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Determining the Casual Model the Role of Information and Communication Technologies in Improving Food Accessibility of Iranian Rural Households

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Abstract: Access to desirable, sufficient, safe and nutritious food is one of the basic components of the development and health of a society. Information and communications technologies (ICTs) represent an important strategy that can be used in attaining food accessibility. An increase in the capability of these technologies in different areas and the consideration of the problems that are faced by rural Iranian households regarding food accessibility are areas that need to be investigated. The main purpose of this research, performed in 2006-2007, was to identify the effectiveness of ICTs in improving the food accessibility of rural Iranian households. A descriptive methodology was applied in this research, through questionnaires. The statistical population for the study included 253 agricultural extension experts; from this population, 170 persons were selected. The results showed that, according to the experts' point of view, the situation of food accessibility in rural Iranian households was unsuitable, but that ICTs could play an important role in improving the situation. The results of stepwise regressions showed that decreasing costs to access to information, improving the ability to acquire knowledge for individuals, considering clientele needs, Clientele-oriented programs and content of old technologies were determined to account for 69% of the variance of the food accessibility of rural Iranian households. Moreover, the path analysis technique demonstrated that improving the ability to acquire knowledge for individuals had the greatest influence on determining the casual model of improving the food accessibility of rural Iranian households ($\beta = 0.95$).

Key words: Information and communications technologies · Food accessibility · Rural households

INTRODUCTION

Access to desirable, sufficient, safe and nutritious food is a basic component of development and health of a society. Thus, when developing country goals and priorities, food security is of utmost importance. Most observers of rural development believe that, currently, the necessary condition for obtaining food security is information. Knowledge and information are important factors to ensure food security and ICTs have the ability to present the information required 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. Food security for a household means access by all members at all times to enough food for an active, healthy life [1]. In other words, food security is the guarantee of the physical availability of and economical accessibility to sufficient food (produced with bioenvironmental and sustainable social methods) in terms of quantity (amount, distribution, calories) and quality (safe, nutritious, balanced), while cultural admittance for all people at all times means having healthy and active lives to preserve human places and degrees [2].

Food Security Can Be Summarized According to Three Factors: Food availability, food accessibility and food utilization. Food availability is achieved when a sufficient amount of food is c onstantly available for all members of 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.

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In other words, food accessibility is possible if the household income allows for the preparation and purchase of enough food [3]. 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 [4].

Different strategies exist for obtaining food security; the use of information and communications technology is one of these strategies. ICTs consist of various collections of resources and technical tools that are used for connecting, spreading, storing and managing information [5]. 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 [6]. In general, ICTs can be classified into three groups:

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 them 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 [7].

Information and communications technologies have an important role in different aims, such as those of increasing rural decision power, extending rural markets, preserving the environment, increasing life quality and empowering the rural poor. It is also important in several domains including social development, research, education, extension, the management and control of organization, gender equality, hygiene, the environment, agriculture and nutrition.

According to Chowdhury [8], ICTs play an important role in food security through facilitating accessibility to related policies and information for market communication, improving market profitability, helping farmers to make decisions, increasing diversity in rural economies and reducing the cost of living. In general, some of the important capacities of ICTs in food security are related to improving communications between research systems, farmers and extension, improving accessibility to information regarding inputs, introducing technologies, providing more rapid accessibility to high quality information, ensuring information about the appropriate times and places for optimized sales of agricultural products, increasing agricultural products and decreasing agricultural waste products [9, 10, 2].

Many 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 [11] focused on creating an agricultural communication network project in Italy has helped to ensure agricultural inputs and product marketing. The results of Indonesia's participatory video project (1998) have been considered to help with clientele needs. The findings from the research of Fortier and Van Crowder [12] about the electronic diffusion of agricultural information projects in rural communities of Kenya can improve the ability for individuals to acquire information, increase food production and develop the local capacity of rural community building. The research of Gerster and Zimmermann [13] focused on a radio program project aimed at improving financial decisions and increasing food production. The findings of Uganda's knowledge system and agricultural information project are related to improving the power of acquiring individual information and attending to clientele needs (2000). The results of PCARRD [14] research regarding the Philippines' information services and agricultural technology were used to improve the marketing of agricultural products and to increase production. The findings of Bangladesh's rural ICT project (2001) resulted in better marketing of agricultural products, decreased costs of accessing information and the creation of jobs. The main results of Malaysia's E-bario project pertained to the improvement of interactions and communications and responses to clientele needs.

