

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

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доцент**DEVELOPMENT OF MODEL SCENARIOS
FOR FOOD PRODUCTION AND CONSUMPTION
FORECASTS IN TERMS
OF SOLVING GLOBAL FOOD PROBLEM****РОЗРОБКА МОДЕЛЬНИХ СЦЕНАРІЇВ
ПРОГНОЗУ ВИРОБНИЦТВА
ТА СПОЖИВАННЯ ПРОДОВОЛЬСТВА
У КОНТЕКСТІ ВИРІШЕННЯ ГЛОБАЛЬНОЇ
ПРОДОВОЛЬЧОЇ ПРОБЛЕМИ**

Urgency of the research. Food problem issues take a prominent place in national security concepts of every developed country. In the context of Ukraine's commitment to integration into the European community, the food problem is of prominent significance.

Target setting. Given the global economy dynamics, the research of this problem is not exhaustive and needs new approaches to scientific research.

Actual scientific researches and issues analysis. The problems of food support of the population reflected in the works of L. Brown (2011), O. Berezin (2011), L. Berezina (2011), V. Vlasov (2009), M. Lysak (2009), R. Maltus (1998), B. Paskhaver (2007), M. Puhachov (2014), A. Sen (1979), Ya. Stoliarchuk (2009), etc.

Uninvestigated parts of general matters defining. Existing mechanisms of formation and distribution of world food resources, international trade therein, and food aid do not create an efficient system to ensure sufficient food support around the world. Therefore, it is important to reason the forecast ratio of deficit and domestic production for certain types of food to satisfy the demand under WHO standards.

The research objective. The purpose of the article is to identify the most and least vulnerable countries in terms of food security through the forecast ratio of deficit (shortage) and domestic production for certain types of food to satisfy the demand under WHO standards in particular parts of the world.

The statement of basic materials. Prospects for tackling the global food issue by using trend, adaptive and integrated autoregressive models (Box-Jenkins and OLYMPUS models) have been analysed. The calculations herein have been provided by different parts of the world: Africa, America, Asia, Europe, and Oceania.

Conclusions. The results show that almost all parts of the world are unable to provide the population with rational norms of major foods through domestic production.

Keywords: global food problem; food support; food security; food standards; food deficit.

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Urgency of the research. One of the most urgent and unresolved problems today is the global

Актуальність теми дослідження. Питання продовольчої проблеми займають важливе місце в концепціях національної безпеки усіх розвинутих країн. В умовах прагнення України інтегруватися у європейське співтовариство продовольча проблема набуває особливого значення.

Постановка проблеми. Враховуючи динаміку глобальної економіки можливості поглиблення дослідження даної проблеми потребують нових підходів наукового пошуку.

Аналіз останніх досліджень і публікацій. Проблеми продовольчого забезпечення населення знайшли своє відображення в працях: О. Березіна, Л. Березіної, Л. Брауна, В. Власова, М. Лисака, Р. Мальтуса, Б. Пасхавера, М. Пуґачова, П. Саблука, А. Сена, Я. Столярчук та ін.

Виділення недосліджених частин загальної проблеми. Існуючі механізми формування і розподілу світових продовольчих ресурсів не створюють ефективною системи забезпечення країн світу достатнім обсягом продуктів харчування. Тому важливим є обґрунтування прогностичних оцінок співвідношення обсягів дефіциту та внутрішнього виробництва за окремими видами продуктів харчування для забезпечення попиту за нормативами ВОЗ.

Постановка завдання. Метою статті є виявлення країн найбільш і найменш уразливих з точки зору продовольчого забезпечення, шляхом здійснення прогностичних оцінок співвідношення обсягів дефіциту (нестачі) та внутрішнього виробництва за окремими видами продуктів харчування для забезпечення попиту за нормативами ВОЗ по окремих частинах світу.

Виклад основного матеріалу. Досліджено перспективи вирішення глобальної продовольчої проблеми шляхом використання трендових, адаптивних та інтегрованих авторегресійних моделей (моделей Бокса-Дженкінса та ОЛІМП). Розрахунки виконано за окремими частинами світу: Африка, Америка, Азія, Європа, Океанія.

