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Global indices in assessment of the global food problem and its impact factor

Abstract. Globalization provides countries with new opportunities for development and brings them together in one world economy. However, the same trend allows global problems to penetrate every single society. Food problem is one of the central and most complex among global challenges to mankind. The purpose of the article is to identify countries most and least vulnerable in terms of food security by such categories as financial and physical accessibility, food quality, and safety. Grouping countries by components of the global food security level shows that the overwhelming majority of countries with low Global Food Security Index (GFSI) score are characterized by low accessibility indicator, but have medium indicators of food availability, quality and safety. The most important factor affecting food supply of a country, as well as its potential to achieve food security, is its economic development, a summary measure for which is GDP per capita. GDP growth ensures an increase in the food security level, provided that the system of national income distribution is fair.
Keywords: Globalization; Global Food Problem; Global Indices; Food Supply; Food Security

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Глобальні індекси в оцінці продовольчої проблеми та чинники впливу на неї
Анотація. У статті здійснено компаративний аналіз стану продовольчої безпеки країн світу за низкою глобальних індексів, які розраховуються міжнародними організаціями. В процесі визначення взаємозв'язку між глобальними індексами в оцінці продовольчої проблеми встановлено, що країни які мають низькі показники за Глобальним індексом конкурентоспроможності, Індексом сприйняття корупції, Індексом людського розвитку та Індексом екологічної ефективності, також мають низький показник за Глобальним індексом продовольчої безпеки. Найважливішим чинником продовольчого забезпечення країни та досягнення продовольчої безпеки є економічний розвиток країни, узагальнюючим показником якого є ВВП на душу населення.
Ключові слова: глобалізація; глобальна продовольча проблема; глобальні індекси; продовольче забезпечення; продовольча безпека.

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Глобальные индексы в оценке продовольственной проблемы и факторы влияния на нее
Аннотация. В статье осуществлен компаративный анализ состояния продовольственной безопасности стран мира по ряду глобальных индексов, которые рассчитываются международными организациями. В процессе определения взаимосвязи между глобальными индексами в оценке продовольственной проблемы установлено, что страны, которые имеют низкие показатели по Глобальному индексу конкурентоспособности, Индексу восприятия коррупции, Индексу человеческого развития и Индексу экологической эффективности, также имеют низкий показатель по Глобальному индексу продовольственной безопасности. Важнейшим фактором продовольственного обеспечения страны и достижения продовольственной безопасности является экономическое развитие страны, обобщающим показателем которого выступает ВВП на душу населения.
Ключевые слова: глобализация; глобальная продовольственная проблема; глобальные индексы; продовольственное обеспечение; продовольственная безопасность.

1. Introduction

Globalization laid an economic foundation for reshaping the global food system, which in its present form emerged only in the 20th century. It is based on agricultural integration and internationalization of the agricultural products exchange, and includes main and auxiliary industries involved in food production. But in the early 21th century the efficiency of its functioning is influenced by two opposite processes: globalization of provision, manufacturing and marketing processes; traditional food consumption patterns in certain regions and countries.

This hinders balanced development of the global food system causing disproportional development of world economic actors. As a result, according to former Director General of the Food and Agriculture Organization of the UN (FAO), Jacques Diouf, «globalization of the world economy and liberalization of the international food trade provides more opportunities for levelling sharp disparities for those having resources, information and expertise» [1]. But in those countries lacking such resources disparities become more extreme.

Therefore, in order to provide the population with food it is necessary to increase both the volume of production and international food trade. Consequently, current global food system should perform social, economic and civilization functions, in other words, it should provide the world's population with food in a sufficient quantity, range, of a certain quality, when necessary resources are available and there are economic conditions for food production, distribution, and exchange.

The processes of globalization have a significant impact on global food problem. Assessment of the global food problem requires application of comprehensive analysis tools, which include different global indices calculated by international organizations.

