Food security: changes and trends on world agricultural markets

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ABSTRACT
This paper aims to investigate the state of food security worldwide, trying to answer the questions: What are the changes of food demand and supply on the world market? What are the gaps in food availability between different regions of the world? Which are the future trends of food demand and supply? In pursuing these questions, statistical data from FAO data base have been gathered and analyzed. Forecasts of food consumption and production are made using graphical method. The results show that in regions where food consumption is low, Africa, Asia, it does not provide the nutrients necessary to maintain harmonious development and health. In contrast, there are countries in North America, Europe and Oceania, where consumption is sufficiently varied and nutritionally balanced.

Keywords: agricultural markets, food security, food crisis, hunger

INTRODUCTION
The research investigates the state of food security, emphasizing the differences among regions of the world, among developed countries and developing countries. It focuses on establishing whether changes in food demand and supply on the market have affected the state of food security and, if so, what are the future considerations of this issue.
The objectives of the research are to identify the dynamics of food consumption and production worldwide, in the last fifty years, the gaps in food security situation between regions, to forecasts the food demand and supply to draw appropriate conclusions about future trends of food security.
The differences in food security assurance between developed and developing countries issue from the gaps of resources spent per capita. It is estimated (Diamond, 2005) that 1 billion people in developed countries use, per capita, 32 times more resources compared to the developing countries.
The market economy has its limits, including international agricultural trade imbalances, debt of underdeveloped countries and food crises causing strong pressure characterizing the agricultural markets. In addition, adjustment of agricultural markets can not be achieved only on the "invisible hand" of competition, but requires interventions to support the supply and / or demand for certain agricultural products.
The world agricultural market show fluctuating trends, under the impact of imbalance between supply and demand, difficult to correct because of the lack of elasticity of agricultural production on the short term.

As trends, in recent decades in developed countries demand remains the same, and supply tends to exceed demand, although the geographical areas and countries remain major imbalances. As a result, prices are fluctuating and agricultural markets are unstable.
World agricultural markets are influenced by agro-dependence of developing countries, particularly in Africa, and in a number of major oil-producing countries, which have no agricultural resources (United Arab Emirates, Iran, Iraq).

MATERIALS AND METHODS

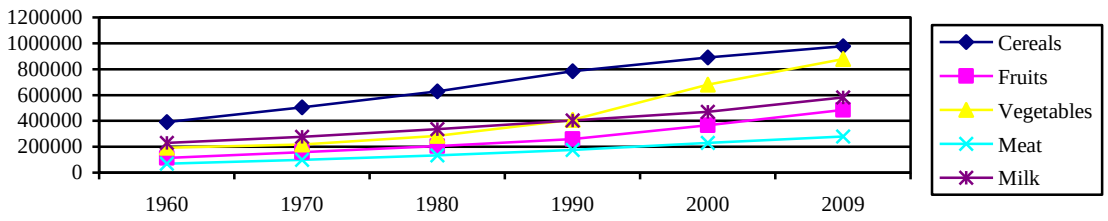
Demand for agricultural products on world markets

Demand for food supply is a complex economic category, reflecting the differences in consumer behavior, both between population groups within the same country and between countries. The size and structure of demand are influenced by economic factors (income and prices), demographic, social, geographical etc.
Among the mentioned factors, income has a significant influence on the structure and size of demand for agricultural products. For example, low income reduces consumption level, especially for products with high nutritional value: meat, milk, vegetables and fruits, and maintain or increase consumption of foods with low nutritional value cereals and cereal products, potatoes, vegetables etc.
To capture the changes in world agricultural demand and differences between countries, the food consumption in different regions of the world is analyzed in dynamic and structurally.
Although, on short-term consumption does not vary greatly, in the long run, in the last 50 years, consumption of agricultural products increased 2.5 times in cereals and milk and 4 times in fruits, vegetables and meat (Table 1). The application not only increased intensively (consumption per capita), but also extensively due to increasing world population.

