

# Development status of rural informatization in Beijing, China

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**Abstract:** The development status of rural informatization in Beijing was analyzed from three aspects, which include infrastructure building, resource platform and service system construction, and the information technology application in rural areas. The infrastructure building in Beijing had certain scale, and the network coverage in rural counties and the rate of network into villages almost reached 100%. The construction of resource platform and service systems was diversified and it provided various types of services for farmers' lives. However, the information platforms and sites were dispersive and needed to be integrated and shared. The typical '211 information platform is one system platform which integrated source and market the two things, which means the first '2'. It used fund which means the '1', and technology which means the other '1' as support, and government departments and all kinds of producers could do some information activities through this platform. It had strong inquiry, analysis and synthesis functions for decision-making services through integrated and shared municipal organizations and counties' agricultural resources. On the aspect of information technology application, informatization has enhanced the technology level of Beijing urban modern agriculture and sustainable development capacity. The application of public service, e-government and e-commerce facilitated farmers' lives, improved the development of government management and rural economy. In the future, the rural informatization still needs to strengthen the integration and sharing of agriculture-related resources, reduce the public service informatization gap between rural and urban areas, and improve farmers' informatization awareness.

**Keywords:** rural areas, informatization, internet, rural development, information technology, Beijing, current status

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## 1 Introduction

Rural informatization is the process of using modern technology to improve agricultural production capacity,

rural management level, and farmers' quality of life in rural areas. Currently, developed countries have all enhanced their rural informatization process.

According to the statistics of U.S. Department of Agriculture in 2009, digital subscriber line (DSL) was the most common method of accessing the Internet, up from 27 percent in 2007 to 36 percent of U.S. farmers using it. Satellite and wireless were each reported as the primary Internet access methods on 13 percent of those U.S. farms with Internet access. Cable was reported as the primary access method on 11 percent of the farms. In 2009, 81 percent of U.S. farms with sales and government payments of \$250 000 or more had access to a computer, 79 percent owned or leased a computer, 69 percent were using a computer for their farm business, and 76 percent had Internet access. In Japan, about 34% households had PC, of which 12.2% had access to the internet<sup>[1-2]</sup>.

In 2009, Internet users in China added 86 million and

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reached 384 million people; the internet penetration rate is higher than the world average<sup>[3]</sup>, but compared to Japan and the United States, rural information technology in China is growing fast but the level is still low. At the end of December 2009, the scale of China rural internet users reached 106.81 million, with an annual growth rate of 26.3% (Figure 1). It is the first time that the scale of rural internet users exceeded one hundred million. From the perspective of urban and rural Internet penetration, Internet penetration rate in urban areas was 44.6%, while it was only 15% in rural areas. There exist big differences in Internet developing levels between urban and rural areas<sup>[4,5]</sup> (Figure 2).

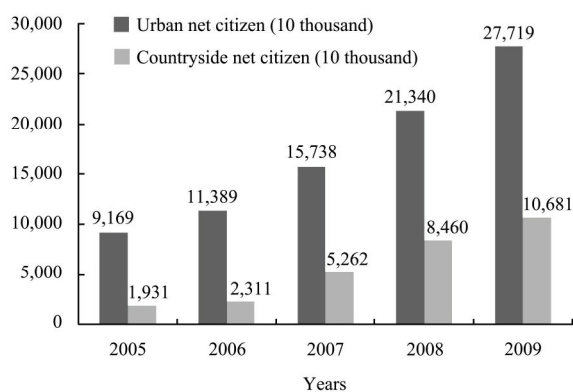


Figure 1 Comparative numbers of urban and countryside internet users

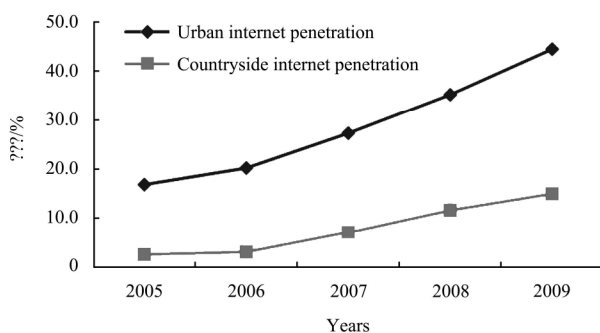


Figure 2 Comparative rates of the Internet penetration on urban and countryside

Rural informatization is an important issue for the building of new socialist countryside. Currently, Beijing is in a strong development phase of urban modern agriculture, and rural informatization is an important support<sup>[6]</sup>. Under the new situation, the establishment of rural informatization is very important to build new countryside and cultivate new farmers<sup>[7-8]</sup>.