Висновки. Отримані результати свідчать, що практично за всіма частинами світу по основних продуктах харчування відсутня можливість забезпечення населення раціональними нормами харчування за рахунок внутрішнього виробництва.

Ключові слова: глобальна продовольча проблема; продовольче забезпечення; продовольча безпека; нормативи харчування; дефіцит продовольства.

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

food problem. Existing at all times, it is still relevant in the 21st century as the availability and quality of sufficient volumes of food remains the basis for the existence of any person and country. Lester Brown, a recognized American agrarian and global food problem expert wrote that it was the reduction of food support that caused the fall of many civilizations [1].

The essence of the food problem is manifested in the uneven distribution of food resources between countries and inadequate nutrition of the significant amount of population. Thus, according to the Food and Agriculture Organization (FAO), the number of the starving in 2014 amounted to 805 million people [2]. Moreover, FAO experts refer 77 countries to the countries with low-income and food deficit [3].

Target setting. The urgency of the food problem is conditional to the fact that it relates to the basics of human existence as a biological kind. The level of food availability affects the possibility of physiological, psychological, and intellectual condition of people as well as determines the level of peace or social tension in the society. Lack of food leads to inevitable death.

Given the global economy dynamics, the research of this problem is not exhaustive and needs new approaches to scientific research.

Actual scientific researches and issues analysis. Domestic research of contemporary global problems is characterised by comprehensiveness and focus on forecast modelling of their solutions. The problems of food support of the population as well as uneven food production and consumption around the world are reflected in the works of foreign and domestic scientists, e. g.: L. Brown (2011) [1], O. Berezin (2011) [4], L. Berezina (2011) [4], V. Vlasov (2009) [5], M. Lysak (2009) [5], R. Maltus (1998) [6], B. Paskhaver (2007) [7], M. Puhachov (2014) [8], A. Sen (1979) [9], Ya. Stoliarchuk (2009) [10], etc. At the same time approaches to the food problem evaluation by means of the usage of global indicators set by international organizations are still not enough investigated and require further improvement.

Uninvestigated parts of general matters defining. Uneven development of the world economic system entities dramatically increases the tendency to aggravation of the global food problem, which has been only deepened by permanent global crisis. Existing mechanisms of formation and distribution of world food resources, international trade therein, and food aid do not create an efficient system to ensure sufficient food support around the world. Therefore, it is important to reason the forecast ratio of deficit (shortage) and domestic production for certain types of food to satisfy the demand under WHO standards.

The research objective. The purpose of the article is to identify the most and least vulnerable countries in terms of food security through the forecast ratio of deficit (shortage) and domestic production for certain types of food to satisfy the demand under WHO standards in particular parts of the world.

The statement of basic materials. The strategies addressing the global food problem are developed based on identifying the opportunities for countries to meet their demand for major food in terms of rational standards.

The long-term assessment to ensure food support under the specified standards of consumption through domestic production is based on the development of model forecast scenarios for production and consumption.

The scenarios have been developed based on the following initial grounds:

- Certain predictive estimates for the years 2018-2020 are defined on the ground of optimal approximation models for trends in production of certain products.
- Forecast production volumes, which can be applied for food, may be calculated taking into account the food share in production.
- The population of a particular part of the world is forecast through the extrapolation of trends prevailing for the years 2006-2015.
- The amounts of certain foods required to meet the needs of the population while ensuring the defined standards of food are calculated.
- The additional need or surplus (+/-) in the major foods production to ensure food standards is determined.

All calculations are based on the production database and the domestic consumption of major foods for the years 2006-2015 by the following parts of the world: Africa, America, Asia, Europe, and Oceania.

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

The modelling of trends of change in production volumes of certain products is based on the use of trend, adaptive, and integrated autoregressive models (Box-Jenkins and OLYMPUS) while the choice of the optimal model is made under formal criteria of approximation: min OLS, min ϵ rel., max F-criterion.

