

The use of mobile phones in the context of a guanxi system

by

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ABSTRACT

Despite the rapid expansion of mobile phone technologies in agricultural development contexts, little work has explored how this adoption intersects with contextualized social systems. Rural China, in particular, represents a large population of agricultural workers who are adopting mobile phone technology but have so far remained overlooked as a focus of these studies. This study addresses these gaps by conducting an in-depth qualitative study of the complex relationships between rural horticulture farmers, their buyers and government officials in China and how each has integrated mobile phone technology into their social system. The results find that while all groups have benefited from the incorporation of mobile phones, some groups enjoy more advantages than others. At the same time, the larger amount of land and the more integrated the communication technology, the more advantage the farmer enjoys in the market. Expanding these social linkages, buyers are eager for more communication through mobile phones than most of the farmers currently provide and government officials are trying to use mobile phones to promote the local agriculture development. Additionally, these farmers work within a unique social system called *guanxi* where reciprocal favors define the sociological structure. For most of the farmers, the introduction of mobile phones has not reduced their reliance on *guanxi*, although the farmers that control the largest land area are using mobile phones in ways that lessen its influence.

CHAPTER 1: INTRODUCTION

Agricultural and rural development (ARD) studies often look at how rural farmers in developing countries can use Information and Communication technologies (ICT) and mobile phone technology to enhance communication and association among each other to achieve certain goals, such as increasing yield, decreasing cost, improving overall livelihood or reducing poverty (Aker, 2008; Beuermann, McKelvey & Vakis, 2012; Burrell & Matovu, 2008; de Silva & Ratnadiwakera, 2010; Furuholt & Matotay, 2011; Salia, Nsawah-Nuamah & Steel, 2011). Previous research demonstrates that efficient and effective rural services for agriculture and development can reduce non-labor transaction fees and improve capital, markets and technical inputs -- consequently enabling small producers to compete with their larger-scale counterparts (Collier & Dercon, 2014; Wiggins, Kristen & Llambí, 2010).

One focus within this research area is in exploring the major changes in the information and communication technology environment within worldwide agriculture. Farmers are actively participating in the change, shifting from traditional face-to-face to globalized transactions, yet the distribution of these technological adoptions is not uniform. Smallholder farmers may face disadvantages without access or knowledge about these information applications that support the operational aspects of farming. Among these information and communication technologies, mobile phones have received significant attention due to their relative advantages. Mobile phones comprise a vital infrastructure, improving economic development and enriching the interaction between farmers and traders (Aminuzzaman, Baldersheim & Jamil, 2003; Chhachhar, Qureshi, Khushk & Ahmed, 2014; Overa, 2006). They also provide five functions of mobile livelihood services: mediated agriculture extension, market information, virtual marketplaces, financial services and direct livelihood support (Donner, 2006). A recent meta-analysis of research articles

looking at mobile phone use for ARD suggests mobile phones can increase the transparency of market information and enhance smallholder's market access (Duncombe, 2015). Meanwhile, price dispersion is decreased and a higher price for products can be achieved. Mobile phones are also believed to have narrowed the gap between buyers and sellers and impacted the bargain and balance of power. Mobile phone use was found be able to reduce agriculture business costs and generally improve smallholders' livelihoods.

However, Donner (2006) also identifies important gaps in the literature. First, many approaches take a technological determinist view by assuming the intrinsic benefits of a technology will lead to impacts, rather than considering the social contexts in which the technologies are introduced that determine how technologies may be adopted, if at all (Duncombe, 2015). According to Rusten and Ramirez (2003), agriculture transformation occurs rapidly in a context of well-educated farmers, well-run telecommunication systems, freely usable electricity, a settled and monitored credit and banking system, advanced transportation networks, high labor costs compared to the expenditure of computing equipment, and reasonably easy access to information and communication technologies. However, in developing countries, these conditions rarely apply.

Studies that do avoid this technological determinist view often focus on narrowly defined quantitative methodology that does not address the larger contextual factors where the actors themselves have a participatory role (Duncombe, 2015). As such, very little is known about what effects found in ARD studies are truly generalizable or are dependent upon contextualized, but often unexplored, factors of the specific social systems or communities studied.

Therefore, the goal of this study is to begin to fill these gaps by conducting an in-depth qualitative study of how rural farmers in China use mobile phones within their agricultural

businesses. In doing so, this study will explore how the sociological system has influenced how this audience has defined their own priorities and goals with regard to this technology.

CHAPTER 2: LITERATURE REVIEW

2.1 Mobile Phones in Agricultural Development

Mobile phones can be used in the whole process of agriculture-related activities: preparing; farming; harvesting and post-harvesting (Furuholt & Matotay, 2011). They generally play the role of providing information, coordinating and supporting business behavior. In developing countries, commerce often is handled at a slow pace, generally through face-to-face contacts, and business exchanges are often done through intermediaries (Jagun, Heeks, & Whalley, 2007). Improved information technology like mobile phones are expected to reduce the costs of marketing, information and transit. Traditional networks of communication tend to be better aligned with the interests of rural dwellers (Islam & Gronlund, 2011) and research from Kenya (Okello, Ofwona-Adera, Mbatia & Okello, 2010) and Uganda (Kashem, 2010; Martin & Abbott, 2011) has identified input suppliers, fellow traders and clients as the principal sources of market information, reinforcing the view that pre-existing informal networks of communication dominate rural information systems (Duncombe & Heeks, 2002).

Yet, as a telecommunication technology, mobile phones support economic development and the enrichment of intra and inter-community interaction and information give-and-take (Egan & Wildman, 1992; Dholakia & Harlam, 1994; Saunders, Warford, & Wellenius, 1994; Schmandt, Williams & Wilson, 1989; Wilson & Teske, 1990). Mobile phones also encourage efficient and informed action leading to greater yield over current practice (Saunders, Warford & Wellenius, 1994). This positive influence of mobile phones has been found in numerous studies across numerous contexts.

Muto and Yamano (2009) found that mobile network expansion had constructive effects on market participation, especially for farmers in remote areas and particularly for smallholders producing perishable crops such as bananas. Jensen (2007) found that the use of mobile phones was strongly interrelated with reduced price dispersion across markets for landed fish and resulted in almost complete elimination of fish waste. Abraham (2006) and Salia et al (2011) report similar findings in other contexts.

Albu and Scott (2001) found that mobile phones could represent a tune-up for development by enabling the rural disadvantaged to react more efficiently to external commercial opportunities or threats. Egyir, Al-Hassan and Abakah (2011) found that even when traditional approaches of gathering and exchanging information had not changed (for example travelling to the market), the use of phones speeded up pre-existing procedures. McNamara (2003) argues that mobile phones can enable the rural poor to ask for and negotiate higher priorities for themselves, because an increase in access to information improved decision-making. Aker (2008) investigated the impact of cell phones on grain markets in Niger, showing a reduction in search costs and hence transaction costs, resulting in positive negotiations and lower grain prices.

However, the benefits of mobile phones do come with prerequisites. Islam and Grönlund (2011) report that the effectiveness of a rural mobile phone-based market information service depends on: 1) how the design and delivery of the service meet the individual's information needs, 2) the availability of adaptive technologies with easy accessibility within a given infrastructure, 3) low cost services with a sustainable business model and 4) enough awareness and efficient communication with the respective community.

2.2 Mobile Phones and Social Networks

When technology is seen as a combination of devices, skills and organizational structures, it becomes natural to think of it as a system (Volti, 2005). As a result, the adoption of technology is a social process. ICTs have enabled a shift from group-based to network-based societies (Castells, 1996). In general, findings show a positive link between ICTs, social interaction and community engagement (e.g., Chen, 2013; Gil de Zúñiga, Jung, & Valenzuela, 2012; Hampton, Sessions, & Her, 2011; Kobayashi, Ikeda, & Miyata, 2006; Norris, 2004; Stern & Adams, 2010; Valkenburg & Peter, 2009).

However, the question remains if the adoption of mobile phones tends to enlarge an individual's social network or merely strengthen existing relationships. Some researchers believe ICT technologies contribute to more diversified social ties by assisting participation in traditional settings such as neighborhoods, voluntary groups, religious institutions, and public spaces (Hampton, Sessions & Her, 2011). Fortunati (2000) points out that since mobile phones offer greater choice in whom to associate with socially, individuals can more easily detach themselves from strangers or acquaintances, providing new ways to expand social ties to fit an individual's needs. In contrast, Geser (2006) contends that mobile phones facilitate network closure and increase a focus on known relationships. Mobile phones allow micro-social organisms to exist in the absence of spatial separation and, thereby, enhance primary bonds (Gergen, 2002). A high concentration of interaction with a closed circle of ties envisages a deepening of established relationships rather than new communicative cohorts (Ling, 2008). Other findings show that mobile phone use intersects with proximity in distinctive ways that are related to spending relaxation time with others in a face-to-face context and being active in organized groups and clubs (Campbell & Kwak, 2010).

