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**Small Traders and Small Farmers:
The Small Engines Driving China's Giant Boom in Horticulture**

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Abstract

The supermarket revolution has arrived in China and is spreading as fast as or faster than anywhere in the world. As the demand for vegetables, fruit, nuts and other high valued products have risen, urban retailers are finding new venues from which they can sell to the increasing prosperous city residents. However, the experience of many developing countries suggests that there could be serious distributional impacts of the rising of supermarkets. There is concern among policy makers and academics that poor, small farmers might be excluded from market. The main goal of our paper is to understand what types of farmers have been able to participate in the horticultural revolution, how they interact with markets and how supply chains affect their production decisions. Using a unique set of spatially sampled communities in the Greater Beijing area, in contrast to fears of some researchers, we find small and poor farmers have actively participate in the emergence of China's horticulture economy. Moreover, there has been almost no penetration of modern wholesalers or retailers into rural communities. In the paper we document seven characteristics of China's food economy that we believe account for this set of findings.

Keywords: Horticulture; Modern Supply Chains; Farmer Impacts; Poverty; China

JEL Classification Codes: O33; O53; Q13

Small Traders and Small Farmers: The Small Engines Driving China's Giant Boom in Horticulture

The supermarket revolution has arrived in China and is spreading as fast as or faster than anywhere in the world. As the demands for vegetables, fruit, nuts and other high valued products have risen, urban retailers are finding new venues from which they can sell to the increasing prosperous city residents. From its start in the early 1990s, today supermarkets have over \$55 billion in sales (Hu et al., 2004). China's supermarkets already sell much higher levels of fresh fruits and vegetables to domestic consumers than exporters sell into overseas markets. This development has been driven by factors shared by other developing countries—urbanization, income growth and liberalization of foreign direct investment in retailing—as well as a number of China-specific policies (e.g., government investment in the sector and policies promoting conversion of wetmarkets to supermarkets—Bi et al., 2004; Hu et al., 2004). Although there has been no systematic study of the penetration of procurement into rural areas, researchers have written about signs that supermarket procurement systems have begun to shift away from the traditional wholesale system toward the use of large, centralized distribution centers, specialized/dedicated wholesalers operating preferred supplier systems and private standards for quality and food safety. Clearly, the spread of supermarkets, in particular, and the rise of the demand for horticultural products, more generally, present opportunities for China's agricultural producers.

The experience internationally, however, suggests that there could be serious distributional impacts of the rise of supermarkets. For example, there are case studies in Guatemala and Costa Rica that suggest that it is the rich, large farmers that benefit from

the rise of demand for fruit and vegetables and the emergence of supermarkets (Berdegué et al., 2005; Alvarado, 2002). Because of the high transaction costs involved with purchasing from millions of small farmers and difficulties in monitoring quality and food safety, it is often assumed that supermarkets and their agents will turn to large and better-off farmers. As a consequence, the rise of demand for horticultural and other high-valued commodities in the consumption basket of consumer and the concomitant rise in supermarkets have created concern among the international community about the possible adverse consequences on small, poor farmers (Reardon and Timmer, 2005).

In many respects, the process that will allow China's procurement systems to mature and spread over larger regions faces similar, if not more severe, challenges than those faced by food retailers in other countries. The average farm size in China is small, less than 0.6 hectare per household (CNSB, 2005). Farmers are not well organized, since historically cooperatives and associations have not been encouraged (Shen et al., 2005). Households who are engaged in mostly farming (that is, full time-farmers) are among the absolute poorest in China and live in relatively poor parts of the nation (Rozelle, 1996; World Bank, 2005). Hence, the typical farm family faces challenges in meeting the demanding product and transaction attributes that are required by most supermarket retailers. Indeed, the rise of supermarkets, like elsewhere in the world, has also generated a concern among policy makers about their impact on the small, poor farming sector (Reardon and Swinnen, 2004). In fact, in China this concern has already dampened the enthusiasm of some of those that believed the rise in the demand for high valued commodities would provide opportunities for farmers to move into the production of goods that could provide them with higher income (Yu, 2003; Yuan, 2004).

