



## Attitude Tehran province expert toward role of biotechnology in improving food security

Farhad Lashgarara\*, Parvaneh Mohitabadi, Jamal Farajallah Hosseini

*Department of Agricultural Extension, College of Agriculture, Tehran Science and Research Branch, Islamic Azad University, Tehran, Iran*

Article published on May 09, 2014

**Key words:** Food security, biotechnology, experts, Tehran province

### Abstract

Nowadays, providing the food needs is one of the fundamental problems, as food security has become one of the governmental priorities. According to the current food insecurity and using biotechnology to produce inexpensive, healthy, and abundant food, the essentiality of this study is justified. This study was aimed at evaluating the attitude of Tehran province's experts toward the role of biotechnology in food security improvement. Results showed that the households' food security status is inappropriate. Results indicated that most of the respondents (57.3 percent) stated that the biotechnological requirements are highly effective for the food security improvement. In addition, according to the biologists, professional and efficient experts, participation and investment of the public and private sectors and government encouragements of the biotechnological products' producers play the main role in Tehran province's food security improvement. Also, regression analysis showed that the biotechnological requirements explained about 9.1 percent of the variance of the households' food security.

\*Corresponding Author: ✉

## Introduction

Out of the world's 6 billion population, according to estimation of the UN, 1 billion are suffering from chronic hunger; about 3 billion have not any food security, undernourished, and are near the critical feeding period. The severity of this situation is better seen when looking at the UN estimation indicating that about 18000 infants die from a direct or indirect malnutrition per day (Lashgarara, 2008). In the other hand, food supply is affected by several factors. To provide the food of world's 9 billion populations in 2050, the current production should be doubled. Realization of this objective depends on removing barriers such as the limitation of agriculture lands, water shortage, high cost of the energy, drop in investment in agricultural researches, and the increase of food waste.

World faces a large crisis, the crisis of food security. This crisis involves most of the poor and developing countries in Africa, Latin America and Asia, as the UN spokesman called the world's food crisis the Tsunami in silence (Chitham and Benson, 2007). Food security is the ability of all people at any time to have a physical and economical access to sufficient, certain, and nutritive food in order to meet their needs for having a well, active, and healthy life. This concept can be summarized by focusing on three items of food availability, accessibility and food utilization (Lashgarara, 2008).

Farmers of the poor countries, according to the mentioned problems, need to use a science such as biotechnology, which can has an effective role in providing the food for the present and future generations (Mirkarami, 2008).

Biotechnology, the golden science of the present century, is one the today's key technologies for mankind. Undoubtedly, biotechnology, in future, will have a more important role in the world's food, medicinal, and military security. Usefulness of biotechnology's role in food security has provided by Juma. Biotechnology is any kind of technology

application using bio systems, living organisms or their derivatives for making or modifying products, or initiating processes for special uses such as creating high-yield varieties, increasing the performance per unit area, production of products resistant to drought, pesticides, diseases, and insects increasing the nutritive value (organic and plant products), inexpensive food production, increasing the exports, reducing the use of poisons and chemical herbicide, and etc.

Biotechnology is an important option to fulfill the developing countries' long-term food needs. It can has a role in solving the issue of drought, products resistant to diseases, output increase, reduction of post-harvest loses, animal performance improvement, and regeneration of the marginal regions. The most important advantages of biotechnology include the production of agriculture items resistant to salinity, drought, pests and diseases, productions technologies well-matched with the environment, on time and inexpensive provide of agricultural inputs, increasing the quality of products, promotional services and technical helps for effective performance, special attention to the needs of rural women and etc (Juma and Konde, 2001).

Juma and Konde (2001) believe that the importance of using biotechnology in improving the situation of food security is to control the hunger and malnutrition in the world, better processing and quality improvement in addition to provide the nutritional needs.

Ahmadi (2007) stated about the use of new technology and its importance in the food security that in the field of agriculture and food sciences, the growth of world's population and increase of the demand for foodstuff have caused a serious and undeniable passage from traditional agriculture to a modern one and using new methods of biotechnology in producing agricultural and livestock products.

Farjallah Hosseini *et al.* (2011) in a study, identification of the private sector's participation in the developing agriculture biotechnology in Iran, stated that agriculture biotechnology has an important role in improving the quality of food produced by the farmers. In addition, findings showed that policy making is an important and effective factor on the participation of the private sector in the biotechnology field in Iran.

Permoz (2010) in a study, applications of biotechnology, concluded that biotechnology causes the production of high-quality and desirable food and agriculture products, durable breeding and production varieties, income for the country and reduction of dependence on oil.

