



Munich Personal RePEc Archive

Population food security assessment – a methodological approach

Alexandri, Cecilia

Romanian Academy, Institute of Agricultural Economics, Bucharest

20 November 2015

Online at <https://mpra.ub.uni-muenchen.de/69258/>

MPRA Paper No. 69258, posted 06 Feb 2016 13:50 UTC

POPULATION FOOD SECURITY ASSESSMENT – A METHODOLOGICAL APPROACH

ALEXANDRI CECILIA¹

Abstract: *The paper approaches the different dimensions and analysis levels of the food and nutritional security, presenting the sets of indicators and methodologies used by the national and international organizations for its assessment. The sources used refer to the indicators and studies elaborated by FAO, OECD, IFPRI, Eurostat, EUI, Defra, the Ministry of Health and NIS. In the recent years, the population food security issue came to the foreground again, due to the challenges at global level, among which we can mention the food demand increase from the new emergent countries, the non-food uses of agricultural production by biofuel production, as well as the impact of climate changes, on agricultural production and on food supply. Food security is a concept that widely evolved in the last decades, while its complexity gradually increased. Practically, at present, in order to evaluate the food security from the different countries of the world, the specialized institutions or research teams use dozens of indicators, in order to measure the multiple dimensions of the food security concept. In this respect, the paper also contains an assessment of the population food security in Romania, as reflected by the most representative indicators presented.*

Key words: *food and nutritional security, methodology, indicators, Romania.*

INTRODUCTION

The first attempts to define the food security, in the early 1970s, focused on the agricultural and food supply availability, as it was considered that the population food security problem is solved if all people have sufficient food to lead an active a healthy life, according to their needs. The access to food and the importance of economic factors conditioning it were issues that appeared later on. The food security concept gradually evolved, and certain authors mention the existence of about 200 definitions for this concept, in early 1992 (Clay, 2002).

Food security can be evaluated at different levels, but most references are made at macro-economic (world, regional or national) level and at micro-economic level, i.e. at household and individual level. Depending on the level referred to, the focus lies on one or several of the four pillars of food security, namely: food availability, supply stability, economic access to food and food utilization represented by the desire of individual people to have a healthy food. In the case of using the food security concept at world or national level, the focus mainly lies on the capacity of countries to provide a sufficient agricultural supply to meet the food and nutritional needs of the population (Pinstrup, 2009). At the same time, recent approaches (FAO, 2014) assign a special importance to the “food autonomy” as factor of food security stability, which diminishes the vulnerability in the face of the fluctuations of domestic and world agricultural markets.

Yet food availability does not ensure the access to food, as the problems related to the distribution of incomes at society level can seriously affect the access to food and the food security at household level implicitly. As such, the food security is ultimately considered as a household or individual issue. It is generally considered that food insecurity and hunger are the direct result of poverty. With the economic growth and increase of population’s incomes, the poor households will have the ability and presumptively the willingness to obtain an adequate diet (Senauer et al., 2007). Although the household is used as observation unit in most studies on the population’s nutritional situation, the key issue is nutrition at individual level, in particular for the people considered at nutritional risk.

There is an intrinsic relation between the economic development and food security. The economic crises and shocks lead to food insecurity, which means not only food consumption diminution, but also compromising diet quality and diversity. And the lack of an adequate diet, both in terms of calorie intake and of essential nutrients, can erode the population’s health and working capacity and thus food insecurity can lead to labour productivity diminution and amplification of the economic problems of different countries (Ghattas, 2014). Thus, together with the FAO

¹ Dr. Alexandri Cecilia, Romanian Academy, Institute of Agricultural Economics, Bucharest, cecilia@eadr.ro

approaches, the focus should be laid on two concepts that accompany food security, namely the dietary diversity and the vulnerability of different population categories (Pieters et al., 2012). The dietary diversity is essential for the recognition of the micronutrients importance in human nutrition. A more diversified diet is associated with diet quality increase, with an improved food intake, under the background of incomes and life quality increase.

The second issue, namely vulnerability, refers to the probability that a family or human community (nation) has food security problems, in the context of negative shocks (wars, social conflicts, severe crises). One of the great challenges of our world is the unprecedented spread of hunger and food insecurity. The latest FAO estimates reveal that 12.5% of the world population (868 million people) is undernourished, this representing only a part of the malnourished population of the planet. About 26% of the world's children are underdeveloped as a result of food scarcity; about 2 billion people suffer from one of the micronutrients deficiency forms, while 1.4 billion people suffer from obesity (FAO, 2013). These are the recent malnutrition dimensions at world level. In all its forms, malnutrition imposes very high costs on the society in economic and human terms. Among the malnutrition forms, undernourishment and the deficiency in micronutrients are the most dangerous and represent the first priority in the food policies for the population's health.

