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THE IMPACT OF HUMAN DEVELOPMENT ON FOOD SECURITY IN ARAB COUNTRIES. PERSPECTIVE FROM A PANEL-ARDL ANALYSIS

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ABSTRACT

The purpose of this paper is to examine the relationship between the Human Development Index (HDI) and food security in Arab countries over the period of 2012-2022. Employing Panel Autoregressive Distributed Lag (PANEL-ARDL) cointegration model, the study examines how the Human Development Index (HDI) affects the General Food Security Index GFSI for seven Arab countries. The empirical results provide evidence of cointegration and long run equilibrium between the HDI and GFSI. Increased values of HDI make predictions of better food security possible through factors like education, health, and income. The error correction term indicates rapid adjustment to long-term equilibrium. While analysing the data the study concludes that HDI shows positive relationship with food security emphasizing on the need to human develop the food security in the Arab region.

1. Introduction

Food security is currently one of the most critical challenges facing societies worldwide, (Karunasagar & Karunasagar, 2016) especially with the continuous growth of the global population (Fróna et al., 2019) . It directly impacts the welfare and livelihoods of people. Governments in both developed and developing countries are striving to develop strategies and plans to ensure sustainable food security for their populations (Varzakas & Smaoui, 2024). This involves enhancing local food production, addressing climate change, and reducing dependence on external markets (Premanandh, ,2011).

Food security is a major part of human development, which mean that one cannot exist without the other, at least not in the long run. The second of the seventeen goals of the Sustainable Development Goals

(SDGs is called "Zero Hunger" and focuses on eradicating hunger, ensuring food security and access to nutrition and promoting the sustainable use of resources (Sporchia et al. 2024). This goal can be attained if people meet the following targets that include; the farmers being empowered, gender parity, no poverty in the rural areas, and healthy lives for the entire nation (Gil et al. 2019). This shows that human development is highly related to food security. providing education especially for females, eliminating rural illiteracy, income equality, health facilities and rise in income levels can improve the well-being of the community, narrow down the rural urban disparity, food supply and can facilitate sustainable agricultural practices hence boosting the food security system (Gupta et al. , 2024).

Despite having significant agricultural resources such as diverse crops, vast lands, and varied climates, Arab countries struggle with insufficient local production and reliance on external markets to meet food deficits (Le Mouël & Schmitt, 2018). This makes them vulnerable to economic dependence and external political and economic crises. Using data from the Arab region, research findings revealed that Arab countries that possess higher human development measures provide better food security measures than Arab countries with lower human development measures (Jemmali et al. 2021). This underscores the significant interactions between food security and human development (Gatobu et al. 2020).

Following the above discussion, we provided new empirical evidence on the impact of human correlation between human development and food security in seven chosen Arab countries, namely Egypt, Saudi Arabia, Tunisia, Algeria, Morocco, Jordan, and Sudan. This study sought to answer two key questions: (1) What is the nature of the relationship between the Human Development Index (HDI) and the overall Food Security Index in Arab countries? (2) Is human development in Arab countries positively related to the levels of food security? From the following year, 2012 to 2022, we applied the Panel Autoregressive Distributed Lag (PANEL-ARDL) model to explore short run and long run relationship among these variables.

Study Hypotheses
- Higher levels of human development enhance the quality of human well-being which also enhances food security levels in Arab countries.
- Arab countries food security for the long-term is positively and statistically significantly related to the HDI for the total Food Security Index.

2. Literature Review
There has been growing research interest in the link between food security and human development more so in developing countries where most of the Arab nation's states are located. This critical nexus has been analysed through a number of panel data models and one of the most effective of the methods is the Panel Autoregressive Distributed Lag (PANEL-ARDL). Certainly, access to food is one of the most crucial concepts in human development and economic growth. In a similar context, Raihan et al. (2022) state that higher growth in agricultural productivity is an essential undertaking that benefits poverty alleviation, household earners' income distribution, food security, and general economic development. Chandio et al. (2021) also agree with this view pointing to the importance of agriculture with regards to provision of food and as a key driver of the economies.

