

Policies Affect the Application of Information and Communication Technologies by Agricultural Extension Service

¹Seyed Jamal F. Hosseini, ²Mehrdad Niknami and ³Gholamreza H. Hosseini Nejad

¹Department of Agricultural Extension and Education,
Islamic Azad University, Science and Research Branch, Tehran, Iran

²Department of Agricultural Extension and Education,
Islamic Azad University, Garmsar Branch, Garmsar, Iran

³Department of Education, Tarbiat Moaalem University, Tehran, Iran

Abstract: Problem statement: The majority of rural population in Iran has limited access to agricultural information. However, bridging the digital divide between urban and rural areas has been a major challenge for authorities in Iran. Agricultural extension by its nature can have an important role in this regard. **Approach:** This study aimed at examining the perception of extension specialists in Iran about appropriate policies that can affect the application of ICTs by extension service. A questionnaire was developed and data was collected from 182 extension specialists. Regression analysis was used to analyze the data. The stepwise method was used in the regression analysis. **Results:** Results showed 80% of the variance in the policies which affect the application of ICTs by extension service could be explained by three variables, advocating the participation of rural population in ICTs project planning, open source system and the integration of conventional information delivery system with new ICTs. **Conclusion and Recommendations:** Results showed that in order to deploy ICTS as an appropriate technology for extension service in Iran, financial, social, human and organizational sustainability should be achieved over time. Policies that provide affordable access to information need to be carefully identified and examined. Agricultural extension in Iran needs to address the policy and regulatory issues that impact on the use of the ICTs. The issue is not to replace the existing technologies, but the extension service should integrate the conventional information delivery system with new ICTs.

Key words: Agricultural extension, Iran, ICTs, policy, rural population, extension specialists, conventional information delivery system, open source system

INTRODUCTION

The majority of the population in the developing world lives in rural areas and has little or no access to agricultural information. Iran is no exception as about one-third of its population, which lives in rural areas, has only limited access to information.

During the last two decades, the world has witnessed unprecedented growth in Information and Communication Technologies (ICTs). ICTs help people to communicate effectively, overcome the limitations of time and space, empower people by providing information and knowledge, provide income-generating and learning opportunities, increase transparency and efficiency in governance and enable people to express their concerns and to actively participate in decision-making processes^[3].

While getting the essential knowledge to those who need it most remains difficult and expensive, much optimism has been generated as a result of the increased growth and sophistication of new electronic information services. Even in remote rural areas, Information and Communication Technologies (ICTs) are offering new options to deliver knowledge and information to farmers directly and indirectly through knowledge intermediaries^[1].

Evidence shows that even small efforts to put rural telecommunication policy on the national agenda can have significant results. Efforts to improve telecommunication and bridge the digital divide, undertaken by civil society advocacy groups in El Salvador, Guatemala, Trinidad and Tobago, Canada and Australia have yielded impressive results^[1,3].

Corresponding Author: Seyed Jamal F. Hosseini, Department of Agricultural extension and Education,
Islamic Azad University, Science and Research Branch, Tehran, Iran

Information and communication technologies can play a major role in improving the quality of life of rural people. However, the promise is yet to be realized owing to lack of connectivity, poor access to universal service and an efficient market. It is necessary to remove the impediments faced by the developing rural economy and provide basic infrastructure in rural areas to enable ICTs to spread, which would enable them to be part of a comprehensive socio-economic development strategy for rural development as a means, not an end^[10].

The major purpose of this research was to identify the appropriate policies by the agricultural extension service in Iran in applying ICTs. The specific objectives were as follows:

- To identify the characteristics of agricultural extension experts in Iran
- To determine the appropriate policies in applying ICTs in the agricultural extension service in Iran
- To examine the relationship between dependent variable and independent variables

Prior research: The World Summit on Information Society (WSIS) has set a target for greater penetration of ICTs: By 2015, half of the world's population will have access to the Internet. However, access to information by rural population is often very limited, which prevents it from using the new technologies and information effectively.

