Estimation of Food Securityin Iran Based on The Main Food Groups

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ABSTRACT *Food security is an important aspect of constant development in human societies. In order to estimate food security in Iran, we require an index that is based on the first principle of food security and can estimate food security of the most main food groups by applying effective factors. The present study analyses the food security of five basic food groups during 1990-2009, using the food security index. The result of this estimation that is based on the differences of food products indicates lack of food security in red meat, relatively adequate food security in rice and eggs, and high food security in vegetables and wheat. An estimation of other indexes showed an imbalance in food consumption, Unstable self-sufficiency of wheat, but it also showed there was lack self-sufficiency in the other two groups during this period.*

The increase in protein productions such as red meat accompanied by insurance development for this product, and providing inexpensive production inputs, the growth of nutrition education and knowledge, the decrease of volatility in the production of some food products by employing qualified technology and management of the drought and also by creating a balance between the import of the basic agricultural products and the internal production of these commodities may result in stabilizing of the food products consumption, and generating and raise food security in all groups and eventually sustainable the food security in the country.

1. Introduction

Food is the first and the most fundamental human need for survival. Rural places are the generative centers of producing the raw materials and agriculture is regarded as the main activity in these regions. Food and nutrition is one of the important aspects of both economic and political development and sustainable health in society. The improvement of the society's nutrition is important since it is related to the growth, survival, lifespan, disease resistance, and increase in learning and therefore it leads to cost-reduction of health care services, development of human resource efficiency, growth of the output of the education and confirming the political and economic independence. The new definition of food security relies on three basic principles: first, providing an adequate amount of healthy and high-quality foods, second, ensuring consistency in supplying food, and finally, physical and economic availability of food in order to fulfill the basic needs. Regarding the importance of food security in people's lives, and also its great influence on various aspects of development, this article tries to employ an index that, considering some important factors and relying on the first principle of food security, can estimate and separate the most basic food products during the last two decades; identifying the most important factors, this article tried to figure out how the process of food security in the five main food groups works on a macro level. In order to analyze the operation of the adopted policies, it was necessary to examine self- sufficiency and consistency of the fundamental agricultural products during under study period and introduce some solutions to improve and stabilize food security.

There are numerous researches on the issue of food security, some of which are mentioned below: Simwalla and Valdes (1978) did some researches in North Africa and Middle East, Sub-Saharan Africa and Latin America and showed that one of the most important factors in food consumption quantity was the fluctuations in production. The impact of another factor showed that despite the decrease in wages in some of these countries, consumption of basic goods has been maintained by cutting down on the consumption of unnecessary goods. Examining the factors which caused lack of food security in developing countries, Smith et al. (1999) concluded that adequate food supply and purchasing power are two principal elements in food security. They found out that the execution of certain policy goals is influential in the improvement of food security. Employing the pattern of international agricultural development fund during 1970-2000, Sung et al. (2000) estimated food security in South Korea, and concluded that food security has been improving, from an adequate food security in the first decades to a high food security in the last decades. It showed an ascending trend. Calculating the general food security index in north Ethiopia, Ramakrishna and Assefa (2002) found out that these regions had high food security. Using Logit model, they also pointed out that elements such as the size of family, production rate, fertilizer demand, and education were effective in food security. Examining the effects of trade liberalization in Agriculture on Sudan's food security by using the multi-market model.Imad and Krischke (2003) concluded that higher world prices increases food security but if it causes an increase in the cost of production it will have an opposite result.Huffman and Jensen(2003) examined food security of families in the United States and concluded although food aid programs plays an important role in fulfilling low-income families' basic needs, and most of families have food security, but 10.7 percent of them have faced lack of food security and one third of these families were under-nourished in 2001. By estimating food security and human development indexes in Islamic countries.Bakhtiari and Haghi(2003) showed that there is a significant and positive relationship between food security and human development in these countries. They stated that foreign revenue and food products import are effective factors in the improvement of food situation in countries which have oil revenue. KhodadadKashi and Heidari (2004) estimated food security in urban families and rural families during 1985-2000, using the aggregate household food security index and concluded that the food security in both rural and urban families was high and it showed an ascending trend during these years. Using documentary method.Shakoori (2000) examined the relationship between the agricultural development and the food security after the 1979 Revolution in Iran and concluded that although the government has

been commencing significant proceedings in the field of agricultural and rural development policies, but it has proved unsuccessful in providing the constant availability to food security for everyone in the society. JafariSani and Bakhshoodeh(2008) tried to estimate the food insecurity index in 200 3 and concluded Carbohydrates deficiency is less observed comparing to calorie and protein deficiency, in fact carbohydrates consumption is more than the minimum daily requirement; and that protein deficiency is more severe than other deficiencies which shows less protein consumption than the minimum daily requirement.