Beyond potential changes to the make up of social networks, Hargittai and Hsieh (2013) claim mobile phones have other social capital-enhancing implications. Mobile phone use is positively connected to various indicators of particular well being, bonding and bridging social capital (Chan, 2013). When it comes to business, Overa (2006) and Donner (2006), following the work of Granovetter (1973), argue that the adoption and use of mobile phones enhances trust-building in trading networks, thus facilitating a higher number of transactions in uncertain environments where trust is at a premium. Molony (2006) explains trust as being located within the traditional networks of communication – the personal and social ties of rural producers that are still mediated predominantly face-to-face.

2.3: Study Objectives

The purpose of this study is to explore how farmers have incorporated mobile phone technology into their agricultural livelihoods. Specifically, this research will examine smallholders in rural china who grow horticultural products for a living. The context is useful for multiple reasons. First, although rural China has difficulties and development needs similar to those in other developing countries, this large and disadvantaged group has been generally overlooked in the literature of agriculture and rural development.

According to Wang, Dong, Rozelle, Huang, and Reardon (2009), the main transaction mode in the Chinese horticulture business is competitor dealings, which indicates higher transaction costs and lower efficiency, insufficient market information and unjust transaction prices – many of the same factors that mobile phones have been found to improve in other contexts. For China, the mobile phone's global diffusion has raised hope in its ability to empower individuals in less-developed regions to increase rural income and life opportunities.

The selected study site is Shizhuang Town in rural Henan, China. Henan, a leading

province in agriculture, has 106,010,000 residents within 167,000 km², with 56.2% living in rural areas (Henan Stat, 2013). With such a large population yet small land area, the average planting area of each household is limited. The soil and climate conditions are suitable for horticulture. The Shizhuang horticulture development and planning map is provided as Appendix A. According to the Huojia Horticulture Development Report, included as Appendix B, there are 12 types of horticulture crops: fresh-cut flowers, potted landscapes, house plants, lawn plants, various shrubs, modeling trees, medicinal flowers, bulbs, small and large seedlings, and transplant trees. They can be divided into 270 kinds, mainly conventional green seedlings, such as *Euonymus Japonicus*, Boxwood seeds, *Ligustrum lobular* privet, cedar and Fatong. Farmers introduce flower seedlings from southern China and grow them before selling to Shaanxi, Shanxi, Hebei, Beijing and other locations. As one of Henan's top four horticulture areas, Chenzhuang used to be a village in Zhangju Town. Zhangju Town is one of the first authorized "Chinese Flowers and Plants Town" in the country. In 2005, Zhangju Town was merged into Shizhuang town and became part of Shizhuang town. Therefore, Chenzhuang and Zhangju both belong to Shizhuang town.

China's horticultural economy involves the interplay between three primary social groups: farmers, buyers and government officials. The farmers are primarily smallholders who are themselves poor and small, operating mainly in family units that have trouble meeting the increasing demand for horticulture products and other related commodities. However, land use policies have recently changed. In 2008, China started to allow farmers to "rent out, transfer and merge the land they have contracted, amid a reform to bolster modern farming and reuse abandoned land" (Xinhua, 2015). In 2013, the central government issued the *China No. 1 Document 2013* that aimed to "support specialized farmers, family-run farms, and farm

cooperatives” (Beijing, 2013). Land transfer has since increase greatly. Before 2013, the largest farmers in Shizhuang may have had a few dozen mu of land, but now, some farmers have acquired up to 3000 mu of land. Big farmers are beginning to emerge with much larger fields, yields and resulting profit.

Moving beyond the farmers, the buyers are more likely to be the newer generation who live in the city, with higher education and a decent income. Three tiers of government are also linked to this industry: the county government, the township government and the village government. In Shizhuang area, the township government mainly works on the horticultural development with support from the other levels.

This population has had access to mobile phones for more than 10 years and has therefore had time for user-derived purposes of mobile phones to develop. Mobile phone networks have been spreading in rural China. As reported by the Ministry of Industry and Information Technology of the People’s Republic of China, by May 2014, there were 1.3 billion mobile phone users in China (People, 2014). According to CNNIC statistics in January 2015, there were 600 million users connected to Internet through mobile phones (CNNIC, 2015).

One communication tool commonly accessed through mobile phones is Wechat. Wechat was launched in China by Tencent company in 2011 and had 600 million active users by June 2015 (Ifeng, 2015). Wechat can serve as a one-to-one communicating platform, yet there are also Wechat groups that may contains hundreds of people in one group. Through Wechat, people can send text, sounds, images and money to each other, and users can make video or voice calls with no extra charge once connected to Wi-Fi. Another relevant function of Wechat is called Moments, which is similar to posting information on Facebook except only friends can view it. On Moments, users may post a photo album to tell a story, or publish content and webpage links.

Due to its popularity, the use of Wechat can represent one indicator of social connectedness of using mobile phone online communication.

This context is also timely as the Chinese government recently announced the development of Internet Plus, a project designed to stimulate the economic base of agricultural regions by providing technology and incentives to start or improve businesses. While many of the specifics of this proposed program remain unclear, it appears to imply a technological determinist view of ARD. Speaking at the March 5, 2015, opening meeting of the National People's Congress, Chinese Premier Li Keqiang said of the Internet Plus concept, “We will develop the ‘Internet Plus’ action plan to integrate mobile Internet, cloud computing big data, and the Internet of Things with modern manufacturing, to encourage the healthy development of e-commerce, industrial networks, and Internet banking, and to get Internet-based companies to increase their presence in the international market” (Caixin, 2015). Yet, if the Chinese government truly wants to revitalize agriculture with technology, it is first necessary to examine how the population has already integrated existing technology into their lives and what needs or barriers remain in their eyes for desired progress.

In sum, this study explores how horticulture farmers in rural China have incorporated mobile phone technology into their agricultural livelihoods and business connections to improve their businesses and how this adoption intersects with the social system. This study asks:

RQ1: How have farmers incorporated mobile phone technology into their agriculture business?

RQ2: How have buyers incorporated mobile phones into how they look for and purchase horticulture products?

RQ3: How has the government used mobile phones to support horticulture development?

CHAPTER 3: METHODS

In-depth interviews were conducted to explore the research questions of interest (Weiss, 1994). Because there are few studies exploring ARD issues within rural China, it is not clear how farmers are using mobile phone technologies. In-depth interviews provide a method for examining exploratory questions such as these. The researcher can ask general questions in order to find out what is important and focus additional questions on themes as they emerge. Therefore, semi-structured questions can offer a depth and richness to the data that other methodologies such as surveys could not approach in this context without more background knowledge.

A question list was developed to guide the interview process. Four broad themes were designed to be asked first, allowing respondents to summarize in their own words or bring up additional issues not listed in the interview protocol. These themes included: (1) personal and business demographics, (2) current business practices, (3) future business visions and (4) barriers to those visions. Following each major topic in the question list was a series of follow-up questions to be asked if interviewees did not offer enough relevant answers on their own. This protocol served as a checklist for the interviewer, but the interview itself was be adjusted to fit the answers from each participant. Each interview closed with a final question asking what the interviewee considers the most important role of mobile phones in their interaction with the horticulture industry. This protocol was approved by Iowa State University Institutional Review Board (IRB, attached as Appendix C) and all interviewees gave their consent. The full question list is provided in Appendix D.

The author traveled to Henan, China, and interviewed three groups of individuals: horticultural farmers, buyers and government officers. Snowball sampling was used to identify

potential interviewees within each group. The author knew a farmer in the local area who had about 20 years experience in horticulture practices. This farmer was interviewed and asked to recommend others that might be interested in participating in this research. The author contacted the recommended individuals and continued asking for additional contacts. The majority of farmers were from Shizhuang Town, while a few were from nearby areas, but all were based in Huojia County. Buyers and government officials were also identified from this process.

One-on-one, semi-structured interviews lasting between 30 and 120 minutes were conducted face-to-face and guided by the prepared question list. Twenty-nine interviewees participated in this research: 16 horticultural farmers, 10 retail buyers and three government officers, one each from the village, town and county levels.

After consent was obtained, interviews were conducted and audio recorded. Following the methodological guidelines suggested by Charmaz (2006), a quick sketch of impressions and highlights were written immediately after each interview, and later the interview was transcribed from the audio recording. The transcripts were also translated from Chinese to English. Names were stripped from transcripts, and respondents were assigned codenames. Data was collected during July 2015. The detailed interview site and times are provided in Appendix E.

CHAPTER 4: RESULTS

4.1 Farmers And Mobile Phones

The first research question asked how farmers have incorporated mobile phone technology into their agriculture business. Table 1 summarizes some of the demographics of the farmers interviewed. All have a mobile phone and have used one for more than 10 years, except for one farmer who has had a phone for only seven years. Therefore, it is reasonable to assume that their usage patterns and opinions about mobile phones are stable. Most of the farmers also use their phones for mobile-based Internet with Wi-Fi at home or their working spaces. Those who don't use the Internet generally cannot afford the costs of Internet access and are more likely to be female, less educated, elderly and control smaller land area.

