

# Regoverning Markets

Small-scale producers in modern agrifood markets

## Innovative Practice

**China**

**Market chain changes in a small-farm economy: A case study of mushrooms in China**

**Jikun Huang, Zhurong Huang, Xianfang Niu, Huayuan Zhi**

Center for Chinese Agricultural Policy

**Suxia Wang, Dinghuan Hu**

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## **Regoverning Markets**

Regoverning Markets is a multi-partner collaborative research programme analysing the growing concentration in the processing and retail sectors of national and regional agrifood systems and its impacts on rural livelihoods and communities in middle- and low-income countries. The aim of the programme is to provide strategic advice and guidance to the public sector, agrifood chain actors, civil society organizations and development agencies on approaches that can anticipate and manage the impacts of the dynamic changes in local and regional markets.

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## **The case studies were coordinated by:**

Julio Berdegue, RIMISP - Latin American Centre for Rural Development, Chile (contact: [jberdegue@rimisp.org](mailto:jberdegue@rimisp.org))

Lucian Peppelenbos, Royal Tropical Institute (KIT), Netherlands (contact [l.peppelenbos@kit.nl](mailto:l.peppelenbos@kit.nl))

Estelle Biénabe, Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), France (contact: [estelle.bienabe@cirad.fr](mailto:estelle.bienabe@cirad.fr)).

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### **Authors**

Jikun Huang, Zhurong Huang, Xianfang Niu, Huayuan Zhi, Center for Chinese Agricultural Policy, Chinese Academy of Sciences

Suxia Wang and Dinghuan Hu, Institute of Agricultural Economics and Development, Chinese Academy of Agricultural Sciences

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[www.iied.org](http://www.iied.org)

Tel: +44(0)20 7388 2117, email: [sustainablemarkets@iied.org](mailto:sustainablemarkets@iied.org)

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# Contents

1	Introduction .....	5
2	Lanbo's mushroom business.....	10
2.1.1	A brief introduction to Lanbo.....	10
2.1.2	Procurement sources.....	10
2.1.3	Lanbo's own production base.....	10
2.1.4	Wholesale markets.....	11
2.1.5	Small-scale producers near the company's base in Beijing .....	12
2.1.6	Other companies in Beijing .....	12
2.1.7	Designated agents who procure mushrooms from other provinces .....	13
2.1.8	Imports from other countries.....	14
3	Sampling measures and data sources.....	15
3.1.1	Selecting mushroom producers for the case study .....	15
3.1.2	Selecting the study areas and households.....	17
4	Local agents and arrangements for procuring mushrooms .....	19
5	Mushroom production and marketing at the household level.....	22
5.1.1	The producers.....	22
5.1.2	Marketing.....	23
5.1.3	Mushroom marketing, production and income .....	24
5.1.4	Mushroom marketing and prices.....	25
6	Conclusion.....	27
7	References.....	31
8	Appendix.....	33

# 1 Introduction

Several recent studies have shown that downstream and midstream segments of the marketing chain in China have evolved dramatically in the past 20 years. China is a country whose food system was once based on rationing in cities, then progressed to wet markets and small shops, and now has the fastest growing supermarket and restaurant sectors in the world (Bi et al. 2004; Hu et al. 2004; Goldman and Vanhonacker 2006). The midstream wholesale sector is also going through some fundamental changes, although these are less rapid than in the retail sector (Huang et al. 2006).

International experience suggests that the rise of supermarkets could have serious impacts on distribution downstream in the market chain. For example, case studies from Latin America, Central and Eastern Europe, Mexico, Brazil, and Kenya suggest that it is rich, large-scale farmers who are benefiting from the growing demand for fruit and vegetables and the emergence of supermarkets (Reardon and Timmer 2007a, 2007b; Berdegue et al. 2005; Schwentesius et al. 2002). It is often assumed that supermarkets and their agents (specialist wholesalers, preferred suppliers, etc.) will use large-scale and better-off farmers because of the high transaction costs involved in purchasing from millions of small farmers, and the difficulties in monitoring food quality and safety. Growing consumer demand for horticultural and other high-value commodities and the concomitant rise in supermarkets have caused concern in the international community about the possible adverse

consequences for small-scale and poor farmers (Reardon and Timmer 2007). However, the findings of a recent global review show that the rise of supermarkets is having a mixed impact on production and marketing at the farm level (World Bank 2007).

