

Full Length Research Paper

Identification of appropriate tools of information and communication technologies (ICT) in the improvement of food security of Iran's rural households

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Access to sufficient and desirable food is one of the principles of any developing and healthy society. One of the important means for attainment of food security is information and communication technologies (ICT). The purpose of the research was to identify appropriate tools of ICT in improving food security of Iran's rural households. The population for this research was 253 extension experts from eight provinces, out of this population, 170 were selected as sample by proportion stratified sampling between 2006 and 2007. This is an applied research with descriptive-survey methodology. The main tool for collecting data was questionnaire. After data extraction, statistical analysis was carried out using SPSS version 13. The results showed that from the view point of the experts, the situation of food security was unfavorable (81.2%). However, ICT can improve food security of rural households. From the viewpoint of experts, rural households have more accessibility to radio, television, phone, face to face interaction and audio cassettes. Radio, television, audio cassettes, workshop and scientific trips are more cost effective than other tools. In addition to television, workshop, scientific trips, exhibition and printed materials are more relevant to rural households needs. Rural households also have more access to old technologies; these technologies are more cost effective and more relevant to the households needs.

Key words: Information and communication technologies (ICT), tools, food security, rural households, agricultural extension experts.

INTRODUCTION

Access to desirable, sufficient, safe and nutritious food is a basic component of development and the health of a society. Thus, amongst developing country goals and priorities, food security is of utmost importance. Most observers of rural development believe that the necessary condition for obtaining food security is information. Knowledge and information are important factors for ensuring food security and information and communication technologies (ICT) have this capability to present the required information for improving food security.

According to the definition determined by the World Food Summit (1996), food security exists when all

people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1998). Food security for a household means access by all members at all times to enough food for an active, healthy life (CTA, 2005). In other words, food security is the guarantee of the physical availability and economical accessibility to sufficient food (produced with bioenvironmental and sustainable social methods) in terms of quantity (amount, distribution, calories) and quality (safe, nutritious and balanced), while cultural admittance for all people at all times means having healthy and active lives to preserve human places and degrees (Temu and Msuya, 2004).

Food security can be summarized according to three factors: food availability, food accessibility and food utilization. Food availability is achieved when a sufficient

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amount of food is constantly available for all members of the society. This kind of food can be obtained through household production, local production, imports or food aids. Food accessibility is obtained when households and individuals have sufficient sources to consume a suitable diet. In other words, food accessibility is possible if the household income allows for the preparation and purchase of enough food (Bakhtiari and Haghi, 2003). Food utilization refers to suitable biological uses of food that depend on a household knowledge of techniques for storing and processing food and basic principles of nutrition and caring for children (Sustainable Development Department, 2006).

The results of FAO research in relation to situation of food security in Iran showed that food security indicator in rural households was decreased during 1985 to 2005. Many nutritious experts also believe that nutrition pattern of rural households in Iran is not favorable. Therefore, in recent years for ensuring food security in Iran, different programs have been carried out, including increasing food production in 1945 to 1948, ensuring rate of strategic products in 1973 to 1981 and investing in agricultural sector in 1983 to 1987 (Ministry of Hygiene, Remedy and Medical Education, 2004).

Different strategies exist for obtaining food security; the use of information and communications technology is one of these strategies. ICT consist of various collections of resources and technical tools that are used for connecting, spreading, storing and managing information (Pigato, 2004). In other words, ICT represents the collection of hardware and software that is used for producing, preparing, transferring and storing data via devices such as computers, radios, televisions, etc., and it includes an extensive scope of traditional and modern media (Norad, 2002). In general, ICTs can be classified into three groups which are new ICTs, old ICTs and very old ICTs.

New ICTs

This group consists of computers, satellites, one-on-one connections, wireless phones (mobile), the internet, e-mail, the web, internet services, video conferences, CD-ROMs, personal computers (PC), distance control systems, informational-geographical systems, global positioning systems (GPS), electronic cameras, databases, etc. The hidden concept behind these technologies is that they are not automatically considered to be new, but their common and inexpensive availability has resulted in their being regarded as new.

