

The Role of Information and Communication Technology on Agricultural Productivity

Alireza Karbasi, Ferdowsi University of Mashhad, IR
arkarbasi2002@yahoo.com

Abstract

The most important information technology tool for strategic management of community that comes with remarkable speed in developing. The relationship between information and communication technology (ICT) and agricultural productivity using panel data for 60 countries period 2007-2000 has been investigated. The results indicate that information and communications technology (ICT) means to do a positive effect on productivity and total agricultural countries and developed countries and is developing. Of course (ICT) on agricultural productivity in developed countries than in developing countries based on the research findings provides easy and affordable to farmers, ICT, government pioneering in ICT utilization in agricultural domain,, establishing databases, especially In rural areas, appropriate culture accepting ICT training and create and manage ICT development projects in agricultural mechanization, including strategies that can be effective in agricultural growth.

Key words: agricultural productivity, communication and information technology (ICT), panel data

Introduction

Complexity of human development variables being unexpectedly and global environmental factors affect agricultural activities on the one hand and the strategic importance of food security and fight poverty, on the other hand agricultural development with deep and broad challenges faced the growing process of globalization and agricultural trade in wide competition Field equations within the framework of the market that has changed all the components of the agriculture industry undergoing fundamental structural changes will be. Information in the field of agriculture and rural development not only as one of the main inputs and capital will be considered but effective factor in improving efficiency and effectiveness of the production and development of resources comes. Including the need for social sector development where information technology is essential to the villages [10]. on time ,40 percent of the total world population of the villages were replaced. Information and communication needs of only one village as a catalyze for development and provides faster development. In most villages lack adequate knowledge and skills, use of resources is not the correct method to use and generally very old and traditional resources and the efficiency is not adequate if you can be through information technology (ICT) transformation and information to farmers will be certainly improved use of resources and increased production of the field of economic growth provides important technology in rural prosperity and promote economic fields, the social and cultural. Questions that may come to mind is that ICT for low income people and rural farmers who live in what can be important to Applied?[2]. Interaction with information technology are agricultural and commercial

economy and increase confidence in the different parts of agriculture by increasing and improving the flow of information will help. ICT development tools and components for their various uses of them can be the Internet, email, global coordinate system, geographic information noted. [6] As the phone all the economic progress is shared access to the Internet Step and direction of this new category is introduced, farmers due to lack of separation distance and adequate and accurate price information on products, can access the Internet are aware of the price of the products through delivering technical information for all agricultural exploitation can be used and technical advice in agricultural technology between them are more established. I need the Internet to higher education and skills of the phone[2] .Therefore this study the effect of information and communication technology on agricultural productivity using panel data is. Overview of the experience of some developing countries in applying communications technology in rural development and Agricultural show that use information technologies in all these countries fit almost capabilities it is considered. Internet Kiosk in 15 languages to a research institute in India to create common country. In this system, an Internet kiosks in several rural location is installed. The network period is a powerful database all the information required to include farmers. With this system, farmers can weather conditions such as information, prices of agricultural products and livestock, veterinary information, buying and selling of livestock and agricultural products and transfer money easily and do Minimum time[2]. Taiwan also set prices for advertising, products, computer systems services side, there were products that all activities and data analysis products and services would examine other production equipment was created to produce the optimum product share is [6]. Service Tel center in rural South Africa and NGOs launched. The center includes a local network that can be several users simultaneously work together. Because of this system of local and network equipment to minimize, for a village [2]. The experience in the field of telephone systems accountable (Isfahan Province and the Research Institute of soil water) and network systems based on exchange of information Web sites in some provinces there are those that combine design desired Nadak [10].

Lio and Liu[24], using FGLS effect ICT on agricultural productivity were analyzed. The results showed that new ICT has a significantly positive impact on agricultural productivity. they found that the ICT adoption levels of the richer countries are much higher than those of the poorer countries. Stienen and colleagues [25], studied the role of ICT on the livelihoods of farmers and agricultural efficiency in developing countries. Agriculture is an important sector with the majority of the rural population in developing countries depending on it. The sector faces major challenges of enhancing production in a situation of dwindling natural resources necessary for production. The growing demand for agricultural products, however, also offers opportunities for producers to sustain and improve their livelihoods. Information and communication technologies (ICT) play an important role in addressing these challenges and uplifting the livelihoods of the rural poor.

