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RESEARCH ARTICLE

Food Security in the Arab World: An Analytical Assessment of Indicators and Structural Realities During the Period 2019–2023

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Abstract

This research paper aims to examine the reality of food security in the Arab world through a comprehensive analytical reading of its key indicators during the period 2019–2023. The study adopts a mixed analytical approach, combining quantitative and qualitative analyses of food security indicators as reported by international and regional organizations, including the Food and Agriculture Organization (FAO) and the Arab Organization for Agricultural Development. The paper evaluates the dimensions of food availability, access, utilization, and stability, with particular emphasis on agricultural production capacity, food imports, self-sufficiency ratios, and the food gap. Despite the Arab region's considerable human, natural, financial, and technological resources, the findings reveal that the overall level of food security remains modest and structurally fragile. This situation is largely attributed to limited local agricultural productivity, inefficient resource utilization, climate-related constraints, and a heavy reliance on external food markets. The study further demonstrates that food security indicators vary significantly among Arab countries due to disparities in production capacities, consumption patterns, resource endowments, and economic resilience. Recent global shocks—most notably the COVID-19 pandemic and the Russia–Ukraine conflict—have exposed the vulnerability of food supply chains and reinforced the region's dependence on food imports, leading to heightened risks of food insecurity. The paper concludes that achieving sustainable food security in the Arab world requires intensified and coordinated efforts focused on agricultural development, technological modernization, resource efficiency, regional integration, and policy reform. Strengthening domestic production and reducing import dependency are identified as critical pathways toward enhancing food security resilience and sustainability.

Citation

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Introduction

Food security refers to the state's ability to ensure food for all its society members at all times, with sufficient quantity and quality to meet their needs. (Food and Agriculture Organization of the United Nations (FAO), 2017, p. 107)

This can be achieved through local production, foreign imports, food assistance, or with a combination of these, to ensure the heathy and active life. (zondo, jacob, & Matondo-Fundani, 2012, p. 01).

Food security is not based on the food availability, but also on the ability of people to access and use it stably and consistently year-to-year (Policy Brief, 2006, p. 1). To achieve this, environmental susutainability must be ensured in a manner that meets the natural needs of the current generations without compromising the needs of the future generations, including preserving the integrity of environment, ensuring its continuity, and managing the consumption of water ...

Since that, a healthy environment supports the ability of sustainable food production, while unsustainable practices and climate change lead food security to the risk.) Pete و al(2019 ،p 1546), wich contributes to the exacerbation of social problems, especially when linked to the threats to livelihoods, as witnessed in many countries where agricultural lands, infrastructure, and irrigation systems were destroyed, along with population displacement and disruptions in global supply chains, leading to higher food prices, increasing poverty and hunger levels, ultimately resulting in fooinsecurity. (Trung & al, 2023, p. 4)

The latest reports issued by United Nations Organizations in 2024, show that the number of people suffering from hunger woldwise reached 673 million, wich is 8.2% of the entire global population, and the wheather fluctuations such as drought, floods are the most prominent factors that lead to presitently high rates of hunger. This indecates the persistence of food insecurity caused by malnutrition, and this is a clear indication that calls for the reinforcement of conditions that can support the accomplishment of Sustainable Development goals related to food security and enhanced nutrition. This can be enhanced throught the adoption of effective monetary and financial policies as encouraging investment in agricultural research and development to ensure access to sufficient food for all populations. And because of the steadily increasing of the world population, and changing in dietary patterns, the demand for food continues to rise, necessitating an increased agricultural production (u.s Departmet of Agriculture, 2024) by an estimated 60 to 70% by the year of 2050 to meet the needs of 10 billion people. The world needs to enhance its natural resource management while implementing sustainable farming methods and developing new food production solutions to achieve worldwide food security. (kozielec & al, 2024, p. 2)

In the past few decades, the Arab region has faced numerous challenges threatening its food system on its journey toward food security, despite having sufficient resources capable of supporting the realization of food security and enabling an active, healthy life whether in terms of climate, water, arable land, and human resources. Faced with these chronic challenges, the region has stands as one of the most vulnerable areas in the world regarding food security. This vulnerability is because of its continued reliance on traditional patterns of cultivation and the low efficiency of its resources, leading to dependence on external markets for what is not provided by local production.

As a result, the region has been repeatedly exposed to successive global crises, including the COVID-19 pandemic in 2019 and the Russia–Ukraine war in 2022, which made clear the fragility of food supply chains and the limited resilience of Arab countries during crises. These facts highlight the immediate need for a collective effort by

international organizations, governments, civil societies, and the private sector to guarantee the sustainability of food security. (arab organization for agricultural develpment, 2022)

Research problem:

Based on the above, the following research problem can be posed: **To what extent do the food security indicators in the Arab region during the period 2019–2023 reflect the actual state of food security in the region?**

Study hypotheses: based on the research problem, the following hypotheses can be proposed:

- The decline in food security indicators in the Arab world is primarily because of the limited capacity of local agricultural production, and the increasingly reliant on imported food products to meet the needs of the population.
- The indicators of food security vary across the Arab countries due to the differences in the level of production and consumption of basic food commodities.
- One of the most significant factors that has adversely affected the sustainability of food security in Arab countries is heavy dependence on food imports.

Reasons for Choosing the Topic: the topic was chosen for reasons which are the following:

- The importance of food security as a fundamental pillar in achieving economic, social stability and sustainable development.
- The Arab region faces increasing challenges of ensuring food security through global price volatility, climate change, and regional conflicts.
- The desire to analyze the current state of food security in the Arab world using data and indicators, which will help develop effective solutions for sustainable food security achievement.