In development fourth program of Iran, 10000 ICT rural offices have been predicated, but 2500 ICT office has been mobilized at the present. There was no ICT rural office in Iran in 2000, but the quantity of ICT office in 2005 was 963, in 2006, 2287 and in 2007, 2446 [15].

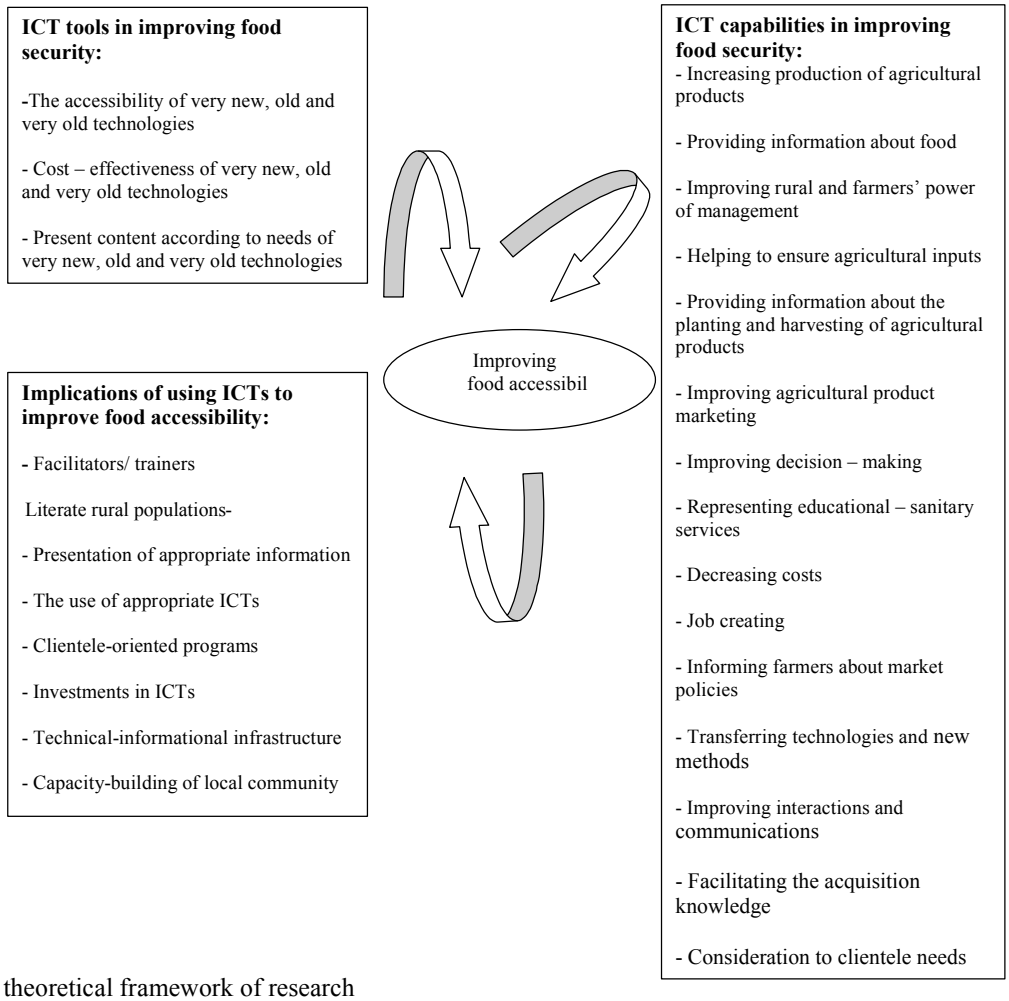

Fig. 1: The theoretical framework of research

The results of FAO research in relation to situation of food security in Iran showed that food security indicator in rural households has been decreased during 1985-2005. Therefore, in recent years for ensuring food security in Iran, different programs have been carried out, including increasing food production in 1945-1948, ensuring rate of strategic products in 1973-1981 and investing in agricultural sector in 1983-1987 [16].

