AGRICULTURAL PRODUCTION AND FOOD SECURITY IN ROMANIA

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Abstract. *The material aims to analyze and discuss several facts regarding one of the most debated and controversial global issues of humanity: food security. It was the first and has been the most important problem and its solution was partial throughout history, different in space and time inside the same community.*
The article investigates the demographic evolution in relation to that of food space at global and regional level. The second part of the material analyzes and comments on the capacity of Romanian agriculture to provide food security for the population in the context of technical and technological progress, of the structural transformations of Romanian agriculture and, not lastly, of market globalization.
In conclusion the author formulates some optimistic conclusions motivated by the present and future evolution of the analyzed phenomena.

Key words: agricultural production, food space, demography, productivity, food consumption

Introduction

It is unanimously acknowledged today that throughout their history, humans have exerted continuous pressure on the food space in various forms. Even before the development of agriculture as a main source of food, as hunters or gatherers, humans were dependent on a particular area from which they procured food. By comparing it across the millennia, this area has now become practically insignificant. The specialized literature [1] even quotes a scale regarding the gradual reduction in time of the food space (Cailleux), namely a quota of land per person.

The author estimates a surface of 5000 ha for the hunting civilization, 1000 ha for the pastoral one, 10 ha for the primitive agriculture (by mattock), 2 ha when the wood and iron plow was invented, 10 times less when the tractor was invented and only 0.16 ha in the current conditions of modern and developed agriculture (FAO estimations).

Given an agriculture with state-of-the-art technologies, this area can also be halved (0.08 ha/person). This occurs in the current conditions when the distribution of arable land resource is approximately 0.28 ha/person, ranging in space from 0.10 to 1.2 ha over.

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Nowadays, the food security of a certain population in a certain region of the planet is no longer directly dependent on the food supply that can be obtained in that particular place. The globalization of economy and particularly of the agricultural markets, the progress of transport facilities (capacity, speed, cost) have contributed considerably so that food can be accessible to any community that has the financial means and will to procure it.

1. Demographic and food supply theories and food security

We must admit that the almost exponential explosion of land productivity, as well as the economic globalization, are practically contemporary with us, while for millennia the food security of certain human communities was dependent on the food that could be obtained in that particular region, using the natural and technological conditions at hand. The Mesopotamian and Inca civilizations are well known and their disappearance is a direct consequence of their incapacity, at some point, to provide the food for their growing populations.

Much closer to us in time and space are the famines that decimated the population of Western Europe in the Middle Ages. Starting with the 13th century, no less than 22 periods of famine were recorded in Central and Western Europe. The French historian H. Taine mentioned famine as one of the main causes for the French Revolution of 1789. The effects of food scarcity were all the more catastrophic as the affected communities lived more isolated, and to this regard, the British islands offer the most telling example. Maybe it is not an accident that this is the place of origin for the most famous (and most extremist, we would say today) theory on population and food supply, namely the Malthusian theory.

The Malthusian theory on population and food supply. *An Essay on the Principle of Population* is published at the end of the 18th century (1798) and it is based on the demographic evolution [4]. The essay is founded on a presumed contradiction between the growth rate of the population and that of the means of subsistence. According to the Malthusian theory:

- Population growth in geometric progression:

  1; 2; 4 ; 8; 16; 32; 64; 128; ……. 4096

- Growth of the means of subsistence in arithmetic progression:

  1; 2; 3; 4; 1; 6; 7; 8; 9; …… 13

The population number doubles in 25 years, which means an average annual growth rate of 3%. Consequently: each person is born in an already occupied world; if their family cannot feed them or if society does not need their work, they have no right to demand a ration of food and they are truly redundant on earth. At the great banquet of nature, they have no place. Nature orders them to leave and it does not delay in executing the order itself. The premises on which Malthus based his theory were the following:

- he appreciated that the food resources were more limited than those that existed as potential;
- he viewed population as an independent variable that fitted a pattern of exponential growth;
- he believed that population regulation must be done by famine, epidemics and wars.