MATERIALS AND METHODS

The current definition of food security is based on the four pillars mentioned above, namely: 1. access to food, in quantitative, qualitative, safety terms and in conformity with the individual dietary and socio-cultural traditions; 2. food availability, 3. stability of agricultural and food supply; 4. utilization of foodstuffs pertaining to the individual food behaviour (willingness to have a healthy diet). At the same time, food and nutrition security has several levels, a macro-economic level and a micro-economic level, yet the most important is the food security at household and individual level, as it is at this level that the nutritional risks can be truly perceived.

Food security at micro-economic level refers to the capacity of states to provide sufficient food for their population. At this level, for the assessment of food security, the demographic, socio-economic, political and anthropometric factors are taken into consideration, together with other factors that evaluate the international economic environment (Pinstrup, 2009). The supply of foodstuffs can be evaluated using the self-sufficiency indicators of the domestic agricultural production, the food imports and the food aids. The food security at household and individual level can be quite thoroughly investigated using the household budget surveys or other similar surveys that provide a cross-cutting picture of the foodstuffs and nutrients consumed at a certain moment, as well as a picture of the socio-economic and demographic variables of the micro-economic environment. Other directions that should be developed refer to the envisaged perspective: food security on short term and food security on long term. The influence of the agricultural prices evolution on food security should be also discussed here.

The factors influencing the four main coordinates of food security are complex. The scope of the economic systems that generate the necessary framework for reaching food security is very different. Thus, reaching the food availability objective involves the resources, the agricultural and food processing systems, trade, technologies, and distribution systems worldwide and at regional, country and local levels. The access to food depends not only on agricultural productivity, but mainly on the general development of human collectivities, of their incomes and distribution as well as on the sanitary and food safety conditions. There are well-known situations, mainly in the developing countries, with a strong social polarization, where although foodstuffs are available in supermarkets, there is an important number of people affected by food insecurity, due to the extremely limited purchasing power (more concretely due to the lack of incomes). Thus, the access to food is linked to the socio-economic success of national governments, which, through the income distribution and redistribution policies decisively determine the level of access to food.

It is considered that food insecurity – or the food scarcity situations – is not generated by the absence of food availabilities, but rather by the inadequate distribution of food across the

different regions of the world. At the same time, the lack of access to food also contributes to this situation, due to either the inability to produce food or to the lack of purchasing power in the subsistence economies. People with the same food needs have different levels of access to food. This is valid for all countries, even for the richest countries, where meeting the food needs has no longer been a problem for many years, but where population categories or people under food insecurity risk still exist. While in these countries there are extremely few people subject to food insecurity, in the poor countries of the world the chronic scarcity and even hunger situations are quite frequent.

Finally, the last dimension of food security, which refers to the individual food procurement and consumption behaviour is of the most important, as food security is ultimately a condition related to families and individuals. While the governments, through their economic, social and food policies, create the general conditions for their population to be supplied with available foodstuffs and to gain the necessary incomes to procure it (availability and access), food security finally becomes a problem of households and individuals. In this respect, there are frequent situations when even in the richest countries, where food security has no longer been a problem for a long time, there are communities and persons subject to food insecurity or at high nutritional risk. We should also mention here that although most food insecurity cases are generated by the scarcity of food, a nutritional risk is also generated by the food excess, which ultimately leads to obesity, nutritional diseases and other metabolic disorders. At the same time, a frequent situation is that even though the family can buy the necessary foodstuffs (has the purchasing power and the food is available), there are persons in the respective family subject to food insecurity (children and women), mainly in the case when the household head has priority in food consumption or has other priorities or addictions (alcoholism, for instance).

All these considerations lead us to the idea that food security is a desirable condition for the population of a given country or human community, but reaching food security has multiple conditionings, which start from the continuous production of increasing amounts of food in all the fertile regions of the world, it requires an adequate management of agricultural resources, maintaining the prices at an acceptable level and the conservation of the population's purchasing power, being finally conditioned by the people's desire to eat a healthy food.

RESULTS AND DISCUSSIONS

We shall next present the methodology and indicators used for the assessment of food security by two important organizations at European and world level, namely Economist Intelligence Unit and FAO.