Debate about the implications for farmers of rapid changes downstream in the marketing chain is further complicated by studies undertaken in China. Several studies based on supermarket or industrial surveys show that emerging supermarkets and specialist suppliers could drive the expansion of food product markets and facilitate agricultural development (see, for example, Hu et al. 2004; Hu et al. 2006). However, recent studies on stratified randomly selected households led by the Center for Chinese Agricultural Policy (CCAP) tell a rather different story. They show that although there have been significant changes downstream in the market chain, these have rarely penetrated upstream due to the high transaction costs between modern retailers and small farmers (Wang et al. 2006; Huang et al. 2006). Production in China is extremely small-scale, and most farmers sell to small traders and small wholesalers who deal with horticultural produce in general and vegetables in particular (Wang et al. 2006; Dong et al. 2006; Huang et al. 2007). There are no formal contracts in the vegetable and fruit markets, and buyers do not provide any technology, technical advice or credit for horticultural and dairy production in Greater Beijing (Dong et al. 2006; Wu et al. 2007) or vegetable production in Shandong (Huang et al. 2007a).

Some argue that while the random sampling framework can generate a representative overall picture, it may ignore new, emerging and innovative practices in marketing chains; and that there is, therefore, a need for case studies. For example, none of the households in the large, stratified random sample from Greater Beijing examined in our earlier studies had contractual arrangements with, or received input services from, supermarkets or special suppliers (Dong et al. 2006; Wang et al. 2006; Huang et al. 2007a and 2007b). On the other hand, many surveys based on interviews with supermarket managers reveal that a modern supply system is emerging, and that procurement is shifting from traditional wet markets to direct contractual arrangements with farmers and farm organisations, or specialist suppliers who can guarantee a stable supply of quality agri-food (Hu et al. 2006; Tan and Zhu 2004).

For better insight into this small but growing new marketing chain, we need a case study that tracks changes in marketing chains. Understanding the institutions and incentives involved as small-scale farming households sell their agri-foods to supermarkets through emerging specialist suppliers has important policy implications for China if these new marketing chains can provide benefits for small farmers or improve food safety for consumers.



In this project we selected Lanbo Agricultural Science and Technology Co. Ltd (referred to hereafter as “Lanbo”) as a case study. There were several reasons for selecting this up-and-coming specialist supermarket food supplier for the case study, and mushrooms: 1) Lanbo is a rapidly growing specialist supermarket mushroom supplier in Beijing; 2) China is the largest mushroom producer in the world, accounting for 70 percent of global production in 2005 with a total output of 13.3 million tons; 3) most mushrooms in China are produced by small-scale farmers; 4) the traditional mushroom supply chain in China is dominated by small traders and wholesalers, from whom retailers procure their mushrooms; 5) Lanbo uses its agents to procure mushrooms directly from mushroom producers; and 6) this case study can supplement the large C1 study of the Regoverning Market project in China.

The overall goal of this study is to gain a better understanding of Lanbo’s mushroom marketing chain and its impact on small farmers. We conducted two surveys to achieve this: one primarily based on interviews with Lanbo’s manager and designated agent, and the other based on a micro-farming household survey in two villages where farmers sell their mushrooms to the agent.

The rest of this report is organised as follows: the next section discusses Lanbo and its overall marketing channels. Section three presents the data and sampling measures used to examine one of the major marketing channels that Lanbo employs to purchase mushrooms through its agent. Section four gives a brief presentation of

the arrangements between Lanbo and the agent, and between the agent and farmers.

Section five presents the results of the household surveys, and the concluding

section considers the study findings and their implications.

## **2 Lanbo's mushroom business**

### **2.1.1 A brief introduction to Lanbo**

Lanbo is a specialist supermarket mushroom supplier in Beijing that has expanded substantially in recent years. Originally the Lanbo Garment Factory, the company went into the mushroom business in the second half of 2002. It began by supplying three supermarket stores: two branches of Huatang and one branch of Puersmart. By 2007, it was distributing mushrooms to more than 30 supermarket stores in Beijing, and the manager told us that the company is now the sole mushroom supplier for Carrefour, Huatang, Wal-Mart, Yichu, and Lianhua. Its market value has increased from less than 0.3 million RMB in 2002 to 8.9 million RMB in 2006, and was likely reach 15 million RMB (about US\$ 2 million) in 2007.

### **2.1.2 Procurement sources**

Lanbo has several sources of mushrooms, which have changed significantly since it went into the mushroom business. These include its own production base, wholesale markets, mushroom-producing households in the vicinity, other mushroom companies, and its designated agents outside Beijing.

