The Effects of Agricultural Informatization on Agricultural Economic Growth: An Empirical Analysis Based on Regression Model

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Abstract This article selects some major factors influencing the agricultural economic growth are selected, such as labor, capital input, farmland area, fertilizer input and information input. And it selects some factors to explain information input, such as the number of website ownership, types of books, magazines and newspapers published, the number of telephone ownership per 100 households, the number of home computers ownership per 100 households, farmers' spending on transportation and communication, culture, education, entertainment and services, and the total number of agricultural science and technology service personnel. Using regression model, this article conducts regression analysis of the cross-section data on 31 provinces, autonomous regions and municipalities in 2010. The results show that the building of information infrastructure, the use of means of information, the popularization and promotion of knowledge of agricultural science and technology, play an important role in promoting agricultural economic growth.

Key words Agricultural informatization, Economic growth, Mechanism, Regression model, Empirical analysis

1 Introduction

Agricultural informatization refers to the use of modern information technology and information system to provide effective information support for agricultural production, supply, marketing and related management and services, so as to improve integrated agricultural productivity and management efficiency. Agricultural informatization involves agricultural science and technology informatization, agricultural product operation informatization, rural life informatization, and many other aspects, which is an important part of agricultural modernization, an important way for agriculture to adapt to the market economy, a valid means to improve agricultural productivity, and an important way for the government to effectively manage agriculture[1].

With the arrival of the information age, like other industries, the development of agricultural economy depends largely on the spread of information technology and sharing of information resources. The network infrastructure building and emergence of agricultural information system and information websites, have greatly changed the farmers' mode of production and way of life, and improved the majority of farmers' ability to obtain and use production information, sales information and life information, making them changing from the past guesswork and blind production and marketing, to the timely and accurate understanding of the market demand through various channels of information and use of agricultural science and technology to produce high quality products to meet the market demand and improve market competitiveness. It can be said that informatization has become an important way to promote rural economic development and increase farmers' income.

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As for the relationship between informatization and agricultural economic development, many China's scholars from different perspectives have carried out relevant research, and drawn a series of conclusions: the construction of agricultural informatization is in favor of the adjustment of agricultural industrial structure, in favor of the farmers' rapid response to markets at home and abroad, in favor of the spread of new agricultural technology, in favor of scientific decision-making of agricultural production management, thereby promoting farmers' income[2]; informatization can overcome the weakness of agriculture, and the use of information technology can improve the contribution of the agricultural science and technology and achieve high value-added of agricultural products[3]; information technology can play an active role in many aspects on agricultural production and management, such as strengthening the links between leading enterprises and farmers, accelerating the development of leading enterprises, expanding the scope of market transactions, reducing the production costs and risks for farmers, and promoting the development of agricultural industrialization[4]; information technology has brought a big change to the operation for the agricultural market, so that the country and even the world become a unified market, and agricultural producers can take advantage of network technology to realize co-management with different industrial allies, work together to build a successful brand and constantly develop new markets[5]. There are also scholars conducting empirical analysis of the effects of agricultural informatization on the rural economic growth, and the results show that there is a strong positive relationship between agricultural informatization and agricultural GDP, and agricultural informatization aims ultimately to achieve rural economic growth mainly by reducing labor input, promoting rural urbanization, industrialization, and increase farmers' average level of education[6].

From the literature review, we can find that China's scholars have conducted a lot of theoretical researches and qualitative ana-

lyses on the role of agricultural informatization, but there are few researches on the intrinsic links between agricultural informatization and agricultural economic growth from the empirical perspective, as well as the effects of agricultural informatization on agricultural economic growth. Even if there are empirical researches, they only generally take agricultural informatization index as the only variable to represent the level of development of informatization, to analyze the relationship between informatization and agricultural development. Few scholars research the contribution of informatization to agricultural economic growth from network infrastructure building, information resources, information personnel training and many other factors on the agricultural informatization system. Therefore, this article takes this as a starting point and use regression model to conduct empirical research on the effects of various agricultural informatization factors on agricultural economic growth.

2 Agricultural economic growth model

2.1 Selection of regression model of long-term agricultural production function To illustrate the role of agricultural informatization in promoting rural economic growth, Cobb – Douglas production function is used for econometric analysis. Compared to other production functions, the regression process of Cobb – Douglas function is convenient and easy, except the advantage of the factor index in the formula as the growth contribution rate of this factor.