Table 1 Dynamics of world consumption for the main agricultural products, 1960-2009
(1000 tons)

Specification	1960	1970	1980	1990	2000	2009	2009/1960 (%)
Cereals	390527	503780	628141	783388	890409	976681	250.1
Fruits	114568	158569	205068	258991	366603	485446	423.7
Vegetables	193962	218763	283602	408140	679353	877489	452.4
Meat	70062	98185	133963	175665	229364	278863	398.0
Milk	229546	275908	337408	404000	469896	580868	253.1

Dynamics of world consumption for the main agricultural products, 1960-2009
(1000 tons)



Source: FAO, own calculations

There are structural differences between regions in per capita food consumption, an important indicator of food security (Table 2). The population of Africa, Asia and South America has a diet based on vegetable products and the population in North America, Europe and Oceania has a diet based on animal products: meat, milk, and products with high nutritional value : vegetables and fruits.

Table 2 Regional disparities of agricultural products per capita consumption for the main agricultural products, 2009

Specification		Africa	Asia	North America	South America	Europe	Oceania	World
Consumption per capita (kg / year / person)	Cereals	151	155	109	118	131	98	147
	Fruits	62	64	113	103	92	103	73
	Vegetables	65	161	122	52	122	99	132
	Meat	18	31	117	73	76	105	42
	Cow milk	44	54	250	130	219	178	87

Source: FAO, own calculations

In regions where food consumption is low, Africa, Asia, it does not provide the nutrients necessary to maintain harmonious development and health. In contrast, there are countries in North America, Europe and Oceania, where consumption is sufficiently varied and nutritionally balanced.

Supply of agricultural products on world markets

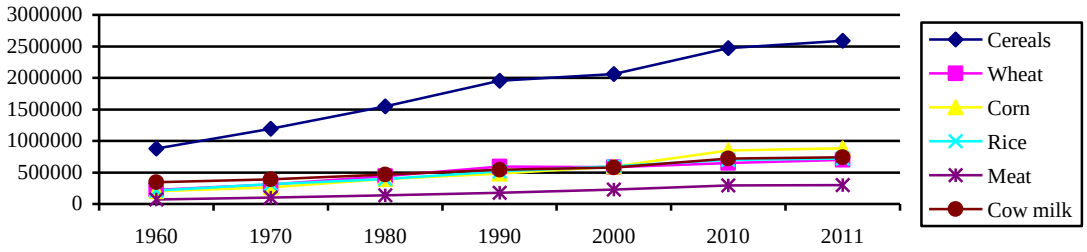
Although currently climate change, economic and social crisis occur, however, the world agricultural production has sharply increased, after the Second World War.

Total world agricultural production per capita for the main agricultural products, although it does not ensure domestic food demand in some regions has, however, an ascendant trend (Table 3).

Table 3 Dynamics of total world agricultural production and per capita for the main agricultural products, 1960-2012

Specification		1960	1970	1980	1990	2000	2010	2011	2012
Total production (1000 tons)	Cereals	876 874	1192508	1549913	1952458	2060595	2474121	2589143	2546631
	Wheat	222 357	310 740	440 187	592 311	585 690	651 906	701 395	674 884
	Corn	205 027	265 831	396 623	483 372	592 479	849 792	885 289	875 098
	Rice	215 646	316 345	396 871	518 568	599 355	701 047	722 559	718 345
	Meat	71 357	100 668	136 736	179 423	229 961	293 242	298 871	-
	Cow milk	344 184	391 820	465 657	542 739	578 986	722 963	739 363	-
Production per capita (kg / person)	Cereals	284.2	323.4	348.8	368.6	336.5			357.2
	Wheat	72.1	84.3	99.1	111.8	95.7			94.7
	Corn	66.4	72.1	89.3	91.3	96.8			122.7
	Rice	69.9	85.8	89.3	97.9	97.9			100.7
	Meat	23.1	27.3	30.8	33.9	37.6			-
	Cow milk	111.5	106.3	104.8	102.5	94.6			-

Dymanics of total world agricultural production, 1960-2012 (1000 tons)



Source: FAO, own calculations

The world currently produces three times more grain than in 60s, four times and two times more meat and milk. The highest production increases recorded to corn and meat (corn sustain, actually, livestock).
Although the production of meat and milk increased, availability per capita consumption remain low compared to normal diet (the availability of milk remained the same for over 40 years).
Increasing agricultural production and improve its global structure, by increasing livestock production, is a way of improving consumption and hence food security. In return, increased animal production depends on the degree of intensification of agriculture and fodder resources (especially cereals and soybeans).

