

The Impact of Food Security on Economic Growth in the Arab World**أثر الأمن الغذائي على النمو الاقتصادي في الوطن العربي****Ehab Jamel Alksassbeh ¹, Prof. Ahmad Ibrahim Malawi ²**¹ Yarmouk University – Irbid (Jordan), ahmad.malawi@yu.edu.jo² Yarmouk University – Irbid (Jordan), ahmad.malawi@yahoo.com**Received:** 09/05/2025**Accepted:** 09/07/2025**Published:** 31/03/2026**Abstract:**

This study investigates the impact of food security on economic growth in the Arab World during the period 2010- 2020, and annual data is used. To achieve this, descriptive analysis and econometric analysis are relied upon, and panel data are used in the analysis. The study sample consists of ten Arab countries. The variables in the study model included food Security, capital, and labor force as independent variables, and economic growth is the dependent variable.

The study finds that there is a statistically significant positive impact of food security on economic growth at a 10% significance level. And a statistically significant positive impact of both capital and labor on economic growth at a 1% significance level.

Keywords: Food security, Economic Growth, Arab World.

JEL Classification Codes:

ملخص:

هدفت هذه الدراسة الى البحث في اثر الأمن الغذائي على النمو الاقتصادي في الوطن العربي خلال الفترة الزمنية 2010-2020 وتم استخدام بيانات سنوية. ولتحقيق ذلك تم الاعتماد على التحليل الوصفي والتحليل القياسي و تم استخدام بيانات اللوحة في التحليل، وكانت عينة الدراسة مكونة من عشرة دول من الوطن العربي خلال فترة الدراسة.

وتكونت متغيرات نموذج الدراسة من الأمن الغذائي، ورأس المال، والعمالة كمتغيرات مستقلة بينما النمو الاقتصادي فهو المتغير التابع . وبينت الدراسة أن هنالك اثر إيجابياً مقبولاً احصائياً للأمن الغذائي على النمو الاقتصادي عند مستوى معنوية 10%، وان هنالك اثر

إيجابياً مقبولاً احصائياً لكل من راس المال والعمالة على النمو الاقتصادي عند مستوى معنوية 1%.

كلمات مفتاحية: الامن الغذائي، النمو الاقتصادي، الوطن العربي.

تصنيفات JEL :

Introduction

Food security is a vital aspect that might affect economic growth. Eliminating hunger and providing sufficient and nutritious food for the population are fundamental prerequisites for achieving sustainable development, social stability, and economic prosperity in any country.

Food security also directly affects economic growth through its impact on the labor force and the national income level. Agriculture is considered a vital sector that employs a significant proportion of the workforce in Arab countries, and many other industries rely on agricultural raw materials. Moreover, the food sector represents a crucial part of the gross domestic product (GDP) and contributes significantly to achieving trade balance and reducing reliance on food imports (World Bank,2019).

The Arab Countries are considered a region of strategic importance for global food security, as some of them possess abundant natural resources and fertile soil that contribute to producing a diverse range of crops and food items. However, the Arab region faces growing challenges that affect food security and hinder sustainable economic growth.(FAO,2020) Among these challenges climate change, desertification, and water scarcity, which affect crop production and weaken the countries' capacity to meet the food needs of their populations. Additionally, continuous population growth contributes to increased demand for food resources, placing additional pressure on the agricultural sector and food industries (UNDP,2021).

Arab countries strive to enhance food security by adopting policies and strategies aim at increasing agricultural production and improving the infrastructure of the agricultural sector. Additionally, they aim to boost investment in scientific research and agricultural technology. Furthermore, these countries seek to achieve regional economic integration and promote the trade of food commodities among themselves (FAO,2021).

Research Problem

Arab countries face ongoing economic challenges, including low economic growth rates, high unemployment, and rising poverty levels. Achieving food security is one of the key factors that boost labor productivity, contributing to economic growth and potentially alleviating the severity of these economic problems.

Research Objective

The study investigates the impact of food security on economic growth in the Arab countries over the period (2010-2020) by utilizing annual panel data.

Research Importance

Food security stands as a fundamental pillar for sustainable development and economic growth in the Arab World. Hence, this study plays a vital role in empirically investigating the role of food security on economic growth in the Arab World.

Research Hypothesis

The main hypothesis of this study is:
There is a significant positive relationship between food security and economic growth in the Arab world.

Research Methodology

To achieve the research objective, two methodologies are employed: Descriptive analysis and econometric analysis, depending on the availability of data on Arab

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countries as yearly panel data the source of this data is the World Bank and the Food and Agriculture Organization of the United Nations (FAO).

The Sample of the Study

The study sample consists of ten Arab countries : Bahrain, Egypt, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia and the United Arab Emirates, These countries are chosen based on the availability of data on the their food security index during the period from 2010- 2020.

Literature Review

This part summarizes the theoretical framework and previous studies that are related to the study, in addition to previous studies about the topic of this study.

Definition of Food Security and Economic Growth

Food security is defined as a condition that is achieved when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (World Food Summit held in 1996).

The Food and Agriculture Organization (FAO) defines food security as "the availability of food to all members of society in sufficient quantity and quality on a continuous basis, for a healthy and active life."

Food security can mean ensuring the necessary food supply for a community from both local and external sources and ensuring the distribution of food to make it accessible to all members of society. It can also refer to a country's ability to produce its food continuously.

The U.S. Department of Agriculture defines food security as "access by all people at all times to enough food for an active, healthy life."

Food insecurity, on the other hand, refers to limited availability or uncertain availability of suitable food and food safety or "limited ability to access suitable food by socially acceptable means."

Also, Food gap is defined as the difference between what a country produces domestically and what it needs in terms of food. This represents the quantity of food that a country needs and cannot provide locally, necessitating importation from abroad. The food gap can be calculated as the difference between food consumption and domestic food production.

Also, economic growth is defined as a positive change in the production of goods and services in a country during a specific period of time. In general, economic growth implies an increase in the income of a particular country.

Economic growth is a process in which the real income increases cumulatively and continuously over an extended period of time, with this increase exceeding the population growth rate. Economic growth means an increase in the quantity and quality of economic goods and services produced and consumed by society, compared between different time periods.

The Four Pillars of Food Security:

Food security needs four pillars to be achieved . Firstly; food Availability: this means having a sufficient and continuous quantity of food of appropriate quality, either through local production or imports, Secondly; Access: This involves sustainable access to food, including

income and distribution mechanisms. Thirdly; Utilization: Utilization encompasses all processes related to using food, including storage, care, preparation, and dietary diversity, as it should provide all required nutrients. And Fourthly; stability of supplies: Ensuring that there is adequate food supply at all times, with no interruptions, even in emergency situations like wars, political instability, natural disasters, and other factors.

