potravinárstvo®
Slovak Journal of Food Sciences

Received: 21.1.2022
Revised: 14.4.2022
Accepted: 19.4.2022
Published: 2.5.2022

Potravinarstvo Slovak Journal of Food Sciences
vol. 16, 2022, p. 206-218
https://doi.org/10.5219/1734
ISSN: 1337-0960 online
www.potravinarstvo.com

Exploring linkages between food security and economic growth: a Systematic mapping literature review

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ABSTRACT

Food security can be achieved by being carried out simultaneously alongside the economy's growth at the macro level. While many countries worldwide carry out economic growth policies to improve food security, the causal relationship between economic growth and food security is still debated. This study uses a systematic mapping review to analyze the relationship between food security (FS) and economic growth (EG) using a systematic mapping review. There are 26 previous research results from 780 articles obtained. Database from google scholar, ScienceDirect, Elsevier, and JSTOR with a limited date range on published information from 2004-2021. The result shows an empirical gap in the relationship between FS dan EG with 76.92% supporting the correlative relationship between FS and EG, while the other 19.23% claimed that there is no correlation, and 3.85% (one study) explored the relationship between EG and FI (Food Insecurity). Furthermore, 11 studies explained that EG has a positive effect on FS; one study stated that it has a negative impact, and another one hurts Food insecurity. Meanwhile, seven studies revealed that FS has a positive effect on economic growth, one study on the contrary, and two studies explained it has no effect. Availability and GDP per Capita variables were mainly used in describing the relationship between FS and EG.

Keywords: Food Security, Economic Growth, Systematic Literature Review, Empirical Gap

INTRODUCTION

Food security has become a significant focus in today's world's sustainable development. One of the main points in the sustainable development goals (SDGs) discussed the purpose of the action was to end hunger, achieve food security, improve nutrition and promote sustainable agriculture. Food security was indeed a significant focus for countries globally because it could lead to a threat of hunger. FAO **[1]** in 2020 estimates that between 720 and 811 million people faced hungry. Furthermore, nearly 2.37 billion people did not have access to adequate food in 2020. Based on a report by **[2]**, it is stated that around 155 million people in the world experience severe food insecurity. Based on this, it was concluded that food was a basic need that every country must fulfill to achieve prosperity. Several countries such as China, Germany, Australia, and New Zealand, became developed countries due to their agricultural sector progress. The fact proved that food has a strategic role in a country due to its ability to guarantee economic development. According to **[3]**, there was a close correlation between food security and the economic growth of a country. Malthus explained that the lack of food availability has caused the prices to increase due to the imbalance of the increasing population and food availability worldwide. Rapid population growth encouraged a country to maintain its economic growth, particularly in income per capita, so the food prices remained affordable. In addition, to keep food security, the governments must strengthen their sustainability in food production and prevent excessive food consumption. The Food and Agriculture Organization **[4]** formulates the concept of food security as a condition in which everyone at all times, both physically and economically, has access to sufficient, safe, and nutritious food to meet their daily nutritional needs according to their preferences. Furthermore, according to FAO, food security can be seen through four dimensions: availability, access, utilization, and stability. The availability viewpoint viewed food security in terms of supply: the production level, the amount of inventory, and the trade value of food products. The access viewpoint assumed that the government must maintain food supply at the domestic or international level and maintain the food price's affordability for

society. The utilization viewpoint considers the diversity of food that can be utilized biologically for the human body to provide adequate nutrition to determine the individual's nutritional status. The stability viewpoint referred to the continuity of food access regularly and the possibility of the risk which may occur due to poor weather, political instability, and economic factors such as unemployment and increased food prices.