The present study introduced various aspects of

information technology in Beijing in recent years, while mainly related to infrastructure construction, resource platform and service system building and the application of information technology. The existing problems in current and some proposals were analyzed.

In New Zealand rural areas, farmers are increasingly purchasing and using on-farm computers to provide decision support information and assist in meeting their tax and other contracts management. While the farmers purchase on Internet, they clearly believe the investment is justified, although there is not enough data to support this conclusion<sup>[9]</sup>. Gloya<sup>[10]</sup> found that in the USA, the producers are unsure on how the Internet can best be used to create value in their farm businesses. Furthermore, in India Raju<sup>[11]</sup> concluded that organizational linkages and networking capacities are to be strengthened for 'digital unity' to provide multiple opportunities to the rural communities to exploit local resources for their self-development. For China, the issue of rural communication development has been conventionally examined under labels such as universal service, digital divide, broadband deployment, and e-government, which generally fall into two seemingly distinct categories—access and applications. In China, these concepts are currently incorporated into a single program, if not a single term—'Village Informatization Program' ('VIP')<sup>[12-13]</sup>.

## 2 Current status

In Beijing, the total land area is 16 410.54 square kilometers, 62% of which is mountainous areas. In 2006, the government divided the 18 districts (counties) to four different function regions: the region of capital central function, the region of urban expanding function, and the region of new urban development and the region of ecological preservation. In the 18 districts (counties), there are 13 districts (counties) retained agricultural registered households, which used to be called suburb region. The resident population in rural area is 5.016 million, including 656 600 farmers. The city's per capita net income of rural residents is expected to be 12 000 RMB.

### 2.1 Infrastructure building

According to the latest data from Beijing Municipal Commission of Rural Affairs, by the end of 2009, the

radio (phone) coverage of the 13 suburban counties was up to 100%; for the cable TV coverage, except for Yanqing, Changping, Miyun, the other 10 districts had achieved 100%; for network coverage, except for Chaoyang area, the other 12 rural counties reached 100%; for the rate of network into villages, except for Shunyi district, the other suburban counties were 100%.

By the end of December 2009 in Beijing, every hundred rural households had 58 home computers, 212 mobile phones, 138 color TV sets, 105 refrigerators,

98 air conditioners, 50 DVD players, 42 cameras, 101 units of washing machines. Compared with the data at the end of the tenth five-year period in 2005, the growing rate were 61.1%, 52.5%, 7.0%, 5%, 55.5%, 2%, 13.5% and 4.1%, respectively. The entertainment type of information products has greatly enhanced, indicating the rural living standards have improved significantly. In addition, the use of household appliances could also promote and train the rural residents to use informatization products.

**Table 1 Annual average possession of durable consumer goods per 100 rural households (2001-2009)**

Year	Mobile phone (unit)	Air conditioner (unit)	VCD/DVD (unit)	Color TV set (unit)	Home computer (unit)	Camera (unit)	Washing machine (unit)	Refrigerator (unit)
2001	30	27	27	112	12	29	91	86
2002	52	35	30	116	16	32	94	91
2003	77	39	34	116	22	32	94	94
2004	102	47	39	119	27	35	96	96
2005	139	63	49	129	36	37	97	100
2006	161	72	50	131	41	38	97	100
2007	182	78	47	134	46	37	99	104
2008	201	89	49	137	52	39	101	104
2009	212	98	50	138	58	42	101	105

## 2.2 Resource platform and service system

Recently, 10 681 various types of information service sites had been built in Beijing suburban counties, including 4 233 distance education sites for rural party members and cadres, 452 distance education sites for agricultural technology, 824 rural 'digital home' sites, 3 118 rural cultural information resources sharing sites, 1 504 'love in agricultural information' sites, and so on.