2. Brief Literature Review

The problems of food supply to the population, misbalances in food production, consumption and trade around the world have been reflected by many scholars, notably Berezin

& Berezina (2011), Bilorus et al. (2008), Braudel (2006), Vlasov, Sabluk, & Lysak (2009), Dobrosotskyi (2000), Malthus (1998), Sabluk, Bilorus, & Vlasov (2008), Sen (1981) [2-9]. In their assessment of the food problem on a global scale Suresh, Gajanan, & Prabuddha (2014) linked food supply security to limitations in consumer goods basket, and opted to devise adequate policy proposals for development of agricultural industry [10]. In Satinder (2015), Motarjemi & Lelieveld (2014), Charis Galanakis (2016), Holden & Ghebru (2016) a system of indicators has been used to evaluate food problem [18-22]. The indicators are combined into three groups: correspondence between equivalent market food quantity and minimal needs of the public; correspondence between equivalent market price of food ration and income of all social groups; and those which characterize the realization of the two main quantitative criteria of food security situation. At the same time methodologies by international organizations to evaluate food problem by means of global indicators are still not investigated enough.

3. The purpose of the study is to identify countries being the most and the least vulnerable in terms of food security by such categories as financial and physical accessibility, and food quality and safety.

4. Results

Comprehensive assessment of the food problem on a global scale is provided in the Global Food Security Index (GFSI). Global Food Security Index, developed by the research unit of The Economist (Economist Intelligence Unit), includes main aspects of financial and physical food accessibility, as well as food quality and safety, and encompasses 113 countries of the world. Financial aspect of food availability is measured by the following indicators: share of expenditures on food in total expenditures of households, share of the population living below the poverty line, availability of credit for agricultural enterprises, level of import duties on food products, physical availability of food from agricultural production and its reserves. The conditions of production, such as volatility of agricultural market, political instability, corruption risks, development of agricultural infrastructure, and expenditures on R&D are also taken into account within this indicator. Food security quality indicator takes into account compliance of food products with internationally established standards for the content of micronutrients, vitamins, and structure of nutritional substances. The index is a dynamic quantitative and qualitative model based on more than 28 indicators, which measures the food security factors in the developed countries. Since May 2014, within Index the impact of two factors, obesity and food loss, on the access to safe, nutritious and financially affordable food products is evaluated. Index defines food security as a condition in which people at given time have physical, social and economic access to food (in sufficient quantity and with sufficient nutrition value), that meets their dietary needs for a healthy and active life. In 2015 individual indexes of countries ranged from 24.0 to 86.6 points. The United States was ranked 1st with 86.6 points, followed by Ireland, Singapore, Australia, and Netherlands. Germany, France, Canada and Britain ranked 6th and 8th respectively. Ukraine received 55.2 points and found itself in 63nd place (Ukraine received 56.4 points and 52nd place in 2014). Russia ranked 48th with 62.3 points (comparing to 62.7 points and 40th place in 2014), Belarus - 46th with 63.1 points, Kazakhstan - 68th with 53.7 points, and Azerbaijan ranked 57th with 7.1 points [11].

The lowest indices were received by Burundi, Sierra Leone, Chad, Niger, Mozambique, and Haiti, whose GFSI was less than 30 points. Grouping countries by food security level shows that the largest group is formed by the countries with low food security level (Figure 1).

