

## *ICT / E-Learning Readiness Analysis of Farmers in China*

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### ***Abstract***

The widespread use of mobile phones and the Internet in China, particularly in cities and urban areas, has speeded up the adoption of ICT technologies in rural areas. However, the digital divide between urban and rural areas and between different parts of the country is huge. The Chinese Government's 11th 5-year Plans has earmarked 'Building of new typed rural areas or communities' as one of its priority programmes. The aim of one of the components - 'rural informatization' – is to deliver information services to rural communities using ICTs.

In order to support this programme of China, an important Member Country of CABI, CABI has conducted a situation analysis to investigate the readiness of Chinese farmers' adoption of ICTs. The situation analysis has looked at the political and policy environment, farmers' education levels, ICT adoption rates, the state of ICT infrastructure, rural information services models, and rural information systems. This paper describes an analysis of the general situation of ICT/e-learning readiness for farmers in China, illustrating some examples of how ICTs have been utilised to deliver information and training in rural China.

**Keywords:** China, rural communities, farmers, ICT, digital divides, internet, information services, knowledge, e-learning

### ***Introduction***

China has had one of the fastest growing economies in the world thanks to economic reforms over the past two decades. Since the reform and opening-up policy began in 1978, some significant progresses have been made in Chinese agricultural production. With less than 9% of the arable land in the world, China has managed to feed 21% of the world's population. China however still faces the complex challenge of feeding its large population and eradicating poverty, whilst assuring an equitable and sustainable use of its natural resources, smooth transitions from a planned economy to a market-led economy and from traditional agriculture to a modern agriculture based on science and technology.

With about 64% of the population living in rural areas (NBS, 2001) and the rural poor accounting for about 80% of the poor population, the development of agriculture, rural economy and farmers' prosperity, what is referred to 'San Nong' in China, is one of the subjects of major interest and concern for the Chinese Government to ensure the sustainable growth of the economy. Using ICTs as well as traditional media to deliver information services to rural communities, and to train farmers is an important part of the cause to facilitate the 'San Nong'.

To support this programme, CABI has conducted a situation analysis to investigate the readiness of Chinese farmers' adoption of ICTs and effective ways of transferring knowledge to rural China with a view to improving farmers' livelihoods. During the situation analysis, we adopted the methods of literature review, case study, and survey. The issues, which we have

paid particular attention to, range from the political and policy environment to the technology and social environment including farmers' education levels, ICT adoption rates, the state of ICT infrastructure, rural information services models, and rural information systems etc.

### ***Political and policy environment***

Since the reforms carried out in the rural economy in 1983, great changes have taken place in rural areas of China. The past 10 years particularly have seen significant improvement in the rural economy and rural livelihoods in China. Thanks to the great efforts of the Chinese Government, civil societies and international communities, over 450 million people in China have been lifted above the \$1-per-day international poverty line since 1979. But wealth divides exist among different regions of China and between the urban and rural areas, with rural areas in the Western region of China being the least developed. The rural poor still accounts for the vast majority of the poor population (135 million) in China (DFID, 2006).

The development of 'San Nong' is therefore placed high in the Government's agenda. In China's 11th five-year plan, 'Building of new-typed rural areas or communities' has been proposed as one of the priority programmes. A series of policies have been devised and measures proposed to ensure harmonious development in rural areas of China by (a) strengthening the development of infrastructure and basic facilities in rural areas such as roads, electricity, bio-gas, telecom and drinking water facilities; (b) strengthening the management of environment in rural areas; (c) promoting development in education, sanitation and culture; and (d) establishing social security system in rural communities.

'Rural informatization' - being coined in China - is an important component of the 'building of new-typed rural areas or communities'. The objectives of 'rural informatization' are in line with some key objectives of E-agriculture as defined by FAO; improving farmers' e-learning and access to information using ICTs are regarded as essential parts. In recent years, the Chinese Government has formulated and implemented a series of policies and programmes to facilitate 'Rural informatization'. As a result, ICTs' adoption has increased tremendously in rural areas.

In addition to the efforts of the Government, research and training institutions, extension centres/stations and civil societies have played increasingly more important roles in information and knowledge transfer to farmers – in most cases by joining forces with government agencies. This is particularly relevant as China has a large professional and technical workforce involved in agricultural research, education and extension, with extensive information support services.