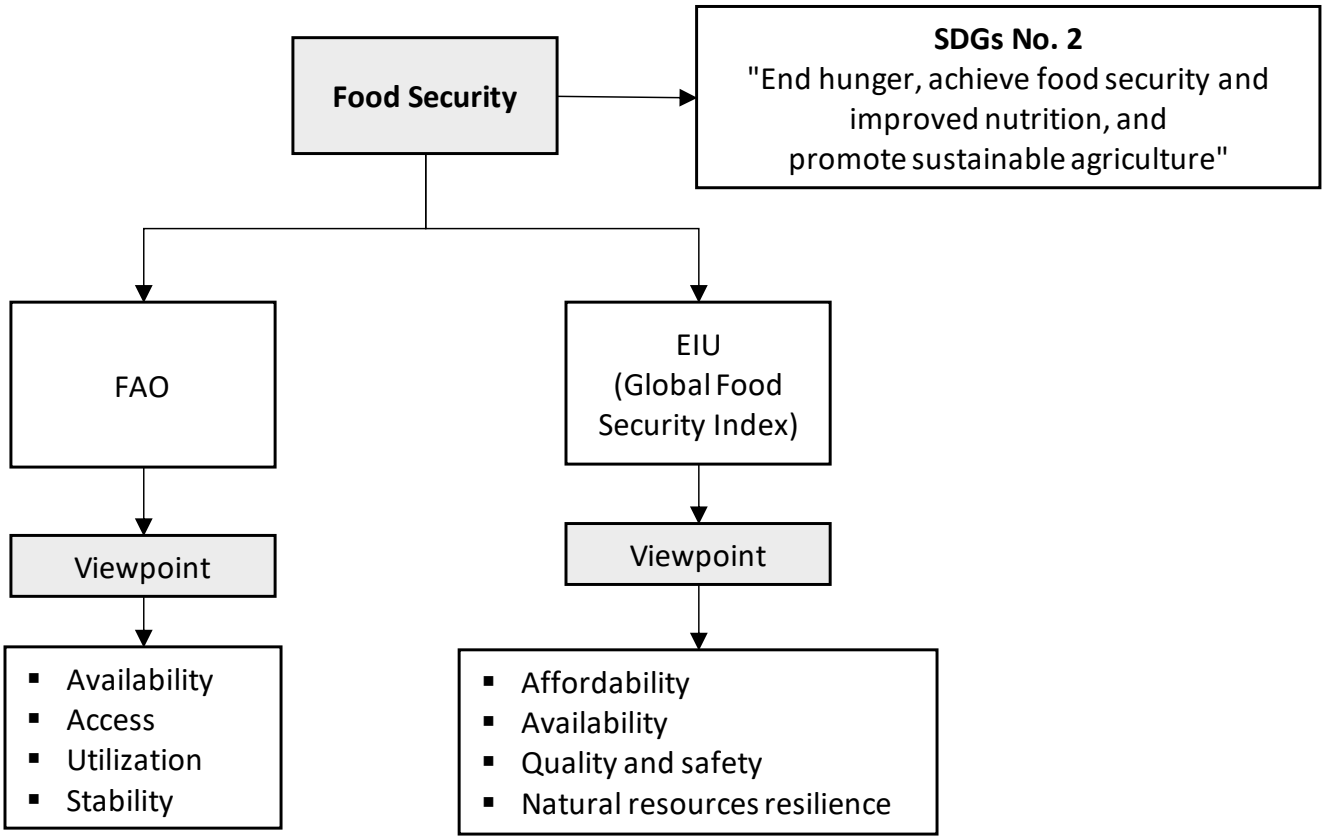

Figure 1 Food Security Concept from Food and Agriculture Organization (FAO) and Economist Intelligence Unit (EIU).

Furthermore, the Economist Intelligence Unit **[5]** described food security as a complex and diverse problem influenced by culture, environment, and geographical area. To identify food security, EIU has formulated a Global Food Security Index, which consists of four aspects, which were: affordability, availability, quality, safety, and natural resources resilience. The affordability viewpoint considered that food security could be achieved with the stability of food prices. No society lived below the poverty line, high GDP per capita, and the availability of a food security net and protection for farmers. The availability viewpoint considered that food security could be achieved with the sufficiency of food supply and agricultural product development. The quality and safety viewpoint described that food security could be achieved with various foods that fulfill the population's nutritional standards. The Natural Resources Resilience viewpoint assumed that food security depended on a country's geographic and demographic factors such as climate and weather, soil and water condition, and population growth and urbanization. In the concept of food security described by FAO and EIU, it was shown that food security required sustainable development, particularly in terms of availability, food prices, and people's incomes which were conditions for achieving stable economic growth. Previous research has attempted to provide empirical facts on the correlation between food security and economic growth. Most of the research was conducted in developing countries **[6]**, **[7]**, **[8]**, **[9]**, **[10]**, **[11]**, **[12]**, **[13]**, **[14]**, **[15]**, **[16]**, **[17]**. That was because the economic growth of the developing countries was highly dependent on food production. In addition, Gross Domestic Product (GDP), or the market value of labour and the products produced by a country in a certain period, were used to measure economic growth. Although many previous studies have attempted to relate food security with economic growth, the causal relationship between the two has not yet been resolved. In other words, whether food security stimulated economic growth, economic growth led to food security, or the economic growth and food security had a two-way causal correlation, the cause has not been found.

This paper will assess previous studies, how the food security linkage with economic growth has been calculated, and recognize shortcomings in future research. A systematic mapping review will investigate the following research question: "Is there a correlation between food security and economic growth?". Therefore, our research

aims to provide an empirical literature review of the relationship between food security based on the results of previous studies. It can be known early identification of the effect of food security on economic growth or vice versa. Therefore, we hope further to identify the connection between food security and economic development to build and enrich the existing literature on food security at the macro level.

Scientific Hypothesis

Based on the theory of Malthus **[3]**, which explains the occurrence of a population trap because the food availability cannot keep up with population growth. Malthus provides an alternative to overcome low food security by increasing per capita income or economic development. However, on the other hand, the population trap can be avoided by strengthening the food supply when population growth is still low so that excess food production can increase per capita income. Based on the two possible relationships between food security and economic development, this study will analyze two alternative hypotheses that contradict using a literature review with the following hypotheses:

H1: Food security affects economic growth.

Otherwise

H2: Economic growth affects food security.

MATERIAL AND METHODOLOGY

This research uses a systematic mapping review to explain the linkage between Food Security (FS) and Economic Growth (EG). Systematic mapping utilizes a straightforward convention to archive each examination interaction step. A systematic mapping review is an experimental investigation that outlines an area to recognize which issues have been thoroughly studied and need extra examination **[18]**. Our review cycle drew vigorously on PRISMA rules for systematic reviews **[19]** and revealed principles for deliberate proof amalgamations in ecological investigation **[20]**, **[21]** to generate the following synthesis ROSES guidelines. The process of systematic mapping review is clarified further in Figure 2. For the information sources and search strategy, the Universitas Indonesia Host was used to access academic and empirical journals to find previous research that discusses the relationship between food security and economic growth. In addition, databases from google scholar, science direct, ScienceDirect, and JSTOR were also included as part of the search process. The date range was limited to published information from 2004-to 2021, and only peer-reviewed and full-text documents were included in the search. The literature search was carried out in August 2021. The following combinations of search terms and keywords were used: the relationship of food security with economic growth, food security and economic growth studies, and empirical evidence of the correlation of food security with economic growth. We found 26 academic and practical journals that discuss the influence or relationship of food security with economic growth from the search results.

