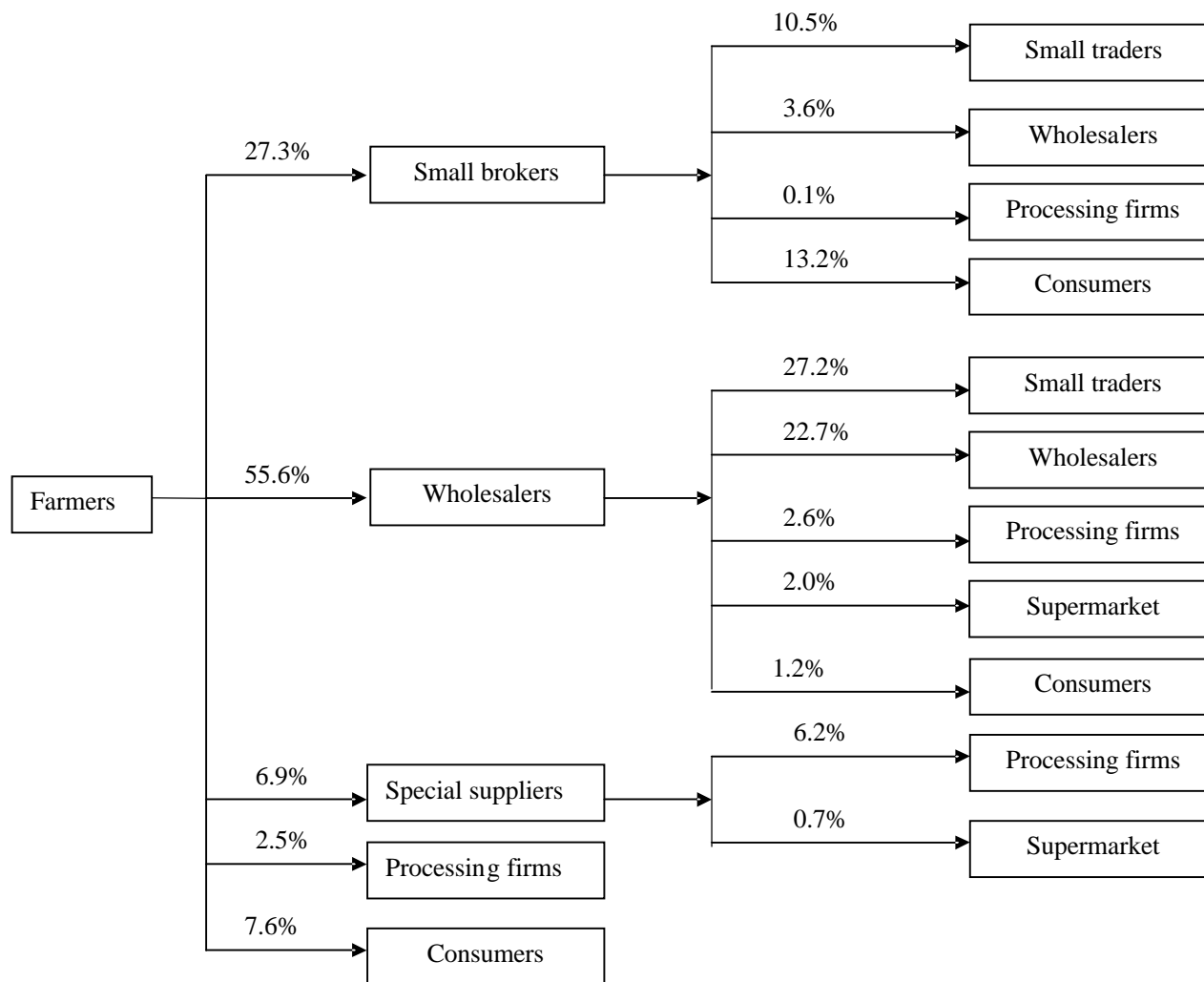


Figure 5a. Apple market chain in Shandong in 2005. Data source: Community level survey by authors

