
**Hungarian University of Agriculture and Life Sciences**

# Impact of Economic Globalization on Agricultural Competitiveness in Developing and Developed Countries

DOI: 10.54598/005050

Doctoral (Ph.D.) dissertation

by

Agus Dwi Nugroho

Gödöllő, Hungary

2024

**Hungarian University of Agriculture and Life Sciences**

| | | |
|---|---|---|
| **Name of Doctoral School** | **:** | Doctoral School of Economic and Regional Sciences |
| **Discipline** | **:** | Agricultural Economics |
| **Head** | **:** | **Professor Dr. Zoltán Bujdosó**<br><br>Professor,<br>Hungarian University of Agriculture and Life Sciences<br>Institute of Agricultural and Food Economics |
| **Supervisors** | **:** | **Prof. DSc. Zoltán Lakner**<br><br>Professor,<br>Hungarian University of Agriculture and Life Sciences<br>Institute of Agricultural and Food Economics |

**…….……** **……..**

**Approval of Head of Doctoral School** **Approval of Supervisor**

# TABLE OF CONTENTS


| | | |
|---|---|---|
| **COVER** | | i |
| **APPROVAL** | | ii |
| **CONTENTS** | | iii |
| **LIST OF TABLES** | | v |
| **LIST OF FIGURES** | | vi |
| **I.** | **INTRODUCTION** | |
| 1.1. | Background | 1 |
| 1.2. | Research Question and Objective | 10 |
| 1.3. | Hypothesis | 11 |
| **II.** | **THEORETICAL FRAMEWORK AND LITERATURE REVIEW** | |
| 2.1. | Theoretical Framework | 12 |
| 2.2. | Literature Review | 16 |
| **III.** | **MATERIAL AND METHODS** | |
| 3.1. | Theory and Variable Selection | 34 |
| 3.2. | Data Source | 34 |
| 3.3. | Data Analysis | 40 |
| **IV.** | **AGRICULTURAL COMPETITIVENESS IN DEVELOPING AND DEVELOPED COUNTRIES** | |
| 4.1. | Agricultural competitiveness in developing countries | 46 |
| 4.2. | Agricultural competitiveness in developed countries | 65 |
| **V.** | **IMPACT OF ECONOMIC GLOBALIZATION IN DEVELOPING AND DEVELOPED COUNTRIES** | |
| 5.1. | Impact of economic globalization on agricultural competitiveness in developing countries | 72 |
| 5.2. | Impact of economic globalization on agricultural competitiveness in developed countries | 92 |

**VI. CONCLUSION AND RECOMMENDATION**

6.1. Conclusion 101

6.2. Recommendation 103

**VII. NEW SCIENTIFIC FINDINGS** 105

**VIII. SUMMARY** 106

**REFERENCES** 109

# LIST OF TABLES


Table 1. Key events in the Doha Round 24

Table 2. Example of food fraud in the market 27

Table 3. The number of child laborers aged 5 to 17 in Asia by economic activity (in 2020) 31

Table 4. Land cover change from 2004 to 2019 in Asian developing countries (%) 32

Table 5. List of developing and developed countries 35

Table 6. Data variable 36

Table 7a. Agricultural competitiveness in developing countries 53

Table 7b. Agricultural competitiveness in developing countries 55

Table 7c. Agricultural competitiveness in developing countries 57

Table 7d. Agricultural competitiveness in developing countries 59

Table 7e. Agricultural competitiveness in developing countries 61

Table 7f. Agricultural competitiveness in developing countries 63

Table 8a. Agricultural competitiveness in developed countries 68

Table 8b. Agricultural competitiveness in developed countries 70

Table 9. Levin Lin Chu unit root test 72

Table 10. Three-stage least square regression results in developing countries 73

Table 11. Mean and standard deviation of world wheat, soybean, and maize prices (US dollars per metric ton) 85

Table 12. Process of agricultural market information system in developing countries 90

Table 13. Levin Lin Chu unit root test 92

Table 14. Three-stage least square regression results in developed countries 93

# LIST OF FIGURES


Figure 1. The Porter's Diamond of national competitive advantage 15

Figure 2. Dynamics of the annual scientific production 19

Figure 3. Number of articles by countries 20

Figure 4. Clusters of the keywords 21

Figure 5. Export and import of agricultural and food products in the world 1990-2020 29

Figure 6. Agricultural FDI inflows in the world 2013-2018 31

Figure 7. (a) Intra-ASEAN export share by product groups; (b) Intra-ASEAN import share by product group 46

Figure 8. (a) Intra-ASEAN average export growth of agricultural products; (b) Extra-ASEAN average export growth of agricultural products 48

Figure 9. (a) Intra-ASEAN average import growth of agricultural products; (b) Extra-ASEAN average import growth of agricultural products 49

Figure 10. Global food prices from May 2017 until May 2022 84

Figure 11. Agricultural average duty in the selected developing and developed countries 2006-2020 86

Figure 12. Changes in Indonesian, Chinese, and Russian plywood competitiveness in the EU market 87

# I. INTRODUCTION

## 1.1. Background

Economic globalization (EG) is the process by which governments quickly liberalize trade, investment, finance, and long-distance movements, as well as the information and perceptions that accompany market exchanges (Torres, 2001; Dreher, 2006). Dreher (2006) developed an EG assessment tool based on an index of actual flows (trade, foreign direct investment (FDI), portfolio investment, income payments to foreign nationals, and capital employed) and an index of trade and capital restrictions (hidden import barriers, average tariff rates, international trade taxes, and capital controls). As a result, many people can now measure EG progress in a variety of settings, including both developing and developed countries.

The importance of globalization for individual countries will be determined by the relative importance of international transactions to purely domestic transactions, the kind of assets and products exchanged, and the mode of international economic activity (Dunning, 1993). EG has continued to increase in the previous four decades. In several developed countries, EG grew by 77% in East Asia, 55% in Europe and Central Asia, and the lowest in North America at 41%. Developing countries also do not want to be left behind to improve their role in the global economy. Countries in the Latin America & Caribbean region experienced a 56% rise in EG, while the Middle East and South Asia saw 50% and 60% increases, respectively, and in Sub-Saharan Africa by 52% (KOF Swiss Economic Institute, 2021).

Because of EG's tremendous pull, countries that were formerly closed and socialist began to open their markets to other countries. One of the most dramatic implementations of EG was in China, which was formerly a socialist country. This process was initiated by Deng Xiao Ping, who proposed transforming the centralized planning system into a socialist market economy. This process aims to strengthen China's ties to globalization and expand the scope of its opening to the outside world (Arencibia, 2011). As a result, China's contribution to global output increased from about 4% in 2002 to 15% in 2017 (Gopalan et al., 2020).

Like China, Vietnam has also changed from a socialist country to one more open to EG. Since the mid-1980s, Vietnam has been a successful market-oriented economic reform (Doimoi). This process is carried out by no longer underestimating the role of monetary market interactions, overcoming economic and political subjectivism in running the economy and politics, and

avoiding severe bureaucratic centralism as a function of planning and economic regulation (Arencibia, 2011). In agriculture, production rights to land are returned to households, and input and output markets are liberalized (Thoburn, 2004). The careful and successive adoption of market institutions completes the process. As a result, Vietnam has risen to the top of the list of countries with the fastest economic growth and success in recent decades (Nguyen et al., 2018). Vietnam's agricultural output expanded at a rate of roughly 4% each year on average. Vietnam also became the largest exporter of rice and other cereals (mostly maize), coffee, cocoa, cashew nuts, and pepper, both intra-ASEAN and the global market (Maitah et al., 2020).

Another example, ASEAN or East Asian economy is involved in nearly 67% of the 62 Asian Free Trade Agreements currently being negotiated (Gopalan et al., 2020). As a result, Southeast Asia (SEA) is more integrated and globalized than other Asian regions. This region is tremendously active in global trade, as evidenced by the ownership of 16% of the world's largest container ports with extremely high traffic volumes (Lissovolik, 2017; Korwatanasakul, 2022).

Thailand is the first Southeast Asian country to emphasize agricultural trade as an economic driver. The political and economic environment of the 1970s and 1980s were ideal for agribusiness dominance in Thailand's agriculture sector dynamics. Then, in 1980, agricultural modernization began, introducing new production relations that linked farmers and agribusiness without state intervention. In 1987, agricultural and agri-industrial exports and manufacturing accounted for approximately equal shares of overall exports by value (44.7% and 45.7%, respectively) (Jasper Goss & Burch, 2001). Furthermore, the Thai government's agricultural spending has the potential to boost food consumption, exports, employment, capital stock, and GDP (Jaroensathapornkul & Tongpan, 2020).

Indonesia and the Philippines did not want to lag behind Thailand, so they reformed their agricultural trade policies in the 1980s and 1990s, lowering agricultural export tax rates and eliminating export restrictions. These reforms may boost farm prices and agricultural export volumes (Laiprakobsup, 2014b). Singapore launched agricultural trade reform initiatives in the mid-1980s, re-exporting agricultural products on a wide scale outside of ASEAN (Nabi & Kaur, 2019; Neville, 1992).

The Lao PDR also encourages trade liberalization and the move to commercial agricultural production. As a result, agricultural product exports, farmer income, and the country's ability to respond to changes in demand, particularly product quality and volume, rise (Alexander et al.,

2017; Castella & Bouahom, 2014; Durevall & van der Weide, 2017; Stuart-Fox, 1998). Myanmar's economy has profited from its openness, particularly in gaining lower prices for imported goods (Nicholas et al., 2018). Cambodia took similar steps to open its market to agricultural product trading (Fukase & Martin, 2001).

There are several different forms of EG employed today, both in trade and finance (Bataka, 2021). Many countries carry out export and import (Nigh, 1997), trade cooperation bilaterally, regionally, and multilaterally (Dollar et al., 2006; Gezmİş, 2016), and join the trade agreement (Ching et al., 2011). Other countries have started an economic reform program to liberalize trade policies, remove trade barriers, and connect their economies with global markets (Svatoš, 2007; Awad & Youssof, 2016). Establishing export processing zones, export subsidies, and boosting import substitution industrialization are all part of these programs (Sanchez-Ancochea, 2006; Pozo et al., 2011; Paus, 2012).

Developing countries also use product and market diversification programs to ensure their survival during EG (Goss & Burch, 2001; Pinilla & Rayes, 2019). Meanwhile, the financial components of EG include FDI (Fonchamnyo & Akame, 2017), debt (Bataka, 2021), the exchange rate (Fonchamnyo & Akame, 2017), monetary policy (Gochoco-Bautista, 2009), and other activities or policies.

Many economists investigated EG, resulting in the debate regarding its impact in different places, particularly in developing countries. EG can enhance trade volumes, FDI inflow, economic growth, infrastructure development, technology, foreign tourists, and international events; and lower inflation, income disparity, poverty, malnutrition, unemployment, and illegal economic activity in developing countries (Arencibia, 2011; Tongzon, 2012; Awad & Youssof, 2016; Ching et al., 2011; Fan et al., 2019; Hoang, 2020; Munir & Bukhari, 2020; Nguyen et al., 2018).

FDI has been shown to boost domestic economic growth, create more jobs, close the gender wage gap, improve gender equality, and broaden export diversification (Samimi & Jenatabadi, 2014). Smallholder farmers highly expect investment to boost and diversify their income and provide access to agricultural markets, training, and services without exposing farmers to extra risks or eroding their rights (Islam et al., 2020).

For example, the benefit of EG implementation is that Asia accounts for 38% of global exports and 31% of global imports. From 2002 to 2017, each Asian country's exports and imports averaged 26% and 23% of GDP, respectively. One of the reasons for this circumstance is the increasing

number of Regional Market Integrations (RMIs) in this region. The benefits of RMIs were demonstrated by the intra-regional proportion of overall Asian product trade rising from 50% in 1990 to 60% in 2017 (Gopalan et al., 2020).

RMIs implement a variety of policies, including tariff elimination, reduced trade (or trade facilitation) costs, labor market reform, lower barriers to FDI, the use of a single currency, deregulation, and wage restraint (Arestis & Phelps, 2018; Balistreri & Tarr, 2018; Umulisa, 2020). Then, RMIs provide some benefits, including increased trade among partner countries, sector growth, increased productivity gains, developed value chains, a significant contribution to connectivity and mobility, reduced unemployment rates, increased real wages, reduced inequality, increased factor incomes and consumer welfare, enhance industrial development and investment, and improves cooperation on infrastructure development (Ben Romdhane et al., 2013; Chakraborty & Kumar, 2012; Arestis & Phelps, 2018; Hearn & Piesse, 2020).

On the other hand, EG makes developing countries vulnerable to even slight external shocks or crises (Nguyen et al., 2018; Pinilla & Rayes, 2019). EG is also responsible for increased labor exploitation, income inequality and resource distribution, large-scale urbanization, and a variety of other problems (Pinder, 2009; Rostam et al., 2010; Fatihudin, 2019). For example, the African Continental Free Trade Area (AfCFTA) makes just a small contribution to grain and food security in Africa (Pasara & Diko, 2020). This problem has also occurred in advanced RMIs such as the European Union (EU). Brexit is the result of divisions and disputes inside the EU over trade and investment (Maier & Pitaraki, 2016).

These issues also exist throughout Asia, demonstrating that RMIs on the continent are not as powerful as they appear (Rahman & Jahan, 2015; Wu, 2020). Moreover, RMIs are very vulnerable to global shocks (Park & Lee, 2011). For example, ASEAN trade with the rest of the world produces greater overall benefits than intra-ASEAN trade (Derosa, 1995). Malaysian agricultural exports are primarily directed outside of ASEAN, namely to new industrial countries such as China, Iran, India, and Ukraine. Malaysia supplies several animal and vegetable fats and oils to these countries (Alias et al., 2014).

Scholte (2005) revealed that globalization is dominated by a single global-Western conglomerate that fails to mobilize developing countries' economic, social, technological, political, and cultural resources. Many EG agreements became sluggish and ultimately collapsed. For example, the initial deadline of 2005 for completing the Doha Round has already passed due to

continued disputes between developed and developing countries over trade barrier reform (Chakraborty & Khan, 2008).

Western countries also use double standards, promoting trade liberalization for their exports while preserving industries vulnerable to competition from developing countries, such as agriculture (B. N. Ghosh, 2009). Hence, many countries have breached the World Trade Organization's (WTO) agriculture accord (Losch, 2004). Even though the Agreement on Agriculture claimed to minimize protectionist trade practices and eliminate various trade distortions and barriers (B. N. Ghosh, 2009). Thus, developing countries are hesitant about applying EG in agriculture (Gupta & Kumar, 2020).

All countries in the world still view agriculture as a critical sector in developing and developed countries because (1) food providers that can affect the country's political stability and economic growth, (2) income and foreign exchange earnings, (3) employment providers both in this sector and manufacturing industries related to agriculture, (4) sources of overhead investment and expansion of secondary industry, and (5) rural net cash income as a stimulus to industry (Johnston & Mellor, 1961). One approach to maintain this position is to boost agricultural competitiveness. Agricultural competitiveness has been shown to raise farmer income and welfare, boost GDP growth, create jobs, diversify exports, and reduce $CO_2$ emissions. However, economic globalization may disrupt this effort because it affects fluctuations in agricultural competitiveness growth, transforming the entire food production, processing, and distribution system, and causing changes in market risks and the impact of trade declines in various countries (Nugroho et al., 2021).

The World Bank (2007) has reported that 75% of poor people in developing countries live in rural regions and are dependent on agriculture. The Food and Agriculture Organization of the United Nations, (2018) stated that agricultural expansion in developing countries has the potential to eliminate poverty faster than other sectors, affecting particularly impoverished rural communities. According to Hwa (1989), rapid agricultural growth enhances productivity, raises the efficiency of resource transfers (capital and labor), and promotes overall economic growth.

Governments in many developing and developed have begun to implement policies and programs to boost agricultural growth. These include irrigation, water use, and land tenure policies, the use of improved seeds and modern inputs, farm credit and input subsidies, the implementation of minimum guaranteed prices, import tariffs and export incentives, the reform of exploitative

marketing systems and increase agricultural competitiveness (Jones, 1995; Mollett, 1988; Van Campenhout, 2017).

Although numerous measures have been implemented, agricultural performance remains suboptimal (Jenicek & Grofova, 2014). So far, significant programs in developing countries, such as the Green Revolution, have failed to achieve their objective goal of enhancing agricultural markets. Farmers' incomes have decreased as a result of product excess and farmers' reluctance to embrace modern agricultural technologies, among other factors (Otsuka, 2019).

Macroeconomic indicators show that agricultural GDP per capita in developing countries remains one-tenth that of developed countries. This condition can be attributed to the inefficient markets and technologies being used, along with some obsolete labor skills (George, 2020). Hence, it is critical to focus on enhancing the efficiency and competitiveness of the local agricultural market because it has far-reaching implications for production, technology, and labor (Mollett, 1988). Furthermore, agriculture remains the most difficult sector to negotiate in international trade agreements, with poor competitiveness and frequent market distortions that impede economic diversification into higher-value-added businesses (Draper et al., 2013).

Meanwhile, consumers in developed countries have a dynamic demand for agricultural products. Consumers in developed countries are very focused on healthy, quality, and environmentally friendly food (Nedra et al., 2015; Polimeni et al., 2018). For example, in Japan, consumers are ready to pay a higher price for environmentally friendly agricultural products, particularly organic items. They are prepared to spend up to 33% more on organic and safe products than on conventional products (Seo et al., 2019).

Nowadays, the global economy has also suffered because of the Covid-19 pandemic. The Covid-19 pandemic has been a serious health threat to the world since late December 2019. It caused 5.32 million deaths around the world at the end of 2021. The pandemic disease significantly affected health, economy, social life, and supply chain activities, including agriculture (Hammad et al., 2023; Paul et al., 2023).

According to the International Monetary Fund, the global economy contracted by more than 3% in 2020. More than a billion people have been forced into poverty caused by Covid-19, which estimates that 87% of people in sub-Saharan Africa, Asia, Latin America, and the Caribbean are in poverty (Hammad et al., 2023). Even more significant are the negative effects of the epidemic

on the price of staple foods. Previously, there had been a pattern of falling real farm prices as a result of rising agricultural productivity (McCann et al., 2023).

Meanwhile, there was an increase in price and poor performance in the stock market, and high volatility of the country's stock returns (Kusumahadi & Permana, 2021; Machmuddah et al., 2020; Nurhayati et al., 2021). Simultaneously, societal prejudice increased (Narayanan & Saha, 2021). For example, women are more likely than men to lose their jobs and income (Dang & Viet Nguyen, 2021).

This pandemic also has effects on agriculture, such as changes in planting area and crop productivity, decreases in total agricultural production and GDP, lowered farm-gate product prices, increases production costs, causes farmers lose a lot of profits, increases emphasis on local products, difficulties moving agricultural products within supply chains, labor shortages, lack of operating capital, and heightened food insecurity (D. Gupta et al., 2021; Jha et al., 2021; McBurney et al., 2021; Wang et al., 2020). The World Bank predicted that the COVID-19 pandemic would reduce agricultural productivity by 2.6% to 7% and food imports by 13-25% (McCann et al., 2023).

Every country is adopting different actions to prevent the spread of Covid-19 and sustain these economies in the short-run and revamp them in the long-run (Amutabi, 2022). Some of these actions such as limiting human contact by implementing social distancing, staying at home, closing numerous business outlets, and lockdowns (Wallingford et al., 2023). Furthermore, governments all over the world are establishing and putting into effect a variety of tax, economic, and monetary policies to help lessen the effects of the pandemic (Amutabi, 2022).

Even though these actions have been successful in halting the spread of the new coronavirus, they have had far-reaching effects on various facets of the economy such as healthcare services, food supply, education, mental health, and quality of life among others (Chang et al., 2022). They have also decreased labor availability and restricted access to inputs, which has disrupted the product supply chain (Cariappa et al., 2022). Countries such as Austria struggled to locate labor in the fruit and vegetable business due to restrictions on free movement. This country requires approximately +/− 3000 labors from eastern European countries (Poland, Czech Republic, Slovakia, Hungary, and Romania) and from outside the European Union such as Ukraine (World Farmer Organization, 2020).

Food shortages, a decrease in dietary diversity, and a rise in emotional suffering happening everywhere caused by the loss of jobs and inflation (Chang et al., 2022; Manyong et al., 2022).

This could affect the ability of vulnerable households to buy enough food and the length of their periods when they are unable to meet their feeding needs is rising (Hammad et al., 2023). Making problems worse, the lockdown raises the possibility of food-related conflicts, food looting, riots and violence against civilians (Gutiérrez-Romero, 2022).

Food processing has also been impacted by Covid-19 because of rising food processing costs, declining supply chain trust, a lack of transparency and traceability, the dissemination of fake information, sluggish communication between supply chain participants, delays in advancing supply chain technologies, and frequent changes in food processing planning (Paul et al., 2023). Poor resource management and planning puts businesses and communities at risk of overspending and financial crises (Yetkin Özbük et al., 2022). The food processing sector is also facing fluctuating market demand and supply/raw material shortages (Paul et al., 2023).

Covid-19 cases significantly affect food prices in India, South Africa and China in the long run. In contrast, Covid-19 has harmful effects on food prices in every country in the short run except Russia and Turkey (Chang et al., 2022). It's interesting to note that the rise in food prices also happened in countries like Solomon where there were no cases of Covid-19 reported. This is a result of the country's reliance on food imports and lockdowns (Farrell et al., 2023). Significant losses have also been reported in developed countries, such as Italy, as a result of delayed transport, which has caused products to disappear. Meanwhile, this disease is also caused by reduced consumption of up to one-third of normal conditions (World Farmer Organization, 2020).

An update of the international political situation creates new conditions for further development because the increasing conflicts between Russia and Western countries (mainly but not exclusively member states of NATO) lead to fragmentation of the global supply system. The war significantly damaged productive assets, agricultural land, labor availability, roads and other civilian infrastructure, with farmers unable to tend to their fields or harvest them (Feng et al., 2023). The supply of food, fuel, and fertilizer in global markets is much lower end of April 2022 than it should be due to this war (Arndt et al., 2023).

The conflict disrupts the production process by preventing farmers from working in their fields, harvesting, and marketing their crops. Lang and McKee (2022) reported that between 20 and 30% (approximately 1.9 million hectares) of lands seeded for winter crops in Ukraine will go unharvested during the 2022/23 season, making it impossible to plant crops for the following season. The areas where food production and fighting were concentrated, such as Donetsk,

Kherson, and Kharkiv, experienced the greatest yield losses. Other parts of Ukraine may also face disruptions as a result of farmers' inability to locate fertilizers and control pests and diseases, as well as labor shortages and inadequate storage infrastructure.

Russia is one of the world's fertilizer producers, so the war prevented this country from exporting fertilizer to the world market optimally. Russia accounts respectively for 23%, 21%, 14%, and 10% of ammonia, potash, urea, and processed phosphate exports worldwide (Feng et al., 2023).

The war had also a detrimental effect on global grain security, which decreased from 0.538 to 0.419 (Xu et al., 2023). The war resulted in damage to agricultural production, storage, and processing facilities as well as the loss of productive regions due to occupation or active warfare. The movement of Ukrainian grain to global markets was also nearly stopped by the blockade of Ukrainian ports that was conducted at the start of the war (Hussein & Knol, 2023). If Russia and Ukraine cut their wheat exports by 50%, grain prices may rise by 15%. This would result in an 8% fall in grain consumption and dietary energy intake (Mottaleb et al., 2022). This is very dangerous considering how dependent many developing countries in Asia and Africa are on Russian and Ukrainian wheat supplies (Nasir et al., 2022).

Food prices see a sharp rise in 2022 by concentrating on a select few commodities, most of which are reliant on Ukraine (Arndt et al., 2023). For example, in the worst-case scenario, the conflict resulted in a 60% decline in wheat trade, a 50% increase in wheat prices, and severe food insecurity with a 30% decline in wheat purchasing power, particularly for countries that heavily rely on wheat imports from Ukraine, like Egypt, Turkey, Mongolia, Georgia, and Azerbaijan (Lin et al., 2023). Hence, this war caused a welfare decline of 15–25% for most of the affected countries. The war will also leave 1.7 billion people hungry and 276 million people in severe food insecurity (Lin et al., 2023). This will also exert severe effects on the stability and predictability of global agricultural and food markets (Nasir et al., 2022).

This war is even more dangerous because many countries have imposed sanctions on Russia. Russian farmers could continue their regular agriculture activities, but it will be challenging to market their products owing to international economic sanctions (Mardones, 2022). In fact, these sanctions are not only hurt the Russian economy but also the world. Mardones (2022) created a simulation of how sanctions will affect Russia. Economic sanctions made Russia difficult to export

food. But this also hurts the countries that apply sanctions—Latvia and Lithuania—, particularly deteriorating the condition of their food industry.

Varacca and Sckokai (2020) claimed that if there is a change in the relationship between the exporting countries and the EU, imports of food into the EU are extremely sensitive. Food price increases in exporting countries will have a detrimental impact on the EU. The sanctions also target the cessation of foreign investment in Russia. Simultaneously, Russian agricultural investments are crucial for maintaining local food output and world prices (Koizumi, 2019). Global inflation also soared as a result of a substantial increase in the price of oil and gas (Yatsiv et al., 2023). The war also resulted in actual GDP declines in other nations. Rwanda and Myanmar experienced very significant real GDP losses due to stagnant agricultural export prices and a reliance on imported inputs for a substantial portion of production (Arndt et al., 2023).

Besides that, the lack of fertilizer supply on global markets causes an increase in the price and some farmers may choose to use less of this input, which lowers agricultural competitiveness and drives up food prices. Food price shocks affect geoprocessing more severely and directly since they drive up the price of imported inputs (such as domestic grain milling) (Arndt et al., 2023). The consequences of this creasing are hardly predictable. Therefore, developing and developed countries must strive to increase agricultural competitiveness in global market competition.

There have been many studies on agricultural competitiveness and EG with different findings, even contradictory ones. However, these studies have only been conducted in a few countries or even just some commodities (Borisagar et al., 2023; Dimitrijević et al., 2023; Hidayat et al., 2023; Long, 2021). This results in a partial equilibrium, there will undoubtedly be controversy regarding the study's findings. As a result, I conducted a wider study with a larger sample of countries and agriculture in general to achieve a general equilibrium and conclusion.

## 1.2. Research Questions and Objectives

Based on the introduction, this research has 3 research questions:

a. Do agricultural products in developing countries have competitiveness?
b. Do agricultural products in developed countries have competitiveness?
c. Does economic globalization have an impact on agricultural competitiveness in developing and developed countries?

After formulating the research question, this study aims to:

a. identify the competitiveness of agriculture in developing countries.
b. identify the competitiveness of agriculture in developed countries.
c. know the direction and how big the influence of economic globalization on agricultural competitiveness in developing and developed countries.

## 1.3. Hypothesis

Based on this research questions in framework of the current thesis three hypotheses will be tested:

**Hypothesis 1:** agricultural products in developing countries have competitiveness.

**Hypothesis 2:** agricultural products in developed countries have competitiveness.

**Hypothesis 3:** economic globalization has a positive impact on agricultural competitiveness in developing and developed countries.

A detailed theoretical framing and presentation of literature background of these hypotheses is presented in the “Literature review” section of the current thesis.

# II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

## 2.1. Theoretical Framework

EG has been applied since the beginning of human civilization when goods needed to be transported between locations. However, EG science began to develop in the early 17th century. EG replaced mercantilism, which pushed for rigorous government control of all economic activity and promoted economic nationalism because they felt that a country could only gain in commerce by exploiting other countries.

Adam Smith was the first economist to propose EG through free trade and a strong advocate of minimal government intervention in the economy (laissez-faire). Free trade will promote global well-being by enabling the most efficient use of the world's resources. When one country is more efficient (or has an absolute advantage over) another in the production of one commodity but is less efficient than (or has an absolute disadvantage) the other country in the production of a second commodity, then both countries can benefit by specializing in the production of its absolute advantage commodity and exchanging a portion of its output with the other country for its absolute disadvantage commodity (Smith, 1776).

Free trade also increases aggregate consumption efficiency, allowing consumers to pick from a wide range of goods and prices. Many people feel that international trade provides the opportunity for countries to develop. Trade benefits both large and small countries (Feenstra & Taylor, 2017). However, several countries are currently implementing various restrictions on the free flow of international trade. This predicament arises because free trade is viewed as exclusively benefiting developed countries in the face of international competition. Developing countries have nothing because they are not as efficient as developed countries. Free trade is also viewed as unfair and harmful to other countries due to its reliance on cheap wages, often known as the pauper labor argument (Salvatore, 2013). This is also reinforced by Krugman & Obstfeld (2003) who stated "the theory of the second-best". The government must interfere (for example, by introducing import tariffs) to boost market output. Market distortions can boost well-being.

The next economist to endorse EG is David Ricardo, who emphasizes the importance of labor productivity. Ricardo proposed the law of comparative advantage in his Principles of Political Economy and Taxation, which was published in 1817. This is one of economics' most significant

and unchallenged laws, with several practical applications. This law assumes that trade between countries would be liberalized and made free suddenly (Ricardo, n.d.).

The comparative advantage consists of economic agents (capitalists, labors, and landlords) and political economy. But, the main aspect of the comparative advantage is labors (Cinquetti, 2018). It will influence the cost and price of a product. According to the comparative cost law, the advantage of a product is determined by its manufacturing and distribution costs. If they are low, the price will be cheaper, and the comparative advantage will be stronger (Krugman & Obstfeld, 2003).

Trade competition requires a country to highlight the comparative advantages of its goods and services. The comparative advantage principle requires higher relative productivity and/or lower costs while producing a commodity. It determines each country's pre-trade relative prices, terms of trade, and potential gains for trading partners (Dev Gupta, 2014).

The initial differences in relative product prices between countries will boost cross-border trading. Because price discrepancies between countries are a direct effect of technological differences, the model's trade is driven by technological differences. Profit-seeking enterprises in each country's comparative advantage industry would notice that their product prices are more than the other. Exports produce more profit than local sales (Suranovic, 2012).

There is an economic benefit for a country to specialize in producing goods for which it has a comparative advantage, and then trading those goods with other countries. On a macroeconomic scale, the theory of comparative advantage can be expanded. Not only will trade take place to meet conditions of comparative advantage; in principle, if each country specializes in what it does best, the world's overall wealth will improve (Sherlock & Reuvid, 2008).

One of the most influential theories in international economics holds that international trade is primarily driven by resource differences between countries. The Heckscher-Ohlin (H-O) theory was created by two Swedish economists, Eli Heckscher and Bertil Ohlin. The factor-proportions theory is so named because it emphasizes the interaction between the proportions in which different sources of production are available in different countries and the proportions in which they are employed to generate different commodities (Krugman & Obstfeld, 2003).

The H-O theory is expressed in terms of factor intensity and factor abundance. Factor intensity is the amount of capital per unit of labor used in the production of two commodities. Factor abundance can be defined in two ways. One method is to think in terms of physical units

(i.e., in terms of the overall amount of capital and labor available to each country). Factor abundance can also be defined in terms of relative factor pricing (i.e., in terms of the rental price of capital and the price of labor time in each nation) (Heckscher & Ohlin, 1920). The H-O also claims that special protection is needed for sectors that rely heavily on factors that the country is poorly endowed (Kwon, 2011).

After the H-O theory, trade theory continues to develop. Complementary trade theories are still being developed to explain the significant amount of international trade left unaccounted for by the H-O theory. This is done by relaxing the assumptions of the H-O theory. For example, relaxing the first assumption (two nations, two commodities, and two factors) to include more than two nations, more than two commodities, and more than two factors complicates the analysis, the H–O model remains essentially valid if the number of commodities is equal to or greater than the number of factors. When dealing with more than two factors, one issue is that the researcher can no longer describe a commodity as L or K intense; instead, the researcher must create a factor-intensity index to predict trading patterns (Salvatore, 2013).