The main factors influencing agricultural economic growth are determined as follows: labor, capital input, farmland area, fertilizer input, and information input. The function form is as follows:

$$Y = AX_1^{\beta_1}X_2^{\beta_2}X_3^{\beta_3}X_4^{\beta_4}X_5^{\beta_5} \quad (1)$$

where Y is total agricultural output value; X_1 is agricultural capital input; X_2 is agricultural labor; X_3 is farmland area; X_4 is the application rate of chemical fertilizer; X_5 is the information input.

Taking logarithm of both sides of formula (1), the regression model is derived:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 a + \beta_5 \ln X_5 + u \quad (2)$$

2.2 The value of input-output factors

2.2.1 Selection of specific variables. According to the statistical data collected, this article uses total output value of farming, forestry, animal husbandry and fishery to represent the annual output value of agriculture; original value of the productive fixed investment per rural household at the end of the year to represent the agricultural capital input; the labor in farming, forestry, animal husbandry and fishery to represent the national agricultural labor; national arable land area to analyze the impact of farmland on agricultural growth; the application rate of agricultural chemical fertilizer to represent the application rate of chemical fertilizer.

The most critical is the determination of information input variable. China's agricultural informatization theory and practice is still in its infancy, and the evaluation indicator system concerning agricultural informatization is not perfect, so there is a need to use proxy variable method, to find the proxy variable of information input. This article refers to the national informatization indicator, believing that the components of rural economic information system include the following aspects: information resources, information infrastructure building, information technology and application, information personnel and information institutions and organizations, so this article selects some factors to explain information input, such as the number of website ownership, types of books, magazines and newspapers published, the number of telephone ownership per 100 households, the number of home computers ownership per 100 households, farmers' spending on transportation and communication, farmers' spending on culture, education, entertainment and services, and the total number of agricultural science and technology service personnel.

The regression equation is as follows:

$$\ln X_5 = \alpha_0 + \alpha_1 \ln Z_1 + \alpha_2 \ln Z_2 + \alpha_3 \ln Z_3 + \alpha_4 \ln Z_4 + \alpha_5 \ln Z_5 + \alpha_6 \ln Z_6 + u \quad (3)$$

where Z_1 is the number of website ownership; Z_2 is types of books, magazines and newspapers published; Z_3 is the number of telephone ownership per 100 households; Z_4 is the number of home computers ownership per 100 households; Z_5 is farmers' spending on transportation and communication, culture, education, entertainment and services; Z_6 is the total number of agricultural science and technology service personnel.

Then the overall regression equation is as follows:

$$\ln Y = \beta_0 + \beta_1 X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 (\alpha_0 + \alpha_1 \ln Z_1 + \alpha_2 \ln Z_2 + \alpha_3 \ln Z_3 + \alpha_4 \ln Z_4 + \alpha_5 \ln Z_5 + \alpha_6 \ln Z_6) + u \quad (4)$$

Namely:

$$\ln Y = \xi_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \xi_1 \ln Z_1 + \xi_2 \ln Z_2 + \xi_3 \ln Z_3 + \xi_4 \ln Z_4 + \xi_5 \ln Z_5 + \xi_6 \ln Z_6 + u \quad (5)$$

where $\xi_0 = \beta_0 + \beta V 5 \alpha_0$, $\xi_1 = \beta_5 \alpha V_1$, $\xi_2 = \beta_5 \alpha_2$, $\xi_3 = \beta_5 \alpha_3$, $\xi_4 = \beta_5 \alpha_4$, $\xi_5 = \beta_5 \alpha_5$, $\xi_6 = \beta_5 \alpha_6$.

2.2.2 Data selection and processing. Using regression model, this article conducts regression analysis of the cross-section data on 31 provinces, autonomous regions and municipalities in 2o10. The data is complete and easy to obtain, basically meeting the requirements of the number of large samples.