### **2.1.3 Lanbo's own production base**

The company initially rented 100 mu (1 hectare = 15 mu) from a village in Beijing, invested more than 2 million yuan (about US\$ 250,000) in greenhouses, and set up contracts with ten experienced mushroom-producing households from other

provinces. These households are better off than average farmers, normally working on fixed three- to five-year contracts wherein Lanbo buys all their mushrooms at the current market price. All production, technology and management are undertaken within the production base so that quality and safety can be easily controlled. Lanbo's own small production base only accounts for a minor part of its mushroom business, providing very little return on the company's high investment. Nevertheless, there are considerable indirect gains from having its own production base, which can act as a showcase for a safe, high quality mushroom supply.

#### **2.1.4 Wholesale markets**

Due to the limited supply from its own production base, Lanbo initially sourced most of its mushrooms from the Xinfadi wholesale market in Beijing. The largest wholesale market in Asia, this accounted for over 90 percent of the mushrooms sold by the company in 2002. To improve its competitive edge over other mushroom suppliers to supermarkets in Beijing, Lanbo also began seeking alternative sources of mushrooms to ensure that its products are cheaper, safer, and better quality. The company's manager told us that it procured 80 percent of all its mushrooms from the wholesale market in 2003, 60 percent in 2004 and just 30 percent in 2006. The main reasons for buying less from the wholesale market were quality control, which is trickier with small traders in the wholesale markets; and price, as it is cheaper to buy through an agent and there are high transaction costs involved in sending people and trucks to buy mushrooms from wholesale markets.

### **2.1.5 Small-scale producers near the company's base in Beijing**

The vegetable association in Shangzhuang Township, where Lanbo is located, helped the company buy from local mushroom-producing households. The volume of procurements has gradually expanded, so that by 2007 about 50 households were regularly selling Lanbo all their mushrooms fulfilling its quality requirements (which mainly relate to size, appearance, and dryness). There are no written contracts, but the arrangements are often akin to an oral contract. Mushrooms are procured in two ways: Lanbo either sends a truck to collect them direct from the farm gate, or the producers send them to the company's distribution centre. The manager told us that this is a mutually beneficial arrangement, as the rapid expansion of Lanbo's mushroom business has provided a welcome outlet for more small-scale rural producers, who not only supply a stable source of goods, but are also close enough to allow the company to supervise cultivation and provide some technical support. Unfortunately, we were unable to visit any of them during the course of this study to determine the level of technical assistance they receive from the company.

### **2.1.6 Other companies in Beijing**

Lanbo has an arrangement to buy mushrooms from several other companies in Beijing, two of which are discussed below. Between 2003 and 2005, it established links with the Agricultural Service Centre in Dasuanzhuang village, Shunyi County.

It was agreed that the Agricultural Service Centre, which is owned by the local government, would be responsible for establishing the mushroom plant and organising production by local farmers, and that Lanbo would purchase all the mushrooms that met its quality requirements. However, according to interviews with Lanbo's manager, this initial attempt to work with other company was delayed by problems with the quality of the mushrooms.

In 2005, Lanbo began cooperating with Dadi Fubang Edible Fungi Co. Ltd in Beishiqiao Township, Shunyi County, with a particular focus on its output of *Pleurotus eryngii*. The company's production techniques and products meet Lanbo's quality requirements in terms of insecticide residue, moisture content, and shape. Both parties now cooperate closely, and Lanbo has secured a year-round supply of *Pleurotus eryngii*.

### **2.1.7 Designated agents who procure mushrooms from other provinces**

Lanbo began sourcing mushrooms from 'supporting bases' outside Beijing, to avoid being restricted by the number of mushroom varieties available and the limited total supply in Beijing. These bases include Zhunhua County and Pingquan County in Hebei Province; Fuxin City in Liaoning Province; Xinxian County in Shandong Province; Shanghai Municipality; and Gutian County in Fujian Province. Mushrooms are either obtained through part-time agents who procure them from individual mushroom producers (households), or by purchasing them from

large-scale industrialised mushroom farms. Lanbo's arrangements with its agents are discussed in detail in a case study presented in the next section.

