



## Incentive and barriers of information technology adoption in agribusiness, Sichuan Province, China

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### Abstract

The paper discusses the information technology adoption in agribusiness based on survey in Sichuan Province, China. The results show that most of the agribusiness has low diffusion and penetration of information technology. Most of them who adopt IT still are at the initiation stage based on Nolan's growth model. They are not satisfied with the benefit of IT. Lack of specialized staff and generalists ranks the first factor, which influenced the IT application, followed by lack of enthusiasm of employee and shortage of benefits achieved from IT. It also shows that information technology application is positively correlated with enterprise's growth.

**Key words:** Agribusiness, IT (information technology) adoption, incentive, barriers, China

### Introduction

Agribusiness emerged rapidly has fundamentally changed the landscape of Chinese agriculture since the rural reforms initiated in 1978. They have offered new opportunities for farmers to increase productivity and income given the limited land resources<sup>1</sup>. Most of agribusiness in China is small, medium-sized, with weak economic strength, low labor efficiency, unscientific manufacture and management, and uncertain economic affection by special production factors.

New competitive pressures, which are derived from opening market, consumer growing behavior in product variety, freshness, convenience, and year-round availability stimulated by rising incomes and global trade patterns after China entered the WTO with new traffic rules, have a strong exposure of agribusiness to face many types of uncertainty and risk, which are likely to increase in the future. As the new emerging technology, IT (information technology) can deliver many advantages to agribusiness from cost savings and improved productivity to greater business intelligence and decision-making capabilities. Agribusiness has also been greatly benefited from the advancement of information technology, which is closely incorporated in agricultural education, research and commerce. For instance, precision farming practices apply global position system, geographic information system and remote control technologies to improve farmer's ability to control field and yield variations<sup>2,3</sup>.

It's necessary to find out the state-of-art, incentive and barriers of IT adoption in order to provide the vision about the diffusion and penetration of IT application in Chinese agribusiness for policy-maker. The objectives of the research were to determine the diffusion and penetration of IT application in the agribusiness, incentive and barriers for IT adoption and correlation relationship among IT application and enterprise's growth.

### Materials and Methods

Sichuan province was selected as the main survey area by purposive sampling, taking into account it is one of the major agricultural production and processing province with strategic location in the upper reach of the Yangtze River and the hinterland of Southwest China. In addition, Sichuan has plenty of labor resource; agribusiness plays the roles in agricultural growth and economic development under the context of agricultural structure adjustment and labor transfer out of traditional agricultural industry. IT is adopted as strategic resolution to promote the enterprise competitiveness.

A questionnaire, designed for this survey, consisted of 3 components: demographic characteristics of agribusiness; the incentive of IT adoption and the barriers for IT adoption. Except the first component, every item was the standard multiple-choice question.

The survey was fulfilled from July to August in 2007. The samples contained agribusiness from different industrial sectors, including crop farming, stockbreeding, farm produce process, agricultural products marketing, and others. Face-to-face interview was the basic method of survey. The interviewees were the persons who took in charge of IT department or IT adoption decision-makers. More than 160 enterprises were investigated and 160 questionnaires were collected back, in which 102 questionnaires were effective.

The descriptive statistical analysis was adopted as the basic analysis tools. The crosstab analysis method was used for analyzing the correlation among IT application and enterprise's growth. Crosstabs is an SPSS procedure that cross-tabulates two variables, thus displaying their relationship in tabular form. All of calculation was executed in SPSS software.

## Results and Discussion

**Characteristics of enterprises:** The majority of the sample agribusiness was small, medium-sized firm, 75.5 percent of these enterprises employed less than 50 persons, 61.8 percent had less than 500 thousand turnover, and 51 percent provided their products and services in local market (Table 1).

**Table 1.** General description of the sample.

Staff size	%	Sales (RMB)	%
1~10	46.1	<100,000	45.1
11-50	31.4	100,000-500,000	16.7
51-100	7.8	500,000-1,000,000	19.6
101-500	2.0	1,000,000-2,000,000	2.9
>500	12.7	>2,000,000	15.7

**Incentives for IT adoption:** Only 34.2 percent had adopted IT, the majority didn't adopt IT. All the respondents were asked to indicate the reasons why they adopted IT or not. Tables 2-3 illustrate the internal and external factors agribusiness didn't adopt IT. Table 4 shows the incentive for IT adoption.

**IT applications:** Of respondents 90.9 percent applied IT in routed business, 78.8 percent in word processing, 72.7 percent in marketing and 60.6 percent in data processing. Table 5 details the results.

Respondents were asked to report benefits achieved so far. Of the total sample, 48.5 percent were not satisfied with the benefit whereas 15.2 percent were satisfied. Table 6 shows the results for achieved benefits.

**Table 2.** The internal factors for no adoption of IT.

Internal factor	%	Rank
Unnecessary	69.6	1
Lack of capital investment	49.3	2
Lack of knowledge of IT application	29.0	3
Lack of perceptive leader	23.2	4
Lack of professional staff	20.3	5
Don't know how to do it	8.7	6
High operational costs	7.2	7

**Table 3.** The external factors for no adoption of IT.

External factor	%	Rank
Competitors don't adopt	69.6	1
Lack of government's support	36.2	2
Worry about IT safety	23.2	3
Bad environment of IT adoption	18.8	4
Difficult to IT supplier selection	8.7	5

**Table 4.** The incentive for IT adoption.

Reason	%	Rank
Improve the competitiveness	24.2	3
Follow the competitors	45.5	1
Go with the stream	30.3	2

**Table 5.** IT applications in adopted firms.

Application item	%	Rank
Word processing	78.8	2
Data processing	60.6	4
Design	18.2	6
Routed business	90.9	1
Production management	48.5	5
Marketing	72.7	3

**The barriers to IT application:** Lack of specialized staff and generalists ranks the first factor (57.6 percent), which influenced the IT application, followed by lack of enthusiasm of employee (51.5 percent), shortage of benefits achieved from IT (39.4 percent), lack of capital investment (30.3 percent) and lack of deep development of commercial software (27.3 percent). Respondents were asked to select key successful factors for IT application. Table 7 shows the results.