The results showed that the better access to ICT prices, inputs, markets and increase the level of farmers livelihoods are. Richardson [21], the role of ICT in improving livelihoods of poor rural households paid and showed increased production of ICT, marketing, agricultural activities and thus poverty reduction is effective. Kumar [20] the study as information technology (ICT) in agriculture in India, This article discusses the different models related to ICT in Indian agriculture like, Kisan call centers, The Gyandoot project, Bhoomi project, Village knowledge centers, and

AGMARKNET. In the end, the article discusses the barriers and the outlook of ICT in Indian agriculture.

. The results show ICT improve the stability of India is agriculture. Ghafari [5] use information technology in agriculture can be evaluated. Precision agriculture research showed that using the GPS, geographic information system and remote sensing can lead to automate agricultural operations without the agricultural chauffeur, use of variable amounts of pesticide, fertilizer, seed and planting depth different from the specific conditions of each part of the farm has been the result of reduced costs, increased product and the environment will be. Ghaffari and Razmian [6], information technology and its role in various areas of agricultural study placed. in the first studies to evaluate the technologies included paid and then use it in agricultural and different countries were studied. Results showed that all agricultural operations such as planting was harvested and after withdrawal can use this technology search. Ashrafi and colleagues [2], information technology and communications and promote the improvement of rural management were investigated. The protection field emergence, development and achievements of important information and communications technology and face questions related to promoting as the work involved with ICT in rural management were analyzed. Research findings showed that the efficiency and effectiveness of ICT in rural managers has positive effects.

Materials and methods

Data and variables:

cross-country data sets are used in this study for the period 2007-2000 on 60 countries¹.the first information is based on World Development Indicators data, Fixed telephone lines per 100 people, mobile lines per 100 people of each country as the information technology index is considered. The second data set, also based on Food and Agriculture Organizations statistical databases(FAOSTAT), Information on agricultural inputs, including labor force, machinery, fertilizer, land and from World Bank is collected on total agriculture and education level. Labor, measured by thousands of participants in agriculture in the economically active population; land, measured by thousands of hectares of arable and permanent cropland and permanent pastures; machinery, measured by the number of agricultural tractors; fertilizer, measured by the sum of nitrogen,potas,and phosphate content of various fertilizers consumed; livestock, measured by the number of cow equivalent livestock units as Calculated by Farhumand (1374); Total Agricultural output (Q) is measured by value-added in agriculture in U.S\$. Education, measured by the number of secondary level people in each country as representative of human capital variables ; refining and the estimated to help software is Excel and Eviews.

1- Australia - Austria - America - England - France - Italy - Denmark - Argentina - Bangladesh - Brazil - Panama - Spain - Germany - New Zealand - Romania - Russia - Hungary - Iran - Turkey - Bolivia - Netherlands - Finland - India - Saudi Arabia - Cameroon - Canada - Chile - China - Colombia - Costa Rica - Ecuador - Egypt - El Salvador - Greece - Honduras - Indonesia - Jamaica - Japan - South Korea - Mexico - Nepal - Norway - Pakistan - Philippines - Peru - Portugal - Senegal -Slovakia - South Africa - Sri Lanka - Sweden - Switzerland - Tunisia - Ukraine - Venezuela - Zimbabwe - Poland - Morocco - Malaysia – Kuwait

production function estimates

The widely used Cobb-Douglas production function is adopted for this study. The economic theory of production places certain technical constraints on the choice of the functional form, such as quasi-concavity and monotonicity. Further more , as multiple inputs are used in agricultural production, the agricultural production function form should display sufficient flexibility to allow continuous adjustment between inputs as relative factor prices change. The simplest production function form consistent with these constraints is the Cobb-Douglas specification, which is also the most common specification used for estimating agricultural production functions in the literature. The inter-country agricultural production function for estimation is specified as Eq(1):

$$\log Q_{it} = \alpha_0 + \alpha_1 \log LAND_{it} + \alpha_2 \log LIVESTK_{it} + \alpha_3 \log TRACTOR_{it} + \alpha_4 \log LABOR_{it} + \alpha_5 \log FERT_{it} + \alpha_6 \log EDU_{it} + \alpha_7 \log ICT_{it} + \varepsilon_{it}; \quad i=1, \dots, m; \quad T=1, \dots, T,$$

(1)

Where Q_{it} is the total agricultural output of the j th country in year t , $i = 1, \dots, m$ the number of countries and $T = 1, \dots, T$ number of years shows. ε_{it} is the random error term and EDU , human capital and ICT is the indicators information technology. Estimate panel data models and methods for identifying model - the model is the integration of data, fixed effects model and random effects model we have used Hasman Test. According to test done, all the models are the fixed effects model.