The effects of climate change on food security has been of interest in several researches. Ditta et al. (2023) examined this relationship using the panel data involving the selected developing countries, with the aid of the Panel-ARDL analysis. According to their findings, climate change featured severe impacts on Human development, economic development, and food security. In the same way, Affoh et al. (2022) applied the Panel-ARDL technique to analyse long-run causal relationship between climate variability and food security in SSA, which should be noted and viewed by researchers every time the food security is analysed.

Specifically for Arab countries, Chaudhary and Hanif (2022) described climate change and food security in the frame work of sustainable development goals. Their panel ARDL/PMG models showed that temperature shocks significantly affected the food security indicators for the Arab countries, which confirms the importance of climate variables. In more detail, Mohamed (2022) also discussed climate change, agricultural production and food security concerning the Sudan case with the help of panel ARDL method and stressing the role of rainfall for food security in the region.

The human development aspect has been incorporated in related studies. In terms of the impact of aid for trade, Sardar et al. (2022) have conducted a panel ARDL model analysis more recently to identify the plausible roles of aid for Trade food Security and Human Development Indicators for the South Asian Area. As for their methodological approach, it does not necessary has to be specific to Arab countries, but it shows how panel ARDL can be used to assess the human development outcomes.

The effects of food production to sustainable development in upper middle-income countries were examined by Erdogan (2022) employing Panel ARDL. A correlation between food safety and food supply security and the human development factors was also observed, thus supporting the argument of the two way causality of the food security and human development.

Some other literatures that are relevant in explaining the relationship between food security and human development have been advanced. In their study, Uddin et al. (2023) applied panel ARDL analysis to examine the presence of the climate change and agricultural employment in the selected South Asian countries. In this respect, their results on the effects of climate change on the food production system could be useful in the analysis of food security processes in the Arab countries. In a similar manner Pickson & Boateng 2022 employed panel ARDL methods in a study to analyse climate change implications for food security in Africa, findings of which could be relevant for the Arab region especially for the North African countries.

Further, the same type of panel ARDL models used for development studies has been applied by Kowalewska et al. (2023) where in their study the authors examined standard and non-standard indicators of development such as; GDP per capita, Human Development Index (HDI). Further, the use of panel ARDL models by Oluoch et al., (2021) for analysing factors influencing renewable energy consumption in Sub-Saharan Africa revealed energy-related issues and food security problems . Regarding food security, Duasa and Mohd-Radzman (2022) examined the impact of climate change on food security in ASEAN countries using a dynamic panel ARDL approach, underscoring the importance of considering both short-run and long-run relationships.

Food security, economic growth and environmental factors have also been analysed combining by using Panel ARDL methods. Sarkodie et al. (2019) analysed the connection between trade modernized agriculture and Co2 emissions, which seems to explain that there is not a simple link between the development of agriculture and the state of the environment but that it is an intricate process.

Other similar studies that have utilized panel ARDL in the analysis of climate change and, in particular, its effects of agricultural production in Mediterranean countries including some Arab countries are for instance Atay (2015). There is also a focus on the regional context in this research, which is significant in the field of food security analysis.

However, it is worth mentioning that the majority of papers in this literature recognize some limitations with the data and model assumptions. As mentioned by (Asongu & Odhiambo , 2020), it is possible that some important characteristics of inclusive human development could be omitted in panel models.

Thus, based on the previous studies, it is clear that panel ARDL methods will be suitable and appropriate to analyse the association between food security and human development. Yet, there is a lack of sufficiently detailed and systematic investigations of the issue in question, mostly covering Arab countries. Consequently, the current study aims to address this research gap by employing the panel ARDL model to examine the relationship between food security and human development in selected Arab countries as part of the expanding literature on this vital area. Thus, the employment of the PANEL-ARDL approach will enable this study to reveal short run and long run relationship between food security and human development for Arab countries thereby providing policy implication geared towards improving on food security and future human development in Arab world.