Rural areas are characterized by the following challenges^[3]:

- Inadequate infrastructure to use ICTs
- Far away locations of service centers to maintain and repair ICT devices and systems
- Small markets
- Inadequate financial resources, which make ICTs less affordable and lower levels of literacy and ICT literacy
- Low awareness of opportunities and benefits that ICTs can provide

However, bridging the digital divide between urban and rural areas is one of the challenges facing governments and policy-makers today. Factors that contribute to and widen this divide include the following^[9]:

- Economic: ICT infrastructure remains prohibitively expensive for many communities and nations

- Geographic: Difficult terrain, long distances and inadequate infrastructure
- Technological: Lack of skills to participate in the economy that uses ICTs extensively
- Cultural: Inequalities of access and participation
- Political: Long-term investment versus short-term political cycle^[9]

To address these challenges, extension planners and policy-makers need appropriate arguments backed with data to strengthen the case for agricultural extension playing a broader role in promoting ICTs.

Agricultural extension by its nature has an important role in promoting the adoption of new technologies and innovations. The trend from supply-driven extension to demand-driven extension requires a new approach, which opens the door for using ICTs as a cost-effective and practical communication tool to address the needs and demands of rural population.

Extension organizations have a key role in brokering between providers of communication technologies or services and their potential customers. To do justice to this role, extension organizations must be able to examine the appropriateness of various ICTs and the accessibility of ICTs in rural and remote areas, to reconcile costs and benefits and to ensure that access to ICTs is gender-sensitive and includes a diversity of cultures, languages, social strata and age-groups^[14].

However, adopting ICTs has proved difficult-and sometimes counterproductive-for extension services. Adoption is rarely instantaneous; the technology has to be taught and learned, adapted to experience and integrated into production. As is often the case with technological innovation, potential and expectations can outpace reality^[7].

The knowledge gap is compounded by the lack of essential skills, particularly in communication and management that extension workers must have if they are to effectively transfer technologies to farmers in a manner that leads to sustainability. It is important to realize that the information that extension workers need includes not only technical knowledge but also knowledge and skills that increase the effectiveness of delivery. Improving access to these vital extension skills will lead to better designed, delivered and supported technologies^[5].

Extension organizations face several challenges in applying ICTs^[6,8,15-17] including:

- Lack of training for agents
- Lack of knowledge and skills among agents
- Poor infrastructure

- Inadequate finances
- High cost of buying and maintaining hardware and software
- Legislative, policy and regulatory hurdles

Richardson^[14] stated that a key challenge facing extension planners and policy-makers in enabling extension workers to harness ICTs is handling subject matter and policy issues that are not strictly in the domain of agriculture.

The application of ICTs by extension organizations in Iran faces challenges and obstacles including high start-up costs, inadequate infrastructure and lack of competent trainers, poor connectivity and lack of rugged hardware^[11].

The government as part of a national development program is establishing Community e-Centers (CeCs) rural areas For instance, the Ministry of Agriculture, along with the Ministry of Communication and Information Technology, has set up more than 6000 CeCs in rural areas and more than 52 000 villages in Iran have access to the telephone. The goal is to set up more than 12 000 CeCs by the end of the Fifth National Development Program.

There is no single appropriate way to introduce and promote ICTs in the developing countries: Constraints and opportunities vary from country to country and therefore require location-specific approaches.

MATERIALS AND METHODS

We conducted a series of in-depth interviews with some senior experts in the Department of Extension of the Ministry of Agriculture to examine the validity of our questionnaire. A questionnaire was developed based on these interviews and relevant literature. The questionnaire included both open-ended and fixed-choice questions. The open-ended questions were used to gather information not covered by the fixed-choice questions and to encourage participants to provide feedback. A 5 point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used as a quantitative measure.

A pilot study was conducted with 25 extension experts who had not been interviewed before the earlier exercise of determining the reliability of the questionnaire for the study. Computed score was 91.0%, which indicated that the questionnaire was highly reliable.

The research population included all agricultural extension experts in Iran (N = 2024). The Ministry of Agriculture has divided the 29 provinces in six areas and one province was selected randomly from each

area. Using stratified sampling and the results of the pilot test, a sample of 182 experts was constituted, each of whom was mailed a copy of the questionnaire. For measurement of correlation between the independent variables and the dependent variable, Kendal method was used. The data were also analyzed by using the regression analysis.