The following variables are directly obtained from 2011 China Statistical Yearbook: total output value of farming, forestry, animal husbandry and fishery, original value of the productive fixed investment per rural household at the end of the year, the labor in farming, forestry, animal husbandry and fishery, farmland area, the application rate of chemical fertilizer, types of books, magazines and newspapers published, and farmers' spending on transportation and communication, culture, education, entertainment and services. The number of website ownership is taken from China Internet Development Statistics Report released by CNNIC (China Internet Network Information Center) in January 2011; the number of telephone ownership per 100 households (including landline and mobile phones), and the number of home computers ownership per 100 households are from 2010 Telecommunication Service Level Reporting released by the Ministry of Information In-

dustry; the total number of agricultural science and technology service personnel is from 2011 Statistical Yearbook of China's Tertiary Industry. The data processing results are shown in Table 1, 2.

Table 1 Cross-section data

Regions	Total output value of farming, forestry, animal husbandry and fishery//10^8 yuan	Original value of the productive fixed investment per rural household at the end of the year //yuan/household	The labor in farming, forestry, animal husbandry and fishery//10^4 people	Farmland area//10^3 hm^2	The application rate of chemical fertilizer//10^4 t
Beijing	315.0	15 705.04	65.7	231.7	13.8
Tianjin	281.7	14 696.57	77.7	441.1	26.0
Hebei	3 640.9	11 135.23	1 483.6	6 317.3	316.2
Shanxi	908.7	6 397.57	635.8	4 055.8	104.3
Inner Mongolia	1 570.6	16 914.80	558.0	7147.2	171.4
Liaoning	2 704.6	12 077.17	694.4	4 085.3	133.6
Jilin	1734.3	16 180.78	516.6	5 534.6	174.2
Heilongjiang	2 251.1	16 813.17	781.0	11 830.1	198.9
Shanghai	283.2	1129.78	47.6	244.0	12.6
Jiangsu	3 816.0	10 298.14	896.9	4 763.8	344.0
Zhejiang	1 873.4	17 349.54	659.3	1 920.9	93.6
Anhui	2 569.5	8 759.08	1 579.6	5 730.2	312.8
Fujian	2 001.2	9 215.63	638.6	1 330.1	120.7
Jiangxi	1 733.8	6 112.82	882.3	2 827.1	135.8
Shandong	6003.1	12091.22	1 994.4	7 515.3	472.9
Henan	4 871.5	9 178.61	2 764.9	7 926.4	628.7
Hubei	2 985.2	6 368.83	990.1	4 664.1	340.3
Hunan	3 207.9	4 751.60	1876.4	3 789.4	231.6
Guangdong	3 337.6	4931.72	1 536.7	2 830.7	233.2
Guangxi	2 377.2	6 671.44	1 561.2	4 217.5	229.3
Hainan	705.0	9 017.22	226.1	727.5	46.3
Chongqing	913.1	4 614.26	655.7	2 235.9	91.2
Sichuan	3 689.8	7 022.83	2 158.3	5 947.4	248.0
Guizhou	875.2	5 968.84	1 210.5	4 485.3	86.5
Yunnan	1 706.2	9 358.08	1 672.7	6 072.1	171.4
Tibet	93.4	36 237.14	92.2	361.6	4.7
Shaanxi	1 337.2	8 242.74	877.6	4 050.3	181.3
Gansu	876.3	8 915.33	739.3	4 658.8	82.9
Qinghai	157.3	13 342.46	122.6	542.7	8.0
Ningxia	243.5	21 310.13	130.8	1 107.1	35.5
Xinjiang	1 297.6	18 849.44	425.8	4124.6	155.0

Table 2 Cross-section data (continued)