Table 1: Demographics and mobile phone usage for farmers

Farm size/ Characteristics	Land Size	Gender	Age	Education	Mobile	Mobile based Internet
More than 100 Mu	3000	Male	51	College	Yes	Yes
	400	Male	42	College	Yes	Yes
	100	Male	40+	High school	Yes	Yes
Between 10-99 Mu	80	Male	40	High school	Yes	Yes
	80	Male	50+	Elementary school	Yes	No
	46	Male	52	High school	Yes	Yes
	20	Male	43	High school	Yes	Yes
	20	Male	60+	Technical secondary school	Yes	No
	16	Male	31	Elementary school	Yes	Yes
	15	Male	35	High school	Yes	Yes
	10	Male	50	Middle school	Yes	Yes
	10	Female	49	Elementary school	Yes	No
Under 10 Mu	7	Male	55	High school	Yes	Yes
	3	Female	65	Elementary school	Yes	No
	3	Male	48	Elementary school	Yes	No

One man said that he considers 50 years old as a threshold for using Internet on their mobile phones:

Internet? For those older than 50, few people are getting online. I didn't figure out the Internet, I didn't try hard enough. For the ones that have more connection outside, they are fluent at Wechat and so on.

Gender plays an important role in the division of labor in information seeking and ICT self-efficacy. In Shizhuang, people think husbands should take charge of external matters while wives should take care of domestic matters. Two women smallholders said they are playing an equally important role than their partners, but when there are opportunities or responsibilities about information seeking, they think men should be the ones to take the chance.

A woman in her 40s, who works alongside with her husband together on their business noted:

My mobile phone has the function, but I don't know how to use the Internet. I know some young men are using the Internet for advertising and doing business, but I can't do that; my husband is too busy. He is not so interested in, or motivated to learn about, computers and the Internet.

Another woman works with her son.

I don't know how to use Internet, although my phone is a smart phone.

There are also other technical concerns related to the Internet:

No. My phone can't connect to the Internet, I don't have the skill and have no desire to use internet on mobile. Because the Internet will shorten the battery endurance.

Using the Internet on mobile phones assumes affordable cost for connectivity. For farmers, if they don't have a Wi-Fi connection at home, high-speed connectivity can be unavailable or very expensive. Therefore, farmers will make trade-offs about the potential costs and benefits. If they have limited products to sell, the benefits from the Internet may seem limited, and they will be less likely to seek access to Internet or the skills to do so.

However, some of these Internet-adverse individuals have noticed that farmers who are using the Internet seem to gain advantages. One man said:

Big farmers sell more easily, they use the Internet.

Another man said he is willing to learn about the Internet:

After completion of recent jobs, I will learn how to use computers and the Internet. I hope to learn about techniques and marketing through mobile phones and the Internet.

During the interviews, it became apparent that the ways mobile phones were being used manifested into three patterns that aligned with the amount of land owned. Grouping farmers based on the size of the land area they control captures different management styles that seem to have shaped how farm households are now using mobile phones.

Tiny farmers

Tiny farmers are defined as those controlling land areas under 10 mu. These smallholders are using their mobile phone primarily in response to customers' calls, and continue to use traditional ways to sell their products. One smallholder introduced the way she is using mobile phone and other communication channels in doing business:

We put a sign with our names and mobile phone number at the edge of our farm, in case anyone is in need of our products. Mostly, our products sell to acquaintances, mainly because we can't sell just by ourselves. Sometimes, we use the broadcast in villager committee site to advertise. When we want to use the broadcast, we go have a smoke with the village officers to get the agreement of allowing us to use the broadcast.

Another farmer had similar answer:

The most import usage is business calls. We put a sign in front of our field, whoever wants the products may call us at any time.

These farmers are treating the mobile phone as merely another channel that buyers can reach out to contact them. Not missing any relevant calls remain the top concern rather than

seeking out information themselves.

The one farmer in this group with a high school education was the only one who had access to the Internet. He did describe his mobile phone use as being more outward looking:

Mobile phone is used for contact, to reach out to ask if they need my products. Other times, I use phone for online news.

Small farmers

Small farmers whose land size is between 10-99 mu have different mobile phone use habits compared with the tiny farmers. These farmers are more likely to use their mobile phones to arrange horticulture activities. People call their friends to ask about price information, communicate with customers, employ day laborers, learn horticulture knowledge, and check weather information.

In this area, people generally work in family units and larger farmers may hire one or two long-term employees. However, during planting and selling seasons, there is a large amount of works that needs to be finished in one or two days. During these times, farmers will hire daily workers to help out. Most interviewees said they use mobile phones to reach out for hiring these daily workers:

In spring, there are hundreds of daily workers in my village. All contacts are made by phone. I contact the man in charge, he will contact the daily workers.

These farmers also using mobile phone to get pricing information and confer with their family members while doing business:

Information is from everywhere. I am a dealer myself, I purchase from others, therefore I know the price. I also search for information online. I won't state a high price because no one will buy my stuff if I behave like that.

We ask for the price on a regular base through phone calls, and double check before selling.

My wife and I were doing business. If the customers' offer is high, one person can make the decision. If the price is at the edge of our bottom-line, we call each other to discuss it. I discuss with my friends when selling my stuff. We also talk about where to buy and where to sell, and which market has saturated.

Most mobile-related activities remain locally based, which is similar with the previous group. Yet more of them are Internet-based, which may extend this communication outward. Farmers mentioned using the immediate chatting applications such as Wechat to make voice calls or video calls, seek information, look for new business opportunities and use online payment options.

Voice call, video call, and immediate online chat were the most mentioned functions of their mobile phones. If people can get access to Wi-Fi, these services will be free, and farmers may save money on their phone calls. However, installing Wi-Fi will cost more money than merely making phone calls. If farmers are using computer at home at the same time as they use mobile phones, it's more likely they will have Wi-Fi at home.

I contact my customers by mobile phone, and I sometimes use Wechat for contacting them.

Other farmers also talked about their experience of online group chatting through Wechat. They noted that there are different kinds of Wechat horticulture groups. Some Wechat groups are composed of local people from Shizhuang town while others groups are composed of horticulture farmers from all over the country who are generally strangers. Farmers in these groups usually actively communicate and participate in the relevant activities:

I use many Wechat functions, for example, moments, make a voice call or video call, take classes in Wechat groups, and bargain online. I change e-business card with the ones I know from the Wechat groups.

Mobile phones also carry some extension services and serve as communication channels with government and potential business partners. Some information that previously was considered not worth a call is now more easily accessed and reaches more farmers in the network.

I check the weather report on my mobile phone three times a day. Also I keep a close eye on the county government information and the updates from the local horticulture Wechat group. I look for new business and transformation opportunities through mobile devices.

Farmers and buyers separated by distance are also using Wechat to exchange information so buyers don't need to come to Shizhuang to begin the transaction. They say the pictures of their products are more believable than just phone calls or newspaper advertisements. These farmers say that mobile phone communication can enhance their credibility and protect them in the process.

We can use phones to see pictures of the products, use Wechat to communicate about supply and demands.

Mobile phones can improve the credibility (among strangers).

I know if we make a deal through Wechat, law protects the contract.

Wechat also offers an online payment system. Some farmers are already using this function, some are willing to try, yet some are concerned about the safety.

I use Wechat and QQ on my phone. Also, I learned the horticultural knowledge online. I have an Alipay and Wechat payment accounts.

We can use the mobile phone for automatic e-money transfer, I haven't used mobile transfer yet, but I have seen my friend using it. No mention about the saved transaction fee, just think about the convenience!

I don't subscribe to any account online. There were push notifications, now I have canceled them. I am not good at mobile phones, so I don't dare to use online payment, because I worry about the financial security. What if someone stole my money?

In summary, this group considered mobile phones an important asset to their horticulture business. These farmers were both enthusiastic about mobile phones and were open to share their thoughts about their use.

I rely on my phone for everything related to farming.

My mobile phone is very important in my business, the relevant functions including buying and selling, and communication. It has helped me improve the profit and growth in output.

The most important function of the mobile phone is matching demands and supplies. I can figure out other people's needs while satisfying my own needs.

Large farmers

Large farmers were defined as those whose land size is larger than 100 mu. This group has been using the Internet the longest, one for up to 20 years, yet this group didn't offer many details about their use of mobile phones. When asked directly, they repeated many of the themes and uses from the previous group, but this group seems to have so integrated their use of mobile phones and the Internet in their daily life and business that they don't see it as something new to discuss – it is so natural that they didn't need to mention details.

The only novel phone use in this group was an extension of mobile phone use past business purposes to entertainment.

I use my mobile phone to get access to the Internet, read news and play video games.

4.2 Buyers

The second research question asked how buyers have incorporated mobile phones into how they look for and purchase horticulture products. Table 2 summarizes some factors about these individuals.

Table 2: Demographics and mobile phone use of horticulture buyers

Group/Characteristics	Male/Female	Age Range	Education	Mobile Phone	Internet
Buyers	2/8	25-35	4 master/6 bachelor	10	10

Local individuals in the rural community (who are not horticulture farmers) don't usually buy horticulture products, if they want them at all. They either plant a little themselves or they get the products from their friends or relatives for free. The emerging horticulture retail customers are more likely to be new generation, educated individuals who live in the city and have a decent income. Therefore, the author interviewed regular horticulture buyers in the nearby city. All the buyers have a mobile phone and use the Internet on their phone.