Although there have been numerous studies concerning food security in Iran, but there has not been any research on the subject of food security especially focusing on the five food groups on a macro level, which also examines the most important and influential indexes in the last two decades. Accordingly, this article tries to estimate the food security in the most main food groups in the last two decades.

2. Materials and methods
The present research is employing a library-based methodology. The required statistics to estimate the food security index of the five food groups on a macro level were produced from the Food and Agriculture Organization raw data in 1990-2009. In order to estimate this index, the most main food groups according to their nutritional value and their place in providing Calories in the country, according to the latest data in the Iran's Food Balance Sheet were determined first. (Ebadi and SaeedNia, 2009). Therefore, wheat, rice, red meat, eggs and vegetables were recognized as the most main food groups. The total amount of calorie supplied calculated then. In order to do so, after reducing the amount of the waste, seed consumption, livestock feeds and changes in storing, the production and consumption rates of the five food groups were calculated and converted to calorie unit. This was later used as the base to calculate the index. In order to convert the production and consumption rates of each food product into the calorie unit, FAO calorie table for 100 grams of each food product (local nutritional value tables of nations, Iran) was used. The minimum amount of calories needed per day is different in each country based on the dietary patterns of its people. This article used the appropriate daily dietary pattern by Asgharzadeh (1996).IFAD has developed a guideline of FSI to assess food security as mentioned in the previous section and Sung et al. (2000) devised the following index based on the above three concepts for food security. This article also employed FSI that proposed follows:

$$FSI = a[(\frac{x_1}{1+x_6}(1+x_2)^x)] + b[x_4(\frac{x_3}{1+x_3})] \quad (1)$$

X_1: Calorie supply index

X_2: annual average growth rate of calorie supply

X3: production index for food

X_4: self-sufficiency index

X_5: coefficient of variations in production

X_6: coefficient of variations in consumption per capita

a and b are the weights for the variation of consumption and production for food,

respectively

n: the number of years for analysis.

Equations 1 consists of two parts. The first term of the right hand side explains food security resulted from consumption and the second term denotes food security from production. The index variable such as calorie supply index (x_1) and production index (x_3) are evaluated compared to the starting

time in the sample period, for example, if the production index in the starting time is 1, the second time can be relatively larger or smaller than the first. And the relative magnitudes of coefficient of variation in the production and consumption in the first and the second term of the equation. As people consume more food (x_1), food will be more secure. As more grains are produced (x_3), food will be secure. But the more risk in consumption (x_6) and production (x_5), that is, the more volatility in consumption and production harm the food security, the more insecure food is, while the self-sufficiency rate (x_4) increases food security.

3. Results and discussion
According to table 1, the result of the estimation of food security in the most mainly categorized food products during 1990-2009 shows that food security index based on the average of effective variables in wheat and vegetables was above the one, which means there is high food security in this food group. This index was estimated the same as the one in eggs and rice, which represent relatively adequate food security, and in the case of red meat it was below the one that indicate low food security in this food group.

The calorie supply index (x_1), in wheat, rice and vegetables are above the one and in the case of eggs it is below the one. This index, which is estimated according to the minimum daily requirement of an appropriate dietary pattern indicates that there is an unbalance in providing the daily required energy from different food groups based on their role in fulfilling the nutritional needs. The results showed that different groups within the society provide their daily required energy mainly from the food group of wheat and rice and the calorie intake of red meat and eggs is relatively less and at times it is even below the recommended level.