### ***ICT infrastructure, facilities and connections***

Presently, three kinds of communications networks are utilized to deliver rural information services in China, i.e. radio and television networks; landline and mobile phone networks; and computer networks and Internet. The Chinese Government has invested a lot of money in ICT infrastructure construction in rural areas. In the last ten years, the coverage of all these three networks has increased greatly. However, the digital divide between urban and rural areas and among different regions (e.g. well-off Eastern China vs. less developed Western China) is still wide.

By the end of 2006, the coverage rates of radio and television networks in China are 95.04% and 96.23% respectively. However in rural areas, they will be 84% and 82% in middle

2008. As for the Agricultural Channel of China Central TV, Channel 7, the coverage rate in rural areas will be 68% (SARFT, 2007).

The number of mobile phone users has increased exponentially in China. China had more than 540 million mobile phone users and 360 million landline phone users at the end of 2007. The penetration rate of mobile phone users was 41.6%. The high growth rate of mobile phone users (approx. 20%) is due largely to the increase of rural users (>60%). Under the 'village connection programme' launched by the Chinese Government in 2004, 99.5% of the Chinese villages can now access telephone networks including mobile phone networks(MII, 2008). For this programme, Chinese telecommunication services providers such as China Mobile have invested significantly in telecommunication infrastructure development in the rural areas. However, the penetration rate in rural China is still low compared with that in the urban areas.

In the last decade, Internet connections and usage experienced rapid development in China. China had 210 million Internet users (called 'netizens' in Chinese) at the end of 2007 and its online population is on course to become the world's largest at the beginning of 2008. China had so far about 122 million broadband users, ranking top among the world. There has also been considerable development of the Internet in rural areas. The number of rural Internet users has increased to 52.62 million at the end of 2007, up 127.7 percent year-on-year. The growth rate was much higher than the 38.2 percent for urban areas. Broadband connections have now reached 92 percent of the villages nationwide. China's information industry authority plans to expand broadband service to more than 95 percent of the nation's villages in 2008. Some of the central and eastern provinces will have all their townships and villages covered by broadband service by the end of 2008. However, netizens' scope, penetration rate and related infrastructure and facilities in rural China still lag far behind their urban counterparts. By the end of 2006, the number of computers owned by rural families was 2.7 per hundred families, far lower than the average of 47.2 per hundred families in urban areas. As of end 2007, the Internet penetration rate reached 5.1% in the rural China while penetration rate in urban areas reached 21.6%. Farmers account for only 0.4% of total Internet bandwidth of the entire country. The lack of related facilities and skills have been identified as key barriers for lower internet usage in rural areas (CNNIC, 2007a, 2007b).

There are different forms of access/services for the three types of networks mentioned earlier. Except for the common access/services like websites, radio & television programmes, agricultural information hot-lines, and text message services for mobile phones, many new electronic products/devices have been used to transfer information to farmers, for example, the Internet Protocol Television (IPTV)<sup>1</sup> and 'farmer touch connection'. With IPTV, farmers can enjoy information resources transferred by IP networks using a normal television set. 'Farmer touch connection' is a new type of equipment combining the functions of television, Internet and telephone. Shanghai City plans to extend this service to 1,800 villages in 2 years time. Another example relates to expert system and precision agriculture.. In early 2000s, the Chinese Ministry of Science and Technology funded the research and development of expert systems for crop production and protection using handheld computers. Some 20 knowledge tools/expert systems named 'Nongwutong', i.e. knowledge tools for agricultural production, have been developed and used by farmers for information on variety selection, applications of fertilizers, irrigation and crop protection methods, and diagnostic decision-making in the fields etc.

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<sup>1</sup> IPTV is the process of providing video and/or audio services to a normal television through Internet protocol networks

### ***Education level, and information and skill needs in rural China***

The overall education level in the rural China has improved greatly in the past 10 years. In addition to the normal education system, there are rural schools catering specially for adult education. Farmers are particularly keen for their children to have better and higher education. However, on the average, Chinese farmers receive less than 7 years of education because of the large rural population and departure of the educated younger generation for urban areas where job opportunities are higher. The breakdown of education levels of rural farmers (480 million) are: 38.2% - basic education i.e. below primary school level; 49.3% - middle school level; 11.9% - high school level; and 0.6% - Junior College and above (Yu, 2006).

Computer and internet literacy, and skills among farmers are generally low. It was noted that internet cafes provide the major means of internet access for rural netizens. Internet surfing behaviour has revealed that most surfing is for entertainment and leisure purposes. Among the most important information channels for non-netizens in rural areas are television programmes; 84.7% of rural non-netizens choose to obtain information frequently on TV.