Study objectives: the major aims of this research paper are to achieve the following:

- It emphasizes the main resources that characterize the Arab region to produce essential food products.
- The research paper evaluates the Arab countries' food security achievement according to the dimensions adopted by the Arab Organization for Agricultural Development.
- Highlighting the state of food gap in the Arab world and identifying the factors led to its expansion.
- The research paper provides operational solutions to enhance Arab agricultural development because it serves as the essential foundation for achieving food security.

Methodology:

According to the subject of this research paper and to answer its main problem, this study adopts an analytical method, which uses international organization statistics to study the food security indicators. The research paper will give a set of conclusions and presenting suggestions.

1- **Food availability in the Arab world:** this indicator reflects the capacity of a state to provide adequate supplies for its citizens with necessary food items through domestic farming and international trade operations . The assessment of this dimension requires data about cultivated land patterns and major food commodities production levels, because these elements determine how well local farming contributes in local production to meet the Arab nutritional needs. The analysis includes a review of food export and import values across the Arab countries.

1-1 Cultivated area of major food corps: the analysis of this section examines the how local food commodities production affects the region through the cultivated area of cereals, oilseeds, fruits, vegetable seeds, vegetables, legumes, and sugar corps.

Table (01): The Arab Region cultivated major food crops during the period 2019–2023

Unit: one thousand hectares

Corps	2019	2020	2021	2022	2023
Cereals	30389	29301	26750	27684	27021
Wheat	10972	10869	10079	10605	10252
Rice	1048	764	689	785	684
Barley	5528	5996	3808	4292	4089
Maize	1448	1897	1461	1363	1396
Sorghum and Millet	11393	9776	10712	10639	10600
Tubers	742	742	807	758	769
Legumes	1679	2061	1451	1527	1679
Oilseeds	9994	9605	9141	8092	8660
Vegetables	2611	2466	2041	1927	1972
Fuits	4012	3240	3674	3675	3691
Sugar corps	521	552	460	531	552
Sugarcane	235	223	217	229	229
Beets	286	328	243	302	323

Source: Arab Organization for Agricultural Development ,Arab Organization for Agricultural Development , https://aoad.org/website/en/,

The table above shows cereals as the leading corp in the Arab countries cultivated lands during 2023, estimated about 37.57% of the total cultivated area, followed by sorghum and millet corps at about 14.74% of the total cultivated area, then oilseeds which occupied an area of about 12.04%, and fuits corps, wich made up about 5.1% of the total cultivated area, as for the remaining corps, they all together constituted about 30.55% of the total planted area.

It is also noticeable that the corps of the main food commodities experienced instability during the period 2019-2023 due to climate changes, crises, and disasters affecting the Arab region, despite the policies and mesures taken by the Arab countries to enhance the conditions of food security.

1-2 Production of major food commodities:

This section includes an analysis of the contribution of local production of major food commodities, such as of cereal corps, pules, oilseeds, vegetables, legumes, vegetable seeds, sugar corps, fuits and tubers. In addition to animal products such as eggs, fish, red meat, poultry, and dairy products.

Table (2): Production of major food commodities in the arab region during 2019-2023

Unit: million tons

Commodity	2019	2020	2021	2022	2023	Change between 2022 and 2023 %
Cereals	56300	52826	52860	48451	51009	0.05
Tubers	17164	17176	18313	17576	17595	0.00
Raw sugar	3710	3550	3525	3279	3765	0.13
Legumes	1741	1704	1766	1617	1631	0.01
Vegetable oils	3060	3780	2773	2762	3105	0.11
Vegetables	50532	55623	55530	56401	55851	-0.01
Fruits	40276	37080	36740	38990	39484	0.01
Fish	2558	5745	6225	6184	6192	0.0012
Eggs	25380	2344	2610	2500	2522	0.01
Dairy	4380	27308	28541	27444	27663	0.01
Red meat	4389	4314	4486	4367	4391	0.01
Poulry	4931	5126	5848	6178	6112	-0.01

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development, https://aoad.org/website/en/

From the table No. (2) it is evident that cereals are among the most prominent food commodities in the arab countries, greatly contribting to the value of the food gap for major commodities from 2019 to 2023, which reflects their dominance whitin both dietry patterns and the structure of food supply in the Arab region.

Cereal production in the arab region reached more then 50 million tons in the year of 2023, compared with the production of the year of 2022, that represents an increase of 5.28%, as wheat production accounted for about 48.03% of the total cereal production in the Arab region during 2023, and this reflects the importance of wheat as the most important corp among the cereal corps in the arab countries.

On the other hand, the arab countries had a large number of livestock animals, concentrated in Sudan, Mauritania, Somalia, Algeira and egypt, this wealth depends largely on natural rangelands, wich lack an adequate suitable of breeding and care system that is able to ensure production efficiency, impoved output, and enhance the added value in livestock production in the arab region.

Animal and fish products are on of the most important resources of animal protein In the arab region. According to the reports of the Arab Organization for Agricultural Development, the total livestock population was estimated approximately to 365.96 million head in the year 2023, with a decrease of nearly 0.38% as compared with the previous year. Sheep and goats constituted approximately 291.7 million head, or 80% of the total number of livestock of the entire region, while camels reached around 18.50 million head, with a contribution of 5% of the total number of livestock. Buffaloes and cattle reached about 55.80 million head representing a contribution of approximately 15% of the total livestock of the Arab region.

