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FOOD PRODUCTION VERSUS POPULATION FROM FOOD SECURITY PERSPECTIVE

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Abstract: *The food-population ratio has two determinants: population and agricultural production. The population is constantly growing, putting pressure on existing resources, which are becoming insufficient. Globally, agricultural production has grown at the same rate as population growth, but at different rates in different geographical areas and regions. This raises the question of comparing the rate of growth of agricultural production with the rate of population growth and identifying regions where agricultural production is growing compared with regions where population growth is occurring.*

Keywords: *Food-population ratio, food security, population growth, agricultural production.*

JEL classification: Q18, Q56.

INTRODUCTION

Food security refers to people's access to sufficient, safe and nutritious food to lead healthy and active lives. Food security involves issues such as the availability, accessibility, adequacy and utilization of food. (DO IT)

Thus, ensuring food security involves, among others, the physical access of the population to sufficient food, thus two important variables intervene: population and food.

Regarding the population, there is sufficient evidence that it will increase considerably in the future, globally, and the pressure of the population on the resources will be greater and greater.

Thus, the second component intervenes, namely access to food, the latter being achieved following the processing of agricultural production.

This raises the issue of comparing the agricultural production growth index with the population growth index and identifying the regions where agricultural production growth is taking place versus the regions where demographic growth is taking place.

There are various factors that influence food production and food security. Agriculture is the main source of food production. Farmers grow agricultural crops such as cereals, vegetables, fruits and oilseeds and raise animals for meat, milk and other derived products (He, et al., 2019). The use of modern agricultural technologies such as agricultural machinery, irrigation and pesticides improves yields and productivity. (Takahashi, et al., 2020)

Climate change can affect food production by altering rainfall patterns, increasing temperatures, and causing extreme events such as droughts and floods. (Anderson et al., 2020)

Government policies, such as agricultural subsidies and regulations, can influence food production and distribution. (June, 2017)

Regarding the interdependencies between the population and food security, according to the specialized literature, various manifestations have been identified. A growing population requires greater food production to meet increasing food demands.

Increasing urbanization can affect access to agricultural land and lead to dependence on imported food in cities. (Szabo, 2016)

Poor people may have difficulty affording healthy and nutritious food, which can lead to food insecurity. (Laborde, et al., 2020)

Areas affected by conflict and social instability can have major difficulties in ensuring food security due to the destruction of infrastructure and the disruption of food production.

International trade relations influence the availability and affordability of food, as many countries depend on food imports. (Amit, et al., 2017)

In general, to ensure food security, it is important to have policies and programs that promote sustainable food production, improve access to food for the disadvantaged, and adapt to climate change and other threats to food production.

MATERIALS AND METHODS

In this paper, we want to analyze the relationship between the dynamics of agro-food production and the dynamics of the population with implications for ensuring food security. To achieve this aspect, the use of statistical data provided by the international FAOSTAT database was used, namely data on world population dynamics in the period 1961-2020 and forecasts for 2030 and 2050, as well as data on global agricultural production. With the help of these data, a quantitative analysis of them was resorted to, determining dynamic indices for the analyzed period, as well as determining the agricultural production per inhabitant at the continental level.

RESULTS AND DISSCUSION

The food/population ratio has two determinants: population and agricultural production. The growing population puts pressure on existing resources, which are no longer sufficient. Globally, agricultural production is growing at the same rate as population, but at different rates in different geographic regions. This raises the issue of comparing agricultural production growth rates with population growth rates and identifying areas of agricultural production growth versus areas of population growth.

The demographic factor. Population growth is a debated issue in many specialist papers because of the consequences it has on food security and resource use. In the year 2023, the world's population is 8 billion people, and 99% of the population growth, which is about 80 million people per year, is occurring in developing countries. It is estimated that the population of Central African countries will increase by 193% between 2003 and 2050 (Semionov, 2009, p.272). About 90% of the world's population lives on 10% of land. The highest population densities are found in the United States, Europe, India and East Asia. But densely populated areas are not necessarily overpopulated, as long as they have sufficient food, energy and water resources. The region with the largest population growth, Africa, faces the worst shortages of such essential resources.

To estimate the degree of satisfaction of the need for food products in the world, the ratio between population growth and food production growth is analyzed. The latter, even if it has an increasing trend, the food situation in the world has not changed. In Africa, the region where hunger is most acute, and in Asia, the region with the highest population density, food security is still low.