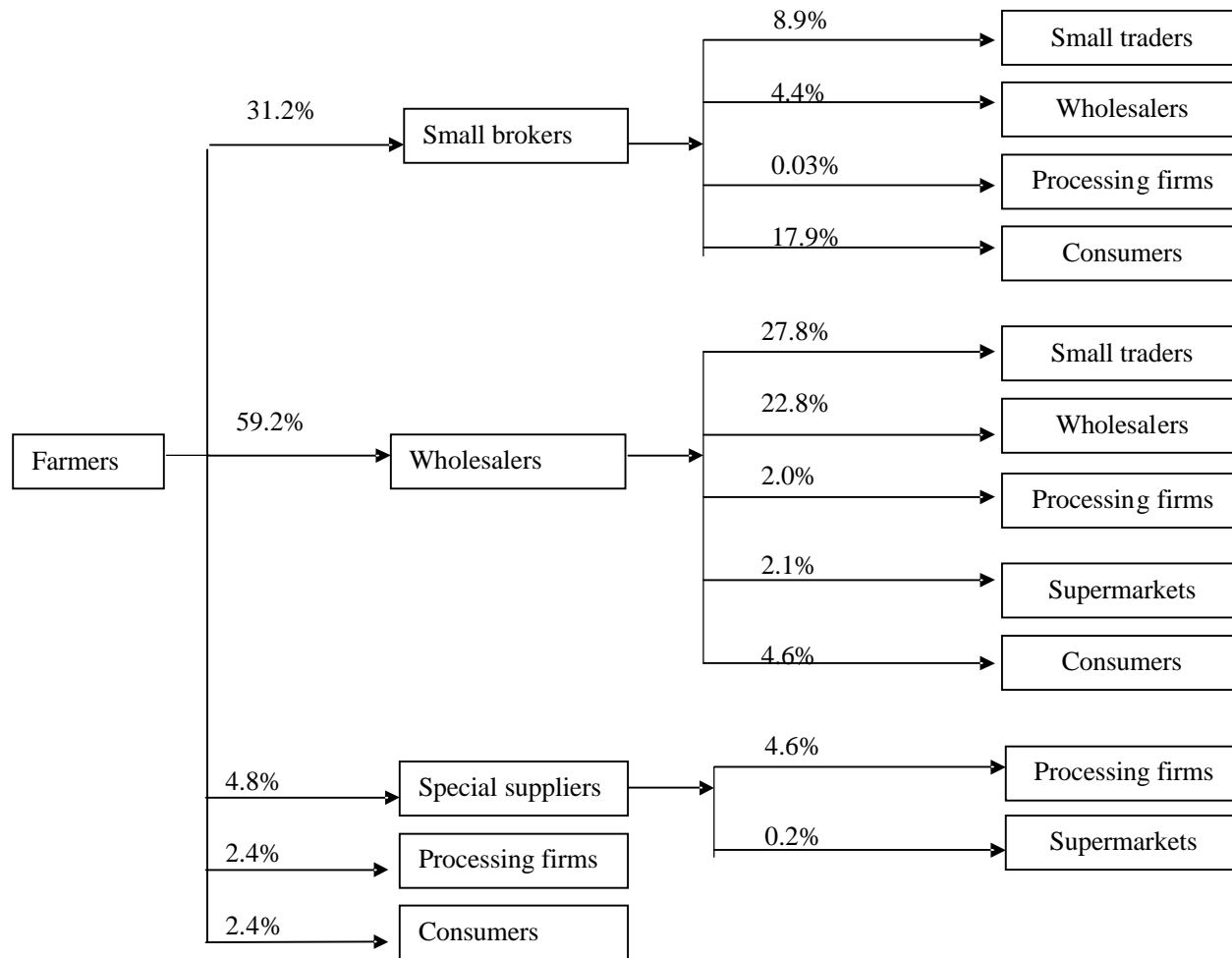


Figure 5b. Apple market chain in Shandong in 2000. Data source: Community level survey by authors