Khezri (2007) in a study, role of biology in food security, stated that using agriculture biotechnology increases the distribution of basic foodstuff, provides a part of the country's economical growth, makes employment for the active forces, increases the nonoil exports, increases the coefficient of self-sufficiency and reduces the country's coefficient of Vulnerability.

Mahboodi and Sanei (2007), in a study, biotechnology form the scientific backgrounds of yesterday to the practical application of today, stated that biotechnology in agriculture controls the world's hunger and malnutrition, remove the additional costs of production and reduces the use of herbicides.

Virchow and Qaim (2004) in a study, the role of biotechnology in the world's food security (case study of Kenya and Mexico), concluded that there is significant relationship between using the biotechnology in agriculture and product improvement, production of resistant products, increase of the production power, reduction of risk taking in production, access to the world's foodstuff with reasonable prices, increase of incomes gained through agriculture production and employment for poor villagers.

Kropiwnicka (2005) in a study, biotechnology and food security in the developing countries, stated that the protection and reinforcement of the developing countries' food safety depend on measures such as protecting the biodiversity and the rights of farmer, research and development in order to handle the developing countries' food needs, and development of humanitarian activities of the developed countries for the future generations.

Ozor and Igbokwe (2007) in a study, role of agriculture biotechnology in providing the food security of the developing societies, concluded that using agriculture biotechnology causes paying less prices for food, growth of plants resistant to diseases, pests and stressors, high profits in producing foodstuff, direct modification of plants, response to the new needs, development of cultivation, growth of agriculture production power, reduction of using chemical fertilizers, pesticides and insecticides, improvement of the water use efficiency, possibility of effectively controlling of weeds, preservation of the biodiversity, protection of soil fertility, improvement of nutritive value and major reduction in the costs of work and energy.

Nyange *et al* (2011) in a study, biotechnology for sustainable agriculture, food security, and poverty reduction in Africa, concluded that the agriculture biotechnology is capable to increase the production power, produce products with high economical importance, produce products resistant to drought and rate of salinity, and increase the nutritive value and foodstuff's useful life.

Omiti *et al* (2002) in a study, the role of agriculture biotechnology in reducing poverty and hunger in the developing countries, concluded that the problems of progress in using biotechnology in the developing countries are the farmers' unawareness or lack of information on the advantages of using biotechnology in agriculture, consumer's pessimism (fear of risk) and lack of professionals.

Given that the plant genetic resources are the most valuable reservations of any country, creating plant varieties with high performance in order to achieve food security depends on the access to these resources. Having more than 8000 species, Iran is one of the richest plant genetics resources of the world. Sustainable protection, identification, and use of this amazing genetic variety seen in Iran's genetic resources is critical for success in any breeding and/or plant biotechnology plan (Najafi, 2006). Because of its 14 million population and modest climate, use of new biotechnologies is necessary in Tehran province, while 5.3 percent of the added value of the country's agriculture is designated to this province and it (with 202 thousand hectares of agriculture lands) produces 5.2 million tons of agriculture products making it the fifth producer in the country.

This study was aimed at evaluating the attitude of Tehran province's experts toward the role of biotechnology in food security. In order to achieve this objective, specific objectives are presented as below:

- Evaluating the rate of the expert's awareness of using biotechnology in food security improvement
- Identification of barriers and limitations for using biotechnology in food security
- Identification of requirements of using biotechnology in food security
- Identification of effective capabilities of biotechnology in food security improvement

## **Materials and methods**

### *Research Method*

This is an applied study. The analysis used in this study involved a combination of descriptive and quantitative research and the methodology is descriptive co relational.

### *Statistical population*

Statistical population of the study was 90 faculty members of national research center of biotechnology and Iran's biotechnology research institute.

### *Validity and Reliability*

Content and face validity were established by a panel of experts consisting of faculty members and some specialists. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts. A pilot study was conducted with 30 persons. Cronbach Alpha score was between 0.906 - 0.978 %, which indicated that the questionnaire was highly reliable.