Regions	The number of website ownership percentage	Types of books, magazines and newspapers published	The number of telephone ownership per 100 households	The number of home computers ownership per 100 households	Farmers' spending on transportation and communication, culture, education, entertainment and services//yuan	The total number of agricultural science and technology service personnel
Beijing	25.5%	14 7501	320.66	52.27	2 092.50	6 589
Tianjin	1.1%	4 390	218.34	12.50	853.12	4944
Hebei	2.9%	2 391	157.26	6.05	614.45	28 994
Shanxi	1.3%	2 493	170.34	6.24	741.83	19 824
Inner Mongolia	0.8%	2 610	150.73	1.89	857.19	20 956
Liaoning	3.4%	9 083	199.70	5.93	854.20	29 080
Jilin	1.2%	10 007	204.94	4.63	732.75	21 577
Heilongjiang	1.2%	3792	187.99	7.86	923.77	229 49
Shanghai	4.5%	19 303	271.00	54.33	2 155.14	8 155
Jiangsu	4.8%	13312	235.62	8.24	1 510.01	69 652
Zhejiang	5.3%	8126	270.67	31.07	1 811.51	32 204
Anhui	1.7%	5795	180.48	4.32	614.28	44 170
Fujian	2.0%	3483	264.23	17.86	991.93	19 536
Jiangxi	1.8%	3867	181.19	3.35	550.53	37 690
Shandong	4.9%	7 263	212.07	10.83	933.50	58 069
Henan	2.7%	5 056	161.76	4.05	544.12	45 598
Hubei	2.4%	9 124	189.82	5.15	588.90	50 611
Hunan	2.4%	6 240	164.03	3.00	632.28	61 125
Guangdong	9.6%	6 368	266.52	16.21	855.50	32 109
Guangxi	1.4%	7 485	185.93	2.99	468.11	24 066

(Table 2)

Regions	The number of website ownership percentage	Types of books, magazines and newspapers published	The number of telephone ownership per 100 households	The number of home computers ownership per 100 households	Farmers' spending on transportation and communication, culture, education, entertainment and services // yuan	The total number of agricultural science and technology service personnel
Hainan	0.5%	1 986	156.11	1.81	645.14	3 601
Chongqing	1.7%	4 152	164.72	1.83	497.71	25 347
Sichuan	2.8%	7 153	177.41	3.73	530.72	69 245
Guizhou	0.4%	1 063	120.58	0.98	326.67	21 947
Yunnan	1.0%	3 711	144.79	1.21	490.92	30 696
Tibet	0.1%	388	76.88	0.21	285.97	1 489
Shaanxi	1.7%	6 109	198.33	4.59	680.70	21 886
Gansu	0.5%	1 898	155.67	2.72	455.27	14 140
Qinghai	0.2%	526	186.67	1.17	514.88	4 597
Ningxia	0.2%	789	215.66	4.00	582.80	3 721
Xinjiang	0.6%	8043	114.64	1.68	477.52	21 631

2.3 Regression process Based on the above data collected, Eviews 6.0 software is used for the regression of equation (5), and the results are shown in Table 3.

Table 3 Regression results

Dependent Variable: lnY
Method: Least Squares
Date: 12/11/12 Time: 10:20
Sample: 1 31
Included observations: 31

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	0.980 850	2.778 448	0.353 021	0.727 8
$\ln X_1$	0.262 885	0.079 938	2.786 668	0.440 7
$\ln X_2$	0.360 291	0.172 736	2.085 782	0.050 0
$\ln X_3$	-0.135 479	0.131 975	1.326 555	0.316 9
$\ln X_4$	0.284 023	0.126 442	4.618 885	0.000 2
$\ln Z_1$	0.232 038	0.139 094	2.733 588	0.471 7
$\ln Z_2$	0.215 597	0.094 881	1.269 777	0.790 1
$\ln Z_3$	0.325 031	0.346 982	3.792 639	0.437 3
$\ln Z_4$	0.151 677	0.120 815	1.979 426	0.859 4
$\ln Z_5$	-0.001 422	0.239 255	-0.325 140	0.022 6
$\ln Z_6$	0.378 656	0.146 534	2.536 778	0.597 3
R-squared	0.972 128	Mean dependent var		7.173 372
Adjusted R-squared	0.958 192	S.D. dependent var		1.062 431
S.E. of regression	0.217 236	Akaike info criterion		0.055 758
Sum squared resid	0.943 830	Schwarz criterion		0.564 592
Log likelihood	10.135 75	Hannan - Quinn criter.		0.221 625
F-statistic	69.756 10	Durbin - Watson stat		2.065 477
Prob(F-statistic)	0.000 000			

2.3.1 The overall significance test of equation. As can be seen from Table 3, R-squared = 0.972 128, Adjusted R-squared = 0.958 192, Prob (F-statistic) = 0.000 000, so it can be believed that the overall significance of equation holds.