All buyers had experience buying horticulture products and they all use mobile phones when doing so. Nine out of ten said they use mobile phone to compare the product prices. Most of them search for relevant information on the Internet before purchase. And about half use mobile phones to negotiate with the sellers or for online payment.

I use mobile phone to compare price, bargain with the seller, and make online payment and so on.

Mobile is mainly used for online shopping. I hope to make mobile phone convenient to contact with the seller at any time. Hope it's easier to feedback about the plant growth, flower photos upload and sharing online, dealing with pest and consulting. Now these are mainly just what I am thinking.

However, the buyers are generally not satisfied with the sellers' services. Half of the interviewees said they want to know better how to identify trustworthy sellers. It is common for sellers to initially state a high price, but the final price will highly depend on the buyer's negotiation ability and judgments.

Others complained that:

The sellers are not professional enough;

The relevant information are lacking;

The market is not mature;

Has no long term cooperation.

One possible reason for this concern is that there is not enough information about sellers. Buyers are already very used to getting this type of information and service about other products on the Internet. Yet local farmers selling their products sometimes offer no information online at all. Even for the ones that do, very few are staying connected to buyers after the sale. There is no reliable platform to evaluate the seller's performance and credibility. So potential buyers need to base their purchasing judgment on the buyer's knowledge and courage.

Buyers said there are many types of information they wish were easier to find about the market:

Introduction before purchase and assistance after sale;

Checking the sales record of the seller;

Find discount;

Information during the purchase; proper advertising, proper price, convenience in purchasing

Raising skills; coping methods when there is problem coming up; recommendation depending on different situations;

Credibility and sellers' reputation;

Word of mouth communication from other buyers.

4.3 Government Officials

The third research question asked how the government has used mobile phones to support horticulture development. Table 3 summarizes some factors about these individuals.

Table 3: Demographics and mobile phone use of government officials

Group/Characteristics	Male/Female	Age Range	Education	Mobile Phone	Internet
Government	3/0	38-60+	2 college/ 1 middle school	3	2

Three tiers of government are highly related in this research: the county government, the township government and the village government. For each tier, the author interviewed the officer in charge of the horticultural business. In Shizhuang area, it is the township level mainly working on horticultural development. The activities mentioned below were organized by the township government and was supported by both the village and county levels. All government officers have mobile phones, the township officer and the county level officer are using Internet on their mobile while the village level officer is not. The two using the Internet are around 40 years old and the individual at the village level is over 60 years old.

The government is increasingly making efforts to provide more access to information and services for farmers, businesses, and civil servants.

In the past, the government didn't do a good job of supporting development in the industry. They turned a blind eye and let it emerge itself and perish itself. In recent years, the town government got more actively involved.

The government officials cited numerous reasons why they want to support the horticulture industry.

This is a green ecological industry, consistent with the large national policy. It won't cause any problems to the leaders by supporting it. Horticulture can also improve the living environment, related to people's happiness index. If the development is good, it can also be counted as leaders' political performance. Compared with other industries such as the coal chemistry industry, horticulture is less risky. The county used to develop the coal chemistry industry, not only was the pollution extremely bad, but it also caused an explosion, and there is very negative influences.

The government won't benefit directly, but if normal people are rich, they will not cause trouble to the government, and the whole market will flourish.

They also cited the possibility of pairing a strong horticulture industry with tourism for more development opportunity. The three levels of local governments came to an agreement that the township government should support horticulture development with training classes for the farmers.

Although the available resources at the town level are very limited, we held three training classes with other departments last year.

To sum up, the town level and the county level department cooperated to provide the training classes for free, such as skills training and so on, to avoid any cost to farmers.

These classes are organized and disseminated through mobile phones. The officer in charge of horticulture development is trying to build an online communication/transaction platform while sending out some new opinions and information about it.

I use Wechat a lot. People don't want to check my moments because I have too many updates. I have built some horticultural Wechat groups, some local industrial groups, attracted lots of outlanders to join in to learn and exchange with others. I share professional horticulture information and something may be useful in improving people's idea. I use mobile phone Internet. Of course, I make phone calls a lot.

Yet, he complains that not enough farmers are participating, and that he sometimes calls them when the Wechat communication isn't effective.

My headache is farmers' consciousness is not enough. I have to call them one by one if there is an activity, sometimes there are not enough people to sign up.

The majority of farmers interviewed in this research said they have participated in these training classes. Some were pleased with the classes:

I have participated in the training class provided by the government, and benefited a lot.

I learnt the knowledge about weeding and synergy.

The government is playing an important role. They organized the field trips through the agricultural technology extension school, and provide special funds for horticulture development. These policies are very useful; 80% of participants on the field trip to Shuyang have never traveled before.

Others were not satisfied with the training.

I have been to the training class and can't speak highly of it. The main reason is the instructors treat the participants as if we know nothing, the content is not in a meticulous and in-depth way. Therefore, the class is meaningless to us. However, if the government wants to hire better instructors, they can't afford them.

Almost no contact with the government, no one provides supply and marketing information. There are free training classes, but they're useless. The theory and practice are separated.

4.4 Guanxi

Throughout the interviews, almost every farmer said directly or indirectly that they rely on guanxi, which is a collection of social connections and obligations unique to Confucianism society. This concept was so ubiquitous that it became clear that to fully understand how mobile phones are being incorporated into this society, the questions must be examined through this lens of guanxi. Therefore, a post-hoc research question was explored as the interviews were conducted: How does guanxi interacts with the ways mobile phones have been integrated into farmers' business relations?

In Chinese, guanxi is a broad-spectrum term for social networking and is usually interpreted as relationship or connection (Yeung & Tung, 1996). To some extent, guanxi is similar to Pierre Bourdieu's concept of "social capital," which is framed as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectively-owned capital, a 'credential' which entitles them to credit, in the various senses of the word" (Bourdieu, 1986, p. 248–249).

However, *guanxi* functions differently in Chinese society than social capital in the Western world. Fei (1947) provided a widely accepted explanation: the theory of the differential mode of association. As stated in Fei's theory, unlike the Western social pattern that he describes as bundles of firewood bound together, China's social pattern is like ripples sent out by multiple stones thrown into water. Each individual is the center of the circle created by his social influence. Persons affected by the ripples of the circle are linked with each other. The Chinese sage Liang Shuming claimed that Chinese society was neither individual-based nor society-based, but *guanxi*-based. In a *guanxi*-based social scheme, the emphasis is consigned on the *guanxi* between particular individuals (Liang, 1987). Compared to the West, therefore, Chinese have a stronger propensity to treat people inversely, depending on one's relationship to them (Chen, Chen, & Huang, 2013). In China, *guanxi* is unquestionably crucial to "successfully complete any task in virtually all spheres of social life" (Gold, Guthrie & Wank, 2002, p. 3) and Hwang argues that the supremacy of *guanxi* in Chinese society under any circumstance is an indispensable part of "China's national character" (Hwang, 1987, p. 959).

There are five fundamental dimensions of *guanxi*: instrumentalism, personal relationships, trust, reciprocity, and longevity as well as four strategies for maintaining *guanxi* relationships: tendering favors, nurturing long-term mutual benefits, cultivating personal relationships, and cultivating trust (Yeung & Tung, 1996). As such, *guanxi* can be best translated as friendship with overtones of unlimited exchange of favors (Pye, 1982). *Guanxi* indicates a special association between someone who needs something and another person who has the ability to give something (Osland, 1990). Hu (2007) points out that in both traditional and modern Chinese society, the establishment of *guanxi* and an existing *guanxi* network is closely connected with favor (Hu, 2007). For Dunfee and Warren (2001), *guanxi* involves "relationships

between or among individuals creating obligations for the continued exchange of favors” (Dunfee & Warren, 2001). It is also believed that guanxi “involves the use of personal and/or inter-firm connections to secure favors in the long run” (Lee & Humphreys, 2007, p. 451).

Some researchers summarize guanxi as “reciprocal obligations” (Boisot & Child, 1996). To better understand guanxi as a resource in Chinese society, Zhai (2004) introduced the concept of *bao* to describe the paying of a debt of gratitude for other’s favor. Reciprocal obligations can only be fulfilled when people are trying to pay their debt, which allows for the possibility of long-term guanxi. Here is an important difference between guanxi and western relationship: the debit and credit sides of *bao* are never in equilibrium, since such equilibrium implies the end of a guanxi relationship (Fei, 1985; Zhai, 2004). Guanxi, and therefore *bao* as well, functions in a closed system of a society and its culture, which involves its own peculiarities of stability, principles and levels (Zhai, 2007). Because guanxi is seen as a valuable personal asset, individuals are reluctant to share or talk about it.

Guanxi can only be established on the basis of some common point of reference, such as kinship ties or, to a lesser extent, dialect group (Yi & Ellis, 2000). This aspect of Guanxi has been referred to as “expressive ties” (Hwang, 2009, p. 169), which involve “an individual’s feelings of affection, warmth, safety, and attachment” (Hwang, 1987, p. 949). For outsiders, establishing guanxi can be difficult and requires what Yeung and Tung describe as rearranging one's social network "in such a way as to involve the person who wishes to be included in it" (Yeung & Tung, 1996, p. 60). Business and governmental ties are emphasized within work-related contexts and Hu notes that blood and geographical relationships are also characteristically strong in informal organizations, especially in rural areas (Hu, 2007, p. 55).