The Arab region produced approximately 10.5 million tons of meat during 2023, where white meat accounted for 58.2 with an increase of 1% during the period 2022-2023, while white meat represented 41.8% with a decrease by aound 1% over the same period.

Regading fisherie sector, production of fish generates an exportable surplus, wich encouages increase current production. This can be achieved trough optimal use of water divers resources, including rivers and valleys, In addition to the still underutilized aquacultural potential. The Arab region produced approximately 6.192 million tons od fish during 2023 according to the table (2), wich represents a 0.12 increase compared with the previous year output of 6.184 million tons.

1-3 Food availability through foreign trade:

Trade plays a crutial role in improving the food availability at both local and inetrnational levels, and countries facing deficits in food production meet this needs through imports. International food trade between countries alows the balancing of surpluses and deficits of different food commodities among nations for better availability.

Food security in the Arab countries is highly dependent on imports to meet the population needs, as the food industry in the region suffers from various challenges related to water scarcity, poverty, conflicts and climate change. The value of Inta-regional trade for key food commodity groups declined by about 9.16% in the Arab region durign 2022 and 2023. This decline is due to the fluctuations in the global agricultural tarde in response to the measures taken by major food producing countries as a result of the Russuian-Ukranian war. The following table shows the paterns of major food commodity imports and exports and inta-regional trade values in the Arab region during 2021-2023.

Table (03): Value of Exports, Imports, and Intra-Regional Trade of Major Food Commodities in the Arab region during the Period 2021–2023.

Unit: million dollars

	2021	2022	2023	Change between 2022-

				2023
Total exports	12334.59	13506.28	12269.7	-0.09
Major Food exports	23616.6	24953.6	25171.2	0.008
Total imports	12371.364	13547.53	12382.45	-0.05
Major Food imports	76091.4	94157.8	77945.9	- 0.17

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development , https://aoad.org/website/en/ . United Nations Conference on Trade and Development (UNCTAD), https://unctad.org/ .

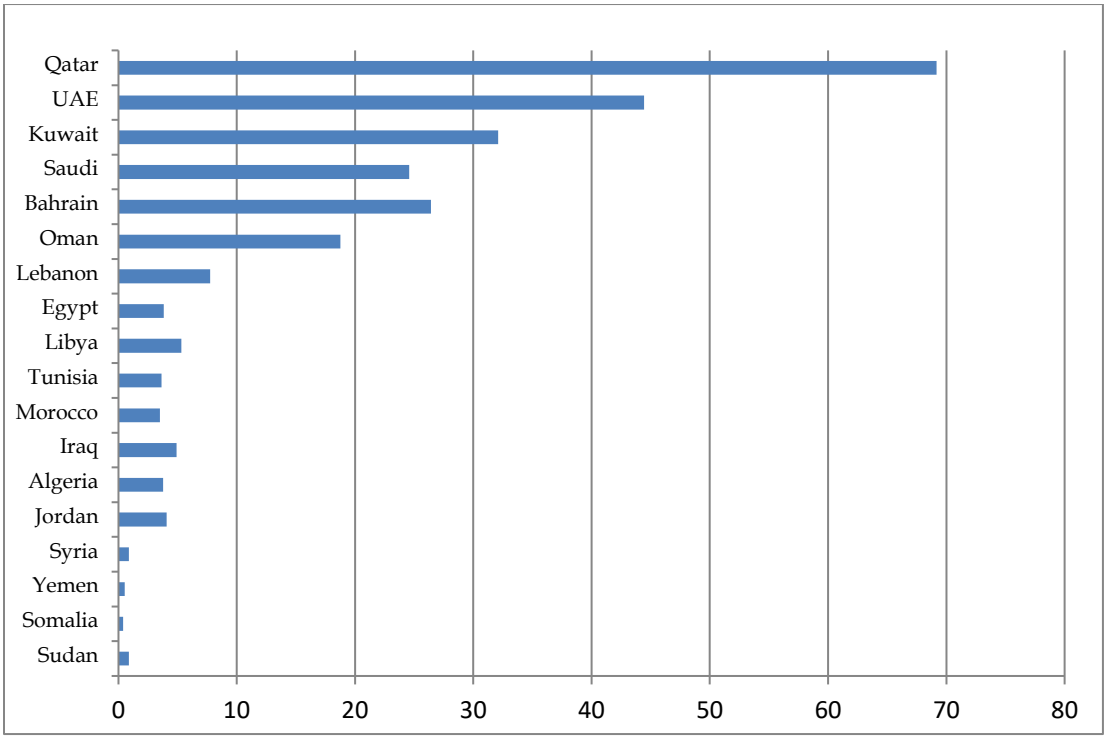
2- Food Access Indicator: this indicator mesure the degree to which people in a society are can meet their food needs safely and sustainably based on their financial resources and the prices of food commodities.

2-1 the impact of national income on food security:

The average of National Income per capita determines the level of food security since it shapes purshasing power of individuals. When the average per capita income is higher, people can afford sufficient and more food with diversity, resulting in improving food security. And also in case of insufficient income levels, it may be dificult for people to get enough nutrition, leading to increased poverty and increased hunger rates. The figure (1) demonstrates the distribution of the food access indicator in the Arab region through average per capita income levels.