2.3.2 Significance test of regression coefficient. t-statistic of equation coefficients is 2.786 668, 2.085 782, 1.326 555, 4.618 885, 2.733 588, 1.269 777, 3.792 639, 1.979 426, -0.325 140, 2.536 778, respectively, so at 5% level, $\ln X_1$, $\ln X_2$, $\ln X_4$, $\ln Z_1$, $\ln Z_2$, $\ln Z_3$, $\ln Z_4$ and $\ln Z_6$ are significant; at 10% level, $\ln X_3$ is significant, and $\ln Z_5$ is basically not significant, due to small t-statistic.

2.3.3 Multicollinearity test. The correlation coefficient between the explanatory variables is shown in Table 4, and it can be seen that there is no significant collinearity in the equation.

2.3.4 Information variable coefficient test. The regression is conducted on the equation not containing information input (Z_1-the number of website ownership; Z_2-types of books, magazines and newspapers published; Z_3-the number of telephone ownership per 100 households; Z_4-the number of home computers ownership per 100 households; Z_5 - Farmers' spending on transportation and communication, culture, education, entertainment and services; Z_6-the total number of agricultural science and technology service personnel).

$$\ln Y = 2.043 + 0.15\ln X_1 + 0.17\ln X_2 + 0.24\ln X_3 + 0.82\ln X_4 \quad (6)$$

R-squared = 0.943 215

$F = (R_{ur}^2 - R_r^2/q/[(1 - R_{ur}^2)/(n - k - 1)] = (0.972\ 128 - 0.903\ 215)/5/[(1 - 0.972\ 128)/(31 - 9 - 1)] = 10.360\ 9$

P = 0.0000

herefore, the information variables are jointly significant. The rate of contribution of the number of website ownership, types of books, magazines and newspapers published, the number of telephone ownership per 100 households, the number of home computers ownership per 100 households, and the total number of agricultural science and technology service personnel to growth of agricultural economy is 10.2%, 22.56%, 32.5%, 15.17% and 37.87%, respectively.

Overall, the regression results are ideal. Except the variable of farmers' spending on transportation and communication, culture, education, entertainment and services, the value of other regression coefficients and parameters of equation is good, and all variables successfully pass the statistical test.

2.4 Regression results analysis $\ln Y = 0.98 + 0.26\ln X_1 + 0.36\ln X_2 - 0.14\ln X_3 + 0.28\ln X_4 + 0.23\ln Z_1 + 0.22\ln Z_2 + 0.33\ln Z_3 + 0.15\ln Z_4 - 0.001\ln Z_5 + 0.38\ln Z_6$

(1) In 2009, the input-output elasticity of the national agricultural production capital was 0.26, indicating that currently, increasing the input of agricultural production capital still plays an important role in promoting the growth of China's agricultural GDP.

Table 4 Correlation coefficient matrix

	$\ln X_1$	$\ln X_2$	$\ln X_3$	$\ln X_4$	$\ln Z_1$	$\ln Z_2$	$\ln Z_3$	$\ln Z_4$	$\ln Z_5$	$\ln Z_6$
$\ln X_1$	1.000 0	−0.358 4	−0.029 1	−0.372 2	−0.163 1	−0.440 7	−0.056 6	−0.165 3	−0.298 7	−0.101 2
$\ln X_2$	−0.358 6	1.000 0	0.750 2	0.902 4	−0.268 8	0.265 4	−0.465 5	−0.325 6	0.698 8	0.572 3
$\ln X_3$	−0.029 1	0.750 2	1.000 0	0.815 4	−0.334 2	0.246 5	−0.329 8	−0.372 2	0.756 8	0.528 7
$\ln X_4$	−0.372 2	0.902 4	0.815 4	1.000 0	−0.125 6	0.543 8	−0.152 4	−0.165 4	0.826 4	0.588 8
$\ln Z_1$	−0.163 1	−0.268 8	−0.334 2	−0.125 6	1.000 0	0.402 1	0.725 5	0.741 2	−0.226 9	0.357 7
$\ln Z_2$	−0.440 7	0.265 4	0.246 5	0.543 8	0.402 1	1.000 0	0.571 2	0.569 8	0.401 2	0.682 2
$\ln Z_3$	−0.056 6	−0.465 5	−0.329 8	−0.152 4	0.725 5	0.571 2	1.000 0	0.875 6	−0.189 5	0.235 6
$\ln Z_4$	−0.165 3	−0.325 6	−0.372 2	−0.165 4	0.741 2	0.569 8	0.875 6	1.000 0	−0.265 4	0.641 1
$\ln Z_5$	−0.298 7	0.698 8	0.756 8	0.826 4	−0.226 9	0.401 2	−0.189 5	−0.265 4	1.000 0	0.487 7
$\ln Z_6$	−0.101 2	0.572 3	0.528 7	0.588 8	0.357 7	0.682 2	0.235 6	0.641 1	0.487 7	1.000 0