The theory did not come true due to the dimming of this contradiction both through the moderation of the demographic rhythm, but especially due to an explosive growth, we might say, of the land productivity and of labor.

Another theory, that of Josué de Castro in his *Geography of Hunger*, claims that starvation leads to overpopulation through a high rate of human fecundity. The theory is supported by some statistical correlations between the two phenomena, at least for some parts of the world. Another Neo-Malthusian, W. Vogt believed that in some countries with considerable population, famine of great proportions is inevitable, not only imminent but also desirable for the regulation of the ratio between population and food resources (W.Vogt *Road to Survival* New York, 1948) [1].

History will refute these theories also called "Malthusian scarecrows", which does not mean that famine has been eradicated. However, this is not caused by the incapacity of the planet to feed humankind, but by a difficult to explain inversion of priorities for numerous human communities.

2. Demographic and food supply theories and food security

The first report of the Club of Rome (the Meadows Report, 1972) [3] presents the evolution of world population in the time period 1650-1950 and offers a prognosis for 1960-2000 (see Table 1).

Table 1
The global demographic evolution between 1650-1950 and the prognosis for 2010, after the first report of the Club of Rome

Specification	1650	1750	1850	1950	1975	2000
Population (billion inhabitants)	0.5	0.7	1.17	2.5	3.6	5.8
Time for population doubling	170 years	105 years	55 years	30 years?		
Growth	from 0.5 to 1.0	from 1 to 2	from 2 to 4	from 4 to 8		
	1650	1820	1925	1980	2010?	

Source: The Meadows Report, 1972.

The report explains the acceleration of the population growth rhythm by the increase of life expectancy (from 30 in 1650 to 53 in 1950) and by the extrapolation of the positive birth rate tendency. It also appreciates that, given the absence of a brutal mortality increase (which humankind will try to avoid), we could expect a population of 7 billion people around 2005. And if the mortality rate continues to decrease and the birth rate keeps up, "we could expect a quadrupling of the population in the next 60 years."

We are now in 2011 and the Earth population has not yet reached 7 billion, only 6, and not because of a brutal mortality increase, but because of certain tendencies whose result is the significant moderation of the population growth rhythm at global level.

Indeed, the demographic rhythm is high in "third world countries", but it is low and even negative in developed countries with a high level of food, as well as in the European former communist countries, both due to the liberalization of family planning and to the worsening of the food regimen. Also, demographic policies meant to balance the ratio between the population and the food supply are known. The case of China, the most populated country, is conclusive as over the recent years the food production growth rhythm exceeded significantly the population growth rhythm. More recent projections foresee an accentuated deceleration of the growth rate of the global population in the first decades of the 21st century and even a stabilization of the number of inhabitants at global level starting with the middle of this century (Figure 1).

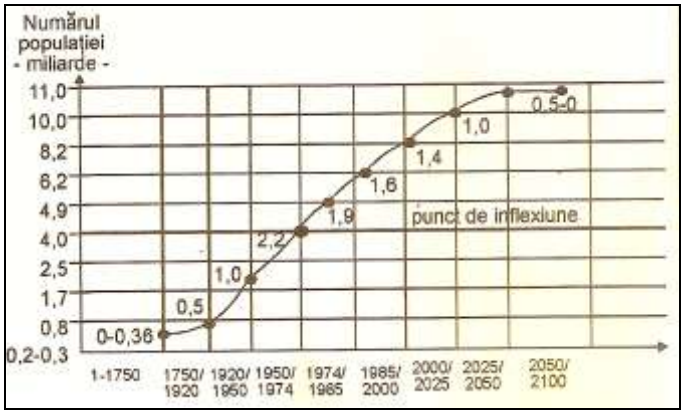

Figure 1. The logistic curve of the evolution of the global population (adjusted model)

It is true, there is no lack of prognoses we might call "alarmist" such as the one of the US Census Bureau which offered as certain a global population of 7.5 billion inhabitants [6] in 2000. In fact, the Earth population was 6.01 billion [6] people at the beginning of the third millennium.