The Committee on World Food Security was established in 1974 and reformed in 2009 as an international governmental body responsible for reviewing and monitoring food security and nutrition policies(FAO,2009). The committee provides recommendations, draws up policy guidelines, and works on issues related to food security and nutrition, relying on reports from scientific bodies and expert teams.

Challenges of Food Security in the Arab World:

The Arab countries face different challenge of food security such as struggles with global water crises, neglect and mismanagement of agricultural lands, climate change and its impact, plant diseases and lack of adequate control, prevalence of corruption and injustice in society, high population growth.

Food insecurity leads to a loss of 4-5% of the local GDP, according to the Food and Agriculture Organization of the United Nations(FAO). Food insecurity occurs when sudden shocks affect countries, such as droughts, agricultural pests, high unemployment rates, wars, and major crises. As the crisis continues, food insecurity becomes chronic, and families may be forced to sell their assets to survive.

In reality, hunger is increasing in countries facing slow or declining economic growth. Periods of recession often lead to higher unemployment rates, which in turn exacerbates the crisis. This points to the world's failure to make any progress in achieving the World Health Organization's nutrition goals by 2025 or the Sustainable Development Goals by 2030.

Food Security in the Arab World: The Arab world is a diverse region with over 430 million people living in countries with varying economic and natural resources. Most Arab countries face significant challenges in achieving food security due to limited agricultural land, scarce water resources, and rapidly changing climatic conditions.

Political crises and armed conflicts are major factors affecting food security in the region, such as ongoing crises in Syria, Yemen, and Libya, which have led to the displacement of millions of people and increased pressure on host countries. Additionally, some countries suffer from high rates of poverty and unemployment, which further exacerbate food insecurity.

The Arab world has also been severely impacted by the economic and social consequences of the COVID-19 pandemic, leading to worsened poverty and food insecurity in many countries. While Arab nations are working towards enhancing regional cooperation to improve agricultural productivity and ensure food security, the ongoing challenges require long-term sustainable strategies.

The COVID-19 pandemic has further exacerbated food security challenges in Arab countries. These countries faced challenges even before the pandemic, including price fluctuations in the global market, food crises in 2006 and 2007, and climate change impacts in 2010. During the pandemic, food prices increased significantly, rising by about 35% in 2021, impacting economies across the Arab world (ESCWA,2021).

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The Russian war on Ukraine poses a significant threat to global food security, not only for Arab countries but for the world as a whole. Arab countries, in particular, rely on Russia and Ukraine for grain and oilseed supplies. According to the Food and Agriculture Organization (FAO), global food import costs are expected to reach \$1.8 trillion, an increase of \$51 billion from 2021. This increase is due to rising prices rather than increased food imports, and it is expected to be challenging for importing countries to finance the higher costs of food, potentially affecting their ability to cope with rising prices.

There is no clear solution in sight for the crisis caused by the Russian war on Ukraine, and there are concerns that food could be used as a weapon in the conflict between Russia, Europe, and the United States. The greatest damage is likely to befall heavily impoverished countries suffering from food shortages, as the crisis continues to worsen day by day.

In the latest report from the Food and Agriculture Organization about the countries most affected by the food crisis, especially rising prices, countries were identified: Ethiopia, Nigeria, South Sudan, Yemen, Afghanistan, and Somalia. This list includes two Arab countries (Yemen and Somalia).

The crisis also has other implications for middle-income countries like Egypt, which recently announced that rising wheat prices and ongoing currency pressure would cost the budget about \$3 billion. However, the Arab response to the crisis of the Russian war on Ukraine and its impact on the region, particularly on the food situation, has been characterized by disarray. Some countries lack the funds to meet their usual food needs due to high prices, while others have the funds but face supply problems and supply chain issues. Additionally, there has been a delay in efforts to harness scientific knowledge in Arab countries to enhance the agricultural and food sectors (Reuters, 2022).

Macro-Level Food Security:

The Middle East and North Africa (MENA) region is considered the most dependent on food imports globally, with net food imports expected to increase in the future. Between 2000 and 2002, net food imports accounted for 25% to 50% of national consumption. This heavy reliance on imported food is attributed to both demand and supply factors. On the demand side, factors include population growth and changing consumption patterns driven by rising income levels. On the supply side, limited natural resources such as land and water play a significant role.

The period from 2007 to 2009 witnessed significant increases in food and oil prices, serving as a stark reminder of the region's food security vulnerability. The population of the MENA region has tripled, rising from 100 million in 1960 to over 300 million in 2006, with an annual growth rate of 1.7% expected to continue. Additionally, demand patterns are shifting from basic commodities to higher-value food items (work bank, 2010).

.House-Level Food Security:

The Middle East and North Africa (MENA) region faces a moderate level of hunger, but the number of people experiencing food insecurity increased between 1990 and 2005, according to the Global Hunger Index (GHI).

MENA was the only region globally to witness a rise in the proportion of people suffering from hunger over the past decade. While other regions showed declines, MENA

experienced an increase in the percentage of its population with insufficient calorie intake, rising from 3.8% to 4.6%. This increase might underestimate the actual situation, as Iraq, which suffers from severe hunger, was excluded from GHI calculations due to a lack of data. Furthermore, the 2009 GHI does not fully reflect the impacts of recent spikes in food and energy prices or the global financial crisis of 2008-2009.

Similar to the 2009 global GHI, the GHI for the MENA region showed improvement compared to 1990, decreasing from 7.7 to 5.2 (Global Hunger Index, 2009).

The Micro Dimensions of Food Security:

For the purposes of government policy, food security can be viewed as a continuous spectrum ranging from the micro perspective of individual nutritional well-being to the macro perspective of ensuring a consistent supply of food in national, regional, and local markets. The challenge, and one of the key objectives of food policy, is to create an environment that guarantees every household access to purchasing power, nutritional knowledge, and healthcare, ensuring sufficient food demand in those markets and thereby achieving food security at both ends of the micro and macro spectrum.

Achieving food security at both the micro and macro levels is a complex task in an open, market-based economy. However, such an economy is the only one capable of delivering rapid growth and reducing poverty. Both elements of the Asian food security strategy—rapid economic growth and food price stability—address the "macro" dimensions of food security rather than the "micro" dimensions.

Growth, Poverty and Stability:

The close historical connection seen in much of East and Southeast Asia between improvements in food security and reduction of poverty has been a result of government efforts to link market-led economic growth to interventions that improve food security at both the household and national levels. This strategic connection is not an accident. A coherently designed macro food policy couples a strategy for food security with a strategy for growth that reaches the poor. Establishing this link to food security from the macro side allows a country to capture growth opportunities, some quite subtle, that are missed otherwise. Such a macro food policy has three components which, in turn, reinforce the country's food security: rapid growth in the macro economy, poverty reduction through rural economic growth, and stability of the food security (Asian Development bank, 2013).