1) Agricultural resources management decision-making system: '221 information platform'. With the joint efforts of various departments, 15 municipal building and sharing organizations and 13 counties agricultural resources, including 105 categories and 490 items of data, had been integrated, covering the soil, weather, water landscape and other natural resource conditions, and population, labor, economic development and other socio-economic conditions, and technological resources, market supply and demand, monetary policy and other information. Database capacity is more than 20GB, which is equivalent to 200 thousand books of information. The platform contained agriculture facilities, agricultural products supply and demand, agricultural finance and 138 other topics. It had 240

information layers, including soil information, and market distribution and so on. And it had more than 100 non-graphical data layers, including rural economy and so on. The platform had strong inquiry, analysis and synthesis functions for decision-making services.

2) Government departments can take advantage of the Intranet to analyze agricultural resources and market demand, and provide a scientific basis for management decisions on industrial layout, structural adjustment, and emergency protection; the farmers, businesses and the public can check the website for the information about planting, breeding adapt evaluation, new varieties, new technology, new product that adapt local areas, and also about market prices, rural tourism and agriculture-related support policies.

3) Beijing new village science and technology hotline '12396': since it was opened in early August to the end of November in 2009, log hits had reached 246 000 people, nearly 2 800 people per day; provided 3 859 automated answering services through phone, video and internet to the users; provided 245 consulting services by experts; the average daily volume was more than 30 people.

4) Beijing agricultural service hotline '12316': It had been the important channel for receiving complaints for counterfeit and inferior agricultural resources, and for protecting the legitimate rights and interests of farmers. It collaborated with law enforcement departments to combat illegal behaviors harming farmers' interest, and a total of 271 agriculture complaint cases were received in one year. On this basis, the 12316 hotline actively promoted agricultural science and technology, market, government regulations and other information services into villages and households, and helped farmers on scientific breeding and, increasing profit, and it had received all kinds of advice calls nearly 40 000 annually.

5) Beijing mobile rural power system: Until the end of 2009, 13 rural counties installed 222 sets of information machines and 3 810 sets of agricultural information machines, and had sent 10 370 000 practical messages and served 38 million users. Nearly ten million messages had been published which involved in agricultural production and rural major weather warning etc. Timely release, accuracy, and pertinence of information were improved and good service effects were achieved.

6) Love agricultural station: By the end of 2009, it had grown to 1 504 sites, including 504 love agricultural information sites and 1 000 secondary agricultural information service points. Twelve large-scale demonstration sites and 12 industry points were built, which provided the following functions: 'farmer enriching information distribution service'; 'help farmers for distance education service'; 'e-payment service for farmers'; and 'digital cultural services for farmers.'

7) Digital home: The public information services had been built in rural grass-roots areas, and the aim was to provide information service, skills training, and learning and entertainment platform to meet the information needs of rural residents. Rural digital home mainly provided information inquiries, information dissemination, information consulting, skills training, culture and entertainment, and other information services through Internet. At the end of 2009, there were 824 rural digital home sites in 13 suburban counties.

8) 'Three-one' integrated service platform: 'The three telecommunication' means: telephone, computer and TV,

'the three-one' means: establish the local area network with appropriate equipment and system software to collect, conduct and release agriculture-related information, build and improve local personalized databases. So far, the municipal agriculture bureau and the ten suburban districts and counties have established 'three-one' agricultural information service platforms.

9) Township information service stations: These stations were built according to the requirements of agriculture ministry 'six-one' standard (i.e.: one dedicated room, one set of special equipment (such as multimedia computers and printers, etc), one telephone network line, 1-2 full-time or part-time people, one information team, and one set of management and service system). In recent years, the rural outskirts of Beijing has built 6 346 various kinds of grass-roots information service sites.

10) Cultural information sharing grass-roots service stations: The cultural information resources sharing project is the use of modern information technology for digital processing and integration of Chinese culture and information resources, and the use of nationwide network management and service system for realizing cultural information resources sharing. At the end of 2009, the network service point of rural grass-roots cultural information resources sharing project had completed 3 118 accesses.