Aside from differences in the relative availability of labor, capital, and natural resources (as emphasized by the Heckscher–Ohlin theory), economies of scale, and product differentiation, dynamic changes in technology among countries can be an independent factor of international trade. The technology gap and product cycle models are used to investigate this (Salvatore, 2013).

Lastly, Michael Porter invented the "Diamond Theory." Porter's "focus on rivalry or competition represents a departure from traditional economic thought. Countries' rivalry has altered over the last decade as a result of shifting patterns in global trade, globalization of the world economy, rapid dissemination of technology and information, and the creation of transnational organizations (Smit, 2010). Porter also emphasized the significance of government policies that boost the productivity of created assets, allowing people and firms to innovate new products or deliver old items at lower real prices (Dunning, 1993).

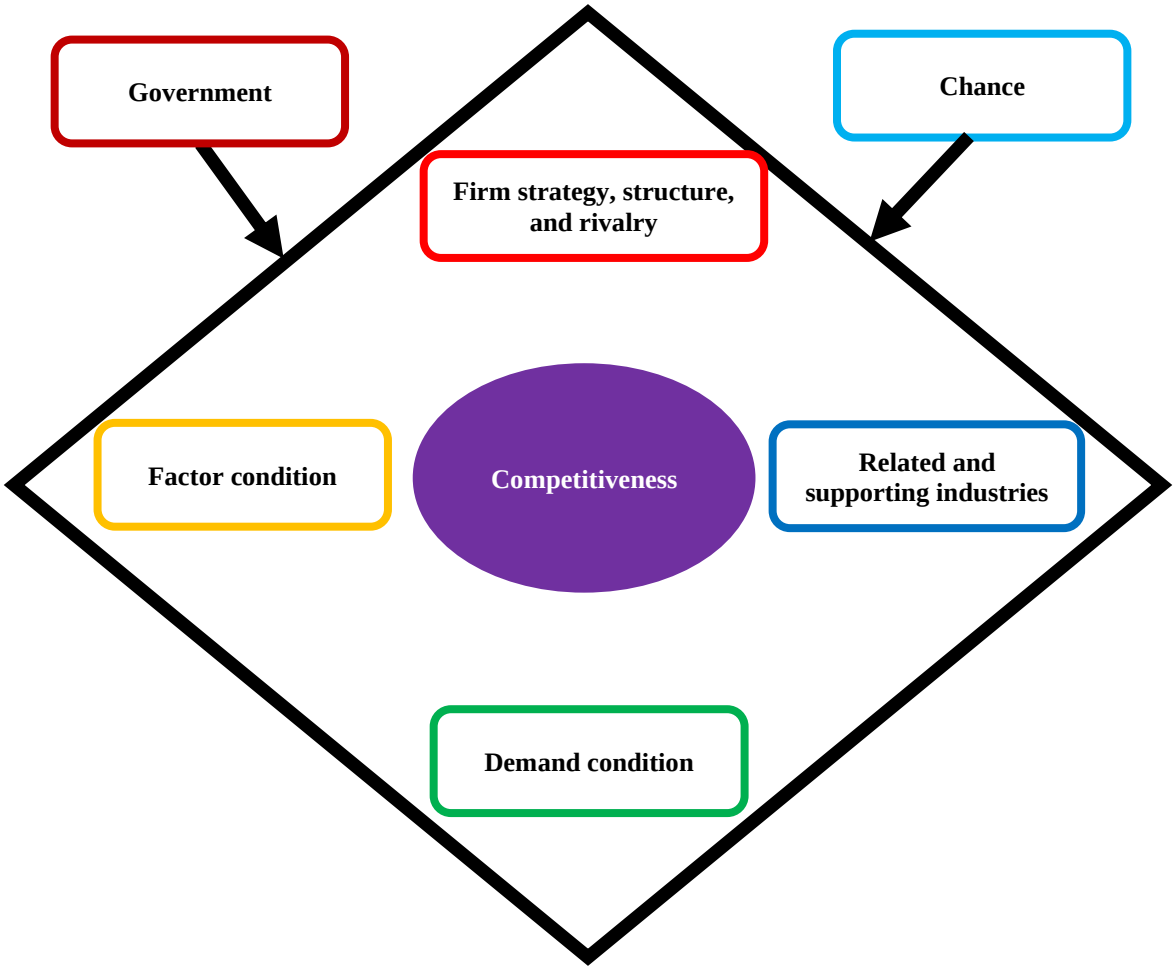



**Figure 1.** The Porter's Diamond of National Competitive Advantage

Figure 1 shows how a country's competitiveness is determined by its industry's ability to innovate and upgrade. Because of the pressure and challenge, companies acquire an advantage over the world's greatest rivals. Strong domestic competitors, aggressive home-based suppliers, and demanding local customers help them succeed. Nations have grown more essential, not less, in a more globalized world. The nation's role has expanded as the foundation of competitiveness has turned more and more to the generation and assimilation of information. A highly localized process is used to establish and maintain a competitive advantage (Porter, 1990).

There are many more theories in international trade, including (1) the relationship between the production possibility frontier and the relative supply curve; (2) the relationship between relative prices and relative demand; (3) the determination of global (world-level) equilibrium by world relative supply and world relative demand; and (4) the effect of terms of trade—the price of

a country's exports divided by the price of its imports—on the welfare of a country (Krugman & Obstfeld, 2003).

## 2.2. Literature Review

### 2.2.1 Agricultural competitiveness and its challenges

Agriculture is critical for food and biomass production, which is a major source of renewable energy and bio-based raw materials (Nowak et al., 2021). Agriculture also generates income and foreign exchange earnings, overhead investment and secondary industrial expansion, and rural net cash income to stimulate industry (Draper et al., 2013). All of this can happen if agriculture increases its competitiveness (Prasada et al., 2022).

Increased competitiveness is one of the most significant aspects of agriculture. The analysis of agricultural competitiveness in developing and developed countries reveals differences. Developing countries including Argentina, Brazil, Egypt, India, Indonesia, Thailand, and Vietnam are becoming more competitive (Suroso et al., 2023). However, according to some studies, the competitiveness of oilseeds in India is inefficient, thus it lacks competitiveness in the international market even though its agricultural output has generally increased (Borisagar et al., 2023). The competitiveness of Indonesian palm oil has increased during the same period (Hidayat et al., 2023).

Several developing countries, such as China, Iran, and Russia, have seen their competitiveness decline (Suroso et al., 2023). China's agriculture export competitiveness is low and expected to deteriorate further. Some traditional agricultural products with regional features, such as tea and live pigs, have a reasonably substantial international presence (Long, 2021).

Other developed countries saw rises (Belgium, France, and Spain) or reductions in competitiveness (Czech Republic, Germany, Singapore, Switzerland) (Suroso et al., 2023). In the case of these countries, agricultural competitiveness has indeed increased, but its contribution to GDP has decreased because of a low level of processing, and low added value (Dimitrijević et al., 2023). Many studies show that there are differences in competitiveness across commodities and countries, so this study must provide a reason for determining the competitiveness of agriculture in developing and developed countries.

The government in every country has begun to initiate policies and programs to accelerate agricultural competitiveness. This consists of land tenure, water use, and irrigation policies; the use of improved seeds and modern inputs, input subsidies, farm credit, minimum guaranteed price,

exploitative marketing system reform, import tariffs, and export incentives (Van Campenhout, 2017).

Irrigation is critical to maintaining agricultural yield, land productivity, farmer profitability, and competitiveness. Irrigation is also a response to growing concerns about food and water security, which are already stretched thin (Nie et al., 2021). Every country maintains fertilizer availability at the agricultural level by encouraging domestic production or providing input subsidies. Farmers will lower their use of inputs, particularly fertilizer, as prices rise. Brazil is expected to surpass developed countries in the global food agribusiness market due to its high-quality resources and easy access to low-cost labor and raw materials (Samargandi et al., 2020). In other countries, Ghana and Mexico, exports, foreign aid, and agro-industrialization have demonstrated their capacity to enhance agricultural output and value-added (Barbier, 2000).

Meanwhile, lending affordability is critical to long-run agricultural development. Farmers use loans to improve product quality and efficiency, increase revenue, purchase farming equipment, and modernize (Bahşi & Çetin, 2020; Dawuni et al., 2021; Ganbold et al., 2021). Low-interest credit has been shown to boost agricultural productivity, employ agricultural machinery and organic inputs in Nigeria (Osabohien et al., 2020), use advanced facilities to realize economies of scale and reduce agricultural storage losses in China (M. Zhang et al., 2022), motivate farmers to implement good agricultural practices and promote product certification in Turkey (Bulut & Celik, 2022), improve the value chain and rural entrepreneurship in Iran (Ataei et al., 2020).

Countries are also working to improve agricultural players' education through counseling and training. Education is critical for sustainable agricultural growth because it raises their knowledge, improves their skills and practices, changes their attitudes, and encourages farmers to use proper strategies and technologies, such as performing postharvest operations for perishable products and boosting agricultural competitiveness (Ali et al., 2021; Alwedyan & Taani, 2021; Marenya et al., 2021; Zobeidi et al., 2021). In addition to farmers, food processors and retailers must be trained to deliver high-value-added products. Consumer education is also required for them to select high-value-added agricultural products and spend their money on them (Ali et al., 2021).

The Green Revolution was primarily responsible for the international spread of new crop varieties into Asia's growing economies. In Asia, particularly in China, contemporary cultivars accounted for more than 80% of wheat plantings and more than 60% of maize, rice, and other cereals (Maskus, 2006). In another case, Thailand's agricultural modernization began around 1980,

with the introduction of new production relations that connected farmers and agribusinesses without the state's involvement. In 1987, agricultural and agri-industrial exports and manufactured goods amounted to nearly the same share of total exports in terms of value (J. Goss & Burch, 2001). The technology may also assist agricultural enterprises in expanding their business and market in the face of global competition (Camargo & Wang, 2015). For example, in 2002, China's domestic market for seed and planting materials was valued at around $3.0 billion. Of course, this is a profitable business for international agriculture firms (Maskus, 2006).

Although many policies have been issued, agricultural performance in developing countries remains not optimal. This is related to the slow adoption of technology which causes inefficient use of agricultural resources. For example, in Tunisia, inefficient water use results in a loss of economic value of 470 million Tunisian Dinars, including in agriculture (Chebil et al., 2019). Meanwhile, inefficiency has resulted in reduced agricultural yields and production patterns in Egypt that are biased against high-value crops (Osman et al., 2019). Finally, Iran will need to invest a lot of money to improve agricultural management (Tahbaz, 2016).

Major programs in developing countries, such as the Green Revolution, were not followed by the improvement of agricultural markets. As a result, farmers' incomes fall because of the oversupply of products and farmers' reluctance to use new agricultural technologies (Otsuka, 2019). Agriculture also confronts various obstacles, including poor income, a lack of capital, the nature of small-scale businesses, slow technological adoption, low levels of farmer education and training, and inadequate infrastructure (van Berkum, 2015). Nugroho, (2021a) added a few of the challenges relating to agriculture, including the oligopsony agricultural market system, which causes farmers to lose money, a lack of infrastructure that restricts farmers' access to market information, and gender inequality.

Climate change (rainfall, temperature, river flow, and CO2 fertilization) cut world food output by 0.5% in the 2020s and 2.3% in the 2050s. Reduced food output will raise food prices by 39% to 43% across all crops, particularly cereal grains, sugarcane/beet, and wheat. Agricultural production and price swings influence welfare and GDP changes (Calzadilla et al., 2013). In addition, rising temperatures in developed countries would result in considerable losses in agricultural gross value added per worker of 10% to 30% by the end of the century (Farajzadeh et al., 2022). Worse, only a few business actors (Biswas et al., 2022) and academics (Milovanovic et al., 2022) recognize the harmful impact of climate change.

### 2.2.2 Economic globalization in agriculture

The first part of this subsection analyzes various literature that ties economic globalization (EG) with agriculture. The first article examines the relationship between EG and food-agriculture beginning in 1987. The trend of articles on this topic continued to increase from 1987 to 2022 (Figure 2). In the first five years, the number of articles examining the relationship between EG and food-agriculture was less than ten documents. However, there has been significant global growth in the production of articles since 1993. Several important moments have grown worldwide, especially the emergence of various international agricultural agreements.

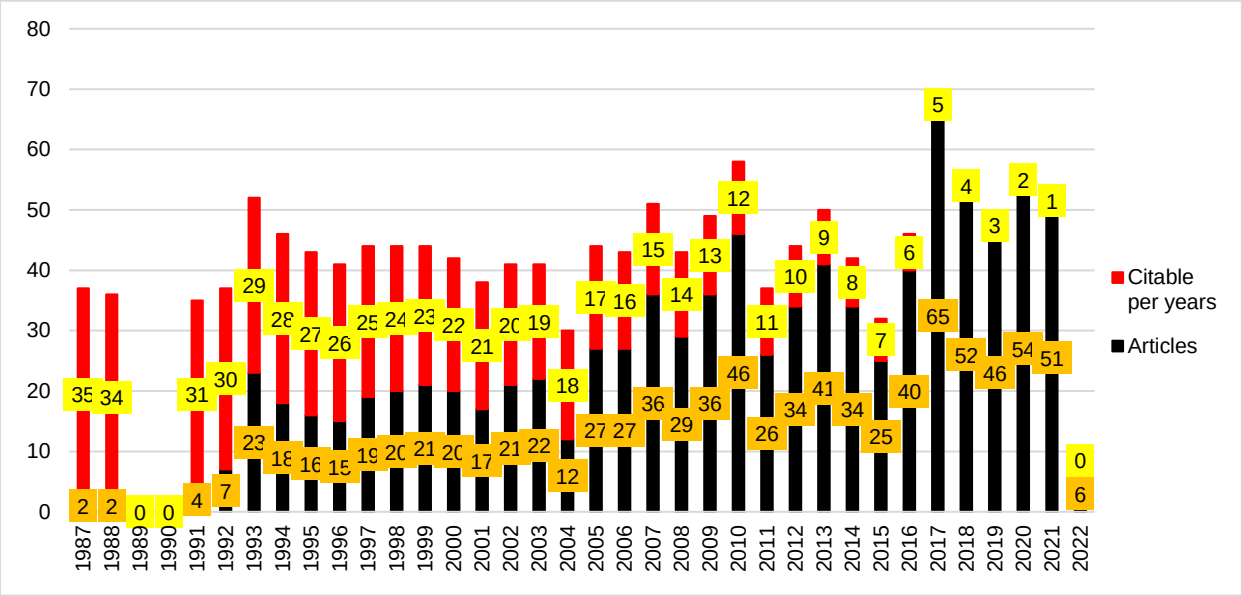



**Figure 2.** Dynamics of the annual scientific production

Further analysis of the countries that publish articles on this topic shows that the USA comes out on top with 381 articles, followed by China (118). Interestingly, this topic is also intensively studied by developed countries (Figure 3). This relates to the EG process that involves all countries and will also affect developed countries. For example, massive research in the EU countries (representation of developed countries) because of their geographical location close to Asia and Africa (which are representatives of developing countries) makes them intense in conducting trade and financial activities. Likewise, the USA and Canada are geographically close to Latin American developing countries.

Researchers in developed countries work to understand their countries' trade and financial dealings with developing countries. Meanwhile, researchers in developing countries like India, South Africa, Ethiopia, Argentina, and Brazil are starting to focus on this topic. This is highly positive for EG's progress, considering that there is still a lot of debate about this activity, especially its benefits for developing countries (Scholte, 2005).

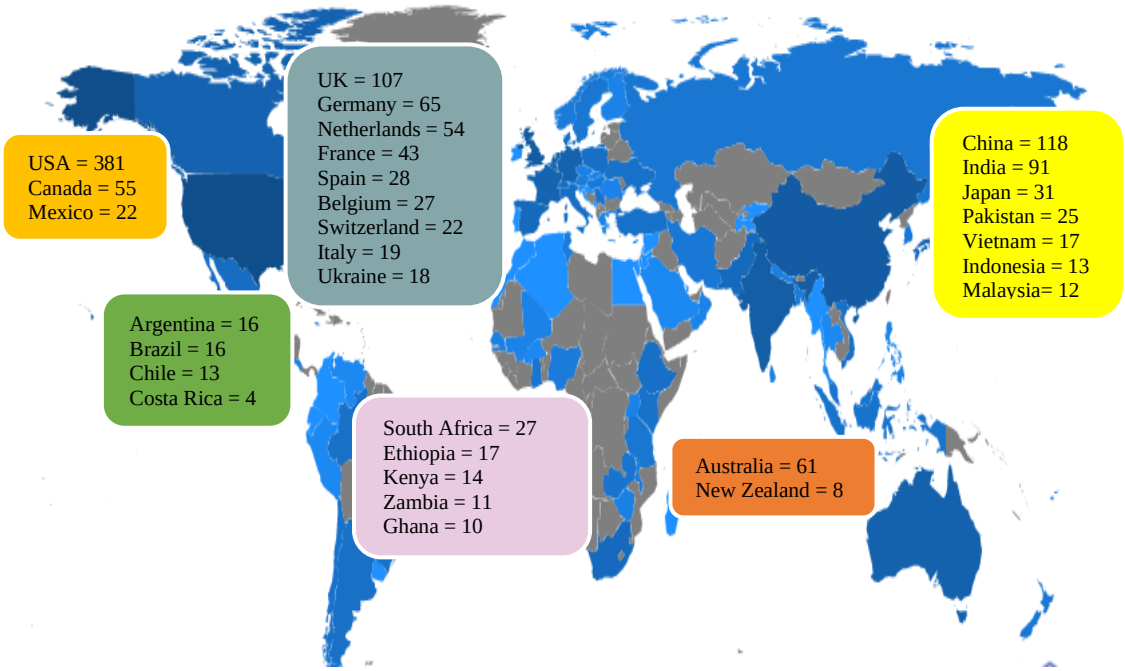



**Figure 3.** Number of articles by countries

The impacts of EG that many researchers have extensively studied are food security, climate change, poverty, welfare, and productivity. This is further supported by the outcomes of keyword analysis using VOS viewer, which shows the existence of two clusters addressing the effects of EG (Figure 4). The first red cluster illustrates how EG has impacted farm households' lives, particularly concerning food security. The second blue cluster is concerned with the income, productivity, and level of education of agricultural workers.

The VOS viewer analysis produced two more clusters, the EG activity cluster (green) and the agriculture policy cluster (yellow). EG engages in a variety of activities, including trade-in products. Additionally, this cluster is provided with several trade restrictions and agreements. Finally, the yellow cluster displays several trade regulations, particularly those applied by Europe

in the food market to maintain the sustainability of agriculture. The most interesting point is that no studies have linked EG to agricultural competitiveness, either in developing or developed countries. That way, this issue can become a novelty for this research.

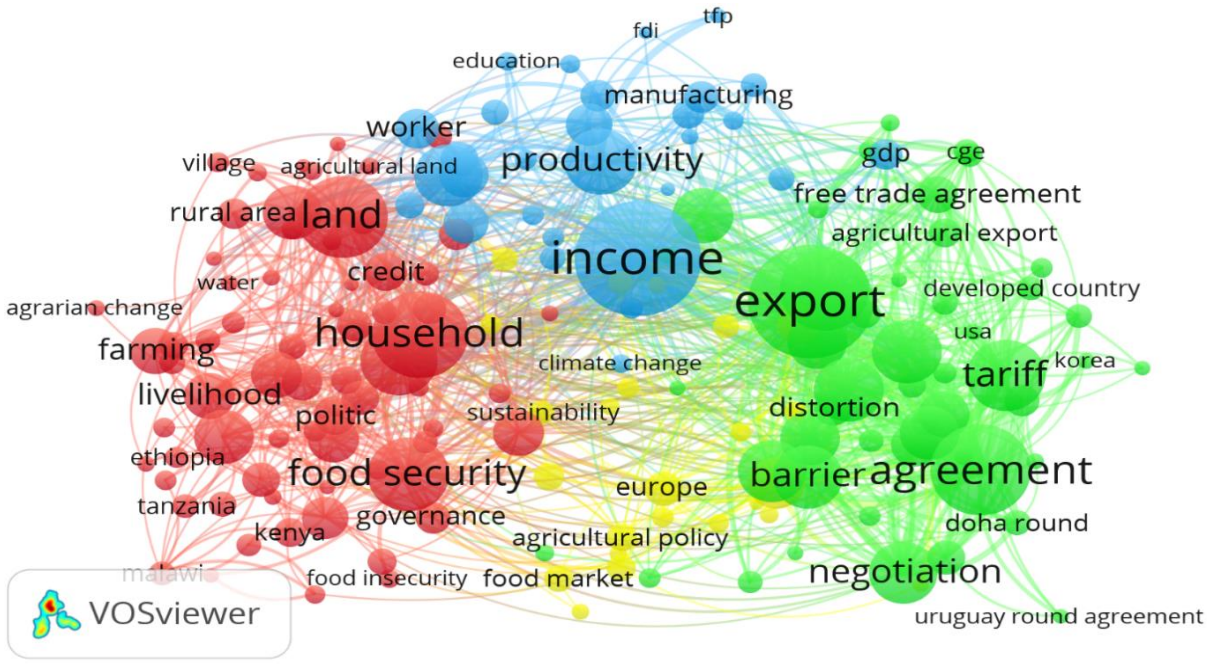



**Figure 4.** Clusters of the keywords

The second part of this subsection addresses the history of EG in agriculture, as well as its beneficial and harmful effects in various countries. The global economy in the 1920s and 1930s was in decline, prompting many governments to protect domestic producers by increasing protections against imports. The introduction or raising of tariffs on imported products is the most common measure of protection. Tariffs were widely utilized in the 1920s and 1930s, resulting in employment losses in other countries – a cyclical process. Following 1945, a strong worldwide effort was made to establish institutions that would minimize the consequences of trade protection and any future decreases in global economic activity.

The Bretton Woods Agreement in 1947 established the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD), now known as the World Bank. The IMF's primary goal is controlling how countries adjust to exchange rate fluctuations. The IMF was established to allow countries with trade deficits to borrow funds from a central source to pay their debts. The World Bank has taken on the responsibility of providing preferential

loans to developing countries for initiatives that would aid and accelerate their economic growth (Sherlock & Reuvid, 2008).

Between 1947 and 1993, the main agricultural agreement in the world was the General Agreement on Tariffs and Trade (GATT), established by the World Trade Organization (WTO) on January 1, 1995, to prevent the competitive tariff wars of the 1930s. The GATT was signed in Geneva in 1947 and went into effect in 1948. The agreement has facilitated a worldwide reduction of trade barriers, including in agriculture. From 1945 onwards, GATT imposed enforceable agreements on its members to cut tariffs through a series of prolonged talks known as 'rounds.' Each round cut general tariffs even further, paving the way for steady growth in global trade.

Under the GATT rules, every proposal to impose a new tariff had to be submitted to GATT, and any disagreements between members were supposed to be resolved through GATT. Market liberalization encourages farmers to specialize more, increasing agricultural land productivity while maintaining or improving environmental standards and competitiveness under the GATT. Farmers can also diversify their agricultural products to satisfy the changing needs of local and global consumers (de Roest et al., 2018) and produce technology and knowledge spillovers that boost countries' agricultural total potential (Mihalache-O'keef & Li, 2011). These steps allow farmers to get a good price for their produce. During the GATT implementation, for example, the Indian government opened up agriculture to international investment. Farmers can improve their agriculture capacity, eliminate poverty and hunger, and increase the carrying capacity of the environment (Nedumaran & Manida, 2019).

However, numerous issues in agricultural trade remain unresolved that were not addressed during GATT implementation, such as export subsidies, tariff, and non-tariff barriers, including quantitative restrictions and dispute settlement, among others. Many countries continue to debate the optimal mechanism for controlling the nature of policy measures used to protect farmers, the overall degree of help given in different countries, and the potential repercussions of cutting support (Reeves, 1987). Several food-safety regulations also serve as a barrier to agricultural product entry into importing countries (Wahidin & Purnhagen, 2018).

These problems and violations have prompted several countries to agree to take a more serious approach to adopt a more serious commitment to promoting fair agricultural trade. This aim is fulfilled through the founding of the WTO, which tightens agricultural trade oversight. Following the implementation of the WTO agreement, producers' input and output price supports will be

gradually phased down (de Roest et al., 2018). Domestic supports are designated as "green," "blue," or "amber" by the WTO based on how much they distort trade and production.

Subsidies in the "Green Box" must not disrupt commerce; they are normally not targeted at specific items but do include direct income supports for farmers that are not affected by current output levels or prices. The Green Box category also includes environmental and regional development initiatives. As a result, Green Box subsidies are unlimited. Domestic assistance measures thought to distort production and commerce are designated as "Amber Box." This support is subject to limitations. The "Blue Box" is an "Amber Box with Conditions Attached" designed to prevent distortion (Kobori, 2010). For example, producer subsidy equivalents in Japan were 40% during GATT implementation but were significantly decreased after WTO implementation (Reeves, 1987).

WTO members will also open their markets to foreign products, services, and investments (J. Goss & Burch, 2001). They have vowed to convert all border protection measures into import duties (tariff equivalents) and then gradually decrease them (by 36% for developed countries and 24% for developing countries between 1995 and 2000) (François Nègre, 2022). The Indian government, for example, announced that quantitative restrictions (QRs) on 715 products will be removed, allowing them to be freely imported without a license (Kwon, 2011). Sri Lankan officials used the WTO implementation window to lock in the continuing trade reform process at low duty levels, eliminate all non-tariff measures, and lower agricultural import duties (Athukorala & Kelegama, 1998). Several WTO dispute settlement meetings were also convened to resolve agricultural trade disputes. For example, China has sued Australia over anti-dumping and countervailing duty measures on wine and barley. China was also sued for setting tariff limits on specific agricultural items. Similarly, other countries have sued India for sugar and sugarcane policy (WTO, 2022).

In 1994, WTO member countries signed the Agreement on Agriculture (AoA), which is part of the Uruguay Round. They are committed to radically reducing agricultural trade tariffs. Most of the countries that signed the agreement have now implemented the guidelines and are steadily reducing protectionism (Josling, 1999). However, the AoA harms the economy of developing countries, for example, an increase in income inequality (Gil-Pareja et al., 2016). Moreover, fluctuations in global agricultural exports increased with the implementation of the AoA (Saran et

al., 2013). As a result, implementing AoA in agriculture has not been the focus of many studies (Goldstein & Gulotty, 2022).

Although WTO membership has continued to increase, particularly with the admission of China in December 2001, and more effective dispute resolution processes have been adopted, progress has been slower since the completion of the Uruguay Round in December 1993. The WTO's most recent concerns, including those connected to EU agricultural subsidies and tariff protection for US farmers, have been revealed during the current Doha round deadlock (Sherlock & Reuvid, 2008). Even though this agreement was prepared by considering many things and continues to be perfected today (Table 1).

**Table 1.** Key events in the Doha Round.

| Date | Event |
|---|---|
| 14 November 2001 | The round is launched by the Doha Ministerial Declaration. |
| 1 February 2002 | The Trade Negotiations Committee (TNC) agrees on how to organize the negotiations; chairs for the negotiating groups are chosen two weeks later. |
| 31 March 2003 | Members miss deadlines in the agricultural and services talks. |
| 13 August 2003 | The European Community and the United States released a joint agricultural text that was soon criticized sharply by other agricultural exporters. |
| August, 2003 | The G20 forms in opposition to the joint EC–US agricultural proposal. |
| 10-14 September 2003 | The Fourth Ministerial Conference in Cancún failed, with agriculture and Singapore issues being the most controversial topics. |
| 2 August 2004 | The "July Package" creates a partial framework for the conclusion of the round. |
| 1 January 2005 | The original deadline for completing the round is missed. |
| 13-18 December 2005 | The Sixth Ministerial Conference in Hong Kong produced an agreement to eliminate agricultural export subsidies, but other agricultural issues are stalled. |
| 30 April 2006 | Negotiators miss the NAMA and agriculture deadlines set in Hong Kong. |
| 24 July 2006 | Director-General Pascal Lamy suspends the negotiations after a G6 fails to break an impasse on agriculture. |

| | |
|---|---|
| 31 January 2007 | Mr Lamy calls for a full resumption of negotiations at a meeting of the TNC. |
| 12 April 2007 | G4 talks begin in Delhi focusing on concrete priorities and sensitivities. |
| 21 June 2007 | The G4 process breaks down at a meeting in Potsdam. |
| 8 February 2008 | The chairs of the NAMA and agriculture negotiating groups issue revised drafts. |
| 21-29 July 2008 | A mini-ministerial in Geneva comes close to solving the round but fails when the Indian and US ministers disagree on an agricultural safeguard and other issues. |
| 6 December 2008 | The chairs of the negotiating groups issue revised drafts. |
| 21 April 2011 | The chairs of the negotiating groups issue status reports. |

Source: VanGrasstek (2013)

The three key topics of negotiations for the Doha Round of trade talks are, first, boosting cross-border service sectors; second, decreasing agricultural subsidies and protectionism; and third, lowering industrial tariffs (Fung & Siu, 2008). WTO countries who are sensitive to agricultural imports would prefer that any formulas used to reduce tariffs be less severe in structure and changed with greater flexibility. Eliminating various import taxes will have an impact on producer prices due to their ability to develop high-quality, efficient items. It will also affect the decline in production factors and domestic pricing in the majority of developing and developed countries (Qin, 2005; Countryman & Narayanan, 2017). The commitment to eliminate agricultural export subsidies comes next. It covers not just blatant subsidies, but also programs like export credits, state trading firms, and food aid that can have the same impact (VanGrasstek, 2013).

These various activities are stages toward achieving EG, which occurs not only in the flow of international goods and services but also in other fields. Lots of labors have moved from industrialized countries to emerging markets, and millions of individuals of all skill levels have traveled throughout the world. Finance has also become more global: people can now invest in firms all over the world and buy financial products (stocks and bonds). People can simply and rapidly exchange dollars for euros and most other currencies, and the rates at which people exchange money regularly and dramatically (Salvatore, 2013).

After 1994, the study of AoA processes (Fafchamps & Minten, 2002), impacts (Angelsen & Kaimowitz, 1999; Winters et al., 2004), barriers (Ghosh, 2010), and related issues developed

rapidly. Studies on EG are becoming more and more attractive as new agreements emerge, such as the Doha Round in 2002 (Hepburn & Bellmann, 2009) and the Bali package in 2014 (Dufour & Pavot, 2020). There are also significant events in the world that have had an impact on this topic, including the world food crisis in 2007 (Sasson, 2012), the Covid-19 pandemic (Nugroho, 2021b), and most recently the conflict between Russia and Ukraine (Pereira et al., 2022).

In practice, EG has many effects, especially in the agricultural sector. EG has been shown to increase agricultural production (Ding et al., 2016; Kamran et al., 2021). This is due to several reasons, such as the increased use of agricultural production factors (Jorgenson, 2007; Jorgenson & Carolina, 2008), farmers' motivation to meet rising domestic and international market demand (Murray, 2000; Erokhin, 2016), government efforts and policies to increase food production (Salim, 2015) and expansion the international food organization's role (Paarlberg, 2002; Díaz-Bonilla, 2010).

Increased food production in countries will have an impact on food security (Mihalache-O'keef & Li, 2011). However, Pirkle et al. (2015) disagreed, claiming that EG adds to food insecurity in the countries. This is because EG might induce market volatility and food price swings, limiting economic access in developing countries (Yigletu, 1997; Díaz-Bonilla, 2010; Josling, 2012). There are still over 842 million malnourished individuals around the world and in the latest years, this situation further deteriorated (Salim, 2015).