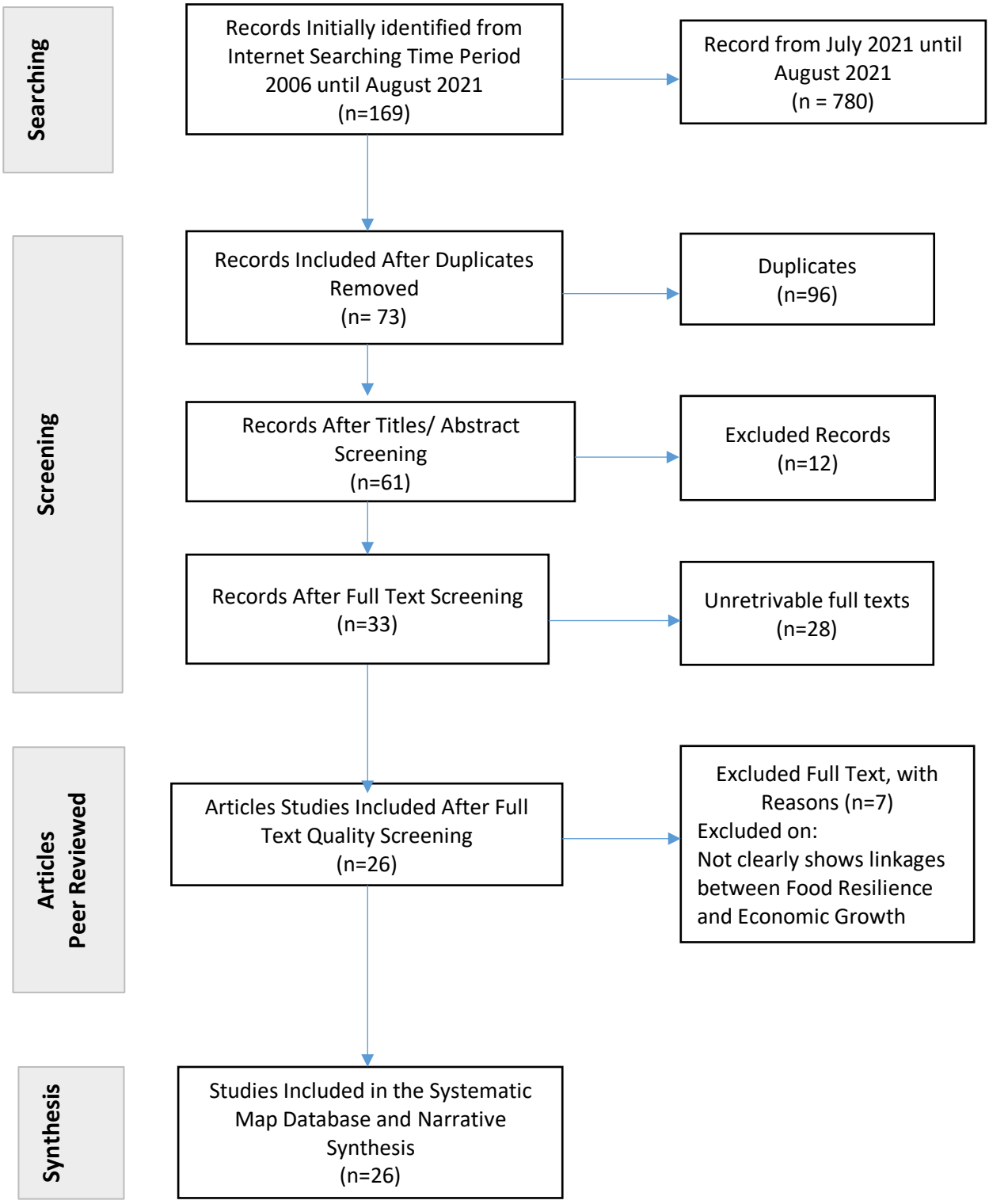

Figure 2 ROSES Flow Diagram for Systematic mapping review process (adopt from **[22]**).

Table 1 Tabulated systematic mapping literature review from selected articles.