11) Modern distance education system for Party members and cadres in rural areas: Currently, 4 233 modern distance education terminal sites had been built in Beijing, which formed four levels of distance education transmission systems that covered city, district (county), township (town), and village. It has made important contributions on transferring central policy, sharing culture and education resources, and strengthening the integration of various resources.

12) Farmers distance education sites: Until December 2009, modern distance education projects had been established at 667 terminal sites. In Beijing, there were 452 sites in rural areas, covering 13 suburban counties. The distance education had extended to key villages, demonstration gardens, and businesses, and reached more than 20 provinces and regions outside Beijing.

### 2.3 Information technology application

The unprecedented development of modern

information technology and the Internet, agricultural expert systems, model systems, intelligent information systems, intelligent control technology, Internet of things (IOT) in electronic trading of agricultural products are the current mainstream technology on promoting the development of rural informatization. The application form is divided into for four categories: for agriculture, for the public service, for government and for market.

#### A. For agriculture

1) Precision agriculture technology: It has played an important role in field crop management, soil testing and fertilizer, and facilities of agriculture in Beijing area. It has enhanced the technology content of Beijing urban modern agriculture and sustainable development capacity. In addition, high-tech agricultural equipment has been effectively applied.

2) The intelligent control technology of agricultural facilities: There are 500 sets of information automatic acquisition systems and greenhouse production management and intelligent control systems in Beijing suburbs. The significant function of the technology is reducing cost, increasing production and efficiency, which significantly improved the level of facilities for agricultural production and technology.

3) 3S technologies: 3S was three integrated information technologies including Remote Sensing (RS), Global Positioning System (GPS) and Geographic Information System (GIS). 3S technology is widely used in the agricultural divisions, resource distribution, land monitoring, and it is useful for the city to provide the scientific basis for agricultural production.

4) Digital water-saving technology: By automatic irrigation control system and water management systems and other digital water-saving technologies, agricultural water saving effect is remarkable. Currently, the demonstration regions using automatic irrigation control systems have reached 4 550 acres in Beijing suburbs. Application of water and fertilizer integrated water-using technology and automatic control systems can annually save an average of 160 cubic meters of water, 18.4 kg of fertilizer, 70 Yuan of electricity, and 90 Yuan of labor costs for every acre of farmland.

5) Crop pest and disease early warning information system: Crop pest and disease comprehensive digital

forecasting were realized, and the timely and accurate delivery of pest and disease data was guaranteed and reliable for forecasting trends of Beijing crop pests and diseases and for their prevention and control.

6) Epidemic prevention and quarantine of livestock production information system: The livestock production information system combined 58 livestock-related organizations which distributed in 18 suburbs counties. They transfer data by Internet, and provide thirty thousands of data records each month. The livestock production management system provides a comprehensive management platform for the city and animal disease prevention and control, effectively improving the level of livestock management and decision-making.

#### B. For the public service

1) Medical treatment: Beijing new rural cooperative medical management information system framework (Figure 3) includes a municipal comprehensive application service management platform, a district management platform and a web content release.

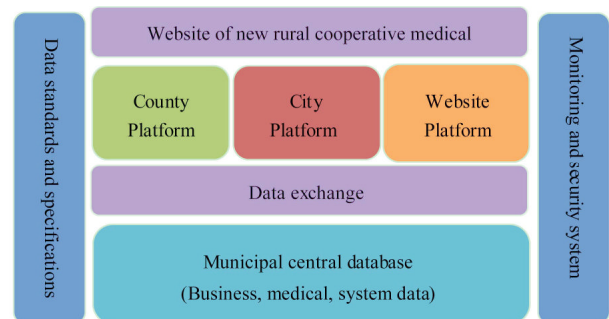


Figure 3 Beijing new rural cooperative medical management information system framework

2) Community security: Rural community security systems such as video monitoring, home alarm systems, and access patrol systems, have been installed mainly at road intersections and key facilities. The security system that mainly contains the video monitoring system at intersections has been established in rural villages (communities) that currently have relatively high levels of information technology. Wuxionsi village of Shunyi District has built a wireless monitoring network, which has achieved the monitoring of intersections, streets and important locations (remote control via the network) (Figure 4).