Countries with high GFSI level (GFSI≥70)		Countries with medium GFSI level (50≤GFSI<70)		Countries with low GFSI level(GFSI<50)	
United States	86.6			Uzbekistan	49.8
Ireland	84.3	Hungary	69.3	Guatemala	49.6
Singapore	83.9	Malaysia	69.0	Philippines	49.5
Australia	82.6	Uruguay	68.4	India	49.4
Netherlands	82.6	Argentina	68.3	Nicaragua	49.4
France	82.5	Costa Rica	68.3	Honduras	48.2
Germany	82.5	Mexico	68.1	Ghana	47.8
Canada	81.9	Slovakia	67.7	Pakistan	47.8
United Kingdom	81.9	Brazil	67.6	Myanmar	46.5
Sweden	81.3	China	65.5	Uganda	44.2
New Zealand	81.1	Romania	65.5	Nepal	42.9
Norway	81.0	Panama	64.4	Kenya	42.7
Switzerland	80.9	Turkey	63.6	Cote d'Ivoire	42.3
Denmark	80.0	Belarus	63.1	Cameroon	41.6
Portugal	80.0	South Africa	62.9	Senegal	41.0
Austria	79.3	Russia	62.3	Rwanda	40.7
Finland	78.9	Colombia	61.0	Benin	40.2
Israel	78.9	Bulgaria	60.6	Cambodia	39.8
Spain	77.7	Thailand	59.5	Nigeria	39.4
Qatar	77.5	Serbia	59.4	Mali	39.3
Belgium	77.4	Tunisia	57.9	Tajikistan	38.6
Italy	75.9	Botswana	57.8	Togo	37.9
Japan	75.9	Peru	57.7	Tanzania	36.9
Chile	74.4	Ecuador	57.5	Bangladesh	36.8
Czech Republic	73.9	Azerbaijan	57.1	Syria	36.3
Oman	73.6	Egypt	57.1	Guinea	35.0
Kuwait	73.5	Vietnam	57.1	Ethiopia	34.7
South Korea	73.3	Jordan	56.9	Sudan	34.7
Poland	72.4	Venezuela	56.9	Yemen	34.0
United Arab Emirates	71.8	Morocco	55.5	Angola	33.7
		Ukraine	55.2	Zambia	33.3
Greece	71.5	Dominican Republic	55.1	Laos	32.7
Saudi Arabia	71.1			Madagascar	31.6
		Sri Lanka	54.8	Malawi	31.4
Bahrain	70.1	Algeria	54.3	Burkina Faso	31.0
		Paraguay	54.2	Congo (Dem. Rep.)	30.5
		Kazakhstan	53.7	Haiti	29.4
		El Salvador	53.3	Mozambique	29.4
		Bolivia	51.6	Niger	29.0
		Indonesia	50.6	Chad	28.6
				Sierra Leone	26.1
				Burundi	24.0

Fig. 1: **Division of countries by level of global food security**
Source: Compiled by the author based on [11]

The group of countries having an index score of less than 50 points includes 42 nations; these are primarily countries with the highest percentage of undernourished people, with 53.4% of population in Haiti, 47.8% in Zambia and 34.4% in Chad.

The calculation of the Global Food Security Index makes it possible to assess approaches to food problem in most countries of the world by its components. Grouping countries by components of the global food security level (Figure 2) shows that the overwhelming majority of countries with low GFSI level are characterized by low accessibility indicator while having medium indicators of food availability, quality and safety (Ghana, Myanmar, Uganda, Nepal, Kenya, Cameroon, Senegal, Rwanda, Nigeria, Mali, Tanzania, Ethiopia, Sudan, Malawi, Burkina Faso, Congo, Haiti, Niger, Chad, and Burundi), which indicates that population is unable to buy food because of low income level.

GFSI also allows to study the correlation between food problem and other global problems. For example, Haiti has the highest percentage of undernourished people (53.4%), and low food security index (29.4 points); the data by GFSI components shows that the availability indicator has the biggest impact, it is 24.6 points, and the country also has low GDP per capita - USD 830. Chad, Niger, Burundi, Burkina Faso, Malawi are also among those lagging behind. At the same

Division of countries by GFSI components in 2015			

Countries with high GFSI level

Countries / GFSI indicator	Accessibility	Availability	Quality and safety
United States	85.7	85.7	86.6
Ireland	82.0	81.2	85.8
Singapore	90.6	77.9	78.2
Australia	83.4	78.7	86.4
Netherlands	81.6	81.3	86.1
France	79.7	80.8	88.7
Germany	81.7	81.6	81.3
Canada	81.4	80.5	84.4
United Kingdom	81.3	76.9	81.0
Sweden	80.9	77.3	85.4
New Zealand	80.3	81.6	81.3
Norway	78.3	80.1	85.1
Switzerland	80.7	81.0	80.6
Denmark	81.3	75.7	83.4
Portugal	76.2	76.9	89.7
Austria	81.9	74.5	82.8
Finland	79.9	71.5	86.0
Israel	77.6	73.3	85.5
Spain	78.8	71.7	86.2
Qatar	93.7	60.9	76.5
Belgium	80.3	70.7	82.9
Italy	78.7	68.7	83.3
Japan	78.0	70.3	81.8
Chile	73.8	72.6	71.6
Czech Republic	77.3	67.1	75.9
Oman	74.5	70.5	74.0
Kuwait	83.4	62.8	73.7
South Korea	72.8	70.0	82.2
Poland	75.5	67.8	75.1
United Arab Emirates	85.9	58.3	72.8
Greece	69.7	65.9	86.3
Saudi Arabia	76.5	66.7	68.0
Bahrain	79.1	64.0	67.6