1. Global Food Security Index (GFSI) developed by the Economist Intelligence Unit for the years 2008 and 2011-2014. This index represents a score on the basis of which the countries are classified from the point of view of the food security level. The classification includes 105 countries, both rich countries and low-income countries. The selection of countries is based on regional diversity, economic importance and population size. The index starts from taking into consideration the three coordinates of food security, namely: 1. Financial access, 2. Supply availability and 3. Quality and safety. The shares assigned to these three groups of indicators for the final score calculation are: access 40%, availability 44% and quality and safety 16%.

Table 1: The main categories of indicators used for evaluating the Global Food Security Index (GFSI)

Food security		
A. Financial access	B. Supply availability	C. Quality and safety
- share of food consumption value in total household expenditures -share of population under the poverty threshold -GDP/capita at the purchasing power parity	-domestic supply sufficiency - public expenditures for research and development in agriculture -agricultural infrastructure -agricultural production volatility -risks concerning political stability	-dietary diversification -government's legislation on increasing nutritional standards -availability of micro-nutrients -protein quality -food safety

-customs duties on agricultural imports -presence of food safety -farmers' access to finance		
--	--	--

Source: Global Food Security Index 2012: An assessment of food affordability, availability and quality, Economist Intelligence Unit, 2012.

The indicators used for this index are from the category of food security determinants and risk indicators. The database is complex, it contains quantitative indicators coming from national and international sources. Qualitative indicators coming from experts' opinions, governmental websites and different other sources are also used. But the main data sources come from international organizations, e.g. FAO, World Bank, IMF, United Nations Development Program UNDP, World Health Organization, World Trade Organization, IFPRI and national institutes of statistics, as well as certain important experts' opinions worldwide.

Recent evaluations of the GFSI index reveals a decrease of the ranking score for Romania, i.e. a 3 point diminution of the food security situation compared to 2013, from 64.3 to 61.3; this decrease mainly comes from the increase of agricultural production volatility in 2014 compared to 2013. In all the years presented in Table 2, the lowest assessments for Romania are in the category of indicators regarding the population's access to food. We mention that this category mainly includes indicators referring to the population's incomes, the share of food consumption expenditures in total consumption expenditures, poverty level.

Table 2: GFSI values for Romania, 2012-2014

	Out of 100 scores			Position among 109 countries		
	2012	2013	2014	2012	2013	2014
General score	64.3	64.3	61.3	39	39	44
1. Economic access	61.8	58.6	58.9	41	48	48
2. Availability	65.7	65.8	59.1	31	31	44
3. Quality and safety	66.6	74.4	73.6	38	29	31

Source: The Economist/Intelligence Unit, Food Security in focus, Europe 2014.

USA is on the first position on the list, with 89.3 scores, followed by Austria and Netherlands, and the last positions are occupied by Congo with 24.8 scores, preceded by Madagascar and Chad.

2. Food security indicators according to FAO methodology

FAO methodology takes into consideration the four pillars of food security, namely: A. Supply availability, B. Access to food, C. Food use and D. Supply stability. This methodology uses indicators for the assessment of food security at macro-economic level, i.e. world, regional and national level, while focusing mainly on the nutritional and food safety issues. For the assessment of food security at micro-economic level, i.e. at household and individual level, FAO uses another set of indicators, generally from the Household Budget Surveys and the Nutritional Surveys, as we shall next see.

A. The Supply availability is evaluated starting from five indicators, namely:

A.1. Average dietary energy supply adequacy, which expresses on a percentage basis to what extent the daily food calorie availability satisfies the specific nutritional needs of the population of each country, in conformity with the national health authorities' recommendations.

A.2. Average value of food production, which represents the food production value per capita in each country, expressed in international dollars. It is calculated as an average for three consecutive years, according to Faostat methodology.

A.3. Share of dietary energy supply derived from cereals, roots and tubers, which represents the daily energy (kcal/capita/day) coming from cereals, edible roots and tubers, related to

the daily energy availability. It is expressed in percentage terms and represents an assessment modality of diet quality and food diversity in different countries and regions.

A.4. Average protein supply, which represents the available protein quantity (gr./capita/day), calculated as a three-year average. It also represents a food quality indicator.

A.5. Average supply of protein of animal origin, which is an indicator identical with the previous one, but it refers only to the daily animal protein availability (gr./capita/day).