3. Data & Methodology
3.1. Data and variables

The purpose of this research is to evaluate the influence of human development on food security in Arab nations. In order to achieve this, the cross-sectional regression test between the General Food Security Index (GFSI) as dependent variable and the Human Development Index (HDI) as the independent variable will be performed. We focus on a group of Arab countries with available data on both indices, specifically Egypt, Saudi Arabia, Tunisia, Algeria, Morocco, Jordan, and Sudan, covering the period from 2012 to 2022. This period was chosen because the GFSI began to be calculated starting in 2012, and the latest HDI data is from 2022. Other Arab countries were excluded due to insufficient or partially available data.

The General Food Security Index (GFSI) (Dependent Variable of the Study)

The General Food Security Index (GFSI) was designed and developed by Economist Impact with support from Corteva Agriscience (Economist Impact, 2024) . The methodology of the GFSI is developed and reviewed annually in consultation with a panel of experts to ensure it remains a reliable source of information for better understanding the global food security environment. The GFSI 2022 is the eleventh edition of the

index. Economist Impact updates the model yearly to capture annual changes in the structural factors affecting food security. (Economist Impact, 2024)

The GFSI measures the level of food security in 113 countries based on four pillars: food affordability, food availability, food quality and safety, Sustainability and Adaptation (Economist Impact, 2024). Initially, from 2012 to 2016, the GFSI was built based on the first three pillars. However, since 2017, the fourth pillar has been included in the index calculation (Economist Impact, 2024). This fourth pillar is critically important as it assesses the risks of natural resource shortages on food security and the countries' adaptability to these risks (Economist Impact, 2024).

The Human Development and Human Development Index (Independent Variable of the Study)

The United Nations Development Programme (UNDP) defines human development as "a process of expanding people's choices. In principle, these choices can be infinite and can change over time, but at all levels of development, the three essential elements are that people live long and healthy lives, acquire knowledge, and have access to the resources needed for a decent standard of living. Without these fundamental choices, many other opportunities remain inaccessible" (UNDP, 1990, p. 10)

The Human Development Index (HDI) is a concise measure of human development. It assesses the average achievements in a country across three fundamental dimensions of human development (UNDP, 2007, p. 355):

- Long and healthy life, measured by life expectancy at birth.
- Acquisition of knowledge, measured by the literacy rate and the combined enrolment ratios for primary, secondary, and tertiary education.
- Decent standard of living, measured by GDP per capita adjusted for purchasing power parity in US dollars.

The Human Development Index is calculated as:

HDI=1/3 (Life Expectancy Index)+1/3 (Education Index)+1/3 (GDP Index)

The following figure illustrates the changes in both the General Food Security Index (GFSI) and the Human Development Index (HDI) among various Arab countries for the year 2022.