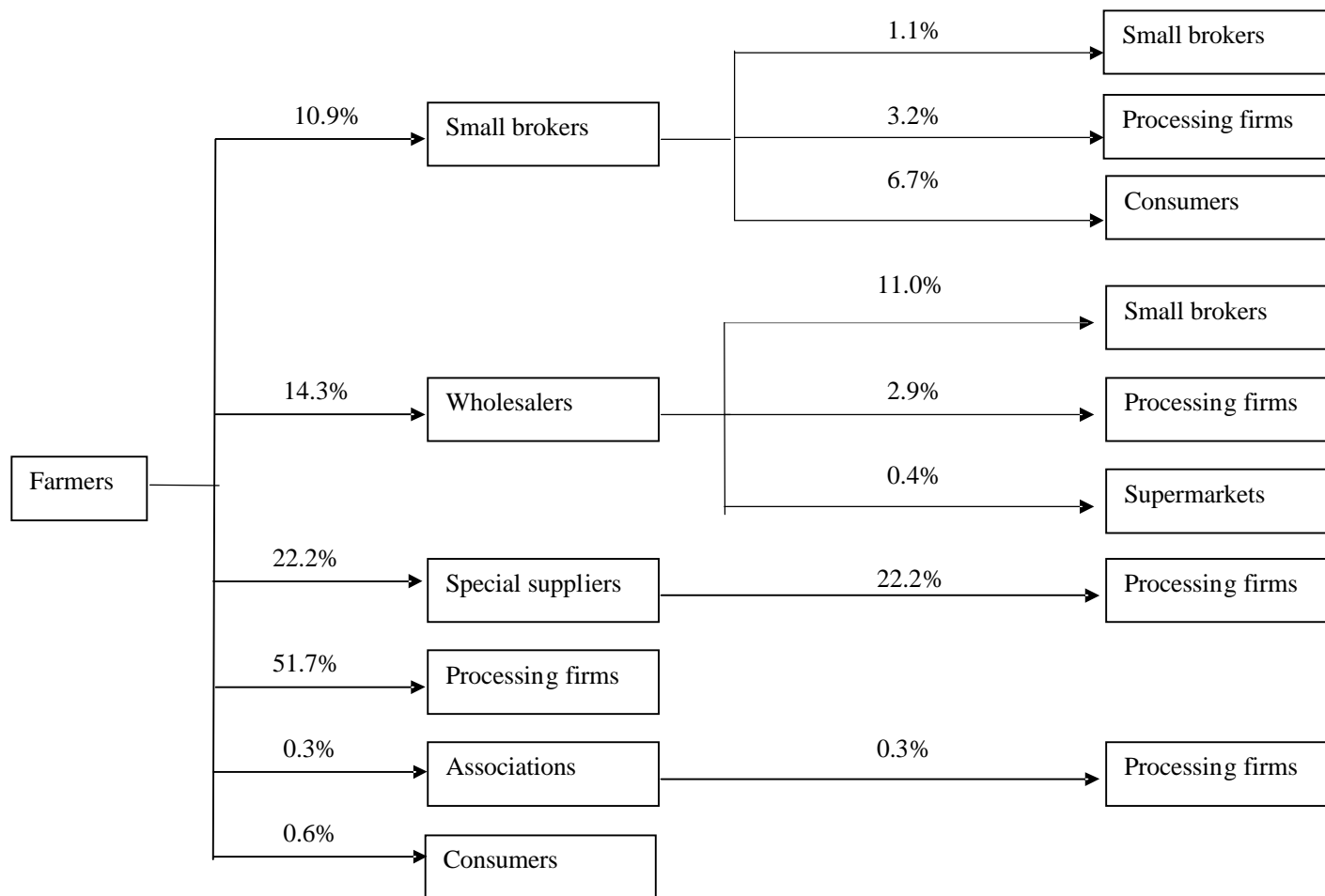


Figure 6a. Grape market chain in Shandong in 2005.
Data source: Community level survey by authors