RESULTS: WORLD AGRICULTURAL DEMAND AND SUPPLY – GAPS, TRENDS AND FORECASTS

Analysis of the global food security situation is based on comparisons of the level of agricultural production in different parts of the world and highlighting gaps between developing countries and developed countries. This, compared to the share of the main areas considered, highlight disparities and unequal distribution of agricultural production, the main source of food security.
In Africa, where lives 15% of the world population, only 6% of grain is produced, 3.6% of wheat and 13% of fruits, 6% of vegetables, 5% of meat and around 5% of milk. In Asia lives two thirds of the world population, but get less than half the production of cereals, fruits, meat, and cow milk. Only the share of vegetable production produced in Asia in total world production is greater than the share of population. North America produce two-three times more grains, wheat, meat and milk, than the needs of consumers. In South America and Europe the situation is more balanced: production of cereals, fruits, meat and cow's milk is even higher than consumption needs. Oceania produces more than consumer demand, excluding vegetables.

Table 4 Regional disparities of total world agricultural production and per capita for the main agricultural products, 2012

Specification		Africa	Asia	North America	South America	Europe	Oceania	Total world
Share of area population in the world population (%)		15.4	60.2	5.0	5.7	10.4	0.5	-
Share of area production	Cereals	6.1	50	16.8	6.2	18	1.6	
	- Wheat	3.6	46.8	13.2	2.9	29th	4.5	
	Fruits	13.4	51.6	4.4	12.8	11.2	1	

Specification		Africa	Asia	North America	South America	Europe	Oceania	Total world
in total world production (%)	Vegetables	6.2	76.9	3.4	2.3	9.2	0.3	
	Meat	5.3	41.8	15.8	12.8	19.4	2	
	Cow milk	5.0	36.9	13.4	9.1	29.6	3.7	
Production per capita (kg / person)	Cereals	153	302	1151	422	565	1164	351
	Wheat	22	73	251	48	264	794	94
	Fruits	81	76	79	201	97	170	84
	Vegetables	65	195	104	62	135	83	150
	Meat	15	29th	132	95	78	154	40
	Cow milk	38	64	275	163	290	707	101

Source: FAOSTAT, own calculations

More than half of production and supply of main agricultural products of vegetal origin are obtained in Asia (50% of cereal production, 51% of fruit, 77% of vegetable). But Asia is in the top of world producers for animal products as well: 37% of milk production and 42% of meat production.

The large geographical disparities arise between the share of population and the share of grain production, between Europe and North America and populated and poorest areas of the world.

Developed countries, which hold 16% of world's population, produce 36% of the grain, while the developing countries, which hold 84% of world's population, produce only 64% of the grain. The situation is not only due to the lower land resources of the developing countries, but also the gap in yields.

Solutions to increase agricultural production in developing countries aimed at both extensively approach - increasing the area cultivated - and intensively approach - additional allocation of factors per unit of production (per hectare and / or animal) and higher average yields.

In some developing countries, agricultural production increased as a result of the Green Revolution, so India has produced in the years 1986-1987, 160 million tons of grain, other countries in Central Asia, the Middle East and Latin America have notably increased production in the 80s.

However, the level of grain production per capita remains very low. Compared to the world average of 351 kg / capita, 1151 kg / capita in North America, and 1164 kg / capita in Oceania, in Africa it is only 153 kg / capita.

Imbalance between per capita grain production in different continents and groups of countries is obvious. Thus, the ratio between the grain production per capita between Africa and North America is 1: 7.5.

Increasing yield is the only way to solve the problem of cereals in developing countries. In Africa, doubling yields would improve the food situation of the population and reduce structural power imbalances.

Meat production per capita in the world is 40 kg. The higher per capita productions are obtained in Oceania, North America, South America and Europe. The ratio of the average meat production in Africa and Oceania is 1:10.