Old ICTs

This group consists of radios, televisions, telephones telegraphs, audio and video cassettes, films and slides. This group of technologies has been used for several

decades.

Very old ICTs

This group of technologies has been used for several centuries and includes newspapers, books, photo albums, posters, theater, human interactions, markets and plays (Obayelu and Oyunlade, 2006).

Some studies have been carried out in relation to the role of ICTs in improving the food security of rural households. The main result of the FAO research (1998) is focused on the role of TV in increasing agricultural production.

The findings of the research of Fortier and Van Crowder (2000) about agricultural information projects in rural communities of Kenya showed that electronic diffusion can improve the ability of individuals to acquire information. The research of Gerster and Zimmermann (2003) focused on a radio program project aimed at improving financial decisions and increasing food production. Lashgarara et al. (2010) in his study found that old technologies are a determining factor on food security. Results of the study by Lashgarara and Mohammadi (2011) indicated that ICT tools such as computers, electric journals, website and mobile phones determined agricultural marketing.

In the development of fourth program of Iran, 10000 ICT rural offices have been predicated, but 2500 ICT office has been mobilized at present. There was no ICT rural office in Iran in 2000, but the quantity of ICT office in 2005 was 963, in 2006 it was 2287 and in 2007 it was 2446 (Information Technology Company, 2007).

The different technologies are currently being used by the agricultural extension experts, such as mobile phones, CD, fax, internet, radio, telephone and printed materials.

The main purpose of this research was to identify the appropriate tools of ICT for improving food security of Iranian rural households.

MATERIALS AND METHODS

This is an applied study. The methodology of this research was non experimental (descriptive), and manipulation of the variables was not possible, in that looking for identification opinions and viewpoints of experts was surveyed. The instrument that was used for data collection was a questionnaire. Content and face validity were established by a panel of experts consisting of faculty members and some specialists in the Ministry of Agriculture. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts. A pilot study was conducted with 20 persons who had not been interviewed before the earlier exercise, which determined the reliability of the questionnaire for the study. Computed Cronbach Alpha score was 87.0%, which indicated that the questionnaire was highly reliable.

For collection of data, the questionnaires were sent to the respondents by mail. The dependent variable was the experts' point of view about food availability and independent variable are the

Table 1. Classification of provinces of Iran according to influence coefficient of rural ICT.

Rank	Province	Coefficient of rural ICT	Range (%)
1	Qom	96	
2	Mazandaran	78.49	75-100
3	Golestan	75.09	
4	Kermanshah	63.59	
5	Chaharmahal	61.15	
6	Ilam	59.26	50-75
7	Southern Khorasan	53.65	
8	Isfahan	48.14	
9	Kerman	43.37	
10	Northern Khorasan	42.40	
11	Fars	38.60	
12	Boshehr	37.38	
13	Semnan	37.19	
14	Sistan	36.78	
15	Kohkiloye	36.51	
16	Qazvin	36.19	
17	Khozestan	35.43	
18	Western Azerbaijan	34.44	
19	Kordestan	34.21	25-50
20	Khorasan	29.21	
21	Eastern Azerbaijan	28.72	
22	Yazd	28.44	
23	Ardebil	26.00	
24	Tehran	24.46	
25	Hormozgan	22.85	
26	Zanjan	21.67	
27	Markazi	20.66	
28	Hamedan	19.46	Less than 25
29	Lorestan	7.34	
30	Gilan	5.25	

tools of ICT. The statistical research personnel consisted of 253 extension experts from agricultural organizations in eight provinces of Iran: Qom, Ilam, Kerman, Semnan, Qazvin, Kordistan, Tehran and Lorestan. The required research sample size was also calculated to be 170 people by using the Cochran formula. Thus, in a pre-test, 30 questionnaires were distributed, and the variance of dependent variable (food security) was calculated as $S^2 = 0.26$. Considering $N = 253$, $d = 0.05$ and $t = 1.96$, the required sample size was determined to be 155 people; to improve certainty; it was increased to 170 people.

$$n = \frac{N^2 t s^2}{N^2 d + t^2 s^2}, \quad n = 170$$

Thus, initially, among the 30 provinces of Iran, the eight listed earlier were chosen randomly in each category according to influence coefficient of rural ICT (Table 1).

