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**THE GLOBAL EXPERIENCE IN PROVIDING
THE SUSTAINABLE DEVELOPMENT OF THE FOOD MARKET**

Abstract. The article researches how the food security is provided among the developed countries based on the global experience. Moreover, recommendations on how to transform the internal market of Kazakhstan towards the more sustainable food system are defined in this research. The research purpose is to define theoretical bases that may help to use economic mechanisms for improving the stability of the food market in Kazakhstan. The research methodology is based on quantitative, analytic, comparative and graphical methods. The research practical significance is to define a set of measures that may help to maintain the same standards of the food security in Kazakhstan as in the top global economies. The research results show that France, Japan and Germany have the most sustainable food markets in 2017. France has kept the leading position both in 2016 and in 2017, and its Food Sustainability Index (FSI) in 2017 equals to 74.79.

Keywords: food market, food security, Food Sustainability Index (FSI), global experience, Kazakhstan, France, Japan, Germany, food market stability.

The global food system nowadays is facing the growing challenge while trying to cope with the growing population worldwide, land erosion, negative impacts of urbanisation which cause a decline in the number of plough lands [1, 2]. Malnutrition impacts every third citizen in the globe, and nearly 815 million of people faced hunger in 2016 [3]. The water scarcity and food scarcity driven violent conflicts were partly caused by the climate change factors as deforestation, environmental pollution and greenhouse gas emissions [4, 5]. On the other hand, the population of some countries face nutritional challenges as obesity and high level of food wastes despite their country providing an adequate level of the food safety in the internal market [6]. Moreover, inefficient agriculture leads to waste of water, overuse of fertilisers and soil degradation [7]. Agriculture is accounted for using 70% of the total amount of water used worldwide [8]. Therefore, the sustainability of the food system plays the significant role in providing the food safety [9]. The sustainability level in the quantitative and qualitative manners of the food system at the national level can be measured by the Food Sustainability Index (FSI) [10]. This indicator was developed by the Barilla Center for Food and Nutrition and by the Economist Intelligence Unit [11].

The Food Sustainability Index (FSI) is calculated by using 58 indicators across the following three pillars [12]:

1. Food loss and waste, including food loss (food loss as % of total food production of the country, policy response to food loss, causes of distribution level loss defined by the quality of road infrastructure, solution to distribution-level loss defined by investment in transport infrastructure) and end-user waste (food waste per capita per year and policy response to food waste).
2. Sustainable agriculture, including water factors (environmental impact of agriculture on water, sustainability of water withdrawal, water management, water scarcity), land factors (environmental impact of agriculture on land, land use, impact on land of animal feed and biofuels, land ownership, agricultural subsidies, animal welfare policies, diversification of agricultural system, environmental biodiversity, quality of R&D and innovation, productivity, land users) and air factors.
3. Nutritional challenges, including life quality, life expectancy and dietary factors.

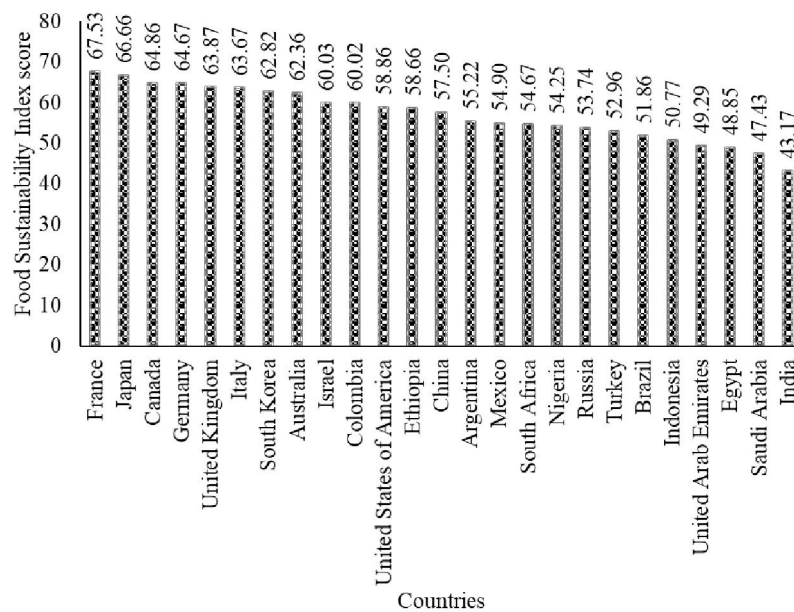


Figure 1 – The Food Sustainability Index (FSI) score among 20 top economic powerhouses (85% share of the world GDP and nearly 2/3 of the global population) and five other nations (Colombia, Ethiopia, Israel, Nigeria and the United Arab Emirates) in 2016

Note: from the source 12.