These relations comprising *guanxi* are then used as a method for evaluating trust and predicting the risk of future interaction (Hu, 2007). North makes a claim that no market can exist without trust (North, 1990). Thorelli (1986) claims that within oriental values, trust is a vital supplement to contractual arrangements, sometimes even a replacement. Fei (1947) explains that trust in Chinese rural society is based not on the prominence of contracts but, rather, on the dependability of people, people who are so enmeshed in customary norms that they couldn't behave in any other way (Fei, 1947).

Therefore, *guanxi* becomes “the lifeblood of the Chinese business community” (Davies, Leung, Luk, & Wong, 1995, p. 209). Some established benefits of *Guanxi* include: 1) increased prospecting; 2) increased sales revenue; 3) enhanced negotiation; 4) increased business; 5) elimination of competition; 6) facilitating futures transaction; 7) increased source of information; 8) increased source of resources and 9) building company image (Yi & Ellis, 2000). Good relations with buyers foster brand loyalty, can enrich firms' knowledge about customers, and can provide businesses more choices in resolving new problems arising from market changes (Katila & Ahuja, 2002). Similarly, close associations with buyers could decrease the perceived risk of product adoption and backing new product launches. *Guanxi* with business partners also help companies to gain a better understanding of buyers' preferences and identify new market niches (Zhang & Li, 2010) and thus empower them to respond more competently to market changes. Chen and Wu (2011) confirmed that *guanxi* is useful in acquiring quality services, receiving timely deliveries, and gives companies the ability to negotiate extensions of payment deadlines, thereby offering them more flexibility and adaptive ability.

While *guanxi* is intrinsic to the Chinese social system, reliance on *guanxi* is also responsive to other social factors. China's economic growth has reduced resource shortages;

however, a high level of uncertainty regarding access to resources and information still exists. This, together with information uncertainty and intense information asymmetries (Akerlof, 1970), leads to greater reliance on *guanxi* in accessing resources in business behaviors (Nee, Oppen & Wong, 2007; Xin & Pearce 1996; Chang, 2011). However, Guthrie (1998) holds the opinion that *guanxi* is becoming less important due to both increasing competition and legalism. Some research suggests that the peculiarity and pervasiveness of *guanxi* is due to a weak institutional structure in China, and as China's rational-bureaucratic system develops, the importance of *guanxi* will decline and ultimately disappear (Zhang & Keh, 2010). The integration of mobile phones into this system will likely serve a dual and interesting role -- conforming to the *guanxi* system into which it is used as well as altering the information environment that may impact the reliance on *guanxi* itself.

Within the current horticulture context, if a buyer accepts a seller's gift or a personal favor, the buyer will be expected to repay the seller by purchasing the product from supplier which may not be the best choice for the buyer's business (Standifird, 2006). To avoid such a *guanxi* expectation, the buyer could decline the gifts or favors (Chen, Huang & Sternquist, 2011). *Guanxi* between farmers could manifest as sharing information about planting strategies, telling each other about business opportunities, purchasing products from each other before other sources, or sharing business-related secrets. Farmers without *guanxi* would not have access to these opportunities and would be placed in a disadvantageous position.

Many of the interviewee responses revealed this reliance on *guanxi*. When asked if *guanxi* is important in his business, one man answered:

Guanxi is of course important, without guanxi, how do you do business?

The interviewees responded that guanxi is working in several areas. Guanxi helps farmers form their market linkages and businesses are introduced through guanxi.

Generally, my products are sold to some companies. The businesses are introduced by friends or relatives.

My business has just started and there is no output yet. I don't have regular customers until now. I have a friend doing the same business, I will sell my products to him, but we haven't finished a trade yet. If I want to try my own luck to find customers, it probably will be a long wait.

Guanxi provides advantages when doing business. For example, it provides more chances for negotiation.

Customers will not do business with you if you have no guanxi. When it comes to the price, 70% of businesses negotiate their prices. If it's good friends, I am willing to negotiate, for common people, I state the price and that's it. However, the price is already in line with the market, friends or not friends are all buyers and sellers.

Networking is necessary, or your products will be stuck in your hands. At the same time, quality is the basis. You don't have a say if the quality is poor.

In some cases, information is controlled by those who are in power and are directly associated with business opportunities. In these cases, having guanxi means you have access to key information about a market. Guanxi means a source of information and opportunities:

In project bidding, if there is nobody to inform you of the essential information, you won't win the bidding.

We are relatively sensitive in what to plant. We are trying to be different than others. We only tell people who are really close to us what are we breeding, for others, they will

figure it out when our seeds germinate. By doing this, our product launch will be available in market one year ahead of time. When you are the only provider of the specific product, the price will be good. If everyone starts growing the same thing, the price will go down.

Guanxi helps farmers identify potential business opportunities and helps them evaluate the risks:

My customers are mainly regular customers. People with no guanxi won't come to me, and even if they come to me, I won't do business with them because I am worried about uncollectible accounts and not getting my money back. My customers are all guanxi and guanxi adds to guanxi.

Even if was possible to eliminate the barriers of information imbalance, skills and ability, guanxi can still be decisive in people's judgment. Because guanxi leads to trust, relying on guanxi is one way to lower business risks.

There are many liars online. I spent lots of time online checking products. Everything looks good online; however, if you really go there, there are no products at all. I would prefer to let the acquaintance take advantage of me, because the loss will not be too much. But for strangers, the loss can be a lot. For example, strangers will sell you something lame at unreasonable high prices, if you don't take the products, you can't leave, if you take them, you will lose lots of money.

We don't cheat each other locally, but the outside world is different. If you go to other places, you must have a reliable acquaintance, otherwise you might be robbed, beaten or cheated, or forced to accept shoddy products. People don't trust each other and don't behave morally.

I am most worried about the customer who can not pay on time. Even if the contract is signed and the project is finished, the buyer may go back on their own words. If you sue them, the cost is really high and difficulties in executing the judgment of civil cases in the rural areas are scaring, the lawsuit will last forever.

Tiny and small farmers don't have many advantages in the market and so must face the regular risks of the society. In such a system where people's legal rights often cannot be protected or enforced, individuals will justifiably rely on business practices that minimize their risks. Almost every farmer said the scariest thing would be not getting paid or not getting paid on time. Therefore, they choose to rely on guanxi to reduce the possible loses, because maintaining a long-term guanxi is a reciprocal obligation. If someone violates the rules of guanxi, it will endanger the friendship or the blood relations, sometimes the event will even ruin his name and reputation.

Still, the moral obligations of guanxi do not always lead to legal activities:

Maybe 10%-20% of villagers have contacts with the outside market, however, just around 10 households are successful. They're successful for two reasons: 1. Caution in business; 2. Have guanxi. Those who can earn money are already rich. Rich people have money to bribe, the person in power receives his bribe then gives him the opportunity to earn money from public property. Almost all big farmers are using Guanxi. I don't have contacts with customers.

For most of the farmers, the introduction of mobile phones does not reduce this reliance on guanxi, but deepens it. They use mobile phones to get information from their friends in the same business:

I discuss with my friends when selling my stuff. We also talk about where to buy and where to sell, and which market has saturated.

We cooperate when buying and selling. If we buy stuff from a distant area, renting a truck by myself will be too costly, so two or three of us will rent a truck together. Also we buy products from each other if there is a project and we don't have everything we need from our land. We call each other to discuss.

From the farmers' statements, there is no sign that mobile phones have changed their circles. Instead, it is more likely mobile phone makes their existing relations tighter. There are occasional online Wechat groups that bring new farmers together to discuss pests or farming techniques, but these discussions don't happen often. In fact, use of the Internet sometime introduces new problems that increase reliance on existing guanxi:

Last year I registered on a horticulture website. After I posted my products' information on the website, the trading volume was not good. The good thing is there are many calls coming in. This year, the business was not good because of the small scale and low quantity. Sometimes, the clients are hoping to order something from my farm, but there is a huge gap in the quantity between my supply and their demands, deal broke. My current business is generally introduced by regular customers. My interpersonal guanxi is the main customer source as before.

However, not every farmer described this need for guanxi. The large farmers discussed their operations with a distinct lack of guanxi. The only farmers that didn't mention a fear of not getting paid or not getting paid on time came from this group. And the largest farmer didn't even mentioned guanxi, instead focusing on land size and management. He said the customers are coming to him without asking.

I don't need to travel a lot to promote sales. My products can sell themselves on the market. To get bigger and the management are the main concerns for me.

Not surprisingly, the larger amount of land and the more integrated the communication technology, the more advantage the farmer enjoys in the market. This advantage may somewhat lessen these farmers from a reliance on guanxi. Possibly, these farmers have enough capital or power to protect them from these obligations or they have more choices about the customers, and are thus less concerned about it. With the mobile phone and the Internet, information about supplies and demands are more sufficiently shared. The farmers that can provide more products at one time are more popular in the market because buyers don't need to look for another supplier, which will save both time and money for the both parties.