Related Resources for Achieving Food Security in the Arab World:

Achieving food security in the Arab world requires leveraging a range of resources and strategies that can contribute to enhancing food sustainability and reducing dependence on imports. These resources include:

1-Human resources:

Human resources in the Arab world represent a diverse mix of populations in urban and rural areas, with a total population of approximately 134.85 million people, according to 2017 statistics. Of this number, around 29.76 million individuals are employed in the agricultural sector, reflecting the vital role of agriculture as a primary source of employment, especially in countries with agricultural-based economies such as Sudan and Yemen. However, the per capita share of total and agricultural output varies significantly across Arab countries due to differences in economic

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development levels and the scale of investment in the agricultural sector. The region faces major challenges impacting this sector, including water scarcity, climate change, and heavy reliance on food imports, which necessitates the need to strengthen policies supporting rural development and enhance agricultural productivity (FAO, 2017).

2-Natural resources:

Geographic and agricultural land area: The geographical area in the Arab world is 1,345.28 million hectares, with agricultural land covering 72.36 million hectares, accounting for 5.38% of the total area (FAO,2017).

3-Water Resources:

Water resources in the Arab world face severe challenges, with approximately 90% of the population living in countries experiencing water scarcity. Nearly 50 million people in the region lack access to basic drinking water, highlighting the critical impact of this issue on water security, food security, prosperity, and quality of life. The Arab region is the most water-scarce in the world, with 19 out of 22 countries suffering from water shortages and 21 of these countries relying heavily on trans boundary water resources. This scarcity underscores the urgent need for sustainable water management strategies to address this pressing issue (Worldbank,2020).

4- Agricultural Resources:

According to a report by the Arab Organization for Agricultural Development, there has been an increase in the production of most plant, animal, and fish food commodities in the Arab world. The value of the food commodity gap decreased from approximately \$39.3 billion for the average period (2009-2015) to about \$33.6 billion in 2017 and approximately \$34.5 billion in 2016, despite population growth (AOAD, 2017).

Indicators For Measuring Economic Growth

Indicators for measuring economic growth include population size, real per capita income, and per capita income adjusted for purchasing power parity. Human development indicators, such as health, education, and training, along with productive capacity, also play a crucial role in evaluating a country's economic progress and potential.

Economic Growth and Food Security:

The agricultural production and its impact on the economy of our Arab countries are significantly low compared to industrial production. Some studies have shown that there is limited and decreasing attention to food output, which contradicts what is expected given the factors and infrastructure available in Arab countries that could boost agricultural production.

There should be a reciprocal relationship between the financial system and the food economy to ensure growth, increase food trade, open up avenues for capital flow, facilitate investments in the agricultural food economy, secure water resources, and work on improving the environment for food manufacturing and production, especially for strategic food items like wheat.

We have started to see the dangers of concentrating production in certain countries and its impact on the global food economy, making it a political and economic pressure point on

countries that lack the production of these strategic goods. Here, there is a need to reconsider and emphasize agriculture, climate change, and food security. Engaging and encouraging youth to utilize modern technologies, building capacities in manufacturing and nutrition sectors are essential steps.

The agricultural sector serves as the backbone of the economy in our countries. It represents the largest share of the Gross Domestic Product (GDP), employs a significant portion of the workforce, serves as a major source of foreign exchange, and provides the majority of basic food items. Additionally, it offers livelihoods and income to more than half of the population in these countries. The strong connections between agriculture, rural sectors, and other sectors of the economy provide an extra impetus for growth and income generation (FAO, 2018).

Substantial progress in driving economic growth, reducing poverty, and enhancing food security in most of these countries cannot be achieved without improving the human and productive capacities of the agricultural sector and increasing its contribution to economic and social development in general. A robust and vibrant food and agricultural system represents a key pillar of any comprehensive strategy for economic growth and development. Agriculture in less developed countries should not continue to receive such minimal attention in policies and investments.

Previous Studies:

The correlation between food security and economic growth is presented through the research of Arcand (2001), where a typical neoclassical growth model is adopted to measure malnutrition, serving as an indicator of both food security and economic growth. The neoclassical growth model relies on the functions of technology, capital, and labor. The researcher added the labor variable as an influential factor, where the productivity of labor depends on the level of nutrition in terms of dietary energy supply (DES) or the prevalence of food inadequacy (PFI). The inclusion of the labor equation into the neoclassical growth model is intended to develop new growth models.

In addition to the Solow Neo-Classical Growth Model, there is another growth theory related to food security concerning nutritional intake, known as the human capital augmented Solow Model, which was presented by Mankiw, Romer, and Weil in 1992. The impact of nutrition lies in its influence on human capital. The concept of human capital stems from investing in human knowledge and health, which includes education, physical exercise, and ensuring adequate nutrition. Knowledge and health are interrelated: when individuals possess good knowledge of health and are more aware of the importance of proper nutrition in maintaining health, it leads to increased life expectancy and enhanced economic growth (Brumm, 1996).

Enhancing development efficiency and economic growth will lead to a reduction in poverty, famine, and malnutrition, ultimately achieving food security, particularly in arid developing countries. Numerous studies have demonstrated that efficiency in economic growth has a positive impact on food security. However, the relationship between food security and economic growth can be both direct and indirect, though this topic has been addressed in limited research. Jenkins and Scanlan (2001) conducted a study on food security in less developed countries between 1970 and 1990, identifying six crucial factors related to

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food security: modernization, economic dependence, urban bias, neo-Malthusian population pressure, ecological evolutionary processes, and militarism. To capture stable structural trends over time, the aforementioned authors adopted a lagged panel or conditional change model, which is considered the most effective method. Moreover, some prior studies measured food security at the macro level (Timmer, 2000). Based on this research, policymakers have established conditions for food security at the micro level, ensuring households' access to food through local markets and available resources. It appears that food security has a relatively weak impact on economic growth. Nevertheless, focusing on food security strategies, this study primarily concentrated on Asia, exploring issues such as food price instability in the global rice market, income distribution rates, and trade policies, all of which have influenced food security and economic growth.

Moreover, food intake plays a significant role in increasing labor productivity and promoting economic growth. Strauss (1985) pointed out that improving nutrition leads to better health and nutrition in the human body and enhances decision-making abilities, which in turn improves economic growth. Additionally, the author claimed that good childhood nutrition contributes to improved educational outcomes, enhances education, and fosters labor productivity. These findings are supported by studies conducted by Deolalikar (1988), who found that nutrition based on the Minimum Dietary Energy Requirements (MDER) plays a crucial role in determining the level of labor productivity. According to this author's analysis, the elasticity of farm output with respect to the MDER of family workers is high. This implies that better nutritional intake by workers will increase farm output and result in enhanced economic growth.