Because they grow them at room temperature, small-scale rural producers (households) can only cultivate mushrooms at certain times of the year, and cannot produce during the hot summer months. Lanbo needs to maintain a year-round supply for the supermarkets, so it also purchases mushrooms from a number of large-scale industrial mushroom farms. In their efforts to standardise production and produce a stable supply of safe, good quality mushrooms, some farms maintain a constant temperature with equipment imported from The Netherlands. The high costs of industrial production are reflected in the market price, which in turn affects consumer demand, so industrially produced mushrooms are mainly used to ensure that there is a steady supply of different varieties throughout the year.

### **2.1.8 Imports from other countries**

Lanbo also imports certain specific varieties of mushroom from Japan, South Korea, and Taiwan. One major imported variety is *Flammulina velutipes*. However, they only account for a very small share of the mushrooms that Lanbo delivers to supermarkets, as they are much more expensive than local produce.

### **3 Sampling measures and data sources**

#### **3.1.1 Selecting mushroom producers for the case study**

As discussed in the previous section, Lanbo procures mushrooms from various sources and then delivers them to supermarkets in Beijing. Its sources include its own production base, wholesale markets, large industrialised companies, imports, local households in Beijing, and agents who procure mushrooms for Lanbo from individual households outside Beijing. In its first few years in the mushroom business, Lanbo obtained most of its produce from the wholesale market, which saw its share fall from 80 percent of Lanbo's mushrooms in 2003 to only 30 percent in 2006, as company agents increasingly turned to farmers. Because we are particularly interested in Lanbo's business with small farmers, the rest of this report will focus on the mushrooms it procures from farmers.

We have already noted that Lanbo gets its mushrooms from three different kinds of farm in various locations. The first is the company's own 6.7-hectare production base near its headquarters in Beijing. Because total production here accounts for a very small proportion of all the mushrooms procured by Lanbo, and the greenhouses are owned by the company, it is not particularly relevant to scaling up production by small farmers in China, so we did not conduct an intensive household survey here. However, brief interviews with five households in Lanbo's production base revealed that their mushrooms were above average in terms of the quality and prices found in



the wholesale market. Production costs are also relatively high in this production base.

Lanbo's second source of mushrooms is small farming households that produce mushrooms in Beijing. We were told that about 50 households sell mushrooms to Lanbo through a contract arrangement, but when we came to start our household survey in May 2007, local farmers told us that they do not have contracts. Mushroom producers in Beijing sell their wares to various buyers, including Lanbo, depending on what price they are offered. It also became apparent that few of the 50 mushroom producers in question are local farmers. They are actually migrants from other regions who rent land from local farmers and distribute their produce in many villages. Interviewing this kind of household and analysing data on them is problematical: first, because some greenhouses are managed by several migrants working together, while others are managed by a single person or a couple; and second, there is no way of examining issues such as the inclusion or exclusion of small farmers, whether the family is rich or poor, family characteristics, and household income or assets. In the end we had to abandon the survey of these households in Beijing.

Lanbo also sources its mushrooms through local brokers or agents, who obtain them from small farmers in other provinces such as Hebei, Liaoning, Shandong, Shanghai, and Fujian. Although we don't know the total amount of mushrooms procured in

this way, it seems to have become increasingly important for Lanbo in recent years. Therefore, the household case study in this project focuses on this marketing channel, which will be discussed in detail in the rest of the report.

### **3.1.2 Selecting the study areas and households**

In order to understand the marketing arrangements between Lanbo and local agents and farmers, and ascertain their likely impacts on local farmers, an enumerating team composed of five graduate students from the Center for Chinese Agricultural Policy and the Institute of Agricultural Economics conducted an intensive household survey in two villages in Zunhua county, Hebei province, about 135 km from Beijing.

We selected two villages in Zunhua county for the following reasons. During our industrial interview, we were told that Lanbo has developed a model that effectively links farmers with mushroom producers through its procurement agent (or local broker) in Zunhua county. We were also told that a similar arrangement is used to buy mushrooms from farmers in other provinces. We were introduced to Mr. Zhang, a local mushroom producer from Ximenzhuan village in Zunhua county, who works as an agent for Lanbo. He told us that he began procuring mushrooms from local farmers in two villages (Ximenzhuan and Dongmenzhuan, in Penancheng township) in 2002, and started doing business with Lanbo in 2005.