No	Reference	Research Scope	Time Horizon	Research Method
1	**Abogahsem, P., et al. (2018) [6]**	Country Level	2014-2015	Qualitative
2	**Aikaterini, K., et al. (2014) [7]**	Selected Countries	2001-2011	Quantitative
3	**Alexander, B.M., et al. (2019) [23]**	Country Level	2018	Qualitative
4	**Andrew, A., et al. (2021) [24]**	Global	2018-2019	Quantitative
5	**Arif, W.W., et al. (2017) [9]**	Country Level	2007-2014	Quantitative
6	**Calestous, J. (2007) [10]**	Selected Countries	Unidentified	Qualitative
7	**Clemens, B., and Olivier, E. (2014) [11]**	Country Level	2009-2013	Quantitative
8	**Desta, A. (2017) [12]**	Country Level	2006-2016	Qualitative
9	**Dikshit, P. and Munisamy, G. (2021) [13]**	Selected Countries	2008-2015	Quantitative
10	**Krystina, S. (2018) [25]**	Selected Countries	2012-2015	Quantitative
11	**Melissa, C.C. (2013) [26]**	Country Level	2008-2012	Qualitative
12	**Michael, C. (2012) [27]**	Global	2005	Mix Method
13	**Singh,Ajay.K (2018) [8]**	Country Level	1961-1990	Quantitative
14	**Olabode, P.O., et al. (2015) [14]**	Region	1990-2014	Quantitative
15	**Paul, T. (2020) [28]**	Country Level	2019	Qualitative
16	**Putra, Y., et al. (2021) [29]**	Region	2000-2018	Quantitative
17	**Shenggen, F., et al. (2021) [30]**	Region	2019-2020	Qualitative
18	**Sujarwo, and Nuhfil, H. (2016) [31]**	Country Level	2010-2014	Qualitative
19	**Supardi, R. and Aries, M. (2017) [32]**	Country Level	2009-2013	Qualitative
20	**Timmer, P.C. (2010) [33]**	Region	1961-2007	Qualitative
21	**Timmer, P.C. and Thomas, R. (2014) [17]**	Region	1990-2012	Qualitative
22	**Torero, M., (2014) [34]**	Global	1996-2007	Qualitative
23	**Susilastuti, D (2018) [35]**	Country Level	2007-2016	Quantitative
24	**Timmer, P (2004) [36]**	Region	2004	Qualititative
25	**Liefert,W (2014) [37]**	Country Level	1990-2000	Qualitative
26	**Manap, and Ismail (2019) [38]**	Selected Countries	1970-2016	Quantitative

Note: Constructed by Author.

Table 2 Empirical results from systematic literature review.

No	Food Security (FS) Dimension	Economic Growth (EG) Indicator	Findings	Empirical Result
1	**Affordability, Utilization**	GDP Growth	FS has an impact on EG	+
2	**Availability**	GDP Growth	EG has no impact on FS	×
3	**Availability**	GDP Growth	EG has an impact on FS	+
4	**Availability, Affordability, Quality and Safety, Natural Resources Resilience**	GDP Per Capita	EG has an impact on FS	+
5	**Availability, Natural Resources Resilience**	GDP Growth, GDP Per Capita, Unemployment, Inflation	FS has an impact on EG	+
6	**Availability**	GDP Growth	FS has an impact on EG	+
7	**Affordability, Availability, Quality and Safety, Natural Resources Resilience**	GDP Growth, GDP Per Capita	EG has an impact on FS	+
8	**Availability**	GDP Per Capita, Inflation	EG has no impact on FS	×
9	**Availability, Affordability, Natural Resources Resilience**	GDP Per Capita	EG has no impact on FS	×
10	**Affordability, Availability, Quality and Safety, Natural Resources Resilience**	GDP Per Capita	EG has an impact on FS	+
11	**Availability**	GDP Per Capita	FS has an impact on EG	+

Table 2 Cont.

No	Food Security (FS) Dimension	Economic Growth (EG) Indicator	Findings	Empirical Result
12	**Quality and Safety, Utilization**	GDP Growth	EG has an impact on FS	-
13	**Affordability, Availability, Quality and Safety, Natural Resources Resilience**	GDP Per Capita, Inflation	EG has an impact on FS	+
14	**Availability**	GDP Growth, GDP Per Capita	EG has an impact on FS	+
15	**Availability, Affordability, Quality and Safety**	GDP Growth, GDP Per Capita	EG has an impact on FS	+
16	**Availability, Affordability**	GDP Per Capita	EG has an impact on FS	+
17	**Availability**	GDP Growth	EG has an impact on FS	+
18	**Availability, Affordability**	GDP Per Capita, Unemployment	FS has an impact on EG	+
19	**Availability**	GDP Per Capita	EG has an impact on FS	+
20	**Availability**	GDP Growth, GDP Per Capita	FS has an impact on EG	+
21	**Availability, Quality and Safety**	GDP Growth, GDP Per Capita	EG has an impact on FS	+
22	**Quality and Safety**	GDP Growth	FS has no impact on EG	×
23	**Availability**	GRP (Gross Regional Production)	FS has no impact on EG	×
24	**Availability, Access, Utilization**	GDP Per capita (Growth)	FS has an impact on EG	-
25	**Availability, Access, Quality, and Safety (Nutrition)**	GDP Growth	EG has an impact on FI	-
26	**Quality and Safety (Dietary Energy Supply)**	GDP Growth	FS has an impact on EG	+

Note: FS (Food Security), EG (Economic Growth), FI (Food Insecure); +means positive impact between variables; - means negative impact between variables; x means no correlation between variables.