Furthermore, EG increases a country's openness and reliance on food imports, reducing self-sufficiency capacity (Gulati, 2000; von Braun, 2002; Urrego-Mesa, 2021). Hence, when there is a global food crisis, these countries will be affected (Yigletu, 1997; Atici, 2005; Winkel et al., 2016). For example, food prices climbed throughout the first half of the 1970s, increasing concerns about social and political stability in developing countries that import food (Díaz-Bonilla, 2010). Another example is that the global financial crisis created an economic downturn and decreased consumer spending power in both developed and developing countries. As a result, farmers have to deal with changeable market conditions for their products (Swaffield & Primdahl, 2010).

The confrontation between Russia and Ukraine is another example that has hurt both countries, as well as others. One month after the conflict began, in March 2022, global food prices skyrocketed. Maize prices rose by 14.66%, soybeans by 8.91%, and wheat by 24.53%. This condition will jeopardize the fulfillment of the Sustainable Development Goals (SDGs),

particularly zero hunger. Even the FAO estimates that 8 to 13 million more people may become undernourished globally in 2022-2023 (Nasir et al., 2022).

Apart from production, food quality has improved since the establishment of food certification. Farmers and agricultural enterprises will compete to produce the best agricultural goods based on consumer demand. Today's consumers are extremely concerned about the quality and safety of their food. In truth, there are countless incidents of food fraud in the market (Table 2). Food certification also helps to increase market access in other nations. For example, farmers in India who already have organic certification from "Indocert" can sell their products in the European and North American markets (Thottathil, 2014). This is what the globalization of food quality standards is attempting to address, and EG is one approach to do it.

**Table 2**. Example of food fraud in the market

| Type of fraud | For example in food product | Example in packaging product |
|---|---|---|
| Substitution | Mineral oil to replace vegetable oil | Nonsustainable source of material in packaging material sold as “100% from sustainable source” |
| Mislabeling | Declaration of the wrong country of origin | Material containing BPA in a packaging labeled as ”BPA-free” (Bisphenol A) |
| Adulteration | Addition of forbidden dyer in a product to enhance its color | Multi-layers PET film sold with fewer layers |
| Counterfeiting | Copy of a big brand, using downgraded quality of ingredients | Copy of a big brand, using downgraded quality of components |

Source: IFS (2021)

Today's growing consumer demand has prompted companies to become more concerned about food quality. Various food certifications and laws have evolved to do this (Barrett et al., 2002; Josling, 2012; Qiang et al., 2020). For example, free of Sanitary and Phytosanitary Measures content and organic certification are essential to assure food quality and safety (Paarlberg, 2002s).

Food certification also makes tracking the origins of food easier in the event of a problem (Opara & Mazaud, 2001).

Other certifications to consider include the Business Social Compliance Initiative and The Ethical Trade Initiative. This regulates labor use, including the ban on child labor. The Europe Standard Association notes several important points, regarding food safety (General Food Law by EU, HACCP, and Quality Minima Document of the European Spice Association/ESA such as being free of contaminants (aflatoxin, pesticides, and salmonella), falling under the maximum radiation limit (average overall dose maximum absorbed radiation is 10 kg), and complying with additive regulations (European Spice Association, 2018).

On the other hand, this certification is regarded as a trade barrier because many agricultural products from developing countries are unable to meet it and are refused entry to developed countries (Diao et al., 2002). This is exacerbated by the fact that many certified farmers cannot sell their whole production at certified prices (Méndez et al., 2010). For example, Italy banned Egyptian pepper because it had more pesticides than allowed. Pesticides in food must comply with the EU's Regulation 540/2011. For pesticides that are not yet regulated, the Maximum Residue Levels will be set to the default level of 0.01 mg/kg (Camanzi et al., 2019).

Finally, EG can contribute to increased food diversification and supply chain efficiency (Renard, 1999). Agricultural production factors and food are becoming more readily available and traceable (Opara & Mazaud, 2001). Many new food processing businesses have emerged in developing countries and increased food diversification (Camargo & Wang, 2015). Furthermore, many multinational agricultural corporations invest in developing countries and link upstream and downstream (vertical integration). They act not only as providers of agricultural production factors but also as producers, processors, and retailers (Biles et al., 2007). Likewise, in developed countries, EG can boost raw material availability for industry while also ensuring the food supply (Renard, 1999). This makes food more accessible to customers (Nelson et al., 2016).

As previously stated, EG has theoretically enabled farmers in developing countries to sell their products to a bigger market. Due to increased consumer demand, farmers and business people compete to raise the volume of agricultural trade and competitiveness (Figure 5) (Murray, 2000; Hopewell, 2013; Serrano & Pinilla, 2014; Prasad, 2015; Schwarz et al., 2015; Todirica et al., 2018; Qasim et al., 2020; Ghazal et al., 2021; Guo et al., 2021). For example, coffee has been a local commodity in Guatemala since the Mayan era. Foreign tourists and coffee drinkers both at home

and abroad can now purchase this product (Steinberg et al., 2014). This phenomenon can indicate that the agricultural competitiveness of many countries throughout the world is increasing.

Between 1986 and 2016, overall agricultural physical trade expanded by 2.55 times through a progressive growth trend (Qiang et al., 2020). This trade is supported by the specialization of agricultural commodities in each country (Nelson et al., 2016; Urrego-Mesa, 2021). This is similar to Adam Smith and David Ricardo's theory that free trade drives a country to specialize. As a result, each country's agricultural trade becomes more competitive (Losch, 2004; Abbas & Waheed, 2017). Furthermore, many producers can increase their earnings and enhance their living (Nigh, 1997).

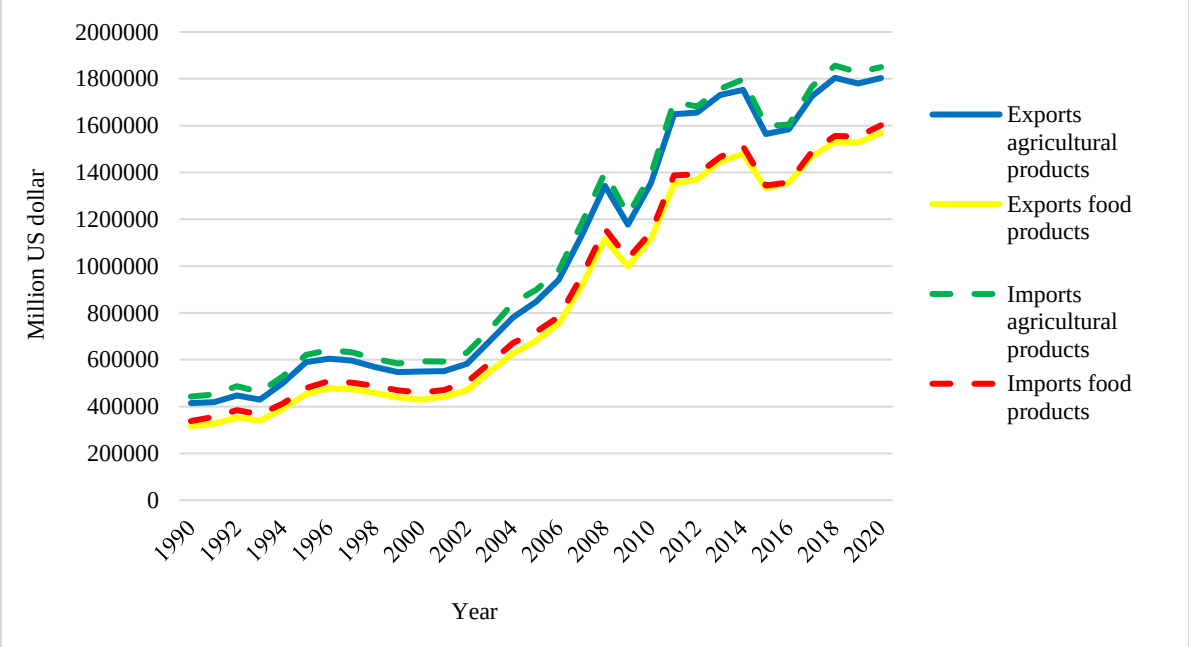



**Figure 5**. Export and import of agricultural and food products in the world 1990-2020

Source: WTO (2021)

This point of view is still hotly debated. According to Meher (2009), EG failed to provide small farmers with a better and more sustainable livelihood. They are unable to compete with farmers or businesses that use cutting-edge technologies because they lack the technical skills and financial resources to do so (Nugroho, 2021). EG also leads farmers to lose agricultural land since it was purchased by a foreigner, limiting access to state agriculture (Todirica et al., 2018). They

finally went bankrupt, lost their jobs, became frustrated, and even committed suicide (Ghosh, 2009; Cheshire & Woods, 2013; Pirnea et al., 2013; Pirkle et al., 2015).

Another issue is that many countries impose trade barriers (both tariff and non-tariff). Countries with competitive production sectors and high export potential have pushed for more open markets, but those that are less competitive and concerned about bad consequences for their farmers have been unwilling to push for further liberalization. Similarly, many governments intervene through subsidized programs (Goss & Burch, 2001; Diao et al., 2002; Bullion, 2003).

Import tariffs will affect agriculture in two ways. The first effect of lowering tariffs on intermediate inputs is to boost aggregate agricultural output and competitiveness. It allows for better and more inexpensive access to global inputs and is utilized to supply raw resources to industry (Chao et al., 2006). However, lowering import duties on finished agricultural products would have the opposite impact. Significant losses for agricultural enterprises and decreased exports since the growth of total imports will be greater than the growth of exports (Atici, 2005).

EG has a big economic influence on agriculture. EG increases economic growth, the share of agriculture in GDP, FDI inflow (Figure 6), and employment in agriculture; develops rural and urban areas; and alleviates poverty (Anderson, 2006; Reardon et al., 2007; Méndez et al., 2010; Ding et al., 2016; Kamran et al., 2021). However, economic growth is unequal, which leads to agricultural inequity. Only a few parties profit significantly from the agricultural trade. This discrepancy is also seen between developing and developed countries. Developed countries are thought to have monopolized global agricultural trade, therefore many earnings are concentrated in these countries (Reimer & Li, 2010).

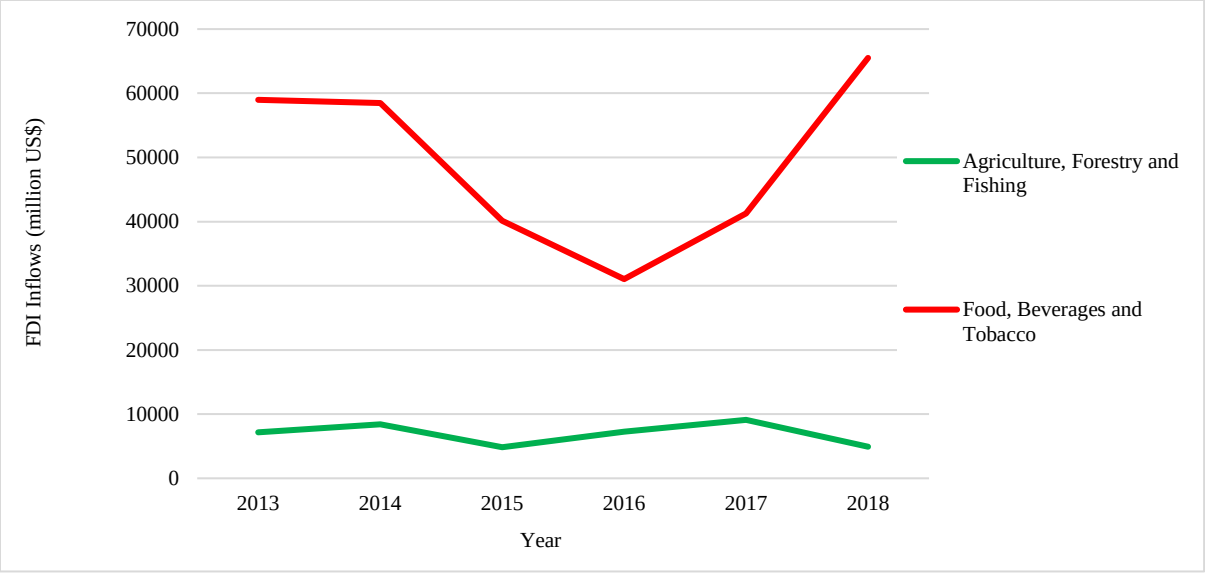



**Figure 6.** Agricultural FDI inflows in the world 2013-2018

Source: FAO (2021)

EG also does not boost productivity in terms of workforce development but rather affects the employment of child labor in agricultural activities (Table 3). Instead of attending school, many children prefer to labor on the farm (Minten et al., 2007; Lin, 2021). People also migrate from small farms to metropolis of several billion people. For example, the significant wealth differential between urban and rural areas attracts Kazakhstan's rural population to cities. Furthermore, in 2000, Kazakhstan's agriculture business had a per capita income of only 27.40% of the whole industry. A similar situation occurred in Tajikistan, where urbanization was extensive, as industrial workers earned 9.7 times more than farm laborers in 2018 (H. Ma & Sun, 2021). Many countries have also adopted policies that refuse to limit domestic agricultural assistance and instead open it to imports (Gulati, 2000). This demonstrates that EG influences social and political transformation (Murray, 2000; Ghosh, 2009; Méndez et al., 2010; Schipanski & Bennett, 2012; Winkel et al., 2016).

**Table 3.** The number of child laborers aged 5 to 17 in Asia by economic activity (in 2020)

| **Region** | **Children in employment (thousands)** | | | |
|---|---|---|---|---|
| | **Agriculture** | **Industry** | **Service** | **Total** |
| Eastern Asia | 7357.80 | 2025.10 | 4863.90 | 14246.90 |

| | | | | |
|---|---|---|---|---|
| South-Eastern Asia | 11778.90 | 2515.10 | 6249.20 | 20543.20 |
| Southern Asia | 20054.60 | 5299.10 | 6704.30 | 32058.00 |
| Central Asia | 1921.30 | 373.00 | 1143.70 | 3438.10 |
| Western Asia | 1364.80 | 330.60 | 1017.70 | 2713.10 |

Source: ILO (2021)

For the environment, EG has both positive and negative effects. EG increases pesticide and fertilizer use while enhancing resource efficiency (Jorgenson, 2007; Jorgenson & Carolina, 2008; Méndez et al., 2010; Lambin & Meyfroidt, 2011; Schwarz et al., 2015, Schwarz et al.,2019). Technology, improved plant types, and mechanization all contribute to the efficient use of land and other resources. Meanwhile, EG continues to harm resource sustainability (Atici, 2005; Schipanski & Bennett, 2012; Li et al., 2017). For example, irrigated commercial crops consume more groundwater (Ringler, 2005; Schwarz et al., 2019). Chemicals and resource overexploitation are the primary causes of environmental degradation and deforestation in developing countries. The commercialization of agriculture appears to have reduced agricultural business participants' concern for environmental sustainability (Hopewell, 2013s). For example, many policymakers, business executives, and governments in Asia promote clearing mountains, plateaus, and forests for agricultural land (Table 4) (Hodges et al., 2014).

**Table 4.** Land cover change from 2004 to 2019 in Asian developing countries (%)

| **Country** | **From sparse vegetation to cropland** | **From bare area to cropland** | **From shrubland to cropland** | **From tree cover to cropland** | **From inland water to cropland** | **From grassland to cropland** |
|---|---|---|---|---|---|---|
| Bangladesh | 0.00 | 3.80 | 3.00 | 0.80 | 2.60 | 6.40 |
| China (People's Republic of) | 2.60 | 0.60 | 2.30 | 1.30 | 0.30 | 0.80 |
| India | 0.20 | 0.10 | 1.00 | 1.00 | 0.20 | 0.50 |
| Indonesia | 0.00 | 0.00 | 12.60 | 6.50 | 0.90 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Kazakhstan | 2.30 | 0.20 | 0.00 | 0.70 | 0.40 | 4.70 |
| Kyrgyzstan | 0.50 | 0.10 | 0.00 | 1.30 | 0.00 | 2.60 |
| Malaysia | 0.00 | 0.00 | 0.00 | 9.00 | 1.40 | 0.00 |
| Mongolia | 0.90 | 0.00 | 0.00 | 3.20 | 0.20 | 1.00 |
| Pakistan | 0.60 | 0.40 | 0.00 | 0.30 | 0.00 | 0.60 |
| Philippines | 0.00 | 0.00 | 83.40 | 3.90 | 1.60 | 0.00 |
| Thailand | 0.00 | 0.00 | 2.80 | 0.30 | 0.60 | 2.10 |
| Vietnam | 0.00 | 0.10 | 3.70 | 1.40 | 0.80 | 0.30 |

Source: OECD (2020)

EG has a positive impact on infrastructure and R&D procurement, with no negative implications. First, EG contributes to the development of agricultural infrastructure (Mykhailov et al., 2021). Furthermore, agricultural farming is rapidly mechanized, resulting in enhanced yield (Ozogul, 2012). This also influences agro-industry upgrading, which increases the added value of agricultural products (Fold, 2000; Reardon & Barrett, 2000; Neilson et al., 2020). Second, EG promotes the transfer of technology and know-how from developed to developing countries. This is accomplished through several international research collaborations, FDI inflows, and trade cooperation (Tanaka et al., 1999; Malezieux, 2000; Parayil, 2003; Ozogul, 2012; Camargo & Wang, 2015; Song & Zhang, 2016).

# III. MATERIAL AND METHODS

## 3.1 Theory and Variable Selection

Advantage may be viewed from two perspectives. The initial view of advantage is from a comparative one. Advantage, in this context, is defined as a company's or country's ability to use its natural resources or production factors efficiently. Meanwhile, the second perspective takes a competitive stance. This approach highlights the role of non-natural resource factors like technology, legislation, and globalization in achieving advantage (Salvatore, 2013). Hence, this study is inclined towards the use of competitive advantage due to the wide role of various factors in today's competitiveness.

This study employed the Diamond Porter model to explain competitiveness-related characteristics. Porter identifies four elements that determine competitiveness: factor conditions; demand circumstances; related and supporting industries; and strategy, structure, and competition (Porter, 1990). I divide these four parameters into numerous variables. Land areas equipped for irrigation, agricultural employment, human capital, and temperature variables are included as factor conditions. Consumer prices are variables that represent the demand conditions. Mobile cellular subscriptions will represent related and supporting industries (technology). While exchange rates and economic globalization represent the strategy, structure, and competition.

## 3.2 Data Source

This study used panel data, which mixes time series and cross-sectional data. The time-series data in this analysis span from 1990 to 2020, whereas the cross-sectional data come from 71 developing and 24 developed countries (Table 5). I classified countries using IMF measures, which included both developing and developed countries. There are 25 developing countries in Africa, 16 in Asia, 18 in Latin America and the Caribbean, and the remainder in Europe and Oceania, including Brazil, China, Hungary, India, Indonesia, Nigeria, and South Africa. This study sample includes developed countries from America, Asia, Europe, and Oceania, such as Australia, Canada, France, the Netherlands, the Republic of Korea, the United Kingdom, and the United States, among others. Table 6 shows a list of additional explanatory variables and data sources that will be used in this research.

**Table 5.** List of developing and developed countries

| Developing Countries | | | Developed Countries |
|---|---|---|---|
| 1. Albania | 25. Fiji | 49. Nigeria | 1. Australia |
| 2. Bangladesh | 26. Gabon | 50. Pakistan | 2. Austria |
| 3. Benin | 27. Guatemala | 51. Panama | 3. Belgium |
| 4. Bolivia | 28. Guyana | 52. Paraguay | 4. Canada |
| 5. Botswana | 29. Haiti | 53. Peru | 5. Cyprus |
| 6. Brazil | 30. Honduras | 54. Philippines | 6. Czechia |
| 7. Brunei Darussalam | 31. Hungary | 55. Poland | 7. Denmark |
| 8. Bulgaria | 32. India | 56. Romania | 8. Finland |
| 9. Burkina Faso | 33. Indonesia | 57. Russia | 9. France |
| 10. Burundi | 34. Iran | 58. Rwanda | 10. Germany |
| 11. Cambodia | 35. Iraq | 59. Saudi Arabia | 11. Greece |
| 12. Cameroon | 36. Jamaica | 60. Senegal | 12. Iceland |
| 13. Chile | 37. Jordan | 61. South Africa | 13. Israel |
| 14. China | 38. Kenya | 62. Sri Lanka | 14. Italy |
| 15. Colombia | 39. Lesotho | 63. Sudan | 15. Netherlands |
| 16. Congo | 40. Madagascar | 64. Togo | 16. New Zealand |
| 17. Costa Rica | 41. Malawi | 65. Trinidad and Tobago | 17. Norway |
| 18. Democratic Republic of the Congo | 42. Malaysia | 66. Turkiye | 18. Portugal |
| 19. Dominican Republic | 43. Mali | 67. Uganda | 19. Republic of Korea |
| 20. Ecuador | 44. Mauritania | 68. United Republic of Tanzania | 20. Spain |
| 21. Egypt | 45. Mauritius | 69. Uruguay | 21. Sweden |
| 22. El Salvador | 46. Mexico | 70. Yemen | 22. Switzerland |

| | | | |
|---|---|---|---|
| 23. Eswatini | 47. Mongolia | 71. Zambia | 23. United Kingdom of Great Britain and Northern Ireland |
| 24. Ethiopia | 48. Nepal | | 24. United States of America |

**Table 6.** Data variable

| Variable | Symbol | Source |
|---|---|---|
| Agricultural Comparative Advantage | ACA | Index, calculated by the author |
| Temperature change ($^0$C) | TEMP | FAO |
| Industry (including construction), value added (annual % growth) | IND | World Bank |
| Population (000 people) | POP | World Bank |
| Consumption of renewable energy (% of total final energy consumption) | RENEW | World Bank |
| Total natural resources rents (% of GDP) | RENT | World Bank |
| Net Forest conversion (000ha) | CONV | FAO |
| Consumer price index (%) | CPI | IMF |
| Official exchange rate (LCU per US$) | EXC | Federal Reserve Economic Data |
| Economic globalization index | EGI | KoF |
| Land area equipped for irrigation (%) | IRRI | FAO |
| Mobile cellular subscriptions (per 100 people) | MOB | World Bank |
| Employment in agriculture, forestry, and fishing (000 people) | EMPL | ILO |
| Human capital index | HCI | Penn World Table |

Agriculture competitiveness refers to the ability of the agriculture sector to compete and achieve success. Competition can take place in the internal market (between enterprises or sectors in the same country) or on a global scale (between countries). Increased agricultural

competitiveness will improve the ability to offer products that fulfill demand (price, quality, quantity) while ensuring profits over the long run.

Agricultural competitiveness is developed from the ground up, starting with the on-farm, support, and post-harvest subsystems. These numerous activities have an impact, including changes in land use, the production of natural and chemical residues (manure, agrochemicals, fertilizers, and diesel emissions), as well as GHG emissions ($CO_2$, $N_2O$, and $CH_4$). (Engelbrecht et al., 2013). The reduction of GHG emissions in industrialized countries from fuel burning in agricultural, forestry, and fisheries economic activities is slower than the rate of economic growth (Jurkėnaitė et al., 2022). In other words, various agricultural operations will induce temperature increases.

Temperature change explains annual data on average surface temperature changes by country. In the last 30 years, the average global surface temperature has risen by 0.2 degrees Celsius every decade (Hansen et al., 2006), whereas precipitation has decreased (Trenberth, 2011). As a result, worldwide food production, agricultural employment, and producer net income have declined (Melo & Foster, 2021). Meanwhile, farmers are having problems securing water for their crops and have begun limiting the number of planting periods (Chiarelli et al., 2022). This is an especially concerning issue in places where water has long been scarce, such as the Middle East and North Africa (MENA). In fact, MENA is critical in supplying food to European, Asian, and American countries (Freund & Braga, 2012). On the other hand, Arab countries are the world's largest net importers of grains (Keulertz & Woertz, 2015).

The other sector is industry, whose expansion boosts a country's economy while harming the environment. Climate change, including rising temperatures and $CO_2$, has been blamed on industrial emissions (Nassary et al., 2022). For example, air temperature would rise 1.3 to 1.8 $^0$C by the mid-century and 1.6 to 3.2 $^0$C by the end of the century in Hawaii's agricultural and livestock industries. This change will have an adverse influence on cattle (Adhikari et al., 2022). Mining, manufacturing (which is frequently recorded as a separate category), construction, electricity, water, and gas all contribute to industry value added.

Population growth is another factor that can increase temperature (Choi et al., 2022). The larger the population, the greater the economic activity, and hence the risk of harmful residues and emissions (Warsame et al., 2022). Population growth will increase agricultural and food waste.

Both incineration and landfilling have negative impacts on greenhouse gas emissions and environmental pollutants (Chen et al., 2022).

The rising global attention on natural environment protection and conservation for future generations has led to various research studies on renewable energy (Nowak et al., 2021). Renewable energy generation highlights the possibilities of employing alternate energy sources and becoming independent of fossil fuels. At the same time, using renewable energy to lower temperatures and reduce greenhouse gas emissions has major benefits (Paschalidou et al., 2016). Renewable energy consumption refers to the proportion of renewable energy in overall final energy consumption.

Natural resource rents, another natural-related element, are positively correlated with temperature (Chatzopoulos & Lippert, 2015). Total natural resource rents are defined as the sum of oil rents, natural gas rentals, coal rents (hard and soft), mineral rents, and forest rents in total GDP. Total natural resource rents will place further strain on the ecosystem, including climate change and temperature increases (Batmunkh et al., 2022).

The conversion of forests to farmland contributes significantly to climate change. Forest conversion is the process of destroying natural forests (deforestation) so that the land can be used for other purposes. The temperature difference between the forest and the transformed land is 10.1 $^{0}$C, whereas the surrounding area suffers a 1.05 $^{0}$C increase (Sabajo et al., 2017). Vice versa, future temperature increases will result in a decrease in the extent of forest land (Choe & Thorne, 2017).

Consumer price indexes are index numbers that track changes in the prices of goods and services purchased or obtained by consumers. An official exchange rate is the rate at which one currency is converted into another. Because the exchange rate is a key factor in understanding international trade, it should affect export competitiveness (Kargbo, 2006). Volatile currency rates will reduce a country's agricultural competitiveness (Abbas, 2022). For example, from 1988 and 2001, South Africa's currency, the Rand, depreciated at a rate of 14% annually. This circumstance promotes exporters of fruit, wine, and sugar while hindering importers of more expensive items. South Africa's agricultural competitiveness was improving at the time. Between December 2001 and the end of 2004, the Rand rose by over 60% against the main currencies. As a result, exporters lose money due to lower product prices and diminished agricultural competitiveness (Day & Vink, 2019).

The economic globalization index is a composite indicator that assesses globalization in economic terms for practically every country in the globe. Infrastructure development, especially irrigation, is an important driver of increasing agricultural production and competitiveness (Calzadilla et al., 2013). Irrigation-ready land is land that can be fully controlled for irrigation utilizing surface, sprinkler, or targeted irrigation technologies. Infrastructure development will improve logistics and distribution while boosting economic efficiency. Furthermore, this could boost the competitiveness of agricultural products (Bojnec & Fertő, 2017). Other infrastructure, like as irrigation, was found to improve the agriculture industry's export competitiveness (Huo, 2014). Efficient irrigation is required in modern agriculture to lower production costs and boost competitiveness (Ren et al., 2022).

Mobile cellular telephone subscriptions are for public mobile telephone services that use cellular technology. Farmers who own mobile phones have easy access to market information and can connect with market actors, allowing them to create high-quality products (Neglo et al., 2021). Farmers can also learn correct pesticide application and production strategies. Farmers can use mobile phones for a variety of transactions, including mobile payments and supplier cooperation (Fetai et al., 2016). There are examples of ICTs which can reduce marketing costs in rural Niger by 50%. Meanwhile, E-Choupal, an agricultural trading platform in India, has shown a rise in farmers' sales prices. The ICTs are useful not only for farmers but also for other market participants and the government. In Africa, Haiti, Afghanistan, and some Central American countries, market information from the Famine Early Warning System Network has been shown to reduce the incidence of panic-driven price surges (FAO, 2017b).

Another major component in boosting agricultural competitiveness is the availability and quality of human resources. Employment in agriculture, forestry, and fisheries refers to the number of people employed in the sector each year per country. Agricultural competitiveness skyrockets when labor expenses are kept low (Sarker & Ratnasena, 2014). The human capital index is based on average school years and an expected rate of return on education. Education will help farmers grasp a wide range of technology options and decision-support tools for sustaining their livelihoods (Rodenburg et al., 2011). Meanwhile, agricultural extension may assist farmers with seed variety selection, fertilizer application, and effective agricultural product marketing. As a result, agriculture will be able to provide maximum competitiveness while also driving rural poverty reduction (Neglo et al., 2021).

### 3.3. Data analysis

Following the collection of data from multiple sources and the determination of the variables in this study, the following step is to design the analytical model based on the study's hypothesis. The first and second hypotheses were tested using Revealed Comparative Advantage analysis. The approach is suitable given the increasing volume of agricultural commerce, the use of technology, and the application of diverse trade regulations.

The second analysis is the 3-stage least squares equation (3-SLS) to prove the third hypothesis. This model will analyze the explanatory variables in Table 6: Consumer price index, official exchange rate, economic globalization index, land area equipped for irrigation, mobile cellular subscriptions, employment in agriculture, forestry, and fishing, and human capital index. The reasons for selecting these explanatory variables have been explained both according to Diamond Porter's theory (section 3.1) and various literature (section 3.2). The 3-SLS model was chosen due to the strong relationship between the explanatory variables, particularly ACA and TEMP. and often known as the endogeneity issue. There are 4 tests related to this model: 1. unit root test as a pre-estimation test, 2. The Hausman test, 3. Stock & Yogo test, and 4. the Sargan test.

#### 3.3.1. Agricultural competitiveness of a country (ACA)

The first analysis model utilized in this study is intended to prove the first and second hypotheses. ACA can be calculated using Revealed Comparative Advantage (RCA). RCA is often used to determine a country's product competitiveness in international trade and its ability to gain from bilateral trade. This method computes comparative advantage by examining a country's export trade flow for specific items and markets (French, 2017).

Bela Balassa was among the Hungarian economists who used 1951 data to validate this idea. The data used are the ratio of US to British exports in 1951 and the ratio of US to British labor productivity in 26 manufacturing industries. The Balassa index of the revealed comparative advantage (RCA) approach was born as a result of this (Krugman & Obstfeld, 2003; Salvatore, 2013). Currently, global trade is a combination of resource, technology, and policy issues, thus the findings of this estimate are associated with competitiveness.

Individual countries' trade performance in terms of manufacturing products can provide insight into RCA. The trade product trend incorporates both relative costs and variations in non-price

elements. For one side, comparative advantage would be necessary to identify the export structure; for the other, export-import ratios would indicate relative advantages under the assumption of taste uniformity and the occurrence of duties in each country's industry. While the heterogeneity of statistical commodity groupings permits exports and imports to occur within the same grouping, the larger a country's advantage in manufacturing the products in question, the higher the ratio of the FOB value of exports to imports (Balassa, 1965). RCA can also compute the revealed competitive advantage based on the share of the type of goods or services in a given country's exports as well as worldwide exports to that country (Deardorff, 2011).