Furthermore, there is a crucial relationship between nutrition and poverty. A study conducted by Miller and others (1994) revealed that long-term poverty leads to cognitive development problems among young children. This problem is caused by deficiencies in nutritional requirements and low birth weight, both of which can impact children's verbal memory, vocabulary, math, and reading abilities, ultimately resulting in behavioral issues. Nevertheless, sufficient nutrition can be available in these impoverished countries to foster body development, prevent diseases, increase productivity, and enhance economic growth. Salehi and others (2004) stated that children in poverty-stricken areas can have sufficient nutrition if all parents and family members involved receive educational interventions related to food and nutrition. It is imperative for all parents and family members to play their role as caregivers by providing adequate energy and protein through simple, hygienic, and affordable foods to ensure their children's nourishment. These practices can contribute to improving children's growth and enhancing their educational performance.

Furthermore, while adequate nutrition can prolong life expectancy, excessive food intake can have the opposite effect. Kinsella (1992) discovered that nutrition plays a crucial role in increasing life expectancy and reducing mortality rates. However, in developed countries, increased nutritional intake can lead to obesity and subsequently reduce life expectancy due to chronic diseases. The escalating obesity problem may trigger a diabetes epidemic, further reducing life expectancy. Nevertheless, in arid regions of developing countries, where a significant number of people suffer from inadequate nutritional intake, increasing their nutrition can decrease mortality rates and raise life expectancy (Walls et al., 2012).

Food production is a crucial factor in achieving food security. The Food and Agriculture Organization (FAO) has identified five essential resources for food production, namely land and irrigation, labor, machinery, fertilizers, and pesticides. Previous studies have shown that all these five elements are highly necessary to increase food production in dry-land developing countries. However, this study differs from others as it focuses specifically on dry-land developing countries, which have a distinct geographical situation compared to other dry-land developing nations facing water scarcity issues. The objective of this study is to determine whether all these five inputs yield similar results as observed in other dry-land developing countries or if the outcomes show variations.

The Descriptive Analysis

This part introduces the descriptive analysis of the study variables, which are: economic growth, food security, real gross capital formation, and total labor force during the time period 2010-2020, for the sample of study.

Countries of the Arab World

An explanation of the countries of the Arab World is included in the study and it is as follow:

There are many factors that help raise the level of food security, and each of the countries in the study sample is characterized by many of these factors, including: a small percentage of vulnerable workers, which represent the total number of self-employed workers, are in Bahrain, Kuwait, Oman, and Qatar; The development of productive societies is in Egypt, Jordan, and Saudi Arabia. A high number of people who have a basic skill in information and communication technology live in and United Arab Emirates. Those focusing on education are in Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, and United Arab Emirates.

Economic Growth in the Arab World Included in the Sample

Economic growth is a fundamental goal for nations as it directly contributes to improving a country's overall situation. It raises the standard of living for individuals, fosters societal development, and reduces unemployment rates by creating job opportunities. Consequently, this helps alleviate poverty and economic disparity. This analysis examines Gross Domestic Product (GDP) data from 2010 to 2020 for ten Arab countries, providing insights into their economic growth and variations in performance , as shown in the table (1).

Table (1) Gross Domestic Product in the Arab World in Dollars (\$B) (in Current Prices)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Rate of growth
Bahrain	25.71	28.77	30.74	32.53	33.38	31.05	32.23	35.47	37.80	38.65	34.62	34.66%
Egypt	218.98	235.99	279.11	288.43	305.59	329.36	332.44	248.36	262.58	318.67	383.81	75.27%
Jordan	27.13	29.52	31.63	34.45	36.84	38.58	39.89	41.60	43.37	44.50	43.70	61.09%
Kuwait	115.41	154.08	174.04	174.16	162.65	114.58	109.40	120.68	138.20	136.19	105.94	-8.20%

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Morocco	100.86	110.08	106.93	115.73	119.13	110.41	111.57	118.54	127.34	128.92	121.35	20.32%
Qatar	125.12	167.77	186.83	198.72	206.22	161.74	151.73	161.09	183.33	176.37	144.41	15.42%
Saudi Arabia	528.20	677.63	742.84	754.86	767.60	669.48	666.99	715.99	847.58	839.58	734.56	38.94%
Sudan	74.15	78.40	63.19	66.02	76.81	84.89	102.94	129.71	32.33	32.33	27.03	-63.45%
Tunisia	46.20	48.12	47.31	48.68	50.27	45.77	44.36	42.16	42.68	41.90	42.53	-7.94%
United Arab Emirates	297.6	368	375	387.24	403.24	358.14	348.74	390.57	427.04	417.98	349.47	17.43%
Highest value	528.20	677.63	742.84	754.86	767.60	669.48	666.99	715.99	847.58	839.58	734.56	75.27%
Lowest value	27.13	28.77	30.74	21.36	21.50	16.46	12.59	16.36	21.49	22.60	11.15	-63.45%
Average	156.94	192.84	206.76	210.09	216.17	197.30	196.03	200.32	210.97	214.32	198.74	23.87%

Source: The World Bank, Data Bank, GDP, 2023. <https://databank.worldbank.org/>

The data set includes GDP data for Bahrain, Egypt, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia, and the United Arab Emirates. These values reflect the economic performance of these nations over the specified period. Notably, Saudi Arabia consistently recorded the highest GDP throughout the years, reaching a peak of 754 billion USD in 2013. Conversely, the United Arab Emirates had the lowest GDP during some years, such as in 2017 and 2018, with a recorded value of 11.2 billion USD.

Between 2010 and 2015, most countries experienced overall GDP growth. For instance, Egypt's GDP increased significantly from 218.98 billion USD to 329.37 billion USD. Similarly, Qatar's GDP rose from 125.12 billion USD to 206.22 billion USD, while Saudi Arabia demonstrated robust growth, with its GDP reaching 847 billion USD in 2018. However, from 2016 onwards, variations in growth patterns emerged. The UAE experienced a sharp decline in GDP, dropping to 22.6 billion USD in 2019, and Sudan faced fluctuations, with GDP falling from 74.2 billion USD in 2010 to 27 billion USD in 2020.

Country-specific trends highlight relative stability in GDP growth for Bahrain, while Kuwait showed slight declines, such as in 2015, followed by gradual improvements. Morocco exhibited steady growth until 2017 but faced declines in subsequent years. Saudi Arabia consistently led in GDP, maintaining its position as the top performer among the analyzed countries.

The average GDP for all ten countries showed an increase from approximately 151.46 billion USD in 2010 to 164.46 billion USD in 2020. Despite some fluctuations, like those observed in 2015 and 2020, the general trend indicated growth or stability in most nations GDP.

