Date submitted: 25/06/2010

Information worlds of Chinese farmers and their implications for agricultural information services: a fresh look at ways to deliver effective services

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Meeting: **Session 85 — Agricultural Libraries**

WORLD LIBRARY AND INFORMATION CONGRESS: 76TH IFLA GENERAL CONFERENCE AND ASSEMBLY

10-15 August 2010, Gothenburg, Sweden

http://www.ifla.org/en/ifla76

Abstract:

This paper aims to examine the major characteristics of Chinese farmers' information worlds with a view to shedding light on new approaches to improving agricultural information services. "Information world" is defined here as a concept to describe individuals and their aggregates rather than social environment; it refers to the space-time-cognition delimited life sphere of an individual in which he/she obtains information and communication utilities from components of Popper's worlds 1, 2 and 3 through intentional, conscious and involuntary information practices that are performed by him/her as an information creator, provider, transmitter, seeker, receiver and/or user. The characteristics of farmers' information worlds are examined using this concept as a framework and the interview survey of 83 farmers in a northern Chinese county as empirical evidence. The study shows that these farmers' information worlds appear to be highly limited in all its spatial, temporal and cognitive dimensions and are dominated by involuntary information practices sporadically performed in the process of doing non-information activities, which render only a very small proportion of resources made available in rural China actually accessible from within their information worlds. Consequently, when there is a need for information, these farmers seem to have very few resources to utilize. Based on these findings, this paper advises agricultural information system designers and service providers to inform their product design with knowledge of farmers' information worlds, particularly knowledge about how these worlds redefine the accessibility of information and how this redefinition sharply reduces the range of information that is useful to farmers.

Introduction

In contemporary China, the concept of 'farmers' is a highly complex one and can cause considerable misunderstanding to anyone who approaches it with the image of western farmers in mind. The connotation of the concept as well as the reality of being farmers' can only be understood in the distinct context of rural China and in the web of concepts pertaining to rural China. The first of these concepts is that of peasants, or the agricultural population (*nong min*). This refers to a particular section of the Chinese population who are designated as peasants by China's population registration system, which since the 1950s, has served as a control system to bound peasants to the countryside and has, together with other social policies, institutionalized a sharp divide between the urban and rural Chinese societies. The second related concept is that of countryside, or the rural areas (*nong cun*), which refers to those geographical areas that are under the administration of county governments and their subordinates. A related concept to this is the concept of rural residents or rural population. This refers to all residents who live in the jurisdiction of townships below county governments. The third related concept is that of agriculture (*nong ye*). This refers to the economic sector which comprises production activities in farming, forestry, fishing and livestock farming. This sector is engaged in by both peasants and the state owned farms and their workers. It is widely recognized today that the full picture of rural China can only be grasped by examining the peasant (nong min), the countryside (nong cun) and agriculture (nong ye) all together. Therefore, the issue of rural China is also referred to as the issue of "three nongs".

The concept of 'farmers' can be roughly applied to those members of Chinese society who are registered as part of the agricultural population (peasants), and live in the countryside and engage completely or in part in the agricultural production. According to the latest statistics, in 2008, 66.38% of China's total population (or 881.59 million) are registered as agricultural population (nong ye ren kou) (National Statistics Bureau of China, 2009a), 54.32% (or 721.35 million) are categorized as the rural population (xiang cun ren kou) (National Statistics Bureau of China, 2009b)； as of 2005, around 59.5% (or 299.76 million) of all the rural labour force were in the agricultural sector (The Ministry of Agriculture, 2006). Perplexing as they are, these statistics indicate unanimously the critical position of rural China and its agricultural sector in contemporary China's social and economic development.

Information services to rural areas in general and to its agricultural sector in particular have been of great concern in rural development especially since the beginning of the economic reform in the early 1980s. Central to this reform was the contracting of the previously collectively managed land to farmers, which instigated considerable independent decision making on the side of farmers and great need for supportive information. To facilitate farmers' decision making and to boost the rural economy, the central and local governments initialised numerous initiatives/projects on rural information services since the mid 1980s. During the 11th five year plan period (2006-2010) alone, for instance, over ten major projects have been implemented for this purpose.