Individual industries' export performance in a specific country can be analyzed using the RCA model by (a) comparing a country's relative shares in global exports of individual commodities and (b) tracking changes in relative shares over time. The requirements for the RCA method are as follows (Balassa, 1965):

$$\frac{X_{ij}^{0}}{X_{nj}^{0}} / \frac{X_{it}^{0}}{X_{nt}^{0}} = \frac{x_{ij}^{0}}{x_{i}^{0}} \quad (1)$$

$$\frac{X_{ij}^{1}}{X_{nj}^{1}} / \frac{X_{it}^{1}}{X_{nt}^{1}} = \frac{x_{ij}^{1}}{x_{i}^{1}} \quad (2)$$

$$\frac{x_{ij}^{1}}{x_{i}^{1}} / \frac{x_{ij}^{0}}{x_{i}^{0}} \quad (3)$$

where: (1) the relative share of the country i's exports of commodity j in the first period; (2) the relative share of the country i's exports of commodity j' in the second period; and (3) the ratio of the relative share of country i's exports of commodity j in the second period to that in the first period.

Explanation of symbols: X = exports, x = relative share of exports. 0 = average for the first period, I = average for the second period, i = country i, n = aggregate countries taken together, j = product j, and t = total products.

RCA measures the agricultural export performance of developing and developed countries (Balassa, 1965):

$$RCA_{ij} = \left(\frac{X_{ij}}{X_{it}}\right) / \left(\frac{X_{ej}}{X_{et}}\right) \quad (4)$$

where: $X_{ij}$ = the current year's total value of agricultural exports of a country (US Dollars), $X_{it}$ = the current year's total value exports of a country (US Dollars), $X_{ej}$ = the current year's total value of agricultural exports of all countries (US Dollars), and $X_{et}$ = the current year's total value exports of all countries (US Dollars). The formula produces the following results: 1) a country has a competitive advantage if the index generated by the RCA calculation is greater than 1 or the first and second hypotheses of this study were proven, and 2) a country has a competitive disadvantage if the RCA value is less than 1 or the first and second hypotheses of this study were unproven.

### *3.3.2. Determinant of ACA*

In the second analysis model, this study will prove the third hypothesis. Before proceeding with the empirical analysis, a unit root test is performed first. The stationarity test was used to eliminate spurious regression induced by nonstationary time-series data over the period. Stationary data satisfies the following criteria: the mean and variance are constant across time, and the covariance between two-time series data depends only on the lag between the two time periods.

$$E(Y_t) = \mu \qquad \text{Y mean constant} \qquad (5)$$

$$\text{var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2 \qquad \text{Y variance constant} \qquad (6)$$

$$Y_k = E(Y_t - \mu)(Y_{t+k} - \mu) \qquad \text{covariance} \qquad (7)$$

A widely used method for testing stationary problems is the unit root test.

$$Y_t = pY_{t-1} + v_t \qquad -1 \leq p \leq 1 \qquad (8)$$

$v_t$ is error variables that are random or stochastic with an average of 0, constant variance, and are not related to each other (non-autocorrelation). The error variable Y has a unit root if p = 1. The data is not stationary and moves randomly if the time series data has a unit root.

Equation (8) minus $Y_{t-1}$: in both sides

$$Y_t - Y_{t-1} = pY_{t-1} - Y_{t-1} + v_t \qquad (9)$$

$$= (p-1)\, Y_{t-1} + v_t$$

Equation (9) can be written

$$\Delta Y_t = \Phi Y_{t-1} + v_t \qquad (10)$$

Equation (10) needs to be estimated using $H_0$: Φ = 0. If = 0 and p = 1, so Y contains unit root or data is not stationary; equation (10) can be written as:

$$\Delta Y_t = v_t \quad (11)$$

cause $v_t$ is error variable has white noise, the first difference from the data is stationary. One type of test is used to evaluate the stationarity of the variables, including Levin Lin Chu (Levin et al., 2002):

$$\Delta Y_{it} = \alpha Y_{it-1} + \sum \beta_{it} \Delta Y_{it} - j + X_{it}\delta + v_{it} \quad (12)$$

$Y_{it}$ is the pooled variable, $X_{it}$ is an exogenous variable, $v_{it}$ is the error term.

In practice, the explanatory variables used in this study are interconnected, particularly ACA and TEMP. According to the Environmental Kuznets Curve (EKC) theory, a country's economic activity increases its level of environmental harm. The EKC also describes when a country's income is still low, its attention will be focused on increasing income by ignoring environmental quality problems. As a result, rising incomes will be followed by rising pollution, which will eventually fall with sustained growth (Mason & Swanson, 2003). Meanwhile, according to the Diamond Porter model, a country's TEMP determines its ACA.

Based on that, I performed the three-stage least squares (3SLS). The 3SLS model was chosen because the study model, notably the TEMP, has endogeneity issues. Endogeneity occurs when the TEMP is meant to influence ACA; but other variables, including ACA, affect the TEMP simultaneously (Batmunkh et al., 2022). This model is also widely used in economic relations which are not only one effect but are mutually influencing.

Endogenous variables create errors and correlate with one another, rendering the standard least squares model ineffective (endogeneity problem). Endogenous variables have values that are determined within the model, whereas exogenous variables are determined outside of the model. When endogeneity is identified in a simultaneous equation, the 3SLS can be used to solve it.

The 3SLS model uses an instrumental variable technique to integrate calculations (step 1). The residuals from step 1 are then utilized to accurately estimate the covariance matrix of the

disturbance equation (step 2). Finally, it uses the generalized least squares (GLS) model to calculate the correlation structure in each equation (step 3) (Greene, 2003).

Equation 13:

$$TEMP = \beta_0 + \beta_1 ACA + \beta_2 IND + \beta_3 POP + \beta_4 RENEW + \beta_5 RENT + \beta_6 CONV + \mu \quad (13)$$

Equation 14:

$$ACA = \gamma_0 + \gamma_1 TEMP + \gamma_2 CPI + \gamma_3 EXC + \gamma_4 EGI + \gamma_5 IRRI + \gamma_6 MOB + \gamma_7 EMPL + \gamma_8 HCI + d_{it} + \sigma \quad (14)$$

$d_{it}$ = cross-country heterogeneity. This variable represents the differences in conditions and policies between countries that are not included in the study's explanatory variables.

The reformulation of equations (13) and (14) is called the reduced form of the structural equations system. The reduced form is obtained by substituting TEMP equation (13) into equation (14):

$$ACA = \gamma_0 + \gamma_1 (ACA + IND + POP + RENEW + RENT + CONV) + \gamma_2 CPI + \gamma_3 EXC + \gamma_4 EGI + \gamma_5 IRRI + \gamma_6 MOB + \gamma_7 EMPL + \gamma_8 HCI + d_{it} + \sigma$$

$$ACA - \gamma_1 ACA = \gamma_0 + \gamma_1 IND + \gamma_1 POP + \gamma_1 RENEW + \gamma_1 RENT + \gamma_1 CONV + \gamma_2 CPI + \gamma_3 EXC + \gamma_4 EGI + \gamma_5 IRRI + \gamma_6 MOB + \gamma_7 EMPL + \gamma_8 HCI + d_{it} + \sigma$$

$$ACA = \frac{\gamma_0}{1-\gamma_1} + \frac{\gamma_1}{1-\gamma_1} IND + \frac{\gamma_1}{1-\gamma_1} POP + \frac{\gamma_1}{1-\gamma_1} RENEW + \frac{\gamma_1}{1-\gamma_1} RENT + \frac{\gamma_1}{1-\gamma_1} CONV + \frac{\gamma_2}{1-\gamma_1} CPI + \frac{\gamma_2}{1-\gamma_1} EXC + \frac{\gamma_2}{1-\gamma_1} EGI + \frac{\gamma_2}{1-\gamma_1} IRRI + \frac{\gamma_2}{1-\gamma_1} MOB + \frac{\gamma_2}{1-\gamma_1} EMPL + \frac{\gamma_2}{1-\gamma_1} HCI + \frac{1}{1-\gamma_1} d_{it} + \frac{1}{1-\gamma_1} \sigma$$

$$ACA = \pi_0 + \pi_1 IND + \pi_1 POP + \pi_1 RENEW + \pi_1 RENT + \pi_1 CONV + \pi_2 CPI + \pi_2 EXC + \pi_2 EGI + \pi_2 IRRI + \pi_2 MOB + \pi_2 EMPL + \pi_2 HCI + d_{it} + v_t \quad (15)$$

Equation (12) is the derivative equation for the ACA function

$$\pi_0 = \frac{\gamma_0}{1-\gamma_1} \qquad \pi_1 = \frac{\gamma_1}{1-\gamma_1} \qquad \pi_2 = \frac{\gamma_2}{1-\gamma_1} \qquad v_t = \frac{1}{1-\gamma_1} \tag{16}$$

$\pi_0, \pi_1$, and $\pi_2$ are reduced form parameters and $v_t$ is reduced form residual.

$\sigma$ residual has E($\sigma$) = 0, var ($\sigma$) = $e^2$, and cov($\sigma_t, \sigma_s$) = 0 for t≠s, so that the reduced form has the following properties:

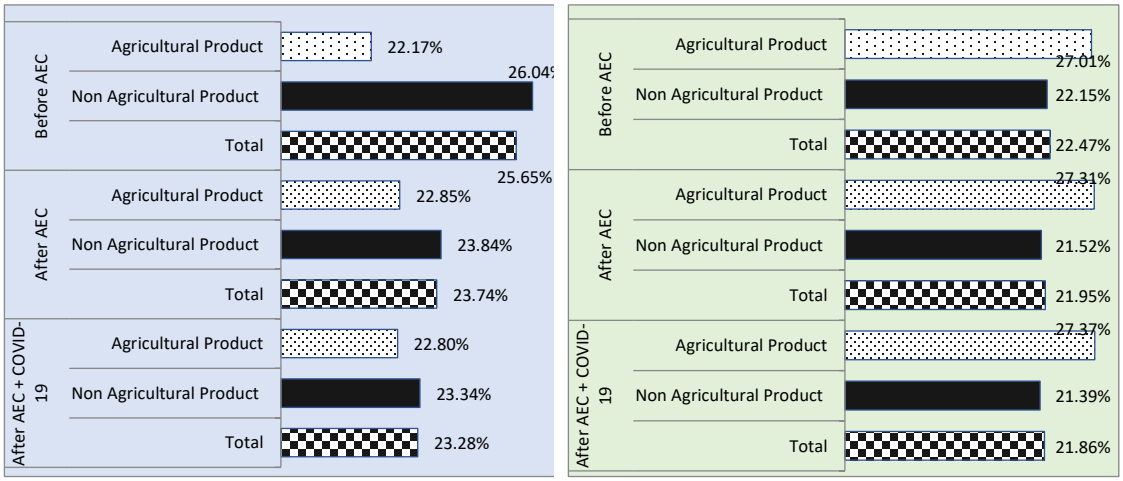
E($v_t$) = 0, var ($v_t$) = $e^2$, and cov($v_{t_t}, v_{t_s}$) = 0

The 3SLS model must pass many post-estimation criteria to be considered valid. The post-estimation tests for the 3SLS model include (Greene, 2003): 1) an endogeneity test using the Hausman method to examine whether endogenous variables are related to error variables. The Hausman test procedure was carried out by looking for the reduced form residual ($v_t$). $H_0$ there is no simultaneity problem if the $v_t$ coefficient is not statistically significant, 2) A weak instrument test utilizing the Stock & Yogo method, and 3) An identification restriction test with the Sargan method. The 3SLS model is valid if it meets these three criteria. First, the model must have an endogeneity problem, which means that the dependent variables in two or more equations influence each other simultaneously (J. Li et al., 2021). If this happens, multiple linear regression will be inefficient and may result in a biased estimate (Hill et al., 2021). Second, the 3SLS model must meet the assumption that the model's instrument variables are highly correlated with endogenous regressors (J. Choi et al., 2018). Third, the 3SLS model must meet the identification restriction test conditions, which are valid when the compiled model is just-identified or over-identified (Mariano, 2007).

# IV. AGRICULTURAL COMPETITIVENESS IN DEVELOPING AND DEVELOPED COUNTRIES

## 4.1. Agricultural Competitiveness in Developing Countries

Agricultural competitiveness in this study is related to export and import performance. Higher competitiveness indicates the performance of a country's agricultural exports is higher than its imports (Figure 7). Unfortunately, agricultural exports and competitiveness have been disrupted by several shocks in the world. For example, following the Covid-19 pandemic, agricultural commodities exports in the intra-ASEAN market fell marginally to 22.80%. Meanwhile, the share of agricultural product imports from the intra-ASEAN market increased marginally to 27.37%. According to this data, transactions in the intra-ASEAN market are often modest, accounting for less than 30%. This position illustrates that the function of the intra-ASEAN market has not yet predominated the trade transactions of ASEAN members, notably in agricultural products (Jamhari et al., 2021).

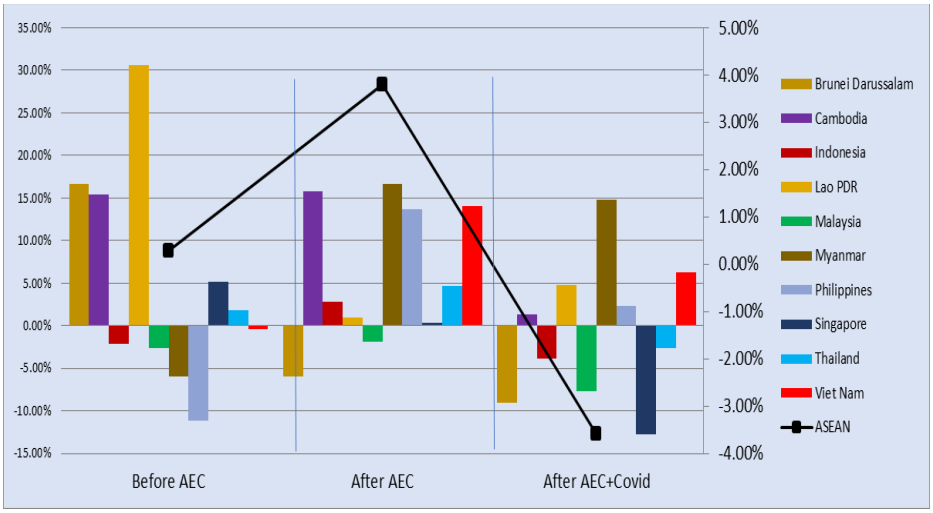



(a) (b)

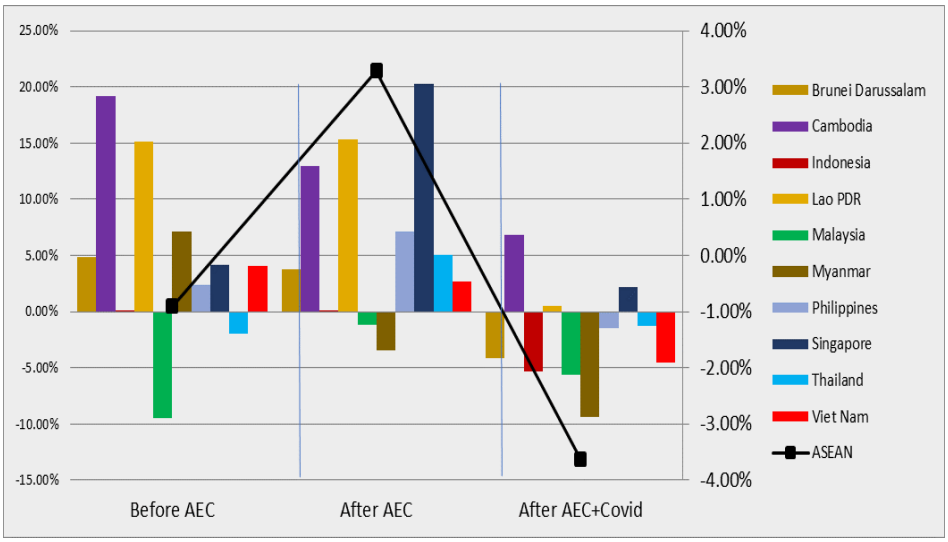
**Figure 7.** (a) Intra-ASEAN export share by product groups; (b) Intra-ASEAN import share by product group

The Covid-19 pandemic has also had a significant negative impact on agricultural products export performance in Southeast Asian countries. The average value of export increase for SEA agricultural commodities has decreased by more than 10% in both intra-ASEAN and extra-

ASEAN markets. This condition is inversely proportional to the period when the ASEAN Economic Community was established and before the Covid-19 pandemic, when agricultural product exports to the two destination markets surged dramatically, by an average of more than 20%. This performance is significantly better when the AEC is not yet applied (Figure 8). Many countries, notably Cambodia, Lao PDR, Myanmar, the Philippines, and Vietnam, have been successful in sustaining agricultural product export performance within the ASEAN region. Meanwhile, ASEAN's supplementary markets, Cambodia, Lao PDR, and Singapore, are seeing record export growth rates. Although Singapore is not a producer of agricultural commodities, it can nonetheless enhance re-export activities for these commodities (Jamhari et al., 2021).



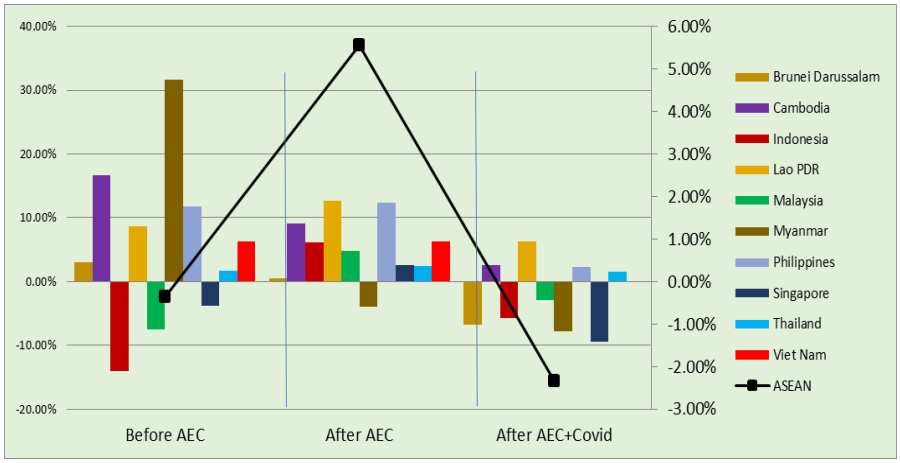

(a)



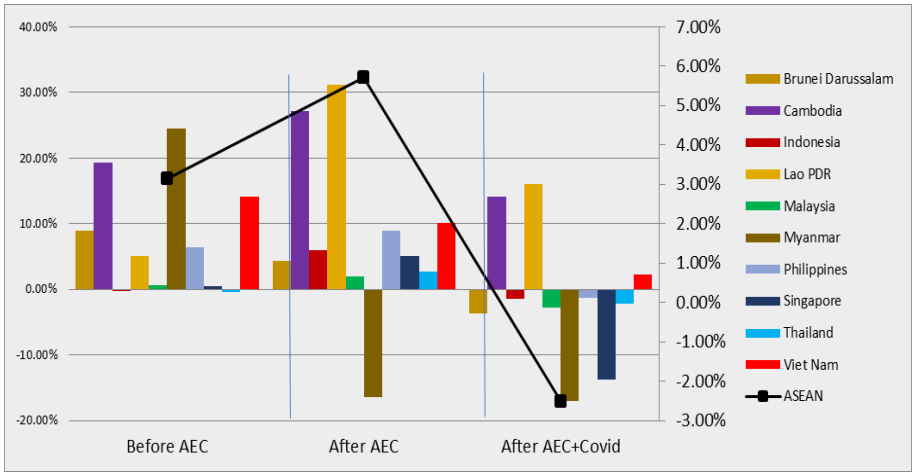

(b)

**Figure 8.** (a) Intra-ASEAN average export growth of agricultural products; (b) Extra-ASEAN average export growth of agricultural products

Shrinking performance has also affected agricultural commodity imports in both intra-ASEAN and extra-ASEAN markets. Overall, import growth slowed following the Covid-19 pandemic. When the AEC first went into effect, imports of SEA agricultural commodities grew significantly. The drop in import rates reflects a slowdown in ASEAN's overall transactions. However, following the Covid-19 outbreak, some countries expanded their agricultural commodities imports. Cambodia, Lao PDR, the Philippines, and Thailand are among the ASEAN countries with the highest import levels. Meanwhile, imports of agricultural commodities from the extra-ASEAN markets of Cambodia, Lao PDR, and Vietnam rose during the pandemic (Figure 9) (Jamhari et al., 2021).




(a)




(b)

**Figure 9.** (a) Intra-ASEAN average import growth of agricultural products; (b) Extra-ASEAN average import growth of agricultural products

Tables 7a-7f depict agricultural competitiveness in developing countries. Developing countries that are categorized as having agricultural competitiveness (ACA > 1) include Benin, Bolivia, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Ethiopia PDR, Fiji, Guatemala, Guyana, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Lesotho, Madagascar, Malawi, Malaysia, Mali, Mauritius, Nepal, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Rwanda, Senegal, South Africa, Sri Lanka, Sudan (former), Togo, Turkiye, United Republic of Tanzania, Uganda Uruguay, and Yemen. Meanwhile, countries that have lost their agricultural competitiveness (ACA < 1) include Albania, Bangladesh, Botswana, Brunei Darussalam, China,

Congo, Democratic Republic of the Congo, Gabon, Haiti, Hungary, Iran, Iraq, Mauritania, Mexico, Mongolia, Nigeria, Panama, Russian Federation, Saudi Arabia, Trinidad and Tobago, and Zambia. Therefore, hypothesis 1 of this study is unproven because there are developing countries that do not have agricultural competitiveness.

Romania is a developing country that has increased its agricultural competitiveness seven times in the last three decades. Several other countries have seen significant increases in agricultural competitiveness over the last three decades, including Brazil (58.94%), Egypt (29.38%), Indonesia (122.69%), Iran (195.45%), Jamaica (44.12%), Malawi (11,18%), Nepal (336.06%), Russian Federation (245.83%), South Africa (72.15%), Uruguay (60.80%), Yemen (61.54%), and Zambia (427.78%).

Brazil has great agricultural production and trade potential due to its size and developed land resources. Agricultural transportation infrastructure is also developing rapidly, such as paved roads, railroads, waterways, and storage (Fuller et al., 2003). This is still coupled with the Brazilian government having launched several programs, including agricultural research and credit, deregulating and modernizing the economy, and facilitating trade (Rada & Buccola, 2012). As a result, Brazil has the highest competitive advantage in beef, both fresh and preserved (Korinek & Melatos, 2009). Meanwhile, South Africa made extraordinary changes in agricultural policy and practice with reforms centered on domestic and foreign market deregulation (Mosoma, 2004). Zambia, another African country, prioritizes crop research investment, which is supplemented by improved infrastructure, institutions, and markets to increase agricultural competitiveness (Zhou et al., 2017).

The Russian Federation is one of the world's leading producers of food. Food production in Russia (wheat, maize, and barley) might increase by up to 64% (267 million tons) by 2030 (Deppermann et al., 2018). Russia is the world's fourth-largest wheat producer, after the EU, China, and India. At the same time, Russia is expected to produce 5.3 million metric tons of soybeans by 2022, placing it seventh in the world. Russia also produces 15.5 million metric tons of maize in the same year (Nasir et al., 2022). Russia has extremely high food crop output due to its fertile agricultural environment, also known as "black soil" (Zhao et al., 2020). Russia's substantial significance is further highlighted by the country's changing food production, which is a key source of uncertainty for global food markets (Araujo-Enciso & Fellmann, 2020).

Southeast Asian countries, such as Indonesia, achieve high competitiveness in crop and crop processing, wood. and fisheries sectors such as rice, natural rubber, spices, fixed vegetable fats and oils, wood chips, fuelwood, fish, and crustaceans. Indonesia reforms its agricultural trade policy in the 1980s and 1990s, lowering agricultural export tax rates and eliminating export restrictions. These improvements may boost farm prices and agricultural export volumes. This was further strengthened after the effective implementation of the AEC increased the awareness of every Southeast Asian country to trade both with other countries in the same region as well as non-member countries (Jamhari et al., 2021). All of these policies must be executed since enhanced competitiveness will increase prices, income, trade, efficiency, labor, technology adoption, food security, and human capital (Almeida et al., 2020; Goel et al., 2021; Nugroho et al., 2021; Qasim et al., 2020).

However, countries such as Botswana (-50.00%), Brunei Darussalam (-75.00%), China (-65.67%), Dominican Republic (-55.06%), El Salvador (-55.51%), Eswatini (-44.96%), Ethiopia (-36.16%), Guyana (-63.53%), Honduras (-53.55%), Hungary (-63.26%), Lesotho (-54.55%), Madagascar (-22.19%), Mali (-73.42%), Mauritania (1262.5%), Mauritius (-108.88%), Mongolia (-77.82%), Paraguay (-13.62%), Philippines (-38.04%), Rwanda (-73.88%), Senegal (-29.06%), Sudan (-45.66%), Togo (-26.84%), Türkiye (-47.10%), the United Republic of Tanzania (-53.44%), and Uganda (-54.44%) have lost their competitiveness. The country with the most drastic decline in agricultural competitiveness in the last 3 decades is Panama. Meanwhile, agricultural competitiveness in countries such as Benin, Bolivia, Fiji, Iraq, Kenya, and Pakistan has stagnated. Thus, most of the developing countries experienced a decline in agricultural competitiveness.

According to trade theory, developing countries should have agricultural competitiveness due to their abundance of natural resources. Most developing countries continue to rely on abundant natural resources and low labor costs to obtain international advantages through intensive and small-scale agriculture (Yang Lu et al., 2021). However, the agricultural policy bias in developing countries makes it difficult to capitalize on this competitiveness.

There are other internal challenges in developing countries themselves, such as a shortage of human resources. This includes a lack of knowledge and skilled workers, as well as a shortage of experienced professionals to assist in problem-solving (Pholphirul & Bhatiasevi, 2016). Other issues in developing countries are corruption, inefficient bureaucracy, and a lack of understanding

of education, which prohibits them from making rapid advancements in dealing with the global economy (Sánchez-Ancochea, 2012).

On the other hand, agricultural subsidies in developed countries create artificial competitive pressures in developing countries' markets. Even the volatility of global food prices does not help developing countries' competitiveness, as they are generally price takers (Jambor & Babu, 2016). Another opinion states agricultural competitiveness remains low in developing countries due to poor product quality, inefficient use of production resources, and bad market structure (Nowak & Różańska-Boczula, 2022).

According to Serrano & Pinilla (2014), developing countries were more specialized in bulk and unprocessed agricultural products, while developed countries won the new challenge in general. Indeed, global agricultural trade is skewed toward high-income economies, limiting developing countries' ability to integrate into the global economy (Beyene, 2014). As a result of this situation, developing countries face serious problems and are unable to compete with developed countries.

At the country level, many factors have contributed to a decline in China's agricultural competitiveness. Rising labor costs widened the price disparity between domestic and international markets, allowing high-quality foreign agricultural products to occupy the domestic market. Another reason is that China's large population results in smaller land management scales, low agricultural investment, and overexploitation (Yujia Lu & Chen, 2021). Several other researchers explored the variables that cause the low competitiveness of Chinese agriculture: increased domestic factor prices, decreased energy prices and hence transportation costs, changes in exchange rates, and government policies aimed at safeguarding farmers' welfare (Q. Chen et al., 2018).

The failure of African countries to maintain or increase agricultural competitiveness is due to low research budgets, high transportation costs, a lack of market information, and a lack of input market competition (Nakhumwa et al., 1999; Mosoma, 2004). Meanwhile, Bolivia and Paraguay play competitively minor roles in the international agricultural market (Fuller et al., 2003).