Countries with medium GFSI level

Countries / GFSI indicator	Accessibility	Availability	Quality and safety
Hungary	75.5	60.3	73.8
Malaysia	68.5	68.4	71.1
Uruguay	69.5	68.3	65.6
Argentina	69.4	60.5	75.0
Costa Rica	66.0	67.6	69.5
Mexico	66.5	65.5	73.9
Slovakia	73.4	61.0	67.2
Brazil	70.2	60.6	75.3
China	60.9	65.1	70.6
Romania	66.8	59.6	74.4
Panama	63.0	64.9	58.6
Turkey	60.8	65.0	69.9
Belarus	61.7	59.2	70.8
South Africa	58.8	66.5	59.6
Russia	68.9	49.7	75.7
Colombia	58.2	58.3	61.6
Bulgaria	69.5	50.3	59.4
Thailand	62.6	56.5	56.8
Serbia	63.3	55.1	59.9
Tunisia	55.8	57.7	60.1
Botswana	53.4	66.7	50.1
Peru	56.5	55.6	61.3
Ecuador	55.0	54.6	56.6
Azerbaijan	63.4	56.1	43.0
Egypt	46.3	64.7	56.8
Vietnam	54.8	58.2	51.9
Jordan	57.6	58.1	52.1
Venezuela	59.3	53.1	69.5
Morocco	50.5	57.9	56.4
Ukraine	57.1	48.7	63.0
Dominican Republic	54.0	54.3	55.2
Sri Lanka	53.5	58.8	47.6
Algeria	52.7	55.3	48.5
Paraguay	54.5	51.3	59.2
Kazakhstan	64.4	42.6	55.7
El Salvador	55.0	49.0	56.1
Bolivia	53.9	50.0	49.1
Indonesia	46.8	51.1	41.9

Countries with low GFSI level

Countries / GFSI indicator	Accessibility	Availability	Quality and safety
Uzbekistan	47.8	53.0	45.3
Guatemala	46.6	49.2	55.4
Philippines	43.6	53.1	51.7
India	42.5	55.5	46.7
Nicaragua	49.6	46.4	52.4
Honduras	43.6	45.2	54.3
Ghana	36.3	55.7	53.5
Pakistan	46.4	49.5	44.5
Myanmar	29.5	53.6	53.1
Uganda	38.5	48.4	46.4
Nepal	36.7	46.4	48.2
Kenya	39.2	45.6	41.9
Cote d'Ivoire	42.2	55.3	30.9
Cameroon	32.8	43.4	54.2
Senegal	33.1	47.8	40.7
Rwanda	29.9	45.1	48.2
Benin	30.0	47.4	32.1
Cambodia	41.5	40.1	33.9
Nigeria	24.5	45.4	49.8
Mali	26.0	49.1	44.0
Tajikistan	37.7	39.0	40.1
Togo	33.5	43.6	23.2
Tanzania	28.1	45.2	33.6
Bangladesh	29.2	44.5	29.6
Syria	37.3	37.1	40.0
Guinea	30.5	40.0	25.6
Ethiopia	23.1	44.5	34.7
Sudan	29.7	34.3	44.6
Yemen	41.6	38.7	28.1
Angola	30.8	36.5	35.5
Zambia	22.5	44.5	26.5
Laos	30.5	34.8	31.0
Madagascar	20.7	44.9	20.1
Malawi	23.6	39.6	31.9
Burkina Faso	21.1	34.6	39.9
Congo (Dem. Rep.)	21.0	36.5	29.1
Haiti	25.1	39.5	24.6
Mozambique	21.7	38.9	15.6
Niger	18.8	35.7	36.0
Chad	21.2	31.8	35.9
Sierra Leone	26.7	25.1	34.0
Burundi	15.6	30.1	33.4

Fig. 2: **Division of countries by components of the Global Food Security Index**
Source: Compiled by the author based on [11]

time, there are countries with relatively high GDP per capita, yet with low GFSI. For example, Congo with GDP per capita at USD 2,031, has percentage of undernourished people at 30.5%; here availability is the all lowest component within GFSI (21 points).