3. The food space and the food production

The quantity of food that can be obtained at a given moment is nothing but the product between the agricultural food space (ultimately cultivated) and the potential or actual productivity per surface unit. When the Meadows Report was elaborated, it was appreciated that, given the productivity of the time, the necessary surface to feed one person would be 0.4 ha, even though a third of the global population was undernourished.

However, the American experts considered 0.9 ha of cultivated surface necessary for one person, which would lead us to a necessary agricultural land of 24.3 billion ha. The number is fantastical since the entire land surface of the Earth is only 13.4 billion ha. Of this, only a third (4.6 billion ha) are used for agriculture and only 11.0% of these (approximately 1.4 billion ha) were actually cultivated at the beginning of the 1970s (20^{th} century).

Nowadays, agriculture is practiced on 5.01 billion ha, of which 1.4 billion ha (29.0%) represent arable land, 69.0% are permanent meadows and 2.0% are perennial plantations. Reported to the global population, the land resource provides an average surface of 0.82 ha of agricultural land and 0.23 ha of arable land for each inhabitant of the Earth. The extremes of these averages are, however, particularly distanced in space as they range between 0.15 ha/person in Asia (where half of the Earth inhabitants live) and the territories of the former Soviet Union with 0.81 ha/person.

There are certain differences between the data of the Meadows Report and more recent evaluations (FAO, Fischer et al, 2000) regarding cultivated and cultivable surfaces. In the former case, it was appreciated that the resource of agricultural land at global level could not exceed 3.2 billion ha, while the arable surface cultivated in the 1970s was approximately 1.4 billion ha. The evaluations of the end of the 2000s mention 4.1 billion ha of agricultural land, of which 1.6 ha (39.0%) of cultivated arable land.

The increase of the cultivated or cultivable surface, though somewhat significant for a period of three decades, is not meant to avert concern in this regard. The authors of the Meadows Report calculated that even if nothing was lost of this surface of 3.2 billion ha (even though considerable medium agricultural surfaces are lost annually, and not from the less productive ones, by urbanization, means of communication etc), around the year 2050 the land could no longer feed the population of the Earth, even if the productivity would quadruple in the meantime [3].

4. The productivity of the land and of labor in agriculture

Given the prognosis regarding the slowing down of the population growth rhythm and even its stabilization in a not very distant future, the hope of ensuring food security comes again from the increase of land productivity. In a period of over 2000 years, from Antiquity to the Second World War, the cereal crop per surface unit tripled, from 300-350 to approximately 1000 kg/ha. Over the following years (1950-2000), a new tripling occurred in the cereal production as well as in the productivity: 4342 kg/ha in wheat and 3585 kg/ha in maize.

However, in the countries with advanced agriculture, the productivity in cereals is between 8000 and 10000 kg/ha. Specialists from the famous Wageningen University (Netherlands) appreciate that we cannot even imagine

how much the productivity per production unit can increase in agriculture in the near future. In regards to the labor productivity, this will have an even more spectacular evolution, being determined both by the evolution of productivity per surface unit, but most especially by mechanization. Already in cereal cultivation, a single worker assisted by the state-of-the-art machinery works a surface of over 15 ha from which he harvests 15-20 thousand tons of seeds.

5. Romanian agriculture and food security

The economic structure in relation to the development level. It is known that the most basic structuring of a national economy is the one including the three economic sectors:

I. *The primary sector* which is made up of agriculture, fishing and hunting;

II. *The secondary sector* which is made up of industry, including the processing of primary agricultural products beginning with milling, drying or animal slaughtering.

III. *The tertiary sector* which is made up of everything not included in the first two sectors, namely services including tourism.

It is also known that the weight of the tertiary sector both in the GDP and in the structure of the active employed population, as well as the size of the GDP per capita are basic indicators for the measuring of the degree of economic development of a state (Table 2).