Surprisingly, given the importance of this topic, there has been little, if any, systematic empirical analysis of the effect of the rise of demand for high-valued commodities and the rise of supermarkets that are promoting these goods on the welfare of farmers in China. The work that has been done (e.g., Hu et al 2004; Yu 2003; Yuan, 2004), while interesting and providing important insights, is unable to answer a few key questions in a systematic way: Where are the new high-valued crops being cultivated and who is cultivating them? Are the farmers that are supplying most of the demand rich and large? Are farmers that are poor and small able to benefit? What is the nature of the supply chains that facilitate the procurement of crops from the farmers? Are these supply chains imposing new quality and food safety standards on farmers?

The main goal of this paper is limited to one major theme: getting the facts right regarding the emergence of supply chains and the participation of farmers in China's rapidly evolving food economy. We have three main objectives. First, we sketch a picture of who is supplying horticultural products in China. Second, we describe the patterns of marketing chains in China's rural areas, examining who is procuring vegetables, fruits and nuts from farmers, where the transactions are taking place and to whom the first buyer is selling. Finally, we seek to understand how marketing supply chains are affecting the way farmers are producing horticulture crops.

Even given such a circumscribed set of objectives, we still must further recognize the limitations of our work. First, while our sample is spatially sampled and is able to produce a representative view of China's horticultural economy in rural areas, we are still only looking at one region, the greater Beijing metropolitan region. We also only look at the first two links in the marketing chain. Hence, our findings are not able to trace the

marketing paths of vegetables, fruits and nuts all the way to the consumer. Hence, while we know from our study that supermarkets are largely absent from rural areas, we can not say anything about how supermarkets procure horticultural goods. Finally, because exports are such a small part of total horticulture production (only around 2%), and because we are not studying horticultural production in the centers of China's export industry, we are almost exclusively focusing on the domestic side of the industry. Therefore, we are unable to answer many questions about the dynamics of the export segment of the market, which in many cases may be expected to behave quite differently.

To meet our objectives, the rest of the paper is organized as follows. The first section describes our data. The next two sections examine the production and procurements sides of the horticultural economy. The following section briefly examines descriptively the way that marketing channels are affecting the way that horticultural crops are being produced. The final two sections use multivariate analysis to try to explain who is benefiting from the rising demand for horticultural goods and concludes.

Data

The data set, collected by ourselves, is comprised of observations on 201 villages in 50 townships in the greater Beijing metropolitan region. In the summer of 2005 enumerators visited each of the villages and interviewed village leaders about the horticultural economy from the village's point of view between 2000 and 2004. Among other things, during a several hour-long, sit-down questionnaire sessions with enumerators, village leaders recounted information about production trends of their community's major horticultural commodities. The leaders also provided information on the two most common ways that horticultural goods are procured from farmers—

including a.) the type of buyer that purchased the crop from the farmer (henceforth, the *first-time buyer*); b.) the location of the first transaction; and c.) the agent/trading firm to whom the goods were sold by the first time buyer (henceforth, the *second buyer*). In total we identify 8 main types of first-time buyers and 7 main types of second buyers. Finally, we asked leaders to tell us the nature of the contractual arrangement—either explicit or implicit—between the farmer and first-time buyers. Enumerators also asked village leaders about the characteristics of their communities (for example, income per capita; cultivated land per capita; location; etc.).

The main way that our study is differentiated from previous research on these issues is in the way that we chose our sample. In simplest terms, we began with detailed administrative maps of Beijing Municipality and Hebei Province. We then used stratified random spatial sampling procedures to choose the townships and villages. In short, this study, unlike most other studies did not go to where the horticulture suppliers were; instead, we took a random sample, collected data to be able to weight the observations (by the frequency in which we are likely to observe such villages) and, as such, have collected a representative sample of horticulture producers and marketing in one of the nation's important farming regions.