RESULTS

Table 1 shows the demographic profile and descriptive statistics. The results of descriptive statistics indicated that the majority of extension experts were men, 39 years old on average and had an undergraduate degree with agriculture as a major subject.

Responses for the 11 perception statements are displayed in Table 2. A majority of respondents agreed that establishing the open source be an appropriate policy for extension service in applying ICTs. More than two third of extension experts agreed that enhancing the rural telecommunication infrastructure would help extension service in applying the ICTs. A majority agreed multi-stakeholders approach would be an appropriate policy for extension service in applying the ICTs.

Table 1: Personal characteristics of extension experts

Sex	Women (19.8%)	Men (80.2%)
Age (years)	Mean = 39	
Work experience (years)	Mean = 14	
Degree	Undergraduate (63%)	Graduate (37%)
Field of study	Agriculture (64.8%)	Other (35.2%)

Table 2: Likert-scale responses to 11 statements that pertained to policies which would affect the application of ICTs by extension service in Iran (1 = strongly disagree; 5 = strongly agree)

Perception statement	No. of respondents				
	1	2	3	4	5
Establishing open source system	2	2	70	79	29
Enhancing rural telecommunication infrastructure	0	11	34	102	35
Encouraging multi-stakeholder approach	0	8	31	94	49
Networking with other communities	0	0	24	107	51
Articulating common principles for applying ICTs in rural areas	0	2	15	114	51
Advocating participation of rural population in ICT project planning, implementation and evaluation	0	3	17	108	54
Integration of conventional information delivery system with new ICTs	0	6	21	107	48
Public private partnership	0	5	20	102	55
Liberalizing telecommunication marketplace	8	12	20	80	62
Involvement of the rural organization in shaping and monitoring national telecommunication policy	0	2	19	129	32
Developing a framework for applying ICTs in rural areas	4	5	32	96	45

Table 3: Mean rankings concerning the policies which affect the application of ICTs by extension service

Items	Statements	n	Mean
1.	Establishing open source system	182	3.71
2.	Enhancing rural telecommunication infrastructure	182	3.88
3.	Encouraging multi-stakeholder approach	182	4.01
4.	Networking with other communities	182	4.15
5.	Articulating common principles for applying ICTs in rural areas	182	4.18
6.	Advocating participation of rural population in ICT project planning, implementation and evaluation	182	4.17
7.	Integration of conventional information delivery system with new ICTs	182	4.08
8.	Public private partnership	182	4.14
9.	Liberalizing telecommunication marketplace	182	3.97
10.	Involvement of the rural organization in shaping and monitoring national telecommunication policy	182	4.04
11.	Developing a framework for applying ICTs in rural areas	182	3.95

(1 = Strongly disagree; 5 = Strongly agree)

Table 4: Correlation measures between independent and dependent variables

Independent variables	Dependent variable	R	Sig.
Application of ICTs	Establishing open source system	0.194	0.000**
Application of ICTs	Enhancing rural telecommunication Infrastructure	0.207	0.001**
Application of ICTs	Encouraging multi-stakeholder approach	0.188	0.003**
Application of ICTs	Networking with other communities	0.128	0.046*
Application of ICTs	Articulating common principles for applying ICTs in rural areas	0.229	0.000**
Application of ICTs	Advocating participation of rural population in ICT project planning, implementation and evaluation	0.345	0.000**
Application of ICTs	Integration of conventional information delivery system with new ICTs	0.157	0.014*
Application of ICTs	Public private partnership	0.254	0.000**
Application of ICTs	Liberalizing telecommunication marketplace	0.101	0.112
Application of ICTs	Involvement of the rural organization in shaping and monitoring national telecommunication policy	0.340	0.000**
Application of ICTs	Developing a framework for applying ICTs in rural areas	0.061	0.327

*, p = 0.05, **, p = 0.01

Extension experts in Iran agreed with the statements that articulating common principles for applying ICTs in Rural Areas is an appropriate policy to help extension service in applying ICTs. Approximately more than three-fourth of respondents agreed participation of rural population in ICT project planning, implementation and evaluation would help extension service in applying ICTs.