On the other hand, these big farmers are also more likely to have a closer relationship with the government. When the biggest farmer is talking about his plan, he has lot of intersections with the government:

I want to combine the local industry with cultural tourism. We have rich cultural stories that are thousands of years old, for example the story about the God of flowers. We also have a very strong sports culture. We have a huge project targeting on tourists that we are working on. There used to be a brick factory, and we are building a huge lake where it used to be, and plan to develop the surrounding area. We're building it there because it's difficult to develop farmland due to the government's food security policy; by building it where the factory was, we don't violate the policy.

It is also possible that these large farmers are lessening their reliance on guanxi with the traditional relational and geographic connections and instead strengthening it with those in the government who can reciprocate with much larger favors.

CHAPTER 5: DISCUSSION

This study investigated how horticulture farmers have incorporated mobile phone technology into the business practices within a social system structured around guanxi.

Even with a relatively small sample and short period of observation, we can come to some conclusion about the current progress of Chinese agriculture and rural development. This study shows mobile phones are playing an indispensable role in horticulture activities. In the past, farmers needed to travel to get information from the sellers or buyers, but now are more able to get information through phone calls or mobile apps. Mobile phones help farmers improve their efficiency and manage their laborers. Mobile phones reduce information, transportation and transaction fees for farmers while simultaneously increasing business linkages, negotiation ability and possible profit. However, these benefits are not evenly distributed. The capability of using mobile phone and mobile phone based Internet is positively associated with the farmer's land size. Large farmers are gaining benefits from the sufficient interchange of information, while the small farmers and tiny farmers are marginalized in the market competition. This aligns with previous research that finds a lack of information can trap farmers in subsistence farming and prevent them from adopting more profitable production activities (Ashraf, Gine & Karlan, 2009).

Tiny smallholders have less motivation and less ability to seek information, and are mainly concerned about price information. To gather this information, they often ask their neighbors and follow their neighbors' price. They generally would rather sell at a lower price than keep their products in stock. This implies that tiny farmers, in effect, often have to accept the price they are told their products are worth, because they lack external information to help negotiation or a strong collective organization to back them up.

These tiny farmers are also less likely to have access to the Internet. In this situation, they are unable to try new mobile phone-based services or seek information on market prices, and potential buyers in other markets. They are also alienated from the online governmental information and are out of the communication channels describing free training classes. They also miss the opportunity to advertise their products and present themselves to buyers who are using mobile phones and the Internet to look for potential sellers. If this situation continues, this group of farmers will miss the chance for development and may even lose the chance to stay in the business.

Small farmers (land from 10-99 mu) have stronger motivation and ability to get information through their mobile phone. These farmers consider the mobile phone an integral tool for their business and use it in various ways, such as to hire daily workers, get pricing information, confer with family members while doing business, use Wechat to make voice calls or video calls, seek information, look for new business opportunities and some are starting to use online payment options.

Mobile phones have proven to be most useful to larger scale farmers (land more than 100 mu). For reasons that might have to do with education, power, and potential benefit, larger farmers have embraced mobile phones and are using them in a variety of ways. They use them to get information about markets, negotiate prices, and locate horticultural goods they can accumulate. This gives them an advantage in setting the prices they offer to small farmers, and then to locating more lucrative places to sell. Large farmers are also more interested in policy information, and try to cooperate with the government – sometimes setting the agenda together with the government. One large farmer said:

The information I need most is about the industry and relevant policies such as Wild China.

Wild China is the nation-level policy targeting on horticulture development. He also held the opinion that:

The business situation is not good enough. The local horticulture should combine with the tourism and sports industries, we can hold a cycling road race as starting point.

His statement clearly aligned with the official Huojia Horticulture Development Plan, shown in Appendix B.

Given its importance in this sociological context, the role of guanxi in technological adoption is still understudied. This research finds that, for the most part, farmers have chosen to use mobile phones to deepen their guanxi relationships and continue using this guanxi to guide their information seeking, information sharing, partner selection and contract relationships.

However, this is not case across all farmers. Mobile phones have enhanced existing business relationships and enlarged the business network for certain groups. While insider information and opportunities are still highly associated with guanxi, public information and outside business information are clearly associated with ICT ability. The mobile phone has created communication and marketing opportunities that allow people to bypass old ways of doing things, which aligns with Guthrie's (1999) view that modernization has reduced the importance of traditional forms of guanxi based in the family or community. In this respect, the mobile phone has been transformative. Structurally, mobile phones generally benefit all the groups in rural society, but it also increasingly disables smallholders to compete with their large-scale counterparts. Again, this result aligns with previous research that larger farmers gain more benefit from information received about prices, markets and inputs (Abbott, Yarbrough &

Schmidt, 2000). Even when small farmers can see the information and opportunity, they may not have the ability to seize the chance.

As a group within this social system, buyers have advanced mobile phone skills and are familiar with online shopping and confident in using mobile technology. They are eager for more communication through mobile phones. However, the farmers generally don't provide these services and the demands of the buyers are not being met. Buyers are interested in ways to evaluate the trustworthiness of sellers and ensure fair trade. Guanxi is not an important concern to these individuals.

This research also explored how government officers are using mobile phone within the horticulture industry. Government officials consider a strong horticulture industry not as profitable in itself, but as a means for attracting further development. These officials use mobile phones primarily to share information or announce the availability training classes and field trips. They also create online groups to promote information change and long-distance interaction among sellers and buyers. These activities have the potential to reduce the reliance on guanxi through new information and contacts, however a significant portion of their farmer audience is not using their mobile phones to receive this information, and some of the ones that are do not find the sessions targeted for their level of knowledge.

While this study provides one of the first qualitative accounts of mobile phone use in a guanxi social system, there are limitations. As this study is qualitative, there is no claim that these findings are generalizable outside of this particular context. It is likely that many of these same themes and relationships exist in other horticulture areas within rural China, and it is possible that they also exist in other agricultural contexts as well. Yet the extent to which these findings are representative is unknown.

In this research, guanxi is taken as an existing social structure and so there is no detailed discussion about its formation. For example, when farmers say someone has guanxi, they actually mean the one has guanxi with someone who matters or has power. In many cases, guanxi is conducted through mianzi, the Chinese word for face. While the literature and current research have contributed to the understanding of guanxi, the existing research is far from fully capturing the rich meaning and abundant context of guanxi within in Chinese society. There are still many areas that need further exploration, such as the relationship among guanxi, mianzi and social distance of power.

Despite these limitations, this study still offers insights into how mobile phones are promoting information diffusion, agriculture development and market linkages in a guanxi context. For media scholars, this research shows the characteristics of mobile phone communication among personal, group and organizational levels, which can help better understand and summarize the benefits and barriers of mobile phone interactions. For sociological scholars, this research provides a unique analysis of how both a new technology and social system vie for equating information with power in different ways, which help understand a changing social context. For practitioners, the findings of this study can provide guidance on how to better incorporate mobile phone technology into diverse social systems as well as how to segment mobile phone in their agriculture production, business linkages and daily life.

These results can also suggest future activities for each of the three farmer groups involved in this research. Tiny farmers have limited control over their place in the market and have little opportunity for networking outside of guanxi relationships. For this group, securing access to the Internet should be a primary goal to permit the possibility of greater networking. Small farmers have incorporated mobile phones into their businesses with many successes, yet

they are not meeting the needs of their buyers and primarily use their communication to deepen their existing guanxi relationships. This group should modify their Internet use to incorporate seller's credibility and online service. Additionally, this group should actively engage in new networking activities to expand their interactions outside of existing guanxi. Finally, large farmers have somewhat transcended their reliance on guanxi, and should continue to expand their marketing activities and governmental interactions through their mobile phone and internet use.