The global food situation and, consequently, ensuring food security is influenced by the demographic factor. In table 5.1. and Figure 5.1. the world population dynamics from the last decades of the last century, in 2015, and the world population forecasts for the years 2030 and 2050 are presented.

The distribution of the population on the globe is unbalanced: 75% is distributed in the northern part (about 60% in Asia, 10% in Europe, 5% in North America) and 25% in the southern

part (15.3% in Africa, 5.7% in South America and 0.5% in Oceania). 60% of the world's population lives in Asia, 19.5% in China, and 17.8% in India.

Table 1. World population dynamics, 1961-2020, projections for 2030 and 2050 (thousands of people)

Geographical area	1961	1970	1980	1990	2000	2010	2020	2030*	2050*
Total world	3085785	3687496	4443492	5296249	6122769	6985603	7840952	8321382	9306131
Africa	293662	368149	482806	635288	811099	1055233	1360677	1562046	2191597
North America	207562	231284	254453	281162	313288	345272	373956	401658	446864
South America	151779	191462	240854	295577	347433	393078	431530	461497	488072
Asia	1704840	2089418	2581949	3132855	3719042	4221171	4664324	4867740	5142223
Europe	637317	692764	738988	776947	726780	736276	746225	741232	719258
Oceania	16104	19502	22970	26967	31130	37102	43933	47095	55235

* forecasts, Source: FAOSTAT, 2023

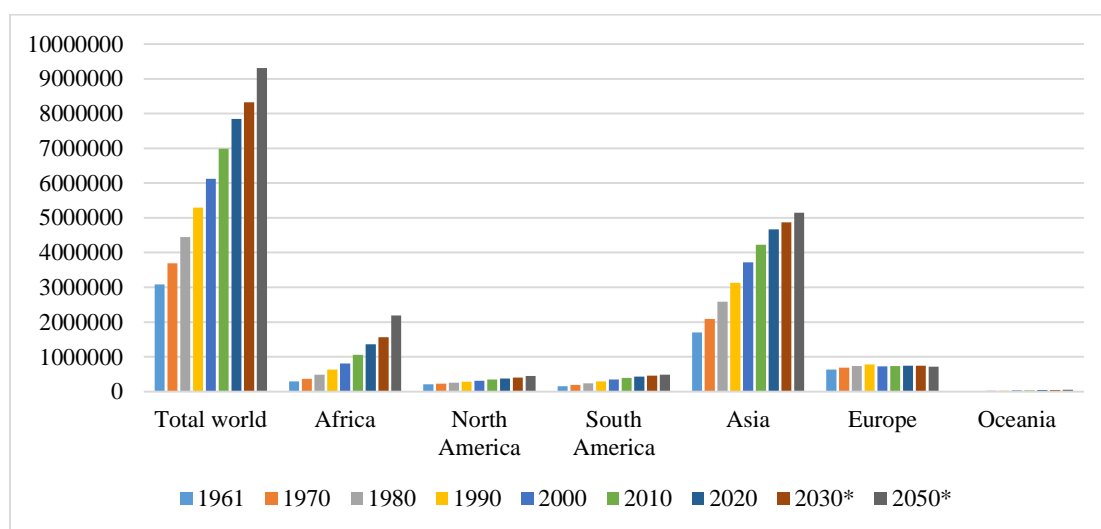


Figure 1. World population dynamics, 1961-2020, projections for 2030 and 2050 (thousands of people)

Source: own realization based on the data in Table 1.