Figure (1): Distribution of Arab countries according to the average per capita nationa income in 2023

Unit: million dollars



Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development , https://aoad.org/website/en/

From the figure (1), we can classify the Arabs countries into 3 tiers according to Food access indicator as mesaures be average per capita nationa income:

- Group 1 (0-3 million Dollars): low income countries such us: Yemen, Syria, Sudan, and Somalia.
- Group 2 (3-9 million Dollars): middle-income countries such us: Algeria, Egypt, Lebanon, Libya, Tunisia, Iraq, and Morocco.
- Group 3 (9-70 million Dollars): high income countries, including Bahrain, Saudia Arabia, United Arab Emirates, Qatar, and Kuwait.

These classification indicate a severe division in incom levels mong the Arab countries, leading to significant disparities in the extent to wich food security is attained. More precisely, around 27% of the population is found in the first group (low income), while approximately 60% are in the group of medium per capita national income, and the population of higher income countries represent just about 13% of the total arab region's population.

2-2 The impact of the food prices on food security in the Arab region:

Increased food commodity prices negativeley affect food security by reducing individuals' purchasing power and increasing hunger and poverty. Therefore, stable food prices are a prerequisite for ensuring food security, espicially among people with low incomes. The table below shows the level of food accessibility through the food basket price index during the per-iod 2019-2023.

Table (04): indicators of food basket price index for the 2019-2023 period

Year	Nominal prices	Real prices	Annual change in real prices during 2022 and 2023
2019	95.1	95.6	1.4
2020	98.1	99.2	3.5
2021	125.8	125.2	26
2022	144.7	141.5	-16.3
2023	124.7	120	-21.6

Source: Food and Agriculture Organization of the United Nations (FAO), https://www.fao.org/home/en

From the table (4) indicates a sharp increase in the prices of the food basket within the period 2019-2021, wich negatively reduce consumers' ability to access primary food commodities. This sharp increase price coincided with the emergence of the COVID-19 pandemic, wich caused an exceptional disruption to the supply of food products to markets, raised production costs, and therefore increased market monopolization and higher prices. All these developments were accompained by increased devaluation in local currencies, and wages remained at the same level in many arabs countries.

Starting in 2023, prices began to decline gradually, which led to an improvement in the ability to obtain food among the population both globally and at the level of Arab countries.

3- Food utilization dimension: The food utilization dimension is a fundamental pillar of achieving food security, reflecting the actual quantity of food products that will be available for consumption. These quantities are determined after accounting for the portion of the production that will be utilized for seeds in the next year, in addition to the lost during the different stages of trasportation, storage, and processing.

3-1 Availability of major food commodities for consumption:

The quantities available for consumption represent the quantities of good commodities produced locally, reduced by exports and supplemented by imports over a specific period, usually one year. Availability depends on a number of factors, most importantly, changing in helath conditions, dietary habits, and nutritional awareness of consumers, and the most food commodities are made accessible by Local production.

The following table shows tha availability of major food commodities for consumption in the Arab world during the period 2019-2023.

Table (05): availability of consumption of major food commodities in the Arab countries during the 2019-2023 period.

Unit: million Tons

Commodity	2019	2020	2021	2022	2023	Rate of change between 2022-2023 %	Percentage of total available for consumption in 2023
Cereals	126344.9	137404.1	120851.8	115934.3	139211.5	20.08	**41.65**
Tubers	16407.72	16514.94	17656.71	18113.81	18738.3	3.44	**5.6**
Sugar	16564.42	16999.84	17047.32	16870.53	16331	3.20	**4.88**
legumes	4447.109	3799.021	3384.132	3796.475	3269.987	13.88	**0.97**
vegetables	54679.5	57869.55	58736.26	52663.14	54691.52	3.85	**16.36**
Fruits	43627.9	38667.42	39560.03	41692.27	41770.6	0.19	**12.5**
Fishs	5481.777	5403.453	5541.138	5743.68	5692.47	0.89	**1.7**
Eggs	2852.691	2576.571	2808.188	2657.259	2680.39	0.87	**0.86**
Dairy	32832.81	36898.37	34440.72	37119.57	37923.53	2.16	**11.35**
Red meat	6020.427	5898.355	5170.546	5330.921	5371.306	0.81	**1.6**
Poultry	7542.977	7534.357	8018.332	8608.171	8484.002	1.44	**2.53**
Total	342502,231	329565,977	313215,176	308530,226	334164,605	8.3	**100**

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/ . United Nations Conference on Trade and Development (UNCTAD), https://unctad.org/ .

As observed in the table above, the total avilability of major food commodities within the Arab region decreased by about 10% during the period 2019-2022. This is essentially attributed to critical limiting factors that include climatic issues such as water scarity and drought, in addition to the increasing in the international food prices during the period of COVID-19 pandemic, and also the economic crises that undermined household purchasing power in some Arab countries during the period.

Food availabilty for consumption increased by about 8.3% in the year 2023, driven by increases in the agricultural production of some Arabs countries as well as the improvement in consumer purchasing power. Government policies in Arab countries were indeed very instrumental in increasing local production by expanding supports programs and encouraging local production through the subsidized food items.

The major contributors to available consumption are cereals, with a share of approximately 42% in 2023, followed by vegetables with 16.36%, fruits with 12.5%, and diary products with 11.35 %, while the rest products contribute with only minor shares, wich vary from 0.97% to 5.6%.

Plant-based commodities coonstitute the primary source of food accounting for over 81.96 % of all the major foods available in the arab region, in comparison, fish and animal products represent less than 18.04%. this trend reflects how important are the plant-based foods in the dietary patterns within the region.