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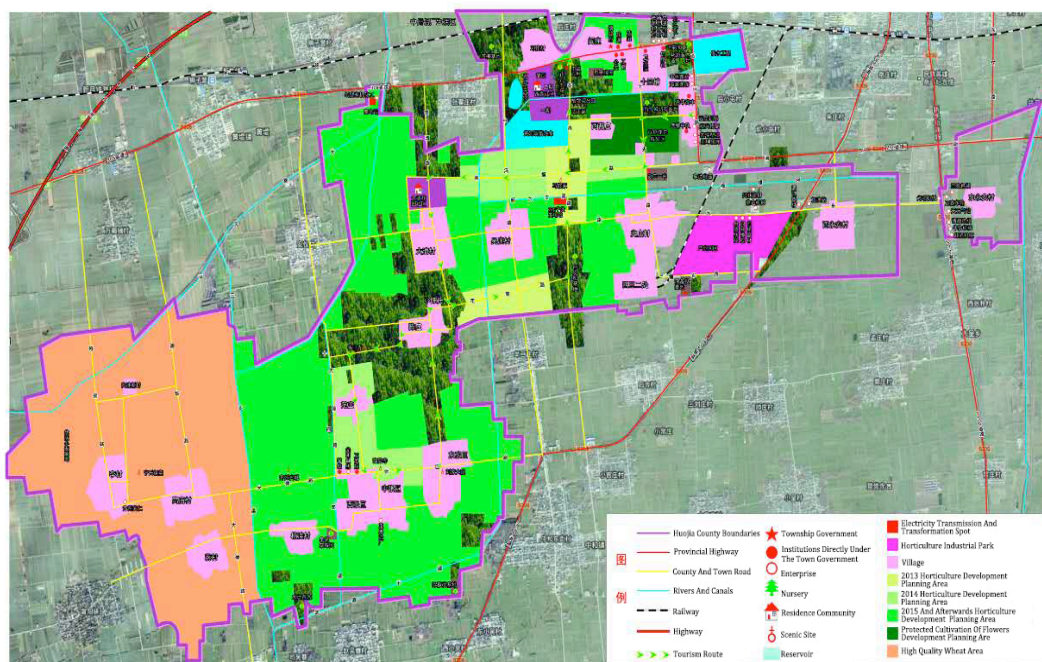
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APPENDIX A: SHIZHUANG HORTICULTURE DEVELOPMENT PLANNING MAP

Shizhuang Horticulture Development Planning Map



APPENDIX B: HUOJIA HORTICULTURE DEVELOPMENT REPORT

Huojia is a county with more than 2500 years of horticulture industry. Back to the Spring and Autumn Period, Chenzhuang was Miaozechang King Garden. During the Ming and Qing Dynasties, Chenzhuang Garden, which is in the territory of Huojia, had been listed as one of the top 4 gardens (Huangchuan Garden, Yanling Garden, Anyang Longquan Garden, Chenzhuang Garden) in Henan. In 2000, the previous Zhangju Town was authorized as “Chinese Flowers and Plants Town.” In recent years, the county government and county committee has put forward the strategy objective of “beautiful and rich, with a great community and culture, harmony and happiness, ecological habitable.” Huojia is the satellite city of Xinxiang, enjoys a good location and a convenient transportation system. It’s possible to integrate the local horticultural tourism into Yuntai Mountain Scenic Area and South Taihang tourism economic zone, to achieve development in sightseeing horticultural and leisure agriculture. Especially now that the Central government has put environmentally friendly OR “Green” practices high on their agenda, this offers a great opportunity for the horticulture industry to develop. Huojia has been named as one of the five key horticulture industry bases in Henan. It’s the right time for Huojia to develop the industry.

1. Introduction of the current situation:

Huojia county has 32,000 mu devoted to horticulture, including 300 mu in greenhouses, 650 mu of sunlight greenhouse, 30, 300 mu of general land, and 750 mu of other land.

There are 12 types of horticulture: fresh-cut flowers, potted landscapes, house plants, lawn plants, various shrubs, modeling trees, medicinal flowers, bulbs, small and large seedlings, and transplant trees. They can be divided into 270 kinds, mainly conventional green seedlings, such as *Euonymus Japonicus*, Boxwood seeds, *Ligustrum lobular* privet, cedar, Fatong, etc. The

county has an annual output of 150 acres of lawns, 48,500,000 green seedlings, five million fresh cut flowers, 15,000 potted plants pots and 35000 kg medicinal flowers. There are 191 business entities, including 20 scale enterprises, 171 general businesses. There are 4300 people devoted to horticulture farming.

The first industrial output value 1,057,440,000 yuan, sales income of 311.48 million yuan. Tertiary industry mainly employs florists. The 9 flower shops in the county employ more than 50 people, and have an annual sales income of 2.5 million yuan. The county has a horticultural association, a flower cluster, four provincial floristries, industry leading enterprises (Henan Calla Biological Development Co., Ltd., Xinxiang Jiyu Landscaping Engineering Co., Xinxiang Bibo Landscaping Engineering Co., Ltd., Xinxiang Green Garden Engineering Co., Ltd.), 10 flower specialized cooperative economic organizations, and 660 horticulture brokers.

Huojia county has 28 registered professional companies, including 20 large and medium-sized companies. 9 companies have landscape engineering qualification: 1 first class, 2 second class, 5 third class and 10 professional associations comprised of farmers.

2. Main behaviors:

1) Organizing and promoting. The county government has set up a horticulture commission to exercise unified leadership and coordination. To Stick on the “Governments set up the stage, various companies cooperate and enterprises put in the show, level playing-field” model. With the philosophy of “enterprises as the main player, profit as its key point and market as its orientation,” we will insist on sensible investment according to the market situation. Currently Cherry Avenue, Flora Plaza, specialized horticulture markets and boutique potted flowers, potted plants, and the cut flowers market are under construction to provide a platform for market-oriented operation.

2) Planning and guiding. Put forward <Horticulture Industrial Clusters Development Plan> and <Specific Plan for Horticultural Tourism>, focus on developing horticultural industrial clusters and horticultural tourism. Launch horticulture information website, strengthen the service system, provide guidance for marketing and selling, provide good service in policy broadcast, information supply, demonstrating with typical models, popularization of agricultural techniques, balancing between production and marketing to improve the level of industrialization, specialization and marketization to expand market demand and to maximize economic efficacy.

3) Policy-driven. Around flowers and other variables of industrial development, the county government issued a special study "Huoqia County preferential policies of modern agriculture." In order to attract high-quality agro-industrial projects settled in the county, to promote horticulture industry cluster development, the county introduced preferential policies. For a concentrated continuous horticulture base larger than 1000 mu, grant a one-time reward of 30,000 yuan, more than 2,000 mu a reward of 80,000 yuan, more than 3,000 mu an award of 150,000 yuan, and more than 5,000 mu an award of 300,000 yuan. Investment in fresh-cut flowers more than 200 acres, new high standard solar greenhouse more than 100 or more than 200 new plastic greenhouses, offer a one-time award of 300,000 yuan. Reduce relevant taxes.

4) Project-driven.

3. Plan for next step

1) Horticulture industry development orientation: to build up:

- An annual horticulture and landscape creation show,
- An urban ecological recreational tourism destination,
- A healthy pension Corning,

- A modern ecological agriculture cultural experience place.

2) Horticulture industry development plan:

- Develop a “green” Huojia, based on the overall plan for the horticulture industry
- Implement the master plan as the basis of the flower industry,
- Develop cultural and leisure tourism as the theme to improve the economy.
- Develop an Xinxiang industrial Park for transaction platforms, culture and

entertainment, rural tourism,

- Develop and implement the "Chinese flowers and trees" marketing campaign.

3) The Flowers and landscape art show will display the following:

- Use flowers in artistic designs,
- Calligraphy with flowers and park as a platform to build converged cut flowers,
- Landscaping,
- Production of nursery stock,
- Landscape samples,
- Folklore Museum,
- Tourism product development,
- Cultural creativity broadcast and advertising,
- Calligraphy studio,
- Painting and photography,
- Flower exhibitions.

4) Urban ecological leisure tourism goals:

- "Landscape" features, building to Flora culture,

- Alliance culture,
- Shang culture,
- Surname culture as the core of the provincial garden cultural industry,
- A comprehensive history of Xuying Zhen,
- Huang embankment part of the region and the town.
- Form a "sell seedlings to see the landscape eleven eleven eleven cultural

experience and enjoy life,"

- The high level of industrial chain,
- To achieve the county landscaped industrial mention taste and quality.

5) Health Endowment Corning Location: In the history of the village area as the core, relying landscaped industrial development, promoting urbanization, the transformation of old, family travel, retirement, real estate, township construction, development of the park combine to achieve tertiary linkage, the city produced interactive.

6) Cultural experience to modern ecological agriculture: by hiring experts, the introduction of intellectual resources, to create "flowers Institute" for research funding to study the development of standardized technical specifications landscaped industrial production, production standards established demonstration garden flowers. Actively preparing for "Landscape Forum," to capture the latest planning, design concepts and ideas, guidance garden industrial development, the formation of "the concept of a plan to design a landscape nursery stock production and marketing of a standard" a complete industrial chain.

APPENDIX C: IRB APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
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Date: 6/1/2015

To: Lijing Gao
4625 Steinbeck, Unit 16
Ames, IA 50014

CC: Dr. Michael Dahlstrom
215 Hamilton Hall

From: Office for Responsible Research

Title: The Impact of Mobile Phone on Market Linkage for Smallholders

IRB ID: 15-253

Study Review Date: 5/29/2015

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
 - **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.
- Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.
- Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form.** A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed**. For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX D: INTERVIEW GUIDES

Question List For Farmers:

Intro: Thank you for talking with me today. I am a graduate student doing research on how mobile phones are used in the horticultural businesses. I will be interviewing farmers, buyers and local government officials to better understand how mobile phones are being used and how you think they could be more helpful.

1. Demographics

- a. What's your name? Record gender.
- b. How old are you?
- c. What's your education level?
- d. How long have you had a cell phone?
- e. Can you connect to the Internet through your cell phone?