The figure below illustrates the Food Sustainability Index (FSI) in 2016 among 25 countries.

The figure above illustrates that the highest Food Sustainability Index (FSI) score in 2016 belongs to France – 67.53. The high Food Sustainability Index (FSI) score means that France in was the leading country on the right way towards more sustainable food system and had one of the highest food security levels among the top economic powerhouses. The mean value of the Food Sustainability Index (FSI) score for all 25 countries is 57.14. The figure below shows the summary report only for 20 most powerful economies in the world.

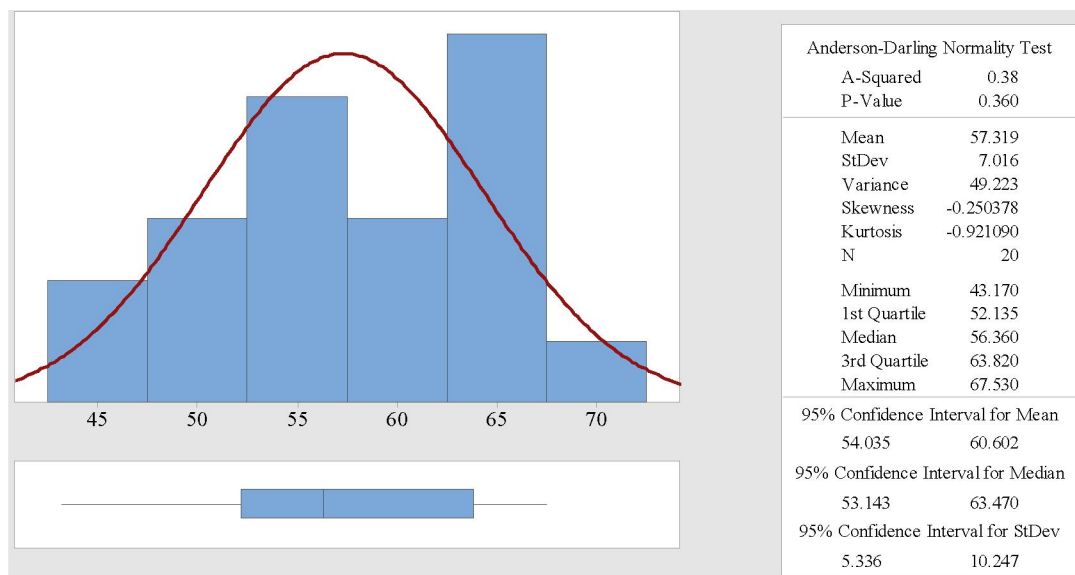


Figure 2 – The summary report for the Food Sustainability Index (FSI) score among 20 leading economies (85% share of the world GDP and nearly 2/3 of the global population)

Note: not including Colombia, Ethiopia, Israel, Nigeria and the United Arab Emirates.

The figure above illustrates that the median for the leading economies of the world is 56.36 scores in the Food Sustainability Index (FSI) which is 0.78 scores less than the median for all 25 countries considered by the EIU in figure 1. The interquartile range for the Food Sustainability Index (FSI) equals to 11.685 scores.

The figure below illustrates the Food Sustainability Index (FSI) in 2017.