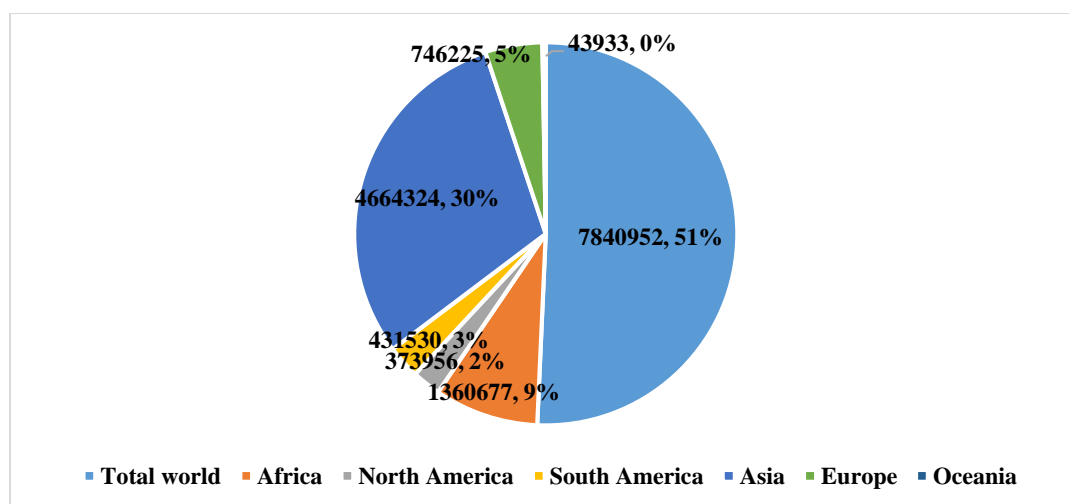


Figure 2. Distribution of world population by geographic region, 2020

Source: own realization based on the data in Table 1.

In terms of dynamics, the last decades had the fastest rates of population growth. Worldwide, the population has increased 2.5 times since 1961 to date. The most accelerated rate of population growth is registered on the continents of Africa (4.6 times), South America (2.8 times) and Asia (2.7 times), where the level of poverty is higher than the world average. Demographic gaps between developed and developing countries have deepened, all the more so as the world population has grown from 3 billion in 1961 to 8 billion people in 2023.

According to estimates, the world's population will continue to grow, so that in 2050 it will exceed 9 billion inhabitants. The results of research in the field of population dynamics show, however, that the population explosion will not take place, due to the manifestation of some phenomena that will limit it, such as natural calamities, diseases of the modern world, inadequate resource distribution systems, family planning, etc.

Globally there are two types of trends. On the one hand, special demographic phenomena are manifested in several countries where the birth rate is low (the United States of America, Japan, France, Italy, Germany and other Western European countries, where the population dynamics is approximately 100%). On the other hand, there are countries where population explosion is difficult to control. In China, the population grew from 1,264,099,069 people in 2000 to 1,425,671,352 people in 2023 (112%), and in India, from 1,059,633,675 people to 1,428,627,663 people (134%).

To solve the food problem from the perspective of population growth, worldwide, there are numerous initiatives. Thus, at the Population Conference in Cairo (Wijkman, Rockstrom, 2013, p.142) an action plan was developed whose main goal was to radically improve the situation of women and reduce the birth rate. The conference showed that measures to limit population growth, reduce poverty, increase well-being and reduce environmental degradation are closely linked and mutually reinforcing. Reports compiled after the Cairo conference showed that significant progress had been made: the birth rate had fallen significantly from an average of about 5 children per woman in the 1950s to 2.6 in 2010.

Decline in the birth rate it is a determinant of increased well-being and prosperity globally. More than 70 countries have a birth rate of less than 2 children per woman. Among them are Canada, Australia, Japan and many European countries, but also countries such as Singapore, South Korea, Russia and Uruguay. At the opposite pole, however, in many African countries, but also in countries such as Afghanistan, Yemen, Saudi Arabia, Pakistan, Guatemala, Bolivia, the average number of births for a woman is between 4 and 8.

In this context, it is easy to predict an increase in the population in the perspective of 2050.

Food production per capita. The analysis of population dynamics is accompanied by that of food production per inhabitant.

In Table 2. food production indices are shown in 2021 compared to 2010, calculated based on the value of food production, based on the period 2014-2066. Although population growth creates pressure on food resources, still, worldwide, humanity has the necessary daily food, food production having an increasing trend, more dynamic than that of population growth (124%, compared to 112%).

Although food production increased in the year 2021, compared to 2010, to 124%, however, at the level of the continent, different trends are manifested. In Africa, food production grew the fastest (at 133%), followed by Asia at 127%.

In South America, food production increased by 124% and in Oceania by 121%. Slower rates of agricultural production growth were recorded in Europe and North America, where the indices have values of 116% and 114%, respectively.

Table 2. Indices of the value of world agricultural production, by region, compared to population indices

Region	Value of agricultural production (thousands of international dollars)			Population (thousands of people)		
	2021	2010	2021/2010 0 (%)	2021	2010	2021/2010 (%)
World	4125746540	3323571228	124	7840952	6985603	112
Africa	387135537	290349849	133	1360677	1055233	129
North America	426895240	374503460	114	373956	345272	108
South America	422268222	339448241	124	431530	393078	110
Asia	2147622130	1687523240	127	4664324	4221171	110
Europe	575369257	496870062	116	746225	736276	101
Oceania	66271653	54753119	121	43933	37102	118

Source: own processing based on FAOSTAT data, 2023

The production of agro-food products shows a certain specialization of the continents (Table 3).