The survey covered three groups of households. The first group includes all the mushroom producers who sold some or all of their crop to Lanbo's agent (Mr. Zhang) in the 2006-07 growing season: 30 households in total (15 in Ximenzhuan village and 15 in Dongmenzhuan village). The second group consists of mushroom producers who did not sell any mushrooms to Mr. Zhang. There are 17 mushroom producers in Ximenzhuan, and as only two of them sold no mushrooms to Mr. Zhang, our second group has just two households from this village. In Donmenzhuan village, we randomly selected 15 households from those who never sold mushrooms to Mr. Zhang. After we cleaned up the survey data, we found that one household did not complete the survey as the farmer had difficulty recalling his prices and other information. The third group consists of 32 randomly selected non-mushroom producing households.

#### **4 Local agents and arrangements for procuring mushrooms**

Our mushroom case study confirms earlier findings (Dong et al. 2006) that local part-time brokers who work as agents for large wholesalers or specialist suppliers play an important role in bringing horticultural products from the farm gate to various markets. As well as acting as Lanbo's agents in our two study villages, Mr. Zhang and his brother (known hereafter as "the agent" or "agents") produce their own mushrooms and procure them from other farmers for resale in Beijing's Xinfadi wholesale market. So far there is no formal written contract between Lanbo and the agents – their working relationship is based on informal oral contracts and mutual trust.

Lanbo pays the agents a kind of commission fee for each transaction. Rather than paying them a standard commission (actual procurement price plus commission), their fee is based on the prices in Xinfadi market recorded by Lanbo, plus 0.2–0.4 yuan/kg (usually 0.4 yuan/kg). This is about five to ten percent of the average procurement price for mushrooms in our study villages (4 yuan/kg). If the agent can buy mushrooms from local farmers at much lower prices than those in Xinfadi wholesale market, he earns more profit. However, if he pays local farmers more than the going rate in Xinfadi wholesale market he stands to lose money.

Overall, because the agent has to take a risk on the market price, he can make more profit than a regular agent whose income is based solely on commission fees.

Payments are made through bank transfer immediately after each transaction. It is worth noting that the term “commission fee” used here might not be altogether appropriate. When we asked the agent what price he could get in Xinfadi market for the mushrooms he delivers to Lanbo, he said that there is usually little difference between the two, but that he is happy to sell to Lanbo because the business is stable and he doesn’t need to spend time sitting in Xinfadi market waiting for buyers. Lanbo is also willing to work with the agent because he can ensure a regular supply of good quality mushrooms.

In addition to Mr. Zhang and his brother, three extra local mushroom producers are hired to collect mushrooms in our two study villages. The agent usually pays them a commission of 0.2 yuan/kg, although this can rise to as much as 0.4 yuan/kg if he can get better prices in the market. During the harvest season, between September and June, they start collecting mushrooms from farmers at 7.00 a.m. and continue until they return from Beijing late at night. The agent owns a truck with 2.5 tons loading capacity, and is normally finished in the villages by noon. He then drives to Lanbo and Xinfadi wholesale market, selling about 50 percent of the mushrooms to Lanbo and the rest in Xinfadi wholesale market. Thus, every two or three days, he sends about 2,500 kg of mushrooms to Lanbo.

While the overall price of mushrooms is determined by the market, the variations in price between the different kinds of mushroom sold by farmers are largely

determined by their appearance and moisture content. The agent told us that Lanbo normally demands better quality mushrooms that are neither too big nor too small, and have a moderate moisture content. This is tested by weighing the mushrooms in a particular sized basket.

It is interesting to note that when we asked the farmers who sold their mushrooms to the agent whether they were then sold on to Lanbo, some knew that they were, but most didn't know who subsequently purchased them from the agent. The market is very competitive, and farmers are more interested in the price that the first buyer offers them. In addition to Mr. Zhang, there are other small local brokers who procure mushrooms from individual farmers and sell them on in local markets or markets in Beijing and other provinces.

## **5 Mushroom production and marketing at the household level**

### **5.1.1 The producers**

Mushroom farmers are relatively poor compared with non-mushroom producers. In 2006, mushroom-producing households had average per capita durable consumption assets of 13,477 yuan. This is nearly 20 percent less than those of non-mushroom producing households (see Table 1 below), meaning that on average, poor households produce more mushroom than richer ones. The relative poverty of mushroom-producing households may be largely due the fact that they earn less income from off-farm employment. For example, the survey shows that on average, 34.3 percent of mushroom-producing households were engaged in off-farm employment in 2006, compared with 41.7 percent of non-mushroom producing households.