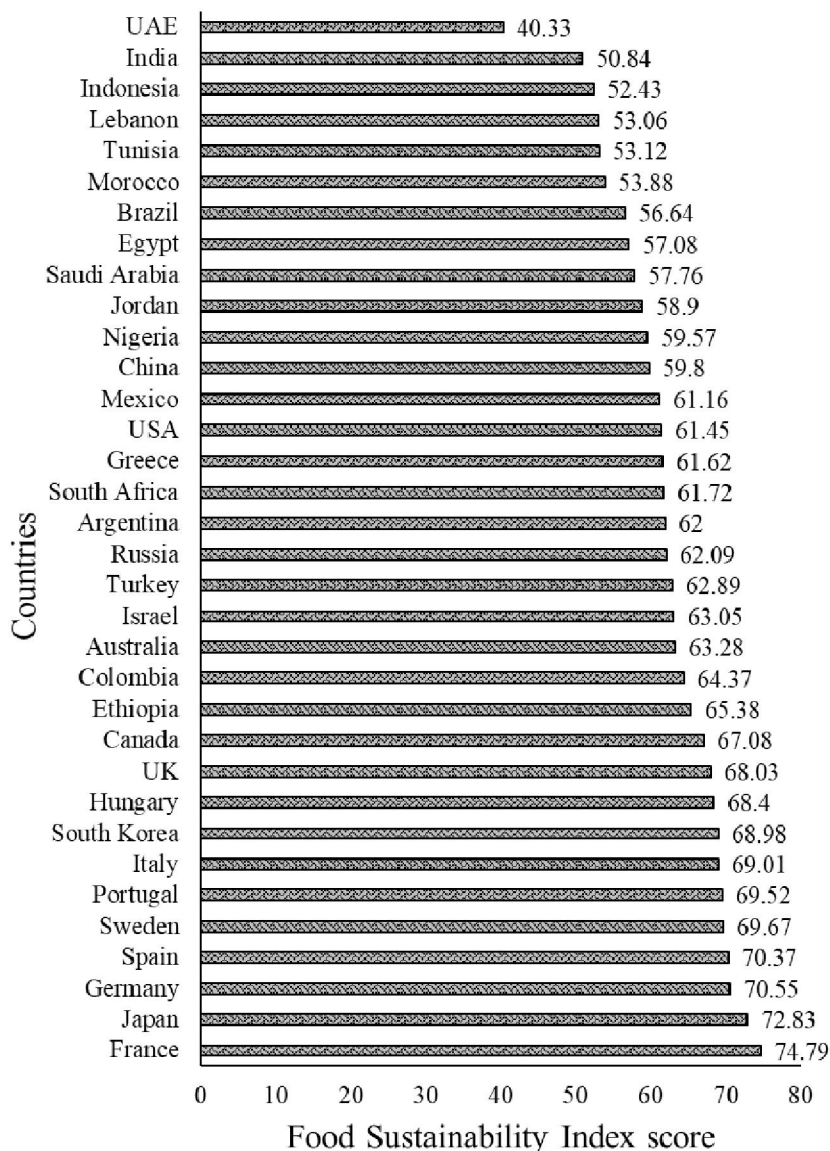


Figure 3– The Food Sustainability Index (FSI) score in 2017 for 34 countries, including 20 leading countries with 85% share in the global GDP

Note: from the source 13.

The figure above shows that the mean value of the Food Sustainability Index (FSI) score among 34 countries equals to 62.11 scores out of 100.

The figure below illustrates the graphical summary report for the data given by the figure above.