Farmers' information needs have increased significantly in recent years thanks to the incentives of generating more income and improving competitiveness. A field survey on farmers' information needs in 4 provinces (Zhejiang Province, Anhui Province, Jilin Province, and Ningxia Province) by the Chinese Ministry of Agriculture (MoA) and FAO in 2004 indicated that Chinese farmers' information needs are huge and diversified, and that the top nine needs are information on market prices of local agricultural products, new varieties, new technologies, practical technologies, disease and pest control, agricultural policies and preferential measures by the Government, prices of agricultural materials, and weather forecast etc. In other words, their needs are especially for technical/practical information to assist them in improving their productivity, and market information for the better trade of their products.

### ***Rural information systems and services models***

Under the 'Golden Agriculture' Programme launched by the Chinese Government in 1994, the "Information Systems for Agricultural Integrated Management and Services" has gradually been established. By early 2006, almost all of provincial and city levels, 77% of county level, and 47% of township level agricultural departments have set up agriculture information management and services divisions.

There are now about 180, 000 rural information personnel in the whole country. A national network for rural information services has been formed. Marketing and production-related information services have been provided through this network, which connects focal points at provincial, city, county and township levels, and also links the leading enterprises of agriculture, wholesale markets, intermediary agencies and large households of production and business operations. At present, all the provincial level, 83% of regional level and 45% of county level of agricultural departments have set up rural ICT service stations to provide rural information services. The development of a nation-wide system for providing scientific and technical information services to rural communities is also under way, and being led by the National Agro-Technical Extension Services Centre (NATESC), Chinese Academy of Agricultural Sciences (CAAS) and the National Agricultural Broadcasting School (NABS) etc.

A wide range of information content and services are being delivered via internet portals and websites; there were more than 6,000 agricultural-related websites or portals in China by the end of 2006. About 50% of these websites are concentrated in the 5 big cities/eastern coastal

provinces, and 35% of them are agricultural enterprises websites. However, it is widely recognized that information content development and delivery to the rural communities need special considerations. In many cases, traditional media is more appropriate. Efforts have been put into developing practical, marketing and value-added information, and delivering them through multiple media (including printed, digital and audio-visual media). For example, with TV sets and DVD/VCD players being widely available in rural households, many national, local TV and video programmes have been developed to cater for the information needs of the rural communities. One noticeable example is Channel 7 of China Central TV (CCTV), which is a dedicated Agricultural Channel showing programmes on practical agricultural technologies and knowledge.

A joint field survey in China in 2003 by MoA and FAO identified three successful rural information services models in China (Zhong, 2004; Zhang, 2005b):

- Service station model: Information services centres located in counties, townships and villages, which form a three-level rural information service network
- Farmers' home model: Independent and open agricultural facilities integrating the functions of agricultural technology consultation, agro-technological extension, information services and business operations
- Association model: Associations which are formed according to common interests providing members with information on technology, crop seeds or animal breeds, production materials and marketing and related information services

In the recent years, different regions have built on the existing models or developed some new models according to the situation on the ground. Li Dao Liang (2007) summarized that generally, these models are based on two basic patterns. One is the Government-dominated pattern, and the other is the Community-participatory pattern. Under the Government-dominated pattern, there are 4 models:

1. Government agency + science and technology(S&T) demonstration areas + farmers: In this model, the local governments sponsor and establish agricultural S&T demonstration areas, which are usually combined with scientific research and development bases of agricultural research institutes and universities. This model is being adopted by more developed areas, i.e. suburbs of some big cities which are close to agricultural research institutes and universities.
2. Government agency + information service station + farmers: Information services centres are located in counties, townships and villages, which form a three-level rural information service network. The three-level information services centres are supported separately by government agencies at each of these levels. This model is being adopted by rural areas where economic development levels are relatively higher and the service function of local government system is relatively good.
3. Government agency + Technical Task Forces (TTF) + farmers: in this model, TTFs are selected from the government agencies at city or county levels. They are sent to work in rural areas on secondment arrangements - their main responsibilities are to introduce and promote new varieties, new techniques, and new facilities to the rural areas. TTFs are encouraged to establish profit-sharing bodies with farmers in the forms of investing funds or technologies. This model is being adopted by areas which have a comprehensive agricultural S&T system, and a relative higher level of agriculture industrialization.
4. Government agency + rural information personnel + farmers: Rural information personnel refer to farmers who are competent, better-off economically and IT savvy. In this model, the rural information personnel are selected and recommended by the agricultural departments

at county, town, and village level, and then trained and examined by the local governments. There are at least 3 to 5 qualified rural information personnel in each village providing face-to-face information services such as gathering information from the Internet, newspapers, magazines and books, identifying valuable information, new technologies, or job opportunities to meet local farmers' information needs. This model is very popular in many rural areas of China.