A perpetually intriguing issue for information service providers is that while

information needs surveys consistently show that there exists a great need for information among farmers (Shao, 2003; Tan et al., 2003; Xiang, 2003), not all services aiming to meet these needs are effectively utilized; some in fact, are poorly utilized (Yu et al., 2007). Surveys have shown that when farmers are in need of agricultural information, they tend to consult "capable fellow villagers" rather than organized information services (Peng, 2002; Tan et al., 2004; Wang, 1999; Zhao, 2001); very few farmers reported using Internet-based agricultural information systems, local information centres and libraries (Yu et al., 2007).

Providing effective rural and agricultural information services is also a world-wide challenge for library and information professionals. Efforts to improve the effectiveness of such services have mainly been informed by the user-centred philosophy of services which emphasizes the central place of knowledge about users in system/service design and the necessity to involve users throughout the designing process. So far this approach has induced a great array of studies on farmers' information needs and behaviour (Anwar & Supaat' 1998; Ocholla, 2004; Leach, 2001; Sturges & Chimseu, 1996; Raju, 2000, Gloy, et al., 2000; Tucker and Napier, 2002; Leckie, 1996), but effective information services for rural residents and farmers are still far from easily attainable.

This paper attempts to shed new light on effective agricultural information services based on the information worlds concept developed by this author. It examines the characteristics of farmers' information worlds with reference to the major parameters of the concept; it will then show how these characteristics excluded some of the information resources available on China's rural information landscape from the views of farmers and eventually made them inaccessible.

Information worlds of individuals: A conceptual framework

The information world concept is developed by this author in a series of studies on information inequality conducted in northern China during a span of time that lasted for over five years. The conceptualization draws on empirical evidence collected in these studies on the one hand, and on the theoretical insights of existing LIS concepts (e.g., LIS adoption of Popper's three worlds concept, Savolainen's way of life concept, and the information practice concept) on the other hand. It is defined as a space-time-cognition delimited life sphere of an individual in which the individual obtains information and communication utilities from components of Popper's worlds 1, 2 and 3 through intentional, conscious and involuntary information practices that are performed by him/her as an information creator, provider, transmitter, seeker, receiver and/or user. Thus defined, the concept is meant to describe individuals and their aggregates rather than their social environment. The following hypothetical farmer's life provides an illustration for this concept: The farmer spends most of his day-time in the crop field, during which he occasionally picks up information about the growth problems of his crops (e.g., threats of certain insects) and makes up decisions on appropriate actions; he comes back home very late in the evening and watches the national news while having dinner; he then moves on to watch soap operas after dinner; he does not read, however, because, having not finished his primary education, he can hardly read now. These information related

features of his life depict an information world that is very different from, for instance, an agricultural entrepreneur's.

With the above connotation, the information world concept establishes that elements from all of Popper's three worlds – the physical material world, the mental world and the objective knowledge world – can all be made useful for informational purpose (i.e., to generate information utilities) even though the ontological nature of some elements as information is open to dispute. A crop, for instance, is not normally regarded as an information resource. A special one (a problematic one, for instance), however, can generate information utility for a farmer in the same way as experimental materials can for a researcher. The concept also establishes that although the information society abounds in information resources, not all resources will enter the personal information worlds of certain individuals and become actually accessible to them. For individuals who do not use libraries at all, for instance, unless they change this habit (hence change their information worlds), library collections are in effect excluded from their accessible resources. In a similar vein, for people who do not understand English, unless they learn to master the language first (hence change their information worlds), anything presented in that language remain in effect inaccessible. The actual information accessibility for certain individuals at any point in time is therefore redefined by the spatial, temporal and cognitive boundaries of their information worlds at that time.

A related concept that emerged from the afore-mentioned studies in tandem with the information world concept is "the information resource bases of individuals" concept (Yu, 2010). This refers to the categories and ranges of resources that an individual uses to obtain information utilities (i.e., to get himself/herself informed) on a daily and regular basis. An individual establishes his/her information resource base by asserting "usership" over certain categories and ranges of resources. To put it in another way, those categories and ranges of resources for which a person is eligible to be called a user are eligible to be called part of his/her information resource base. A hypothetical farmer's experience again offers an illustration for this concept. If, for example, this farmer obtains information utilities from TV programmes, his/her own experiences and other people's experiences on a daily and regular basis, but hardly ever obtains information utilities from books, newspapers and the internet, then only the former categories of resources can be said to be part of his/her information resource base; if he/she only watches news and entertainment programmes on TV but not documentary and other educational programmes, only the former range of programmes can be said to be part of his/her information resource base. Apparently, it is one's information resource base, not whatever is available in his/her social environment nor even whatever is accessible in his/her own information worlds, that produces most information utilities for the individual.