Table 1. Estimation of the food security index in the five basic food groups during the last two decades

Food products	X_1	X_2	X_3	X_4	X_5	X_6	FSI
wheat	1.85	0.01	1.54	1.04	0.42	0.33	1.34
rice	1.32	0.05	1.69	0.78	0.50	0.34	1.03
red meat	1.14	0.02	1.46	0.91	0.46	0.47	0.82
eggs	0.90	0.06	2.17	1.02	0.34	0.35	0.92
vegetables	1.93	0.07	1.95	1.03	0.34	0.50	1.42

According to table 2 and 3 we can conclude that the food security of wheat indicated an ascending trend in the last two decades, except 1998-2000 and 2007 when a drought caused a reduction in the production index and accordingly, the increase of wheat import decreased the self-sufficiency index. Therefore the increase of the coefficient of variations in production and consumption caused lack of food security

Table 2. Estimation of the food security index in the main food groups during1990-2009

Food products year	wheat	rice	Red meat	eggs	vegetables
1990	1.27	0.88	0.85	0.62	1.11
1991	1.35	1.16	0.79	0.75	0.86
1992	1.37	1.19	0.78	0.83	1.62
1993	1.44	1.13	0.81	0.91	1.13
1994	1.47	0.76	0.77	0.98	0.98

1995	1.16	1.69	0.78	0.81	1.17
1996	1.43	0.94	0.93	0.98	1.63
1997	1.46	0.83	0.85	0.78	1.21
1998	1.35	1.09	0.87	0.89	1.58
1999	1.32	0.94	0.71	1.02	1.46
2000	1.27	0.88	0.78	0.92	1.22
2001	1.36	0.73	0.83	0.95	1.30
2002	1.29	1.39	0.77	0.87	1.61
2003	1.35	1.07	0.86	1.05	1.34
2004	1.47	0.83	0.85	1.04	1.53
2005	1.35	0.98	0.81	1.17	1.70
2006	1.35	0.93	0.89	0.95	1.49
2007	1.40	0.93	0.86	1.09	1.60
2008	1.16	0.81	0.85	1.05	1.48
2009	1.31	0.70	0.87	1.03	1.78

1997	0.91	0.84	0.91	0.99	1.05
1998	1.11	0.92	0.91	1.00	1.04
1999	0.77	0.79	0.95	1.00	1.05
2000	0.71	0.66	0.99	1.07	1.05
2001	0.79	0.79	0.94	1.06	1.04
2002	1.11	0.80	0.99	1.04	1.03
2003	1.23	0.80	0.95	1.05	1.05
2004	1.27	0.81	0.93	1.03	1.03
2005	1.29	0.85	0.96	1.05	1.03
2006	1.35	0.81	0.94	1.05	1.10
2007	1.36	0.89	0.92	1.00	1.01
2008	0.69	0.72	0.90	1.00	1.02
2009	1.17	0.89	0.89	1.00	1.01

There have been a lot of volatility the food security of rice. Although the self-sufficiency index of rice indicated a relatively ascending trend, but it was below the one in all these years. The food security of eggs has indicated an ascending trend and its self-sufficiency has been up to the expectations in these years.

The food security of red meat indicated an ascending trend, although it was below the estimated level all these years, which represent lack of food security in this product and self-sufficiency index was below the one in the study period. Therefore, we require more meticulous planning in the production and consumption of this significant product.

Table 3. Estimation of the self-sufficiency in the main food groups during1990-2009

Food products year	wheat	rice	Red meat	eggs	vege-tables
1990	0.87	0.78	0.80	1.00	1.00
1991	0.92	0.81	0.81	1.00	1.01
1992	1.05	0.72	0.85	0.99	1.01
1993	1.06	0.66	0.85	1.00	1.00
1994	1.01	0.88	0.90	1.03	1.02
1995	1.24	0.57	0.93	1.00	1.02
1996	1.00	0.80	0.88	0.99	1.01

4. Discussions/ conclusions

Food security is one of the most central factors in the constant development of human societies. Considering the existing research, although there have been numerous studies concerning food security in Iran, but there has not been any research on the subject of food security, especially focusing on the five food groups on a macro level, which also examines the most important and influential indexes in the last two decades. Accordingly, this article tries to estimate the food security in the most main food groups in the last two decades. The results showed that although most of the studied food groups indicated ascending trends in the period but the average of effective variables proved that there was low food security in red meat, relatively adequate food security in rice, and high food security in eggs. The examination of the calorie supply index showed there is an imbalance in food consumption in the country and the examination of other indexes indicated unstable self-sufficiency of wheat due to the droughts crises. According to the preceding points, The increase in protein productions such as red meat accompanied by insurance development for this product, and providing inexpensive production inputs, the growth of nutrition education and knowledge, the decrease of volatility the production of some food products by employing qualified technology and management of the drought and also by creating a balance between the import of the basic agricultural products and the internal production of these commodities may result in stabilizing of the food products consumption, and generating and raise food security in all groups and eventually sustainable the food security in the country.

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