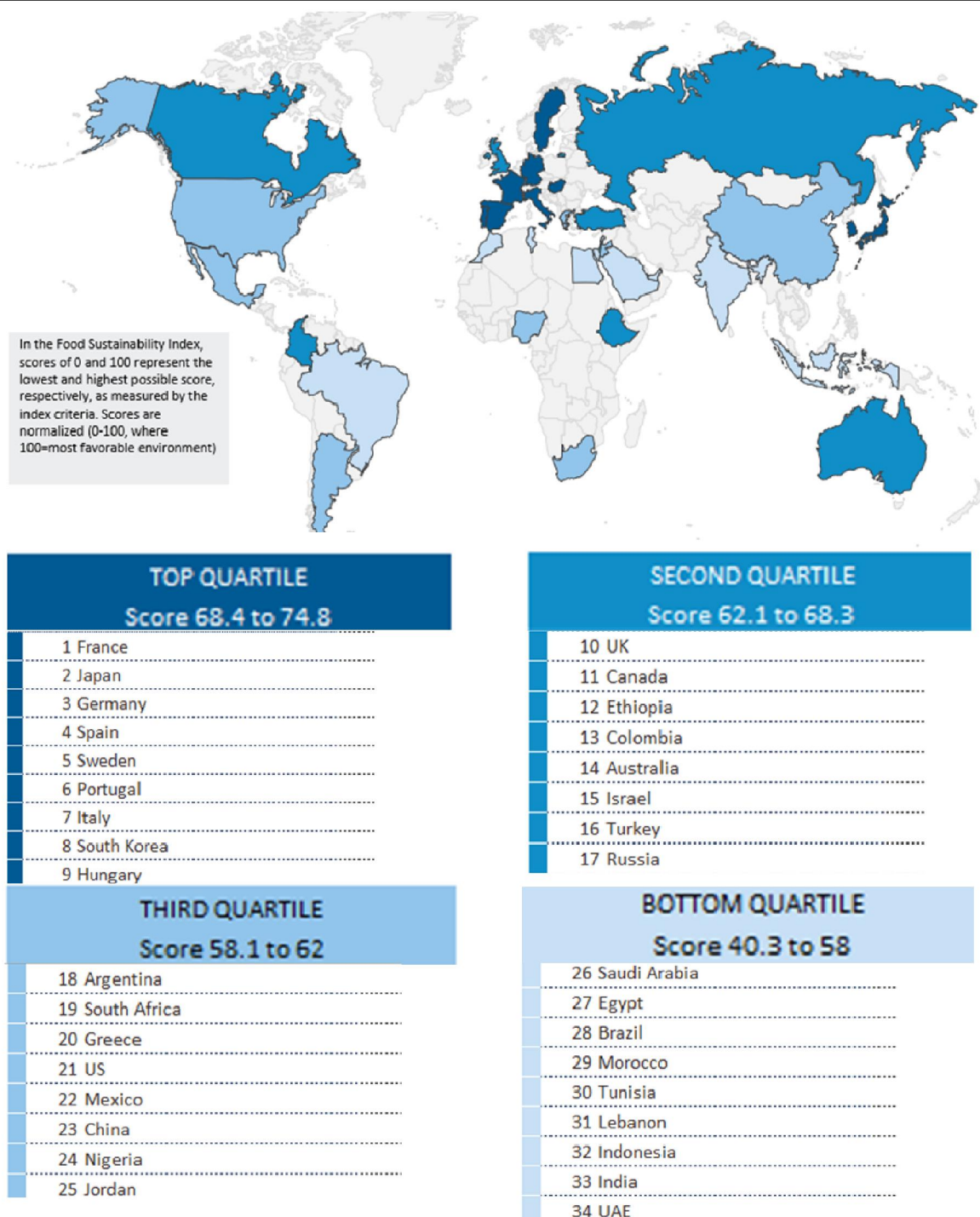


Figure 4 – The graphical summary report for the Food Sustainability Index (FSI) score among 34 countries of the world, including 20 powerful economies which own 85% share in the global GDP value), in 2017

Note: from the source 13.

The figure above illustrates that France is still the top country with the highest score of the Food Sustainability Index (FSI) in 2017 which has grown by nearly 10.75% or by 7.26 scores since 2016.

The figure below illustrates the graphical summary report on how France's the Food Sustainability Index (FSI) score for 2017 was calculated.

0-33			33-67			67+		
FOOD LOSS AND WASTE			SUSTAINABLE AGRICULTURE			NUTRITIONAL CHALLENGES		
Food loss			Water resources			Life quality		
Food loss			Environmental impact of agriculture on water			Prevalence of malnourishment		
Policy response to food loss			Sustainability of water withdrawal			Micronutrient deficiency		
Causes of distribution-level loss			Water scarcity			Enabling factors		
Solutions to distribution-level loss			Water management			Life expectancy		
End-user waste			Trade impact			Health life expectancy		
Food waste at end-user level			Sustainability of fisheries			Prevalence of over-nourishment		
Policy response to food waste			Land (land use, biodiversity, human capital)			Impact on health		
			Environmental impact of agriculture on land			Physical activity		
			Land use			Dietary Patterns		
			Impact on land of animal feed and biofuels			Diet composition		
			Land ownership			Number of people per fast food restaurant		
			Agricultural subsidies			Economic determinant of dietary patterns		
			Animal welfare policies			Policy response to dietary patterns		
			Diversification of agricultural system					
			Environmental biodiversity					
			Agro-economic indicators					
			Productivity					
			Land-users					
			Air (GHG emissions)					
			Environmental impact of agriculture on the atmosphere					
			Climate change mitigation					

Figure 5 – The graphical summary report for the Food Sustainability Index (FSI) of France in 2017

Note: from the source14.

The figure above illustrates that France is dealing highly well with avoiding food loss and dealing with waste pillar. The mentioned achievements can be the reflection of France's policy success while dealing with food loss and waste. On the other hand, France does not have the best dietary patterns despite having some high indicators for nutritional challenges.