In conclusion, the analysis reveals considerable variation in economic performance among the Arab countries. Saudi Arabia, Egypt, and Qatar demonstrated sustained economic growth,

whereas the UAE and Sudan experienced notable declines during specific periods. Bahrain and Kuwait exhibited relative stability, reflecting resilience in their economies. This variability underscores the diverse economic trajectories within the Arab world, shaped by internal and external factors affecting each nation's performance.

Food security Index in the Arab World Included in the Study Sample

The analysis of the Food Security Index table for Arab countries from 2010 to 2020 as shown in table (2) reveals a general trend of improvement in food security across the region, albeit at varying rates among countries. Some nations, such as Sudan and Qatar, recorded significant growth in their indices, reflecting considerable advancements in food security measures. Meanwhile, countries like Bahrain and Kuwait exhibited more stable and consistent progress over the decade.

Table (2) Food security Index in selected Arab Countries during the period(2010-2020)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Rate of growth
Bahrain	63.3	64.6	63.4	63.7	65.7	66	70.1	68.6	67.8	66.6	64.6	0.202%
Egypt	51.5	51.6	51.6	51.7	52.7	61.8	57.1	56.6	56.3	64.5	61.1	1.72%
Jordan	50.2	50.4	50.6	52.3	55.5	58.5	56.9	58.3	57	61	60.4	1.86%
Kuwait	65.4	65.8	66	67.6	69.2	75.5	73.5	74.6	74.8	74.8	70.7	0.78%
Morocco	48.2	48.7	49.3	49.4	50.7	53.9	55.5	52.8	55	62.8	63	2.68%
Qatar	60.5	61.4	63.2	64.7	65.8	69.7	70.2	73.3	77.2	78.3	78.8	2.66%
Saudi Arabia	65.4	66.7	68.7	65.7	68.2	72.8	71.1	71	72.4	73.5	73.8	1.22%
Sudan	22.8	23.5	24.3	25.2	27.6	36.5	34.7	34.8	36.4	45.7	46.2	7.82%
Tunisia	51.8	52.3	52.7	58	59.5	60.1	57.9	58.8	60.1	60.9	61.2	1.66%
United Arab Emirates	65.2	66.5	67.6	68.6	69.4	70.6	70.9	71.8	72.5	75.6	76.2	1.58%
Highest value	65.4	66.7	68.7	68.6	69.4	75.5	73.5	74.6	77.2	78.3	78.8	7.82%
Lowest value	22.8	23.5	24.3	25.2	27.6	36.5	34.7	34.8	36.4	45.7	46.2	0.202%
Average	54.43	55.15	55.74	56.69	58.43	62.54	56.172	56.418	57.46	55.30	59.63	2.05%

Source: <https://impact.economist.com/sustainability/project/food-security-index/resources/EIU-Methodology.pdf>

Among the high-performing countries, the UAE, Qatar, Kuwait, and Saudi Arabia consistently maintained top positions in the Food Security Index throughout the ten years. Qatar stood out as the fastest-growing country in this category, with its index rising

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remarkably from 60.5 in 2010 to 78.8 in 2020, showcasing its effective food security policies and strategies.

In the moderate category, countries like Bahrain, Tunisia, and Morocco demonstrated gradual and steady improvements. Bahrain's index, for example, grew from 63.3 in 2010 to 64.6 in 2020, while Morocco experienced a more substantial increase, improving from 48.2 to 63 during the same period. These countries exhibited relative stability, reflecting their ongoing efforts to enhance food security.

At the lower end of the spectrum, Sudan recorded the lowest Food Security Index among the countries analyzed. Despite this, Sudan achieved remarkable progress, with its index increasing from 22.8 in 2010 to 46.2 in 2020. This growth indicates substantial developmental efforts aimed at addressing food security challenges despite the nation's economic and political hurdles.

Several factors influenced the trends observed in the Food Security Index during this period. Political and economic events played a significant role, particularly in countries like Sudan, where improvement efforts overcame substantial challenges. Additionally, global events such as the COVID-19 pandemic impacted food security in 2020. Some nations, including Bahrain and Kuwait, experienced stabilization or slight declines in their indices during that year, reflecting the pandemic's effects on food supply chains and economic stability.

Overall, Qatar, the UAE, and Saudi Arabia emerged as top performers, achieving high and stable indices throughout the decade. These nations demonstrated robust policies and strategic initiatives to ensure and sustain food security. The analysis highlights the diverse trajectories of food security improvement across Arab countries, emphasizing the need for tailored strategies to address specific challenges faced by each nation.

3.4 Gross Capital Formation in the Arab World Included in the Study Sample

Table(3) provides a detailed overview of the gross capital formation for several Arab countries from 2010 to 2020, focusing on the value of these investments in U.S. dollars (at current prices). This data serves as an indicator of the economic performance of these countries over the decade, shedding light on their investment in physical assets such as machinery, equipment, and infrastructure, which are crucial for economic growth.

Table (33) Gross Capital Formation in selected Arab Countries in Dollars (\$B) (in Current Prices) during the period (2010-2020)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Rate of growth
Bahrain	7.01	6.44	8.65	8.44	8.96	7.92	9.39	11.68	13.33	12.61	12.15	5.8%
Egypt	42..70	40.36	44.73	40.99	41.69	47.06	50	42.58	49.12	63.90	61.39	3.7%
Jordan	9.50	9.37	9.81	9.16	9.50	9.58	9.33	1.02	1.05	9.52	9.69	0.2%
Kuwait	20.38	20.86	22.33	24.99	26.49	29.13	32.77	33.46	34.97	34.07	34.07	5.3%

Morocco	31.76	36.26	34.41	37.04	36.66	33.31	35.65	37.52	40.92	39.44	34.92	0.96%
Qatar	39.13	48.70	50.71	55.30	65.55	59.95	74.15	68.64	74.54	77.13	63.32	4.9%
Saudi Arabia	163.35	186.35	200.64	202.71	222.45	229.12	205.77	205.89	221.15	237.27	203.33	2.2%
Sudan	15.12	18.23	12.46	11.35	11.55	10.88	9.57	13.96	3.22	4.62	15.6	-25.4%
Tunisia	11.93	12.04	12.34	11.62	11.99	99.5	9.08	8.97	9.80	8.13	5.33	-6.5%
United Arab Emirates	78.59	81.21	81.97	75.12	89.36	91.82	92.90	97.54	99.26	93.72	79.63	0.13%
Highest value	163.35	186.35	200.64	202.71	222.45	229.12	205.77	205.89	221.15	237.27	203.33	5.8%
Lowest value	7.01	6.44	8.65	8.44	8.96	7.92	9.08	8.97	3.22	4.62	1.56	-25.4%
Average	40.95	45.99	47.74	48.57	52.42	52.87	52.86	52.03	54.74	58.03	50.54	-1.49%

Source: The World Bank, Data Bank, Gross Capital Formation, 2023.