Table 2

The GDP per capita and economy sectors, the structure of the employed population in several EU countries compared to Romania

Country	GDP €/inhab.	GDP structure per economy sectors %			Structure of the employed population %			
		I primary	II secondary	III tertiary	I	II	III	Tourism
Belgium	31500	1	24	75	1.9	17.8	80.3	(16.4)
France	29500	2	21	77	3.8	17.6	78.6	(16.8)
Hungary	10100	4	30	66	4.9	24.1	71.0	(18.9)
Poland	8100	5	32	64	15.7	23.6	60.7	(16.0)
Romania	***5743***	***9***	***40***	***51***	***30.5***	***24.6***	***44.9***	***(12.8)***
Bulgaria	3800	9	31	60	8/.1	27.1	64.8	(20.9)

Source [5]

6. The land resource and the productivity of Romanian agriculture

It has been often stated lately that Romanian agriculture could feed 80 million people, but we import 70% of the food we eat. Where are you Romania, the granary of Europe? (Romania has never been *the* granary, but *a* granary of Europe. Let's see what the numbers tell us).

The land resource of Romanian agriculture. **According** to the latest statistical data (2008), the agricultural sector exploits a surface of 14702 ha, of

which 9415 ha represent arable land. The distribution is 0.42 ha/inhabitant of arable land compared to 0.27 ha/inhabitant (the European mean), 0.51 ha/inhabitant (Spain), 0.38 ha/ inhabitant (**Poland**), 0.34 ha/ inhabitant (France), 0.21 ha/ inhabitant (Italy), or 0.06 ha/ inhabitant (the Netherlands).

Romania holds 0.17% of the cultivated surface at global level (ranking 75) and 4.9% of the European cultivated surface (raking 17). In the European Union, we are 7th after Poland. The soil quality is also superior to the European average, and if to all these we add an irrigation potential of 3000 ha (data from 1989), we can appreciate that our country has one of the most generous land resources.

The production and productivity of Romanian agriculture. Given the size of the land resource, Romania's place in the EU agricultural production should be, if not identical, at least close to the one held in terms of agricultural and arable surface. Unfortunately, the results are completely unsatisfactory. The lack of investments, the production factors allotted at the lowest level, the improper exploitation structures, and improper management have all contributed to the Romanian agricultural production being one of the lowest in Europe, given the land resource (Table 3).

Table 3

The total production and the productivity per surface unit in the main crops (2008-2010)

Crop	Total production in thousand of tons			The average production kg/ha		
	2008	2009	2010	2008	2009	2010
Wheat	7181	7718	5885	3403	3475	2835
Barley	1209	1336	1295	3059	3235	2542
Maize	7849	7960	9177	3215	3221	4029
Sunflower	1170	1214	1338	1437	1443	1634
Soy	91	93	1147	1817	1792	2294
Potatoes	3049	-	3286	14108	-	13367
Vegetables	3820	-	3155	-	-	13403

Source: The Statistical Yearbook of Romania, 2009, and data from the Ministry of Agriculture and Rural Development

The low productions accomplished by Romania over the recent years are due exclusively to the totally unsatisfactory productivities per surface unit. Still, because of the large cultivated surfaces, Romania has one of the largest productions of maize or sunflower in the EU, for example.

7. Romanian agricultural production and food security

Agriculture has been accused of not being able to ensure food security for the population and, consequently, we appeal to the large food imports. An objective analysis of the data disproves, however, such information released mostly by the mass-media. Here is, for example, the average consumption per capita, the necessary calculated for the Romanian population (21.5 million

inhabitants) and the production accomplished in 2008 in the main vegetal and animal products (Table 4).

Table 4

The annual consumption per capita in Romania in the main food products and the production accomplished in 2008

Product	Average annual consumption per capita kg/inhab.	Necessary per total population thousand of tons	2008 production thousand of tons
Cereals	204	4386	16698
Potatoes	100	2150	3649
Vegetables	176	37S4	3820
Fruits	62,9	1355	Î179
Oil	14,6	322,5	
Milk	255	5483	5900
Eggs	267	5741	6692
Fish	4	86	
Meat	66,6	1432	947

Source: The Statistical Yearbook of Romania, 2009

In all the agricultural or agro-alimentary products, the production exceeds the consumption, except meat, but this also has an explanation that must be taken into account. The average human consumption of cereal products does not exceed 4200-4500 tons annually, and Romania produces 16000-18000 tons of cereals.