**Table 7a.** Agricultural competitiveness in developing countries based on RCA values

| Year | Albania | Bangladesh | Benin | Bolivia | Botswana | Brazil | Brunei Darussalam | Bulgaria | Burkina Faso | Burundi | Cambodia | Cameroon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 2.60 | 1.17 | 3.20 | 2.09 | 0.48 | 3.02 | 0.04 | 1.48 | 7.99 | 9.58 | 4.80 | 3.00 |
| 1991 | 2.56 | 0.93 | 2.82 | 1.82 | 0.51 | 2.70 | 0.04 | 2.28 | 6.24 | 10.04 | 1.79 | 1.96 |
| 1992 | 2.41 | 0.77 | 2.77 | 1.59 | 0.55 | 2.68 | 0.03 | 2.43 | 5.64 | 9.37 | 0.64 | 2.07 |
| 1993 | 2.26 | 0.61 | 2.70 | 1.82 | 0.62 | 2.81 | 0.03 | 2.17 | 6.76 | 9.50 | 0.55 | 1.43 |
| 1994 | 1.63 | 0.47 | 3.54 | 2.43 | 0.57 | 3.21 | 0.03 | 2.42 | 3.98 | 10.47 | 1.11 | 2.69 |
| 1995 | 0.84 | 0.44 | 5.77 | 2.35 | 0.71 | 3.36 | 0.04 | 2.55 | 1.42 | 10.63 | 1.31 | 3.97 |
| 1996 | 1.89 | 0.37 | 5.34 | 2.85 | 0.58 | 3.48 | 0.10 | 2.14 | 1.25 | 10.90 | 0.74 | 4.07 |
| 1997 | 2.31 | 0.45 | 6.45 | 3.60 | 0.50 | 3.71 | 0.01 | 1.76 | 1.18 | 8.24 | 0.69 | 3.08 |
| 1998 | 1.13 | 0.37 | 6.79 | 3.89 | 0.85 | 3.76 | 0.01 | 2.08 | 8.40 | 11.44 | 0.37 | 3.24 |
| 1999 | 0.57 | 0.34 | 7.03 | 4.71 | 0.51 | 3.95 | 0.01 | 2.08 | 6.47 | 11.16 | 0.63 | 3.90 |
| 2000 | 1.36 | 0.33 | 14.89 | 4.96 | 0.69 | 3.65 | 0.00 | 1.53 | 7.40 | 13.46 | 0.23 | 3.11 |
| 2001 | 1.06 | 0.23 | 13.83 | 4.51 | 0.86 | 4.13 | 0.01 | 1.68 | 10.34 | 11.28 | 0.37 | 3.37 |
| 2002 | 1.04 | 0.29 | 8.98 | 4.84 | 0.35 | 4.09 | 0.01 | 1.86 | 9.14 | 10.70 | 0.30 | 3.87 |
| 2003 | 0.88 | 0.26 | 13.53 | 4.36 | 0.30 | 4.15 | 0.01 | 1.52 | 13.81 | 11.66 | 0.29 | 3.73 |
| 2004 | 0.93 | 0.24 | 14.15 | 4.24 | 0.22 | 4.29 | 0.00 | 1.61 | 10.69 | 6.89 | 0.33 | 3.91 |
| 2005 | 0.98 | 0.39 | 14.54 | 3.21 | 0.18 | 4.18 | 0.00 | 1.71 | 12.82 | 15.38 | 0.21 | 3.26 |
| 2006 | 0.96 | 0.42 | 15.77 | 2.56 | 0.17 | 4.23 | 0.00 | 1.65 | 11.39 | 12.94 | 0.27 | 2.82 |
| 2007 | 0.90 | 0.43 | 12.70 | 2.56 | 0.47 | 4.32 | 0.00 | 1.41 | 10.59 | 15.44 | 0.27 | 2.95 |
| 2008 | 0.70 | 0.23 | 5.46 | 2.22 | 0.46 | 4.46 | 0.00 | 1.91 | 5.74 | 15.02 | 0.24 | 2.37 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 0.63 | 0.23 | 5.74 | 2.72 | 0.68 | 4.62 | 0.00 | 2.20 | 5.41 | 11.52 | 0.23 | 3.65 |
| 2010 | 0.52 | 0.27 | 6.61 | 2.20 | 0.74 | 4.54 | 0.00 | 2.40 | 4.04 | 12.51 | 0.52 | 4.08 |
| 2011 | 0.59 | 0.27 | 5.14 | 2.07 | 0.33 | 4.48 | 0.00 | 2.17 | 2.86 | 9.27 | 0.76 | 3.42 |
| 2012 | 0.64 | 0.23 | 2.92 | 1.92 | 0.31 | 4.63 | 0.00 | 2.17 | 3.11 | 9.53 | 0.70 | 3.19 |
| 2013 | 0.63 | 0.21 | 3.62 | 2.31 | 0.34 | 4.77 | 0.02 | 2.42 | 4.79 | 7.71 | 0.86 | 3.43 |
| 2014 | 0.37 | 0.23 | 2.28 | 2.02 | 0.27 | 4.80 | 0.05 | 2.18 | 4.18 | 8.13 | 0.98 | 2.99 |
| 2015 | 0.70 | 0.24 | 3.12 | 2.19 | 0.31 | 4.93 | 0.01 | 2.05 | 3.79 | 7.88 | 0.89 | 4.10 |
| 2016 | 0.87 | 0.18 | 2.02 | 2.56 | 0.22 | 4.68 | 0.01 | 2.02 | 3.59 | 7.82 | 0.78 | 4.38 |
| 2017 | 0.58 | 0.17 | 3.46 | 1.71 | 0.23 | 4.59 | 0.01 | 1.77 | 3.23 | 6.07 | 1.11 | 3.69 |
| 2018 | 0.50 | 0.17 | 4.13 | 2.09 | 0.24 | 4.62 | 0.01 | 1.93 | 3.25 | 6.56 | 0.91 | 3.54 |
| 2019 | 0.73 | 0.21 | 2.67 | 2.06 | 0.24 | 4.62 | 0.01 | 2.00 | 2.62 | 5.88 | 0.83 | 3.26 |
| 2020 | 0.74 | 0.22 | 3.31 | 2.39 | 0.24 | 4.80 | 0.01 | 1.93 | 1.52 | 5.89 | 1.10 | 4.04 |

**Table 7b.** Agricultural competitiveness in developing countries based on RCA values

| Year | Chile | China | Colombia | Congo | Costa Rica | Democratic Republic of the Congo | Dominican Republic | Ecuador | Egypt | El Salvador | Eswatini | Ethiopia PDR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 1.51 | 0.67 | 3.86 | 0.16 | 5.91 | 1.53 | 5.63 | 3.18 | 1.77 | 5.35 | 6.85 | 8.85 |
| 1991 | 1.61 | 0.66 | 3.75 | 0.14 | 6.10 | 1.09 | 6.14 | 3.88 | 1.12 | 5.63 | 6.13 | 8.65 |
| 1992 | 1.68 | 0.60 | 3.83 | 0.15 | 3.91 | 2.16 | 5.82 | 3.13 | 1.37 | 4.82 | 5.06 | 8.24 |
| 1993 | 1.82 | 0.58 | 3.75 | 0.09 | 3.91 | 1.84 | 5.83 | 3.17 | 1.26 | 5.10 | 4.32 | 7.82 |
| 1994 | 1.71 | 0.58 | 4.54 | 0.08 | 4.82 | 2.67 | 5.64 | 4.06 | 1.74 | 3.46 | 3.97 | 8.77 |
| 1995 | 1.58 | 0.51 | 3.99 | 0.11 | 5.30 | 3.34 | 5.27 | 3.89 | 1.23 | 3.76 | 3.85 | 9.81 |
| 1996 | 1.95 | 0.50 | 3.52 | 0.05 | 4.89 | 2.82 | 5.51 | 3.89 | 1.27 | 3.24 | 4.18 | 9.39 |
| 1997 | 1.86 | 0.45 | 4.32 | 0.14 | 4.83 | 2.03 | 8.98 | 4.55 | 0.96 | 3.64 | 5.25 | 9.55 |
| 1998 | 2.30 | 0.43 | 4.41 | 0.16 | 4.33 | 3.60 | 10.52 | 4.72 | 1.38 | 2.79 | 3.97 | 9.55 |
| 1999 | 2.21 | 0.41 | 3.71 | 0.17 | 3.56 | 2.03 | 9.07 | 4.95 | 1.71 | 2.51 | 3.83 | 10.10 |
| 2000 | 2.33 | 0.43 | 3.50 | 0.10 | 4.10 | 0.70 | 9.26 | 4.24 | 1.22 | 3.34 | 5.18 | 10.91 |
| 2001 | 2.61 | 0.40 | 3.26 | 0.17 | 4.17 | 0.38 | 10.48 | 4.81 | 1.28 | 2.10 | 3.82 | 6.23 |
| 2002 | 2.80 | 0.38 | 3.36 | 0.15 | 3.87 | 0.34 | 10.09 | 5.05 | 1.68 | 1.89 | 2.92 | 11.08 |
| 2003 | 2.43 | 0.34 | 3.10 | 0.18 | 3.83 | 0.23 | 8.24 | 4.73 | 1.62 | 1.81 | 2.13 | 11.62 |
| 2004 | 1.98 | 0.28 | 3.07 | 0.16 | 4.37 | 0.32 | 7.53 | 3.95 | 1.87 | 1.92 | 2.60 | 6.25 |
| 2005 | 1.84 | 0.29 | 3.33 | 0.15 | 4.52 | 0.27 | 7.13 | 3.53 | 1.33 | 2.43 | 1.91 | 6.48 |
| 2006 | 1.52 | 0.27 | 3.24 | 0.06 | 4.80 | 0.28 | 6.52 | 3.36 | 0.98 | 2.81 | 2.85 | 14.40 |
| 2007 | 1.56 | 0.27 | 3.03 | 0.15 | 4.45 | 0.26 | 5.64 | 3.12 | 1.31 | 2.64 | 1.48 | 12.94 |
| 2008 | 1.74 | 0.26 | 2.60 | 0.10 | 5.12 | 0.21 | 2.08 | 2.75 | 1.25 | 2.58 | 2.19 | 12.92 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1.86 | 0.26 | 2.33 | 0.10 | 4.45 | 0.27 | 2.48 | 3.67 | 2.49 | 2.65 | 1.68 | 10.89 |
| 2010 | 1.77 | 0.26 | 1.99 | 0.05 | 4.84 | 0.21 | 2.65 | 3.30 | 1.57 | 2.80 | 1.86 | 10.93 |
| 2011 | 1.78 | 0.26 | 1.67 | 0.03 | 4.91 | 0.14 | 2.15 | 3.06 | 2.21 | 3.26 | 1.97 | 10.50 |
| 2012 | 1.90 | 0.25 | 1.48 | 0.04 | 4.64 | 0.10 | 2.60 | 2.70 | 1.86 | 2.95 | 1.72 | 11.28 |
| 2013 | 2.06 | 0.24 | 1.49 | 0.02 | 4.66 | 0.10 | 2.53 | 2.69 | 2.28 | 2.75 | 3.76 | 11.33 |
| 2014 | 2.06 | 0.25 | 1.72 | 0.05 | 4.98 | 0.12 | 3.01 | 2.82 | 2.19 | 2.32 | 3.20 | 12.69 |
| 2015 | 2.25 | 0.26 | 2.42 | 0.03 | 5.66 | 0.14 | 2.75 | 3.98 | 2.66 | 2.39 | 3.92 | 11.77 |
| 2016 | 2.27 | 0.28 | 2.61 | 0.04 | 6.69 | 0.16 | 2.57 | 4.11 | 2.13 | 2.08 | 3.28 | 6.47 |
| 2017 | 2.00 | 0.27 | 2.39 | 0.03 | 6.46 | 0.08 | 2.76 | 3.83 | 2.42 | 2.16 | 3.13 | 5.97 |
| 2018 | 2.10 | 0.28 | 2.28 | 0.03 | 5.54 | 0.05 | 2.67 | 3.73 | 2.43 | 2.17 | 3.54 | 5.48 |
| 2019 | 2.26 | 0.28 | 2.38 | 0.02 | 5.01 | 0.09 | 2.54 | 3.60 | 2.46 | 2.34 | 3.71 | 7.36 |
| 2020 | 1.93 | 0.23 | 2.92 | 0.05 | 4.52 | 0.12 | 2.53 | 3.91 | 2.29 | 2.38 | 3.77 | 5.65 |

**Table 7c.** Agricultural competitiveness in developing countries based on RCA values

| Year | Fiji | Gabon | Guatemala | Guyana | Haiti | Honduras | Hungary | India | Indonesia | Iran | Iraq | Jamaica |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 3.97 | 0.01 | 7.52 | 4.25 | 1.99 | 8.59 | 2.64 | 1.80 | 1.19 | 0.22 | 0.06 | 2.04 |
| 1991 | 5.23 | 0.03 | 7.13 | 4.61 | 1.81 | 7.88 | 2.73 | 1.61 | 1.15 | 0.33 | 0.20 | 2.27 |
| 1992 | 4.33 | 0.03 | 6.75 | 4.91 | 2.28 | 6.46 | 2.60 | 1.47 | 1.06 | 0.33 | 0.22 | 2.33 |
| 1993 | 4.33 | 0.02 | 6.95 | 4.41 | 2.61 | 6.35 | 2.45 | 1.62 | 1.10 | 0.46 | 0.09 | 2.53 |
| 1994 | 4.17 | 0.02 | 7.06 | 4.47 | 2.38 | 4.88 | 2.39 | 1.30 | 1.35 | 0.55 | 0.22 | 2.11 |
| 1995 | 4.49 | 0.04 | 7.87 | 4.73 | 2.39 | 5.14 | 2.61 | 1.87 | 1.41 | 0.62 | 0.20 | 2.27 |
| 1996 | 4.03 | 0.05 | 6.73 | 5.11 | 4.03 | 4.27 | 1.98 | 1.96 | 1.37 | 0.51 | 0.15 | 1.97 |
| 1997 | 3.67 | 0.06 | 7.61 | 4.67 | 2.15 | 4.34 | 1.80 | 1.86 | 1.38 | 0.51 | 0.07 | 2.14 |
| 1998 | 4.48 | 0.08 | 7.90 | 4.71 | 1.65 | 6.13 | 1.48 | 1.87 | 1.31 | 1.02 | 0.05 | 2.18 |
| 1999 | 3.85 | 0.07 | 8.09 | 8.46 | 1.25 | 5.26 | 1.24 | 1.64 | 1.45 | 0.67 | 0.02 | 2.72 |
| 2000 | 4.35 | 0.05 | 9.18 | 5.65 | 1.40 | 6.96 | 1.22 | 1.60 | 1.25 | 0.54 | 0.01 | 2.76 |
| 2001 | 4.16 | 0.08 | 8.27 | 4.65 | 1.05 | 7.57 | 1.18 | 1.66 | 1.16 | 0.64 | 0.01 | 2.58 |
| 2002 | 4.58 | 0.03 | 4.65 | 4.73 | 0.94 | 5.73 | 1.13 | 1.43 | 1.59 | 0.61 | 0.04 | 3.12 |
| 2003 | 4.08 | 0.04 | 4.49 | 5.17 | 0.87 | 6.05 | 1.09 | 1.40 | 1.61 | 0.67 | 0.06 | 2.99 |
| 2004 | 4.37 | 0.06 | 4.46 | 5.56 | 0.78 | 7.15 | 0.97 | 1.26 | 2.04 | 0.50 | 0.09 | 2.75 |
| 2005 | 5.66 | 0.13 | 5.70 | 5.16 | 0.60 | 7.83 | 1.02 | 1.29 | 2.05 | 0.56 | 0.02 | 2.31 |
| 2006 | 6.00 | 0.14 | 5.31 | 6.28 | 0.71 | 7.26 | 0.97 | 1.40 | 2.34 | 0.59 | 0.01 | 2.35 |
| 2007 | 5.64 | 0.08 | 6.34 | 6.46 | 0.63 | 7.55 | 1.02 | 1.73 | 2.36 | 0.61 | 0.02 | 2.38 |
| 2008 | 5.40 | 0.08 | 6.11 | 5.93 | 0.79 | 3.44 | 1.07 | 1.26 | 3.02 | 0.44 | 0.02 | 2.04 |
| 2009 | 4.68 | 0.07 | 6.07 | 4.38 | 0.63 | 3.40 | 1.01 | 1.17 | 2.36 | 0.27 | 0.02 | 3.22 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 3.33 | 0.08 | 6.32 | 5.74 | 0.66 | 3.89 | 1.10 | 1.14 | 2.77 | 0.76 | 0.01 | 3.14 |
| 2011 | 3.16 | 0.12 | 6.04 | 4.80 | 0.51 | 4.58 | 1.15 | 1.28 | 2.92 | 0.51 | 0.01 | 2.28 |
| 2012 | 3.43 | 0.08 | 6.66 | 4.26 | 0.42 | 4.13 | 1.29 | 1.65 | 2.83 | 0.56 | 0.01 | 3.01 |
| 2013 | 3.74 | 0.08 | 6.40 | 3.55 | 0.37 | 3.48 | 1.23 | 1.65 | 2.60 | 0.77 | 0.01 | 2.71 |
| 2014 | 3.61 | 0.05 | 5.92 | 4.64 | 0.48 | 3.24 | 1.15 | 1.50 | 2.75 | 0.92 | 0.03 | 2.83 |
| 2015 | 4.13 | 0.07 | 5.73 | 4.26 | 0.48 | 3.32 | 1.07 | 1.39 | 2.83 | 0.68 | 0.03 | 2.79 |
| 2016 | 3.54 | 0.06 | 5.84 | 3.10 | 0.38 | 3.24 | 0.99 | 1.25 | 2.75 | 1.00 | 0.04 | 3.12 |
| 2017 | 4.38 | 0.08 | 6.16 | 3.85 | 0.34 | 3.88 | 1.02 | 1.28 | 2.96 | 0.80 | 0.03 | 3.12 |
| 2018 | 3.92 | 0.06 | 6.56 | 2.95 | 0.29 | 3.64 | 0.99 | 1.27 | 2.68 | 0.44 | 0.02 | 2.35 |
| 2019 | 3.86 | 0.04 | 6.56 | 2.10 | 0.35 | 3.04 | 0.99 | 1.18 | 2.57 | 0.61 | 0.06 | 2.80 |
| 2020 | 4.40 | 0.13 | 6.28 | 1.55 | 0.58 | 3.99 | 0.97 | 1.37 | 2.65 | 0.65 | 0.03 | 2.94 |

**Table 7d.** Agricultural competitiveness in developing countries based on RCA values

| Year | Jordan | Kenya | Lesotho | Madagascar | Malawi | Malaysia | Mali | Mauritania | Mauritius | Mexico | Mongolia | Nepal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 1.13 | 6.67 | 2.31 | 6.04 | 9.84 | 1.60 | 8.05 | 1.09 | 3.53 | 1.18 | 2.39 | 1.47 |
| 1991 | 1.86 | 5.78 | 1.80 | 5.42 | 10.45 | 1.37 | 8.08 | 1.15 | 3.30 | 1.27 | 3.02 | 1.79 |
| 1992 | 1.53 | 6.03 | 1.00 | 5.44 | 9.57 | 1.28 | 8.30 | 1.19 | 3.30 | 1.14 | 1.22 | 1.34 |
| 1993 | 1.66 | 7.96 | 0.88 | 5.81 | 10.02 | 1.18 | 8.85 | 1.27 | 3.15 | 1.33 | 1.14 | 1.31 |
| 1994 | 1.34 | 7.16 | 0.95 | 5.87 | 8.37 | 1.24 | 7.93 | 1.13 | 3.10 | 1.29 | 0.91 | 0.60 |
| 1995 | 1.47 | 6.67 | 0.79 | 6.22 | 10.21 | 1.30 | 5.73 | 1.13 | 3.11 | 1.36 | 0.58 | 0.78 |
| 1996 | 1.15 | 6.43 | 0.51 | 5.15 | 9.10 | 1.16 | 7.16 | 1.12 | 3.26 | 1.09 | 2.65 | 1.30 |
| 1997 | 2.11 | 6.77 | 0.51 | 4.90 | 11.32 | 1.12 | 6.17 | 0.98 | 3.02 | 1.17 | 2.05 | 1.50 |
| 1998 | 2.11 | 8.50 | 0.39 | 4.23 | 8.96 | 1.34 | 5.40 | 1.04 | 2.69 | 1.33 | 1.94 | 1.09 |
| 1999 | 1.85 | 7.92 | 0.23 | 4.86 | 13.61 | 1.15 | 5.78 | 1.17 | 2.91 | 1.30 | 2.93 | 1.60 |
| 2000 | 1.97 | 8.95 | 0.26 | 2.87 | 14.90 | 0.93 | 7.30 | 0.58 | 2.65 | 1.34 | 2.51 | 0.39 |
| 2001 | 1.69 | 8.23 | 0.16 | 7.04 | 12.88 | 0.93 | 6.00 | 0.78 | 3.15 | 1.37 | 1.19 | 0.86 |
| 2002 | 1.71 | 6.29 | 0.08 | 5.61 | 12.06 | 1.15 | 3.62 | 0.62 | 3.03 | 1.38 | 1.38 | 2.91 |
| 2003 | 1.87 | 7.60 | 0.05 | 6.89 | 14.36 | 1.32 | 5.96 | 0.70 | 2.73 | 1.42 | 1.07 | 2.84 |
| 2004 | 1.64 | 7.20 | 0.04 | 7.96 | 12.60 | 1.29 | 7.40 | 0.56 | 2.92 | 1.46 | 0.58 | 1.78 |
| 2005 | 2.11 | 7.52 | 0.03 | 5.94 | 14.47 | 1.21 | 4.56 | 0.42 | 2.99 | 1.44 | 0.70 | 2.27 |
| 2006 | 2.03 | 8.91 | 0.10 | 5.50 | 15.85 | 1.32 | 4.61 | 0.20 | 2.88 | 1.60 | 1.18 | 1.61 |
| 2007 | 2.12 | 8.58 | 0.03 | 2.21 | 14.78 | 1.60 | 3.33 | 0.31 | 2.58 | 0.84 | 0.97 | 2.57 |
| 2008 | 1.89 | 8.17 | 0.02 | 2.23 | 13.41 | 1.79 | 2.55 | 0.19 | 2.38 | 0.81 | 0.41 | 2.38 |
| 2009 | 2.11 | 7.40 | 0.02 | 2.37 | 11.63 | 1.44 | 1.44 | 0.26 | 2.10 | 0.88 | 0.63 | 4.35 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 2.17 | 7.93 | 0.03 | 2.13 | 12.10 | 1.71 | 1.51 | 0.30 | 2.01 | 0.81 | 0.49 | 3.07 |
| 2011 | 2.07 | 6.20 | 0.03 | 3.05 | 11.22 | 2.03 | 1.91 | 0.14 | 2.22 | 0.84 | 0.35 | 2.95 |
| 2012 | 2.40 | 4.71 | 0.05 | 2.87 | 9.44 | 1.76 | 2.92 | 0.13 | 1.98 | 0.81 | 0.42 | 3.61 |
| 2013 | 2.65 | 6.99 | 0.39 | 2.61 | 10.70 | 1.51 | 4.91 | 0.12 | 2.02 | 0.83 | 0.50 | 3.34 |
| 2014 | 2.62 | 5.50 | 0.71 | 2.70 | 9.66 | 1.53 | 2.56 | 0.16 | 1.60 | 0.83 | 0.41 | 3.73 |
| 2015 | 2.56 | 5.41 | 0.72 | 3.63 | 10.06 | 1.45 | 2.20 | 0.30 | 1.65 | 0.88 | 0.97 | 3.44 |
| 2016 | 2.05 | 5.42 | 0.83 | 4.20 | 9.87 | 1.47 | 2.83 | 0.20 | 1.98 | 0.93 | 0.93 | 3.44 |
| 2017 | 2.03 | 7.50 | 0.69 | 5.06 | 10.77 | 1.37 | 2.23 | 0.17 | 2.08 | 0.96 | 0.91 | 3.61 |
| 2018 | 2.07 | 7.77 | 0.17 | 5.39 | 10.03 | 1.22 | 2.94 | 0.14 | 1.47 | 0.98 | 1.09 | 4.06 |
| 2019 | 1.75 | 7.22 | 0.57 | 4.33 | 12.91 | 1.20 | 2.71 | 0.11 | 1.66 | 0.98 | 0.94 | 6.11 |
| 2020 | 1.67 | 6.96 | 1.05 | 4.70 | 10.90 | 1.18 | 2.14 | 0.08 | 1.69 | 0.98 | 0.53 | 6.41 |

**Table 7e.** Agricultural competitiveness in developing countries based on RCA values

| Year | Nigeria | Pakistan | Panama | Paraguay | Peru | Philippines | Poland | Romania | Russian Federation | Rwanda | Saudi Arabia | Senegal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 0.18 | 2.09 | 7.71 | 9.03 | 0.90 | 1.63 | 1.19 | 0.17 | 0.24 | 9.80 | 0.09 | 3.20 |
| 1991 | 0.17 | 1.78 | 6.81 | 8.73 | 1.02 | 1.53 | 1.19 | 0.65 | 0.41 | 9.56 | 0.10 | 2.23 |
| 1992 | 0.16 | 1.91 | 6.34 | 8.18 | 0.89 | 1.48 | 1.46 | 0.69 | 0.23 | 9.22 | 0.10 | 1.97 |
| 1993 | 0.31 | 1.39 | 6.89 | 8.52 | 0.85 | 1.32 | 1.24 | 0.76 | 0.18 | 7.88 | 0.12 | 1.45 |
| 1994 | 0.37 | 1.10 | 6.27 | 7.99 | 1.14 | 1.18 | 1.25 | 0.73 | 0.26 | 2.22 | 0.11 | 1.76 |
| 1995 | 0.41 | 1.49 | 6.11 | 8.52 | 1.09 | 1.26 | 1.18 | 0.74 | 0.18 | 5.75 | 0.10 | 1.38 |
| 1996 | 0.42 | 1.95 | 5.93 | 8.81 | 1.26 | 0.99 | 1.21 | 1.02 | 0.22 | 0.66 | 0.07 | 1.09 |
| 1997 | 0.40 | 1.27 | 5.98 | 9.52 | 1.46 | 0.87 | 1.46 | 0.89 | 0.20 | 4.69 | 0.09 | 1.21 |
| 1998 | 0.53 | 1.72 | 5.18 | 10.27 | 1.36 | 0.74 | 1.29 | 0.66 | 0.18 | 6.03 | 0.15 | 1.58 |
| 1999 | 0.50 | 2.02 | 5.92 | 11.02 | 1.52 | 0.51 | 1.22 | 0.77 | 0.11 | 10.21 | 0.07 | 1.86 |
| 2000 | 0.19 | 1.83 | 5.77 | 9.53 | 1.42 | 0.61 | 1.17 | 0.54 | 0.14 | 9.23 | 0.10 | 3.55 |
| 2001 | 0.33 | 1.63 | 4.95 | 9.76 | 1.33 | 0.66 | 1.14 | 0.57 | 0.16 | 5.66 | 0.10 | 2.47 |
| 2002 | 0.31 | 1.45 | 4.61 | 5.45 | 1.42 | 0.61 | 1.06 | 0.48 | 0.25 | 6.32 | 0.11 | 1.93 |
| 2003 | 0.36 | 1.45 | 4.43 | 8.86 | 1.32 | 0.76 | 1.10 | 0.49 | 0.22 | 6.51 | 0.13 | 2.17 |
| 2004 | 0.24 | 1.33 | 4.90 | 12.59 | 1.32 | 0.79 | 1.34 | 0.49 | 0.18 | 4.83 | 0.13 | 2.02 |
| 2005 | 0.22 | 1.64 | 6.04 | 12.97 | 1.22 | 0.92 | 1.52 | 0.50 | 0.22 | 8.60 | 0.11 | 1.49 |
| 2006 | 0.22 | 1.86 | 5.98 | 13.02 | 1.23 | 0.86 | 1.54 | 0.63 | 0.24 | 8.01 | 0.12 | 2.98 |
| 2007 | 0.15 | 1.75 | 5.96 | 13.36 | 1.11 | 0.87 | 1.47 | 0.62 | 0.35 | 6.68 | 0.14 | 2.86 |
| 2008 | 0.15 | 1.89 | 5.32 | 11.67 | 1.23 | 1.01 | 1.38 | 0.98 | 0.25 | 13.03 | 0.08 | 1.78 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 0.23 | 2.14 | 4.02 | 11.50 | 1.19 | 0.88 | 1.44 | 1.00 | 0.33 | 4.57 | 0.12 | 2.00 |
| 2010 | 0.19 | 2.23 | 4.68 | 12.40 | 1.23 | 0.93 | 1.45 | 1.17 | 0.21 | 5.27 | 0.17 | 2.28 |
| 2011 | 0.17 | 2.76 | 5.52 | 8.68 | 1.33 | 1.34 | 1.44 | 1.22 | 0.25 | 4.72 | 0.13 | 2.67 |
| 2012 | 0.19 | 2.55 | 5.93 | 8.11 | 1.21 | 1.07 | 1.63 | 1.22 | 0.37 | 5.55 | 0.13 | 2.30 |
| 2013 | 0.16 | 2.72 | 6.00 | 8.58 | 1.33 | 1.15 | 1.67 | 1.42 | 0.35 | 4.75 | 0.13 | 3.04 |
| 2014 | 0.18 | 2.59 | 0.39 | 8.82 | 1.72 | 1.23 | 1.63 | 1.38 | 0.43 | 4.12 | 0.14 | 2.90 |
| 2015 | 0.34 | 2.55 | 0.38 | 8.18 | 1.91 | 0.89 | 1.61 | 1.37 | 0.50 | 5.02 | 0.23 | 3.23 |
| 2016 | 0.53 | 2.23 | 0.35 | 7.93 | 1.86 | 0.93 | 1.52 | 1.29 | 0.61 | 4.38 | 0.24 | 2.82 |
| 2017 | 0.49 | 2.22 | 0.35 | 7.89 | 1.66 | 1.04 | 1.57 | 1.25 | 0.61 | 3.97 | 0.20 | 2.65 |
| 2018 | 0.37 | 2.63 | 0.39 | 8.51 | 1.83 | 1.04 | 1.64 | 1.29 | 0.62 | 4.56 | 0.15 | 2.57 |
| 2019 | 0.36 | 2.52 | 0.55 | 8.41 | 1.95 | 1.09 | 1.59 | 1.36 | 0.62 | 4.80 | 0.17 | 2.56 |
| 2020 | 0.50 | 2.14 | 0.49 | 7.80 | 2.09 | 1.01 | 1.55 | 1.33 | 0.83 | 2.56 | 0.24 | 2.27 |

**Table 7f.** Agricultural competitiveness in developing countries based on RCA values

| Year | South Africa | Sri Lanka | Sudan (former) | Togo | Trinidad and Tobago | Turkiye | United Republic of Tanzania | Uganda | Uruguay | Yemen | Zambia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 0.79 | 4.24 | 8.41 | 4.88 | 0.58 | 2.59 | 7.13 | 9.59 | 5.00 | 1.17 | 0.18 |
| 1991 | 0.76 | 3.62 | 8.05 | 4.28 | 0.62 | 2.95 | 6.98 | 8.96 | 4.44 | 0.92 | 0.19 |
| 1992 | 0.73 | 2.72 | 8.00 | 4.84 | 0.64 | 2.45 | 7.03 | 8.11 | 4.21 | 1.31 | 0.34 |
| 1993 | 0.68 | 1.71 | 9.37 | 4.70 | 0.83 | 2.57 | 7.54 | 9.70 | 4.64 | 0.73 | 0.43 |
| 1994 | 0.89 | 1.32 | 8.33 | 4.50 | 0.82 | 2.41 | 7.95 | 6.43 | 4.66 | 0.87 | 0.16 |
| 1995 | 0.88 | 2.02 | 9.18 | 6.72 | 0.88 | 2.25 | 7.33 | 10.00 | 5.10 | 0.56 | 0.30 |
| 1996 | 0.93 | 2.50 | 9.61 | 6.49 | 0.93 | 2.29 | 7.43 | 9.45 | 5.35 | 0.23 | 0.48 |
| 1997 | 1.04 | 2.91 | 9.78 | 7.05 | 1.09 | 2.37 | 7.22 | 8.56 | 5.81 | 0.15 | 1.04 |
| 1998 | 1.02 | 2.84 | 9.56 | 7.03 | 1.25 | 2.19 | 10.25 | 10.39 | 6.26 | 0.52 | 1.25 |
| 1999 | 1.06 | 2.83 | 6.49 | 4.68 | 1.06 | 2.15 | 13.31 | 10.97 | 6.66 | 0.30 | 1.92 |
| 2000 | 1.10 | 2.91 | 3.15 | 3.41 | 0.85 | 2.03 | 10.54 | 8.66 | 6.90 | 0.26 | 1.85 |
| 2001 | 1.11 | 2.95 | 2.35 | 4.17 | 0.83 | 1.94 | 6.55 | 4.40 | 6.23 | 0.33 | 1.59 |
| 2002 | 1.13 | 3.03 | 2.81 | 2.98 | 0.92 | 1.41 | 5.00 | 7.81 | 6.67 | 0.36 | 1.98 |
| 2003 | 1.16 | 2.84 | 2.52 | 3.21 | 0.62 | 1.47 | 4.45 | 2.92 | 7.19 | 0.41 | 2.21 |
| 2004 | 1.11 | 2.97 | 2.26 | 3.32 | 0.54 | 1.42 | 4.87 | 7.08 | 7.81 | 0.33 | 3.45 |
| 2005 | 1.21 | 3.15 | 1.87 | 2.51 | 0.49 | 1.67 | 4.96 | 6.43 | 8.33 | 0.35 | 2.72 |
| 2006 | 1.05 | 2.46 | 1.37 | 4.31 | 0.43 | 1.22 | 4.81 | 6.22 | 8.96 | 0.33 | 1.44 |
| 2007 | 0.94 | 2.32 | 0.58 | 4.75 | 0.40 | 0.98 | 4.50 | 6.03 | 8.36 | 0.41 | 1.36 |
| 2008 | 1.02 | 3.85 | 0.60 | 3.84 | 0.19 | 1.19 | 4.44 | 7.53 | 8.79 | 0.38 | 1.04 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1.17 | 3.53 | 0.89 | 5.54 | 0.41 | 1.34 | 3.58 | 6.27 | 8.31 | 0.41 | 1.20 |
| 2010 | 1.07 | 3.96 | 0.58 | 4.45 | 0.33 | 1.46 | 3.35 | 7.09 | 8.65 | 0.20 | 0.98 |
| 2011 | 0.98 | 3.82 | 0.80 | 7.98 | 0.17 | 1.44 | 2.83 | 7.34 | 8.48 | 0.37 | 1.18 |
| 2012 | 0.92 | 3.76 | 2.59 | 2.90 | 0.24 | 1.32 | 3.91 | 6.93 | 9.20 | 0.41 | 1.94 |
| 2013 | 1.35 | 3.62 | 1.86 | 2.26 | 0.25 | 1.47 | 3.60 | 7.28 | 9.17 | 0.35 | 1.58 |
| 2014 | 1.35 | 3.39 | 3.14 | 2.06 | 0.23 | 1.47 | 6.95 | 7.32 | 8.97 | 0.49 | 1.09 |
| 2015 | 1.28 | 3.24 | 7.87 | 2.85 | 0.48 | 1.46 | 5.47 | 7.32 | 8.25 | 1.20 | 1.36 |
| 2016 | 1.36 | 3.15 | 4.50 | 2.32 | 0.45 | 1.36 | 4.18 | 6.29 | 8.13 | 2.86 | 1.31 |
| 2017 | 1.35 | 3.27 | 5.66 | 2.84 | 0.37 | 1.29 | 4.44 | 6.91 | 8.23 | 2.04 | 1.01 |
| 2018 | 1.44 | 2.27 | 6.29 | 3.03 | 0.27 | 1.34 | 3.38 | 7.00 | 8.36 | 1.96 | 0.92 |
| 2019 | 1.39 | 2.18 | 5.53 | 3.23 | 0.47 | 1.36 | 3.64 | 5.42 | 8.97 | 1.58 | 1.08 |
| 2020 | 1.36 | 3.39 | 4.57 | 3.57 | 0.41 | 1.37 | 3.32 | 4.34 | 8.04 | 1.89 | 0.95 |

## 4.2. Agricultural Competitiveness in Developed Countries

Tables 8a-8b depict agricultural competitiveness in developed countries. Developed countries that are categorized as having agricultural competitiveness (ACA > 1) include Australia, Austria, Belgium, Canada, Cyprus, Denmark, France, Greece, Italy, Netherlands, New Zealand, Portugal, Spain, and the United States of America. Meanwhile, developed countries that have lost their agricultural competitiveness (ACA < 1) include Czechia, Finland, Germany, Iceland, Israel, Norway, the Republic of Korea, Sweden, Switzerland, and the United Kingdom of Great Britain and Northern Ireland. Therefore, hypothesis 2 of this study is unproven because there are developed countries that do not have agricultural competitiveness.