<https://databank.worldbank.org/>

Note: * Was Estimated by Researchers Using the Continuous Growth Rate Equation.

To begin with, the data encompasses ten Arab countries: Bahrain, Egypt, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia, and the UAE. These countries exhibit varying levels of capital formation, reflecting differences in their economic strategies and priorities. Notably, Saudi Arabia recorded the highest value of capital formation during this period, reaching 237.27 billion dollars in 2019. In contrast, Bahrain marked the lowest value at the start of the period, with only 7.02 billion dollars in 2010.

Over the course of the decade, several countries demonstrated distinct trends in capital formation. For example, Egypt experienced significant growth, with its capital formation increasing from approximately 42.7 billion dollars in 2010 to 61.4 billion dollars in 2020. Similarly, Qatar witnessed a remarkable rise, growing from 39.1 billion dollars in 2010 to 63.3 billion dollars in 2020. Saudi Arabia, on the other hand, maintained stability with a steady increase from 163.35 billion dollars in 2010 to 203.33 billion dollars in 2020. However, Sudan faced a sharp decline, with its capital formation dropping drastically from about 15.1 billion dollars in 2010 to just 1.56 billion dollars in 2020, reflecting severe economic and political challenges.

When examining individual performances, Bahrain exhibited notable fluctuations in capital formation, with periods of both increases and decreases. In contrast, Kuwait displayed consistent growth, with values rising from 20.4 billion dollars in 2010 to 34.1 billion dollars in 2020. The UAE stood out for its high levels of capital formation, reaching approximately 79.6 billion dollars in 2020, further reinforcing its position as a major economic player in the region.

In terms of averages, the capital formation across all countries increased over the decade, with the average value rising from approximately 36.9 billion dollars in 2010 to 45.6 billion dollars in 2020. Despite this overall growth, certain years, such as 2015, saw declines, likely influenced by regional and global economic challenges.

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In conclusion, the analysis reveals significant disparities in capital formation among Arab countries. While nations like Saudi Arabia, Qatar, and Kuwait demonstrated continuous growth, others, such as Sudan, faced sharp declines. Moreover, countries like the UAE and Kuwait exhibited relative stability, contrasting with the fluctuations observed in Bahrain. These findings underscore the varying economic trajectories of Arab countries, highlighting the need for tailored strategies to address their unique challenges and capitalize on their strengths to foster sustainable economic growth.

Labor Force in the Arab World Included in the Study Sample

Table (4) provides an overview of the total labor force in several Arab countries from 2010 to 2020, measured in millions. The labor force includes individuals actively employed or seeking employment, offering a clear picture of workforce dynamics across the region over this period.

Table (4) Total Labor Force in Arab Countries in Millions during the period(2010-2020)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Rate of growth
Bahrain	0.69	0.68	0.69	0.72	0.74	0.76	0.80	0.83	0.86	0.86	0.84	21.74%
Egypt	28.73	29.06	29.54	30.18	30.65	30.54	30.92	30.42	29.89	29.70	29.87	3.97%
Jordan	1.73	1.76	1.75	1.84	2.03	2.32	2.53	2.69	2.70	2.79	2.92	68.79%
Kuwait	1.55	1.69	1.85	2.02	2.11	2.22	2.32	2.37	2.49	2.56	2.39	54.19%
Morocco	11.44	11.53	11.54	11.70	11.82	11.85	11.79	11.69	11.92	12.16	11.95	4.46%
Qatar	1.27	1.33	1.40	1.49	1.64	1.81	1.96	2.04	2.08	2.09	2.04	60.63%
Saudi Arabia	11.04	11.61	12.17	12.63	12.97	13.44	13.96	13.92	14.52	15.48	15.99	44.92%
Sudan	9.60	9.75	9.94	10.16	10.45	10.80	11.16	11.55	11.95	12.31	12.56	30.83%
Tunisia	3.89	3.97	4.07	4.08	4.10	4.12	4.16	4.17	4.20	4.24	4.08	4.88%
United Arab Emirates	5.68	5.78	5.87	5.97	6.06	6.15	6.24	6.32	6.40	6.47	6.49	14.26%
Highest value	28.73	29.06	29.54	30.18	30.65	30.54	30.92	30.42	29.89	29.70	29.87	68.79%
Lowest value	0.69	0.68	0.69	0.72	0.74	0.76	0.80	0.83	0.86	0.86	0.84	3.97%
Average	7.5	7.55	7.89	8.009	8.26	8.42	8.58	8.54	8.60	8.97	8.91	%35.77

Source: The World Bank, Data Bank, Labor force, 2023. <https://databank.worldbank.org/> **Note:** *

Are Estimated by Researchers Using the Continuous Growth Rate Equation.

The data covers ten Arab countries: Bahrain, Egypt, Jordan, Kuwait, Morocco, Qatar, Saudi Arabia, Sudan, Tunisia, and the UAE. These countries exhibit varying labor force sizes,

reflecting differences in population, economic activity, and workforce participation. Among them, Egypt consistently recorded the highest labor force, reaching 29.8 million in 2020. Conversely, Bahrain had the smallest labor force throughout the years, with only 0.69 million in 2010 and 0.84 million in 2020.

Over the decade, most countries experienced steady growth in their labor forces. For instance, Bahrain's labor force grew gradually from 0.69 million in 2010 to 0.84 million in 2020. Similarly, Egypt's labor force expanded from 28.7 million to 29.8 million during the same period. Jordan showed remarkable growth, with its labor force increasing from 1.7 million in 2010 to 2.9 million in 2020. Kuwait also exhibited gradual growth, rising from 1.56 million in 2010 to 2.39 million in 2020. Morocco's labor force remained relatively stable, with a slight increase from 11.4 million in 2010 to 11.95 million in 2020.

In contrast, countries like Qatar and Saudi Arabia showed significant growth. Qatar's labor force grew sharply, from 1.28 million in 2010 to 2.05 million in 2020, while Saudi Arabia's labor force expanded consistently, from 11.04 million to 15.99 million over the same period. Sudan, too, experienced steady growth, with its labor force increasing from 9.6 million to 12.6 million. Similarly, Tunisia's labor force rose modestly, from 3.89 million in 2010 to 4.09 million in 2020. The UAE, a regional economic hub, saw its labor force grow from 5.69 million in 2010 to 6.49 million in 2020.

On average, the labor force across all countries increased over the years, reflecting overall growth in the active workforce. The average labor force was approximately 7.57 million in 2010 and rose slightly to 7.92 million in 2020, indicating an upward trend. However, the pace of growth varied significantly among the countries.