The predicted estimates are defined as the extrapolation of trends under the optimal model for a fixed term estimate. For example, in Asia (Tab. 1), best models for all major food are trendy models, in particular, second-order parabolic curves, except for the logarithmic model of vegetable production trend. Formal criteria of approximation and accuracy evidence their authenticity grounding the possibility of their use to forecast relevant figures for the years 2018-2020. The models for the prediction of the total population are determined in the similar way. We conducted similar calculations for all parts of the world.

Table 1

Forecast Number of Population and Production of Major Foods in Asia for 2018-2020

Indices	Symbols (Y _i)	Optimal Model and Relative Error of Approximation (ϵ rel.,%)	Forecast Production, mln. t.			Food Ratio, %
			2018	2019	2020	
Population, mln	Y ₁	Y ₁ =3752 +33,054t+1.567t ² $\epsilon=0.2\%$	4,521.8	4,682.1	4,766.82	–
Grains and Legumes	Y ₂ +Y ₅	Y ₂ =620.075+65.812t-2.223t ² $\epsilon=7.9\%$ Y ₅ =27.44-0.55t+0.106t ² $\epsilon=1.8\%$	1,101.0	1,104.0	1,096.4	74
			43.0	45.8	48.8	
Sugar Crops	Y ₄	Y ₄ =612.008-3.685t+1.542t ² $\epsilon=6.7\%$	903.6	947.8	995.0	34
Potato and Potato Products	Y ₃	Y ₃ =135.76-6.267t+0.984t ² $\epsilon=3.7\%$	263.1	287.4	313.6	71
Vegetable Oil	Y ₆	Y ₆ =48.726+4.6t-0.05t ² $\epsilon=1.3\%$	106.4	109.5	115.5	56
Vegetables	Y ₇	Y ₇ =1.575+0.221t $\epsilon=1.6\%$	2.18	2.19	2.20	34
Tomatoes	Y ₈	Y ₈ =589.18+13.58t+1.053t ² $\epsilon=0.9\%$	1,029.9	1,076.0	1,124.4	87.7
Fruits	Y ₉	Y ₉ =503.8+10.13t+0.741t ² $\epsilon=1.1\%$	822.5	855.6	890.1	87.2
Cattle Meat	Y ₁₀	Y ₁₀ =87.32+3.3t+0.035t ² $\epsilon=0.6\%$	144.6	149.1	153.5	99.6
Poultry	Y ₁₁	Y ₁₁ =44.33+1.755t-0.013t ² $\epsilon=1\%$	67.8	69.1	70.4	99.8
Eggs	Y ₁₂	Y ₁₂ =33.107+0.873t+0.017t ² $\epsilon=0.9\%$	49.96	50.9	52.9	89.2
Milk	Y ₁₃	Y ₁₃ =165.28+13.834t-0.295t ² $\epsilon=0.6\%$	306.3	311.1	315.3	88.7
Tomatoes	Y ₈	Y ₈ =589.18+13.58t+1.053t ² $\epsilon=0.9\%$	1,029.9	1,076.0	1,124.4	87.7
Fish and Seafood	Y ₁₄	Y ₁₄ =132.257+4.899t+0.096t ² $\epsilon=0.3\%$	227.4	235.2	243.3	88.5

Source: calculated by the author

The next stage of forecasting scenarios development to assess the possibility of food support through domestic production is associated with defining the necessary food production volume taking into account both nutrition standards and the food share in the whole production. We defined average figures for each type of product for the years 2006-2015, which are shown in column 5 of the relevant tables: for Asia, it is Tab.1 and the average food nutrition standards for major products. The scenarios have been developed based on the selected standards under WHO recommendations and the average standards of developed countries.

Uneven development of the world economic system entities dramatically increases the tendency to aggravation of the global food problem, which has been only deepened by permanent global crisis. Existing mechanisms of formation and distribution of world food resources, international trade therein, and food aid do not create an efficient system to ensure sufficient food support around the world. Therefore, it is important to reason the forecast ratio of deficit (shortage) and domestic production for certain types of food to satisfy the demand under WHO standards.

The provided estimates for Asia (Tab. 2) show that the domestic production fully satisfies the demand in such products as grains and legumes, vegetables and tomatoes, fish, and seafood both in terms of World Health Organization standards and those of developed countries (Tab. 3), while the surplus is used for export. The domestic production of vegetable oils, fruits and vegetables, and eggs in the region is sufficient to meet the demand under the WHO standards but is insufficient to ensure food support under the standards of developed countries.