The figure above shows that the value of the mean for the indicator level of the food loss is 74.9 scores. The value of the first quartile for the same indicator is 25.9 scores out of 100.

Figure 3 illustrates that Japan is one the second place based on the value of the Food Sustainability Index (FSI). The figure below explains on how this indicator was calculated for Japan.

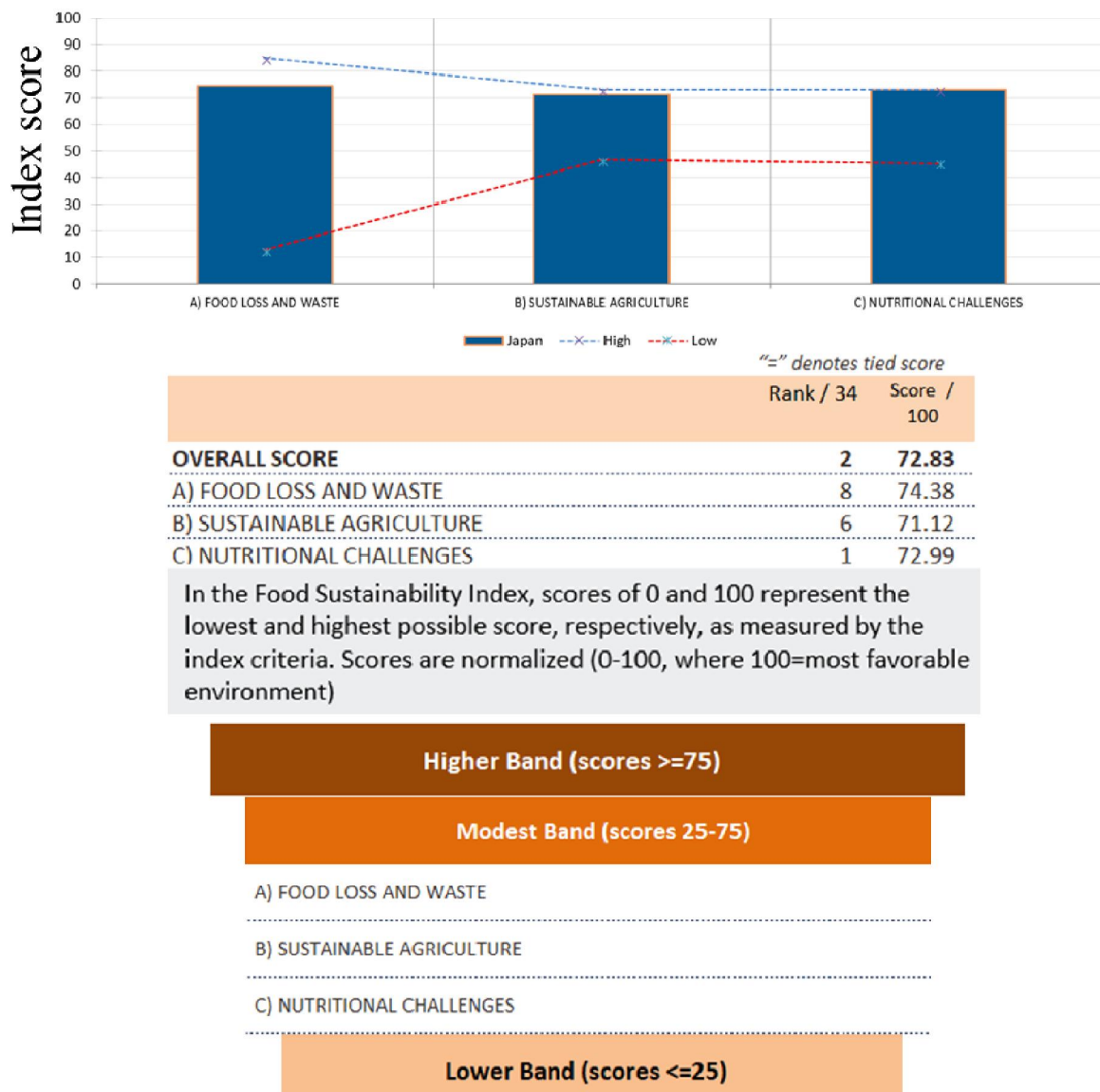


Figure 6 – The Food Sustainability Index (FSI) of Japan in 2017

Note: from the source¹⁵.