In 2012, Europe has 19% of global meat production to a population of 10% of humanity, and North America 15% to 5% of the population, while Africa and Asia holding 5% and 42% of production, for 15% and 60% of the population. Although there is surplus production of meat in

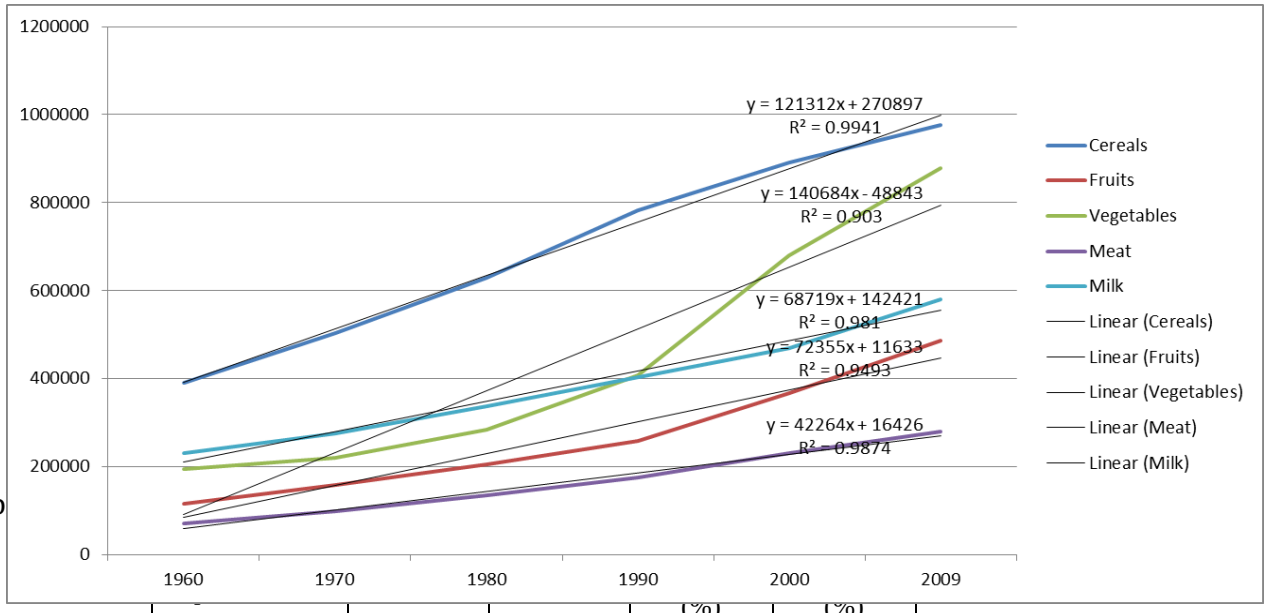
rich areas of the globe, humanity still suffers from major imbalances due to the lack of animal protein.

World milk production is concentrated in Europe, where large surpluses occur. The average per capita production of milk varies depending on the area, as follows: in Africa 38 kg, 64 kg Asia, 163 kg in South America. Developed countries have the highest per capita production of milk, 2-3 times higher than the world average and 6-9 times higher than production per capita in developing countries. The gap between milk production per capita in Africa and Europe is of 1:7.6.

For better understanding the food market trends, we forecast supply and demand for the next period of time. Considering the data of table 1 Dynamics of world consumption for the main agricultural products, 1960-2009, and the data of table 3 Dynamics of total world agricultural production for the main agricultural products, 1960-2012, data for 2020 and 2030 result using graphical method of extrapolation.

Table 5 Forecasts of world consumption for the main agricultural products, 2020, 2030 (1000 tons)