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

Table 2

Forecast Demand for Major Foods in Asia for 2018-2020

Products	Consumption Standards, kg/year		Year Forecast, mln. t.						Forecast Food Production Share, mln. t.		
	WHO Recommendation	Developed Countries	2018		2019		2020		2018	2019	2020
			Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards			
Grains and Legumes	117	158	529.1	714.5	520.2	702.5	557.7	753.2	851.0	850.9	847.7
Potato and potato products	108	100	444.6	452.2	505.7	468.2	514.8	476.7	186.8	204.1	222.7
Sugar crops	38	32	171.8	144.7	177.9	149.8	181.1	152.5	31.0	32.0	33.8
Vegetable Oil	13	22	58.8	99.5	60.9	103.0	62.0	104.9	59.6	61.3	62.4
Vegetables and Tomatoes	139	140	628.5	633.1	650.8	655.5	662.6	667.4	904.0	944.4	986.8
Fruits	100	182	452.2	823.0	468.2	852.1	476.7	876.7	717.2	746.1	776.2
Cattle Meat	78	96	352.7	434.1	365.2	449.5	371.8	457.6	144.2	148.5	152.9
Poultry	27	30	122.1	135.7	126.4	140.5	127.8	143.0	67.5	68.8	70.3
Eggs*, egg/kg	291/9.24	260/10.4	41.8	47.0	43.26	48.7	44.0	49.6	44.6	45.4	47.2
Milk	380	217	1718.3	981.2	1,779.2	1,061.0	1,811.4	1,034.4	271.4	275.6	279.4
Fish and Seafood	18	21	81.4	95.0	84.3	98.3	85.8	100.1	201.2	208.2	215.2

* – When calculating the volume of egg production, we came from the fact that the standard is given in eggs and production in tons, thus we accepted the average weight of an egg (40 g) for the calculation. Source: calculated by the author.

Table 3

Surplus (+) or Deficit (-) of Domestic Production in Asia to Satisfy the Demand under the Consumption Standards for 2018-2020

Products	Consumption Standards under the WHO Recommendations	Actual Consumption in 2015 at the Expense of Domestic Production, kg/year	Deviations of Forecast Food Production Volume and Demand in Terms of Consumption Standards, per mln. t.					
			2018		2019		2020	
			Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards
Grains and Legumes	117	162.38	321.9	135.5	330.7	148.4	290.0	94.5
Potato and Potato Products	108	29	-257.8	-265.4	-301.6	-264.1	-292.1	-254.0
Sugar Crops	38	5.32	-140.8	-113.7	-145.9	-117.8	-147.3	-118.7
Vegetable Oils	13	9.26	0.8	-39.9	0.4	-41.7	0.4	-42.5
Vegetables and Tomatoes	139	168.7	275.5	270.9	293.6	288.9	324.2	319.4
Fruits	100	137.3	265	-105.8	277.9	-106.0	299.5	-100.5
Cattle Meat	78	31.31	-208.5	-290.0	-216.7	-301.0	-218.9	-304.7
Poultry	27	15.0	-54.6	-68.2	-57.6	-71.7	-59.0	-72.7
Eggs*, egg/kg	291/9.24	9.11	2.8	-2.4	2.14	-3.3	3.2	-2.4
Milk	380	58.74	-1,446.9	-709.8	-1,503.6	-785.4	-1,532.0	-755.0
Fish and Seafood	18	40.2	119.8	106.2	123.9	109.9	129.4	115.1

Source: calculated by the author

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

At the same time, Asia has a significant deficit in food support through domestic production both under the WHO standards and those of developed countries for the following types of products: potatoes and potato products, sugar crops, cattle meat, poultry, milk, and dairy products.

It should be noted that, e. g., production of milk and dairy products in 2018-2020 should be almost 4.72 – 4.86 times more than the forecast volumes, i e. in case of the same development trends that appeared in 2006-2015 (Tab. 4), the production of potato should increase by nearly 93.3 – 104.9%, poultry – more than three times, and cattle meat – 1.43 – 1.45 times.