Thus, the most important factor to sustain national food security is *country's economic development*, a summary measure for which is GDP per capita. High level of economic development ensures necessary investments in agriculture and processing industry, promotes development of food production base. It is the foundation of the high standards of living, and food accessibility for all categories of the population. Comparison of the GFSI score with the size of GDP per capita shows the robust relationship between these indicators (Table 1).

Countries with low GDP have low food security indices, with only few exceptions. For example, in 2015 Angola's GDP per capita was USD 4,062, but the country was ranked 101nd in food security (GFSI at 34.7 points). This manifests the problem in distribution of GDP, which do not contribute to the eradication of poverty. Same conclusion may be applied to Sudan, Congo and Nigeria. Despite these deviations, there is a certain relationship between the dynamics of both indicators: the growth of the GDP per capita is accompanied by increase of GFSI.

Another global index that outlines opportunities for economic development in certain countries is *Global Competitiveness Index (GCI)* produced by the World Economic Forum. It includes 113 variables to determine the level of competitiveness of the countries at different levels of economic development.

In order to include such significant number of factors, two-thirds of variables come from the results of the global business leaders' survey, and one-third comes from statistical data and results of studies that are regularly performed by international organizations.

These variables are due to determine national competitiveness by 12 benchmarks: quality of institutions, infrastructure, stable macroeconomic framework, health and primary education, higher education and training, efficient market of goods and services, efficient labour market, developed financial markets, level of technological development, domestic market size, competitiveness of companies, innovative potential. By determining countries' opportunities for economic development it also indicates the ability to solve the food problem.

Comparison of GCI and GFSI scores will allow us to trace interrelation between country's competitiveness and food security (Table 1). GCI is calculated for 144 countries of the world. In 2015 its score ranged from 5.76 points (the highest score, Switzerland) to 2.84 points (the lowest score, Guinea). The table shows GCI scores for countries with low food security level. Analysis of these indicators shows that countries with low GCI scores typically also have low food security level. For example, Guinea is ranked last in GCI and 97th on food security ranking; Chad is ranked 143th in GCI and 111th in GFSI (out of 113 countries). Higher position according to the competitiveness index correlates with higher place in food security ranking. For instance, Philippines is ranked 74th according to GFSI and 52th according to GCI, Guatemala is ranked 73th and 78th respectively. The analysis shows that in some countries high level of competitiveness does not ensure the solving of the food problem; in case of Rwanda, ranked 62th in GCI and 87nd in GFSI, inefficient agricultural policy may be the reason of failure in food security, but this stipulation needs to be further examined.

The *Corruption Perceptions Index* is an important international index that characterizes institutional conditions for addressing food problem. This is an annual ranking of countries that reflects assessment of the corruption perception level by the experts and entrepreneurs on a scale of one to ten; it is cal-

culated by Transparency International since 1995. The index is based on several independent surveys involving international financial experts and experts in the area of human rights, including those from the Asian Development Bank, African Development Bank, World Bank, and the US-based non-governmental organization Freedom House. The index is a score from 0 (maximum corruption level) to 10 (absence of corruption) [14].

This index is calculated for 168 countries of the world, and in 2014 its score ranged from 91 points (the best index assigned to Denmark) to 8 points (Somalia and North Korea, which are the countries with the highest levels of corruption). The impact of corruption on solving food problem is clearly negative since it prevents the development of entrepreneurship, normal functioning of the agricultural market, innovations, etc. Huge amounts of money, which could be invested in the development of agriculture, are flow out of countries' budgets through different corruption schemes. The data on Corruption Perceptions Index (CPI) in Table 1 show that almost all countries with low food security level also have low points in Corruption Perception Index. Comparison of these indices shows that countries having relatively high economic growth (Angola with GDP per capita is USD 4,062 or Sudan with GDP per capita is USD 2,194), but high corruption perception level, have low food security levels.

In previous sections we already highlighted the essential role of human factor, i.e. the educational level of the population, qualification of workers in the agricultural industry, farmers, and their ability to adopt modern agricultural technologies and introduce innovative methods of economic management, in addressing food problem.