The research sampling method was proportional stratified sampling. The necessary sample size was chosen randomly, according to the proportion number of experts in provinces

in Table 2.

To analyze the collective data, the software SPSS 13 was used. In the results, sections central tendencies mean, median and mode were used.

RESULTS AND DISCUSSION

In their opinion, most of the respondents' situation of food security in the Iranian rural households is undesirable (81.2%) (Table 3). Most respondents (36.5%) believed that ICT have much role in improving food security of Iran's rural households (Table 4). The results indicated that in the opinion of agricultural experts according to accessibility indicator, mobile, CD and fax (new ICT), radio, television and fixed telephone (old ICT) and face to face interactions, printed materials and album (very old ICT) were more suitable than other tools. Prioritizing was based on mean (Table 5).

Table 6 shows the prioritizing tools of ICT according to

Table 2. Number of chosen agricultural extension experts on selected provinces.

Province	Total number of expert	Number of chosen expert
Qom	21	14
Ilam	24	16
Kerman	32	21
Semnan	33	22
Qazvin	18	12
Kordestan	32	21
Tehran	67	47
Lorestan	26	17
Total	253	170

Table 3. Agricultural expert's point of view on food security situation (n = 170).

Situation	Frequency	Percentage	Cumulative percent
Unsuitable	138	81.2	81.2
Medium	21	12.4	93.6
Suitable	11	6.4	100

Median, Unsuitable; mode, unsuitable.

Table 4. Role of ICT in improving food security of Iranian rural households.

Role	Frequency	Percent	Cumulative percent
Little	15	8.8	8.8
Medium	60	35.3	44.1
Much	62	36.5	80.6
Very much	33	19.4	100

Median, medium; mode, much.

the economical indicator. The results shows that in the opinion of the agricultural experts according to economical indicator, CD, fax and internet, audio cassette, radio and television, printed materials, album, charts and diagrams were more suitable than other tools.

Prioritizing tools of ICT according to delivering contents based on clientele needs indicator are shown in Table 7. The findings showed that in the opinion of agricultural experts, CD, internet, mobile phone, television, radio, fixed telephone, workshop, field trip and exhibition were more suitable than other tools.

Results of Table 8 indicates that according to accessibility, economical and delivering contents based on clientele needs indicators, old ICT, very old ICT and new ICT were appropriate based on mean, respectively.

We also conclude that according to delivering contents based on clientele needs indicators, economical and accessibility indicators, very old ICT were appropriate, respectively.

Old ICT according to accessibility, economical and

delivering contents based on clientele needs indicators were suitable, respectively. Finally, according to delivering contents based on clientele needs indicators, economical and accessibility indicators, new ICT were appropriate, respectively.

This research showed that the food security situation of rural households was undesirable. From the experts' point of view, ICT have an important role in improving this situation. At present, access to old technologies is more than that to new and very new ICT in rural areas, because the government makes more preparations for these kinds of technologies. According to economical indicators, old ICT is more suitable, because the cost of preparation of these technologies is low. Lashgarara et al. (2010) in his study found that old technologies are a determining factor on food security. Prioritizing tools of ICT according to accessibility indicator showed that among the old and new technologies, radio and mobile phone are the best tools. The research of Gerster and Zimmermann (2003) focused on a radio program. Results

Table 5. Prioritizing tools of ICT based on accessibility indicator.

Technology	Tool	Mean
New ICT	Mobile	4.6
	CD	4.3
	Fax	4.1
	Internet	3.9
	Satellite	3.8
	Electronic sources	3.7
	Video conference	3.6
Old ICT	Radio	3.5
	Television	3.4
	Fixed telephone	3.2
	Audio cassette	3.1
	Visual cassette	3
	Telegraph	2.95
Very old ICT	Face to face	2.9
	Printed materials	2.8
	Album	2.7
	Charts and diagrams	2.5
	Workshop	2.2
	Field trips	2.1

1, Completely undesirable; 2, undesirable, 3, moderate, 4, desirable, 5, completely desirable.