Methodology

Research reported in this paper is based on an interview survey of 83 farmers in the surrounding countryside of Tianjin, China, supplemented by a literature survey of published statistics, government reports and research publications. Participants of the interview survey were selected on the basis of convenience and accessibility; random

sampling was not possible due to the great demand for cooperation upon the participants. Around 57% of the participants were men; around 20% were in their thirties or younger, 43% were in their forties and 38% were in their fifties or older. Semi-structured interview questions were designed to collect data on participants' daily and regular information practices as embedded in their work and non-work activities. The interviews were conducted through house to house visits and were tape recorded when permitted, or otherwise recorded in field notes. For the purpose of this paper, data analysis used a structured coding scheme based on key parameters of the information world concept.

In addition to the survey data, this study also conducted a comprehensive survey of published literature, news reports, government policies and statistics to collect data regarding the information environment of farmers' information worlds. These documents are collected primarily from a group of databases provided by China's Infobank Ltd. Infobank Ltd. is one of the major information content providers in China specialising particularly in factual information. This study searched particularly the databases on news reports, statistics, law and legal documents so as to collect related facts, policies, and statistics about rural information service provision in the past ten years; these materials were then collated and subject to cross verification to show the general picture of information service provision in rural China.

Rural China's information landscape: information availability

Preliminary data analysis shows that contrary to what might have been expected, Chinese farmers are not badly deprived of information resources in terms of mere information availability. In addition to a great amount of information that is originated and shared within and between rural communities, the central and local governments, the media and various institutions have actively provided information to rural areas particularly during the 10th and 11th five year plan periods (2001-2010). Within the 11th five year plan period (2006-2010) alone, for instance, over ten major projects have been implemented by the government to improve information services in rural areas. These include, among others, a project to establish rural information service stations, a project to establish a comprehensive cultural station for each township, a project to establish a reading room for over 0.2 million villages or about one third of all villages, and a national project for cultural information resource sharing. Nearly all these projects have agricultural information services as part of their functions.

In the mean time as information contents and services are multiplied, the telecommunication and mass media infrastructure in rural areas have also improved markedly. The government began to extend the coverage of the nation's broadcast and TV network to all administrative villages in 1998, an initiative it carried on during the 10th and 11th five year plan periods; it started pushing forward universal telecommunication services in rural areas in 2004. As of 2008, the penetration rates of television, fixed telephone, cell phone, and computer in rural areas were respectively 109.1, 67.0, 96.1, and 5.4 for every hundred households (National Bureau of Statistics of China, 2009c).

Table 1 shows some of the major nation-wide initiatives which aimed particularly at improving information infrastructure and services for farmers during the past ten years.

Table 1Major government initiatives to improve rural information services 2000-2010