There is no significant difference in the household characteristics of mushroom producers and non-mushroom producers, apart from the head of household's age. The statistical test shows that they are similar in terms of family population, labour, education, off-farm employment, farm size, and wealth (see Table 1, column 6). In 2006, mushroom producers were generally younger than non-mushroom producers, with heads of household averaging 41 years of age rather than 49 in the non-mushroom producing households (see Table 1). This might be explained by the

lower average rate of off-farm employment in mushroom-producing households, as more young people work off-farm than older people (Zhang et al. 2004).

The results presented in Table 1 also show that there is no significant difference in the household characteristics of mushroom producers who sell to Mr. Zhang (or the agent) and those that never sell to him. In other words, the agent does not differentiate between farmers when procuring mushrooms for Lanbo or selling them in Xinfadi market.

### **5.1.2 Marketing**

In general, most of the mushrooms procured at the farm gate go through traditional channels. Producers who never sell to Mr. Zhang or Lanbo's agent sell nearly all of their mushrooms to small local traders and small wholesalers (see Table 2). Even those who did sell to an agent in 2001 still sold 90 percent of their produce through the traditional channels, the remaining 10 percent going to a specialist supplier. However, this changed as Mr. Zhang's procurement activities increased, so that by 2006 he was taking 40 percent of these producers' mushrooms.

It is interesting to note that the group entirely composed of households that sell mushrooms to the agent still sell around 60 percent of their mushrooms to small traders and wholesalers. However, if we consider the agent as a modern channel, we may conclude that the marketing chain changed significantly between 2001 and 2006,



with the modern marketing chain share increasing substantially from 10 percent in 2001 to 42 percent in 2006 (see Table 2 below).

### **5.1.3 Mushroom marketing, production and income**

This study was particularly concerned with assessing the likely impacts of this rising marketing channel (procurement by Lanbo's agent). In order to do this, we divided all the mushroom producers into two groups – those who never sold to the agent and those who did sell to him – and then looked at the following questions: are there any differences in production, technology, income, or prices between these two groups? Tables 3 and 4 below summarise the results of this analysis.

The most striking finding of this analysis is the lack of any significant differences between these two groups in any aspect of these issues. For example, the average area each group uses to produce mushrooms is about 1 mu (see Table 3 below). Mushroom yield per mu is about 4 percent lower in the marketing channel associated with the agent than the channels not associated with him, but this difference is not statistically significant (Table 3). Similarly, there is no significant difference between the marketing channels with regard to net income per stick or average price per kilo.

#### **5.1.4 Mushroom marketing and prices**

Because the composition of the marketing channels differs between these two groups, and the households that sell mushrooms to the agent do not always sell him all their mushrooms, we have presented the prices that farmers get according to each marketing channel and month (see Tables 4 and 5 below). This will help us determine whether the Lanbo agent pays farmers more for their mushrooms than they would get from other marketing channels.

At first glance, the results seem to confirm that he does pay better than other marketing channels, which would be consistent with our findings from the industrial survey. For example, Table 4 shows that he paid farmers an average of 4.14 yuan/kg, which is about 3.5 percent more than other modern marketing channels such as processors and specialist suppliers, about 6 percent more than small wholesalers, and 13 percent more than small traders.

Focusing solely on the households that sold their mushrooms to the agent, we still find that he pays relatively high prices – although not the highest. Table 5 shows that specialist suppliers offered farmers the highest prices (4.72 yuan/kg), followed by the agent (4.14 yuan/kg), then wholesalers (4.01 yuan/kg), small traders (3.84 yuan/kg), and finally processors (3.74 yuan/kg).

However, when we asked the farmers why they get different prices from different buyers at any given time, they all said that this is due to the quality of the mushrooms. Normally, they sell the best-looking mushrooms with less moisture content first, at higher prices, to the agent or other specialist suppliers; the remainder goes to small traders or wholesalers. Since they are all grown in the same greenhouse, there will be variations in quality, but not in their safety.

Thus, our household survey shows that, mushroom quality aside, there is no statistically significant difference between the prices offered by Lanbo's agent and other marketing channels. All marketing channels pay more for better quality produce.

## 6 Conclusion

This study generated several interesting findings. The first is the rapid growth of specialist mushroom suppliers for modern retailers. Lanbo is a new mushroom supplier that has only been in the mushroom business since 2002, but is now one of most important mushroom suppliers for supermarkets in Beijing. Its unique sourcing system grew from a local to a nationwide network.