In addition, above mentioned solutions, using ICT for improvement food security of rural households can be an important option, because the key element in rural development in general and food security in particular, is information.

The main purpose of this research was the identification of the effective capabilities of information and communications technologies for improving the food accessibility of rural Iranian households. With this purpose in mind, the following objectives were compiled:

- The study of the personal and professional characteristics of extension experts.
- The study of the situation of food accessibility in rural Iranian households, from the extension experts' point of view.
- The examination of the role of information and communications technologies in improving the food accessibility of Iranian rural households.
- The determination of the casual model role of information and communications technologies in improving the food accessibility of Iranian rural households. The theoretical framework has been showed in Figure 1.

MATERIALS AND METHODS

The methodology of this research was descriptive and it was carried out as a survey. The instrument that was used for data collection was a questionnaire.

Table 1: Divisiveness of provinces of Iran according to influence coefficient of rural ICTs

Rank	Province	Coefficient of rural ICTs	Range
1	Qom	96.00	75-100%
2	Mazandaran	78.49	
3	Golestan	75.09	
4	Kermanshah	63.59	50-75%
5	Chaharmahal	61.15	
6	Ilam	59.26	
7	Southern Khorasan	53.65	
8	Isfehan	48.14	25-50%
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	
20	Khorasan	29.21	
21	Eastern Azerbaijan	28.72	
22	Yazd	28.44	
23	Ardebil	26.00	
24	Tehran	24.46	Lower 25%
25	Hormozgan	22.85	
26	Zanjan	21.67	
27	Markazi	20.66	
28	Hamedan	19.46	
29	Lorestan	7.34	
30	Gilan	5.25	

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

Province	Total number of experts	Number of chosen experts
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

The research independent variables consisted of: (A) ICT capability in improving food accessibility (B) ICT tools(C) implications of the use of ICTs for improving food accessibility (as you see in Figure 1) and (D) personal characteristics of extension experts: gender, age, job record, level of education, major and workplace. The dependent variable was the experts' point of view about food accessibility; to assess it, 13 statements were used in the form of a five-point Likert scale (from very unsuitable to very suitable) and the mean score of the answered questions was identified as the respondent's attitude. After computing the statements, they were examined on an interval scale. Some of these statements were related to governmental policies in relation to fixing of food prices, Situation of food supply to rural households, Situation of country transportation, amount rate of rural households incomes, amount rate of rural household accessibility to credit, Governmental policies in relation to poverty alleviation of rural household and governmental policies in relation to insurance of agricultural products. 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 Cockran formula. Thus, in a pre-test, 30 questionnaires were distributed and the variance of the dependent variable (food accessibility) was calculated as $S^2 = 0.26$. Using N = 253, d = 0.05 and t = 1.96, the required sample size was determined to be 155 persons; to increase certainty; it was increased to 170 persons.

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

The research sampling method was stratified. Thus, initially, among the 30 provinces of Iran, the 8 provinces listed above were chosen randomly (Table 1).

To maintain the proportion between research personnel size N = 253 and sample size N = 170 in each province, the necessary sample size was chosen randomly, according to the number of experts in those provinces (Table 2).

To analyze the collective data, the software SPSS 13 was used. For descriptive statistics, mean, median, mode and coefficient of variation and inferential statistics methods such as correlation, regression and path analysis were used.

RESULTS AND DISCUSSION

First Purpose

The Study of the Personal and Technical Characteristics of Extension Experts: The results of this research showed that 131 of the experts were men (77.1%) and 39 persons were women (22.9%). The major of most respondents was agricultural extension (36%). Most of the experts were working in Tehran (27.67%).