年代	**Projects on information resources**	**Projects on information infrastructure**	**Projects on information services**
2001~ 2005	✓ In 2001, the Ministry of Agriculture initialized the “Plan for rural market information services during the 10th five year plan period” which pledged to integrate the mechanism for rural information gathering and disseminating. ✓ In 2001, the Ministry of Agriculture began to provide an integrative system for information on agricultural produce supply and demand. ✓ In 2002 the Ministry of Science and Technology developed its “Star Spark Program Web Site” to connect all provincial “Star Spark Program” web sites serving rural areas. ✓ In 2003, the Ministry of Agriculture launched its “Economic Statistical Information Disseminating Calendar” which disseminated agricultural information through multiple channels. ✓ In 2003 the Ministry of Culture initialized the National Culture Information Resource Sharing Project to create electronic cultural information through collaboration.	✓ Continued the project which began in 1998 to connect broadcast and TV network, resulting in a coverage of 94.48% and 95.81% villages for broadcast and TV respectively in 2005 ✓ In 2004，the Ministry of Information Industry began its “Rural Telecommunication Universal Service: Strategies to Connect Every Village”, aiming to connect 95% of administrative villages to the telecommunication network by 2005	✓ In 2002, the Ministry of Science and Technology began its “Star Spark Information Initiative for Young Rural People”, to provide practical technological information to rural areas through Broadcast and telecommunication networks. ✓ In 2003, the Ministry of Science and Technology began its “Star Spark Rural Information Service System Special Initiative”, proposed to promote a number of information service models across the country. ✓ In 2004, the Ministry of Agriculture circulated its proposals to promote “Agricultural Science and Technology into Houses Action” which proposed to disseminate agricultural science and technologies through demonstration and training. ✓ In 2004, the Ministry of Science and Technology circulated its “Proposals for the Experiment of Grass-root Entrepreneurship of Science and Technology Officers”, which aimed to encourage agricultural science researchers to cooperate with farmers in applying their knowledge at the grass-root level ✓ In 2005，the Ministry of Agriculture began its experiment to develop a comprehensive agricultural information service platform which uses telephone, TV and the computer as unified terminals for information delivery. ✓ In 2005 the Ministry of Science and Technology began to promote the agricultural information service model based on hotline telephone services – Agricultural Science and Technology 110. ✓ In 2005, the Ministry of Agriculture began an initiative to deliver agricultural science and technology to households using buses.

2006-2010	✓ In 2006, the inter-departmental initiative to establish Farmers' Reading Rooms was launched, which aimed to equip 0.2 million reading rooms within the 11th five year plan period, with no fewer than 1000 books for each reading room. ✓ In 2006, the second phase of the National Cultural Information Resource Sharing Project began, which emphasized the development of information resources for rural residents.	✓ In 2006, the State Council promulgated the plan to further extend the nation's broadcast network to villages, aiming to enable all villages with more than 20 households to be connected by 2010 ✓ In 2007, the Ministry of Information Industry proposed its plan to connect all villages with more than 20 households to the telecommunication network.	✓ In 2006, the Ministry of Agriculture circulated its instructions to establish information service stations in "model villages of the new socialist countryside". ✓ In 2006, the Ministry of Information Industry circulated its proposals to experiment with establishing comprehensive rural information service stations ✓ In 2006, the second phase of the National Cultural Information Resource Sharing Project began with the remit to establish rural service stations ✓ In 2007, the Ministry of Agriculture began its rural informatization demonstration project to push forward the development of information resources, services and networks ✓ In 2008, the Ministry of Commerce circulated its instruction to experiment with rural commercial information services ✓ In 2009, the Ministry of Industry and Information Technology circulated the "Basic Standards for establishing rural comprehensive information service stations and regulating their services" ✓ In 2009, the Ministry of Agriculture began to provide "12316" short message services

Spatial, temporal and cognitive dimensions of participants' information worlds

As established in the conceptual framework section, although information society abounds in information resources, only a small proportion of these resources will enter the spatial, temporal and cognitive boundaries of an individual's information world, which in turn, redefines the actual accessibility of information to the individual.

For the dominant majority of farmers interviewed in this study, venues or settings where they perform information practices, i.e., where they play the role of information creators, disseminators, seekers, receivers and users, are confined to a rather limited number of places. The primary places are homes, neighbourhoods, and "business places". These places are reported as the venues for information activities by nearly all participants. For most participants, home is the place where they watch television and discuss matters that are concerning or interesting to them; for a very few, it is also a place to read newspapers and books and to surf the internet. Neighbourhoods are places where useful information is occasionally picked up; news is shared; and notification from the village committee is received (normally from village broadcast). "Business places" are a cluster of places where production or professional information is obtained (e.g., symptoms of problematic farm animals are observed and diagnosed); market information is collected; and production experiences are exchanged. Apart from performing information practices in these common places, some farmers (around 46%) also regularly visit local institutions (e.g., agricultural technology stations, farmers' schools, veterinary stations), and/or local agribusiness shops (pesticide shops, seed shops, medicine shops). These are the places where participants obtain professional or semi-professional helps and, sometimes, training. A very small number of farmers (12%) also regularly visit local bookshops. None of the interviewed farmers, however, ever conduct any information practices in libraries, information centres, and exhibition centres. This suggests that places and settings which society designed or designated for informational purpose and which are consequently information abundant, are generally removed from the participants' information practices. It can be seen from this result that if joined together, venues where these farmers conduct information practices would have formed a very small and informationally thin spatial dimension of their information worlds.