Estimation and Results

. Results to estimate the models have shown in Table 1. Provide models for sample included 60 countries - time for the whole country, developed and developing countries separately for the period 2007-2000 is estimated. ICT -related parameters of the agricultural productivity in positive and Q is significantly high level of ICT development. any country can be expected more growth in agricultural productivity and thus agricultural products will grow. Desired variable human capital as the expected positive and significant effect is based on Nelson and Philips Any comments may be higher education workforce in creating more running ability and acceptance of new technologies. [3] Thus, the growth in agricultural productivity. ICT for better understanding of the total agricultural productivity in selected countries are divided in two developed and developing countries. Table 1 The results are presented. ICT effects on agricultural productivity level of any two countries is positive and significant in developed countries but in developing countries is higher. The reason is that more developed countries the share is allocated to ICT technology is only one chance opportunity that is being provided to countries with appropriate complementary factors to create new technologies allow a gap between themselves and the developed countries reduce. [3] ICT Opportunities to farmers market rates and

using it will help. Another question in this article is that you'd like to ICT effect on agricultural productivity in developed and developing countries are different or not? for this purpose a dummy variable for developed countries following the model 1 was added.

For simplification, a regression model is specified as Eq.(2):

$$\log Q_{it} = \alpha_0 + \alpha_1 \log LAND_{it} + \alpha_2 \log LIVESTK_{it} + \alpha_3 \log TRACTOR_{it} + \alpha_4 \log LABOR_{it} + \alpha_5 \log FERT_{it} + \alpha_6 \log EDU_{it} + \alpha_7 \log ICT_{it} + \alpha_8 H \log ICT_{it} + \varepsilon_{it} \quad (2)$$

Zero hypothesis test is as follows:

$$H_0 : \alpha_1 + \alpha_8 > \alpha_1 \quad \text{or} \quad H_0 : \alpha_8 > 0$$

$$H_1 : \alpha_1 + \alpha_8 \leq \alpha_1 \quad \text{or} \quad H_1 : \alpha_8 \leq 0$$

H=1 if the country is developed and H=0 if the country is developing. Zero hypothesis express that effect of ICT on agricultural productivity in developed countries is more than developing countries. Results in the (Table 1) are estimates. First, the test results to show Hasman test model had fixed effects model. Second, the zero hypothesis can not be rejected, so the effect of ICT in developing and developed countries is different.

Table (1) to estimate model (1) and (2) in the period 2007-2000

	estimation model for 60 countries	estimation model developed countries	estimation model for developing countries	Estimation model for 60 countries with the dummy variable
Constant	14/5***	11/19***	5/91***	3/30
Labor	0/37	0/18	0/001	0/015**
Land	0/51***	0/58*	0/24***	0/086
Livestock	0/29***	0/96**	0/007	0/32*
Machinery	0/122	0/98***	0/14***	0/131
Fertilizer	0/08***	0/14***	0/093***	/26**
Education	0/17**	0/62*	0/82***	1/04**
ICT	0/26***	0/66***	0/22***	0/117**
Hasman-test	51/81***	55/35***	16/72**	54/35***
DumICT				0/706*

Description: * significant at ten percent level, ** significant at five percent level, *** significant at one percent level. Pearson Chi distribution Hasman test - two with K-1 degrees of freedom

Conclusion

The results showed a significant influence on ICT productivity agricultural country. So that one percent per ICT, agricultural productivity 26 percent rate significantly increased. To see ICT as an important role in improving agricultural productivity is playing countries. Now ICT one hand separated from agricultural sector has been the world's countries based on their agricultural science agricultural mechanization is . now at all stages of ICT was planting and harvesting and the harvest and sales processes and marketing are using abundant .

Based on research findings the following recommendations Effective use of ICT in developing countries is provided:

- 1 - easy and inexpensive access to computer information network, especially for low-literate and illiterate farmers in this area
- 2 - establishing databases, especially in rural areas so that the dispatch of all information provided in many ways, providing people adhered.
- 3 - create computer training to villagers and farmers Empowerment individuals and communities in remote data this way can present opportunities for more people in the labor market to.
- 4 - create the appropriate culture and rejection of mental problems in the field of ICT, especially agricultural mechanization agriculture
- 5 - government leadership in applying information technology in the field of agriculture
- 6 - Management programs and ICT development projects in agricultural mechanization Tuesday after staff, cultural and economic.