Table 3: Agricultural expert's point of view about food accessibility of Iranian rural households (n=170)

Situation	Frequency	Percent	Cumulative percent
Unsuitable (14 – 27)	98	6/57	6/57
Medium (28 – 41)	62	5/36	1/94
Suitable (42 – 55)	10	9/5	100

Mean: 23 Median: 27 Mode: 24

Table 4: Priority setting of food accessibility of Iranian rural households in agricultural expert's point of view

Priority	Statements	Coefficient of variation
1	Amount rate of rural household accessibility to credit	2859/0
2	Governmental policies in relation to insurance of agricultural products	288/0
3	Situation of food supply to rural households	3137/0
4	Amount rate of rural households incomes	3416/0
5	Amount rate of rural households costs	3422/0
6	Situation of country transportation	3631/0
7	Governmental policies subsides for helping to rural	3695/0
8	Governmental policies in relation to poverty alleviation of rural household	3776/0
9	Foreign threats	4049/0
10	Governmental policies in relation to fixing of food prices	416/0
11	Percent of rural households suffering poverty	4739/0
12	Amount rate of unemployment in agricultural sector	5059/0
13	Amount rate of country inflation	3416/0

Of all the experts, 116 experts (68.2%) had a Bachelor's degree and 53 persons (31.2%) had Master's degrees. Most respondents (41.8%) had 12 – 17 years of job experience; the mean was 12 years and the values ranged from 1 to 29 years.

Second Purpose

The Study of the Situation of Food Accessibility of Rural Iranian Households According to Agricultural Extension Experts' Point of View: In order to assess the current food accessibility situation of rural Iranian households, 21 statements were used. The scores for these statements were added together and then recoded. According to the number of statements and the Likert scale for examining food security (1- very unsuitable, 2- unsuitable, 3- medium, 4- suitable, 5- very suitable), the lowest and the highest scores for one respondent were 13 = (13x1) and 65 = (13x5). After recoding, the score of a very unsuitable situation was (1- 13), the score of an unsuitable was (14- 27), the medium was (28- 41), suitable was (42- 55) and very suitable was (56- 69). The results of the research indicated that most of the respondents (57.6%) assessed the food accessibility situation of rural Iranian households as unsuitable (Table 3).

The priority settings of food accessibility statements were determined using coefficient variation statistics. In this way, each statement that had a lower coefficient variation was related to a more important situation. According to the results shown in Table 4, in the experts' point of view, the conditions of rural Iranian households were favorable with regard to amount rate of rural household accessibility to credit (0.2859), governmental policies in relation to insurance of agricultural products (0.288) and situation of food supply to rural households (0.3137). However, percent of rural households suffering poverty (0.4739), amount rate of unemployment in agricultural sector (0.5059) and amount rate of country inflation (3416/0) the food security of these households faced serious problems.

Third Purpose

The Examination of the Role of ICTs in Improving the Food Accessibility of Rural Iranian Households: To determine the role of ICTs in improving the food accessibility of rural Iranian households, a total of 48 statements were used. These statements were computed and then recoded. According to 48 effective ICT capabilities and the Likert scale for testing the role of ICTs in improving food availability (1- very little, 2- little, 3- medium, 4- much/ many, 5- very much / many), the lowest and the highest scores for each respondent were 48 (48x1) and 240 (48x5). After recoding, the very little score was (1- 48), little (49- 97), medium (98 – 145), much/ many (146- 194) and very much / many (195 – 243).