Several developed countries that have experienced an increase in agricultural competitiveness in the last 3 decades include Austria (178.38%), Belgium (19.81%), Canada (100%), Finland (25.93%), Germany (33.33%), Iceland (16.67%), Italy (74.29%), New Zealand (37.45%), Norway (50.00%), Spain (41.83%), Sweden (118.18%), and Switzerland (12.50%). Portugal is a developed country with the highest increase in agricultural competitiveness in the last three decades, reaching 2.5 times.

Bojnec & Ferto (2015) predicted that developed countries would have longer-term agricultural competitiveness. Many agricultural enterprises in developed countries are integral to agricultural modernization, serving as a link between dispersed small-scale farmers and the modern market (Yujia Lu & Chen, 2021). Furthermore, advanced technology allows developed countries to efficiently manage production factors (Nowak & Kaminska, 2016).

In the case of the country, trade liberalization is extremely beneficial in terms of improving the competitiveness of the Canadian agri-food sector (Sparling & Thomspon, 2011). So, New Zealand had significant competitive advantages in the markets for fruits and vegetables, beverages, and dairy products. This was due in part to the opening of some of their significant but overly protected markets (Disdier et al., 2015).

Countries in the European Union adopted a Common Agricultural Policy (CAP) to assure agricultural sustainability through higher inputs, additional subsidies, marketing efficiency, labor productivity growth, and risk management, among others (Vavřina & Martinovičová, 2014). Farm production may benefit from CAP subsidies because they create a selection process in which less productive farms exit (Ciliberti & Frascarelli, 2015). Furthermore, EU Member States launched the EAFRD (Agricultural Fund for Rural Development) program to support agricultural and rural

development through agricultural investment in the form of subsidies (Svoboda et al., 2016). The redistributive payment may receive up to 30% of the direct payment amount. The Italian direct payments budget for 2013–2019 is 27,090 million €, or roughly 3,800 million € per year. In terms of the minimum criterion for obtaining direct payments, Italy decided not to award direct payments to farmers whose total amount requested was less than 250 € (regardless of farm size) in 2015-2016, and less than 300 € after 2017. Every year, Italy makes a voluntary coupled payment of over 400 million € to the livestock, arable land, and olive oil sectors (Ciliberti & Frascarelli, 2015).

The EU Member States have also varied agricultural production capabilities because of their existing land resources. France and Spain have the greatest potential in this area, with agricultural land accounting for 30% of EU-27 farmland. These countries are also the most important crop producers in the EU, accounting for more than 30% of total crop value between 2009 and 2011. These countries, along with Germany, also play the most important role in animal production, accounting for 41.3% of EU production (Nowak & Kaminska, 2016). Their land productivity was also nearly three and two times greater than the EU average. Meanwhile, labor productivity in these countries is higher than in other countries because of the high income per hour of labor (Nowak & Kaminska, 2016).

Australia (-56.76%), Cyprus (-43.49%), Denmark (-25.71%), Greece (-25.68%), Israel (-58.41%), and the Netherlands (-27.76%) are countries that have experienced a decline in competitiveness. Countries that have stagnated agricultural competitiveness are the Czech Republic, France, the Republic of Korea, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

The development opportunities for Greek agriculture are further limited by the country's mountainous nature and the land's limited agricultural potential (Nowak & Kaminska, 2016). Czech competitiveness is most likely the result of socioeconomic and historical factors. The transformation of the political system and Czech accession to the European Union has had a significant impact on the country's current agricultural situation (Nowak & Różańska-Boczula, 2022). France's agricultural competitiveness is stagnant because its food commodities are growing, but cereals, oilseeds, and beef are declining (Svoboda et al., 2016).

The United States can maintain its competitiveness because it has previously focused on food processing. This country imports raw materials from other countries and processes them in its

industry. The United States can export these processed food products with a high added value (Gopinath et al., 1996).

**Table 8a.** Agricultural competitiveness in developed countries based on RCA values

| Year | Australia | Austria | Belgium | Canada | Cyprus | Czechia | Denmark | Finland | France | Germany | Greece | Iceland |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 3.33 | 0.37 | 1.06 | 0.77 | 3.38 | 0.60 | 2.45 | 0.27 | 1.63 | 0.51 | 3.31 | 0.24 |
| 1991 | 2.71 | 0.36 | 1.14 | 0.80 | 3.66 | 0.70 | 2.42 | 0.27 | 1.54 | 0.58 | 3.40 | 0.17 |
| 1992 | 2.74 | 0.40 | 1.18 | 0.85 | 3.79 | 0.77 | 2.31 | 0.27 | 1.54 | 0.59 | 3.56 | 0.13 |
| 1993 | 2.85 | 0.40 | 1.23 | 0.78 | 4.28 | 0.96 | 2.38 | 0.35 | 1.68 | 0.62 | 3.47 | 0.13 |
| 1994 | 2.76 | 0.43 | 1.24 | 0.75 | 4.80 | 0.83 | 2.39 | 0.37 | 1.56 | 0.61 | 3.45 | 0.16 |
| 1995 | 2.95 | 0.49 | 1.29 | 0.77 | 5.90 | 0.67 | 2.23 | 0.27 | 1.58 | 0.55 | 3.50 | 0.17 |
| 1996 | 3.09 | 0.52 | 1.23 | 0.83 | 6.99 | 0.64 | 2.23 | 0.32 | 1.54 | 0.58 | 3.74 | 0.15 |
| 1997 | 3.50 | 0.57 | 1.26 | 0.85 | 7.23 | 0.66 | 2.45 | 0.34 | 1.56 | 0.58 | 3.19 | 0.12 |
| 1998 | 3.25 | 0.56 | 1.29 | 0.89 | 6.33 | 0.61 | 2.39 | 0.29 | 1.51 | 0.58 | 3.39 | 0.12 |
| 1999 | 3.58 | 0.71 | 1.28 | 0.83 | 6.50 | 0.60 | 2.37 | 0.25 | 1.56 | 0.60 | 3.69 | 0.14 |
| 2000 | 4.23 | 0.79 | 1.42 | 0.88 | 6.81 | 0.67 | 2.57 | 0.27 | 1.58 | 0.68 | 3.40 | 0.23 |
| 2001 | 3.76 | 0.80 | 1.34 | 0.98 | 6.13 | 0.58 | 2.55 | 0.28 | 1.45 | 0.64 | 3.47 | 0.23 |
| 2002 | 3.53 | 0.78 | 1.26 | 0.95 | 4.24 | 0.52 | 2.39 | 0.29 | 1.55 | 0.62 | 3.50 | 0.19 |
| 2003 | 2.86 | 0.84 | 1.27 | 0.92 | 4.05 | 0.51 | 2.36 | 0.28 | 1.56 | 0.63 | 3.15 | 0.23 |
| 2004 | 3.88 | 0.96 | 1.29 | 0.97 | 3.57 | 0.56 | 2.45 | 0.29 | 1.57 | 0.65 | 3.01 | 0.23 |
| 2005 | 3.28 | 1.11 | 1.30 | 0.96 | 2.45 | 0.67 | 2.41 | 0.29 | 1.63 | 0.70 | 3.35 | 0.21 |
| 2006 | 3.04 | 1.21 | 1.33 | 1.05 | 2.79 | 0.62 | 2.51 | 0.30 | 1.72 | 0.71 | 3.31 | 0.20 |
| 2007 | 2.37 | 1.05 | 1.30 | 1.12 | 3.00 | 0.63 | 2.47 | 0.30 | 1.73 | 0.70 | 3.00 | 0.14 |
| 2008 | 1.92 | 1.05 | 1.32 | 1.22 | 2.64 | 0.65 | 2.31 | 0.30 | 1.69 | 0.75 | 2.95 | 0.20 |
| 2009 | 1.87 | 1.04 | 1.29 | 1.30 | 2.66 | 0.62 | 2.21 | 0.32 | 1.58 | 0.75 | 3.15 | 0.17 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 1.75 | 1.04 | 1.28 | 1.26 | 2.65 | 0.58 | 2.30 | 0.34 | 1.68 | 0.75 | 3.34 | 0.23 |
| 2011 | 1.67 | 1.02 | 1.26 | 1.26 | 2.37 | 0.58 | 2.21 | 0.37 | 1.74 | 0.76 | 2.23 | 0.22 |
| 2012 | 2.00 | 1.04 | 1.30 | 1.33 | 2.30 | 0.66 | 2.25 | 0.37 | 1.72 | 0.78 | 2.31 | 0.24 |
| 2013 | 2.01 | 1.03 | 1.28 | 1.31 | 2.40 | 0.67 | 2.22 | 0.38 | 1.77 | 0.79 | 2.36 | 0.24 |
| 2014 | 2.06 | 1.00 | 1.26 | 1.32 | 1.46 | 0.64 | 2.25 | 0.47 | 1.64 | 0.76 | 2.23 | 0.28 |
| 2015 | 2.38 | 0.98 | 1.28 | 1.39 | 1.17 | 0.66 | 2.17 | 0.49 | 1.59 | 0.71 | 2.56 | 0.27 |
| 2016 | 2.11 | 0.97 | 1.26 | 1.36 | 1.46 | 0.62 | 2.03 | 0.40 | 1.50 | 0.69 | 2.67 | 0.36 |
| 2017 | 2.08 | 0.97 | 1.27 | 1.34 | 1.50 | 0.56 | 2.08 | 0.39 | 1.50 | 0.69 | 2.35 | 0.30 |
| 2018 | 1.83 | 1.01 | 1.30 | 1.37 | 1.23 | 0.55 | 2.08 | 0.35 | 1.57 | 0.69 | 2.31 | 0.32 |
| 2019 | 1.64 | 1.02 | 1.29 | 1.33 | 1.74 | 0.55 | 1.96 | 0.36 | 1.53 | 0.69 | 2.25 | 0.27 |
| 2020 | 1.44 | 1.03 | 1.27 | 1.54 | 1.91 | 0.55 | 1.82 | 0.34 | 1.59 | 0.68 | 2.46 | 0.28 |

**Table 8b.** Agricultural competitiveness in developed countries based on RCA values

| Year | Israel | Italy | Netherlands | New Zealand | Norway | Portugal | Republic of Korea | Spain | Sweden | Switzerland | United Kingdom of Great Britain and Northern Ireland | United States of America |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 1.13 | 0.70 | 2.45 | 5.50 | 0.10 | 0.61 | 0.19 | 1.53 | 0.22 | 0.32 | 0.75 | 1.24 |
| 1991 | 1.04 | 0.76 | 2.47 | 5.19 | 0.10 | 0.68 | 0.16 | 1.59 | 0.21 | 0.34 | 0.79 | 1.13 |
| 1992 | 0.86 | 0.77 | 2.53 | 5.38 | 0.11 | 0.66 | 0.16 | 1.55 | 0.20 | 0.33 | 0.85 | 1.14 |
| 1993 | 0.79 | 0.78 | 2.33 | 5.16 | 0.11 | 0.67 | 0.15 | 1.82 | 0.21 | 0.35 | 0.80 | 1.14 |
| 1994 | 0.74 | 0.77 | 2.42 | 4.86 | 0.12 | 0.68 | 0.15 | 1.67 | 0.23 | 0.36 | 0.76 | 1.13 |
| 1995 | 0.83 | 0.72 | 2.11 | 4.98 | 0.12 | 0.68 | 0.15 | 1.64 | 0.22 | 0.37 | 0.71 | 1.24 |
| 1996 | 0.74 | 0.77 | 2.09 | 5.15 | 0.11 | 0.70 | 0.16 | 1.70 | 0.25 | 0.36 | 0.68 | 1.22 |
| 1997 | 0.66 | 0.80 | 1.88 | 5.89 | 0.11 | 0.75 | 0.16 | 1.83 | 0.28 | 0.36 | 0.75 | 1.11 |
| 1998 | 0.63 | 0.82 | 1.78 | 5.85 | 0.13 | 0.77 | 0.16 | 1.67 | 0.28 | 0.35 | 0.76 | 1.05 |
| 1999 | 0.65 | 0.92 | 2.15 | 6.00 | 0.12 | 0.81 | 0.16 | 1.84 | 0.29 | 0.36 | 0.79 | 1.02 |
| 2000 | 0.45 | 1.02 | 1.88 | 7.67 | 0.10 | 0.91 | 0.14 | 1.91 | 0.32 | 0.42 | 0.91 | 1.13 |
| 2001 | 0.52 | 0.96 | 1.80 | 7.07 | 0.10 | 0.90 | 0.16 | 1.85 | 0.38 | 0.39 | 0.73 | 1.15 |
| 2002 | 0.50 | 1.00 | 1.96 | 6.45 | 0.11 | 0.94 | 0.15 | 1.91 | 0.39 | 0.39 | 0.76 | 1.17 |
| 2003 | 0.53 | 0.99 | 2.04 | 6.60 | 0.11 | 0.94 | 0.14 | 1.97 | 0.38 | 0.39 | 0.81 | 1.24 |
| 2004 | 0.55 | 1.04 | 2.02 | 7.54 | 0.11 | 1.02 | 0.13 | 2.00 | 0.39 | 0.40 | 0.92 | 1.17 |
| 2005 | 0.48 | 1.08 | 2.00 | 7.94 | 0.09 | 1.12 | 0.13 | 2.18 | 0.45 | 0.43 | 0.89 | 1.15 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2006 | 0.58 | 1.13 | 2.00 | 8.62 | 0.08 | 1.18 | 0.12 | 2.16 | 0.44 | 0.48 | 0.72 | 1.14 |
| 2007 | 0.61 | 1.03 | 1.97 | 7.95 | 0.08 | 1.25 | 0.11 | 1.96 | 0.44 | 0.51 | 0.84 | 1.28 |
| 2008 | 0.50 | 1.04 | 1.88 | 6.97 | 0.07 | 1.28 | 0.11 | 1.96 | 0.46 | 0.53 | 0.83 | 1.41 |
| 2009 | 0.55 | 1.09 | 1.98 | 6.93 | 0.07 | 1.32 | 0.11 | 1.89 | 0.46 | 0.53 | 0.82 | 1.26 |
| 2010 | 0.53 | 1.14 | 1.91 | 7.47 | 0.07 | 1.40 | 0.12 | 1.95 | 0.44 | 0.54 | 0.83 | 1.32 |
| 2011 | 0.48 | 1.09 | 1.87 | 5.63 | 0.07 | 1.31 | 0.11 | 1.85 | 0.41 | 0.53 | 0.80 | 1.32 |
| 2012 | 0.52 | 1.11 | 1.83 | 7.52 | 0.07 | 1.37 | 0.13 | 1.99 | 0.46 | 0.53 | 0.84 | 1.29 |
| 2013 | 0.51 | 1.14 | 1.83 | 7.70 | 0.08 | 1.38 | 0.13 | 1.95 | 0.50 | 0.56 | 0.74 | 1.26 |
| 2014 | 0.44 | 1.12 | 1.69 | 7.83 | 0.10 | 1.43 | 0.13 | 1.97 | 0.51 | 0.42 | 0.79 | 1.26 |
| 2015 | 0.40 | 1.13 | 1.67 | 7.50 | 0.11 | 1.40 | 0.13 | 1.98 | 0.49 | 0.40 | 0.76 | 1.17 |
| 2016 | 0.39 | 1.11 | 1.72 | 7.20 | 0.13 | 1.36 | 0.15 | 1.96 | 0.47 | 0.37 | 0.79 | 1.18 |
| 2017 | 0.43 | 1.12 | 1.85 | 7.48 | 0.12 | 1.33 | 0.14 | 1.94 | 0.46 | 0.39 | 0.76 | 1.15 |
| 2018 | 0.43 | 1.19 | 1.85 | 7.98 | 0.12 | 1.39 | 0.14 | 2.00 | 0.46 | 0.42 | 0.79 | 1.15 |
| 2019 | 0.45 | 1.18 | 1.80 | 8.12 | 0.14 | 1.36 | 0.16 | 2.05 | 0.47 | 0.40 | 0.79 | 1.11 |
| 2020 | 0.47 | 1.22 | 1.77 | 7.56 | 0.15 | 1.44 | 0.17 | 2.17 | 0.48 | 0.36 | 0.78 | 1.22 |

# V. IMPACT OF ECONOMIC GLOBALIZATION ON DEVELOPING AND DEVELOPED COUNTRIES

## 5.1. Impact of Economic Globalization on Agricultural Competitiveness in Developing Countries

The Levin Lin Chu unit root test is utilized to generate a stationary variable in this study. The author conducted two-unit root tests: one for developing countries and one for developed countries The unit root test for developing countries reveals that TEMP, ACA, IND, POP, RENEW, RENT, EXC, EGI, IRRI, EMPL, and HCI are stationary at the level. Simultaneously, CONV, CPI, and MOB are stationary at the first difference level (Table 9).

**Table 9.** Levin Lin Chu unit root test

| Variable | Developing countries | |
|---|---|---|
| | **Stage** | **Statistic** |
| TEMP | At level | -6.535*** |
| ACA | At level | -4.890*** |
| IND | At level | -6.203*** |
| POP | At level | -7.822*** |
| RENEW | At level | -2.705*** |
| RENT | At level | -4.186*** |
| CONV | 1st difference | -10.943*** |
| CPI | 1st difference | -4.371*** |
| EXC | At level | -1.797* |
| EGI | At level | -8.590*** |
| IRRI | At level | -5.864*** |
| MOB | 1st difference | -5.852*** |
| EMPL | At level | -5.645*** |
| HCI | At level | -6.715*** |

After the data became stationary, all variables were analyzed using the 3SLS model. Equation (13) demonstrates that the endogeneity test has a significance level of 0.063 in developing

countries, while Equation (14) has a significance level of 0.049 in developing countries (Table 10). The models' endogeneity significance level is less than the 10% alpha threshold, indicating that endogeneity issues exist in their respective structural equations. The overidentification and weak instrument tests both produce significant results at the 5% alpha level, indicating that the structural model is over-identified and that each equation contains a strong instrument variable. Furthermore, the final stage of regression (step 2) produces an adjusted $R^2$ value of 0.810 and an F-statistic value of 116.441 (prob. = 0.000), which is significant at 1% alpha. All statistical tests indicate that the 3SLS regression model can be applied correctly in this research.

**Table 10.** Three-stage least square regression results in developing countries

| **Variable** | **Developing countries** | |
|---|---|---|
| | **Coeff.** | **Std. Error** |
| Dependent variable: TEMP | | |
| ACA | 0.009 . | 0.005 |
| | (1.806) | |
| IND | -0.001$^{ns}$ | 0.005 |
| | (-0.711) | |
| POP | -0.000009$^{ns}$ | 0.00005 |
| | (-0.016) | |
| RENEW | -0.002$^{***}$ | 0.0005 |
| | (-3.852) | |
| RENT | 0.004$^{***}$ | 0.001 |
| | (3.205) | |
| CONV | 0.000001$^{ns}$ | 0.0002 |
| | (0.057) | |
| Cons. | 0.814$^{***}$ | 0.027 |
| | (30.482) | |
| Adj $R^2$ | | 0.491 |
| F test | | 3.988 |
| Overidentification test | | 11.796 |
| Weak identification test | | 16.850 |

| | | |
|---|---|---|
| Endogeneity test | | 3.357 |
| Dependent variable: ACA | | |
| TEMP | -0.313 . | 0.161 |
| | (-1.941) | |
| CPI | 0.005*** | 0.001 |
| | (3.809) | |
| EXC | -0.0006*** | 0.00002 |
| | (-2.970) | |
| EGI | -0.026*** | 0.006 |
| | (-4.667) | |
| IRRI | -0.046*** | 0.004 |
| | (-11.467) | |
| MOB | -0.005*** | 0.001 |
| | (-3.629) | |
| EMPL | -0.00001*** | 0.000001 |
| | (-7.421) | |
| HCI | -1.610*** | 0.178 |
| | (-9.028) | |
| $D_{Albania}$ | -2.064*** | 0.546 |
| | (-3.779) | |
| $D_{Bangladesh}$ | -2.604*** | 0.451 |
| | (-5.779) | |
| $D_{Benin}$ | 4.469*** | 0.513 |
| | (8.711) | |
| $D_{Bolivia}$ | 0.149 | 0.670 |
| | (0.223) | |
| $D_{Botswana}$ | -1.929** | 0.661 |
| | (-2.918) | |
| $D_{Brazil}$ | 1.410* | 0.588 |
| | (2.395) | |
| $D_{Brunei\ Darussalam}$ | -2.177*** | 0.617 |

| | | |
|---|---|---|
| | (-3.529) | |
| $D_{Bulgaria}$ | -0.646 | 0.709 |
| | (-0.911) | |
| $D_{Burkina\ Faso}$ | 4.102*** | 0.517 |
| | (7.933) | |
| $D_{Burundi}$ | 7.887*** | 0.504 |
| | (15.635) | |
| $D_{Cambodia}$ | -1.128* | 0.497 |
| | (-2.267) | |
| $D_{Cameroon}$ | 0.957 . | 0.533 |
| | (1.795) | |
| $D_{Chile}$ | -0.529 | 0.690 |
| | (-0.766) | |
| $D_{China}$ | -1.968 . | 1.179 |
| | (-1.668) | |
| $D_{Colombia}$ | 0.354 | 0.587 |
| | (0.604) | |
| $D_{Congo}$ | -1.993*** | 0.566 |
| | (-3.523) | |
| $D_{Costa\ Rica}$ | 2.484*** | 0.611518 |
| | (4.061) | |
| $D_{Democratic\ Republic\ of\ the\ Congo}$ | -1.503** | 0.520 |
| | (-2.888) | |
| $D_{Dominican\ Republic}$ | 2.661*** | 0.517 |
| | (5.149) | |
| $D_{Ecuador}$ | 0.719 | 0.534 |
| | (1.348) | |
| $D_{Egypt}$ | -1.498 | 1.016 |
| | (-1.474) | |
| $D_{El\ Salvador}$ | 1.069 . | 0.524 |
| | (2.039) | |

| | | |
|---|---|---|
| $D_{Eswatini}$ | 1.547** | 0.505 |
| | (3.064) | |
| $D_{Ethiopia}$ | 7.425*** | 0.502 |
| | (14.793) | |
| $D_{Fiji}$ | 1.747** | 0.642 |
| | (2.719) | |
| $D_{Gabon}$ | -2.294*** | 0.605 |
| | (-3.790) | |
| $D_{Guatemala}$ | 4.571*** | 0.471 |
| | (9.694) | |
| $D_{Guyana}$ | 2.124*** | 0.562 |
| | (3.779) | |
| $D_{Haiti}$ | -1.229** | 0.466 |
| | (-2.638) | |
| $D_{Honduras}$ | 3.136*** | 0.551 |
| | (5.689) | |
| $D_{Hungary}$ | -1.085 | 0.777 |
| | (-1.396) | |
| $D_{India}$ | -0.974 | 0.813 |
| | (-1.199) | |
| $D_{Indonesia}$ | -0.696 | 0.559 |
| | (-1.243) | |
| $D_{Iran}$ | -2.819*** | 0.481 |
| | (-5.857) | |
| $D_{Iraq}$ | -2.823*** | 0.407 |
| | (-6.945) | |
| $D_{Jamaica}$ | 0.211 | 0.612 |
| | (0.345) | |
| $D_{Jordan}$ | -0.276 | 0.613 |
| | (-0.451) | |
| $D_{Kenya}$ | 4.747*** | 0.568 |

| | | |
|---|---|---|
| | (8.361) | |
| $D_{Lesotho}$ | -1.417* | 0.571 |
| | (-2.484) | |
| $D_{Madagascar}$ | 2.438*** | 0.500 |
| | (4.872) | |
| $D_{Malawi}$ | 9.446*** | 0.521 |
| | (18.125) | |
| $D_{Malaysia}$ | -0.675 | 0.664 |
| | (-1.015) | |
| $D_{Mali}$ | 3.059*** | 0.517 |
| | (5.916) | |
| $D_{Mauritania}$ | -1.496** | 0.523 |
| | (-2.859) | |
| $D_{Mauritius}$ | 0.454 | 0.495 |
| | (0.916) | |
| $D_{Mexico}$ | -1.522* | 0.601 |
| | (-2.535) | |
| $D_{Mongolia}$ | -1.713* | 0.696 |
| | (-2.461) | |
| $D_{Nepal}$ | -4.579*** | 1.318 |
| | (-3.473) | |
| $D_{Nigeria}$ | 1.032 | 1.115 |
| | (0.926) | |
| $D_{Pakistan}$ | -7.325*** | 2.190 |
| | (-3.344) | |
| $D_{Panama}$ | 3.152*** | 0.415 |
| | (7.601) | |
| $D_{Paraguay}$ | 7.997*** | 0.676 |
| | (11.822) | |
| $D_{Peru}$ | -1.273* | 0.522 |
| | (-2.438) | |

| | | |
|---|---|---|
| $D_{Philippines}$ | -1.286* | 0.627 |
| | (-2.052) | |
| $D_{Poland}$ | 0.5404 | 0.520 |
| | (1.038) | |
| $D_{Romania}$ | -4.050*** | 1.064 |
| | (-3.806) | |
| $D_{Russia}$ | -0.426 | 0.544 |
| | (-0.783) | |
| $D_{Rwanda}$ | 4.144*** | 0.506 |
| | (8.188) | |
| $D_{Saudi\ Arabia}$ | -1.254*** | 0.366 |
| | (-3.422) | |
| $D_{Senegal}$ | 0.066 | 0.566 |
| | (0.117) | |
| $D_{South\ Africa}$ | -0.882* | 0.366 |
| | (-2.406) | |
| $D_{Sri\ Lanka}$ | -2.692* | 1.117 |
| | (-2.409) | |
| $D_{Sudan}$ | 2.348*** | 0.531 |
| | (4.418) | |
| $D_{Togo}$ | 2.455*** | 0.439 |
| | (5.594) | |
| $D_{Trinidad\ and\ Tobago}$ | -2.668*** | 0.656 |
| | (-4.067) | |
| $D_{Turkiye}$ | -1.524* | 0.607 |
| | (-2.510) | |
| $D_{Uganda}$ | 5.622*** | 0.736 |
| | (7.641) | |
| $D_{United\ Republic\ of\ Tanzania}$ | 6.605*** | 0.510 |
| | (12.957) | |
| $D_{Uruguay}$ | 5.502*** | 0.397 |

| | | |
|---|---|---|
| | (13.856) | |
| $D_{Yemen}$ | -1.708** | 0.555 |
| | (-3.078) | |
| $D_{Zambia}$ | -6.231*** | 0.475 |
| | (-13.115) | |
| Cons. | 2.014*** | 0.597 |
| | (3.375) | |
| | Adj $R^2$ | 0.810 |
| | F test | 116.441 |
| | Overidentification test | 14.722 |
| | Weak identification test | 20.900 |
| | Endogeneity test | 3.914 |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

The research found that ACA, RENEW, and RENT all had an impact on the TEMP variable in developing countries. The ACA and RENT variables have a positive coefficient, implying that the TEMP will rise as ACA and RENT increase. The increase in ACA in developing countries raises the temperature. Agriculture in developing countries continues to use little environmentally friendly technology, consumes a lot of energy, and is less concerned with energy efficiency (Batmunkh et al., 2022). This situation occurs naturally because agriculture consumes chemicals and produces waste, both of which increase methane and $CO_2$ (Lynch & Garnett, 2021). Furthermore, it is impossible to halt economic activity because it would have serious consequences for human life.

The use of superior crop varieties has a significant impact on biodiversity and ecosystem health. Even more worrying, the ACA has resulted in enormous conversion of agricultural land to housing, private industrial, and service sector uses. Many agricultural land rights have passed from small farmers to large multinational enterprises (Sud, 2014). Many policymakers, business people, and governments promote clearing mountains, plateaus, and forests for agricultural land (Hodges et al., 2014).

Furthermore, agricultural products are transported using fossil fuels, which contribute to global anthropogenic emissions (Watanabe & Cavalett, 2022). Whereas, agriculture has the

potential to contribute to reducing the harmful consequences of climate change if properly managed. For example, agriculture in South America is projected to contribute 31% to climate change mitigation through pasture restoration, 25.6% through crop, livestock, and forestry integration, 24.3% through no-till farming, 12.8% through forestation, 4.2% through biological nitrogen fixation, and 2% through industrial organic waste recycling (L. Chen et al., 2022).

RENEW in developing countries can reduce temperature. These findings are consistent with a study from Abbas et al. (2021), which found that traditional energy (natural gas and oil) in developing countries has a significant and positive ecological footprint, whereas renewable energy has a negative and significant relationship with $CO_2$ and temperature in the long-run period. The potential for this energy development in developing countries is enormous because of the variety of sources and the massive amount of land available for biofuel crop growing.

Although not ideal, developing countries are catching up and becoming more active in their implementation of renewable energy and environmentally friendly legislation than many developed countries (Fekete et al., 2021). China, for example, has pledged to become carbon neutral by 2060. Carbon neutrality in China might lower global warming by 0.2-0.3 $^0$C while saving around 1.8 million people from premature death due to air pollution (Yang et al., 2022). Similarly, Vietnam will be able to reduce GHG emissions by 2% annually by 2030 (Fekete et al., 2021).

RENT, as predicted, will raise TEMP in developing countries. According to Agboola et al. (2021), there is a significant positive relationship between total country natural resource rent and $CO_2$ emissions in developing countries in the short and long run. The same pattern applies in Sub-Saharan African countries, where natural resource rents raise $CO_2$ emissions (Adedoyin et al., 2020) and other pollutants over time (Asongu et al., 2020).

Finally, RENT has a double environmental impact in developing countries. On the one hand, environmental pressure is increasing, as the forest area declines. On the other side, this money is used to increase the extent of the agricultural land (Batmunkh et al., 2022). This situation increases environmental reliance, puts natural resources under strain, and makes it harder to maintain a sustainable ecosystem (Li et al., 2016). In contrast, variables such as IND, POP, and CONV have no effect on TEMP in developing countries.

The next analysis is the factors that influence ACA in developing countries. The CPI coefficient in developing countries is positive, implying that an increase in CPI can increase ACA.

ACA will decrease as TEMP, EXC, EGI, IRRI, MOB, EMPL, and HCI rise. The findings indicate that the third hypothesis of this study is unproven since EGI has no positive impact on ACA in developing countries.