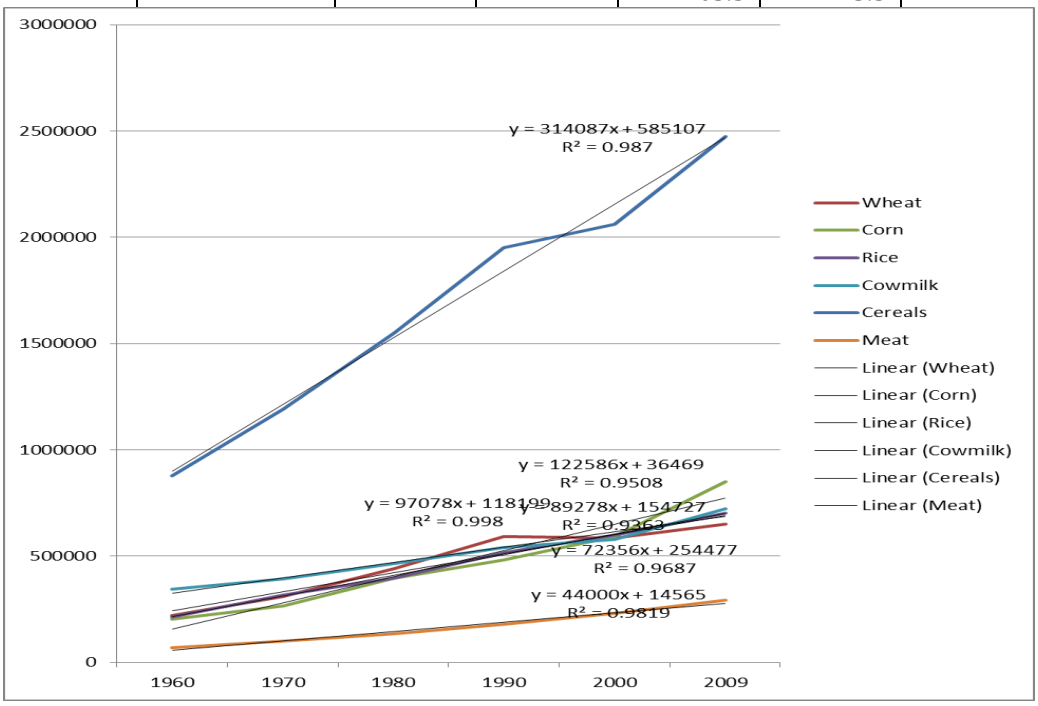
Specification	2020	2030	2020/2009 (%)	2030/2009 (%)
Cereals	1120095	1241409	114.7	127.1
Fruits	518118	590473	106.7	121.6
Vegetables	935945	1076629	106.7	122.7
Meat	312274	354538	112.0	127.1
Milk	623454	692173	107.3	119.2



Tab

			(%)	(%)
Cereals	2783716	3097803	112.5	125.2
Wheat	779673	868951	119.6	133.3
Corn	895971	1018757	105.4	119.9
Rice	797745	894823	113.8	127.6

Meat	322565	366565	110.0	125.0
Cow milk	760969	833325	105.3	115.3



Both food production and consumption will increase, with about the same growth rates, in the next periods, continuing the linear trend. Although currently climate change, economic and social crisis occur, however, the world agricultural production increases. The food consumption grows as well, due to the increase of population.

CONCLUSION

The results show that in regions where food consumption is low, Africa, Asia, it does not provide the nutrients necessary to maintain harmonious development and health. In contrast, there are countries in North America, Europe and Oceania, where consumption is sufficiently varied and nutritionally balanced.

The low level of food security is some regions of the world, due to the gaps in resources allocation and effects of the food crisis, becomes apparent through drastic reduction of global food reserves, far beyond the minimum security, rising food prices on the world market, increasing developing countries' dependence on exports of developed countries.

Researchers (Wijkman, 2013) argue that a second green revolution could solve the food security, in the sense that resources could improve access to food for 1 billion chronically undernourished people, and in addition, provide food for a growing world population estimated 2 up to 3 billion people over the next 30-40 years. Food production should increase by 70% by 2050 to adequately feed a growing world population (IAASD, 2009). In the twentieth century, in the '60s, Asia held the first green revolution, which resulted in a doubling of production for major cereals - wheat, maize and rice. It was the result of modern agricultural policy based on hybrid

perfected on chemical fertilizers on diesel pumps for irrigation and pesticides. These methods led to the growth of agribusiness food production, especially in India.
Currently, the food security is the lowest in Africa. A second green revolution should be sustainable in terms of environment, given that the first green revolution had negative effects, such as decreasing water reserves, soil erosion, chemical pollution of soil with pesticides and heavy overloading them with nutrients through fertilizers. As a result, the main feature of the second green revolution is durability. In addition, it must be based on management practices adapted to a warmer climate.

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