In conclusion, the analysis highlights notable differences in labor force growth among Arab countries. Nations like Saudi Arabia, Qatar, and Jordan experienced significant increases, driven by population growth and expanding job markets. Meanwhile, countries like Morocco, Tunisia, and Bahrain showed steadier but slower growth. Egypt maintained its position as the country with the largest labor force, while smaller nations like Bahrain consistently had much lower figures. These variations reflect the diverse demographic, population dynamics, and labor market trends within the Arab world.

Empirical Analysis

The main objective of this chapter is to investigate the impact of food security on economic growth in the Arab world using panel data from 2010 to 2020, annual data has been utilized.

Model specification:

Depending on economic theory and previous studies (Mankiw, Romer, and Weil, 1992), the model of this study takes the following form:

$$Y_t = (FSI_t, L_t, K_t)$$

Where;

Y_t = Gross Domestic Product (GDP): is the dependent variable and it expresses as the aggregate sum of all goods and services produced in a country during a specified period of time, usually one year. The data is in current US dollars and was obtained from the World bank.

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FSI= can be defined as a comprehensive measure used to evaluate the availability of food, individuals' ability to afford it, its quality and safety, and the stability of the food supply system in a specific country or region.

The data is collected from international sources such as: The Food and Agriculture Organization (FAO), The World Bank, Other international organizations concerned with food security.

The data is integrated with local reports on food production, income, and health practices.

K_t = Real Gross Capital Formation can be defined as the gross domestic fixed capital formation, which is a measure of investment in fixed assets in all their forms that occurs in the economy over a specific time, in addition to the amount of change in the level of inventory, which can be expressed in goods held by firms to face expected and unexpected fluctuations in production and sale. The data is obtained from The World Bank and the data is in current US dollars.

L_t = Total Labor Force, the labor force is made up of people who work hard mentally or physically to produce goods or services within a set period of time.

The data obtained from The World Bank and Agriculture Organization (FAO).

Panel Data Analysis

It has been conducted a panel data analysis using the following linear regression model:

$$Y_{it} = \beta_{0i} + \sum_{j=1}^k \beta_j X_{jit} + \varepsilon_{it} \quad (1)$$

(i = 1, 2, ..., N; t = 1, 2, ..., T; j = 1, 2, ..., K)

Where;

Y_{it} : represents the value of the dependent variable for observation i at time t.

β_{0i} : indicates to the intercept value for observation i assuming intercept stability over time.

β_j : represents the coefficients of the explanatory variables

X_{jit} : represents the explanatory variables and their count is j for observation i at time t ε_{it} : denotes the error term for observation i at time t.

panel data can be analyzed using three different methods:

first: Pooled Regression Model (PRM)

This model is one of the simpler panel data models, with the fundamental assumption that the all coefficient remain constant across time (α_i , β_j), and all explanatory variables are estimated for all observations throughout the specified time period. When the equation (4.1) is restructured, the following pooled regression model is obtained.

$$Y_{it} = \alpha + \sum_{j=1}^k \beta_j X_{jit} + \varepsilon_{it} \quad (2)$$

(i = 1, 2, ..., N; t = 1, 2, ..., T; j = 1, 2, ..., K)

One of the model assumptions is that the expected value of the error term $\{E(\varepsilon_{it}) = 0\}$ is zero and additionally its variance is constant $\{Var(\varepsilon_{it}) = \sigma^2\}$. The model can be estimated by using the ordinary least square method.

A major criticism of this model is that it doesn't distinguish the differences between countries.

Second: Fixed Effects Model (FEM)

The fixed effect model investigates the effect of each observation separately. This has been carried out thorough making the parameter values α of each observation differ while holding

the β_j parameter constant all over all observation. Thus, the model can be represented as follows:

$$Y_{it} = \alpha_i + \sum_{j=1}^K \beta_j X_{jit} + \varepsilon_{it} \quad (3)$$

($i = 1, 2, \dots, N$; $t = 1, 2, \dots, T$; $j = 1, 2, \dots, K$)

The fixed effect models implies that the α parameter is stable for each individual observation over time, but the changes are only in the totals of the cross-sectional data. The model is estimated by using the Least Square Dummy Variable by adding dummy variables numbering (N-1). After adding dummy variables, the models can show as follows:

$$Y_{it} = \alpha_1 + \sum_{d=2}^N \alpha_d D_d + \sum_{j=1}^K \beta_j X_{jit} + \varepsilon_{it} \quad (4)$$

($i = 1, 2, \dots, N$; $t = 1, 2, \dots, T$; $j = 1, 2, \dots, K$)

Where $\sum_{d=2}^N \alpha_d$ shows the changes in the intercept α from observation i .

Third Random Effect Model (REM)

The Random Effect Model assumes that the error term ε_{it} has a normal distribution with a mean of zero and variance equal σ^2 . The assumption of constant error variance across all cross-sectional observations is utilized to ensure that parameter estimation is unbiased and efficient. Furthermore, there is no autocorrelation between distinct sets of crosssectional data during a specific time period.

When the conditions outlined above fail to exist, the random effect model should be chosen. Through this model, each cross-section is treated as random variable and assigned a constant value equal to μ , as shown in the following equation:

$$\alpha_i = \mu + \nu_i \quad (5)$$

($i = 1, 2, \dots, N$)

The random effect model can be derived as follows:

$$Y_{it} = \mu + \sum_{j=1}^K \beta_j X_{jit} + \nu_i + \varepsilon_{it} \quad (6)$$

($i = 1, 2, \dots, N$; $t = 1, 2, \dots, T$; $j = 1, 2, \dots, K$)

Where ν_i is the error term in the cross-section dataset for each observation i .

Econometric Model

The standard model for the study can be formulated as follows:

$$\ln GDP_{it} = \alpha_0 + \sum_{j=2}^K \beta_j \ln X_{jit} + \beta_1 FSI_{it} + U_{it} \quad (7)$$

Where: GDP refers to the Gross Domestic production, and ($j = 1, 2, \dots, K$) indicates to the number of independent variables. Additionally, FSI_{it} denotes to the independent variables for the country i at time t . α_0 represents the estimated cross-sectional regression, β_j indicates the estimated regression parameters for independent variables j , and U_{it} denotes the estimated statistical error.

When substituting the independent variables into the above equation, we can obtain to the formula for the study models as follows:

$$\ln GDP_{it} = \alpha_0 + \beta_1 FSI_{it} + \beta_2 \ln K_{it} + \beta_3 \ln L_{it} + U_{it} \quad (8)$$

After confirming the absence of statistical issues in the standard analysis, we will proceed to conduct statistical test for study variable.

Diagnostic Tests

The researcher uses statistical tests for the study variable to be sure that the results achieve a meaningful estimate. And this estimator has the best linear unbiased estimator (BLUE) features and aims to be free of any statistical problems related to the model variables.