	Egypt	Saudi Arabia	Tunisia	Algeria	Morocco	Jordan	Sudan
GFSI	56	69.9	60.9	58.9	63	64.6	42.8
HDI	0.728	0.875	0.732	0.745	0.698	0.72	0.516
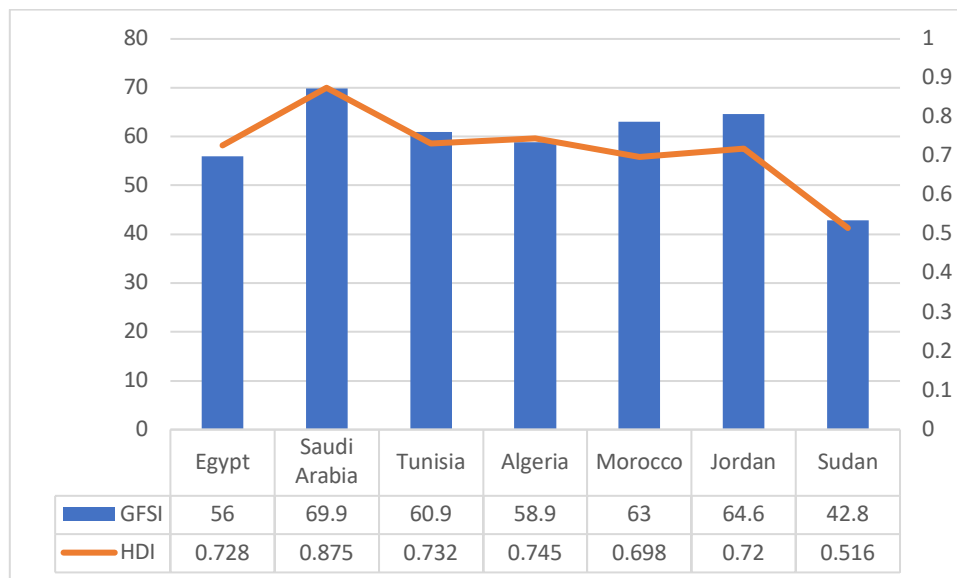
Fig. 1. General Food Security Index (GFSI) and Human Development Index (HDI)
among Selected Arab Countries in 2022
Source: Based on data from (impact.economist, 2024) and the Human Development Report (2023/2024).

Figure 1 shows that Saudi Arabia recorded the highest values for both the General Food Security Index (GFSI) and the Human Development Index (HDI). In contrast, Sudan recorded the lowest values for both indices. This suggests a possible positive relationship between the two indices for Arab countries.

3.2. Model Specification

To estimate the relationship between the general food security index as a dependent variable and the human development index as an independent variable, we use the Autoregressive Distributed Lag Model (ARDL) for panel data. This model differs from other cointegration methods as the bounds testing in this methodology can be applied if the time series are stationary at their levels I(0), at their first difference I(1), or a mixture of both. Additionally, it allows for estimating the relationship even when the time series are short (short study period).

The ARDL Panel model in this case is written as follows:

$$d(GFSI_{it}) = \sum_{k=1}^{p-1} \alpha_{1,ik} d(GFSI_{i,t-k}) + \sum_{k=0}^{q-1} \alpha_{2,ik} d(HDI_{i,t-k}) + \lambda_i (GFSI_{i,t-1} + \beta_i HDI_{i,t-1}) + \omega_i + \varepsilon_{it}$$

$d(GFSI_t)$ is the first difference of the dependent variable, the General Food Security Index, and is explained by long-term information $GFSI_{i,t-1} + \beta_i HDI_{i,t-1}$ and short-term information, which consists of the lagged terms of the dependent variable $\sum_{k=1}^{p-1} \alpha_{1,ik} d(GFSI_{i,t-k})$ and the lagged terms of the independent variable $\sum_{k=1}^{q-1} \alpha_{2,ik} d(HDI_{i,t-k}))$, where:

λ: Stands for the parameter of the error correction term, which should be negative and significant to indicate long-run relationship between the General Food Security Index (GFSI) and the Human Development Index (HDI). It reflects the percentage of short-term errors that can be corrected over a period to return to long-term equilibrium.

β The estimated coefficient of the explanatory variable in the long-term relationship .

$b = -\frac{\beta}{\lambda}$: Represents the long-term equation between the General Food Security Index as the dependent variable and the Human Development Index as the explanatory variable.

Before estimating the proposed model, it is necessary to test for the presence of a unit root in the series to verify their order of integration. The series should be either integrated of order one, or a mixture of series integrated of order zero and order one.

4. Results

4.1. Cross-Sectional Dependency Test

Given the similarity among Arab countries in terms of characteristics, there may be correlation in panel data. To verify this, we apply the CD-test to detect cross-sectional correlation. The CD-test helps in determining whether there is significant cross-sectional dependence among the panel data, which is crucial for ensuring the robustness of the model estimations. The results are presented in table1.