3-2 Average per capita availability of food commodities in the arab countries:

This average is the result of a balance between the growth rates related to food production and the population growth. Per capita availability is affected by the changes in consumption trends, dietary habits, population growth, nutritional awareness and purchasing power. The diversity of food choices also play an important role in determining the per capita share In food availability. The following table shows the average per capita availability of major food commodities during 2019-2023 period in the Arab region.

Table (6): average per capita share of available food commodities for consumption during 2019-2023 period in the Arab region

Commodity	2019	2020	2021	2022	2023	Rate of change between 2022-2023 %
Cereals	286.0	305.7	264.6	249.4	294.0	**17.88**
Tubers	37.1	36.7	35.8	39.0	39.6	**1.53**
Sugar	37.5	37.8	37.3	36.3	34.5	**– 4.9**
legumes	10.1	8.8	9.1	8.2	6.9	**-15.8**
vegetables	123.8	128.8	124.8	113.3	115.5	**1.94**
Fruits	97.9	85.7	88.1	89.7	88.2	**-1.6**
Fishs	12.4	12.0	11.3	12.4	12.0	**-3.2**
Eggs	6.5	5.7	6.0	5.7	5.7	**0**
Dairy	73.8	82.2	75.3	79.8	80.1	**0.4**
Red meat	13.6	13.1	13.1	11.5	11.4	**– 0.8**
Poultry	17.1	16.8	16.5	18.5	17.9	**– 3.2**

Source Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/

A preliminary reading of the data in the table above reveals that the average of per capita availability of food commodities during the period 2019-2023 in the Arab region experienced notable fluctuations. These are due mainly to the instability of national agricultural production and foreign trade, as well as the repercussions of covid-19 pandemic, which had negative impacts on the world supply chains and to the consumers' purchasing power. At the commodity level, cereals recorded an important growth of approximately 18% during the year of 2022 and the year of 2023. This rise is attributed to changes in the Arab region related to the increase in domestic production and the adoption of import policies that made cerelas more available than in the previous years. Regarding the average level of plant-based food commodities in the Arab countries, it remains higher than the global average. Vegetables and tubers increased very slightly by 1.94% and 1.53%, respectively, this is attributed to the improvement driven by positive developments in supply and increases in investment in agricultural sector across some Arab countries. Meanwhile, the average per capita availability of animal products, specifically eggs, remained completely stable, while the average of per capita availability of dairy products recorded a modest rise of 0.4%. on the other hand, red meat declined by 0.8%, and both fish and poultry decreased by the same average estimated at 3.2%. This decline is attributed to the changes in prices and availability of these animal products due to increases feed costs, or it may be due to the changes in consumer preferences across the Arab countries.

3-3 Undernutrition:

Many Arab countries continue to suffer from widespread undernutrition, driven by various additional factors that have profoundly affected nutritional conditions such as disasters, armed conflicts, soaring food prices, and persistent instability. The rate of undernutrition in the Arab world can be reflected by malnutrition rates and the hunger index, as the table below shows:

Table (07): undernutrition and hunger index in the some Arab countries during 2011-2023

Country	Hunger index(100-0)				Undernourished population %		Absolute change in the hunger index since 2015
	2012	2015	2021	2023	2013-2011	2022-2020	
Jordan	8.5	-	8.3	*19.9-10	8	-	-
Tunisia	7	6.4	6	5.9	3.1	3.1	**-0.05**
Algeria	8.9	8.5	6.9	6.8	3.5	-	**-1.7**
Djibouti	35.4	29.6	27.4	23	20.9	16.3	**-6.6**
Saudi arabia	8.2	9.1	6.8	7.3	5.1	3.8	**-1.8**

Sudan	29.8	28.5	25.1	27	13.5	11.9	**-1.5**
Syria	42.3	23.9	42.3	26.1	-	3.8	**2.2**
Somalie	65.1	-	50.8	*49.9-35	77.6	48.7	**-**
Iraq	27.5	16.5	22.8	13.8	36.8	16.3	**-2.7**
Sultanate of Oman	11.6	11.2	12.3	8.3	7.5	2.8	**-2.9**
Comoros	-	24	49.9	22.7	-	13.5	**-1.3**
Kuwait	5 >	5 >	5 >	5 >	2.5	0	**-**
Lebanon	13.2	-	12.3	*9.9-0	13.2	-	**-**
Egypt	15.2	15.2	12.5	12.8	5.1	7.2	**-2.4**
Morocco	9.6	9.1	8.8	9		4.9	**-0.1**
Mauritania		22.6	22.4	21	8.7	7.1	**-1.4**
Yemen		38.4	42.1	39.9	34.5	31.8	**-5.2**

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/. The International Food Policy Research Institute (IFPRI). ,https://www.ifpri.org/ . Food and Agriculture Organization of the United Nations (FAO), https://www.fao.org/home/en.

From the initial reading of the data of the table above, we note that there is an improvement in the share of undernourished people in several Arab countries during the two periods 2011-2013 and 2020-2022, such as Iraq, Djibouti, and the Soltanate of Oman, where the share of undernourished population declined significantly. In contrast, some other Arab countries witnessed a decline in the share of undernourished population, such as: Egypt, Morocco, Yemen, and Mauritania, where undernourished populations have increased. Somalia records the highest rate of nearly 49%, though it showed remarkable progress during 2020-2022 period.
This clearly indicates that the Arab region is still suffering from undernourishment with varying degrees of severity from one country to another.

As for the hanger index, the improvement is clear for the most countries of the Arab region over the years, especially in Yemen, where the index had decreased by 5.2 points since 2015. Djibouti as well, where the index has decreased by 6.6 points. In contrast, Syria witnessed a deterioration with 2.2 points in the index.