By counting on a surplus of minimum 12000 tons of cereals, these may be turned into meat of various species as follows: 1700-1800 tons of bovine meat; 1500-1600 tons of ovine meat; 2700-2800 tons of porcine meat, or 4900-5000 tons of poultry meat, any of these exceeding the annual necessary of meat in Romania.

One of the causes for which this surplus of animal feed is not turned into human food is represented by the market liberalization and the merchants' freedom to export the primary agricultural production and import agricultural products with various degrees of processing (flour, carcass meat, eggs, canned food), all these businesses being profitable or not for the local processors and traders, but definitely not for the Romanian economy and the Romanian consumer.

In 2009-2010, Romania exported 2163 tons of seeds of oleaginous plants, the equivalent of 757 thousand tons of oil, while the annual oil consumption is approximately 320 thousand tons. During the same time, 7018 tons of cereals were exported, the equivalent of 3500 tons of meat for a consumption of 2800 tons of meat. In 2009 and 2010, Romania imported 477.4 tons of meat.

8. The global food crisis and the food security of Romania

Recently, the apocalyptic scenarios have multiplied, among them, the global food crisis. Before being struck by a less predicted crisis, the Japanese had already

been concerned with the global food crisis, so they grouped the world states into four classes according to the extent to which they would be affected by this crisis (source: *Nomura Food Vulnerability* Index) [6].

Group I. Countries outside any danger of being affected by a food crisis: USA, Canada, Brazil, Argentina, France, Switzerland, Australia, New Zealand.

Group II. Countries with minimum risk: Spain, Italy, The United Kingdom, Norway, Sweden, Hungary, The Czech Republic, South Africa and others.

Group III. Countries with maximum risk: The Russian Federation, China, India, Turkey, Mexico, Saudi Arabia etc.

Group IV. Countries with imminent risk of famine, which naturally include (according to the author of the study) Romania, then Bulgaria, Ukraine and some African countries.

An analysis of the respective study leads to the declared conclusion that the grouping was done according to one criterion, the price increase in food, without taking into account the agricultural potential or the actual agricultural production, which we find unrealistic (Table 5).

Table 5

The annual production of wheat and maize per capita in some countries depending on famine risk (according to *Nomura Food Vulnerability* – Japan)

Specification	Population thousand inhabitants	Annual production of wheat and maize thousand tons	Production of wheat and maize per person kg
A. Countries without risk of famine			
- France	62.00	55380	893
B. Countries with minimum risk of famine			
- Spain	46.50	8956	193
- Italy	59.90	19660	328
- Poland	38.10	8070*	211
C. Countries with maximum risk of famine			
- Turkey	74.80	23578	315
- Russia	141.90	50976	359
D. Countries with imminent risk of famine			
- Romania	21.50	15545	723
- Bulgaria	7.60	4647	611
- Ukraine	46.20	22469	486

*) Only wheat Source: The Statistical Yearbook of Romania, 2009

Let's explain. It is known that over 60% of the cultivated surfaces at global level are occupied by cereals, which actually represent the skeleton of the food system. If we take Romania, *with imminent risk of famine*, we will notice that the wheat and maize production per capita is close to the one of France (only one fifth smaller), but 3.7 times greater than the one of Spain, 2.2 greater than the one of Italy, or 3.4 times greater than the one of Poland.

We also appreciate that the price increase in food can affect to a great extent the standard of living, but cannot lead to famine as long as that country can produce necessary food in satisfactory amounts in terms of quantity and variety. The Maslow's hierarchy of needs is well known and according to it, the first concern of each individual is the satisfaction of the physiological needs. At about the same time (the 1970s), N. Georgescu Roegen stated that "man must satisfy his biological needs before he can dedicate time and energy to the production of other goods" and adds "… currently, we are ignoring and often even deny the priority that the production of food must have over the production of any other goods."[2].