Table 5: The role of ICTs in improving food accessibility of Iranian rural households in extension Experts' point of view

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	100.0

Table 6: Pearson correlation coefficient between research variables & improving food accessibility

Variables	r	p
Presentation of appropriate information	*174/0	03/0
Management power of rural people and farmers	*161/0	02/0
Content of old technologies	**196/0	000/0
Improving decision-making	*172/0	01/0
Clientele-oriented programs	**21/0	001/0
Informing farmers about the market policies	*185/0	02/0
Improving interactions & communications	*147/0	02/0
Decreasing costs of accessing to information	**308/0	001/0
Improving individual power of acquiring knowledge	**237/0	002/0
Considering to clientele needs	**225/0	001/0

* = P<0.05, ** = P<0.01

Table 7: Stepwise regression analysis in improving food accessibility of Iranian rural households

Steps	R	R Square	Adjusted R Square	Std Error of the Estimate
1	0.59	0.345	0.281	3.36
2	0.70	0.491	0.414	3.24
3	0.77	0.593	0.532	2.86
4	0.83	0.693	0.624	2.63
5	0.88	0.777	0.691	2.27

Table 8: Standardized & unstandardized coefficients of improving food accessibility

Variables	Unstandardized Coefficients B	Std.Error	Standardized Coefficients Beta	t	Sig
Constant	562/21	697/1	----------	704/12	0.000
Decreasing costs of accessing to information (X1)	273/0	241/0	691/0	195/4	0.000
Improving individual power of acquiring knowledge (X2)	323/0	211/0	611/0	242/3	0.002
Considering to clientele needs (X3)	394/0	174/0	523/0	114/3	0.002
Clientele-oriented programs (X4)	482/0	162/0	404/0	945/2	0.003
Content of old technologies (X5)	574/0	153/0	295/0	746/2	0.002

The results shown in Table 5 indicate that most respondents (36.5%) assigned an important role to ICT capabilities in improving the food accessibility of rural Iranian households.

On the other hand, the food accessibility of rural Iranian households was examined with 13 statements and the 5-point Likert scale that, after being computed, became a quantitative variable.

According to the results shown in Table 6, the presentation of appropriate information, the management power of rural people and farmers, improving decision-making, informing farmers about the market policies and improving interactions & communications had a positive and significant relationship at the 95% level and content of old technologies, clientele-oriented programs, decreasing costs to information, improving individual power of acquiring knowledge and considering to clientele needs had a positive and significant relationship at the 99% level with improving the food accessibility of rural households. The other variables did not have any significant relationships with the improvement of food availability of rural households. Both the food accessibility and the independent variables shown in Table 6 were measured in intervals, thus the Pearson correlation coefficient was used.

In order to determine the improvement of food accessibility of rural Iranian households, all of the variables shown in Table 6 were entered into a stepwise regression analysis. The analysis results are shown in Tables 7 and 8.

According to Table 7, decreasing costs of accessing to information, improving individual power of acquiring knowledge, considering to clientele needs, clientele-oriented programs and content of old technologies were entered as stepwise regressions.

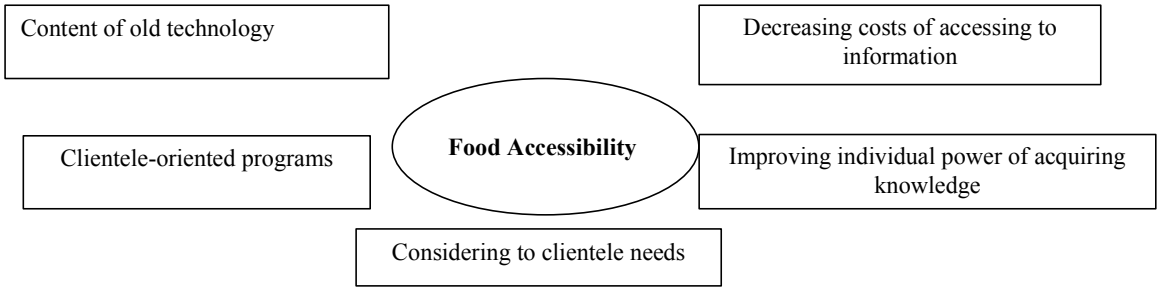

Fig. 2: The factors determining food accessibility of Iranian rural households

In the first step, decreasing costs of accessing to information was entered in the regression equation and it was determined that 28% of the variance of the dependent variable (food accessibility). In the second step, improving individual power of acquiring knowledge and the previous variable represented 41% of the changes. In the third step, considering to clientele needs and the two previous variables were determined to represent 53% of the changes. In the fourth step, clientele-oriented programs and the three previous variables were determined as 62% and finally in the fifth step, content of old technologies and the previous variables were determined 69% of the food accessibility. In total, when entering all of these variables, the result was $R^2 = 0.691$. This coefficient shows that 69.1% of the food accessibility of rural households' variance was related to these five variables. The regression significance was also calculated by the F-test; it was significant at the 99% level (sig = 0.000).