Table 6. Prioritizing tools of ICT according to economical indicator.

Technology	Tool	Mean
New ICT	CD	4.7
	Fax	4.6
	Internet	4.5
	Mobile	4.4
	Electronic sources	4.3
	Satellite	4.2
	Video conference	4.1
Old ICT	Audio cassette	4.0
	Radio	3.9
	Television	3.8
	Visual cassette	3.7
	Telephone	3.6
	Telegraph	3.5
Very old ICT	Printed materials	3.2
	Album	2.9
	Charts and diagrams	2.7
	Conference	2.5
	Exhibition	2.4
	Field trips	2.2
	Face to face	2.1
Workshop	1.9	

1, Completely undesirable; 2, undesirable; 3, moderate; 4, desirable; 5, completely desirable.

Table 7. Prioritizing tools of ICT in according to delivering contents based on clientele needs indicator.

Technology	Tool	Mean
New ICT	CD	4.5
	Internet	4.3
	Mobile	4.2
	Fax	4.0
	Video conference	3.9
	Electronic sources	3.7
	Satellite	3.6
Old ICT	Television	3.3
	Radio	3.1
	Telephone	2.9
	Audio cassette	2.7
	Visual cassette	2.5
	Telegraph	2.3
Very old ICT	Workshop	2.1
	Field trips	1.9
	Exhibition	1.8
	Printed materials	1.7
	Face to face	1.4
	Album	1.3
	Charts and diagrams	1.2
Conference	1.0	

1, Completely undesirable; 2, undesirable; 3, moderate; 4, desirable; 5, completely desirable.

of the study by Lashgarara and Mohammadi (2011) approve these findings too. Based on delivering contents of clientele needs, old tools are more suitable. Perhaps more use of these technologies by households is related to more interest of rural households to use them and the appropriate contents too. Prioritizing tools of ICT according to triple indicators shows that one of the most important resources for food security improvement is electronic sources. More consideration for these sources is needed. The findings from the research of Fortier and Van Crowder (2000) showed that electronic diffusion can improve the ability of individuals to acquire information.

According to most of the experts' point of view, much more precise considerations regarding the use of ICT in improving food security of rural households is completely necessary and logical. Actions such as identifying and assessing appropriate ICT for fulfilling participatory needs, ensuring appropriate ICT for improving food security, ensuring appropriate software and hardware, providing everybody equal access to ICT, considering clientele needs in presenting programs and information, investing in ICT and promoting technical-information infrastructures for these purposes are essential.

Conclusion and recommendations

1. Since household have more accessibility to radio, television, telephone and audio cassette, more accessibility of rural consideration for these technologies is essential.
2. Regarding the fact that tolls such as radio, television, audio cassette, workshop and field trip are more economical for rural household, more use of this kind of technologies is suggested.
3. More consideration to tools such as television, workshop, field trip, exhibition and printed materials, is essential because these kinds of tools are more suitable for meeting the needs of clienteles.
4. Finally, for improving food security of Iran's rural household, the use of old technologies is completely necessary, because these kinds of tools are more economical and suitable for the needs of clienteles. On the other hand, most of the rural households do not have access to new ICT. Considering that these kinds of technologies are not economical, more attention to their preparation and a revision of their contents is very important to better meet the needs of the clienteles.

Table 8. Prioritizing tools of ICT according to three indicators.

Indicator	Technology (tool)	Mean
Accessibility	Old	4.5
	Very old	4.1
	New	3.8
Economical	Old	4.7
	Very old	3.8
	New	3.3
Delivering contents based on clientele needs	Old	4.6
	Very old	3.8
	New	3.1

1, Completely undesirable; 2, undesirable; 3, moderate; 4, desirable; 5, completely desirable.

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