Table 3 shows the means of respondents' views about policies which affect the application of ICTs by extension service. As can be seen from Table 3, the highest mean refers to articulating common principles for applying ICTs in rural areas (mean = 4.18) and the lowest mean to establishing open source system (mean = 3.71). In terms of extension experts' views, advocating participation of rural population in ICT project planning, implementation and evaluation had a mean of 4.17 which indicated involvement of rural population would help extension service in applying the ICTs.

Table 4 shows the relationships between dependent variable and independent variables. The Kendal tau Coefficient was used for measurement of relationships between two variables whenever the data were ordinal scale. The results showed that there were significant relationships between the views of extension experts and some policies which affect the application of ICTs. The variables include: (1) Establishing Open Source System;

(2) Enhancing rural telecommunication Infrastructure; (3) Encouraging multi-stakeholder approach; (4) Networking with other communities; (5) Articulating common principles for applying ICTs in Rural Areas; (6) Advocating participation of rural population in ICT project planning, implementation and evaluation; (7) Integration of conventional information delivery system with new ICTs; (8) Public private partnership and (9) Involvement of the rural organization in shaping and monitoring national telecommunication policy.

The stepwise method was used in the regression analysis and the result shows that 73% of the variance in the policies which affect the application of ICTs could be explained by advocating the participation of rural population in ICTs planning.

In second step, the establishment of open source system was entered in the equation and along with the first variable accounted for 78% of the variance in the policies which affect the application of ICTs. In third step, the integration of conventional information delivery system with new ICTs was entered and it shows that 80% of the variance in the policies which affect the application of ICTs by extension service could be explained by the three above variables.

DISCUSSION

Extension experts agreed that liberalizing the telecommunication policy would help extension service

in applying ICTs. The finding is in accordance with study done by Arokoyo^[2] in Nigeria. In terms of extension experts' views, networking with other communities would affect extension service in applying the ICTs. Oryokot^[12] reported that networking among information and ICT service providers was critical for using lessons learned about a transformation of agricultural extension in Uganda.

Richardson^[13] recommended that rural organization involved in agricultural Extension become proactively involved in national telecommunication policy. Respondents' view in this study shows that involvement of the rural organization on telecommunication policy had an important role in promoting the ICTs in rural areas.

Based on the findings of the study, agriculture extension service in Iran should advocate the participation of the rural population in the process of applying ICTs. This is a main challenge for agriculture extension and if they don't overcome this challenge, it could become a threat.

The findings also show that lack of infrastructure is one the most important issue in application of ICTs. The importance of technical factors pointed out by^[4,6].

CONCLUSION

Information and communication technologies have a tremendous potential to help in improving the living conditions of the rural population in Iran and it is evident that ICTs will change the way people live, work and learn. Agricultural extension now has the opportunity to play a major role in this process of change by harnessing ICTs and using them effectively.

To deploy ICTs as an adaptable, available, accessible, affordable and extendable means for extension services to deliver information to rural population, financial, social, human and organizational sustainability need to be achieved over time. Policies that provide affordable access to information need to be carefully identified and examined.

A large proportion of the rural population in Iran is yet to benefit from this technological revolution. Agricultural extension in Iran needs to address the policy and regulatory issues that impact on the use of ICTs. The issue is not to replace the existing technologies, but the extension service should integrate the conventional information delivery system with new ICTs.

Based on the results of the study, the researchers offer the following recommendation:

Establish the partnerships with the public and private sector. The financial burden of developing ICTs for rural areas is mainly on the government and it is

important to enlist the private sector to participate in the development or expansion of ICTs in rural areas.

Explore ways to increase the participation of the rural population in the planning, implementation and evaluation of ICTs program. The lack of support from rural population may hinder the progress in the development of the ICTs and slow down the momentum.

Design the instructional materials which support the role of new ICTs as a complement for conventional delivery system. These could speed up the application of the ICTs and facilitate the exchange of ideas among various stakeholders.