Who are Producing China's Vegetables, Fruits and Nuts?

The rise of demand for horticultural crops (henceforth the term used to describe “vegetables, fruits and nuts grown in orchards”) that have been observed in the demand statistics is beginning to change production patterns of farmers from grain into other crops in the greater Beijing area after 2000 (Table 1, columns 1 and 2). The total sown area of grain between 2000 and 2004 fell from 68% to 58%. In contrast, cash crops

(which include mainly crops, such as cotton and peanuts, crops that are *not* the focus of our study) rose by 4 percentage points. During the same period, the area sown to horticultural crops also rose by 7 percentage points (from 22% in 2000 to 29% in 2004). Vegetables rose by 2 percentage points; fruit—the crop category with the largest share of horticultural crops—rose by 3 percentage points; and nuts rose by 2 percentage points.

While the production trends for the Beijing area match fairly closely the rise in horticulture demand in China's urban areas, we are most interested the types of farmers that are participating in supplying horticulture crops. In fact, when information on the typical farmer that is engaged in farming inside each of the concentric circles is compared (i.e., information on those farmers close to Beijing are compared to those far from Beijing), it can be seen that farmers in all areas are adjusting their production (Table 1, columns 3 to 12). In particular, while the average farmers in all areas reduced the share of their area sown to grain by 10% (from 68 to 58%, row 1), as might be expected (Fafchamps and Shilpi. 2003) farmers in the first two circles (40 km and 60 km circles) reduced the share of area sown to grain (12 to 16%) more than farmers in the other 3 circles (6 to 10%) that are far away from Beijing. Although the production of horticultural crops rises everywhere, the largest rise in terms of the share that a village's land that is allocated to horticulture crops is in the 40 and 60 km circles. While the share of horticultural crops in 40 kilometer circles rise mainly came from fruit (19 to 26%), the rise in 60km circle came from vegetables and nuts (vegetables, 4 to 9%; nuts, 11 to 17%).

Participation by the Poor

While the relative smaller rise of horticultural area share in remote area is what one may expect according to the theories of von Thunen (1826), the most significant

finding, based on our data, is that poor farmers are increasing their share of the production of horticulture crops (Table 2). To show this, we divide villages into four quartiles, according to each village's reported income per capita. Between 2000 and 2004 we find that farmers in the very poor and poor categories (those farmers living in villages with incomes below the median income level) have increased their share of total sown area of horticultural crops, in general (top row). In fact, by 2004 farmers in very poor and poor villages produced more than half (55%) of horticultural crops in Greater Beijing. Even more significantly, farmers in the very poor villages increased their share of vegetables, fruits and nuts between 2000 and 2004 (rows 2 to 4, columns 1 and 2).

A similar picture emerges when examining different types of horticultural crops (Table 2, row 2, columns 5 and 6). For example, in the case of fruit, production is dominated by the farmers in the very poor and poor farmer village. In contrast, farmers in average income villages produce most of the vegetables. Of course, one of the most interesting findings of Table 2 is that the richest farmers are not the driving force (or beneficiary) of vegetables, fruits or nuts.

Hence, according to our data, we have strong evidence the rise of horticultural production in the greater Beijing area is not following the trends that have been observed in other developing countries (e.g., Farina and Machado 1999). Clearly, our data show that farmers in very poor and poor villages are not being left out. In fact, especially in the case of the very poor, they are the driving force behind the rise in the supply of fruit and nuts. Moreover, there is no evidence—even for vegetable crops—that richer farmers are dominating production. Indeed, farmers that live in the richer villages (above average and rich) have lost their share in all categories of horticultural crops (eg, 65 to 59% for

vegetable, 48 to 38% for fruits and 62 to 51% for nut). In 2004 the richest 25% of farmers only cultivated 19% of the region's horticultural area.

Where are the Supermarkets?