It is important to notice that the reduction in the hunger index means reduced levels of hunger and, thus, indicates the gradual improvements achieved by many of the Arab countries toward fighting hunger. However, many countries, including Syria, Yemen, and Somalia still face huge difficulties and suffer from persistent challenges.

3-4 Food self-sufficiency rates:

This indicator represents the true state of food production. In other words, it reflects the ability of a country to meet its population needs of food by relying on its own agricultural resources and capacities to produce various essential food commodities locally, without importing. Low self-sufficiency arte means the country relies on importing certain food items to meet the needs of the population. Conversely, a higher rate indicates that the country produces enough food not only for domestic needs, but possibly export some. (BOURIHANE Farouq & HEMISSI, 2024, p. 45)

Table (8): self-sufficiency ratios for major food commodities

Unit:%

	2019	2020	2021	2022	2023
Grains and flour	45.7	38.8	39.3	37	**36.1**
Wheat and flour	40.8	38.8	36.2	39.2	**30.9**
barley	55.3	46.3	44.9	35.3	**26.1**
Rice	53.9	46.9	49.8	32.7	**44.9**
Corn	25.4	24.5	24.2	34.6	**30.7**
Potatoes	97.0	96.6	96.4	97	**93.9**
Sugar	37.8	36.3	40.8	25.8	**23.1**

Legumes	39.2	42.9	52.1	46.2	**54.1**
Oils and fats	34.8	35.4	34.2	35.8	**35.6**
Vegeteables	99.2	95.9	94.5	96.4	**94.1**
Fruits	92.3	94.3	93.1	95.6	**94.5**
Meat	67.9	70.6	77.3	75.7	**75.8**
Dairy and its products	80.3	75.5	80.5	73.9	**74.1**
Eggs	87.2	91.3	90.7	94.1	**93.4**
Fish	106.3	106.3	109.7	107.7	**108.8**

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/

As observed in the table (8), there is a fluctuations in the self-sufficiency rates of major food commodities, such as bareley has shown a continuous declining since 2019 in its self-sufficiency rate. On the other hand, commodities like potatoes, fish, and vegetables have maintained stable self-sufficiency levels. And we can classified the food commodities in the Arab countries into 3 groups according to their self-sufficiency rates as follows:

- Group 1 (94.95-108.8%): commodities with higher self-sufficiency rates such as vegetables, fish, fruits, and potatoes.
- Group 2 (69.13-86.72%): this group includes food commodities with a medium self-sufficiency rates, such as eggs, dairy and its products ...
- Group 3 (34.38-41.38%): includes commodities of low self-sufficiency rates such as legumes, oil, grains, and sugar.

3-5 food gap:

The food gap can be defined as the difference between the quantity food commodities needed by the population of a country to satisfy their daily domestic food and agricultural production (Mohannad Alobid, Derardja, & István, 2021, p. 3000). A larger gap means that a country cannot meet its population's needs through domestic production, consequently endangering country's food security (lamraoui, 2024, p. 263).

Among the key reasons for the widening food gap are population growth, inefficient use of available resources, the week domestic production, and the increasing in dependence on imported commodities (Giuma Elbogghi, Alawad Abdullah, & Artan, june 2016, p. 918). This situation necessitates the adoption of new technologies to increase productivity and reduce imports, as well as better exploitation of the natural resources available such as water and agricultural lands. It also means that policymakers should rise the awareness about rational food consumption and waste reduction.

Table (09): contribution of food commodities to the value of the gap during 2019-2023 period

Unit: billion dollars

Commodity	2019	2020	2021	2022	2023	Contribution in gap food in 2023 (%)
Cereals	21.79	24.09	24.35	26.10	26.1	**48.02**
Wheat	8.96	10.56	10.58	11.85	11.85	**21.83**
Rice	-	3.99	3.97	4.7	4.7	**8.66**
Maize	-	6.18	6.35	6.1	6.1	**11.25**
Oilseeds	0.6	1.59	1.85	1.8	1.8	**3.32**
Vegetable oils	2.6	3.46	3.57	2.91	2.91	**5.37**
Sugar	1.05	0.82	1.02	1.38	1.38	**2.55**
Potatoes	0.31	0.27	0.32	0.34	0.34	**0.62**
Legumes	0.87	1.36	1.44	1.27	1.27	**2.35**
Vegetables	0.15-	0.67-	0.57-	0.62 -	0.62 -	**-1.14**
Fruits	1.18	1.3	1.76	3.55	3.55	**6.54**
Live animals	-	1.62	1.61	2.06	2.06	**3.80**

Red meat	-	4.2	4.33	4.24	4.24	**7.82**
Poultry meat	-	3.58	3.76	3.94	3.94	**7.25**
Dairy products	5.53	5.13	6.02	6.46	6.46	**11.90**
Eggs	0.6	0.67	0.68	0.22	0.22	**0.4**
Fish	1.8	0.84-	1.48-	0.88 -	0.88 -	**-1.62**
Value of deficit commodities	43.87	48.1	50.71	54.27	54.27	**100**
Value of surplus commodities	0.15	1.5	2.06	1.5 -	1.5 -	-
Value of intra-regional trade	9.48	13.17	10.75	12.38	12.38	-
Value of the food gap	34.24	33.43	37.9	42.27	40.39	-

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/

Based on the data presented in the table (9), the value of the gap for major commodities at an aggregate level, increased from 34.24 billion dollars in the year 2019 to 42.27 billion dollars in 2022. This is due to the impact of higher international prices for main food commodities, alongside with environmental and social challenges facing the Arab countries, together with security issues affecting some countries. Later during 2023, the value of the gap food decreased, according a value of 40.39 billion dollars, essentially because of the decrease in imports, which contributed positively to the value of the general food gap. However, the persistence of a significant food gap reflects the difficulties and problems that Arab region face in the achieving of self-sufficiency. On the contribution of food commodities, the cereals accounted for approximately 48.02 % of the total value of the food gap, and maize, rice and wheat represented 86.77% within the cereal group, while the red dairy products, meat, and poultry contributed about 27% to the value of the food gap.