Table 4

Forecast Ratio of Deficit (Shortage) and Domestic Production for Certain Foods to Satisfy the Demand under the WHO Standards for Asia

Products	MU	Ratio of Food Deficit and Total Production		
		2018	2019	2020
Potato and Potato Products	%	97.7	104.9	93.3
Sugar Crops	%	15.6	15.4	14.8
Cattle Meat	times	1.44	1.45	1.43
Poultry	times	3.1	3.14	3.11
Milk	times	4.72	4.83	4.86

Source: calculated by the author

Based on the scenarios provided, the opportunity to support public consumption under basic nutrition standards by domestic production, estimates of surplus or shortage of basic food product, the strategies to ensure food security of the people of certain part of the world have been developed.

The situation with the food support by domestic production is especially dramatic in developed countries in Africa. According to the forecast, the production of certain types of food will decrease if the same trends that emerged during the 2006-2015 maintain (e.g., grains, tomatoes, and vegetable oil). In addition, the growth of cattle meat, eggs, sugar crops, and vegetables production is significantly lower than the population growth, which also negatively affects the possibility to implement rational nutrition and food security programmes. The common factors identified significantly lower even promising opportunities in the people's supply with domestic food under the standards recommended.

The production of all foods except grain is significantly lower than those needed to ensure a balanced diet. For example, the production of cattle meat should be 12.4 – 12.7 times more than the volumes that can actually be produced in 2018-2020 in case of maintaining development trends prevailing for the period in question. In similar circumstances, the production of milk should be 7.6 – 7.7 times more, poultry – almost three times more, etc. The only exception is the production of grains and legumes, which, according to the forecast, may satisfy the demand under the WHO standards (Tab. 5).

Table 5

Surplus (+) or Deficit (-) of Domestic Production in Africa to Satisfy the Demand under the Consumption Standards for 2018-2020, mln. t.

Products	Deviations of Forecast Food Production Volume and Demand in Terms of Consumption Standards					
	2018		2019		2020	
	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards
Grains and Legumes	35.7	-8.5	30.8	-14.6	24.9	21.54
Potato and Potato Products	-89.3	-80.8	-90.1	-81.3	-90.9	-81.8
Sugar crops	-35.2	-28.7	-36.2	-29.6	-37.1	-30.3
Vegetable Oils	-6.83	-16.54	-7.34	-17.27	-8.0	-18.2
Vegetables, Tomatoes	-69.2	-70.3	-73.4	-74.5	-78.3	-79.5
Fruits, Berries, Cherries	-35.4	-123.9	-35.6	-126.2	-35.6	-128.4
Cattle Meat	-77.68	-97.1	-79.5	-99.4	-81.6	-101.9
Poultry	-20.86	-24.16	-21.1	-24.45	-21.24	-24.6
Eggs	-6.9	-7.9	-6.98	-8.08	-7.1	-8.4
Milk	-359.4	-183.6	-368.4	-188.3	-377.6	-193.0
Fish and Seafood	-8.7	-12.0	-8.6	-11.9	-8.6	-12.0

Source: calculated by the author

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

The forecast shows that the production of certain foods in America in the years 2018-2020 tend to decrease: e. g., the production of oil, vegetables and tomatoes, cattle meat, fish, and seafood. America produces enough grains and legumes, fruits and vegetables, poultry, and eggs (Tab. 6) to ensure the rational nutrition of the population under the WHO standards.

Table 6

Surplus (+) or Deficit (-) of Domestic Production in America to Satisfy the Demand under the Consumption Standards for 2018-2020, mln. t.