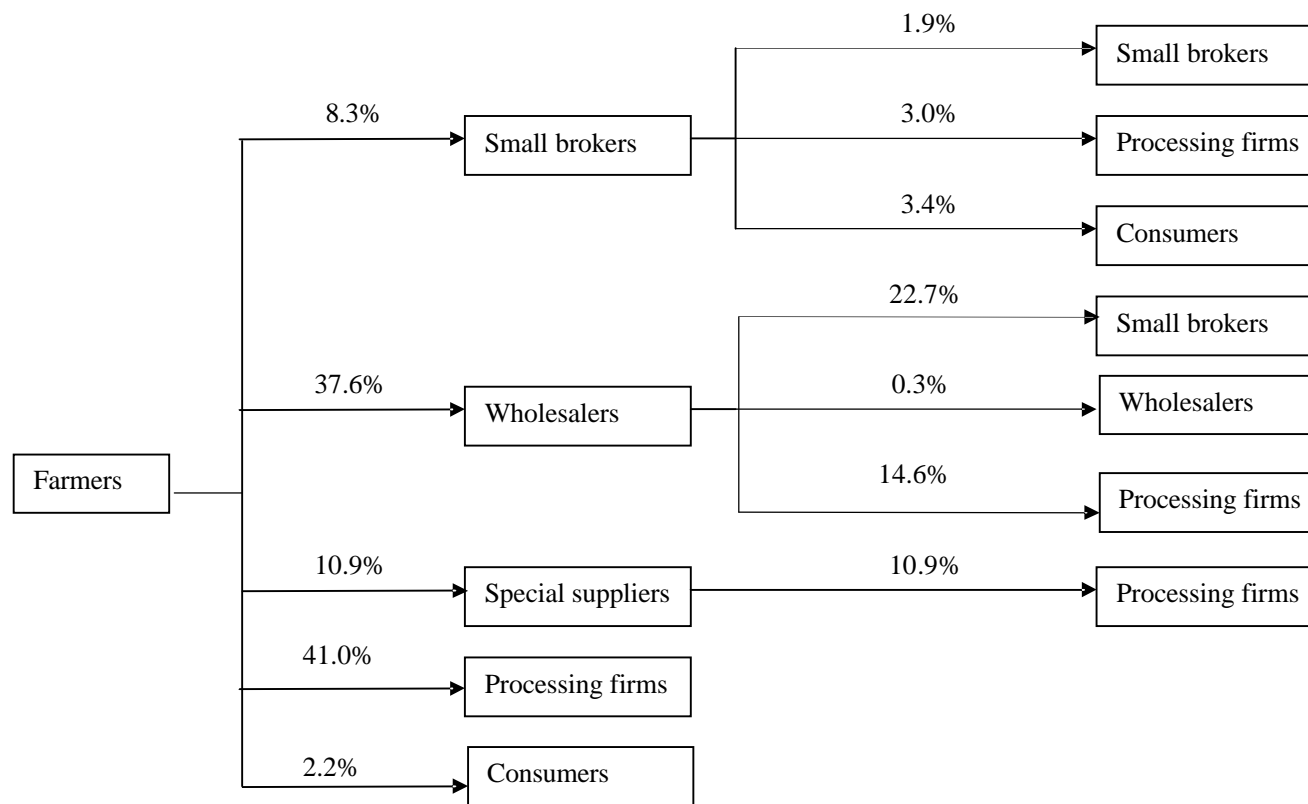
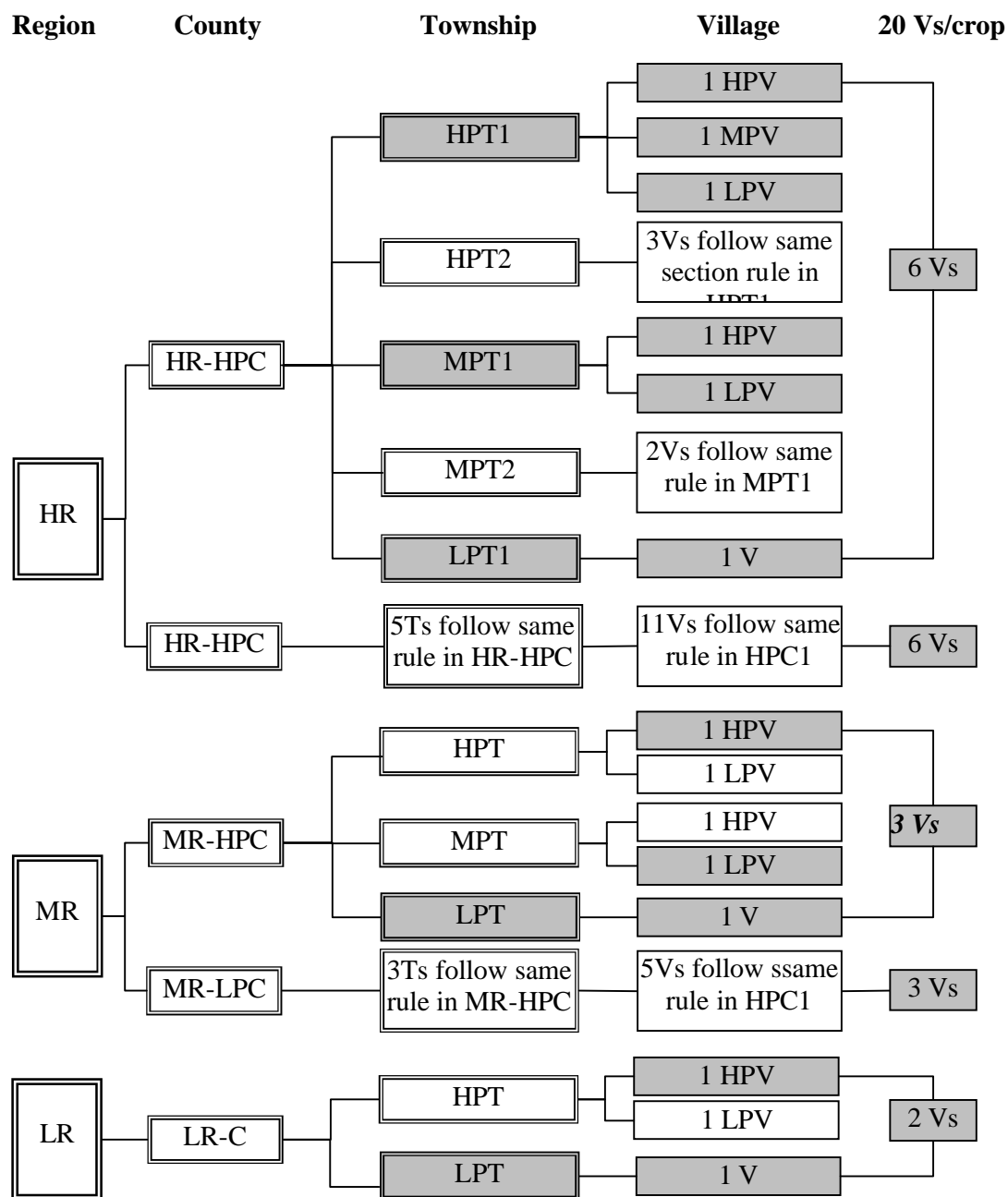


Figure 6b. Grape market chain in Shandong in 2000.
Data source: Community level survey by authors

Appendix Figure 1. Schematic depiction of sample counties, townships, villages, and focused groups in Shandong meso-level study in China.



Note: L=Low, M=Medium, H=High.

P=Production per average farm or rural population.

R=Region, C=County, T=Town, V=Village.

The samples with grey are selected for PRA survey.