The figure above illustrates that Japan is the top country for the Food Sustainability Index's (FSI) category level of the nutritional challenges - 72.99 scores out of 100.

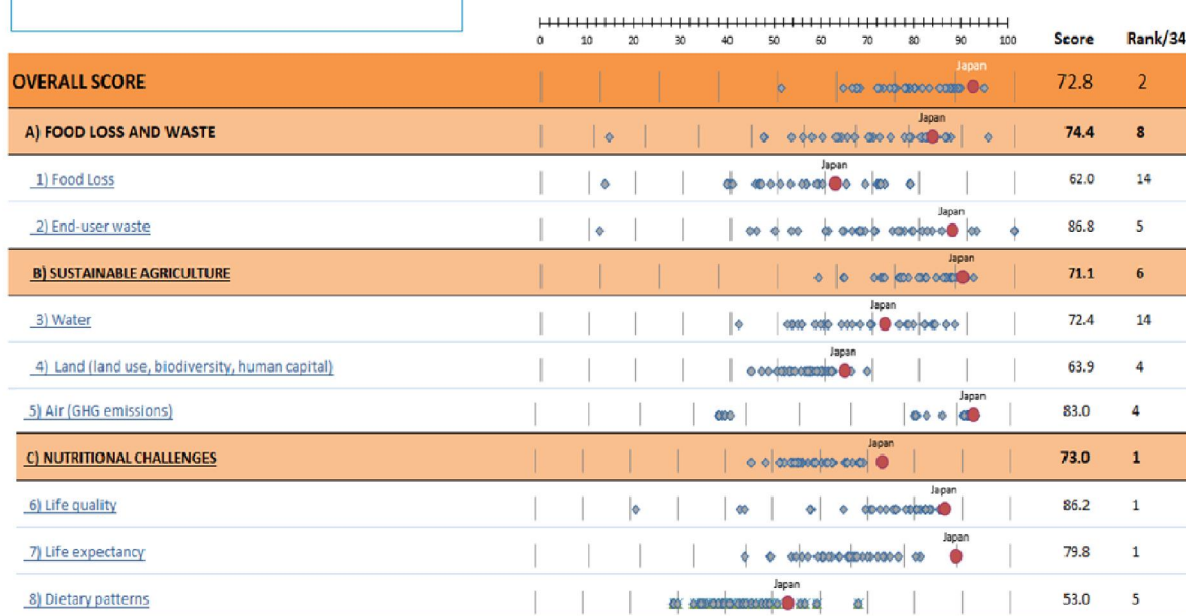
Figure 4 demonstrates that the index of the food loss and waste equals to 74.38.

The figure below illustrates score and which place Japan takes among other countries based on the category level of the Food Sustainability Index (FSI).

SCORE: Normalised scores 0-100, where 100 = highest recorded score across all countries.

RANK: Position out of all countries, 1=best

'=' denotes tied rank between two or more countries



Higher Band (scores >=75)

Modest Band (scores 25-75)

Lower Band (scores <=25)

Category level

Higher Band (scores >=75)

- 2) End-user waste
- 5) Air (GHG emissions)
- 6) Life quality
- 7) Life expectancy

Modest Band (scores 25-75)

- 1) Food Loss
- 3) Water
- 4) Land (land use, biodiversity, human capital)
- 8) Dietary patterns

Lower Band (scores <=25)

Figure 7 – The category level indicators for the overall score of the Food Sustainability Index (FSI) of Japan in 2017

Note: from the source¹⁵.

The figure above demonstrates that Japan is dominating in the field of the nutritional challenges due to having the highest life quality and life expectancy among all other countries considered by the Economist Intelligence Unit. On the other hand, dietary patterns of Japan also match the high standards of the Food Sustainability Index (FSI).

Figure 3 illustrates that Germany owns the third place based on its value of the Food Sustainability Index (FSI). The figure below demonstrates how the Food Sustainability Index (FSI) for Germany was calculated on the domain level.