References

- 1 - Ashraf Zadeh, H., Mehregan,N(2008). Panel Data Econometrics, Cooperative Research Institute of Tehran University first Edition.
- 2 - Ashrafi, M., Ahmadpour, A., Mehdi Pour, A. (2006). Communications and information technology (ICT) and promote its policy to support the improvement of

rural management. Sixth Conference of Agricultural Economics.

3 - Rahmani, T, vital, Q. (2006). Effects of information and communication technology on the growth of total productivity of production factors, the study between countries. Journal of Economic Research, No. 33: 25-51.

4 - Tayebi, K, Jabbari, A., footman, M., Small-Zadeh, M.. (1386). Assessment of impact of the Internet during the export (experimental study of 8 elected members alliance in Asean + 3). Journal of Economic Studies No. 33: 105-127 5 - Ghafari, H.. (1385). Application of IT in agriculture, Precision agriculture

6 - Ghafari, H., Razmian, Y. (1385). IT and its role in different areas of agriculture

7 - Farhumand, p. (1379). General animal. Summer 79, Urmia, University Publishing Unit, Shiraz, Second Edition.

8 - Moshiri, Q, Jahangard, A. (1383). Information and communication technology (ICT) and economic growth in Iran. Journal of Economic Research, No. 19: 78-55

9 - Moshiri, Q, Nick-poor, Q. (1386). Impact of information and communication technology and its economic growth Srryz·hay world. Journal of Economic Research, No. 33: 75-103

10 - Mirshahi, Q. Emadi, M.. (1386). Role of information and communication technology in accelerating agricultural development process.

<http://www.mydocument.ir/main/index.php?article=450>

11-Bayes, A., (2001). Infrastructure and rural development: insights from a

Grameen Bank Village phone initiative in Bangladesh. Agric. Econ. 25, 261-272.

12-Dewan, S., Kraemer, k., (2000). Information technology and

productivity: evidence from country-level data. Manage. Sci. 464, 548-562.

13-Economist The, (2002). Making the Web World-Wide. The Economist

Newspaper Ltd., London, 28 September, 79 pp

14-Eigen-Zucchi, C., (2001). The measurement of transaction costs, Ph.D. Thesis.

Department of Economics, George Mason University, Virginia.

15-Forestier, E., Grace, J., Kenny. C., (2002). Can information and

communication technologies be pro-poor? Telecommun. Policy 26, 623-646

16-Fulginiti, L., Perrin, R., (1993). Prices and productivity in agriculture.

Rev. Econ. Stat. 75, 471-482.

17-Green William H. (2002), Econometric analysis, fourth edition, New Jersey, prentice Hall International Inc.

18-Grimes, S., (2000). Rural areas in the information society: diminishing distance or increasing learning capacity? J. Rural Stud. 16, 13-21.

19-Hayami, Y., Ruttan, V., 1970. Agricultural productivity differences among countries. Am Econ. Rev. 60, 895-911.

20-Kumar, D. (2005). Information and communication Technology (ICT) in Indian Agriculture.

- 21-Richardson, D. (2005), How can Agricultural Extension Best Harness ICTs to improve Rural livelihoods in Developing countries?
- 22-Singh, V.(2004). Factors Associated with household internet use in Canada, Agriculture and rural working paper series working paper No. 66.
- 23-Kawagoe, T., Hayami, Y., Ruttan, V., 1985. The inter-country agricultural production function and productivity differences among countries. *J. Dev. Econ.* 19,113-132.
- 24-Lio,M.,Liu, M.(2006). ICT and Agricultural Productivity. *Agricultural Economic* ,34 :221-228
- 25-Stienen,J. Bruinsma, w. and neuman, F. (2007), How ICT can make a difference in agricultural livelihoods. International Institute for communication and Development.
- 26-Platallia, M privitera, D. (2005), ICT and typical products: an analysis of Italian farms. Distafa-department of agro forestall and environmental sciences and technologies.
- 27-WDI.(2007). world development Indicators FAO(2005). Food and Agriculture organization statistical Database.<<http://faostat.fao.org/site/291/default.aspx>>.
- 28-Winrock.(2003).International team ,future directions in agricultural and information and communication technologies(ICT) at USAID,economic growth,agriculture,and trade,agriculture and food security.