Table 1. Results of the Correlation Test

Variables	CD-test	Prob
GFSI	9.725293	0.0000
HDI	10.88736	0.0000

The results in the table indicate the rejection of the null hypothesis, which states that there is no cross-sectional correlation between the variables, at the 5% level of statistical significance.

4.2. Panel Unit Root and Cointegration Tests

To detect the levels of variable integration we use the panel unit root test to detect the levels of variable integration. Given the presence of cross-sectional correlation, we apply the CIPS (Cross-sectional Im-Pesaran-Shin (IPS)) test. The results are shown in the following table:

Table 2. Results of the Stationarity Test

Variable	At Levels		At First Differences		Integration Order
	CIPS Statistic	Probability	CIPS Statistic	Probability	
GFSI	-18.30524	<0.01			I(0)
HDI	-1.53718	>0.05	-1.88796	<0.05	I(1)

Based on the results of the unit root test, we observe that the variable GFSI is stationary at the level, while the variable HDI becomes stationary after applying first differences. Therefore, we can proceed with applying the ARDL model. Given that the GFSI is I(0) and the HDI is I(1), the ARDL model is appropriate for analysing the relationship between these variables. The ARDL model allows for the inclusion of variables with different integration orders, making it suitable for this study.

4.3. Cointegration Tests

To detect the presence of a long-term equilibrium relationship between the General Food Security Index (GFSI) and the Human Development Index (HDI), we apply the Pedroni cointegration test. The results are presented in the following table:

Table 3. Results of the Joint Integration Test

	Panel		groupe	
	Statistic	Prob	Statistic	Prob
V-Statistic	-0.911484	0.8190		
rho-Statistic	-1.081919	0.1396	0.271397	0.6070
PP-Statistic	-3.097991	0.0010	-4.323331	0.0000
ADF-Statistic	-2.006228	0.0224	-1.391954	0.0820

Based on the results of the cointegration test:
- **v-Statistic and rho-Statistic**: These statistics indicate acceptance of the null hypothesis, suggesting no cointegration relationship.
- **PP-Statistic and ADF-Statistic**: These statistics reject the null hypothesis, indicating the presence of a cointegration relationship.

From the cointegration test results, the v-Statistic and rho-Statistic suggest that there is no long-term equilibrium relationship (no cointegration) between the General Food Security Index (GFSI) and the Human Development Index (HDI). However, the PP-Statistic and ADF-Statistic reject the null hypothesis of no cointegration, indicating that there is a long-term equilibrium relationship between GFSI and HDI.

Table 4. Results of the Panel-ARDL Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LHDI	2.421004	0.325926	7.428079	0.0000
Short Run Equation				
COINTEQ01	-1.011572	0.271178	-3.730285	0.0006
D(LGFSI(-1))	0.110478	0.183858	0.600886	0.5512
D(LHDI)	-1.270183	0.526692	-2.411626	0.0204
D(LHDI(-1))	-5.524081	2.921233	-1.891010	0.0657
C	5.035563	1.371094	3.672662	0.0007
Statistics				
Root MSE	0.035482	Mean dependent var		0.023237
S.D. dependent var	0.078559	S.E. of regression		0.048625
Akaike info criterion	-2.379474	Sum squared resid		0.096941
Schwarz criterion	-1.283669	Log likelihood		127.6098
Hannan-Quinn criter.	-1.941162			

From the estimation results, we observe the following:
- The selected ARDL model is (2, 2).
- The error correction term has a negative sign and is statistically significant at the 5% level.

From the estimation results, the error correction term (ECT) is found to have a negative sign (-1.01) and is statistically significant at the 5% level. This confirms the presence of a long-term equilibrium relationship between the General Food Security Index (GFSI) as the dependent variable and the Human Development Index (HDI) as the independent variable for Arab countries.