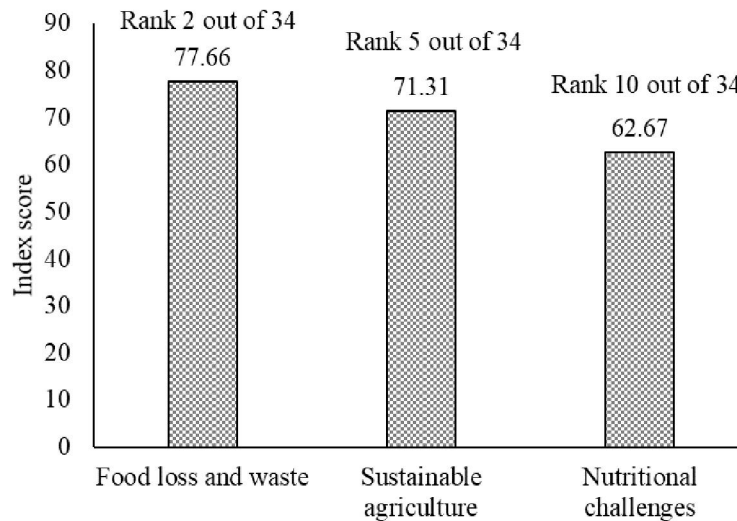


Figure 8 – The category level index scores of Germany for of the Food Sustainability Index (FSI) in 2017

Note: from the source 16.

The figure above illustrates that Germany avoids well food loss and waste as it is ranked in the second place among other thirty four countries. The figure below demonstrates the break down of the food loss and waste.



Figure 9 – The quality of the food loss and waste management in Germany in 2017

Note: from the source 16.

The figure above illustrates that the quality of the food loss and waste management in Germany is overall high except the presence of the significant issues in the solutions level to distribution-level loss.

The figures 1-9 and the analysis of the global experience demonstrate that the strategy of providing the sustainable development of the food market in Kazakhstan should have three focal points: set of measures minimising food loss and waste, set of measures for more sustainable agriculture, set of measure facing the nutritional challenges in the internal food market of Kazakhstan. The main focus should be paid to maintain the sustainability of the agriculture in Kazakhstan through set of recommendations defined in the figure below.

Land factors	<p>The set of measures that are recommended to improve land usage sustainability:</p> <ul style="list-style-type: none"> • precision agriculture; • remote sensing techniques; • minimising use of harmful pesticides and developing environmentally friendly fertilizers; • subsidies and the government policies to fight desertification and soil degradation; • land recultivation; • increasing the share of agricultural lands that are utilised from the total area of available agricultural areas; • subsidies and the government policies for urban farming initiatives; • establishing the official body for monitoring lands used for grazing and feeding animals; • creating laws for protecting small land owners against land grabs by big corporations; • financial and legal stimulation of software developers for applications that help with collecting, analysing and sharing data for more efficient land usage; • subsidies and the government policies for helping farmers to introduce nano-technologies, precision agriculture, remote sensing or other high technologies into their production cycle; • creating a tax-free innovation centre for start-ups that help farmers to have high efficiency of agricultural land usage; • subsidies and the government policies for producers of devices, sensors and services required for precision agriculture, remote sensing of agricultural lands, application of nanotechnologies in the agriculture; • the government regulations to minimise soil pollution.
Water factors	<p>The set of measures that are recommended to improve land usage sustainability:</p> <ul style="list-style-type: none"> • subsidies and the government policies for introducing water efficient agricultural techniques; • investment in total renewable water sources; • investment into more efficient irrigation system to minimise freshwater scarcity in regions; • recycling water for agricultural use; • the government regulations to minimise water pollution.
Air factors	<p>The set of measures that are recommended to minimise harmful impact of agricultural activity on air:</p> <ul style="list-style-type: none"> • the government regulations to minimise GHG emissions from agriculture; • investment into agricultural practices that minimise carbon dioxide emissions; • investment into agricultural techniques that may help to mitigate and adapt to the climate change.

Figure 10 – The set of measures that are recommended to improve the sustainability of the agriculture in Kazakhstan

Note: composed by the author based on the sources 10-15.

The figure above illustrates that implementing high technologies into agricultural practices, including remote sensing techniques and precision agriculture, may help to improve land usage efficiency in Kazakhstan. Moreover, more sustainable agriculture provides higher internal stability in the food market of the Republic of Kazakhstan.

The secondary focus of recommendations for improving the sustainability of the food market in Kazakhstan should be paid to the food waste management and nutritional challenges which are shown in the figure below.