Figure 4 Wuxionsi village monitoring room and the monitor heads which distributed in the important positions of the village

### C. For government

211 information platform: Government departments can use the Intranet to analyze the agricultural resources and market demand, and provide the scientific support for industrial planning and layout, industrial restructuring, and emergency management. Farmers, businesses and the public can check the website for information about planting, breeding evaluation, new varieties, new technologies, new products that adapt to local areas, and also for market prices, rural tourism and agriculture-related support policies.

Rural and village-level government website: By the end of 2009, there were 127 townships built independent domain websites among the whole 12 districts and 183 townships. The village which used touch-screen computers to make village affairs public had reached 400, involving 166 counties and 13 districts.

### D. For market

Beijing agricultural market information resources: The market information system included wholesale market information for agricultural products from local areas and other provinces, and the international agricultural product prices, quantity information of coming into the market and other agricultural market information. Especially, in the construction of agricultural product wholesale market information resources, the city collected more than 20 wholesale markets of agricultural products of vegetables daily, which contained market data for 900 varieties in five categories, such as fruit, meat, eggs, aquatic products, grain and other farm products. Currently, the annual information collection amounted to more than 1 200

million items, which is 120 times of items to the market in 1990.

Rural enterprises and farmers' cooperative organizations applied e-business to the aspect of company production, circulation and management, which not only reduced costs and increased output, but also obtained good economic and social benefits, especially in tourism. For example, Ping Gu District has built 'Diao Wo folk custom travel network', and it made Diao Wo village famous. During the golden week of the National Day's holiday in 2009, the number of tourists reached 180 thousand, and tourism revenue was 2.2 million Yuan, of which the customers' spending through the network interactions achieved 1.0 million Yuan, which was 45.5% of the total tourism revenue. E-business has a strong impetus to the development of the folk tourism industry.

## 3 Existing problems and suggestions

Although the information in rural areas of Beijing has achieved great development in recent years, IT still cannot meet the growing information needs of farmers. Agriculture-related resources need further integration and sharing; the level of urban-rural integration and public service informatization need improving; and the informatization awareness of farmers should be strengthened.

1) Rural informatization construction has not met the farmers' needs

Currently, the infrastructure of Beijing rural informatization has a certain scale, but the utilization and application level is still not high enough. The main problems are the low rate of household computer ownership and the high charge of Internet access. The application level of information infrastructure needs to be improved. Rural information service systems and channels are lack of simplicity and popularity. They do not match farmers' generally low education level and technology proficiency of accepting the information and cannot meet the actual needs of the farmers, thus resulting in poor applications for various systems, and leading to a significant urban-rural information gap, and limiting the process of integration of urban and rural economic and social development.

2) Integration and sharing of agriculture-related resources

All agriculture-related organizations have built their own websites; however, different departments and organizations are lack of communication and coordination, which has caused the waste of resources and is not conducive to the use of resources. In addition, the farmers are unable to receive the information which they need from the relative centralized network platform. Therefore, it is important to use the '221 information platform' to fully integrate agro-resources from both internal and external networks.

3) Public service information gaps between urban and rural areas are obvious

Information construction in rural areas has achieved some success, but it has not yet formed a complete, practical, widely used public service information system in rural areas. The grass-roots e-government and information technology facilities such as online offices are still not complete. There is difficulty in collecting basic information and uploading and extending information is still slow. Primary information resources cannot be shared or exchanged, resulting in duplication of resources or information islands and other issues. Community management has not yet reached to the level of digital informatization, especially for rural communities, government, finance, education, culture, tourism, employment, health and other public affairs management and services, and there are still obvious gaps between urban and rural residents.

4) Awareness of information technology in rural areas needs significant improvement

Into the 12th five-year period, farmers' quality of life and informatization level are significantly affecting the economic and social development of rural areas. Although there are strong guidance from the government and extensive participation of social forces, the farmers' generally low education level makes it difficult for the information infrastructure to be fully applied. The rapid development of rural enterprises and cooperative organizations put forward higher requirements for farmers, and the equipment informatization, e-commerce and enterprise management informatization also require

farmers to improve their own skills to adapt to the development of enterprises. Therefore, on-site and effective training to farmers and distance education resources still need to be carried out vigorously. Modern information technology needs to be used to bring up the new generation of farmers that have skills, techniques and business management knowledge.

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