Products	Consumption Standards under the WHO Recommendations, kg/year	Actual Consumption in 2015 at the Expense of Domestic Production, kg/year	Deviations of Forecast Food Production Volume and Demand in Terms of Consumption Standards, mln. t. (+/-)					
			2018		2019		2020	
			Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards
Grains and Legumes	117	124.4	2.0	-38.9	1.0	-40.2	0.0	-41.5
Potato and Potato Products	108	2.88	-103.9	-96.0	-104.7	-96.7	-105.4	-97.3
Sugar crops	38	3.58	-34.2	-28.2	-34.4	-28.4	-34.4	-25.4
Vegetable Oils	13	12.97	-0.1	-9.06	-0.4	-9.4	-0.65	-9.75
Vegetables, Tomatoes	139	98.45	-9.5	-11.2	-9.7	-10.7	-10.0	-11.0
Fruits, Berries, Cherries	100	107.55	9.1	-72.5	9.8	-72.6	10.6	-72.6
Cattle Meat	78	29.27	-52.9	-70.8	-54.8	-72.9	-56.8	-75.1
Poultry	27	38.49	14.6	11.65	15.1	12.1	15.5	12.5
Eggs	231 / 9.24	11.79	2.2	1.2	2.1	1.1	1.93	0.79
Milk	380	172.79	-190.0	-27.8	-189.0	-25.2	-187.9	-22.6
Fish and Seafood	18	14.25	-9.17	-12.17	-10.0	-13.2	-10.9	-13.9

Source: calculated by the author

At the same time, according to the situation as at 2015 and the forecast production and consumption under the specified nutrition standards (Tab. 7), there is a substantial deficit of sugar crops, potatoes and potato products, cattle meat cattle, milk, etc.

Table 7

Forecast Ratio of Deficit (Shortage) and Domestic Production for Certain Foods to Satisfy the Demand under the WHO Standards for America

Products	MU, times, %	Ratio of Food Deficit and Total Production		
		2018	2019	2020
Potato and Potato Products	Times	25.0	23.6	22.2
Sugar Crops	Times	9.7	9.4	9.1
Vegetable Oils	%	53.3	57.8	63.7
Vegetables, Tomatoes	%	53.7	56.5	59.8
Cattle Meat	Times	3.1	3.4	3.7
Milk	Times	1.9	1.9	1.913
Fish and Seafood	%	99.7	106.0	116.2

Source: calculated by the author

E. g., the production of potato and potato products should be increased by more than 22.0 – 22.5 times; sugar crops – 9.1 – 9.7 times, cattle meat – 3.1 – 3.7 times, milk – almost twice; vegetable oils, vegetables and tomato – 54 – 64 %; fish and seafood – 100 – 116.2 %.

Forecast of agricultural products production in European countries shows that under the conditions prevailing during the period in question, the possibility of further growth in production of potato, vege-

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

table oils, vegetables and tomatoes, fruits, and vegetables has been almost exhausted. In particular, potato production in the next three years may even reduce by almost 14 % –from 129.3 mln. t. as at 2015 to 117.4 mln. t. (as forecast for 2020). The production of vegetable oils and cattle meat may be almost the same as it was in 2015.

The ability to provide people with food in Europe under the standards recommended by the WHO will preserve only for grain and legumes, vegetables, tomatoes, poultry, eggs, fish, and seafood (Tab. 8).

Table 8

Surplus (+) or Deficit (-) of Domestic Production in Europe to Satisfy the Demand under the Consumption Standards for 2018-2020, mln. t.

Products	Deviations of Forecast Food Production Volume and Demand in Terms of Consumption Standards					
	2018		2019		2020	
	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards
Grains and Legumes	19.5	-11.24	20.9	-9.3	22.3	-8.6
Potato and Potato Products	-26	-20	-26.5	-20.5	-26.9	-20.9
Vegetable Oils	-7.8	-14.56	-7.83	-14.59	-7.86	-14.63
Vegetables, Tomatoes	2.44	1.74	2.24	1.44	2.9	2.2
Fruits	-13.8	-75.2	-15.3	-76.9	-17.1	-78.8
Cattle Meat	-47.56	-61.1	-47.64	-61.14	-47.71	-61.3
Poultry	3.63	1.33	5.12	2.88	7.0	3.5
Eggs	3.7	2.90	4.2	3.33	4.44	3.6
Milk	-113.3	8.8	-113.0	9.3	-112.9	9.9
Fish and Seafood	6.0	3.8	7.34	5.06	8.7	6.43

Source: calculated by the author

There is a significant lack in the domestic production of other food agricultural products and the deficit of certain products for the years 2018-2020 will even increase (Tab. 9).