B. The Access to food uses nine indicators, which evaluate the population's economic and physical access to food.

B.1. Percent of paved roads in total road network. This is one of the indicators by which the World Bank evaluates the development of different countries and regions. More concretely, this indicator provides information on the physical access to markets both for consumers and for farmers. It is expressed in percentage terms, and the evaluation is made at national and regional level.

B.2. Road density per 100 km² of land area. This indicator also evaluates the physical access to agricultural and food markets. It is expressed by kilometers of roads per 100 km². This is also a development indicator from the World Bank of database.

B.3. Rail lines density per 100 km² of land area. This indicator also provides information on the physical access to agricultural and food markets.

B.4. Gross Domestic Product per capita on purchasing power parity basis. This indicator is also used in the GFSI methodology for the evaluation of population's incomes and of the economic access to food. GDP is converted into international dollars using the purchasing power parity rates.

B.5. Domestic food price index. This is an indicator of relative prices that is calculated on the basis of the International Comparison Program, of the World Bank and of the consumer price index developed by FAO. The reference period is 2003 – 2006. Practically, this index reveals the relative level of domestic food prices compared to those from the USA. For USA, this index is equal to 1.

B.6. Prevalence of undernourishment (%) expresses the probability that by randomly selecting a person from the population, this has an insufficient food intake that does not ensure the necessary energy supply for an active and healthy life.

B.7. Share of food expenditures in total expenditures of the population from the lowest quintile (population with the lowest incomes). According to Engel's law, the lower the incomes on a given holding, the higher the share of food expenditures. At national level, this indicator provides a synthetic picture of the population's living standard and at the same time represents a measure of population's vulnerability when the food prices increase. Generally, the food consumption expenditures include the monetary value of foodstuffs from all sources, i.e. the bought food, food from household's own production, from gifts or payments in kind.

B.8. Depth of the food deficit. This indicator indicates how many calories would be needed on the average to bring the undernourished population from a country at the level of dietary recommendations in the respective country. It is expressed in calories/capita/day and is of actuality in the very poor countries of the world and less in the European countries.

B.9. Prevalence of food inadequacy. It expresses the share of population that cannot perform a normal physical activity due to food risks. The undernourished population is not included in this category, this category including the population at risk of not having a dietary energy level in conformity with the performed physical activity requirements.

C. Supply stability contains indicators that evaluate to what extent the member states can meet the population's consumption needs from the domestic agricultural resources (self-sufficiency).

C.1. Cereal import dependency ratio (%)

It is calculated as ratio of cereal imports to domestic supply (equal to the domestic production plus import minus export).

C.2. Percent of arable land equipped for irrigation in total arable land (%). It provides a useful picture of agricultural production stability under drought conditions.

C.3. Value of food imports over total merchandise exports.

This indicator provides an image of the capacity of countries to import foodstuffs in case of need and of the availability of financial resources in case of need.

C.4. Political stability and absence of violence in public spaces. It measures the perceptions that governments may be destabilized by non-constitutional and/or violent measures, by politically motivated acts of violence or terrorism. Information from 30 sources are synthesized, which reflect the experiences of citizens, firms, entrepreneurs, experts from the public and private sector, NGOs on the quality of governance from different regions of the world. For instance, in the year 2012, this index had a minimum value of -2.89 in Somalia and a maximum value of 1.92, in Greenland.

C.5. Food production volatility index. It measures the variability of the relative food prices in a given country, representing an assessment form of stability and vulnerability. Monthly relative prices are used. In order to calculate the variability, the standard deviation formula is used.

C.6. Per capita food production variability. This is an expression of the net food production variability per capita expressed in international dollars. For the calculation of variability, the standard deviation of food production trend per capita is used.

C.7. Food supply variability expressed in calories/capita/day. The trend variability is calculated in the period 1990-2010 using the standard deviation formula.

D. Food utilization includes both indicators that evaluate the necessary infrastructure for a healthy diet, as well as a series of indicators that evaluate the nutritional risk of certain vulnerable categories.

D.1. Population's access to improved drinking water sources (%).

It represents the share of the population with a reasonable access to improved drinking water sources. The indicator takes into consideration information on the households' connection to water sources, the existence of public drinking water supply networks, protection of drinking water sources. It is considered that a reasonable access to drinking water presupposes the supply with at least 20 liters/person/day, and the water supply source is found at less than one kilometer from the household. In Romania, this percentage increased from 75.3% in 1991 to 87.7% in 2008, our country being one of the few EU member states where this percentage is not 100%.