The findings of cross-country analysis show heterogeneity in Benin, Brazil, Burkina Faso, Burundi, Cameroon, Costa Rica, Dominican Republic, El Salvador, Eswatini, Ethiopia, Fiji, Guatemala, Guyana, Honduras, Kenya, Madagascar, Malawi, Mali, Panama, Paraguay, Rwanda, Sudan, Togo, Uganda, United Republic of Tanzania, and Uruguay have increased their agricultural competitiveness. Meanwhile, heterogeneity in Albania, Bangladesh, Botswana, Brunei Darussalam, Cambodia, China, Congo, Democratic Republic of the Congo, Gabon, Haiti, Iran, Iraq, Lesotho, Mauritania, Mexico, Mongolia, Nepal, Pakistan, Peru, Philippines, Romania, Saudi Arabia, South Africa, Sri Lanka, Trinidad and Tobago, Turkiye, Yemen, and Zambia have reduced agricultural competitiveness in each country.

Increasing temperatures have been shown to negatively affect business activities, particularly agriculture, in developing and developed countries. Despite having the same impact, temperature changes in developed countries are more sensitive to a drop in agricultural competitiveness than in developing countries. This is evidenced by the fact that the value of the temperature change coefficient is higher in developed countries is higher than in developing countries (Table 14).

High temperatures will lead to more droughts and diseases, less water availability, decreased agricultural land and fodder quality, and a detrimental influence on reproduction (Srbinovska et al., 2015; Debaeke et al., 2017). As temperatures rise, soil respiration accelerates, lowering carbon sinks in the ecosystem. As a result, agricultural productivity and competitiveness have plunged significantly. This condition frequently occurs in several countries and is exacerbated by several other issues: (1) economic policy crises that fail to account for the cost of environmental services, (2) a lack of community and public sustainability education, (3) failure to adapt to new challenges; and (4) technology limits (Silva et al., 1995).

The drought risk index indicates a rise in temperature in developing countries. Because of the high temperatures in the area, the majority of the water evaporates and becomes unavailable for plant growth (Pham et al., 2022). Worse, floods and droughts in Sub-Saharan Africa and Ethiopia might restrict increasing farmers' income, access to financial and natural assets, and the ability to recuperate for the next crop season (Maslova et al., 2020). All this is exacerbated by environmentally unfriendly agricultural activities. For example, China's fertilizer consumption per

hectare of arable land reached 557.05 kg—4.12 times the global average. Furthermore, China's pesticide use increased to 1.81 megatons in 2012, a 41.2% increase over 2000 levels. Agricultural thin membrane use increased by more than 100% during the same period. All of these agricultural pollutants pose a serious threat to China's long-run agricultural development. As a result, agricultural production resources were rapidly depleting. and reduce farmers' motivation to increase agricultural production and competitiveness (Zhou et al., 2017).

The CPI increases agricultural competitiveness in developing countries. Consumer price rises have driven agricultural product prices higher than before (Maslova et al., 2020). Belton and Nair-Reichert (2007) also stated that food inflation has led to higher consumer and producer prices. The rise in the CPI provides an incentive for producers to produce more products. When the CPI is high, producers make more money. Furthermore, CPI can improve product quality because competition to produce the best products is strong. All of this will eventually boost product competitiveness (Prasada et al., 2022).

EXC is a key driver of the agricultural sector's international competitiveness (Sarker & Ratnasena, 2014). The findings of this study are consistent with Abbas (2022) that EXC depreciation has a major detrimental impact on export competitiveness. The depreciation of the domestic currency raises the domestic production cost and the price levels, hence reducing competitiveness. This problem can become worse when exchange rate volatility is accompanied by poor domestic economic policy or agricultural market failure (Kargbo, 2006; Sarker & Ratnasena, 2014).

Globalization, an external economic factor, harms ACA in developing countries. EGI has pushed all countries to carry out structural adjustments as soon as possible. EGI has encouraged the transformation of land tenure, human resources, and social and financial capital to allow for market intervention in the agricultural sector (Neglo et al., 2021). The loss of different agricultural subsidies and poor structural policies continue to exacerbate the problem. Globalization also leads to intense competition among producing countries with similar agricultural products. According to Pasara (2020), globalization can reduce export volume and competitiveness among its participants, particularly small countries.

For example, the implementation of the EGI appears to have caused a deficit in the MENA agricultural trade balance. In the early 1970s, MENA's agricultural exports exceeded its imports. However, from the early 1980s, the situation has changed, with agricultural imports currently

outnumbering exports (Food and Agriculture Organization of the United Nations, 2023). Despite the MENA region provides food to the EU, Asia, and America (Freund & Braga, 2012), it is also the world's largest grain importer (Keulertz & Woertz, 2015). Furthermore, MENA countries are focusing more on oil exports while diversifying their economy into other sectors, such as agriculture, which is currently performing poorly (Kireyev, 2021). These various situations cause EGI to diminish ACA.

On the other hand, developing countries are heavily reliant on global economic conditions, making them vulnerable to even slight external shocks. For instance, the MENA region is especially exposed to rising global food prices. Between 2007 and 2012, the food price index increased from 134.0 to 210.9, indicating the biggest cost-push inflation (Food and Agriculture Organization of the United Nations, 2023). As a result, it will jeopardize ACA's expansion in the MENA region. The findings are consistent with Zaman et al. (2016) study, which found that inflation reduces value-added even in developed countries.

Meanwhile, Argentina's economy will be disrupted if the destination country for its agricultural exports experiences a crisis (Pinilla & Rayes, 2019). The 2008 global economic crisis reduced demand for agricultural products from the Philippines, which also reduced domestic demand and increased inflation in the Philippines. Banks have become reluctant to provide loans for agriculture due to high levels of uncertainty (Gochoco-Bautista, 2009).

Global food prices have also risen in the last decade because of trade wars, the Covid-19 pandemic, and the Russia-Ukraine conflict. The Russo-Ukrainian war has led to an increase in food prices and threatens its competitiveness. Global food prices show an increasing trend between May 2017 and May 2022 (Figure 10). Between 2017 and 2019, global food prices remained stable. However, food prices started to rise in 2020 and 2021. Wheat and maize prices rose significantly each month, by 2.17% and 2.59%, respectively. During the same period, soybean prices grew by 1.73% each month. Meanwhile, global rice prices tend to decline monthly even though it is only 0.14% (Nasir et al., 2022).

Global food prices skyrocket in 2022, particularly in March or a month after Russia invades Ukraine. World soybean prices increased by 8.91% in March, followed by increases of approximately 0.03% and 0.46% in April and May, respectively. Maize prices rose more than soybeans, by 14.66% in March 2022, 3.77% in April 2022, and 0.95% in May 2022. Wheat experienced the greatest price increase among all food products. This commodity's price rose to

24.53% in March and then increased again in April (1.85%) and May (5.45%). The opposite phenomenon occurred in the world rice price, which fell by -1.17% in March. However, in April and May, the price of rice globally increased by 2.13% and 7.66%, respectively. According to the FAO (FAO, 2022), global food and feed prices will rise by 8 to 22% above their present high baseline levels if this issue is not settled soon.

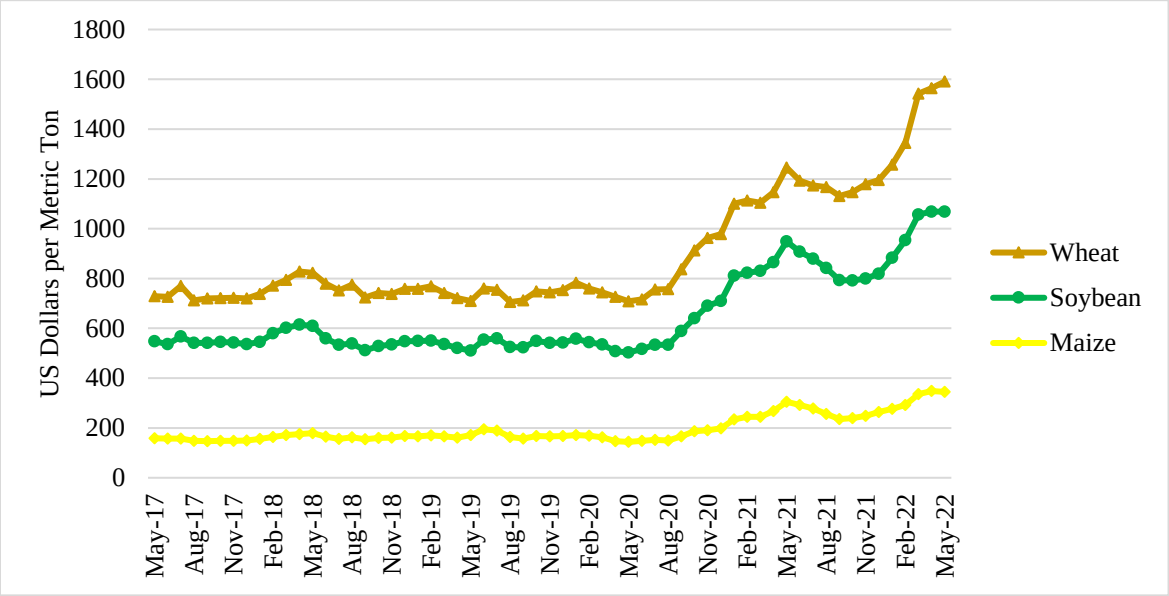



**Figure 10.** Global food prices from May 2017 until May 2022

Source: World Bank (2021)

During the Russia-Ukraine crisis, the average (mean) price of the three commodities reached its peak. When compared to normal conditions, the average price has doubled. Meanwhile, the Covid-19 period saw the greatest price volatility (standard deviation). However, given that the conflict between Russia and Ukraine has only been ongoing for a short time, things may change. The probability of price swings worsening in the future is not negligible (Nasir et al., 2022). The increase in food prices has caused the prices of other products to rise and reduced the competitiveness of various products, especially agriculture.

**Table 11.** Mean and standard deviation of world wheat, soybean, and maize prices (US dollars per metric ton)

| Period | | Wheat | Soybean | Maize |
|---|---|---|---|---|
| Jan2017-Dec2019 (normal) | Mean | 200.04 | 384.27 | 163.44 |
| | Std. Deviation | 15.08 | 21.99 | 10.85 |
| Jan2020-Feb2022 (Covid-19) | Mean | 281.78 | 505.54 | 218.05 |
| | Std. Deviation | 58.16 | 100.81 | 52.77 |
| Mar-May2022 | Mean | 501.29 | 721.83 | 342.85 |
| (Rus-Ukr conflict) | Std. Deviation | 15.26 | 1.60 | 5.35 |

Source: World Bank (2021) analyzed

The competitiveness of agriculture also falls and harms producing countries due to excessive imports. The reduction of trade barriers and inadequate logistics performance are to blame for this situation (Le, 2021). China's transgenic agricultural product imports increased from 80,000 tons in 1996 to 2.83 million tons in 1999, accounting for 5.2% of global transgenic product trade (T. Ma et al., 2006). The same dilemma happens in India, where agricultural imports have greatly increased while domestic foodgrain output has fallen (B. N. Ghosh, 2009).

The developing countries suffer substantial EGI issues, as well as unfair treatment from developed countries, particularly the United States and the European Union. In 2001, the OECD (Organization for Economic Cooperation and Development) spent approximately US$360 billion on agricultural subsidies. Agricultural subsidies in other developed countries remain high, amounting to almost US$235 billion in 2003. Furthermore, several domestic tariff and non-tariff barriers restrict developing countries' access to OECD markets (Kargbo, 2006).

Developed countries are also aggressively imposing various trade barriers that undermine developing countries' agricultural competitiveness and vice versa (Figure 11). The introduction of certification has reduced the competitiveness of agricultural and forestry products. These products easily entered developed countries and were highly competitive before the implementation of certification.

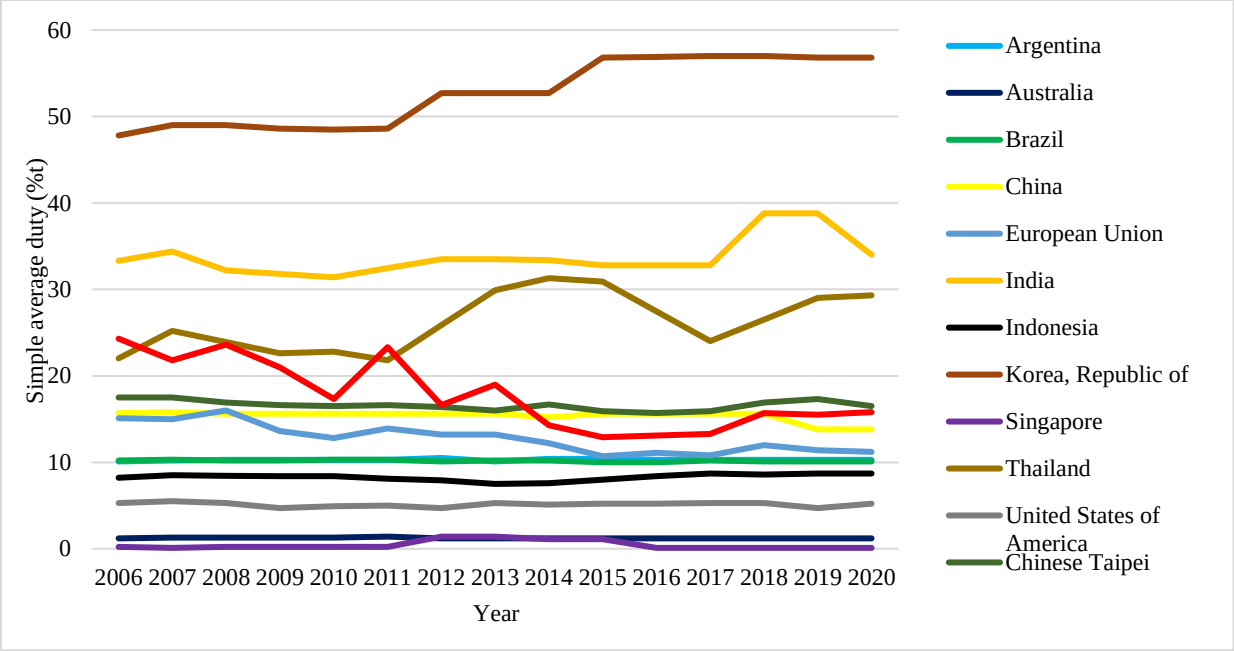



**Figure 11**. Agricultural average duty in the selected developing and developed countries 2006-2020

Source: WTO (2021)

Figure 12 depicts Indonesian plywood competitiveness in the EU market. Between January 1999 and July 2021, the competitiveness of Indonesian plywood tends to diminish. This is being driven by a greater application of restrictive forest products and forest management policies in the EU market. The strategy was launched in 2003 with the FLEGT (Forest Law Enforcement, Governance, and Trade) Action Plan. This policy has two primary instruments: VPAs (Voluntary Partnership Agreements) for countries that voluntarily agree to ratify the FLEGT policy, and the EUTR (European Union Timber Regulation) for countries that have not ratified the FLEGT policy.

Before the VPAs, Indonesian plywood's competitiveness in the EU market was lower than under normal conditions. Furthermore, the competitiveness of Indonesian plywood has declined during the VPA negotiating process. Indonesia began the VPA policy phase in May 2011, and it was officially ratified in April 2014. During this time, Indonesian plywood's competitiveness in the EU market was steadily falling. Indonesian plywood's competitiveness in the EU market has dipped once more during the VPA implementation period. The EUTR policy will compel countries to go through due diligence procedures. This procedure will slow down the export process and may increase export costs (Prasada et al., 2022).

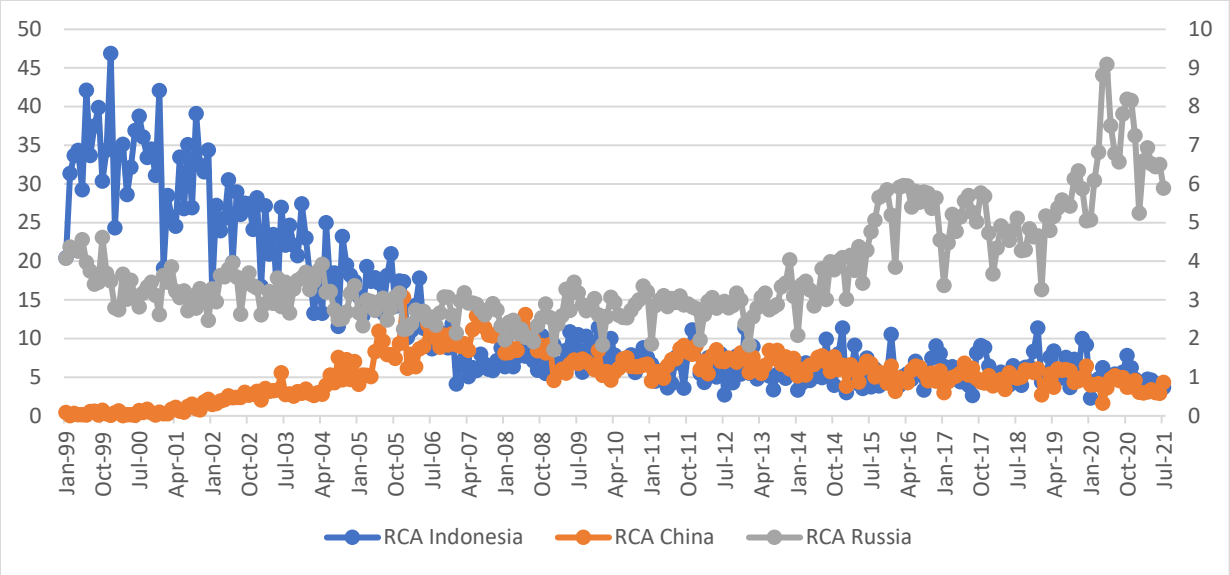



**Figure 12**. Changes in Indonesian, Chinese, and Russian plywood competitiveness in the EU market

Developing countries do not remain silent, instead, they implement retaliatory policies that contravene free trade standards. For example, consider implementing a producer price support scheme. This approach establishes an acceptable price for producers and buys surplus from them at that rate. When prices fall due to good harvests, the government will buy in mass at a price that protects producers (Varshney, 1989). This type of policy benefits farmers. As evidence, increasing farm-level price support in India effectively kept domestic producer prices higher than they should have been (Groom & Tak, 2015).

The governments of Indonesia and the Philippines subsidize importable commodities and raise prices above market levels. The purpose of government involvement is to benefit domestic consumers while simultaneously protecting agriculture from foreign competition (Laiprakobsup, 2014a). Many countries oppose tariff reductions due to high levels of protection and structural concerns in the agricultural industry (Reeves, 1987). They feel that if they do not take safeguards, their producer price volatility will increase with global price volatility (Hertel et al., 2010). These many circumstances render EGI inefficient and reduce agricultural competitiveness.

Increasing the number of employees does not improve agricultural competitiveness in developing countries. A higher proportion of agricultural employment indicates lesser economic

development, increasing the likelihood of failure in agri-food competitiveness (Bojnec & Fertő, 2017). Furthermore, rising labor wages reduce agricultural competitiveness (Huo, 2014).

Another major concern is a shortage of skilled workers, which slows economic growth and increases agricultural labor mechanization. However, attempts to strengthen human capital have not resulted in increased agricultural competitiveness. The agricultural workforce migrated to the non-agricultural sector as education levels rose (Wegren, 2014). Improved education has opened up alternatives for regular and high-income jobs rather than work in agriculture, where product prices, wages, and technical support are poor (Salam & Bauer, 2022).

The infrastructure provision is projected to increase agricultural competitiveness. This is not true in developing countries, as increasing IRRI or MOB decreases competitiveness. The main impediment in developing countries is a shortage of water, hence irrigation supplies are useless in enhancing competitiveness (Haddad & Shahwan, 2012). Even in developing countries, most farmers use untreated wastewater to irrigate their crops. The lack of proper processing facilities exposes both farmers and consumers to health concerns from heavy metals, viruses, parasitic worms, and germs, lowering agricultural product competitiveness (A. Biswas et al., 2021). Untreated wastewater irrigation can generate a variety of environmental risks in the soil and crops (Y. Zhang & Shen, 2019).

The second reason is that irrigation can only be utilized to boost rice yield. Meanwhile, agriculture is more than simply rice; it also includes products that are not irrigated (McIntire, 2014). The last reason is inefficient irrigation in developing countries, which results in suboptimal agricultural cultivation (Calzadilla et al., 2013). For example, treated wastewater reuse for irrigation in MENA countries is either inefficient or the pricing system. Furthermore, the increase in operating and maintenance expenditures has exacerbated the problem (Zekri & Aaisha Al-Maamari, 2019).

Mobile phone use in agriculture is still in its early stages in developing countries, so its effectiveness is limited (Bahn et al., 2021). Due to limited funding, the development of information and communication technologies (ICT) infrastructure in developing countries is also delayed. This is exacerbated by a majority of agricultural actors' lack of knowledge, which precludes them from using ICTs correctly (Nugroho, 2021a). The majority of agricultural industry actors in developing countries are older, making it difficult for them to access advanced technology. This could be due

to deterioration of cognitive ability and increased difficulty using modern technological equipment.

Subejo et al. (2019) also stated farmers who are young and well-educated, which dominates in developing countries, have a better income and stronger infrastructure, and only communications networks use this technology to access agricultural output and marketing information. Meanwhile, farmers with low levels of education and income continue to watch television, while others have started using cell phones. They also prefer to get agricultural information directly from others (Wicaksono et al., 2021). Worryingly, extension staff lacks/has insufficient expertise in ICTs (technology usability). Some extension professionals have poor ICT skills and experience, or they simply do not have enough time. This is due to a lack of training in using most new ICTs (Enwelu et al., 2017). Hence, the use of MOB in developing countries cannot increase agricultural competitiveness.

FAO (2017a) stated that the government and market participants must create the AMIS (Agricultural Market Information System) (Table 12). This program would increase data dependability, timeliness, and frequency.

**Table 12.** Process of agricultural market information system in developing countries

| Process | Purposes | Steps | Actors | Challenges |
|---|---|---|---|---|
| Data collection | to ensure the data is reliable and accurate | 1. Identifying the type of commodities<br>2. Determining information on the required variety, quality, and packaging of selected commodities and other information<br>3. Determining the proper sampling design and number of observations<br>4. Timing of data collection | 1. Government<br>2. Extension staff<br>3. Private company<br>4. Telecommunications agencies<br>5. Consumers, traders, and supermarkets<br>6. Commodity exchange<br>7. Farmers group | Change of collecting data process from paper-based methods to digital methods |
| Data transmission and processing | To ensure the data will be rapidly transmitted | 1. Checking data<br>2. Processing data | 1. Government<br>2. Private company | 1. lack of funds to pay for the enumerator need<br>2. availability of software |
| Data analysis and packaging | To ensure the data easy to use | 1. Analyzing data<br>2. Packaging data | 1. Government<br>2. Private company | ability to interpret the data |

| | | | | |
|---|---|---|---|---|
| Data dissemination | To ensure users receive the data | Disseminating data | 1. Government<br>2. Private company | Choosing the most appropriate medium for dissemination |
| Help users understand data interpretation | To help users (especially farmers) understand and interpret the data | Interpreting data | Extension staff | Lack of extension staff |

Source: FAO (2017a), modified by the author

## 5.2. Impact of Economic Globalization on Agricultural Competitiveness in Developed Countries

Unit root tests in developed countries demonstrate that TEMP, ACA, IND, RENT, CPI, EGI, IRRI, MOB, EMPL, and HCI are stationary at the level. RENEW, CONV, and EXC are stationary at the first-difference level, whereas the POP is stationary at the second-difference level (Table 13).

**Table 13.** Levin Lin Chu unit root test

| Variable | Developed countries | |
|---|---|---|
| | **Stage** | **Statistic** |
| TEMP | At level | -11.520*** |
| ACA | At level | -2.806*** |
| IND | At level | -12.035*** |
| POP | 2nd difference | -11.024*** |
| RENEW | 1st difference | -22.105*** |
| RENT | At level | -8.605*** |
| CONV | 1st difference | -15.021*** |
| CPI | At level | -4.798*** |
| EXC | 1st difference | -17.868*** |
| EGI | At level | -8.031*** |
| IRRI | At level | -5.512*** |
| MOB | At level | -5.734*** |
| EMPL | At level | -6.495*** |
| HCI | At level | -9.372*** |

Equation (13) indicates that in developed countries, the significance level of the endogeneity test generates a Hausman statistic of 0.029, whereas Equation (14) produces a Hausman statistic of 0.038. The endogeneity significance level is less than the 10% alpha level, indicating that endogeneity issues exist in the model's structural equations. The overidentification and weak instrument tests both give significant results at the 5% alpha level, indicating that the structural model is over-identified and that each equation contains a strong instrument variable. Furthermore,

the final stage of regression (step 2) yields an adjusted $R^2$ value of 0.390 and an F-statistic value of 19.955 (prob. = 0.000). All statistical tests indicate that the 3SLS regression model can be applied correctly in this study (Table 14).

**Table 14.** Three-stage least square regression results in developed countries

| Variable | Developed countries | |
|---|---|---|
| | **Coeff.** | **Std. Error** |
| Dependent variable: TEMP | | |
| ACA | -0.090*** | 0.021 |
| | (-4.294) | |
| IND | -0.004ns | 0.011 |
| | (-0.419) | |
| POP | -0.000008ns | 0.00006 |
| | (-0.970) | |
| RENEW | 0.351* | 0.166 |
| | (2.110) | |
| RENT | 0.012ns | 0.020 |
| | (0.612) | |
| CONV | 0.000001ns | 0.0007 |
| | (0.018) | |
| Cons. | 1.134*** | 0.105 |
| | (10.780) | |
| Adj $R^2$ | | 0.387 |
| F test | | 11.591 |
| Overidentification test | | 11.536 |
| Weak identification test | | 14.627 |
| Endogeneity test | | 4.803 |
| Dependent variable: ACA | | |
| TEMP | -0.495*** | 0.093 |
| | (-5.312) | |
| CPI | 0.012** | 0.004 |

| | | |
|---|---|---|
| | (3.130) | |
| EXC | -0.002*** | 0.0003 |
| | (-5.572) | |
| EGI | -0.015** | 0.005 |
| | (-2.799) | |
| IRRI | 0.001ns | 0.005 |
| | (0.242) | |
| MOB | 0.003 . | 0.002 |
| | (1.649) | |
| EMPL | -0.0005*** | 0.0002 |
| | (-3.091) | |
| HCI | -0.599*** | 0.155 |
| | (-3.872) | |
| $D_{Australia}$ | -5.075*** | 0.943 |
| | (-5.379) | |
| $D_{Austria}$ | -4.275*** | 0.859 |
| | (-4.972) | |
| $D_{Belgium}$ | -4.176*** | 0.832 |
| | (-5.017) | |
| $D_{Canada}$ | -4.814*** | 0.969 |
| | (-4.964) | |
| $D_{Cyprus}$ | -4.173*** | 0.706 |
| | (-5.904) | |
| $D_{Czechia}$ | -4.647*** | 0.950 |
| | (-4.887) | |
| $D_{Denmark}$ | -4.696*** | 0.892 |
| | (-5.260) | |
| $D_{Finland}$ | -4.240*** | 0.860 |
| | (-4.929) | |
| $D_{France}$ | -4.555*** | 0.868 |
| | (-5.246) | |

| | | |
|---|---|---|
| $D_{Germany}$ | -5.130*** | 1.011 |
| | (-5.073) | |
| $D_{Greece}$ | -4.686*** | 0.788 |
| | (-5.946) | |
| $D_{Iceland}$ | -4.141*** | 0.774 |
| | (-5.350) | |
| $D_{Israel}$ | -5.365*** | 0.925 |
| | (-5.795) | |
| $D_{Italy}$ | -4.704*** | 0.830 |
| | (-5.663) | |
| $D_{Netherlands}$ | -4.727*** | 0.874 |
| | (-5.406) | |
| $D_{New\ Zealand}$ | -5.127*** | 0.873 |
| | (-5.870) | |
| $D_{Norway}$ | -4.694*** | 0.909 |
| | (-5.164) | |
| $D_{Portugal}$ | -3.636*** | 0.649 |
| | (-5.6029) | |
| $D_{Republic\ of\ Korea}$ | -5.381*** | 1.216 |
| | (-4.423) | |
| $D_{Spain}$ | -4.334*** | 0.793 |
| | (-5.459) | |
| $D_{Sweden}$ | -4.378*** | 0.873 |
| | (-5.010) | |
| $D_{Switzerland}$ | -4.809*** | 0.961 |
| | (-5.004) | |
| $D_{United\ Kingdom\ of\ Great\ Britain\ and\ Northern\ Ireland}$ | -5.345*** | 0.975 |
| | (-5.482) | |
| $D_{United\ States\ of\ America}$ | -6.153*** | 1.1418 |
| | (-5.389) | |
| Cons. | 6.229*** | 0.702 |

| | |
|---|---|
| | (8.867) |
| Adj $R^2$ | 0.390 |
| F test | 19.955 |
| Overidentification test | 6.270 |
| Weak identification test | 9.466 |
| Endogeneity test | 4.254 |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Like in developing countries, the first analysis conducted in developed countries is the factors that influence TEMP. The ACA in developed countries has a negative regression coefficient, implying that TEMP has declined as the ACA has increased. TEMP in this area will rise as RENEW rises. The factors RENT, IND, POP, and CONV have no effect on TEMP in developed countries.

TEMP can be reduced by improving agricultural competitiveness in developed countries (Debaeke et al., 2017). In several developed European Union countries. ACA has changed by more than 1.41%, causing increased pollutants and temperature (Simionescu, 2021). Developed countries prioritize modernizing, increasing efficiency, and diversifying the energy business by offering incentives for renewable energy sources (Pfeiffer & Hepburn, 2016). For example, the 2003 EU CAP reform attempts to increase ACA while simultaneously promoting the conservation of the environment. To achieve these goals, six priorities have been identified: promoting knowledge transfer in agriculture and forestry, improving agricultural competitiveness and viability of farming and forestry, supporting food chain organization and risk management, restoring, protecting, and maintaining agriculture and forestry-dependent ecosystems, promoting efficient resource usage, and transitioning to a low-carbon economy in the agri-food sector (Svoboda et al., 2016),

Furthermore, the CAP is currently separated into two pillars: the first deals with direct payments and Common Market Organizations (CMOs), and the second with rural development policy (Ciliberti & Frascarelli, 2015). Most CMOs have replaced direct production supports with a single payment for each farm, subject to echo-conditionality and restrictions on agricultural system improvements (Fragoso & Marques, 2007). The consecutive reforms in CAP 2014-2020 have created an appropriate environment for developing and implementing innovative,

environmentally friendly farming methods (encouraging sustainable resource management and climate change mitigation actions), allowing farmers to increase output, and manage the local environment (Srbinovska et al., 2015). Proponents of the "environmental frame" suggest that the CAP should be re-focused, seeing both food production and environmental service supply as an integral aspect of European agriculture through better-targeted income assistance and innovation incentives (Ciliberti & Frascarelli, 2015).

In another developed country, the United States, the emphasis is not only on the use of natural production factors but also on the use of degraded plastic mulch. This mulch represents a price premium opportunity for the product grown, as well as an opportunity to improve soil health or reduce field-borne residue, thereby improving environmental sustainability. The people of the United States are open to this innovation and are willing to pay to buy eco-friendly mulch (K. J. Chen et al., 2020).

Developed countries are also enhancing low-carbon agriculture, changing dietary habits, and raising the value of food and agricultural waste to reduce world temperatures. They use food and agricultural waste to create novel medications, phytochemicals, enzyme immobilization, heavy metal removal from wastewater, and cooking oil waste that may be transformed into biodiesel (L. Chen et al., 2022).