The surprises on the supply side, if anything, are matched by surprises on the procurement side (Table 3). Although there has been a lot of discussion about the potential implications of the rise modern supply chains and the effect of their procurement agents on welfare in rural areas, according to our data, supermarkets are completely absent. Indeed, not one of the 201 village leaders that we interviewed reported the presence supermarkets for the procurement of any horticultural goods (Table 3, Panel A, column 1). Likewise, village leaders reported that only 2% of procurement from farmers was from specialized suppliers and only 2% was from processing firms (columns 2 and 3). Hence, in the greater Beijing area in 2004, only 4% of all horticultural goods were procured by those operating in firms that could be described as part of the modern supply chain.

Even when we look at data on the second buyer in the supply chain, the modern supply chain plays a fairly minor role (Table 3, Panel C, columns 1 to 3). When asked to whom the first buyer sells, supermarkets only are involved in 3% of the volume. Specialized supply firms also account for only 3%. Processing firms are the second buyer for 10% of the volume of horticultural crops. Hence, in total, even by the second link of the marketing chain, modern supply chains are playing a relatively minor role, accounting for only 16% of the volume. Therefore, in summary, it is safe to say that in the greater Beijing sample villages, despite the rise of demand for high-valued

horticultural products, and despite the rapid emergence of supermarkets in urban areas, modern supply chains in 2004 were almost non-existent at the producer end of the marketing chain.

Small Traders and Their Domination of Traditional Supply Chains

Instead, the main story of horticulture marketing in China in 2004 is the domination of traditional supply channels, mostly by small traders. According to our data, fully 79 of the first-time buyers of horticultural goods were small traders (Table 3, Panel A, row 1, column 4). These small traders, which during harvest season can be seen veritably everywhere in areas that are producing horticultural crops, enter the village itself and buy directly from farmers. Almost all transactions are spot market transactions, exchanging the commodity for cash. In addition, in another 8% of the cases farmers take their crop, as they have done for hundreds of years, to local period markets to sell to local consumers and traders (column 5—Rozelle and Huang, 2001).

Almost certain in part due to the domination of traditional small traders, it can be seen from our data that the supply chain penetrates far into the village (Table 3, Panel B). While some of the traders bought from farmers in local periodic markets (about 6%), most of them came to the farmer. In fact, when aggregating procurement by traders in the farmer's own fields (65%), at some spot in the village's center (9%) or at the side of the road near the village (3%), more than 75% of all procurement took place inside or immediately next to the boundary of the village (row 1 in Panel B). Only 15% of first time sales take place in formal wholesale markets (11%) or urban wet markets (4%).

Finally, small traders not only make up the first link in the marketing chain. In fact, 49% of second buyers also were small traders (Table 3, Panel C, column 4). In

other words, in nearly half of the cases, small traders bought from farmers and sold their goods to a second small trader. In addition, 13% of small traders took their goods to a nearby retail market and sold their goods to consumers (column 5).

While a comprehensive study of traders is still needed, given their primary role in the rural segment of the marketing chain in the horticultural economy, from interviews and from another data set collected by the authors in 2000, we can sketch a simple profile of small traders.¹ By far, from discussions with village leaders and farmers, most small traders in the greater Beijing area are from three poor provinces, Hebei, Henan and Anhui. On average, small traders worked in small groups (henceforth, trading firms) of 3 to 4 people. On average they received only 7 years of education and their average age was over 30 years old (older and less well-educated than the average migrant to China's largest cities). In almost all cases, those employees/partners working in the same small trading firm were either relatives or fellow villagers, people that could be relied upon to work hard and trusted to work for the good of firm. Moreover, despite the long hours of work (on average, for 8 months of the year), the average income of traders was only about 3200 yuan per person. If this was their only source of income and if we assume each small trader has to support, on average, a single dependent, this would put them right at the high international poverty line (about \$2 per day in purchasing power parity terms). Hence, these small traders can be thought of as poor themselves and willing to

¹ We thank Jian Zhang, a Ph.D. student in the department of agricultural and resource economics, University of California, Davis for these statistics. The data are from a 2000 household data set collected by the Center for Chinese Agricultural Policy and the University of California, Davis. Among other sections of the survey, one part focused in family-run businesses and carefully enumerated the income and expenses, assets and liabilities, and working hours of more than 350 small micro-enterprises, including more than 50 small trading firms.

engage in labor intensive economic activities, including going far distances to procure horticultural crops from farmers.