2. Current business

- a. How long have you been growing flowers?
- b. What is the size of your fields and about how much do you produce and sell a year?
- c. How do you run your business now?
 - 1) With your wife/child, or mainly by yourself?
 - 2) What is your major market? How did you find it?
 - 3) How do you contact your clients?
 - 4) How do you make decision about when and where to sell your product?
 - 5) How do you decide to sell at which price?
 - 6) Do you communicate with other people while making these decisions?

- 7) In what cases do you cooperate with other farmers?
- 8) In what cases is there competition between you and other farmers?
- 9) How do you interact with local government?

Specifically, how do you use your mobile phone to help you with these aspects of your business? (potential questions below).

- 1) Get market information;
- 2) Get or provide help from others;
- 3) Arrange labor/ product/ transportation/ seedlings;
- 4) Improve your horticulture knowledge;
- 5) Check weather information;
- 6) Online payment using mobile phone

3. Future business

- a. What are your main worries about doing business? Eg. delayed payment?

Disease? Transportation? Labor coordination? Which parts would you like to improve?

Specifically explore production, interaction among farmers, identifying buyers or other aspects of selling, interaction with government

- b. Who do you think is the best seller? Do you want to ask questions of him?
- c. What information would you need to help you improve [each of the aspects mentioned]?
- d. Beyond information, what else would you need to improve these [each of the aspects mentioned]?
- e. Specifically, how could your mobile phone help you with these aspects of your business?

Specifically, if not mentioned:

- 1) How could a mobile phone help you produce more flowers?
- 2) How could a mobile phone help you sell more flowers?
- 3) How could a mobile phone help you make more money?
- f. Describe your idea of your ideal business?
- g. What role should local government play?

4. Barriers

- a. What barriers are keeping you from achieving that ideal business?

Again, specifically explore production, interaction among farmers, identifying buyers or other aspects of selling, interaction with government

- b. Have you ever contacted a village committee, training center or other organization for support?
- c. Were they (Do you think they would be) helpful? Why or why not?
- d. Have you heard about Internet plus? (describe it regardless).
- e. What do you think it could do to help your business?
- f. Do you think it actually will help? Why or why not?
- g. Finally, what do you consider the most important role of mobile phones in your business?

Question List For Buyers:

Intro: Thank you for talking with me today. I am a graduate student doing research on how mobile phones are used in the horticultural businesses. I will be interviewing farmers, buyers and local government officials to better understand how mobile phones are being used and how you think they could be more helpful.

1. Demographic characters:

- a. What is your name? Record gender.
- b. How old are you?
- c. What's your education level?
- d. What's your occupation?
- e. What's the name of the organization you buy for?
- f. How long have you had a cell phone?
- g. Can you connect to the Internet through your cell phone?

2. Current practices

- a. How long have you been buying flowers?
- b. How often do you purchase flowers? How much do you buy? What types? For what purposes?
- c. Generally, do you believe the information provided by small sellers online?
- d. How do you purchase flowers now?
 - 1) How do you find sellers?
 - 2) How do you make decisions about when and where to buy?
 - 3) How do you decide what price is right?
 - 4) Do you communicate with other people while making these decisions?
 - 5) In what cases do you cooperate with other buyers?
 - 6) In what cases is there competition between you and other buyers?
 - 7) How do you interact with local government?
- e. Specifically, how do you use your mobile phone to help you with these aspects of your purchasing? (potential questions below).

- 1) Compare prices
- 2) Negotiate with sellers
- 3) Online payment using mobile phone

3. Future vision

a. What are your main worries about buying flowers? Which parts would you like to improve? Eg. How to plant/ raise/ take care of the plant; Plant Appearance; Risk; Cost; After-sale care; Transportation; Time consuming/ effort consuming; Share experience with other people/

1) Specifically explore interaction among buyers, identifying sellers maintaining relationships with good sellers, interaction with government

b. What information would you need to help you improve [each of the aspects mentioned]?

1) Explore before, during and after the purchase.

c. Beyond information, what else would you need to improve these [each of the aspects mentioned]?

d. Specifically, how could your mobile phone to help you with these aspects of your business?

Specifically, if not mentioned:

- 1) How could a mobile phone help you better find what you need to buy?
 - 2) How could a mobile phone help you better identify trustworthy sellers?
 - 3) How could a mobile phone help you save money on purchasing?
- e. Describe your idea of your ideal way to purchase flowers?
- f. What role should local government play?

4. Barriers

- a. What barriers are keeping you from achieving that ideal business?

Again, specifically interaction among buyers, identifying sellers maintaining relationships with good sellers, interaction with government

- b. Have you heard about Internet plus? (describe it regardless).
- c. What do you think it could do to help you with your purchases?
- d. Do you think it actually will help? Why or why not?

5. Finally, what do you consider the most important role of mobile phones regarding your need to purchase flowers?

Question List For Government:

Intro: Thank you for talking with me today. I am a graduate student doing research on how mobile phones are used in the horticultural businesses. I will be interviewing farmers, buyers and local government officials to better understand how mobile phones are being used and how you think they could be more helpful.

1. Demographic characters:

- a. What is your name? Record gender.
- b. How old are you?
- c. What's your education level?
- d. What's your position within the government and your responsibilities and how

long have you held this position? Previous governmental positions?

- e. How long have you had a cell phone?
- f. Can you connect to the Internet through your phone?

2. Current relationships?

- a. Can you describe the horticultural industry in the local community?
- b. How important is the industry for your community?
- c. How has the local government been able to help the horticulture industry?
- d. How else is the local government involved in the process? (Village leader?

County level?)

e. What are the relevant policies directing the horticulture industry at the national, provincial, county, or village level?

f. Do you use your mobile phone in any way in your involvement with the local horticulture industry?

g. Do you purchase flowers as part of your governmental role? (If so, enter relevant questions from the buyer question list here)

3. Future vision

a. What are your main concerns about the horticulture industry? Which parts would you like to improve?

Specifically explore regulation of sellers or buyers and horticulture can benefit the government

- b. What information would be needed to improve [each of the aspects mentioned]?
- c. Beyond information, what else would be needed to improve [each of the aspects mentioned]?
- d. Specifically, how could a mobile phone be used to help with these aspects?
- e. Describe your idea of your ideal vision of the horticulture industry in the community
- f. How should the local government play a role?

g. If the interviewee purchases flowers as part of their governmental role, enter relevant questions from the buyer question list here.

4. Barriers

a. What barriers are keeping this ideal situation from occurring?

Specifically explore regulation of sellers or buyers and horticulture can benefit the government

b. Have you heard about Internet plus? (describe it regardless).

c. What do you think it could do to help you with the situation?

d. Do you think it actually will help? Why or why not?

e. If this research results in the development of a mobile app that will improve the horticulture industry, do you think the local government would be interested in promoting it?

f. If the interviewee purchases flowers as part of their governmental role, enter relevant questions from the buyer question list here.

g. Finally, what do you consider the most important role of mobile phones within the horticulture industry or your interactions with it?

APPENDIX E: LIST OF INTERVIEW SITES AND INTERVIEWEES

Interviewee	Interview Site (Village, town, county)	Interview Date
Farmer 1	Chenzhuang, Shizhuang, Huojia	07/03/2015
Farmer 2	Chenzhuang, Shizhuang, Huojia	07/03/2015
Farmer 3	Chenzhuang, Shizhuang, Huojia	07/04/2015
Farmer 4	Chenzhuang, Shizhuang, Huojia	07/04/2015
Farmer 5	Chenzhuang, Shizhuang, Huojia	07/05/2015
Farmer 6	Chenzhuang, Shizhuang, Huojia	07/05/2015
Farmer 7	Chenzhuang, Shizhuang, Huojia	07/05/2015
Farmer 8	Chenzhuang, Shizhuang, Huojia	07/07/2015
Farmer 9	Chenzhuang, Shizhuang, Huojia	07/07/2015
Farmer 10	Chenzhuang, Shizhuang, Huojia	07/07/2015
Farmer 11	Zhangju, Shizhuang, Huojia	07/08/2015
Farmer 12	Zhangju, Shizhuang, Huojia	07/08/2015
Farmer 13	Zhangju, Shizhuang, Huojia	07/08/2015
Farmer 14	Zhangju, Shizhuang, Huojia	07/08/2015
Farmer 15	Huojia city	07/09/2015
Farmer 16	Huojia city	07/09/2015
Buyer 1	Zhengzhou City	07/10/2015
Buyer 2	Zhengzhou City	07/10/2015
Buyer 3	Zhengzhou City	07/10/2015
Buyer 4	Zhengzhou City	07/11/2015
Buyer 5	Zhengzhou City	07/11/2015
Buyer 6	Zhengzhou City	07/11/2015
Buyer 7	Zhengzhou City	07/11/2015
Buyer 8	Zhengzhou City	07/12/2015
Buyer 9	Zhengzhou City	07/12/2015
Buyer 10	Zhengzhou City	07/12/2015
Government Officer 1	Shizhuang township, Huojia	07/07/2015
Government Officer 2	Huojia City	07/09/2015
Government Officer 3	Chenzhuang, Shizhuang, Huojia	07/09/2015

* The interviews for farmers and government officers are done in Huojia, a county belonging to Henan Province, China. The interviewees in the buyers group are all from Zhengzhou, the capital city of Henan Province.