The impact of human resources quality on food problem on a global level can be studied with the *UNDP Human Development Index (HDI)*, calculated for 188 countries. HDI includes three indicators: life expectancy at birth; standards of living, measured by GDP per capita; educational level of the population. Comparison of HDI and Global Food Security Index makes it possible to trace correlation between these indicators (Table 2).

Almost all countries with low HDI fall into the group of countries with low food security index. Thus, the insufficient level of human development, education, first of all, is an obstacle to solve the problem of hunger. Therefore, strategies for development of agricultural industry in many countries aim to improve education and competences. For example, due to the fact that the Chinese government has set its sights on increasing the number of specialists for the national economy, in the next ten to twenty years the educational level in this area will increase significantly. In addition, by 2020 one hundred thousand students will account for thirteen thousand university graduates and thirty-one thousand with secondary education. Illiteracy rate will fall to 3% [15].

The impact of environmental factors on food problem can be traced with help of *Environmental Performance Index (IPE)*. This index was developed by team of scholars from Yale and Columbia universities. Index methodology has been developed

Tab. 1: **Correlation of countries by rankings and global indices of food security, competitiveness, and size of GDP**

Countries	GDP per capita, USD	GFSI Index		GCI Index		Corruption Perceptions Index	
		Rank*	Index, score	Rank **	Index, score	Rank***	Index, score
Uzbekistan	2,130	72	49.8			153	19
Guatemala	3,886	73	49.6	78	4.05	123	28
Philippines	2,951	74	49.5	52	4.39	95	35
India	1,688	75	49.4	71	4.31	76	38
Nicaragua	1,965	75	49.4	99	3.75	130	27
Honduras	2,365	77	48.2			112	31
Ghana	1,401	78	47.8	111	3.58	56	47
Pakistan	1,427	78	47.8	129	3.45	117	30
Myanmar	1,269	80	46.5	134	3.32	147	22
Uganda	625	81	44.2	122	3.66	139	25
Nepal	751	82	42.9	102	3.85	130	27
Kenya	1,432	83	42.7	90	3.85	139	25
Cote d'Ivoire	1,319	84	42.3	115	3.93	107	32
Cameroon	1,234	85	41.6	116	3.69	130	27
Senegal	935	86	41.0	112	3.73	61	44
Rwanda	625	87	40.7	62	4.29	44	54
Benin	709	88	40.2	n/a	3.55	83	37
Cambodia	1,140	89	39.8	95	3.94	150	21
Nigeria	2,758	90	39.4	127	3.46	136	26
Mali	672	91	39.3	128	3.44	95	35
Tajikistan	949	92	38.6	91	4.03	136	26
Togo	578	93	37.9			107	32
Tanzania	969	94	36.9	121	3.57	117	30
Bangladesh	1,266	95	36.8	109	3.76	139	25
Syria		96	36.3			154	18
Guinea	546	97	35.0	144	2.84	139	25
Ethiopia	702	98	34.7	118	3.75	103	33
Sudan	2,194	98	34.7			165	12
Yemen	1,235	100	34.0			154	18
Angola	4,062	101	33.7			163	15
Zambia	1,576	102	33.3	96	3.87	76	38
Laos	1,785	103	32.7			139	25
Madagascar	393	104	31.6	130	3.32	123	28
Malawi	353	105	31.4	132	3.15	112	31
Burkina Faso	631	106	31.0			76	38
Congo (Dem. Rep.)	2,031	107	30.5			147	22
Haiti	830	108	29.4	137	3.18	158	17
Mozambique	626	108	29.4	133	3.20	112	31
Niger	403	110	29.0			99	34
Chad	1,011	111	28.6	143	2.96	147	22
Sierra Leone	675	112	26.1	138	3.06	119	29
Burundi	315	113	24.0	139	3.11	150	21

Notes:* among 113 countries for which this index is calculated.
** among 144 countries for which this index is calculated.
*** among 168 countries for which this index is calculated.
Source: Compiled by the author based on [11-13]

Tab. 2: **Comparative table of global indices of food security, human development and environmental performance in 2015 for countries with low GFSI**