Under the Community-participatory pattern, there are many other models, such as "associations+farmers"; "leading enterprises +associations+ farmers"; and "agricultural products wholesale markets+farmers", etc. The key feature of these models is addressing farmers' common information needs.

It is clear that areas with different levels of economic development may adopt different models to carry out rural information services. At present in China, the Central Government and local governments play dominant roles in all of these models. With the development of international economic integration and agricultural industrialization, the functions of the governments' may change from 'management' to 'provision of services' in some models. Chinese agricultural institutions and NARS have also paid increasingly more attentions to the provision of rural information services, and facilitation of 'research into use' and technology transfer to farmers.

### ***Training, e-learning and technology extension for farmers***

MoA has carried out extensive farmer training programmes since early 1990s. Thousands of farmers have been trained by traditional means and/or using ICTs including e-learning and distance learning. ICT-based distance education and electronic learning, which have been made possible with the rapid growth of Internet connections, are growing fast in China. China now has three of the world's mega-universities/institutions in which over 100,000 students largely use distance learning methods. These methods are also being adopted by government agencies, institutions and associations to help farmers obtain knowledge and skills needed to improve their agricultural productions and have better access to the markets.

MoA and NABS have recently launched a programme, namely, 'Science and Technology Mobile Training Stations', aimed at facilitating technology transfer and extension by using ICT facilities (e.g. laptops, PPT projectors, DVD players, camcorders and loud speakers) and traditional means.

The China Agricultural Broadcasting Education System (CABES) plays a very important role in the provision of education and training in rural China. The system led by the National Agricultural Broadcasting School consists of broadcasting schools at national, provincial and county levels. In the recent 5 years, CABES has established (a) 1744 "Farmers' Science and Technology Education and Training Centres"; (b) a satellite distance education and training network with one independent main station and 335 receiving sub-stations; (c) 150 mobile training stations (vehicles); (d) 2100 new farmers' bookshops; (e) more than 6000 rural broadcasting stations; (f) a training network for surplus labours; (g) a text message service on agricultural technologies; and (h) a database of 530,000 records. CABES is also implementing a FAO Technical Assistance project on strengthening distance learning in China (MoA, 2006).

China has a large extension system. The system led by NATESC, is currently undergoing significant reforms, and becoming more demand-led. In order to provide information services to farmers, the extension system has developed 59 internet portals at provincial level, 298 websites at prefectural level, 974 websites at county level, 18 agricultural technology databases

and expert systems and 35 application softwares. It has also formed a cadre of 10,000 information personnel to provide information services directly to farmers (NATESC, 2007).

### ***Discussions***

Wealth and digital divides exist and there are different levels of readiness for ICT adoption among different regions of China and between the urban and rural areas, with rural areas in the Western region of China being the least developed. The key challenges to be addressed are the extent of adoption of ICTs by rural communities, how effectively have these ICTs been used to deliver information services and facilitate knowledge transfer, what farmers must be equipped with to utilise the information services delivered by ICTs and the digital divide between different regions of China.

The present political and policy environment in China has certainly provided excellent opportunities for developing rural information services and e-learning programmes, and for preparing Chinese farmers for better ICT adoptions. The Chinese government's determination to promote 'San Nong' and build new style rural areas/communities has attracted new investments of finance, human and other resources from all concerned. 'Rural informatization', as an important component of this new programme, will no doubt facilitate the development of ICT infrastructure/facilities, Internet connections and information services in rural China.

The findings of this situation analysis have shown the extensiveness and diversity of rural information users and their needs, rural information services models, and systems, and types of information content and media. It is clear that regions with different levels of economic development may adopt different models to carry out rural information services and that government agencies, research institutions, universities, extension stations, associations, enterprises and others bodies have all played important roles in the provision of information and training services. It is particularly encouraging to see that some provinces (e.g. Gansu and Ningxia) in the Western region, whilst facing economic difficulties and large rural poor populations, have identified the provision of effective information services as one of the many important measures to develop their rural economy and reduce poverty.

There is still much progress to be made on behalf of the rural farmer, and many ways in which interventions of different sorts can be developed in order to deliver benefit to China's rural poor. Finding ways to work with local partners who are already using successful rural information delivery models will ensure that our efforts in knowledge transfer and information delivery to farmers are more efficient and cost effective.

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