D.2. Percent of population with access to improved sanitation facilities and sewerage system (%). This indicator starts from the reality that the existence of modern sanitation facilities providing for a correct treatment of dejections from the sanitary point of view represents a condition for the prevention of diseases caused by animals, insects and other pathogens. Thus, the existence of the sanitation infrastructure represents a condition for the food safety and for the food security implicitly. In Romania, the sanitation infrastructure of households is still deficient, mainly in the countryside. In the year 1991, only 71.1% of households had access to a modern sanitation infrastructure, and in the year 2008 this percentage was up to 72.1%, while in most EU member states this percentage has reached 100%. A situation similar to that of Romania is found in the Russian Federation, countries of the former Yugoslavia, or in other former Soviet republics (Lithuania, Latvia, Republic of Moldova, Ukraine) or Albania.

D.3. Percentage of children under 5 years old affected by wasting (%).

This indicator belongs to a set of indicators that measure the effects of undernourishment in small children (underweight children or stunted children). This indicator is internationally recognized as an important indicator for the public health.

Furthermore, the stunted children as a result of a poor diet and/or recurrent infections tend to have a higher risk to suffer from certain diseases and have a higher death risk. In Romania, this percentage was 3.5% in the year 2002, similar percentages being also found in the previously-mentioned countries.

D.4. Percentage of children under 5 years who are stunted due to undernourishment (%)

In the year 2008, this percentage was 12.8% in Romania and 11.3% in the Republic of Moldova, in the year 2004.

D.5. Percentage of children under 5 years old who are underweight (%)

This percentage was 3.5% in Romania in the year 2002, while in the Republic of Moldova it was 3.2% in 2005. We mention that the European countries with such nutritional problems in children are very few and they are mainly among the poor, ex-communist countries.

D.6. Percentage of underweight adults in total adult population (%)

D.7. Prevalence of anaemia among pregnant women (%)

In Romania, this indicator was 34.5% in 1990 and decreased to 26.0% in 2011.

D.8. Prevalence of anaemia among children under 5 years of age. The most vulnerable categories in nutritional terms are the pregnant women and the children under 5 years old. The prevalence of anaemia in children under 5 years old was 36.4% in 1990 and this percentage was down to 27.2 % in 2011.

D.9. Prevalence of vitamin A deficiency, in total population

D.10. Prevalence of iodine deficiency, in total population

It is estimated that about 35% of the population worldwide has dietary iodine deficiency.

CONCLUSIONS

The evaluations made by Intelligence Unit and FAO reveal a series of vulnerabilities and risks for the food and nutritional security for the population in Romania.

These are mainly generated by the low level of incomes of certain significant population categories, by poverty, inequalities and social exclusion, which constrain the population's economic access to food. In the second place, food security is also threatened by food availability, owing to the domestic agricultural production instability, mainly generated by the weather excesses, under the background of the continuous diminution of irrigated areas, of inadequate cropping technologies, insufficient utilization of agricultural inputs and of technical progress in agriculture. The import dependency and the agricultural price volatility also contribute to the vulnerabilization of the population's access to food. Another category of indicators that determine the lowering of the population's food and nutritional security in Romania are those referring to the absence of sanitation infrastructure, mainly in the rural area, the absence of the public drinking water supply network, of the sewerage system, even the lack of electric power supply, as well as the lack of population's information on the risks entailed by these conditions.

BIBLIOGRAPHY

1. Clay, E. (2002). *Food Security: Concepts and measurement*, FAO Experts Consultation on Trade and Food Security.
2. EIU (2012). *Global Food Security Index 2012: An assessment of food affordability, availability and quality*, Economist Intelligence Unit
3. FAO (2013). *The state of food and agriculture 2012*, Rome.
4. Ghattas, H. (2014). *Food Security and Nutrition in the context of the Global Nutrition Transition*, FAO.
5. Pieters, H., Vandeplass, A, Guariso, A., Francken, N., Sarris, A., Swinnen, J., Gerber, N., von Braun, J., & Torero, M. (2012). *Perspectives on relevant concepts related to food and nutrition security*, Foodsecure Project
6. Pinstrup, A. (2009). Food security: definition and measurement, *Food Security*, 1:5-7, Springer.
7. Senauer, B., & Roe, T. (1997). *Food security and the household*, paper presented at the Congress of the International Association of Agricultural Economists, Sacramento, USA.