Temporally, it is noted that up till now, participants still spend the vast majority of their time on non-information activities, although a certain proportion of sporadically performed information practices can be found embedded in these non-information activities, e.g., observing problems with their animals and forming a preliminary diagnosis while attending to them, or hearing something useful when chatting with others, or seeing useful information when watching TV for leisure. Only a very small proportion of their daily time is spent on activities with explicit informational purpose. This is usually in the evening and is most likely spent on watching national and local news and, sometimes, programs related to legal issues and agricultural technology. A significant number of surveyed farmers (around 20%) appeared to devote hardly any time to any practices with clear informational purposes on a daily and regular basis: They do watch TV, but this appears to be purely for recreational purposes.

Due to the complexity of the cognitive dimension of people's information worlds and the great difficulty to measure this dimension, data collect in this study is not adequate to fully depict the cognitive dimension of the surveyed farmers' information worlds, but the following data offers at least a partial indication. Of all the farmers surveyed, around 24% had no formal education at all or hardly any formal education and are therefore illiterate, 32% had no more than primary education, 32% had junior secondary education, and only 13% had senior secondary education; only a very few (around 6%) know how to use computers and the internet.

Information practices that characterize participants' information worlds

The conceptualization of individuals' information worlds divides individuals' information practices into three categories: Intentional information practices, conscious information practices and involuntary information practices. Intentional information practices refer to those information-related activities which are driven by specific intentions to achieve certain goals that an individual perceives as dependent on information, such as problem solving and decision making. Conscious information practices refer to those information activities that an individual conducts for the general purpose to keep pace with interested areas or things and information activities provoked by others. Involuntary information practices are those practices embedded in activities which are performed for non-informational purposes (e.g., observing a health problem of a pig while feeding it); a typical result of this type of practice is the mental registration of information accidentally picked up during these activities.

Table 2 shows the specific information activities that participants perform on a daily and regular basis. As revealed from the data, nearly all participants have regular experiences of picking up information while engaging in non-information activities, responding to others who try to give information, and enquiring or discussing about specific issues with other people like themselves (relatives, friends and other acquaintances). A large majority (73%) also watch news and/or educational programmes on TV; around 46% would consult experts (e.g., agricultural technology extension officers, agribusiness people, local vets, and doctors) when facing fairly critical situations. Just over one third of the participants read or consult printed media for information. These patterns of information practices show that the information worlds of surveyed farmers are in generally characterized by involuntary information practices performed sporadically while doing other things. When they do conduct conscious information practices, these are either provoked by others who want to pass on information or led by TV programs. When they conduct intentional information practices, these are usually driven by fairly critical issues in their lives (e.g., consulting agricultural technology officers about a particular problem of the crops). Together with what has been noted in the previous section, these characteristics seem to suggest that participants' information worlds are not only restricted in their dimensional boundaries, but also rather passive and dormant in action.

Table 2 Information practices engaged by surveyed farmers

Information practices	**Percentage of farmers engaging in the practices (N=83)**
Responding to others who try to give information	100
Picking up information while doing non-information activities	100
Enquiring/Discussing specific issues with other people	100
Watching news and/or educational programs	73
Consulting experts on specific issues	46
Reading/Consulting books, newspapers, or magazines	36
Attending organized training programs	20
Consulting governmental officials on specific issues	12
Investigation of phenomena, events or situations	11
Searching/Browsing the internet	5
Listening to radios	4

Accessibility and access of information within participants' information worlds

As explicated in the conceptual framework section, the most profound implications of the boundaries and practices of one's information world, hence the significance in examining these features, is that they redefine what a person can actually access and use regardless of what is made available in their environments. Available resources become accessible to a person only in so far as they enter his/her personal information world; accessible resources become useful to a person only in so far as they are used to generate information utilities for the person. It needs to be noted that some information resources require certain types of information practice to produce any information utilities. Use of books, for example, requires intentional or conscious information practices of reading; use of Internet information requires intentional practices of searching or conscious practice of browsing.