REFERENCES

1. Abdon, B., R. Raab and S. Ninomiya, 2008. E-learning for international agriculture development: Dealing with challenges. *Int. J. Educ. Dev. Using ICT.*, <http://ijedict.dec.uwi.edu/viewarticle.php?id=415&layout=html>
2. Arokoyo, T., 2003. Nigeria: ICTs for agricultural extension transformation. *Proceeding of the CTA's 6th Consultative Expert Meeting of Its Observatory on ICTs*, Sept. 23-35, CTA, Netherlands, pp: 90. <http://ictupdate.cta.int/fr/Dossiers/ICTs-transforming-agricultural-extension>
3. Asian Development Bank, 2004. Building e-community centers for rural development. *Proceeding of the Report of the Regional Workshop*, Dec. 8-14, Bali, Indonesia, pp: 276. <http://catalogue.nla.gov.au/Record/3623501>
4. Barajas, M. and M. Owen, 2000. Implementing virtual learning environment: Looking for holistic approach. *Educ. Tech. Soc. J.*, 3: 20-36. http://www.ifets.info/others/download_pdf.php?j_id=17&a_id=412
5. Bell, M., 2004. Improving the impact of research: using e-learning to improve agricultural extension. *Proceeding of the Report of the Regional Workshop*, Asian Development Report, Bali, Indonesia, pp: 276. <http://catalogue.nla.gov.au/Record/3623501>
6. Bheenick, K. and G. Brizmohunr, 2003. The scope of information and communication technology application in agriculture extension in Mauritius, Rome, FAO, 23-40.
7. Bonati, G. and E. Gelb, 2005. Evaluating Internet for Extension in Agriculture. In: *ICT in Agriculture: Perspectives of Technological Innovation*, Gelb, E. (Ed.). European Federation for Information Technologies in Agriculture, Food and the Environment, Paris. <http://www.comminit.com/en/node/271583>

8. Castels, M., 1996. *The Information Age, the Rise of Network Society*. Blackwell, Cambridge, ISBN: 1-55786-617-1, pp: 556.
9. Kushner, J. and P. Chong, 2004. Conducive environments for promoting community e-centers. Proceeding of the Asian Development Bank Regional Workshop, Bali, Indonesia, pp: 276. <http://catalogue.nla.gov.au/Record/3623501>.
10. Lee, J.D. and H. Lee, 2004. Economic analysis of community e-centers for rural development. Proceeding of the Asian Development Bank Regional Workshop, Bali, Indonesia, pp: 276. <http://catalogue.nla.gov.au/Record/3623501>.
11. Mirzaei, A., 2003. Country report of Islamic Republic of Iran. Proceeding of the Study Meeting on Application of Information Technology for Effective Agricultural Extension, Feb. 20-21, New Delhi, India, pp: 27.
12. Oryokot, J., 2003. Increasing farmers access to information, knowledge and technologies, role of ICTs in Uganda. Proceeding of the CTA's 6th Consultative Expert Meeting of Its Observatory on ICTs, Sept. 23-35, CTA., Netherlands, pp: 90. <http://ictupdate.cta.int/fr/Dossiers/ICTs-transforming-agricultural-extension>.
13. Richardson, D., 2003. Agricultural extension transforming ICTs! championing universal access. Proceeding of the CTA's 6th Consultative Expert Meeting of Its Observatory on ICTs, Sept. 23-25, CTA., Netherlands.
14. Richardson, D., 2005. How Can Agricultural Extension Best Harness ICTs to Improve Rural Livelihood in Developing Countries. In: *ICT in Agriculture: Perspectives of Technological Innovation*, Gelb, E. (Ed.). European Federation for Information Technologies in Agriculture, Food and the Environment, Paris. <http://www.comminit.com/en/node/271583>
15. Schmitz, J.G., 2005. Agricultural Extension on the Web. University of Illinois. <http://www.digitaldivide.net/articles/view.php?ArticleID=363>
16. Stribhadung, R.A., 2006. Mobile device in e-learning. Proceeding of the 3rd International Conference on E-Learning for Knowledge-Based Society, Aug. 3-4, Bangkok, Thailand, pp: 35.1-35.5.
17. Surry, D.W., 2002. A model for integrating instructional technology into higher education. Proceeding of the Conference on American Educational Research Association, Apr. 2002, New Orleans.