### *Variables*

Dependent variable of this study is food security, to assess it, 24 statements were used in the form of a five-point Likert scale (from very inappropriate to very appropriate). According to these items and Likert scale for identifying the situation of food security (too inappropriate: 1, inappropriate: 2, Moderate: 3, appropriate: 4 and too appropriate: 5), the lowest and highest score for one respondent were  $24 = (1 \times 24)$  and  $120 = (5 \times 24)$ , respectively. After recoding, the scores for the too inappropriate, inappropriate, average, appropriate and too appropriate were 24-42, 43-62, 63-82, 83-120 and 102-122, respectively. Independent variables of the research are capabilities of biotechnology, requirements and challenges of biotechnology in food security. 22 items were used to evaluate the capabilities of biotechnology in food security. According to these 22 items and after recoding, the scores for the too little, little, average, high and too high situations were 22-38, 39-56, 57-74, 75-91 and 92-110, respectively. 17 items were used to evaluate the requirements of biotechnology in Tehran province's food security. After recoding, the scores for the very little, little, moderate, much and very much situations were 17-28, 29-46, 47-63, 64-80 and 81-97, respectively. 13 items were used to evaluate the experts' attitude toward the problems of using biotechnology to achieve food security. According to

these 13 items and after recoding, the scores for the very little, little, moderate, much and very much roles were 13-24, 25-37, 38-49, 50-61 and 62-73, respectively.

*Data Analysis*

For identify explaining variables, multiple regression analysis was used. Statistical analysis was done through SPSS Version 17.

**Results**

*Personal Characteristics*

Based on the collected information, 51 experts (56 percent) were male and 39 ones (42.9 percent) were female. Mean of work experience of them is averagely 56.7 years; less work experience was 1 year and the most was 17. 2 experts (2.2 percent) had BA degree of biotechnology, 33 ones (36.3) had MS degree and most of them, 55 ones (60.4 percent), had the PhD degree. Many respondents` (19.8 percent) field of study was molecular biotechnology, but the most was biotechnology (17.6 percent).

*Current Situation of Food Security*

Findings indicated that 73.4 percent of the respondents stated that the current situation of food security is unsuitable; only 2.6 percent believed that the current situation is suitable and very suitable (Table 1).

**Table 1.** Attitudes of biotechnology experts toward to food security situation (n=90)

Situation	Frequency	Percent	Valid percent	Cumulative percent
Very unsuitable	5	5.5	6.3	6.3
Unsuitable	58	63.7	73.4	79.7
Moderate	14	15.4	17.7	97.5
Suitable	1	1.1	1.3	98.7
Very suitable	1	1.1	1.3	100
Non respond	11	12.2	12.2	
Total	90	100	100	

Mode & Median: Unsuitable

Mean statistic and standard deviation were used to prioritize the current situation of Tehran households` food security. Each item having the highest mean is the first priority and vice versa. Findings showed that the Tehran households` food security is in an appropriate situation from the point of the family planning programs among citizens (2.91), the situation of food distribution for the citizens (2.81) and the amount of under cultivation agriculture lands (2.65).

*Biotechnology potential in Food Security*

Results indicated that most of the respondents (41.9 percent) believed that the role of biotechnological capabilities in improving the food security is in a moderate level (Table 2).

**Table 2.** Attitudes of biotechnology experts toward to biotechnology capabilities (n=90)

Situation	Frequency	Percent	Valid percent	Cumulative percent
Very little	18	20	20.9	20.9
Little	14	15.6	16.3	37.2
Moderate	36	40	41.9	79.1
Much	11	12.2	12.8	91.9
Very much	7	7.8	8.1	100
Non respond	4	4.4		
Total	90	100		

Mode & Median: Moderate

Mean was used to prioritize the items of biotechnological capabilities in improving the food security. According to the biotechnology experts of the province, results showed that producing products resistant to drought, pesticides, diseases and insects, reduction of agriculture products wastes, and creation of high-yield varieties have the most important role in Tehran province's food security improvement.

*Biotechnology implications in Food Security*

Results indicated that most of the respondents (57.3 percent) believed that the role of biotechnological requirements in improving food security is in a high level and only 2.2 percent believed that it is too little (Table 3).

**Table 3.** Attitudes of biotechnology experts toward to requirements biotechnology in food security (n=90)

Situation	Frequency	Percent	Valid percent	Cumulative percent
Very little	2	2.2	2.2	2.2
Little	12	13.3	13.5	15.7
Moderate	9	10	10.1	25.8
Much	51	56.7	57.3	83.1
Very much	15	16.7	16.9	100
Non respond	1	1.1		
Total	90	100		

Mode & Median: Much

In the other hand, mean was used to prioritize the biotechnological requirements in improving the food security. According to the biotechnology experts, results showed that being of professional experts; participation and investment of the public and private sectors, and the government's encouragement of the producers of biological products have the most important role in Tehran province's food security improvement.