The speed of adjustment in the short term is 1.011572, indicating that 101.157% of the deviation in the GFSI in the short term is corrected in order to return to long-term equilibrium. This implies that the adjustment back to equilibrium takes approximately 0.9334 years (1/1.011572), which is roughly one year, a relatively short period. Regarding the short-term coefficients of the HDI, both D(LNHDI) and D(LNHDI (−1)) are negative and statistically significant at the 5% and 10% levels, respectively.

For the long-term coefficient estimation, the log of the Human Development Index (LNHDI) is positive (0.91) and statistically significant. This indicates that an improvement in the HDI leads to an improvement in the GFSI in the long term. Arab countries with higher HDI values also tend to have higher GFSI values, as seen in Saudi Arabia, whereas countries with lower HDI values tend to have lower GFSI values.

From these estimation results, it can be inferred that improvements in the HDI are the result of increased education levels, improved health conditions, and better income levels, all of which positively impact food security in the long term. This is elaborated as follows:
- **Improved Education Levels**: Enhancing knowledge acquisition leads to better agricultural practices through research and development, aiming to increase food production, ensure food quality and safety, and adapt to available natural resources.
- **Increased Life Expectancy at Birth**: Ensuring a long and healthy life enhances productivity levels through a qualified workforce, which ensures the availability, quality, and safety of food.
- **Higher Income Levels**: Ensuring a decent standard of living enhances the purchasing power of the population and their ability to afford food. In this context, the ESCWA (2019) report indicates that high and middle-income Arab countries experience high levels of overnutrition, whereas low-income countries continue to face high rates of undernutrition and food insecurity.

Overall, the results confirm that improvements in the Human Development Index have a significant positive impact on the General Food Security Index, particularly through advancements in education, health, and income levels.

The causal relationship from the Human Development Index (HDI) to the General Food Security Index (GFSI) can be summarized as follows.

5. Discussion

The findings of this study provide significant insights into the relationship between human development and food security in Arab countries. The Panel-ARDL analysis reveals a strong, positive long-term relationship between the Human Development Index (HDI) and the General Food Security Index (GFSI), confirming our initial hypothesis.

The error correction term's high speed of adjustment (101.157%) indicates that deviations from long-term equilibrium are corrected rapidly, typically within one year. This suggests that improvements in human development factors can lead to relatively quick enhancements in food security outcomes in Arab nations.

The positive long-term coefficient of HDI (2.421004) underscores the crucial role of human development in bolstering food security. This aligns with the observed pattern where countries like Saudi Arabia, with higher HDI values, also demonstrate better food security outcomes. Conversely, countries with lower HDI scores, such as Sudan, face greater food security challenges.

The three components of HDI - education, health, and income - each contribute to food security in distinct ways:
1. Education: Enhanced knowledge acquisition likely leads to improved agricultural practices, research, and development. This can result in increased food production, better food quality and safety, and more efficient use of natural resources.
2. Health: Increased life expectancy correlates with a healthier, more productive workforce. This can ensure better food availability, quality, and safety through enhanced labor productivity in the agricultural sector.

3. Income: Higher income levels improve the population's purchasing power and ability to afford nutritious food. This finding is consistent with the ESCWA (2019) report, which notes that high and middle-income Arab countries face issues of overnutrition, while low-income countries struggle with undernutrition and food insecurity.