This research confirmed the results of Fortier (2000), Zimmermann and Gerster (2003), PCARRD (2003), rural ICT of Bangladesh (2001) and E-bario Malaysia (2003).

The variables that were entered in the regression equation were the main part of the regression analysis and are shown in Table 8. The related T-test of regression coefficient showed that these coefficients were significant and in estimate is Y.

According to the results shown in Table 8, the regression equation according to B and β quantities were, respectively:

$$Y = 21.562 + 0.273x_1 + 0.323x_2 + 0.394x_3 + 0.482x_4 + 0.574x_5$$
$$Y = 0.691x_1 + 0.611x_2 + 0.523x_3 + 0.404x_4 + 0.295x_5$$

Figure 2 shows collections of determining and effective factors in improving the food accessibility of rural Iranian households.

Fourth Purpose

The Determination of the Casual Model of the Role of ICTs in Improving the Food Accessibility of Rural Iranian Households: To determine the casual model of effective capabilities of ICTs in improving the food accessibility of rural households, a path analysis technique was used. To determine the path coefficients and calculate the direct and indirect influences of the variables, a regression technique was used. In each step, one variable is the dependent variable and the other variables of the regression analysis are independent variables, thus allowing for the calculation of the direct and indirect influences.

In the first step, food accessibility (X6) was the dependent variable and the other variables were independent variables. According to the quantities shown in the coefficient table (Table 8), the direct influences of decreasing costs of accessing to information (X1), improving individual power of acquiring knowledge (X2), considering to clientele needs (X3), clientele-oriented programs (X4) and content of old technologies (X5)) on food accessibility were 0.691, 0.611, 0.423, 0.523, 0.404 and 0.295, respectively.

In the second step decreasing costs of accessing to information (X1) was the dependent variable and other variables were considered as independent variables. The direct influences of improving individual power of acquiring knowledge (X2), considering to clientele needs (X3), clientele-oriented programs (X4), improving interactions and communications (X3) and content of old technologies (X5) on food accessibility were 0.411, 0.271, 0.404, 0.295 respectively.

In the third step, decreasing costs of accessing to information (X1), considering to clientele needs (X3) and clientele-oriented programs (X4) on improving individual power of acquiring knowledge (X2) were calculated to be0.117, 0.128 and 0.411 respectively.

Table 9: Direct & indirect influences of independent variables on food accessibility

Independent variables	Indirect influences	Direct influences	Total direct & indirect influences
Decreasing costs of accessing to information (X1)	----	691/0	691/0
Improving individual power of acquiring knowledge(X2)	339/0	611/0	95/0
Considering to clientele needs (X3)	407/0	523/0	93/0
Clientele-oriented programs (X4)	328/0	404/0	732/0
Content of old technologies (X5)	219/0	295/0	514/0