Table 3. Production of the main agricultural and food products, in 2021, per inhabitant (kg/person)

Product	World	Africa	North America	South America	Asia	Europe	Oceania
Cereals	439,6	204,7	1446,3	595,3	349,5	746,6	1404,6
Fruits	130,2	119,6	68,8	221,8	126,3	111,2	229,2
Meat	51,2	20,9	157,0	118,6	36,0	88,5	174,3
Milk	131,4	50,9	324,7	170,9	95,2	316,6	829,2
Vegetables	165,3	81,1	87,5	57,9	214,0	121,2	91,6

Source: FAOSTAT, 2023

With the exception of Oceania, where the highest per capita productions are recorded for almost all agricultural products, except for vegetables, the highest amount of cereals per capita is recorded in North America, 1400 kg/person; the largest amount of fruit per inhabitant – in South America, 221 kg/person; the largest quantity of vegetables per inhabitant – in Asia, 214 kg/person; and the largest quantities of milk and meat – in North America, 324 kg/person, respectively 157 kg/person. This structure of agro-food production per inhabitant reflects a certain specialization of it on the continents, with a concentration on the Oceania area for products of animal origin.

The United States of America is the main producer of grains, which are primarily used for animal feed, followed by export. In Asia and South America there are favourable conditions for the development of vegetable and fruit production, even in several cycles.

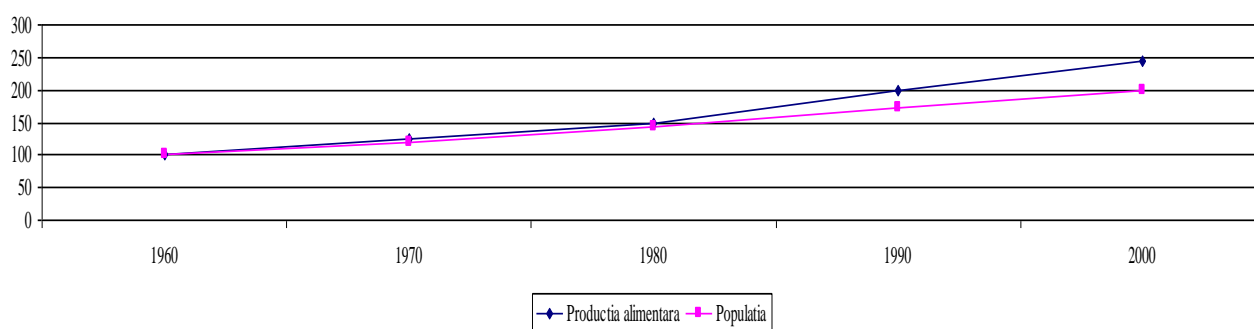


Figure 3. Indices of food production and population, 1961=100 (%)

Source: FAOSTAT

In Figure no. 3 shows the indices of food production and population in the period 1961-2000, with a fixed base in 1961. It can be seen that food production increased more than the population, in 2000 the index was 245%, compared to the population growth index of 198%.

The analysis of the population-food ratio shows that both population and agricultural production have increased in recent decades, but differently depending on the region. Food insecurity is caused not only by the growing demographic factor, but also by food production unevenly distributed across regions and categories of states, which means that solving the food problem can only be achieved through economic restructuring measures of agriculture in developing countries. development, especially through investment and technology transfer.

CONCLUSIONS

The study of the relationship between population and food reveals a complex and interconnected landscape in which food production, food access and food security are key factors. With a growing global population and challenges such as climate change, urbanization and social instability, providing food for every individual becomes a significant challenge.

Investments in sustainable agricultural technologies, innovative agricultural practices and effective government policies are essential to increase food production and ensure equitable access to food. Education and public awareness of healthy and sustainable food choices also play a crucial role in promoting food security.

It is also important to pay special attention to vulnerable populations, such as the poor and those affected by conflict, to ensure that they have access to sufficient and nutritious food. In addition, international cooperation and fair-trade initiatives can play a significant role in addressing inequities in global food distribution.

Achieving long-term food security requires an integrated and collaborative approach involving governments, non-governmental organizations, the private sector and civil society. Only through joint efforts and innovative strategies can we ensure that food is available, accessible and nutritious for all, thus contributing to a safer and healthier future for everyone.

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