Interestingly, the short-term coefficients for HDI are negative and statistically significant. This could suggest that immediate investments in human development might temporarily divert resources from direct food security measures. However, these short-term trade-offs are outweighed by the substantial long-term benefits.
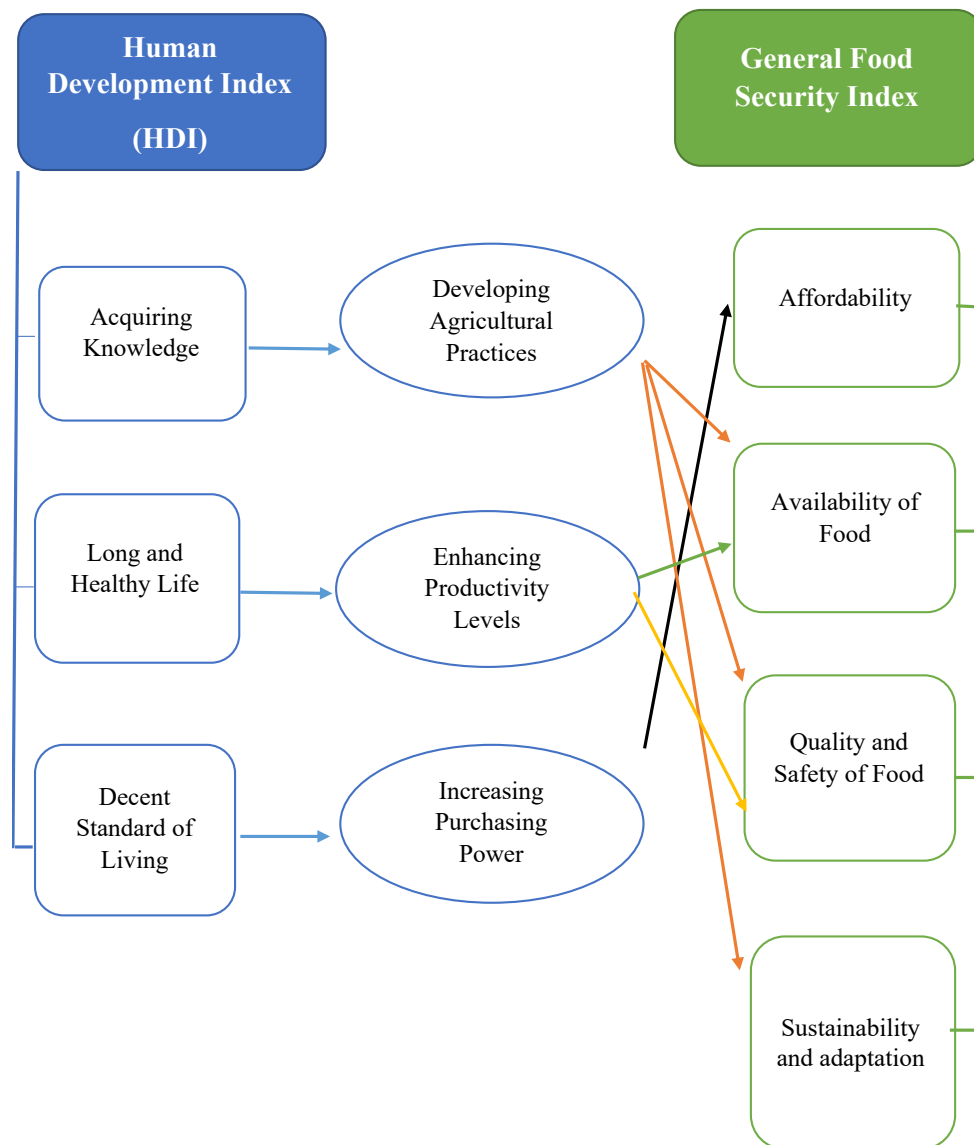

Fig. 2. Diagram Illustrating the Causal Relationship from HDI to GFSI

The study's results emphasize the importance of a holistic approach to food security that encompasses human development strategies. Policymakers in Arab countries should consider that investments in education, healthcare, and economic growth are not just ends in themselves, but also means to enhance food security.

However, it's important to note the study's limitations. The analysis covers only seven Arab countries due to data availability constraints. Future research could expand this to include more countries as data becomes available. Additionally, while the GFSI provides a comprehensive measure of food security, it may not capture all nuances of food security challenges specific to the Arab region.

6. Conclusions and Policy Implication

This study provides compelling evidence of a strong, positive relationship between human development and food security in Arab countries. The Panel-ARDL analysis of seven Arab nations from 2012 to 2022 reveals those improvements in the Human Development Index (HDI) lead to significant enhancements in the General Food Security Index (GFSI) over the long term.