Marketing Supply Chains and Impact on the Quality of the Supply

In this section we examine the data that we collected about technology used by farmers in our sample. Our main purpose is to examine the effect that marketing supply chains have on the use of technology. Although in this paper we examine questions that will let us see how those at the village level perceived marketing supply chains effects, a more definitive answer, based in rigorous multivariate analysis awaits further research.

On one hand farmers, there may be reason to believe that the rise of the horticultural economy has spawned linkages between markets and production choices in the village. In the sample farmers frequently changed technologies—either the crop they were producing or the type of variety they were planting. For example, of the 201 villages in our sample, the main vegetable, fruit or nut crop that was planted in the village in 2000 was replaced by another crop by 2004 in 14% of the villages. When discussing their main vegetable, fruit or nut crop, farmers reported that they switched varieties on average about once every 3 to 5 years. Clearly, farmers in the horticultural economy in the greater Beijing area are actively searching for new technologies.

These descriptive statistics, however, do not really answer our question about the impact of modern supply chains. There are many other reasons why farmers may switch technologies beyond the marketing supply chain. In other words, counts of technology turnover can be deceiving. In fact, during the 1980s, a time when there clearly were not modern supply chains in the grain sector (Sicular, 1988), farmers turned over their grain

varieties up to once every three years (Jin et al., 2004). Moreover, during the 1990s when the market clearly played a larger role in grain marketing, farmers slowed their turnover of varieties to once every 5 years. Hence, the observed turnover in varieties/crop types may be due to other factors.

In fact, when we asked village leaders directly about whether or not their farmers were being required by the procurement agent (including small traders) to change the way that they were producing their horticultural crop, the answer was nearly “zero.” In only 3 of 201 villages (or 0.9% of villages when weighting in used) was it reported that trading firms influenced the timing, quantity or brand of the fertilizer that farmers used on their crop. In only 6 of 2001 villages (or only 1.5%) was it reported by trading firms influenced the timing, quantity or brand of the pesticide that farmers used on their crops. Hence, in our sample, at least from the view point of the producer in 2004, there is little *direct* link between the demands of the trader and the farming practices of the producer.

The Poor are Enjoying the Fruits of the Horticulture Boom

Since descriptive statistics may not be able to accurately gauge the net impact of any single factor on horticultural production or marketing, in Wang et al. (2006) we estimate econometrically the determinants of horticultural production. Although our original intention was to analyze the determinants of participation in modern marketing channels and the effect of modern marketing channels on the way farmers produce and market their horticultural crops, because there are so few villages that had any direct interaction with modern supply chains it was not possible to conduct the analysis on modern supply chain participation or its impacts. In fact, since traditional, small trader

channels are so pervasive, and farmers are mainly interacting with buyers in their villages, the real question of importance is what are the determinants of participation in the horticulture sector. In addition, an important objective of this analysis is to understand if poor people are benefiting from the boom of the horticultural economy (that is, holding all other factors constant, are those that are poor able to participate in the production of horticultural crops).

Our multivariate analysis yields several interesting findings. First, our results demonstrate that villages that are in mountainous areas are relatively more likely to enter the horticulture economy. This may be a sign that the economy is reacting to market signals since farmers in mountainous areas may have a comparative advantage (though not necessarily an absolute advantage) producing fruit and nuts in their villages.