It is in light of this conceptual framework that the characteristics of the participants' information worlds began to show grim implications. The restricted spatial, temporal and cognitive dimensions of these farmers' information worlds suggest that they can only admit limited information resources into their boundaries. Many of the aforementioned information resources provided by governments and institutions will not be admitted either because they are removed from the venues that make up the spatial dimension of these farmers' information worlds, or because they require the amount of time that these farmers cannot or will not afford, or because they demand cognitive skills that these farmers do not possess. Books provided through libraries and information provided through various information centres/stations, for instance, are likely to remain inaccessible to the majority of these farmers as these venues are so far rarely visited by the surveyed farmers.

The categories and ranges of resources over which participants have actually asserted "usership", i.e., resources that these farmers have claimed into their information resource base, are likely even smaller because of the dominance of involuntary information practices in their information worlds. "Usership" of many resources (books, newspapers, and the internet) can only be established through

conscious or intentional information practices. Chances that they are selected into these farmers' information resource bases are scanty even when they are delivered direct into their information worlds.

Table 3 shows the sources of information which farmers actually access and utilize on a daily and regular basis. It shows that most farmers rely on their own experience, other people's experience and TV programmes for information. Just over half of the participants use professional helps from local agricultural technology stations, veterinary stations, farmers' schools and some government agencies. None of other resources are used by over half of the farmers surveyed. It is particularly startling to note that, with the exception of the above institutions, those resources and information services that the government invest heavily (e.g., ICT based resources and services, library/reading room based services, information centre/station based services) are rarely used by the surveyed farmers.

Table 3 Sources of information used by surveyed farmers

Sources of information	**Percentage of farmers using the source (N=83)**
Relatives and acquaintances	100
Own experiences	100
TV programmes	90
Professionals of local institutions & government agencies	55
Agribusiness dealers	31
Books	30
Organized training programmes	20
Newspapers	18
Magazines	6
Computer and the internet	5
Radio	4
Government documents	2
Meetings	1
Associations	1

Conclusion and implications for agricultural information services

Based on the conceptualization of the information world concept, it is possible to distinguish between three clusterings of information resources in relation to a certain individual: those resources that are made available in the individual's social environment, those that are actually accessible from within the individual's information world, and those that are actually used by the individual (i.e., those that form the individual's information resource base). The availability of information in one's social environment is determined by society's information production, provision and distribution; the accessibility of information from within one's information world is delimited by the boundaries of the person's information world although it is also conditioned by information availability; one's information resource base is, in turn, established by the person's "usership" over certain parts of his/her accessible

resources. It can be speculated that those categories and ranges of information resources over which an individual has asserted "usership" (i.e., resources within the individual's information resource base) account for most of his/her information use as well as most of the information utilities he/she obtains from society's information resources.

Examined in this conceptual framework, farmers' information worlds appear to be characterized by limited spatial, temporal and cognitive boundaries and the dominance of involuntary information practices, which render only a very small proportion of available resources actually accessible within their information worlds and even a smaller proportion being claimed into their information resource bases. A typical farmer's information world (hence the accessibility of information) and information resource base (hence the actual use of information) in relation with what is made available on rural China's information landscape is illustrated in figure 1.