1) Multicollinearity Test

When there is linear relationship between explanatory variables, linear correlation occurs, which raises the standard error in the estimated variable and has a negative effect on the statistical (t-value), resulting in the estimated variable statistically insignificant. The correlation coefficients (ρ) between the explanatory variables can be analyzed in order to establish the absence of linear correlation. Researchers use the Variance Inflation Factors Test (VIF) to ensure that there is no linear relationship between explanatory variables. In this test, linear regression analysis is carried out between the explanatory variables, with the assumption that one of the explicating variables is the dependent variable and the other variables are independent variables. The VIF test uses the determination coefficient (R_j^2) for each explanatory variable, with the exception of variable j .

In general, if the VIF is above 4 or tolerance below 0.25 indicates that multicollinearity might exist, and further investigation is required. When VIF is higher than 10 or tolerance is lower than 0.1, there is significant multicollinearity that needs to be corrected.

The results of this test are reported in table (5).

according to the next table, it is obvious that the VIF values of all explanatory variables are less than 4 and the tolerance is more than 0.25. As a result, we are able to deduce that there is no linear correlation between explanatory variables.

Table (5) Variance Inflation Factors Test

Variable	VIF	$Tolerance = \frac{1}{VIF}$
FSI	1.288316	0.776207079629531
K	1.485810	0.673033564183845
L	1.642234	0.608926620688647

Source: Output of E -Views 12

2) Cross-Sectional Dependence Test for Residuals

Cross-sectional dependence is one of the critical diagnostics that researchers must verify before conducting panel data analysis. One of the key assumptions of regression analysis is the independence of residuals (i.e., **no cross-sectional correlation in residuals**). Residuals refer to the differences between the observed and predicted values of the explanatory variables used in the model.

If these residuals are correlated, the use of **Fixed Effects (FE)** and **Random Effects (RE)** models results in biased and inefficient estimators (Sarafidis & De Hoyos, 2006). To test for the independence of residuals, the following tests can be employed:

- **Breusch-Pagan LM test**
- **Pesaran scaled LM test**
- **Pesaran CD test**

These tests evaluate the null hypothesis (H_0) of no cross-sectional dependence. The results of these tests indicate no cross-sectional dependence (i.e., no correlation) among the residuals. After conducting the cross-sectional dependence tests, the results are summarized in **Table 6** as follows:

Table (6) Results of the Cross-Sectional Dependence Test for Residuals

TEST	probability	Statistic
Breusch-Pagan LM	0.0000	146.2055
Pesaran scaled LM	0.0000	10.66800
Pesaran CD	0.0000	4.682776

Source: Output of EViews 12

Note: * Indicates the Acceptance of Null Hypothesis at a Significance Level of 5%.

Table (4-2) The **p-values (Probability < 0.05)** for all the tests in Table (4-2) indicate the absence of any cross-sectional dependence (correlation) among the residuals in the study's data. Consequently, the **Fixed Effects (FE)** and **Random Effects (RE)** multiple linear regression models can be applied to obtain consistent, efficient, and unbiased estimates.

The Estimation Results of the Research Model

After carrying out the tests, it became obvious that the effect model is the most suitable approach for estimation. Table (7) provides the findings of estimating the impact of food security on economic growth.

Table (7) The Estimation Results of the Research Model

Dependent Variable		lnGDP	
Independent Variable	Coefficient	T-Statistic	Probability
C	-15.33727	-295.5895	0.0000
FS	0.000503	6.320984	0.0000
lnK	25.19455	435.6769	0.0000
lnL	0.011810	5.045593	0.0000
R- Squared	0.999630	F- Statistic	95467.70
Adjusted R- Squared	0.999620	Probability	0.0000

Source: Output of EViews 12

Analysis of Results

The regression analysis results presented in the table indicate the relationship between GDP (lnGDP) as a dependent variable and food security, capital, and labor as independent variables.

Food security (FS) shows a positive and significant impact on GDP, with a coefficient of **0.000503**. This means that a one-unit increase in food security leads to a **0.000503%** increase in GDP. This finding is supported by strong statistical significance (T-Statistic = 6.320984, Probability = 0.0000), emphasizing the importance of improving food security to support economic growth.

Capital (K) is one of the most influential factors affecting GDP, with a coefficient of **25.19455**. This indicates that a 1% increase in capital results in a **25.19%** increase in GDP. The effect is also highly statistically significant (T-Statistic = 435.6769, Probability = 0.0000), reflecting the critical role of capital investment in driving economic growth.

Regarding **labor (L)**, the coefficient is **0.011810**, suggesting that a 1% increase in the labor force contributes to a **0.0118%** increase in GDP. This result is also statistically significant (T-Statistic = 5.045593, Probability = 0.0000), highlighting the importance of creating job opportunities and developing human resources to stimulate the economy.

Additionally, the model's statistical indicators, such as **R-Squared**, with a value of **0.999630**, indicate that the independent variables explain about **99.96%** of the variations in GDP. The **Adjusted R-Squared**, at **0.999620**, further confirms the model's suitability even after adjusting for degrees of freedom.

Moreover, the **F-Statistic**, with a value of **95467.70** and a probability of **0.0000**, suggests that the model as a whole is highly statistically significant, affirming its validity and explanatory power for the relationships among the variables.

Conclusion:

These findings align with economic theories that emphasize the positive impact of food security, capital, and labor on economic growth. Capital stands out as the primary driver of GDP improvements, followed by food security and labor. The results underscore the need to invest in human and physical capital and enhance food security to achieve sustainable development.

The previous study in general analyzed the impact of total employment combined with food security conditions on economic growth in developing arid-land countries. Generally, the agricultural sector is the largest contributor to employment in these countries. The World Trade Organization (WTO) has supported new negotiations on agriculture, enabling developing countries with arid lands to reassess and raise tariffs on agricultural products to protect national food security and employment.

Improving employment efficiency increases household income and enhances access to food. Furthermore, the Food and Agriculture Organization (FAO) has encouraged the provision of decent work in rural areas, particularly in the agricultural sector, to improve nutrition, boost agricultural productivity, and promote economic growth. Adequate nutritional intake also contributes to higher employment and labor productivity.

Increased nutrition and food intake protect families from severe diseases associated with inadequate sanitation facilities. This indicates that achieving food security, especially in developing arid-land countries, enhances people's ability to work as skilled or unskilled

laborers. Higher labor productivity increases capital intensity in agricultural production, raises income levels, and strengthens purchasing power parity (PPP).

This situation aids developing arid-land countries in fostering economic growth (Strauss, 1985; Deolalikar, 1988). Additionally, the research relied on three significant control variables: government expenditure, capital formation, and population growth, all of which significantly influence economic growth

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