Second, our results show that over time the poor are benefiting increasingly more from the rise of China's horticulture economy. Specifically, we find that when looking at the *income quartile dummies* in the year 2000, those in the very poor category, *ceteris paribus*, were not participating as much as villages in the other income quartiles. Farmers in very poor villages allocated less of their land to horticultural crops in the year 2000 (the base year), but between 2000 and 2004 many of these farmers were able to significantly expand their area. Hence, since 2000, a time when the horticultural economy has boomed, we see that, holding all other things equal *paribus*, it is the farmers in the poorest villages that have expanded their area relatively the most.

Discussion and Conclusions

In this paper we set out to assess the effect that modern supply chains and the rise of the horticultural economy in China has had on the farming sector in China. Although we only have data on a single area of China—greater Beijing, our sample is spatially sampled and so we are able to produce regionally representative figures on the rise of opportunities for planting horticultural crops and the penetrations of modern marketing supply chains into rural areas. These questions have worried policy officials not only in China but are of concern to leaders around the world.

Interestingly, although we showed the rise of horticultural crops was paralleled by a surge in the emergence of supermarkets in urban areas, there has been almost no penetration of modern wholesalers or retailers into rural communities. Less than 6% of first-time buyers and less than 16% of second buyers could be identified as being from modern supply chains—either supermarkets, professional suppliers or processing firms. Instead, China’s horticultural economy is dominated by small traders who are themselves poor and small, operating in firms of 4 people or so and are themselves earning low wages. Moreover, unlike the evidence found in other countries, it appears as if in China, far from being hurt by the rise of supermarkets and the horticulture boom that has come with it, poor, small farmers in our sample appear to have gained. The richest farmers, in contrast, were playing a smaller role in 2004 than in 2000. Clearly it appears as if this is a special case of “Producing Horticultural Crops with Chinese Characteristics.”

So what makes China special? While a full analysis and more definitive conclusions require more research, it is our opinion that there are 7 characteristics about

China's horticultural economy that produces these surprising results. First, China's land holdings (and those in our sample—see Appendix 1, row 2) are relatively equal (characteristic 1). In essence, there are no large farmers in China; indeed in our sample, the average farm size of the largest 20% of the farmer is only 0.36 ha per capita.

Second, there also are almost no farmer cooperatives that can allow farmers to act in concert with one another (characteristic 2). In our sample, only 11.4% of the villages reported that they had a horticultural or general farm cooperative. Only 1.05% of farmers said that they belonged to a cooperative (row 3, column 1). These numbers, as it turns out, are remarkably similar to figures for all of China reported by Shen et al. (2004) using data from a national representative sample of more than 2000 villages. Because of characteristic 1 and 2, it is easy to see why it could be so difficult for supermarkets and other modern supply firms to deal with farmers, given their atomistic size and the absence of organization. Clearly the transaction costs of contracting or direct procurement would be high.

The third characteristic that may be relevant to explaining the role of small, poor farmers in the rise of China's horticultural economy is that although land is relatively equally allocated across all communities in China, there are still differences (characteristic 3). And in the case of horticultural producers, farm households in more poorer, more remote areas have relatively more land (0.17 ha per capita) than those in areas nearer to the richer, urban center (0.09 ha per capita—row 2, columns 2 and 6).

In addition, there are also differences in the access that these households have to labor for working on the farm (characteristic 4). Although horticultural farmers have the same family size as those not engaged in horticultural farming, the main differences are

due to differential access to off farm jobs (rows 4 to 7). Farm households that are nearest to Beijing have a higher percentage of their labor force in off farm employment (42 for those nearest; 31 for those furthest) and they work a larger number of days per year (111 for those nearest; 82 for those furthest). The same is true when dividing the sample between better off households and poorer households. Poorer households have more land and labor available for use in producing horticultural crops (Appendix 2, rows 2 to 5). Hence, when considering characteristics 3 and 4 together, it is easy to see why poor farmers have increased their share of area in many of the horticultural crops—they are relatively land and labor rich, the two factors that are keys factors in the production of horticulture crops.