Most of the respondents (70.9 percent) believed that the importance of the current barriers in using biotechnology in order to achieve food security is high (Table 4).

**Table 4.** Attitudes of biotechnology experts toward to biotechnology applying barriers in food security (n=90)

Situation	Frequency	Percent	Valid percent	Cumulative percent
Moderate	18	20	20.9	20.9
Much	61	67.8	70.9	91.9
Very much	7	7.8	8.1	100
Non respond	4	4.4		
Total	90	100		

Mode & Median: Much

*Biotechnology barriers in food security*

Based on the findings, according to the experts, government's lack of programming and policy-making in supporting the production of biological products (4.50), government's lack of financial support for using the biological methods (4.46), and

lack of support for the private sector to invest in biotechnology (4.33) are the most important barriers and problems facing the biotechnology to achieve food security.

*Explaining factors on Improving Food Security*

In order to identify explaining variables of food security improvement, by using regression analysis, variables of biotechnological capabilities, requirements and barriers were entered the multiple regression. Biotechnological requirements are the only variable entered the equation, meaning that the mentioned variable had the highest effect among the independent variables. In this stage, the coefficient of correlation (R=0.302), coefficient of determination (R<sup>2</sup>=0.091), and the adjusted coefficient of determination (Adj R<sup>2</sup>=0.078) were calculated. Based on this, the variable of biotechnological requirements explains about 8 percent of the food security variance (Table 5).

**Table 5.** Coefficients of multiple regressions analysis of food security improvement

V variables	B	Beta	Sig
Constant	45.623	-----	0.000
Transfer of technology	0.146	0.302	0.009

R= 0.302      R<sup>2</sup>= 0.091      R<sup>2</sup> adj= 0.078

Regression linear equation of food security is as below:

$$Y = 45.623 + 0.146 x$$

To identify the contribution and effect of each independent variable on food security improvement, the  $\beta$  equation is:

$$Y = 0.302x$$

**Discussion**

This study aimed at evaluating the attitude of Tehran province's experts toward the role of biotechnology in food security improvement, indicated that most of the respondents (73.4 percent) believed that the situation

of the province's food security is inappropriate. The current situation of the province households' food security is appropriate from the point of family planning programs among citizens, the situation of food distribution for the citizens and the amount of under cultivation agriculture lands. Lashgarara (2008) has concluded that the rate of rural households' access to credits, government policies concerning the insurance of agriculture products and the situation of distributing foodstuff to the citizens are desirable. Most of the respondents (41.9 percent) believed that the rate of biotechnological capabilities' role in the province's food security improvement is in average level. In addition, biotechnology has a important role in improving the province's food security form the point of producing products resistant to drought, pesticides, diseases and insects, reducing the agriculture products' waste and creating high-yield varieties, while Khezri (2007) and Ayres and Mc Calla (2002) believe that the main capability of biotechnology is the reduction of poverty and hunger. These results are agreed by pars Pars biology (2007), Arzanlou (2003), Mohammadzadeh (2010), Omiti *et al* (2002), Badeggi (2010). Findings indicated that most of the respondents (67.8 percent) believed that the importance of the current problems of using biotechnology in order to achieve the food security is high, in the other hand, according to the experts, government's lack of programming and policy-making in supporting the production of biological products, government's lack of financial support for using the biological methods, and lack of support for the private sector to invest in biotechnology are the most important barriers and problems facing the biotechnology to achieve food security, respectively, while Igbokwe and Ozor (2007) believe that lack of information and awareness in addition to the cultural weakness are the most important problems facing the biotechnology. These results are agreed by Omiti *et al* (2002).

Results indicated that most of the respondents (57.3 percent) believed that the role of biotechnological requirements in improving the food security is in high

level. In addition, according to the biotechnology experts, results showed that being of professional experts, participation and investment of the public and private sectors, and the government's encouragement of the producers of biological products have the most important role in Tehran province's food security improvement, while Sajad (2010) believed that publication of scientific journals and the existence of effective management are the effective factors in order to use biotechnology in food security. In the other hand, results are agreed by Ghasemi (2004), Parmoz (2010) and Omiti *et al* (2002). Results of explaining the food security indicate that the item of biotechnological requirements explains about 9.1 percent of the households' food security variance. Mohammadzadeh (2010), Kropiwnicka (2005) and Igbokwe and Ozor (2007) confirm the role of biotechnology in the food security improvement.

According the findings and results of the study, suggestions concerning the improvement of the biotechnology role in the food security are indicated below to improve the food security of Tehran province.