RESULTS AND DISCUSSION

About 169 previous studies searched for the connection between FS and EG. However, only 33 previous studies met the criteria that provide empirical evidence of the association between FS and EG. Furthermore, an in-depth analysis of 26 studies was conducted to find the linkage between FS and EG. Concepts and perspectives based on the dimensions of global FS and EG indicators were used to determine the relationship between variables. The literature found that previous researchers used the FS dimension from FAO or other sources such as the Global Food Security Index (GFSI). **[39]** divides FS's dimension into four pillars: availability, access, utilization, and stability. **[40]** also divides FS into four dimensions: affordability, availability, quality and safety, and natural resources and resilience. However, not all sizes of FS from FAO or GFSI were used by previous researchers to clarify the connection between FS and EG. For example, FAO's FS dimensions were not used, such as access and stability.

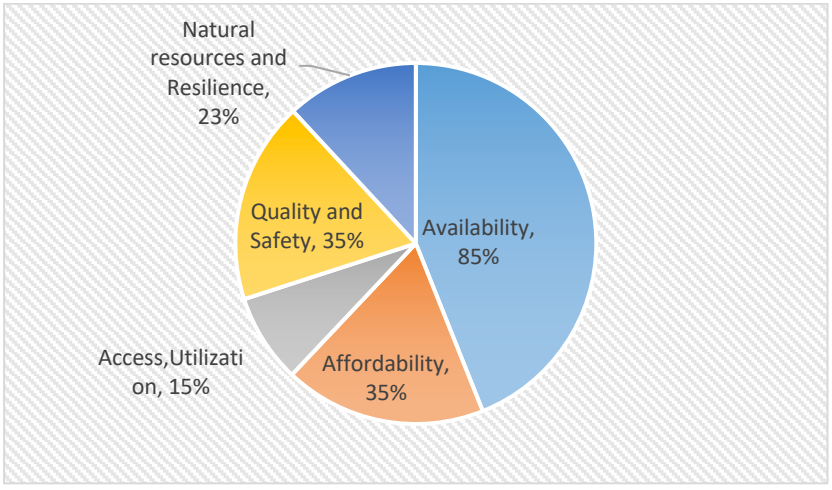

Figure 3 Percentage of Types of Food Security Dimensions Frequently Used.

Furthermore, out of the 26 previous studies (Figure 3), 22 studies (85%) used the availability dimension to determine the linkage between FS and EG. Nine studies explored FS (35%) through the affordability dimension, and two studies used the Access dimension (8%). Nine studies (35%) specifically focused on quality and safety by examining how malnutrition impacts FS and EG. Natural resources and resilience were reviewed by six studies (23%). Finally, two studies (8%) focused on food utilization at a national and global level **[6]**, **[27]**. The results show that availability is the most widely used dimension, which means that the economic approach is still the mainstream in measuring food security. The relationship between FS or FI and EG can be mapped based on their function (independent or dependent) for empirical results (Figure 4). Eleven studies (50%) were found to explain that EG has significantly and positively impacted FS **[8]**, **[23]**, **[24]**, **[11]**, **[25]**, **[27]**, **[14]**, **[28]**, **[29]**, **[30]**, **[32]**, **[17]**. However, One study states that EG hurts FS **[27]**. On the other hand, seven studies (27%) explained that FS has a significant positive impact on EG **[6]**, **[9]**, **[10]**, **[26]**, **[31]**, **[33]**, **[38]**, while four studies (15%) explained that EG has no impact on FS **[7]**, **[12]**, **[13]**, **[34]**. Another interesting finding is that food security has a significant but negative impact on economic growth in the long term. These results refer to the findings of **[36]** in cases in Asian countries. The final finding by **[37]** explains that EG reduces food insecurity.

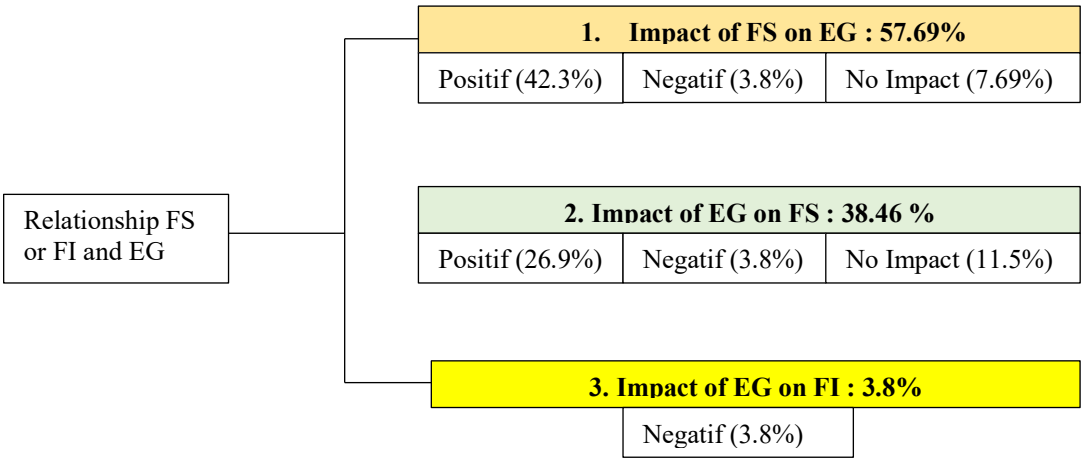

Figure 4 Comparison of Relationship Proportions between FS or FI and EG.

Results from 26 previous studies showed that most of them proved the effect of FS on EG empirically. On the other hand, an important fact (38.46%) of earlier studies explains that EG's effect on FS cannot be ignored and indicates an empirical gap.