**Table 6.** Benefits achieved from IT investment.

Benefits from IT investment	%	Rank
Access customers widely	39.4	4
Improvement in circulation efficiency	48.5	3
Management efficiency promotion	51.5	1
Labor cost reduction	51.5	1
Reduction of logistic cost	39.4	4
Stock capital reduction	39.4	4
Decision-making cost reduction	36.4	7

**Table 7.** Key successful factors for IT application.

Factor	%	Rank
Leadership promotion	75.8	1
All staff participation	51.5	3
Management level	75.8	1
IT adoption & application plan	45.5	4
Process management	36.4	5
Support from supplier	27.3	6
Financial support	27.3	6

**The correlation among IT adoption and enterprise size:** A further crosstab analysis shows IT adoption is statistically significant with the business domain, industrial sectors, staff size and annual turnover of agribusiness. According to the survey, 58 percent running their business in national and international area have stronger incentive to IT adoption than those who only run in local market. In fact, 7.7 percent of them have adopted IT (Table 8).

With the correlation analysis between enterprise size and IT adoption, the results show that the agribusiness has more diffusion and penetration of IT with larger size of enterprise. Table 9 shows IT application items were positively correlated with enterprise size ( $P < 0.01$ ).

Based on Nolans growth model, which is a theoretical model for the growth of information technology in a business or similar organization, the IT application in most of agribusiness is in Stage I, namely the "initiation" stage. This stage is marked by "hands off" user awareness and an emphasis on functional applications to reduce costs.

Few agribusiness is in Stage II, "contagion" stage, along with further growth of IT application. In this stage there is a proliferation of applications as well as the potential for more problems to arise<sup>4</sup>. Table 10 shows the correlation between the incentive for IT adoption and post-evaluation of IT application. In addition, training for IT is also taken into account.

From the crosstab relation between the incentive for IT adoption and post-evaluation, 62.5 percent of agribusiness with the incentive of improving the competitiveness, have been satisfied with information technology application; 93.3 percent, only adopted IT following the competitors, have not been satisfied with information technology application.

From the crosstab relation between training to employees in agribusiness and post-evaluation of IT application, only 6.7

**Table 8.** Correlations between IT adoption and agribusiness size.

		No IT adoption		IT adoption		Chi square
Business area	Local market	48	0.923	4	0.077	P = 0.000
	National market	21	0.490	22	0.510	
	International market	0	0	7	1	
Staff size	1~10	46	0.979	1	0.021	P = 0.008
	11-50	19	0.594	13	0.406	
	51-100	4	0.500	4	0.500	
	101-500	0	0	2	1	
	>500	0	0	13	1	
Turnover (RMB)	<100,000	46	1	0	0	P = 0.004
	100,000-500,000	11	0.647	6	0.353	
	500,000-1,000,000	11	0.550	9	0.450	
	1,000,000-2,000,000	1	0.333	2	0.667	
	>2,000,000	0	0	16	1	

**Table 9.** Correlation analysis among IT application and enterprise size.

		Staffs	Turnover
Application items	Pearson correlation	0.799(**)	0.958(**)
	Sig. (2-tailed)	0.000	0.000
	N	33	33

\*\* Correlation is significant at the 0.01 level.

**Table 10.** Post-evaluation of IT application.

		Satisfactory		Mean	Unsatisfactory		Chi square
Incentive for IT adoption	Improve the competitiveness	5	0.625	3	0.375	0	P = 0.01
	Follow the competitors	0	0	1	0.067	14	
	Go with the stream	0	0	8	0.80	2	
IT training	Yes	4	0.267	10	0.667	1	P = 0.003
	No	1	0.056	2	0.111	15	

percent of agribusiness, which have trained employees, has been satisfied with IT application. In contrast, about 83.3 percent having not trained employees, are not satisfied with IT application.

### Conclusions

The paper discusses the information technology adoption in agribusiness based on survey in Sichuan Province, China. The results indicate that there are some troubles in IT adoption of agribusiness contrary to the expectation that agribusiness will take advantage of information technology sufficiently from most managers. Information technology adoption of agribusiness is still far from being satisfactory given that most of agribusiness in China is small, medium-sized. Meanwhile, some barriers limited the IT application in agribusiness. Lack of specialized staff and generalists ranks the first factor, which influenced the IT application, followed by lack of enthusiasm of employee and shortage of benefits achieved from IT.

The research showed that information technology application is positively correlated with enterprise growth. It also shows that there is a close correlation between incentive for adoption and post-evaluation of IT application, and IT training is helpful to improve degree of satisfaction for IT.

Generally speaking, IT adoption and application in agribusiness is becoming a difficult systemic project and faces many difficulties during planning or designing. Agribusiness needs generalists who are professional in IT knowledge and management to decide how to plan and develop a scheme to IT adoption.

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