Two additional characteristics help reinforce the propensity for poorer farmers to be increasing their participation in the horticultural economy, while the supermarkets are almost completely absent from the production areas. Since China's horticultural economy is almost completely unregulated (characteristic 5) and since China's road and communication networks have improved remarkably over the past 10 years (characteristic 6—Appendix 1, row 11 to 13), small traders working with a limited amount of capital and using extremely large amounts of low cost labor (while utilizing the relatively efficient road and communication infrastructure) appear to be out-competing all other types of would-be procurement agents. According to our interviews with the small traders and producers, the competition among small traders is fierce and profit margins on traders are almost always razor thin. There is little above normal profits available to attract new, more innovative entrants. Interestingly, in this type of

small trader dominated system, there is little or no effort being made to impose or monitor quality or safety standards directly on producers.

Finally, one of the main characteristics of China's economy that produces the status quo is that China is still a relatively poor nation and its consumer, so far, may not be placing a very high premium on food safety or obtaining a standard product (characteristic 7). Although there is a rising middle class, most urban consumers still live in households making around 1000 US dollars per capita annual disposable income (CNSB, 2005). Many of them are becoming increasingly stressed with rising payments in other expenditure categories—housing, automobile ownership, education and health care (among other expenditure categories). Combined with the absence of an active pro-consumer lobby (which may be limiting the information consumers have on the quality of their food), it is almost certain that the premium willing to be paid by the average urban consumer is still relatively small. When this low premium is combined with the high transaction costs that would have to be born should the supermarket want to maintain tight control over its horticultural supply, along with the thriving, deep, extremely competitive wholesale markets, it may be (although further research is required to definitively say so) that, at least now and in the immediate future, China will still be relying mostly on traditional wholesale channels.

If this is true, food safety in China's food system may suffer. However, it is good news for small poor farmers. Although, it should be recalled how fast China is changing in so many areas; if any one (or perhaps any several) of these characteristics changed, we should expect to see China's horticultural economy—from both the supply and procurement side change. The change, like so many other things in China, could be fast.

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Table 1. Cropping Patterns and the Role of Horticultural Crops in Greater Beijing, 2000 and 2004

Crops	Greater Beijing (total)		40 km Concentric Circle Sample Region		60 km Concentric Circle Sample Region		80 km Concentric Circle Sample Region		100 km Concentric Circle Sample Region		140Km Concentric Circle Sample Region	
	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)
Grain	68	58	64	52	63	47	68	62	72	64	72	62
Cash crop	10	14	9	12	9	13	9	11	9	14	12	17
Horticultural Crops ¹	22	29	27	36	28	39	23	27	18	22	16	21
Vegetables	4	6	4	4	4	9	6	7	2	3	4	6
Fruit	13	16	19	26	13	13	12	16	13	16	10	11
Nuts	5	7	4	6	11	17	5	5	3	3	2	5

¹ Sown area for horticultural crops includes area sown to vegetable, fruit and nut orchards.

Table 2. Contribution of Sampling Areas by Income Category (Quartiles) to Horticultural Production in Greater Beijing, 2000 and 2004

	Very Poor First Quartile (1-25)		Poor Second Quartile (26-50)		Above average Third Quartile (51-75)		Rich Last Quartile (76-100)	
	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)	2000 (%)	2004 (%)
Crops								
Horticultural Crops	15	23	31	32	33	25	20	19
Vegetables	9	12	25	29	53	47	12	12
Fruit	16	25	37	37	34	24	14	14
Nuts	21	30	17	19	8	9	54	42

Data source: Authors' survey.