Availability Viewpoint

Our review revealed that previous researchers used the availability dimension to show the relationship between FS and EG. Twenty-two previous studies (85%) indicated that FS affects EG regarding the availability dimension. In addition, most previous research explained the connection between food availability and EG through indicators such as GDP growth per capita. From the review, it is found that there were three empirical results:

First, 11 of 26 studies revealed that EG had a significant effect on FS **[28]**, **[23]**, **[24]**, **[11]**, **[25]**, **[14]**, **[28]**, **[29]**, **[30]**, **[31]**, **[17]**. It provided evidence that the increase in EG increases domestic food availability. Furthermore, EG, in terms of GDP per capita, shows economic equilibrium between low-income and high-income citizens **[23]**, **[14]**. It will impact the development of agribusiness infrastructure, which in turn will increase agricultural production. Research on broader-based EG in Yemen proved that massive infrastructure development is needed to return to FS levels [27] quickly. Besides that, the increase in EG also showed an increasing trade in food products, proving an increase in FS in terms of availability **[29]**, **[17]**. Increasing food availability by diversifying imports through trade in food products is a strength for higher-income countries such as Singapore to increase FS in the global sphere **[28]**. In addition, to support imports, Singapore applies a zero-tariff policy for foodstuffs. Furthermore, the government should focus more on maintaining EG to maintain national food availability to control FS **[30]**. It can be done by developing FS by (a) Increasing the availability of food through increasing productivity and production, diversifying the production of food crops, both fresh and value-added processed food, and (b) Increasing community food access to reduce food insecurity through empowering economic and institutional capacities **[31]**.

Second, 6 of 26 studies believe that FS influences EG **[6]**, **[9]**, **[10]**, **[26]**, **[33]**. It means that FS can be achieved

by increasing the quantity and quality of consumption and increasing food availability, economic access, and stability **[9]**. Furthermore, improvement and innovation of agricultural production can help to increase GDP. It is present in a study on agricultural improvement and economic development in Sub-Saharan Africa, which grew 6% per year during 2002 to 2007. It is equivalent to doubling the GDP in sub-Saharan Africa **[10]**. Besides that, increasing food availability is a substantial effort to improve FS through agricultural technology development. It increases domestic food availability to reduce dependence on imports **[26]**. In theory, reducing dependence on imports will significantly affect GDP because it will increase net exports. The total demand for food products such as rice is also essential to ensure GDP growth because rice is still the largest source of calories for most consumers worldwide. The literature review results show that FS in Asia has generally centred around rice creation, advertising, and utilization. However, the region's rapid EG and the structural transformation redefine Asia's needs. The importance of agriculture to the Asian economy is 3.7 times greater than that of the world. This ratio increased to 5.2 times in 2007 **[33]**. The quick change of Asian economies demonstrates that farming remains vital. It is critical because the Asian economy is still inferior. After all, even with rapid economic growth, many small farmers in Asia cannot move into modern and managerial professions in metropolises in just a few decades. In addition, several studies have stated in **[41]** that the vulnerability of climate change has impacted decreasing the income of farmers, most of whom are small and marginal farmers.

Third, 3 of 26 studies assessed no relationship between food availability and EG **[7]**, **[12]**, **[13]**. The empirical results show that the faster EG model has helped developing countries improve their trade balance but does not incentivize overcoming domestic FS by increasing domestic consumption **[7]**. Further empirical evidence of the relationship between FS and EG in Ethiopia proved that food insecurity is caused by inflationary pressures, resulting from the excess money supply, population growth, and budget deficits, not EG **[12]**. It showed that other factors affect FS, with the conditions of each country being different. This is supported by the Food Insecurity Experience Scale (FIES) results for 2015–2017, showing that GDP and capital significantly reduce food insecurity, while most other coefficients are not statistically significant **[13]**. The relapse examination consequences of the percent expansion in GDP per capita (or financial development), food frailty diminished by 0.77%. In the interim, the rate expansion in the portion of arable land declined food uncertainty by 0.27% **[13]**. The impact of capital development on reducing food instability is slightly smaller (0.11%), but it varies with per capita GDP and arable land.

Affordability Viewpoint

The Global Food Security Index (GFSI) defines affordability as a dimension that describes buyers' capacity to purchase food, weakness to value vacillations, and the existence of programs/policies to support consumers when shocks occur. Nine studies (41%) discuss the relationship between the affordability dimension of FS and EG. Most previous studies attempted to explain this relationship through a quantitative approach (6 of 9 studies). Most studies used indicators of GDP growth and GDP per Capita to see the connection between EG and FS. Moreover, few studies used other indicators such as inflation and unemployment rate. The empirical results classify into three:

First, 6 of 9 studies explained that EG has a significant effect on the affordability dimension of FS **[8]**, **[24]**, **[11]**, **[25]**, **[28]**, **[29]**. The result showed that increasing EG and GDP per capita can increase purchasing power, and government support to ensure affordable food prices can increase FS. Further findings are that inflation and population growth rates are the most responsible for food insecurity in most developing countries such as India **[8]**. It supported a causal mechanism by which increased income increases FS without extraordinary local factors. However, based on a review study, the strength of this effect varies depending on the country's condition, either negatively or positively **[24]**, **[11]**. The consequences of an itemized investigation of FS in various areas and nations affirm that the vast regional separation is because of contrasts in financial turn of events and GDP per capita. It tracked down that the geological differences in GDP per capita in 2012-2015 are under regional FS. Compared to countries with the highest GDP per capita, the lowest domestic-income countries are food insecure most **[25]**. For example, Singapore has provided some lessons that can use economic growth and systemic food reserves to find durable solutions to ensure the security of financial services in response to temporary supply shortages. Improving citizens' economic conditions as measured by per capita GDP is essential to ensure economic access to food **[28]**, **[29]**. It is also supported by intraregional trade and trade openness to support EG. It has a positive and significant effect on increasing FS through increased food production.