According to the inappropriateness of the food security's situation, for a better improvement of the food security, new governmental policies to fix the foodstuff's price, increasing the quality of natural resources and environment management, and improvement of the government's measures to integrate the lands are necessary.

More serious attention to use the biotechnological capabilities in improving the food security of the province's households is too necessary, so paying attention to items such as employment, creating opportunities for the producers to export biological products, providing strategies for a chipper production of biological products and increasing the quality of the products is too important and logical.

According to the experts' attitude indicating that the biotechnological requirements have an important role in improving the food security of the province's households, more and serious attention to items such as creating appropriate infrastructures in order to produce biological products, publication of scientific journals, developing the communicational bases, and identifying in addition to be aware of the needs of the global market is necessary to reinforce and preserve this role.

Paying attention to reinforce the international cooperation, encouraging the farmers to use biotechnological methods, and more investments to make better fields for using new technologies are necessary.

#### References

**Ahmadi M.** 2007. Biotechnology and agriculture. 8th Iran's genetic congress. University of Ferdowsi, Mashhad, Iran.

**Arzanlou M.** 2003. Recommendations for entering developing countries into biotechnology world market. Network of technology thinking and country economic.

**Ayres W, Mc Calla A.** 2002. Rural Development, Agriculture and Food security. Finance & Development. [Available on]: <http://www.fao.org>

**Chitham R, Benson A.** 2007. To fill of hungers through biotechnology. [Available on] with updates at Iran's agricultural science Journal).

**Ghasemi H.** 2004. Food security and nutrition and future challenges in country. Proceeding of the first agriculture congress and national development. Tehran: Institute of programming institute and agriculture economy. [Available on] with updates at <http://www.cassiator.com>).

**Igbokwe M, Ozor N.** 2007. Roles of agricultural biotechnology in ensuring adequate food security in developing societies. African Journal of Biotechnology **6 (14)**, 1597-1602.

**Juma C, Konde V.** 2001. The new biotechnology, industrial and environmental biotechnology in developing countries. United Nations. conference on trade and development. [Available on]: with updates at [http://ro.unctad.org/trade\\_env/test1/publications/newbioeconomy.pdf](http://ro.unctad.org/trade_env/test1/publications/newbioeconomy.pdf).

**Khezri M.** 2007. Food security and lawful of governments. Strategic studies center.

**Kropiwnicka M.** 2005. Biotechnology and food security in developing countries. The case for strengthening international environmental regimes magdalena kropiwnicka action Aid international, via Volta 39 B, 00153 Rome.

**Lashgarara F.** 2008. Feasibility of application ICTs in food security improvement of Iran's rural households perceived by agricultural extension experts. Ph. D diss., Dept. Agr Ext., Univ. science and research branch, Islamic Azad University, Tehran, Iran.

**Mahboodi F, Sanei A.** 2007. Biotechnology form the scientific backgrounds of yesterday to the practical application of today. Tehran: Ministry of health and remedy. Govt. of Iran, Tehran, Iran.

**Mirkarami A.** 2008. Investigation of effective factors on adoption of biotechnology in garden products from view point of experts. Ph. D diss., Dept. Agr Ext., Univ. science and research branch, Islamic Azad University, Tehran, Iran.

**Mohammadzadeh A.** 2010. The nineteen congresses of food industries with focus on biotechnology and technology in developing food security and quality of food industry. [Available on] with updates at [www.itanetwork.org](http://www.itanetwork.org)).

**Najafi A.** 2006. Managing of biodiversity. Opportunities and threats. Proceeding of 8th Iran's genetic congress. University of Gilan., Rasht, Iran.

**Nyange R, Kingamkono R, Kullaya A, Mneney E.** 2011. Biotechnology for sustainable agriculture, food security and poverty reduction in Africa. Smith-Gordon.

**Omiti J, Rosemary N, Mosoti S, Andama B.** 2002. Biotechnology can improve food security in Africa. Afr J of food and nut sci. **2 (2)**, 12.

**Pars biology.** 2007. Biotechnology usages in agriculture. Available on: <http://www.cassiator.com>

**Permoz S.** 2010. Biotechnology applications in agriculture. [Available on] with updates at <http://www.parsianforum.com>.

**Sajad A.** 2010. View of biotechnology in 2015. [Available on] with updates at [new-star.mihanblog.com](http://new-star.mihanblog.com)).

**Tonukari J, Douglason G.** 2010. Biotechnology and food security in developing countries. Bio and Mol Biol Rev. **5 (1)**, 013-023.