Second, while previous studies show that the rapid growth of modern retail markets rarely penetrates upstream in a small-farm dominated economy, the Lanbo case study provides initial evidence of an emerging vertical coordination system, with a specialist mushroom supplier and dedicated or semi-dedicated small traders (agents) who procure mushrooms direct from small mushroom producers. In response to modern retailers' quality requirements, and in order to improve its midstream market competitiveness, this specialist mushroom supplier has adjusted its marketing practices by gradually shifting its sourcing from the wholesale market to dedicated agents.

Third, while one might argue that this vertical coordination system is still in its infancy (a fledgling form of semi-vertical coordination, with no formal contracts) and may only exist for this specialised product (mushrooms), it does show how small farmers can be integrated into the modern retail system through local agents who live in the villages where mushrooms are produced. At the moment the

system seems to be well suited to the local context, even though there are no formal contracts between the specialist supplier and its agents, or between the agents and the farmers. Quality control is cheaper because it is done at the farm gate when the agent procures the mushrooms from each household. He then delivers some of the produce to the specialist supplier or company, and sells the rest in traditional wholesale markets. The agents, who are often also mushroom producers who live in the village themselves, procure the produce from their neighbours. This not only reduces transaction (or procurement) costs, but also establishes informal relationships and trust with the villagers who sell their mushrooms to agents. This procurement system has been increasingly important for Lanbo's mushroom business, and we expect this will soon be the case for other products too.

Fourth, the findings show that poor and small-scale farmers are not excluded from the emerging mushroom production sector. In fact, we found that on average, poor farmers produce more mushrooms than richer ones. This may be due to the fact that the poor have fewer opportunities to work off-farm (Zhang et al. 2004), and are therefore more engaged in mushroom production. This would be consistent with previous studies in China, which also show that the poor produce more horticultural products (Dong et al. 2006; Huang et al. 2006a).

Fifth, poor and small-scale farms are not excluded from the modern marketing channel either. The results of the household survey show that there is very little

difference between the characteristics of households that sell their mushrooms to Lanbo's agent and other small traders. This may be largely due to the fact that China's agricultural production is dominated by small farmers, and that land is equally distributed among households within villages. Several other studies on Beijing and Shandong came to the same conclusion (Wang et al. 2006; Dong et al. 2006; Huang et al. 2007a and 2007b).

And last, but not least, the findings on the impacts of marketing choice show that the different marketing channels make no statistical difference to production, yield, or farmer income. Each buyer pays very competitive prices, and there is no difference between the marketing channels once quality is taken out of the equation. The buyers play no role in providing technology, technical advice or credit for mushroom production. The results of this study also confirm those of our previous study on the impact of changes in the marketing chain on horticultural production (Huang et al. 2007b).

The findings of this case study have several policy implications. First, because vertical market coordination or integration that links supermarkets, large specialist suppliers, small local agents, and farmers can meet the quality requirements of modern retailers and consumers at lower transaction costs, it may be worth getting industry and government involved in scaling up this model. One of the key elements of this marketing chain is the fact that agents are local farmers who sort the produce

as it is procured, tying the traditional and modern marketing chains in with existing small-farm production systems and small-trader systems.

Second, while small and poor farmers are not excluded from either the expanding food market or emerging modern marketing chains, meeting the rising demand for food safety as China's income grows is a challenge for an economy where marketing is dominated by small farmers selling to small traders and agents. Policy-makers may need to address the most critical aspects of small farmers' ability to provide food that is both high quality and safe in competitive markets. A food tracking system might be a potential solution, and could also facilitate the scaling up of Lanbo's model, since it is not difficult to track costs with this system. In some cases, farmer cooperatives could also help overcome the high transaction costs of dealing with millions of small farmers.

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## 8 Appendix

Table 1. Characteristics of mushroom-producing and non-mushroom producing households in the study areas in 2006

	Mushroom-producing households			t-test: diff. between (2) and (3)	Non-mushroom producing households	t-test: diff. between (1) and (5)
	Average	Sold to agent	Never sold to agent			
	(1)	(2)	(3)	(4)	(5)	(6)
Household samples	46	30	16		32	
Per capita assets (yuan)	13477	13955	12581	0.568	16593	0.449
Off-farm employment (%)	34.3	38.9	25.8	0.197	41.7	0.322
Family size (no. of persons)	3.9	4.1	3.6	0.207	4.1	0.608
Head of household's age (years)	41	41	40	0.870	49	0.001
Head of household's education (years)	6.9	7.0	6.7	0.668	6.7	0.660
Family labour (no. of persons)	2.8	3.0	2.6	0.179	3.2	0.203
Per capita land (mu)	1.8	1.8	1.7	0.419	1.5	0.165

Note: 15 mu = 1 hectare; 7.8 yuan = 1 US\$. The critical probability value of t-test is 0.05.