Second, 2 of 9 studies assess FS from the affordability dimension that affects EG **[6]**, **[32]**. The empirical results show that the economic cost of micronutrient deficiency has reduced the GDP of most developing countries by 0.72%. Due to macronutrient and micronutrient losses, global losses in economic productivity account for more than 2-3% of GDP. Without a state-claimed FS system, there will be a supported unfavourable impact on human resources, adversely impacting government spending. In addition, it will prompt stale financial development over the long haul. This way, the proper FS methodology is fundamental for all nations to ensure affordable food prices for citizens. In addition, the affordability dimension in FS aims to reduce inequality so that EG can be evenly distributed to the community. It can be supported by increasing community food access to reduce food insecurity by empowering economic capacity, encouraging farmer cooperatives, and expanding market information availability **[31]**.

Third, one study does not support the correlation between the affordability of FS and EG **[13]**. This study believes that the FIES measures from 2015 to 2017 show that per capita GDP and FS are not statistically significant. This relationship is the weakest in developing countries, and it is generally estimated that hunger in low-wage countries has been reduced by 0.29%. For low-wage countries that use agribusiness as their primary source of GDP, genetic modification and education seem to provide accessible food for the entire population. So at this point, land assets, capital, and urbanization are the most useful for realizing FS. The FS network access commitment provides an additional way to regularly use economic development to achieve food security.

Quality and Safety Viewpoint

Quality and safety are indicators used in the Global Food Security Index (GFSI), which measures changes in the average diet, food security, and nutritional quality. 8 of 22 studies analyzed the relationship between quality and safety aspects of FS with EG. Most studies tried to see the correlation or influence with economic indicators such as GDP growth, GDP per capita, and inflation. There are two groups based on empirical results from the reviewed literature as follows:

First, 6 of 8 studies support EG's impact on quality and safety dimensions **[8]**, **[24]**, **[11]**, **[25]**, **[28]**, **[17]**. The study identified that EG could push FS and nutrition **[11]**, **[25]**. In addition, broad-based EG will benefit the poor because it will positively impact how nutrition programs are implemented, such as integrated childcare programs and awareness campaigns related to family planning, women's education, and consumption. In addition, previous studies have also identified that countries with good EG, such as Singapore, can improve quality and safety in FS. It works well when EG aligns with increasing GDP per Capita **[28]**, **[8]**. It means increasing people's purchasing power to buy nutritious food to achieve FS. In addition, the government's role in increasing the subsidy budget for the poor to get nutritious food can maintain sustainable FS in developing countries **[8]**, **[17]**.

Second, 2 of 8 studies do not support the correlation between EG and FS or vice versa **[27]**, **[34]**. **[34]** explained that EG does not contribute to FS. Furthermore, Torero argued that economic development is feasible whenever created nations attempt to accomplish FS as a reason for their residents. His observation is still up in the air that expanding 10% in financial development just diminished the persistent lack of healthy sustenance by 6%. Therefore, it determined no direct relationship between EG and FS; Torero stated that economic development without help from others would not take care of the ongoing shortage of healthy food. In other words, economic growth is not strong enough to create food security without equitable development. However, it should be regarded as one of the fundamental factors of any FS strategy. **[27]** supported this view, and he believes that EG cannot be trusted enough to feed the world. He also persuades EG critics to pay more attention to food-related issues in development evaluation. The result comes from empirical testing of the Food Human Security Index (FHSI), which shows no relationship between FS and EG. FHSI enhances conventional thinking as it relates not exclusively to FS yet additionally to development and thriving. Likewise, it will be helpful for future examination to understand better why inequality impacts FHSI indicators, especially among high-income countries.

Natural Resources Resilience Viewpoint

Global Food Security Index (GFSI) defines Natural Resources Resilience as a dimension to measure a country's vulnerability to climate change, natural resource risks, and the efforts the country to adapt to the risks. In addition, 6 of 22 previous studies explained the relationship between EG and aspects of Natural Resources and Resilience. Three empirical results can be grouped based on the review literature as follows:

First, 4 of 6 studies support that EG significantly impacts the natural resources resilience aspect on FS **[8]**, **[24]**, **[11]**, **[25]**. The Global Food Security Index (GFSI) study proves that EG impacts climate factors (i.e., average temperature, a statistically significant negative, and rainfall). Furthermore, empirical results based on the OLS

model show that GFSI can reduce 1.70% with an average temperature increase of 1% **[8]**. In addition, the rise in income in EG also has a critical effect on farmers in improving land management to improve FS. The result discovered blended proof that cereal creation per capita, grain yield per hectare, total administration measurements, coordination execution, and paid business levels are public FS indicators. In addition, the outcome of a deep analysis of FS confirms that differences in economic development cause enormous territorial differentiation and, what is more, along these lines in, GDP and pay per capita. It tracked down the geological contrasts in GDP per capita in 2012-2015 under regional FS. Compared to countries with the highest GDP per capita, nations with minimal homegrown salaries are miniature food insecure **[25]**.