Food loss and waste management	Nutritional challenges
<ul style="list-style-type: none"> • Investment into technologies of food production that minimise agricultural input loss and food waste volume • Introduction of policies that enforce supermarkets to donate food products instead of them letting those to be thrown away. • Investment into the transport infrastructure, e.g. building more roads, better rail infrastructure or canals, that may to reduce distribution level loss of food products. • Introduction of educational programmes that may help to make school and university students more cautious about food waste. 	<ul style="list-style-type: none"> • The government support for the poor strata of the society to reduce malnourishment issues. • Subsidies and the government policies for programmes that help the local population to deal with obesity issues. • Introduction of educational programmes that may help to make school and university students to become more cautious about their nutrition.

Figure 11 – The set of measures that are recommended to improve the sustainability of the agriculture in Kazakhstan

Note: composed by the author based on the sources 10, 12-16.

The figure above shows that investing into better quality and quantity of the infrastructure may help to reduce food loss in the distribution level.

In conclusion, France, Japan and Germany have one of the most efficient and sustainable internal food markets and strong food systems in the world. The Republic of Kazakhstan in order to maintain the same level of standards in the food market as in the mentioned countries needs to adopt more effective and sustainable agriculture, to improve the infrastructure, to increase efficiency of the food loss and waste management, and to create better policies to face nutritional challenges.

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АЗЫҚ-ТҮЛІК РЫНОГЫН ДАМУ ТҰРАҚТЫЛЫҒЫН ҚАМТАМАСЫЗ ЖАСАУДАҒЫ ӘЛЕМДІК ТӘЖІРІБЕ

Аннотация. Мақалада әлемдік тәжірибеге негізделіп отырып, дамыған елдер арасында азық-түлік қауіпсіздігі қамтамасыз жасалуы зерттелген. Сонымен қатар, мұнда Қазақстанның ішкі нарығының тұрақты азық-түлік жүйесіне бет бұруының ұсыныстары берілген.

Зерттеудің мақсаты. Қазақстанның азық-түлік рыногының тұрақтылығын жақсартудың экономикалық механизмдерінің теориялық базалары сипатталған

Зерттеудің методологиясы аналитикалық, салыстырмалы және графикалық әдістерге негізделген

Зерттеудің практикалық маңызы – келтірілген шаралар реті Қазақстанның азық-түлік қауіпсіздігі стандартын сақтауға ықпал жасайды. Зерттеу нәтижесі көрсетті 2017 жылы Жапония, Германия, Франция мемлекеттерінде азық-түлік қауіпсіздігі ең тұрақты болған. Франция мемлекеті 2016 және 2017 жылдары көшбасшы болған, 2017 жылғы азық-түлік қауіпсіздігі индексі 74,79 тең.

Түйін сөздер: азық-түлік, қауіпсіздігі, азық-түлік, қауіпсіздігінің рыногы, азық-түлік, қауіпсіздігі тұрақтылығының индексі, әлемдік тәжірибе, мировой опыт, Жапония, Германия, Германия, Қазақстан, азық-түлік, қауіпсіздігінің рыногының тұрақтылығы.

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МИРОВОЙ ОПЫТ ОБЕСПЕЧЕНИЯ УСТОЙЧИВОГО РАЗВИТИЯ РЫНКА ПРОДОВОЛЬСТВИЯ

Аннотация. Статья исследует как продовольственная безопасность обеспечивается среди развитых стран, основываясь на мировой опыт. Кроме того, рекомендации о том, как преобразовать внутренний рынок Казахстана в сторону более устойчивой продовольственной системы описаны в данном исследовании. Целью исследования является описание теоретической базы, которая может помочь использовать экономические механизмы улучшения устойчивости продовольственного рынка в Казахстане. Методология исследования основана на количественных, аналитических, сравнительных и графических методах. Практическая значимость исследования – это описание ряда мер, которые могут помочь поддерживать те же стандарты продовольственной безопасности в Казахстане как и в лучших мировых экономиках. Результаты исследования показывают, что Франция, Япония и Германия имеют самые устойчивые продовольственные рынки в 2017 году. Франция удерживает лидирующие позиции в обеих 2016 и 2017 годах, а ее индекс продовольственной устойчивости в 2017 году равен 74,79.

Ключевые слова: продовольственный рынок, продовольственная безопасность, индекс продовольственной устойчивости, мировой опыт, Казахстан, Франция, Япония, Германия, устойчивость продовольственного рынка.

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