Table 2. Share of mushrooms per marketing channel, 2001 and 2006 (%)

	Average		Households that have sold to agent		Households that have never sold to agent	
	2001	2006	2001	2006	2001	2006
Small trader or small wholesaler	94	73	90	58	100	97
Specialist supplier	6	1	10	2	0	0
Processing firm	0	1	0	0	0	3
Agent	0	25	0	40	0	0

Table 3. Mushroom production and income in two groups of households in 2006

	Average	Households that have sold to agent	Households that have never sold to agent	t-test: diff. between (2) and (3)
	(1)	(2)	(3)	(4)
Production areas (mu)	1.02	0.96	1.12	0.157
Yield (kg/mu)	18976	18710	19475	0.605
Net income per mu (yuan)	41806	43130	39324	0.331
Net income per stick (yuan)	1.99	2.07	1.84	0.160
Weighted average price (yuan/kg)	3.80	3.76	3.84	0.370

Note: we also tested the differences that various inputs (e.g. labour, type and amount of fungus, and other inputs) made between (2) and (3). The results show that none of them are statistically significant.

Table 4. Mushroom procurement price per marketing channel for all 46 households in the 2006/07 production season

	Average price (yuan/kg)	Monthly prices (yuan/kg)									
		9	10	11	12	1	2	3	4	5	6
Small traders	3.66	2.26	2.41	4.37	4.03	4.40	4.27	3.91	3.94	3.83	2.47
Small wholesalers	3.89	2.61	2.92	3.96	4.40	4.22	4.26	4.28	4.00	3.54	2.55
Specialist suppliers	4.00	2.20	2.64	3.39	4.48	5.40	4.00	3.88	3.84	3.76	NA
Processors	4.00	NA	3.28	3.41	4.32	4.28	4.14	4.09	3.99	3.80	NA
Agent	4.14	2.70	2.91	4.59	4.66	4.55	4.48	4.22	4.14	3.85	2.77

Table 5. Mushroom procurement price per marketing channel for 30 households that sold to the agent in the 2006/07 production season

	Average price (yuan/kg)	Monthly prices (yuan/kg)									
		9	10	11	12	1	2	3	4	5	6
Small traders	3.86	2.50	2.80	4.48	4.07	4.46	4.41	3.97	3.93	3.64	2.47
Small wholesalers	4.01	3.12	3.07	3.97	4.40	4.30	4.33	4.30	4.14	3.70	2.93
Special suppliers	4.72	NA	1.60	3.20	5.00	5.60	4.00	3.80	3.80	3.60	NA
Processors	3.74	NA	4.00	3.47	4.80	4.40	4.40	4.20	3.80	3.80	NA
Agent	4.14	2.70	2.91	4.59	4.66	4.55	4.48	4.22	4.14	3.85	2.77

## Regoverning Markets

Regoverning Markets is a multi-partner collaborative research programme analysing the growing concentration in the processing and retail sectors of national and regional agrifood systems and its impacts on rural livelihoods and communities in middle- and low-income countries. The aim of the programme is to provide strategic advice and guidance to the public sector, agrifood chain actors, civil society organizations and development agencies on approaches that can anticipate and manage the impacts of the dynamic changes in local and regional markets. The programme is funded by the UK Department for International Development (DFID), the International Development Research Centre (IDRC), ICCO, Cordaid, the Canadian International Development Agency (CIDA), and the US Agency for International Development (USAID).

## Innovative Practice

Innovative Practice is a series of case studies from the Regoverning Markets programme providing examples of specific innovation in connecting small-scale producers with dynamic markets at local or regional level. Based on significant fieldwork activities, the studies focus on four drivers of innovation: public policy principles, private business models, collective action strategies by small-scale farmers, and intervention strategies and methods of development agencies. The studies highlight policy lessons and suggest working methods to guide public and private actors.

The case studies were coordinated by:

Julio Berdegúe, RIMISP - Latin American Centre for Rural Development, Chile  
Lucian Peppelenbos, Royal Tropical Institute (KIT), Netherlands  
Estelle Biénabe, University of Pretoria, South Africa and Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), France