Second, 1 out of 6 studies explains that FS from the aspect of Natural Resource Security impacts EG **[9]**. This study argues that land area, commodity production, CPI (Customer Price Index) of a collection of several commodities, and FIMI (Multidimensional Food Insecurity Index) determine the achievement of FS fairly and equitably. It implies that FS can expand the amount and nature of food utilization and availability, economic access, and stability to influence EG. In addition, this study also explains that the availability of land and climatic factors as endowment factors could increase the number of jobs. It impacts increasing people's income which leads to EG.

Third, one study does not support a relationship between FS and EG from the aspect of Natural Resources Resilience **[13]**. Empirical results were obtained from a meta-regression analysis of the relationship between EG and the Food Insecurity Experience Scale (FIES). Statistical results showed that the natural resources resilience factor has no statistically significant coefficient.

Utilization Viewpoint

[39] explained that utilization is generally understood in how the body uses different supplements in food. Adequate personal intake of energy and supplements results from careful consideration and care of practices, food preparation, dietary diversification, and food flow within the family. Joined with the tremendous natural use of food consumed, this determines people's health. Based on these, 2 of 22 previous studies looked at the connection between utilization dimensions on FS and EG. There are two empirical results where one researcher supports a correlation between utilization and EG, and the other explained that there is no relationship. A study from **[6]** proved a connection between utilization and EG. His research proved that high malnutrition rates could cause a gross domestic product (GDP) loss by 4 to 5 percent. Furthermore, micronutrient's financial expenses also diminish GDP by 0.7-2% in most non-industrial nations. Therefore macronutrients and micronutrients cause global losses in economic productivity that account for more than 2-3% of GDP. It will prompt stale monetary development over the long haul. Hence, a suitable FS system is fundamental for all nations. While the research results from **[27]** refuted this, his empirical study proved that utilization has a significant negative impact on EG. The reason is that EG in developing countries creates inequality. According to this study, the FHSI score is plotted against the degree of national inequality (measured by the Gini coefficient). One hundred twenty-six people found a subtle negative correlation between the variables (correlation coefficient 0.071). However, when low-income countries are excluded, the strength of the negative correlation increases significantly. For example, the correlation coefficient is 0.285 in nations with a per capita GDP more significant than the US $ 20,000 and 0.426 In countries with a per capita GDP of more than the US $ 25,000. Finally, among the highest-income countries, countries with a per capita GDP of at least US $ 35,000, the correlation coefficient is an abnormally stable negative value of 0.97. The differences seem to weaken the evident ability of citizens to make food safe.

Research Priorities and Gaps

Our review revealed the shortcomings of research on the connection between FS and EG. In searching the relevant literature, it is clear that there is a gap in studies of the relationship between FS and EG at the global level. For example, our search revealed only three review-related articles **[24]**, **[27]**, **[34]** that focused on the worldwide level. Therefore, it is not easy to generalize a correlation between FS and EG. Furthermore, most studies have looked at this relationship only at the country level. So that in the future, it is necessary to increase the population of countries at the global level to prove this relationship empirically. Furthermore, we identified that previous studies have mainly used qualitative methods to show the linkages between FS and EG. It was recorded that 12 of the 22 previous studies used qualitative methods to explain this relationship **[6]**, **[10]**, **[12]**, **[26]**, **[28]**, **[30]**, **[31]**, **[33]**, **[17]**, **[34]**. Moreover, nine studies used quantitative methods **[7]**, **[8]**, **[24]**, **[9]**, **[11]**, **[13]**, **[25]**, **[14]**, **[29]** and the only one uses mixed methods **[27]**. So there is an opportunity to expand quantitative or mixed-based research methods in the future. Finally, most studies only focused on the correlation between FS

and EG based on one or a few dimensions of FS. Very rarely does a holistic research approach using global FS indicators such as the Global FS Index (GFSI) and Global Hunger Index (GHI), or other global FS indices. From the review results, only four studies used global FS indicators **[8]**, **[24]**, **[28]**, **[30]**. So for further research, it can be expanded to use the global FS index to see a causal relationship between FS and EG.

CONCLUSION

The results of the literature review show an empirical gap between economic growth (EG) and food security (FS). Although as many as 76.92% of the investigators supported an association between EG and FS, we cannot rule out the 19.23% of the results of other investigators who did not support this result. There are research gaps to be developed in the future, one of which is that most of the previous researchers only used the availability variable as a proxy for food security (FS). In contrast, two more variables determine FS (affordability and utilization). In addition, the object of research is still limited to the national level; there are still few that raise cases at the global level. Therefore, empirical evidence is needed to address this gap. Next, we recommend adding a poverty variable to examine the relationship between EG and FS. It is essential because low food security increases hunger levels (poverty).

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Funds:
This work was supported by grant School of Strategic and Global Studies, Universitas Indonesia No: PKS-0008/UN2.F13.D2/PPM.00.00/2021

Acknowledgments:
We would like to thank you to Dr. Herdis Herdiansyah for advice and support to our research

Conflict of Interest:
We declare no conflict of interest.

Ethical Statement:
This article does not contain any studies that would require an ethical statement.

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