(2) The input-output elasticity of agricultural labor in China has declined over the past years, but the elasticity of 0.36 still shows that China's agriculture is still in the stage of labor-intensive development, and the labor input, both in eastern and western regions, still plays an important role.

(3) The input-output elasticity of farmland area is −0.14, indicating that the farmland area is not entirely proportional to the output value of agricultural products, and especially in the eastern regions, the agricultural output value per unit area is much higher than in the western regions, so the eastern regions with smaller farmland area create higher agricultural output value than the western regions with larger farmland area.

(4) In China's agricultural production in 2009, the input-output elasticity of the application rate of chemical fertilizer was 0.28, indicating that the role of the application rate of chemical fertilizer in promoting the growth of total agricultural output value can not be ignored.

(5) The coefficient of the number of website ownership is 0.23. Due to limitations of statistical information, the data on the number of website ownership use the percentage of the number of various websites ownership across the country, rather than the data on the number of agricultural website ownership, but the significance is still good, indicating that the rapid development of the network plays an important economic role in promoting economic growth.

(6) The input-output elasticity of types of books, magazines and newspapers published is 0.22, indicating that at present, books, newspapers and magazines are still an important channel for farmers to obtain agricultural information.

(7) The input-output elasticity of the number of telephone popularization rate is 0.33. This study uses the number of telephone ownership per 100 households, but the elasticity of 0.33 still shows that telephone (landline and mobile phones) is the main channel for the exchange and transmission of information, and plays a very important role in promoting the economic development, and especially in increasing the total agricultural output value.

(8) The elasticity of farmers' spending on transportation and communication, culture, education, entertainment and services is not significant, indicating that the variable selection is not reasonable, leading to negative value of regression coefficient, but the impact is very little (0.001).

(9) The rate of contribution of the total number of agricultural science and technology service personnel to agricultural economic growth is 37.87%, and very significant, indicating that the total number of agricultural science and technology service personnel plays a very important role in promoting the growth of the total agricultural output value in China.

3 Conclusions and policy recommendations

In the process of China's rural economic development, the construction of agricultural informatization plays an increasingly important role, and agricultural informatization should give full play to the leading role of government.

Therefore, the government should take more effective incentive policies to further strengthen the construction of rural information network; reinforce the development and utilization of agricultural information resources, and speed up the construction and improvement of the agricultural information system; encourage and support the vast majority of farmers to use a variety of information tools and information channels, to gain valuable agricultural information and technology.

In addition, the government should take effective measures to train more agricultural professional and technical personnel, and expand the scale of agricultural science and technology service team, so that agricultural experts and technical personnel play a more prominent role in enhancing the rapid development of the rural economy.

References

[1] GAI LY, TAO F. Study and analysis on agricultural information [J]. Agriculture Network Information, 2007(2): 42-70. (in Chinese).

[2] CHEN LJ. Study on the construction mode of agricultural information in Henan Province [J]. Journal of Anhui Agricultural Sciences Sciences, 2012 (4): 24-27. (in Chinese).

[3] WANG ZF, GENG SH. The positive role and construction path of agricultural information [J]. Economic Review, 2006(12): 35-36. (in Chinese).

[4] AN XP. Chinese agricultural information; Thoughts and countermeasures [J]. Rural Economy, 2008(11): 90-91. (in Chinese).

[5] CHEN XD. The cognition to agricultural information [J]. Sci-tech Information Development & Economy, 2009(9): 88-89. (in Chinese).

[6] DENG PJ, CHEN YZ. Correlation analysis of agricultural informatization and rural economic growth [J]. Resource Development & Market, 2011, 26 (4). (in Chinese).