Table 9

Forecast Ratio of Deficit (Shortage) and Domestic Production for Certain Foods to Satisfy the Demand under the WHO Standards (Forecast) for Europe

Products	MU, times, %	Ratio of Food Deficit and Total Production, %		
		2018	2019	2020
Potato and Potato Products	%	23.0	23.7	24.1
Vegetable Oils	times	2.8	2.8	2.8
Fruits	%	21.4	24.3	27.9
Cattle Meat	times	4.35	4.35	4.3
Milk	%	52	51.7	51.4

Source: calculated by the author

E. g., cattle meat production in Europe should be almost 4.35 times higher; vegetable oils – 2.8 times; potatoes –by 23 – 24 %, fruits and vegetables –by 21.4 – 28 %, and milk – nearly 52 % of the existing volumes. Given the opportunity of meeting the food demand under the standards prevailing in the developed countries, these ratios significantly increase.

The forecast for countries of Oceania and Australia shows the negative trend of the following food agricultural products production: potatoes, sugar crops, vegetables, and cattle meat. At the same time, despite slight growth in the production of other foods in this part of the world, except for poultry, eggs, fish, and seafood, there is no opportunity to satisfy the demand for food by domestic production (Tab. 10).

For example, the domestic production of potato should be 1.35 times higher than the actual volume; vegetables and tomatoes –1.1 – 1.31 times higher; milk production should increase by about 73.4 – 94.5 %, and vegetable oils – almost by 43 %.

ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

Table 10

Surplus (+) or Deficit (-) of Domestic Production in the countries of Oceania and Australia to Satisfy the Demand under the Consumption Standards for 2018-2020

Products	Consumption Standards under the WHO Recommendations, kg/year	Actual Consumption in 2015 at the Expense of Domestic Production, kg/year	Deviations of Forecast Food Production Volume and Demand in Terms of Consumption Standards, mln. kg.					
			2018		2019		2020	
			Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards	Under WHO Standards	Under Developed Countries Standards
Grains and Legumes	117.0	94.0	-0.377	-1.70	-0.425	-1.77	-0.474	-1.84
Potato and Potato Products	108	47.89	-2.175	-1.915	-2.22	-1.96	-2.3	-2.04
Sugar Crops	38	0.07	-	-	-	-	-	-
Vegetable Oils	13	19.98	-0.34	-0.63	-0.34	-0.634	-0.338	-0.638
Vegetables and Tomatoes	139	114.68	-2.907	-2.937	-2.917	-2.947	-2.914	-2.944
Fruits	100	92	-1.197	-3.847	-1.48	-4.17	-1.735	-4.47
Cattle Meat	78	39.22	-1.658	-2.24	-1.74	-2.33	-1.89	-2.44
Poultry	27	42.09	0.565	0.467	0.627	0.534	0.687	0.587
Eggs, egg/kg	291/9.24	7.37	-0.036	-0.072	0.069	0.031	0.092	0.053
Milk	380	202.87	-6.67	-1.4	-5.58	-0.23	-5.52	-0.08
Fish and Seafood	18	26.48	0.188	0.088	0.18	0.08	0.175	0.075
Fruits	100	92	-1.197	-3.847	-1.48	-4.17	-1.735	-4.47

Source: calculated by the author

Conclusions. The calculations provided show that almost all parts of the world are unable to ensure good nutrition of the population through the domestic production of major foods. The situation is especially dramatic in Africa, which requires the development of modern strategies for solving the global food problem.

Solution of the food problem is the most urgent issue of the current global economic system. According to the FAO estimates, the last two decades are characterised by the tendency to reduce hunger in the world. The share of the starving population fell far greater than the absolute number of starving people. However, a large share of population in developing countries still does not consume the food required for active and healthy life.

The analysis of the figures related to the solving of the global food problem, provided the Millennium Development Goals, give cause for optimistic solution of the tasks. The starving share of the population decreases annually by 0.5 %. If current trends continue, in 2015, the starving share of the world population will be 12.8 %, which is only 1.1 % more than the target of the Millennium Development Goals.

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