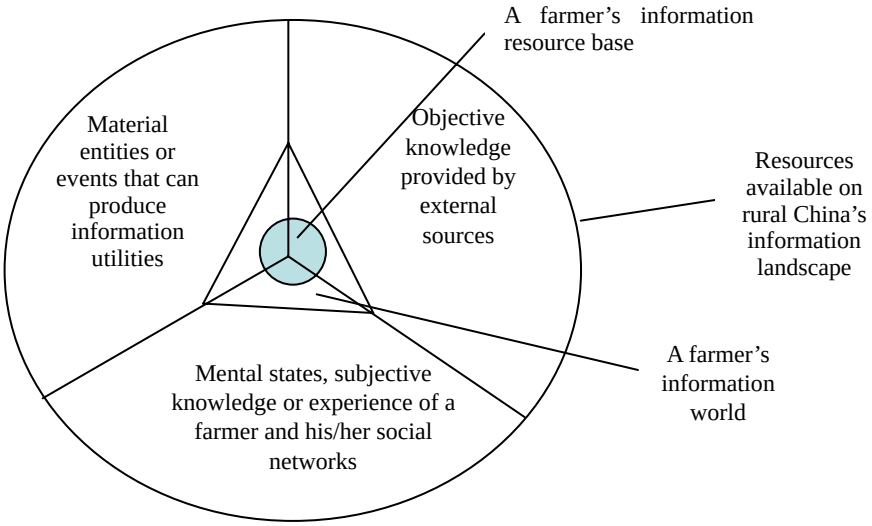

Figure 1 A typical farmer's information world and information resource base in relation to what is made available on rural China's information landscape

During the past decade, in an attempt to build an all-around prosperous society and the new socialist countryside, the central and local governments as well as the library and information profession in China worked assiduously to improve information provision to rural residents in general and farmers in particular. As a result of these efforts, there has been a great increase in the amount of information available in rural areas. Governments and LIS professionals, however, may not have realized that their goodwill efforts do not necessarily improve the accessibility and use of information at the same time as they improve the availability of information. Improvement of accessibility and use of information requires much more than just providing information to rural areas.

To improve the accessibility of information to farmers and to encourage use, information service providers need to ensure that their services can find their way into most farmers' information worlds. One way of ensuring this is to deliver information directly to the venues constitutive of the spatial dimension of farmers' information worlds (e.g., homes and neighbourhoods), deliver it during the time when farmers are able to engage in information activities (e.g., evenings) and in a form that is comprehensible to them. Another way of ensuring entrance of provided information into farmers' information worlds is to change their information worlds by expanding each of the above dimensions, e.g., to attract farmers to visit information venues previously alien to them, to increase the amount of time they spend on information activities by, for instance, directing their attention from other leisure activities to information intensive activities, and to provide farmers with the needed skills to use the information services. In any events, information service providers need to develop a solid understanding of the information worlds of those they intend to serve; a superficial understanding of possible information needs is not adequate to ensure effective information services.

Examined in this light, a number of services currently provided to rural areas will need rethinking. The first and the most notable one is the various electronic information services and the physical stations/centres established to deliver these services (including among others, county and township libraries, various information service stations, local service points of the national cultural information resource sharing project). Due to the low penetration rate of computers in rural households, the alienation of farmers' information worlds from formal information centres and the lack of digital skills among farmers, these services are unlikely to be used for some time to come. For these services to be truly effective, either the current way of delivering them needs to be changed or farmers' information worlds need to be altered. Another set of services that need rethinking are services based on printed media such as libraries and reading rooms. The problem with these services is that a large proportion of farmers' information worlds are dominated by involuntary information activities and are consequently uncongenial to printed media which require conscious or intentional information practices. What this means is that, even when printed media and related services are delivered into the boundaries of farmers' information worlds (e.g., neighbourhoods or homes), there is still very little possibility that farmers will use them. For these services to become effective, ways need to be devised to lead farmers to assert usership over these resources and to sustain their interest in using them. This is apparently far more challenging than delivering the resources into the boundaries of farmers' information worlds.

Although the above findings and implications are based only on empirical evidence from one northern county of China and a small sample of farmers, there is a great likelihood that they have wider resonance across China, because situated in the prevalent context of the "three nongs" (peasants, the countryside and the agriculture sector), Chinese farmers appear to have marked homogeneity among themselves across the country.

These findings have not yet said anything about the forces behind the formation of farmers' information worlds – these require further studies beyond the scope of the

current one, they have nevertheless shown that 'individuals' information worlds' is a useful concept to aid the understanding of agricultural information services to farmers. It explains why some services are used more than others and helps to predict the chance of success of a planned service. While it is imperative for service providers to bear in mind the characteristics of farmers' information worlds and to provide the most appropriate services accordingly, it is also a challenging and worthy task for the library and information profession to proactively change farmers' information worlds to make them more adept to information society's great variety and wealth of information resources.

Acknowledgement
The author wishes to thank the National Science Foundation of China for funding this research (project No. 70673040). She also wishes to thank her students for their assistance in the research: Liu Ya, Lu Xiuping and Zhao Zhigang for assistance in data collection; Chris Clarke for help with English.

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