Our research was guided by two key hypotheses:

- Higher levels of human development enhance the quality of human well-being which also enhances food security levels in Arab countries.
- Arab countries food security for the long-term is positively and statistically significantly related to the HDI for the total Food Security Index.

The results of our study strongly support both hypotheses:

The positive long-term coefficient of HDI (2.421004) in our model confirms that improvements in human development indeed lead to better food security levels in Arab countries. This is further evidenced by the observation that countries with higher HDI scores, such as Saudi Arabia, also demonstrate better food security outcomes.

The error correction term's negative sign (-1.011572) and statistical significance at the 5% level confirm the existence of a positive long-term relationship between HDI and GFSI. This relationship is robust, with deviations from long-term equilibrium being corrected rapidly, typically within one year.

These findings validate our initial assumptions and underscore the critical importance of human development in enhancing food security in the Arab world.

Key conclusions include:

- Long-term Impact: There is a robust, positive long-term relationship between HDI and GFSI, confirming that investments in human development yield substantial dividends for food security.
- Rapid Adjustment: The high speed of adjustment in the error correction term indicates that deviations from long-term equilibrium are corrected quickly, typically within one year.
- Multifaceted Benefits: All three components of HDI - education, health, and income - contribute positively to food security, underscoring the importance of a holistic approach to human development.
- Country Disparities: Nations with higher HDI scores, such as Saudi Arabia, demonstrate better food security outcomes, while those with lower scores, like Sudan, face greater challenges.

These findings have several important policy implications for Arab countries:

- Integrated Policy Approach: Policymakers should adopt an integrated approach that simultaneously addresses human development and food security. Investments in education, healthcare, and economic growth should be viewed not only as ends in themselves but also as means to enhance food security.
- Education Focus: Prioritize investments in education, particularly in agricultural sciences, nutrition, and related fields. This can drive innovation in food production, improve dietary habits, and enhance overall food security.
- Health System Strengthening: Enhance health care structures to preferably extend the longevity of life and generally the overall health of the population. Through the promotion of healthy lifestyle among the people, productivity is enhanced and translates to higher yields in agriculture and food security.
- Economic Policies for Inclusive Growth: Setting up of strong economic policies that will enhance the qualitative standards of the population and at the same time narrowing down income disparity. Increased, fairer GDP per capita may increase the population's ability to afford food and receive it in adequate quantity and quality.
- Research and Development: Designate funds to agricultural research and innovation to produce crops that are tolerant to drought, irrigation methods that are resource-friendly in Arab region climate, and sustainable farming practices.
- Regional Cooperation: Establish regional cooperation among the Arab countries and identify the available commonalities followed by sharing the betterment practices, technologies, and facilities for human development and food security programs.
- Climate Change Adaptation: Strengthen measures that combat effects of climate change on food production and availability of food to the people, this is because environment affects development.
- Monitoring and Evaluation: It is necessary to create a strong reporting to keep track of both the HDI and GFSI of the country and report and introduce modifications and improvements when necessary.

- Gender-Sensitive Policies: Support policies that ensure that women get equal opportunities in education, healthcare and in the labor market bearing in mind that women play a significant role in human development and the provision of foods.
- Youth Empowerment: It is necessary to establish programs that will help youth to gain education and skills that will allow them to be engaged productive members of the society particularly in the field of agriculture and food security.

Despite the significance of the findings presented in this study, and the fact that they support both of the stated hypotheses, future research is necessary to gain a better insight into the specifics of this relationship across a greater number of Arab countries and over a longer span of time. Moreover, further research looking at the effects of particular policy measures on the HDI and on the GFSI could give more solid advice to policy makers. Thus, the results of the hypothesis obtained, based on the recognition and rational use of the connection between human development and food security, can create a positive cycle of Arab countries, which will lead to the overall improvement of both indicators. With such an integration strategy, the possibility of a simultaneous improvement of the food security situation and the general well-being and sustainable development of the region is a real one.

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