9. Organic agriculture and food security

At the beginning of the 2000s, organic agriculture was practiced in 120 countries on a surface of over 20 million ha, of which:

- Australia and Oceania ..... 11.3 million ha
- Europe ..... 6.3 ,, ,,
- North America ..... 1.5 ,, ,,
- Asia ..... 0.8 ,, ,,

In Romania, organic agriculture started in 2010 on a surface of 260 thousand ha, which represent 1.85% of the agricultural land. Of the surface cultivated organically, 80 thousand ha are cultivated with cereals and over 30 thousand ha with oleaginous and proteinaceous species.

Among the advantages quoted from literature:

- To obtain healthier agricultural products;
- To preserve and maintain soil fertility as well as avoid its degradation on the long term;
- The economy of non-renewable resources.

The contribution of organic agriculture to food security would be rather qualitative, but since the motivation of the producer is to obtain a greater profit per surface unit, it will expand.

10. Food security and genetically modified organisms (GMOs)

The consumption of food products from genetically modified plants or animals has become a very controversial topic. The introduction of particular genes into the genetic code of certain species of plants or animals could significantly influence their productivity with positive effect on the food quantity. The growth of productivity is manifested either through the immunization of plants and animals against certain diseases and pests, or through the direct increase of productivity.

The farmers see GMOs as a way to increase production and thus income, while the government sees in them a way to improve or even guarantee food security for the inhabitants. On the other hand, the medical community is more

circumspect because of the lack of specific data regarding possible long-term adverse effects on human health. The consumers are also more circumspect and will side with the medical community and nutritionists. However, the many and the hungry will say "better full now, than sick later or never." The smokers' stubbornness to persist in the consumption of a toxin whose harmful effect on human health has been more than proven is typical to the human behavior.

Authorized institutions have consulted the consumers through specific questionnaires about the opportunity of consuming GMOs by questions such as (source: Environics International, 2000:

- Are the advantages of biotechnologies more important than the risks?
- Is the modification of plant and animal genes a mistake?
- Would you buy food whose nutritional characteristics have been improved?

To the first question, most responses were affirmative, especially in the countries with dense population and reduced food supply from Asia, Latin America, Africa, but also rich countries producers of soy and cereals (USA and Canada), and interested in the increase of export possibilities. The European countries are more reserved and their final decision will be eventually made in Brussels. There are also contradictory responses. For example, Canada answers favorably (60%) to the question whether they would buy food whose nutritional characteristics have been improved, but again respond affirmatively to the question whether the modification of plant and animal genes is a mistake.

Romania is also interested in the increase by any means of the food production and it will agree to cultivate GMOs, in spite of all the opposition, rather weak, of nutritionists and a part of the medical community.

Conclusions

1. Food security, a global problem of humankind, is an equal concern for the specialists engaged in finding the means to increase the food quantity, as well as for the political decision factors whose obligation is to ensure it.
2. In truth, the primary food production depends on two factors, the available agricultural land and its productivity. The specialized literature refers to the limited agricultural land, while its fertility would be unlimited. Both land characteristics have only a relative availability.
3. The resources of agricultural land are still considerable, over 2.5 times larger than the ones currently cultivated. However, the costs of exploitation are also high and the latest environmental policies have become restrictive in this domain.
4. In what regards the land productivity, indeed it increases in an unprecedented rhythm, exceeding the population growth rate, but even here the costs are high and we are still reserved in regards to the health issues posed by the new products.

5. Another important problem is the distribution of food, both in terms of space and of the social groups with various degrees of *famine*. In both cases, the solution is difficult and it is mostly the responsibility of the world political leaders.
6. The globalization of the economy and of the markets may be a favorable factor in assuring food security, if the decision factors could temper the enrichment desires of those that manipulate the flow of primary agricultural production, the processors and distributors.

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