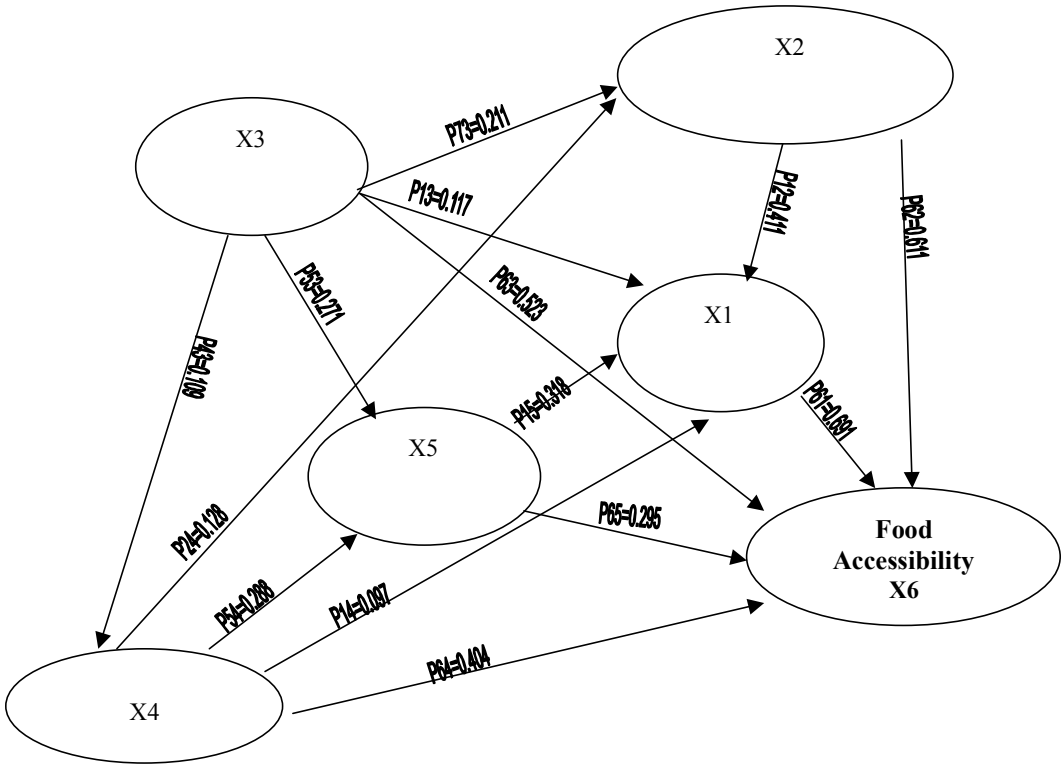

Fig. 3: Diagram of the path analysis of the improvement in rural Iranian household food accessibility with β coefficients

In the fourth step, considering to clientele needs (X3) on clientele-oriented programs (X4) was determined to be 0.109.

Finally, In the fifth step, considering to clientele needs (X3) and clientele-oriented programs (X4) on content of old technologies (X6) were 0.271 and 0.288.

Then, after obtaining the β coefficients, the indirect influences of each independent variable on the dependent variable can be calculated. To calculate the indirect influences, the β coefficients of each path were multiplied by each other until reaching the dependent variable. Each variable had both direct and indirect influences such that casual influences were obtained from all of them.

After calculating of direct & indirect influences of all variables, all of these influences are summarized in Table 9.

According to Table 9, decreasing costs of accessing to information (X1) had the most direct influence (0.691), considering to clientele needs (X3) had the most indirect influence (0.407) and overall, improving individual power of acquiring knowledge (X2) had the most influence on determining the casual model of improving rural household food accessibility (0.95).

The results obtained here are consistent with the results of the VERCON project in Egypt (2000), the Indian global center of agricultural information (2000), research regarding the Philippines' information services and agricultural technology (2003) and E-bario in Malaysia (2003).

The diagram of the path analysis of the casual model of food accessibility is shown in Figure 3.

Decreasing costs of accessing to information (X_1), Improving individual power of acquiring knowledge (X_2), Considering to clientele needs (X_3), Clientele-oriented programs, (X_4) and Content of old technologies (X_5).

CONCLUSION AND RECOMMENDATIONS

This research, carried out to study the role of information and communications technologies in improving the food accessibility of rural Iranian households, has shown that the food accessibility situation of rural households is unsuitable. This means that factors such as percent of rural households suffering poverty, amount rate of unemployment in agricultural sector and amount rate of country inflation not only problematic but that they also threaten the food accessibility situation of rural Iranian households. In the experts' view, information and communications technologies can have an important role in improving the food accessibility of rural households.