3-6 Dietary energy supply in the Arab countries:

Figure (02) reveals that the average daily dietary energy available per capita from major food commodities is about 6.297 kcal/person/day in the Arab countries for the period 2019-2023. This difference is because dietary energy supply is relatively low in some of the Arab countries.

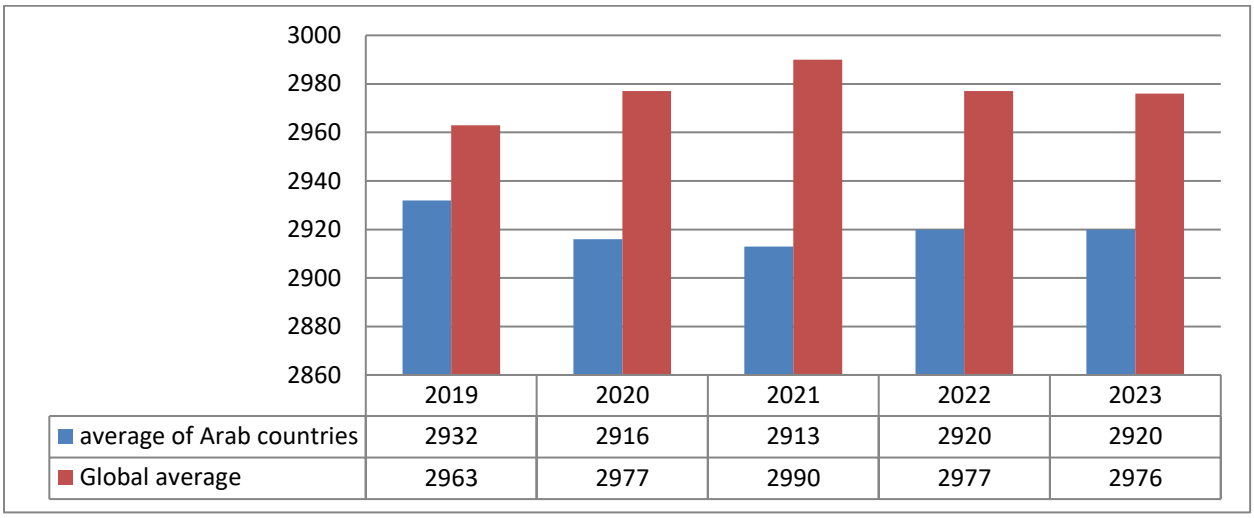
Arab countries can be categorized based on their dietary energy supply into the following groups:

- Group 1 (2.940-3.509 kcal per day): countries that consume high dietary energy level such us Algeria, Morocco, Tunisia, Saudi Arabia, Kuwait, Libya and Egypt. All this countries have reached levels equal to or above the global average.
- Group 2: (1.984-2.876 kcal per day): countries with dietary energy below the global average, including Lebanon, Iraq, Jordan, Djibouti, and Yemen.

This classifications show that there are significant differences in the levels of energy supply throughout the Arab countries due to varying nutritional levels, different challenges related to food security, and particular economic situations compared to the more food-supply stable Arab countries.

Figure (2): dietary energy supply in the Arab countries during the 2019-2023 period

Unit: Kcal/person/day



Source: **Source**: Organization for Agricultural Development ,Arab Organization for Agricultural Development https://aoad.org/website/en/

3-7 Protein food supplies in Arab countries:

Figure (03) above shows that, from 2019 to 2023, the daily per capita dietary protein supply in the Arab countries reached about approximately 80 grams, which is lower than the world average of about 83.905 grams. This indicates wide variation in dietary patterns between the Arab countries and the world. It indicates that the protein is still major components of diets in most Arab countries, but at different levels.

Based on the per capita daily protein supply we can divide the Arab countries into the following:

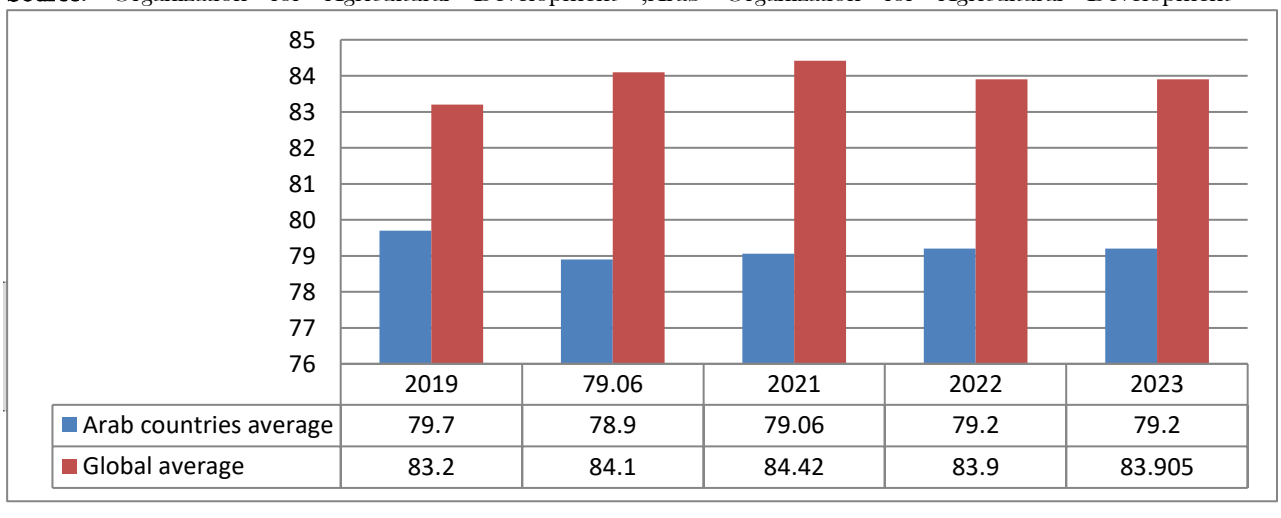
- Group 1 (84.3-100.3 grams/person/day): in this group we find countries as Algeria, Egypt, Tunisia, Morocco, Saudi Arabia, Sultanate of Oman, and Mauritania. All these countries have exceeded not only the regional but also the global averages in terms of daily protein supply, reflecting an improved levels of protein compared to the Arab average.
- Group 2 (56.9-70.9 grams/person/day): this group includes Comoros, Djibouti, Syria, Iraq, Lebanon and Yemen, where the average protein supply fall below both global and Arab levels.

This indicate a variation in the average of daily protein supply among Aeab countries, and this variations is primarily due to the differences in the levels of economic and food system development, as well as the degree of reliance on palnet-based and animal-based protein resources, and it is affected by the environmental and climatic challenges that face the Arab region.

Figure (03): Supplies of protein foods in the Arab countries, during 2019-2023

Unit: grams per person per day

Source: Organization for Agricultural Development ,Arab Organization for Agricultural Development



https://aoad.org/website/en/

Conclusion:

Food seciruty is considred as one of the most important stratigic issues that face th Arab region, which can help to reduce external dependence. However the reality indicates that food surity in the region is still limited due to a range of presistent challenges, Including the growth of people, the rise of global food prices, and the increased in environmnental challenges. Therefore, it is essential to work with the maximum effort possible to adopt the efficient policies and mesures that ensure mitigate these challenges and food security in the region.

Study results:

Based on the conclution of the study and all the foregoing analysis, we have councluded with a set of results, the most important of wich are:

- Food security is defined as the ability of a country to produce enough food commodities to satisfy its population needs ensuring to them a healthy and active life, and this is essentially related to domestic food production capacity.
- Arab countries still facing limited food access related to low income levels, decrease in national currencies value, disruptions in supply chans, continuous dependence on import food commodities, and periodic unavailability of basic food products in the markets.
- Despite the notable improvements achieved in most Arab countries as reducing the rates of undernourishment, several countries recorded relatively high rates such as Sudan, Djibouti and Comoros. This has largely attributed to the combination of environmental factors and political challenges, including political instability, drought, and desertification. All this challenges hinder its ability to achieve sestainable food security.
- Despite the progress in reducing the food gap in many Arab countries during certain years, it remains very significantly high due to the increase in global prices for mani major food commodities. These prices are significantly affected by the development in global production, prices, and trade of these commodoties, and also by the policies of the international trade for food commodities at both international and regional levels. These policies are fluctuated with the political and natural factors surrounding the production and distribution of food commodities.
- Many Arab countries achieve high rates of self-sufficiency in some products, such as vegetbles, fruits, potaoes, and fish, they still rely heavily on imports to meet their general food consumption requirements.
- Arab countries exhibit disparities in the levels of protein availability and dietary energy supply, which means that ther is a differences in their nutritional and economic development, in addition to the environmental and climatic factors faced by some Arab countries copared with others that have the more stable conditions.

Study recommendations:

Based on the results, the following recommendations are proposed:

- Develop coordinate programs and plans among the Arab countries to achieve the integration of resources and to improve the stability of food security in the Arab region.
- The allocation of the appropriate finantial rsources to invest in available water, land and livestock resoures, and redirecting a significant proportion of the currently funds to imports towards food production.
- Encouraging the scientific research related to devolop agriculture, imrove food security, and building the capacity to respond to the crices facing the region.
- Calling the Arab countries to establish an economic bloc to enhance the Arab economics, reducing the food gap, and preserving the interests of the Arab nations.
- Developing appropriate programs to integrate the use of new digital agricultural technologies into the Arab agriculture sectoe, and working to guide the trade as a key pillar to achieve the Arab food security in the region.

Ethical Considerations

This study was conducted in accordance with accepted academic and research ethics standards. All data used in the analysis were obtained from publicly available and reputable international and regional sources. Proper citation and

acknowledgment of all referenced materials have been ensured. The research does not involve human or animal subjects and therefore did not require ethical approval from an institutional review board.

Author Contributions

Dr. Senoussaoui Fatna: Conceptualization of the study, research design, data analysis, and drafting of the manuscript.

Dr. Senoussaoui Salah: Literature review, methodological framework development, and interpretation of results.

Dr. Bouadam Mounir: Data collection, statistical review of food security indicators, and critical revision of the manuscript.

All authors have read and approved the final version of the manuscript.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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