Table 3. Supply and Marketing Channels of Horticultural Markets in Greater Beijing Area, 2004

Panel A: First-time buyers (percent)								
	Modern Supply Chains			Traditional Supply Chains		Other Supply Chains		
	Supermarkets	Specialized suppliers	Processing firms	Small traders	Farmers sell in local periodic markets	Cooperatives	Consumers direct purchase from farmers	Others ¹
Horticultural Crops	0	2	2	79	8	0	7	2
Vegetables	0	3	5	82	5	0	1	3
Fruit	0	1	1	75	11	0	9	3
Nuts	0	6	0	88	3	0	3	0
Panel B: Location of First Transaction (percent)								
	Farmer's fields	Village center	Roadside	Periodic markets	Wholesale markets	Urban wetmarkets	Others ²	
Horticultural Crops	65	9	3	6	11	4	2	
Vegetables	64	0	3	6	18	9	0	
Fruit	60	12	3	9	12	3	2	
Nuts	86	11	0	0	0	0	4	
Panel C: Second-time Buyers (percent)								
	Modern Supply Chains			Traditional Supply Chains		Other Supply Chains		
	Supermarkets	Specialized suppliers	Processing firms	Small traders	Traders sell to consumers in periodic markets	Cooperatives	Others	
Horticultural Crops	3	3	10	49	13	0	22	
Vegetables	6	0	6	57	11	0	20	
Fruit	1	2	9	46	16	0	26	
Nuts	3	10	19	50	6	0	12	

¹ "Others" (first time buyers) includes purchases by agents of hotels or restaurants, gifts to other farmers or procurement by organized groups (such as enterprises for distribution to their workers).

² "Others" (second time buyers) includes sales to other villages and sales to market sites that supply processing and other food firms.

Appendix 1. Summary statistics for sample households and villages, 2004

Variable	Unit	Total Concentric circle sample region	40km Concentric circle sample region	60km Concentric circle sample region	80km Concentric circle sample region	100km Concentric circle sample region	140km Concentric circle sample region
No. of sample households	hhs	494	143	60	111	90	90
Cultivated land per capita ¹	ha	0.14	0.09	0.07	0.16	0.13	0.17
Share of households that belong to a cooperative	%	1.05	2.68	0	3.58	0.59	0
Share of laborers that have off-farm job ²	%	35	42	53	24	43	31
Household Average days of per laborer of those that have off-farm job	day	96	111	125	67	122	82
Share of off-farm income in net income ³	%	40	44	61	25	50	34
Household size	person	3.98	4.06	4.19	3.70	4.46	3.77
Size of household labor force	person	2.82	2.75	2.89	2.72	3.09	2.72
Income per capita	yuan	2913	3881	2974	2299	3085	2752
No. of sample villages	number	201	40	40	41	40	40
Village Average distance from village to the nearest county road	km	4.95	2.46	3.51	6.09	6.30	4.65
Share of villages that are within 5 kilometers of a paved road	%	79	86	76	77	80	78
Share of households that have cell phone	%	48	66	53	42	50	43

¹ Cultivated land includes all farmer-managed land, including contracted land and land rented in, but excluding land rented out.

² Labor includes all able bodied persons 16 to 65 years old and excludes persons within this age bracket that are at school.

³ "Net income" includes cropping net income, off-farm net income and other sources of net income.

Appendix 2. Summary statistics by asset wealth categories, 2004^a

Variables	Unit	Total sample	Poor (Percentile range: 1-25)	Average (Percentile range: 26-75)	Rich (Percentile range: 76-100)
Number of sample households	Number	494	124	247	123
Cultivated land per capita	Ha	0.14	0.14	0.16	0.08
Share of able-bodies laborer that have off-farm job	%	35	24	35	50
Days worked off farm by those with off farm jobs	day	96	90	87	128
Share of off-farm income in net income	%	40	34	37	53
Household size	person	3.98	3.54	4.16	3.98
Size of household labor force	person	2.82	2.72	2.86	2.83
Net income per capita	yuan	2950	1870	2795	4971
Asset wealth per capita	yuan	10485	1064	6143	35525

Data source: Authors' survey.

Note: see Appendix 1 for definition of selected variables.

^a Wealth categories were developed from household level data on total household assets including housing, own business, farm tools and consumer durable assets.