ICTs have an important role in improving the food accessibility of rural households through increasing production and incomes, decreasing costs of accessing to information, improving individual power of acquiring knowledge, considering to clientele needs and clientele-oriented programs. It can be concluded that:

- In considering that the situation of food accessibility of rural households is unsuitable, to achieve improvements in the food accessibility of rural households, more consideration should be paid to improving poverty alleviation policies, incomes improvements, job creating and harnessing of inflation.
- According to most of the experts' point of view, much more precise considerations regarding the use of information and communications technologies in improving the food accessibility of rural households are completely necessary and logical. Actions such as identifying and assessing appropriate ICTs for fulfilling participatory needs, ensuring appropriate ICTs for improving food security, ensuring appropriate software and hardware, providing equal access to ICTs for all people, considering clientele needs in presenting programs and information, investing in ICTs and promoting technical-information infrastructures for this purpose are essential.
- To improve the role of information and communications technologies in increasing the food accessibility of rural households, solutions such as the use of appropriate content from old technologies, for example, radios and televisions, for increasing individual power for searching accurate information, rapid access to update information, improving the quality of required information, more consideration to needs of rural households and designing mechanisms for decreasing costs of access to new technologies and information and providing equal access to ICTs for all people, are highly recommended. In addition to, being of experienced facilitators for vulgarization and preparing condition for using ICTs among rural households is important.

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REFERENCES

1. CTA, 2005. The Role of Information & Communications Tools In Food & Nutrition Security in Pacific Region. Regional Seminar on Apia (Samoa), pp: 26-30.
2. Temu, A. and E. Msuya, 2004. Capacity Human Building in Information & Communications Managements toward Food Security. CTA Seminar on the Role of Information Tools in Food & Nutrition Security, Mapto, Mozambique, pp: 8-12.
3. Bakhtiari, S. and Z. Haghi, 2003. Studying Food Security & Human Development in Islamic Countries. Agricultural Economic & Development Quarterly, 11th Year, No. 43 & 44, Winter of 2003.
4. Sustainable Development Department. 2006. Agricultural Extension,, Rural Development & Food Security Challenge. FAO Corporate Document Repository.
5. Pigato, M., 2004. Information & Communications Technology Poverty & Development in Sub-Saharan Africa & South Asia, Africa Region Working Paper Series, No. 20.
6. Norad, 2002. Information & Communications Technology (ICTs) in Development Cooperation. Network Agency for Development Cooperation.

7. Obayelu, A. and I. Ogunlade, 2006. Analysis of The Uses of Information & Communications Technology for Gender Empowerment & Sustainable Poverty Alleviation in Nigeria. International J. Education & Development.
8. Chowdhury, N., 2001. Information & Communications Technologies. In: Appropriate Technology for Sustainable Food Security. International Food Policy Research Institute.
9. Balakrishna, P., 2003. Food Security at Global, Regional & Local Criteria & the Development.
10. Maoz, A., 2004. Information & Communications Technology Adoption as a Tool for Agricultural Research Coordination & Information Dissemination. Institute of Agriculture & Food Systems Management.
11. FAO, 1998. Knowledge & Information for Food Security in Africa: From Traditional Media to the Internet. FAO Research, Extension & Training Division. Communication for Development Group, Extension, Education & Communication Service (SDRE).
12. Van Crowder, L. and F. Forteir, 2000. National Agricultural & Rural Knowledge & Information System (NARKIS): a Proposed Component of the Uganda National Agricultural Advisory Service (NAADS).
13. Gerster, R. and S. Zimmermann, 2003. Information & Communications Technologies ((ICTs)) & Poverty Reduction in Sub Saharan Africa. CH - 8805 Richterswil, Switzerl.
14. PCARRD, 2003. [Available on]: http://www.pcarrd.dost.gov.ph/fits/fits_home.html.
15. Information Technology Company, 2007. Report of Two Years Function of Communications & Information Technology in 9th Government.
16. Ministry of Hygiene, Remedy and Medical Education. 2004. National Document of Development: Food Security & Nutrition. 4th Program of Economic, Social & Cultural Development of Islamic Republic of Iran.