Countries	HDI		Environmental Performance Index (EPI)		Index GFSI	
	Rank	Index, score	Rank	Index, score	Rank	Index, score
Uzbekistan	114	0.675	118	63.67	72	49.8
Guatemala	128	0.627	88	69.64	73	49.6
Philippines	115	0.668	66	73.7	74	49.5
India	130	0.609	141	53.58	75	49.4
Nicaragua	125	0.631	115	64.19	75	49.4
Honduras	131	0.606	88	69.64	77	48.2
Ghana	140	0.579	130	58.89	78	47.8
Pakistan	147	0.538	144	51.42	78	47.8
Myanmar	148	0.536	153	48.98	80	46.5
Uganda	163	0.483	135	57.56	81	44.2
Nepal	145	0.548	149	50.21	82	42.9
Kenya	145	0.548	123	62.49	83	42.7
Cote d'Ivoire	172	0.462	127	59.89	84	42.3
Cameroon	153	0.512	136	57.13	85	41.6
Senegal	170	0.466	117	63.73	86	41.0
Rwanda	163	0.483	147	50.34	87	40.7
Benin	166	0.480	166	43.66	88	40.2
Cambodia	143	0.555	146	51.24	89	39.8
Nigeria	152	0.514	133	58.27	90	39.4
Mali	179	0.419	174	41.48	91	39.3
Tajikistan	129	0.624	72	73.05	92	38.6
Togo	162	0.484	161	46.1	93	37.9
Tanzania	151	0.521	132	58.34	94	36.9
Bangladesh	142	0.570	173	41.77	95	36.8
Syria	134	0.594	101	66.91	96	36.3
Guinea	158	0.505	139	55.4	97	35.0
Ethiopia	174	0.442	163	45.83	98	34.7
Sudan	167	0.479	170	42.25	98	34.7
Yemen	160	0.498	150	49.79	100	34.0
Angola	149	0.532	145	51.32	101	33.7
Zambia	139	0.586	106	66.06	102	33.3
Laos	141	0.575	148	50.29	103	32.7
Madagascar	154	0.510	178	37.1	104	31.6
Malawi	173	0.445	151	49.69	105	31.4
Burkina Faso	183	0.402	165	43.71	106	31.0
Congo (Dem. Rep.)	176	0.433	171	42.05	107	30.5
Haiti	163	0.483	169	43.28	108	29.4
Mozambique	180	0.416	172	41.82	108	29.4
Niger	188	0.348	177	37.48	110	29.0
Chad	185	0.392	175	37.83	111	28.6
Sierra Leone	181	0.413	162	45.98	112	26.1
Burundi	184	0.400	168	43.37	113	24.0

Source: Compiled by the author based on [16; 17]

so that the states could compare their own progress and short-comings with those of other countries [16].

The comparison was performed by 16 indicators (environmental sustainability index had 76 indicators) from six policy areas grouped into two comprehensive environmental groups: 1) reducing the environmental burden on human health; 2) ensuring vital capacity of ecosystems and rational use of natural resources.

Ecological sustainability is the basis of the natural resource base and ecosystems which must be used so satisfy food needs, and other ecological and socio-economic needs for population. At the same time, the hunger and poverty often force poor people to abuse natural resources. Climate change, growing water shortage, and conflicts over natural resources hinder ecological sustainability and food security.

The data on the Environmental Performance Index (EPI) in Table 2 show that almost all countries with low Environmental Performance Index also have low food security scores. Few exceptions are Philippines, ranked 66th on EPI and 74th on GFSI, and Tajikistan, ranked 72nd and 92nd respectively.

5. Conclusions

The study of the correlation between global indices shows that countries having low scores according to the Global Competitiveness Index, Corruption Perceptions Index, Development Index and Environmental Performance Index, also have low scores according to the Global Food Security Index. We conclude the existence of a significant correlation between global food problem and other global problems of humanity.

Solution of the food problem is the most urgent issue of the current global economic system. According to the FAO estimates, eradication of hunger in the world is the trend of last two decades. But as world population grow, the share of the starving people is reducing in far greater pace than the absolute numbers of starving people. Large share of population in developing countries still does not consume the food required for active and healthy life.

The following factors promote the solution of the food problem: international economic integration and development of foreign trade, liberalisation of foreign trade in agricultural products, activation of scientific research in the agricultural area, such as plant breeding and protection, distribution of highly-efficient seeds and animals. Taking into consideration high potential of the national agriculture and agrarian science, Ukraine has potential to gain fair share of the world agricultural market.

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