Efforts by developed countries to enhance RENEW will be fragmented and ineffective. Excessive demand for RENEW increases the danger of both short and long-run environmental damage (Sadiqa et al., 2022). This is because these countries rely on developing countries and face numerous challenges (Tcvetkov, 2022). For example, To ensure food and energy security, the EU must strictly regulate the use of land for food crops and biofuels (Paschalidou et al., 2016). As a result, the EU is unable to effectively develop renewable energy sources. Countries with a lower concentration of renewable energy sources have found it challenging to mitigate environmental damage, such as rising temperatures and CO2 emissions (Nematchoua et al., 2020).

The following part examines the factors that influence ACA in developed countries. As both the CPI and the MOB climb, so will ACA. Meanwhile, the TEMP, EXC, EGI, EMPL, and HCI all have a negative regression coefficient, indicating that ACA has reduced while TEMP, EXC, EGI, EMPL, and HCI have increased. The findings indicate that the third hypothesis of this study is unproven since EGI has no positive impact on ACA in developed countries. The results of cross-

country analysis show that heterogeneity in the developed countries sampled in this study has reduced agricultural competitiveness in each country.

As in developing countries, increasing TEMP leads to decreased water availability and drought (Srbinovska et al., 2015; Debaeke et al., 2017). Because of the high temperatures, the majority of the water evaporates, making it unavailable for vegetation development (Pham et al., 2022). Hence, agricultural production and competitiveness fell precipitously.

In recent decades, high heat, slight increases in extreme rainfall and drought, and a significant decrease in frost occurrence have all occurred in Zeeland, a Dutch coastal region. This phenomenon is associated with several detrimental environmental and societal implications, including negative effects on agricultural competitiveness and food production (van Tilburg & Hudson, 2022). In fact, agricultural competitiveness in developed countries has experienced a greater decline than in developing countries due to rising temperatures.

CPI increases ACA in developed countries. Consumer price rises have driven agricultural product prices higher than before (Maslova et al., 2020). Belton and Nair-Reichert (2007) also claimed that rising food prices have led to higher consumer and producer prices. A rise in the CPI stimulates producers to produce greater quantities because they make more money.

The volatile exchange rates can have a significant effect on bilateral trade flows (van den Heuvel et al., 2011). As a result, exchange rates play a crucial role in the agriculture sector's international competitiveness (Sarker & Ratnasena, 2014). Depreciation of the EXC raises domestic production costs and reduces competitiveness (Abbas, 2022).

EGI has pushed all countries to carry out structural adjustments as quickly as possible. Even agricultural business players in developed countries are unable to consistently innovate and maintain the survival of their business after implementing EGI (Beber et al., 2021). As a result, they are unprepared, and EGI impedes agricultural progress. For example, the application for the CAP revealed that Greek agriculture was unprepared and vulnerable to new market conditions. Greek consumers prefer imported products due to the high production costs of domestic food crops and livestock. The bigger part of the Greek agricultural production system's failure to integrate is demonstrated by the growing trade deficit and the Greek market's low self-sufficiency rate (Papageorgiou, 2012).

Some EGI components also do not always show a positive effect. Fonchamnyo & Akame, (2017) stated that the depreciation will restrict export diversification and have a substantial impact

on ACA. Otherwise, Mohammed (2015) said the depreciation causes the transfer of resources from aggregate agriculture to aggregate non-agriculture, reducing agricultural volume and competitiveness. Meanwhile, FDI inflows damaged ACA since the agriculture sector is unappealing to investors due to uncertainty in the event of an unsuccessful harvest (Mamba et al., 2020).

EGI also increases developed countries' reliance on agricultural food imports from developing countries. These imports are used to meet domestic consumption and food industry needs. Even the EU's reliance on food imports makes sanctions against Russia useless. EU food imports from Russia have continued to increase after the imposition of sanctions because of Russia's attack on Ukraine. Sanctions on Russian food imports have the potential to raise food prices, inflation rates, household spending, and food insecurity in the EU (Hejazi & Emamgholipour, 2022). Finally, the current EGI implementation is unfair. Subsidies are used by many developing countries to boost agricultural competitiveness (Sanchez-Ancochea, 2006; Pozo et al., 2011; Paus, 2012). As a result, developed-country products find it difficult to compete in developing-country markets because they are more expensive.

Because there are so few IRRIs in developed countries, their impact on agricultural competitiveness is minimal. Countries in this region use more wastewater that has been reprocessed with artificial wetlands, waste stabilization ponds, membrane bioreactors, vermi-biofiltration, and land treatment technologies to remove chemical and biological pollutants. After this process, the water is free of impurities and can be utilized to water plants during cultivation (A. Biswas et al., 2021).

Many developed countries have prioritized technological innovation in their national economic objectives to achieve and benefit from an 'innovation-driven' economy (Jung & Park, 2014). The use of MOB in developed countries facilitates farmers' access to agricultural cultivation and post-harvest information and knowledge (Bahn et al., 2021). Other benefits of using MOB include obtaining higher prices and managing sales, finding buyers, creating product conformity to consumer needs, reducing the possibility of asymmetric information in the agriculture market, increasing price transparency, and improving farmers' market participation and bargaining power (Nugroho, 2021a).

A higher share of agricultural employment signifies a lower degree of economic growth and higher salaries, raising the probability of failure in agri-food competitiveness (Huo, 2014; Bojnec

& Fertő, 2017). Another major concern is that attempts to strengthen human capital have not resulted in increased agricultural competitiveness. Improved education has opened up alternatives for regular and high-income jobs rather than work in agriculture, where product prices, wages, and technical support are poor (Salam & Bauer, 2022).

In general, developed countries must work to prevent climate change, implement efficient monetary policy, extend the use of technology, raise labor productivity, equalize education, and exercise caution in economic globalization. Meanwhile, other investigations reveal policymakers in developed countries can also maintain agri-food export competitiveness by diversifying destination countries or products to improve global market share (Suroso et al., 2023). Other studies encourage developed countries to develop innovative approaches, such as organic production and the introduction of innovations to improve quality standards, differentiate products, and create final products with high added value, as critical prerequisites for increasing competitiveness and encouraging agri-food sector exports (Dimitrijević et al., 2023).

# VI. CONCLUSION

## 6.1. Conclusion

Agricultural competitiveness in both developing and developed countries has fluctuated over the last three decades. Developing countries that are categorized as having agricultural competitiveness (ACA > 1) include Benin, Bolivia, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Ethiopia PDR, Fiji, Guatemala, Guyana, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Lesotho, Madagascar, Malawi, Malaysia, Mali, Mauritius, Nepal, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Rwanda, Senegal, South Africa, Sri Lanka, Sudan (former), Togo, Turkiye, United Republic of Tanzania, Uganda Uruguay, and Yemen. Meanwhile, countries that have lost their agricultural competitiveness (ACA < 1) include Albania, Bangladesh, Botswana, Brunei Darussalam, China, Congo, Democratic Republic of the Congo, Gabon, Haiti, Hungary, Iran, Iraq, Mauritania, Mexico, Mongolia, Nigeria, Panama, Russian Federation, Saudi Arabia, Trinidad and Tobago, and Zambia. Therefore, hypothesis 1 of this study is unproven because there are developing countries that do not have agricultural competitiveness.

Romania is a developing country that has increased its agricultural competitiveness seven times in the last three decades. Several other developing countries have seen significant increases in agricultural competitiveness over the last three decades, including Brazil, Egypt, Indonesia, Iran, Jamaica, Malawi, Nepal, Russian Federation, South Africa, Uruguay, Yemen, and Zambia. However, developing countries such as Botswana, Brunei Darussalam, China, Dominican Republic, El Salvador, Eswatini, Ethiopia, Guyana, Honduras, Hungary, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Mongolia, Paraguay, Philippines, Rwanda, Senegal, Sudan, Togo, Türkiye, the United Republic of Tanzania, and Uganda have lost their competitiveness. The country with the most drastic decline in agricultural competitiveness in the last 3 decades is Panama. Meanwhile, agricultural competitiveness in countries such as Benin, Bolivia, Fiji, Iraq, Kenya, and Pakistan has stagnated.

Developed countries that are categorized as having agricultural competitiveness (ACA > 1) include Australia, Austria, Belgium, Canada, Cyprus, Denmark, France, Greece, Italy, Netherlands, New Zealand, Portugal, Spain, and the United States of America. Meanwhile, developed countries that have lost their agricultural competitiveness (ACA < 1) include Czechia,

Finland, Germany, Iceland, Israel, Norway, the Republic of Korea, Sweden, Switzerland, and the United Kingdom of Great Britain and Northern Ireland. Therefore, hypothesis 2 of this study is unproven because there are developed countries that do not have agricultural competitiveness.

Several developed countries that have experienced an increase in agricultural competitiveness in the last 3 decades include Austria, Belgium, Canada, Finland, Germany, Iceland, Italy, New Zealand, Norway, Spain, Sweden, and Switzerland. Portugal is a developed country with the highest increase in agricultural competitiveness in the last three decades, reaching 2.5 times. Australia, Cyprus, Denmark, Greece, Israel, and the Netherlands are countries that have experienced a decline in competitiveness. Countries that have stagnated agricultural competitiveness are the Czech Republic, France, the Republic of Korea, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

Several factors impede agricultural competitiveness in both developing and developed countries. One of the causes of decreased agricultural competitiveness is economic globalization. The findings indicate that the third hypothesis of this study is not supported since EGI has no positive impact on ACA in developing and developed countries. Even though Diamond Porter's theory states that agricultural competitiveness will increase as free trade is implemented. The author believes that two major factors are impeding international trade today: each country's lack of readiness to compete and the imposition of trade barriers. The entry of agricultural products from other countries surprised almost all countries. Imported goods have hampered domestic industry development. As a result, many countries impose trade barriers to reduce agricultural imports and disrupt the agricultural competitiveness of exporting countries. The study also proves that increasing temperature, representing factor conditions in Diamond Porter has disrupted agricultural competitiveness.

The study uses the EKC theory to examine a country's economic progress. Conditions in developing countries indicate a need to accelerate economic growth and income, therefore they lay less focus on environmental sustainability. People in developed countries, on the other hand, have long been aware of environmental issues, therefore economic activity can help to alleviate environmental damage.

The study also discovered that climate change has reduced agricultural competitiveness, with developed countries being more sensitive to temperature changes than developing countries. This seems normal given that most developed countries suffer highly quick seasonal changes each year,

thus a disruption in one season will have a big impact on agricultural output and competitiveness. Furthermore, because this region has more industry than developing countries, the risks of pollution and rising temperatures are higher. Meanwhile, climate change is causing concern in developing countries, but seasonal variability allows them to have a wider range of plant species, thus the decline process is less severe than in developed countries. However, the EKC theory has reminded people that economic activity harms the environment. The study also demonstrates the inverse phenomenon, in which environmental degradation disrupts economic activity.

The exchange rate, employment, and human capital are other factors that reduce agricultural competitiveness in developed and developing countries. Agriculture has become unattractive due to the large number of labors and increases in human capital because other sectors can pay higher wages.

CPI is an important factor that can boost agricultural competitiveness because it incentivizes producers to increase production quantity and quality. Meanwhile, the advancement of information technology is one method for increasing agricultural competitiveness in developed countries, but it harms developing countries due to lack of digital literacy.

Cross-section conditions in developing countries show varying impacts on agricultural competitiveness. Variations in socioeconomic conditions and policy can boost or undermine agricultural competitiveness in developing countries. Meanwhile, the same changes in developed countries have disrupted agricultural competitiveness.

### 6.2. Recommendation

Several recommendations are made to increase agricultural competitiveness in developed and developing countries in the era of economic globalization. First, increase the commitment of developed and developing countries to reduce support prices and trade barriers. In the short run, this approach will harm each country's economy, but it will improve each country's competitiveness in the long run. Business actors will be able to produce efficient agricultural products that can compete on a global scale. Developed countries are also expected to play a larger role in supporting developing countries with agricultural growth via investment schemes and technology transfer. On the other hand, the WTO must ensure that agricultural trade transactions are strictly supervised, impartial, and transparent.

Second, improve agricultural, distribution, and marketing efficiency. As a means of mitigating climate change, current technologies or precision agriculture make this feasible. This stage ensures that agricultural operations provide low-cost, high-quality agricultural outputs (high efficiency). Consumers will be willing to buy it, and producers will be able to make a decent living. Additionally, developing countries must improve their agricultural marketing systems. So far, the marketing system has primarily benefited traders, with farmers obtaining the lowest profit.

Third, improving agricultural business players' educational and technological literacy. The government, the private sector, and non-governmental organizations (NGOs) continue to provide help and training to agricultural business actors to carry out their activities. They must also get familiar with improvements in information and communication technologies (ICTs) to communicate agricultural and non-agricultural information more readily and rapidly. ICTs will provide business actors with a wealth of information, including effective agricultural production methods, the development of new processed products, the identification of consumers, and the promotion of appropriate items. Fourth, prioritizing agricultural infrastructure investment. This is done to increase the quantity, quality, and efficiency of agricultural products, hence increasing producer pricing. These infrastructures include agricultural machinery, dam, transportation, and road construction.

As a researcher, I believe that this study has many limitations. One of the limitations of this study is that no attempt was made to use technology and its literacy. Even though the use of technology is critical in enhancing agricultural competitiveness. Unfortunately, I cannot identify technological variables that apply to a wide range of countries. I expect that future studies will consider the use of technology in increasing agricultural competitiveness.

I also expect that future studies will examine the heterogeneity within each country. In this study, I identified this heterogeneity only with cross-section variables. Even though this is very important for determining agricultural competitiveness. This is because the oversimplification may lead to a lack of nuance in the analysis, as individual country circumstances and characteristics can vary significantly. In the continuation of this research work I plan to apply a more detailed classification of the states, based on various official (e.g. United Nations, World Bank) or automatic classification systems.

## VII. NEW SCIENTIFIC FINDINGS

Some new and important findings from the study include:

1. Agricultural competitiveness has varied dramatically between developing and developed countries during the last three decades. Many developing countries are agriculturally competitive, but many have lost that competitiveness. Similar problems exist in developed countries. Many countries have been able to boost their agricultural competitiveness, but many have seen declines.
2. Economic globalization has been linked to a reduction in agricultural competitiveness in both developing and developed countries during the last three decades. The primary reason for this situation is these countries' lack of preparedness for economic globalization. Diamond Porter's model states that competitiveness must be maintained by domestic and international environmental conditions. The second cause is the rise of various trade barriers throughout economic globalization. Tariff theory states that trade barriers raise a product's price to the point where it cannot compete with similar products in the worldwide market.
3. Climate change has led to a decline in agricultural competitiveness. This is consistent with the Environmental Kuznets Curve theory, which states that economic activity, particularly in developing countries, causes environmental damage. Furthermore, this will disrupt agricultural production and distribution, rendering products inefficient and uncompetitive in international markets.
4. The huge number of agricultural labors is insufficient to boost agricultural competitiveness in both developing and developed countries. This demonstrates that the Ricardian theory of labor productivity applies to this situation. Agricultural labor has low productivity and a low level of education, making it impossible to optimize agricultural performance.
5. According to engagement theory, improving and equalizing the quality of agricultural labor is crucial since human participation in education benefits a sector. Equality of education in agriculture will encourage farmers to make informed decisions and easily adopt technologies. As a result, all of this has the potential to boost agricultural competitiveness.

# VIII. SUMMARY

Economic globalization (EG) can be defined as a process in which governments rapidly liberalize trade, investment, finance, and long-distance movements, as well as the information and perceptions that accompany market exchanges. Many countries are involved in EG and are carrying out various policy reforms to benefit from this phenomenon. However, EG also had a negative impact, especially on the agricultural sector.

There have been many studies on EG with different findings, even contradictory ones. However, these studies have only been conducted in a few countries. This results in a partial equilibrium, there will undoubtedly be controversy regarding the study's findings. This study wants to investigate: 1) the agricultural competitiveness in developing countries. 2) the agricultural competitiveness in developed countries, and 3) the impact of economic globalization on agricultural competitiveness in developing and developed countries.

This study employed panel data, which combines time-series and cross-sectional data. The time-series data in this study are from 1990 until 2020 and the cross-section data are from 71 developing countries and 24 developed countries. There are 25 developing countries in Africa, 16 countries in Asia, 18 countries in Latin America & the Caribbean, and the rest are in Europe and Oceania. The developed countries for this study sample are spread across America, Asia, Europe, and Oceania

This study used 2 methods: 1) Revealed Comparative Advantage to investigate the agricultural competitiveness in developing countries and developed countries and 2) the three-stage least squares method to examine the impact of economic globalization on agricultural competitiveness in developing and developed countries.

This study found that agricultural competitiveness in both developing and developed countries has fluctuated over the last three decades. Developing countries that are categorized as having agricultural competitiveness (ACA > 1) include Benin, Bolivia, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Ethiopia PDR, Fiji, Guatemala, Guyana, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Lesotho, Madagascar, Malawi, Malaysia, Mali, Mauritius, Nepal, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Rwanda, Senegal, South Africa, Sri Lanka, Sudan (former), Togo, Turkiye, United Republic of Tanzania, Uganda Uruguay, and Yemen. Meanwhile, countries that have lost their agricultural competitiveness (ACA < 1) include Albania, Bangladesh, Botswana, Brunei Darussalam, China, Congo, Democratic Republic of the

Congo, Gabon, Haiti, Hungary, Iran, Iraq, Mauritania, Mexico, Mongolia, Nigeria, Panama, Russian Federation, Saudi Arabia, Trinidad and Tobago, and Zambia. Therefore, hypothesis 1 of this study is unproven because there are developing countries that do not have agricultural competitiveness.

Developed countries that are categorized as having agricultural competitiveness (ACA > 1) include Australia, Austria, Belgium, Canada, Cyprus, Denmark, France, Greece, Italy, Netherlands, New Zealand, Portugal, Spain, and the United States of America. Meanwhile, developed countries that have lost their agricultural competitiveness (ACA < 1) include Czechia, Finland, Germany, Iceland, Israel, Norway, the Republic of Korea, Sweden, Switzerland, and the United Kingdom of Great Britain and Northern Ireland.

Several factors impede agricultural competitiveness in both developing and developed countries. One of the causes of decreased agricultural competitiveness is economic globalization: each country's lack of readiness to compete and the imposition of trade barriers. The entry of agricultural products from other countries surprised almost all countries. Imported goods have hampered domestic industry development. As a result, many countries impose trade barriers to reduce agricultural imports and disrupt the agricultural competitiveness of exporting countries.

I also discovered that climate change has reduced agricultural competitiveness, with developed countries being more sensitive to temperature changes than developing countries. However, my research also demonstrates the inverse phenomenon, in which environmental degradation disrupts economic activity. The exchange rate, employment, and human capital are other factors that reduce agricultural competitiveness in developed and developing countries. CPI is an important factor that can boost agricultural competitiveness because it incentivizes producers to increase production quantity and quality. Meanwhile, the advancement of information technology is one method for increasing agricultural competitiveness in developed countries, but it harms developing countries.

Several recommendations are made to increase agricultural competitiveness in developed and developing countries in the era of economic globalization. First, increase the commitment of developed and developing countries to reduce support prices and trade barriers. The role of developed countries is also expected to be greater in assisting agricultural development in developing countries through investment schemes and technology transfer. On the other hand, the WTO must also conduct strict, impartial, and transparent supervision of agricultural trade transactions. Second, increasing farming, distribution, and marketing efficiency. This is

technically possible with modern technology or precision agriculture as climate change mitigation actions. Third, improving agricultural business players' educational quality. Agricultural business players continue to require assistance and training in carrying out agricultural activities from the government, the private sector, and non-governmental organizations (NGOs). They must also learn about advancements in information and communication technologies (ICTs) to convey agricultural and non-agricultural information more easily and quickly. Fourth, prioritizing agricultural infrastructure investment. This is to increase agricultural products' quantity, quality, and efficiency to boost producer prices. These infrastructures include agricultural machinery, irrigation, transportation, and road infrastructure.

*Keywords:* economic globalization, climate change, agricultural competitiveness, developing countries, developed countries

## REFERENCES


Abbas, Shujaat. (2022). Global warming and export competitiveness of agriculture sector: evidence from heterogeneous econometric analysis of Pakistan. *Environmental Science and Pollution Research*, *29*(23), 34325–34337. https://doi.org/10.1007/s11356-022-18562-y

Abbas, Shujaat, & Waheed, A. (2017). Trade Competitiveness of Pakistan: The Revealed Comparative Advantage Approach. *Competitiveness Review: An International Business Journal*, *27*(5), 462–475.

Abbas, Sohail, Kousar, S., & Pervaiz, A. (2021). Effects of energy consumption and ecological footprint on CO2 emissions: an empirical evidence from Pakistan. *Environment, Development and Sustainability*, *23*(9), 13364–13381. https://doi.org/10.1007/s10668-020-01216-9

Adedoyin, F. F., Alola, A. A., & Bekun, F. V. (2020). The nexus of environmental sustainability and agro-economic performance of Sub-Saharan African countries. *Heliyon*, *6*(9), e04878. https://doi.org/10.1016/j.heliyon.2020.e04878

Adhikari, M., Longman, R. J., Giambelluca, T. W., Lee, C. N., & He, Y. (2022). Climate change impacts shifting landscape of the dairy industry in Hawai'i. *Translational Animal Science*, *6*(2), 1–11. https://doi.org/10.1093/tas/txac064

Agboola, M. O., Bekun, F. V., & Joshua, U. (2021). Pathway to environmental sustainability: Nexus between economic growth, energy consumption, CO2 emission, oil rent and total natural resources rent in Saudi Arabia. *Resources Policy*, *74*(December 2020), 102380. https://doi.org/10.1016/j.resourpol.2021.102380

Alexander, K., Case, P., Jones, M., & Connell, J. (2017). Commercialising smallholder agricultural production in Lao People's Democratic Republic. *Development in Practice*, *27*(7), 965–980. https://doi.org/10.1080/09614524.2017.1353064

Ali, A., Xia, C., Ouattara, N. B., Mahmood, I., & Faisal, M. (2021). Economic and environmental consequences' of postharvest loss across food supply Chain in the developing countries. *Journal of Cleaner Production*, *323*(April), 129146. https://doi.org/10.1016/j.jclepro.2021.129146

Alias, E. F., Radam, A., Fen, Y. P., Yacob, M. R., & Alam, M. F. (2014). Growth in Malaysia's export food market: A shift-share analysis. *Asian Social Science*, *10*(3), 26–43. https://doi.org/10.5539/ass.v10n3p26

Almeida, C. M. V. B., Frugoli, A. D., Agostinho, F., Liu, G. Y., & Giannetti, B. F. (2020). Integrating or Des-integrating agribusiness systems: Outcomes of emergy evaluation. *Science of the Total Environment*, *729*, 138733. https://doi.org/10.1016/j.scitotenv.2020.138733

Alwedyan, S., & Taani, A. (2021). Adoption of sustainable agriculture practices by citrus farmers and its determinants in the Jordan valley: the case of Northern Ghor. *Potravinarstvo Slovak Journal of Food Sciences*, *15*(August), 768–775. https://doi.org/10.5219/1676

Amutabi, C. (2022). COVID-19 and price stability in Eastern Africa: How effective were the governments' policy response measures? *Cogent Economics and Finance*, *10*(1), 1–27. https://doi.org/10.1080/23322039.2022.2093429

Anderson, T. (2006). Globalization and agricultural trade: The market access and food security dilemmas of developing countries. In *Globalization and the Third World: A Study of Negative Consequences* (pp. 251–264). https://doi.org/10.1057/9780230502567

Angelsen, A., & Kaimowitz, D. (1999). Rethinking the causes of deforestation: Lessons from economic models. *World Bank Research Observer*, *14*(1), 73–98.

https://doi.org/10.1093/wbro/14.1.73
Araujo-Enciso, S. R., & Fellmann, T. (2020). Yield Variability and Harvest Failures in Russia, Ukraine and Kazakhstan and Their Possible Impact on Food Security in the Middle East and North Africa. *Journal of Agricultural Economics*, *71*(2), 493–516. https://doi.org/10.1111/1477-9552.12367
Arencibia, M. G. (2011). Socialism between Globalization and the Market: The Experience of Europe, China and Vietnam. *World Review of Political Economy*, *2*(1), 105–116.
Arestis, P., & Phelps, P. (2018). Inequality implications of European economic and monetary union membership: A reassessment. *Environment and Planning A*, *50*(7), 1443–1472. https://doi.org/10.1177/0308518X18781082
Arndt, C., Diao, X., Dorosh, P., Pauw, K., & Thurlow, J. (2023). The Ukraine war and rising commodity prices: Implications for developing countries. *Global Food Security*, *36*(March), 100680. https://doi.org/10.1016/j.gfs.2023.100680
Asongu, S. A., Agboola, M. O., Alola, A. A., & Bekun, F. V. (2020). The criticality of growth, urbanization, electricity and fossil fuel consumption to environment sustainability in Africa. *Science of the Total Environment*, *712*, 136376. https://doi.org/10.1016/j.scitotenv.2019.136376
Ataei, P., Ghadermarzi, H., Karimi, H., & Norouzi, A. (2020). The barriers hindering the application of the value chain in the context of rural entrepreneurship. *Journal of Agricultural Education and Extension*, *26*(4), 365–382. https://doi.org/10.1080/1389224X.2020.1726780
Athukorala, P. C., & Kelegama, S. (1998). The political economy of agricultural trade policy: Sri Lanka in the Uruguay Round. *Contemporary South Asia*, *7*(1), 7–26. https://doi.org/10.1080/09584939808719827
Atici, C. (2005). Liberalization-goals trade-offs. Implications of agricultural trade liberalization for developing countries. *Outlook on Agriculture*, *34*(2), 83–89. https://doi.org/10.5367/0000000054224364
Awad, A., & Youssof, I. (2016). The impact of economic globalisation on unemployment: The Malaysian experience. *Journal of International Trade and Economic Development*, *25*(7), 938–958. https://doi.org/10.1080/09638199.2016.1151069
Bahn, R. A., Yehya, A. A. K., & Zurayk, R. (2021). Digitalization for sustainable agri-food systems: Potential, status, and risks for the Mena region. *Sustainability (Switzerland)*, *13*(6), 1–24. https://doi.org/10.3390/su13063223
Bahşi, N., & Çetin, E. (2020). Determining of agricultural credit impact on agricultural production value in turkey. *Ciencia Rural*, *50*(11), 1–13. https://doi.org/10.1590/0103-8478cr20200003
Balassa, B. (1965). Trade Liberalisation and "Revealed" Comparative Advantage. *The Manchester School*, *33*(2), 99–123. https://doi.org/10.1111/j.1467-9957.1965.tb00050.x
Balistreri, E. J., & Tarr, D. G. (2018). Comparison of deep integration in the Melitz, Krugman and Armington models: The case of The Philippines in RCEP. In *Macroeconomics, Trade and Investment Global Practice* (Vol. 8587, Issue September). https://doi.org/10.1016/j.econmod.2019.05.023
Barbier, E. B. (2000). Links between economic liberalization and rural resource degradation in the developing regions. *Agricultural Economics*, *23*(3), 299–310. https://doi.org/10.1016/S0169-5150(00)00091-8
Barrett, H. R., Browne, A. W., Harris, P. J. C., & Cadoret, K. (2002). Organic certification and the UK market: Organic imports from developing countries. *Food Policy*, *27*(4), 301–318. https://doi.org/10.1016/S0306-9192(02)00036-2

Bataka, H. (2021). Economic globalization and public debt in Sub-Saharan Africa. *International Journal of Finance and Economics*, *January*, 1–16. https://doi.org/10.1002/ijfe.2506

Batmunkh, A., Nugroho, A. D., Fekete-Farkas, M., & Lakner, Z. (2022). Global Challenges and Responses: Agriculture, Economic Globalization, and Environmental Sustainability in Central Asia. *Sustainability (Switzerland)*, *14*(4). https://doi.org/10.3390/su14042455

Beber, C. L., Langer, G., & Meyer, J. (2021). Strategic actions for a sustainable internationalization of agri-food supply chains: The case of the dairy industries from Brazil and Germany. *Sustainability (Switzerland)*, *13*(19), 1–18. https://doi.org/10.3390/su131910873

Belton, W. J., & Nair-Reichert, U. (2007). Inflation regimes, core inflation measures and the relationship between producer and consumer price inflation. *Applied Economics*, *39*(10), 1295–1305. https://doi.org/10.1080/00036840500447682

Ben Romdhane, S., Razavi, H., & Santi, E. (2013). Prospects for an integrated North Africa energy market: Opportunities and lessons. *Energy Strategy Reviews*, *2*(1), 100–107. https://doi.org/10.1016/j.esr.2013.04.005

Beyene, H. G. (2014). Trade Integration and Revealed Comparative Advantages of Sub-Saharan Africa and South Asian Merchandize Export. *Foreign Trade Review*, *49*(2), 163–176. https://doi.org/10.1177/0015732514525170

Biles, J. J., Brehm, K., Enrico, A., Kiendl, C., Morgan, E., Teachout, A., & Vasquez, K. (2007). Globalization of food retailing and transformation of supply networks: Consequences for small-scale agricultural producers in Southeastern Mexico. *Journal of Latin American Geography*, *6*(2), 55–75. https://doi.org/10.1353/lag.2007.0032

Biswas, A., Mailapalli, D. R., & Raghuwanshi, N. S. (2021). Treated municipal wastewater to fulfil crop water footprints and irrigation demand – A review. *Water Science and Technology: Water Supply*, *21*(4), 1398–1409. https://doi.org/10.2166/WS.2021.031

Biswas, R. R., Sharma, R., & Gyasi-Agyei, Y. (2022). Adaptation to climate change: A study on regional urban water management and planning practice. *Journal of Cleaner Production*, *355*(131643), 1–15.

Bojnec, Š., & Ferto, I. (2015). Agri-Food Export Competitiveness in European Union Countries. *Journal of Common Market Studies*, *53*(3), 476–492. https://doi.org/10.1111/jcms.12215

Bojnec, Š., & Fertő, I. (2017). The duration of global agri-food export competitiveness. *British Food Journal*, *119*(6), 1378–1393. https://doi.org/10.1108/BFJ-07-2016-0302

Borisagar, D., Singh, V., & Singh, O. P. (2023). Agricultural Trade Performance: A Case Study of Indian Oilseeds. *Economic Affairs (New Delhi)*, *68*(3), 1735–1746. https://doi.org/10.46852/0424-2513.3.2023.39

Bulut, M., & Celik, H. (2022). Farmers' perception and preference of Islamic Banking in Turkey. *Agricultural Finance Review*, *82*(5), 871–889. https://doi.org/10.1108/AFR-02-2021-0022

Calzadilla, A., Rehdanz, K., Betts, R., Falloon, P., Wiltshire, A., & Tol, R. S. J. (2013). Climate change impacts on global agriculture. *Climatic Change*, *120*(1–2), 357–374. https://doi.org/10.1007/s10584-013-0822-4

Camanzi, L., Hammoudi, A., & Malorgio, G. (2019). Stakeholder perception of EU food safety governance: The case of EU fruit and vegetable imports from southern mediterranean countries. *New Medit*, *18*(4), 19–34. https://doi.org/10.30682/nm1904b

Camargo, E., & Wang, M. Y. (2015). A pilot study on the internationalization of Taiwanese agri-biotech SMEs: A Technology-Organization-Environment (TOE) perspective. *Portland International Conference on Management of Engineering and Technology*, *2015-Septe*,

1207–1217. https://doi.org/10.1109/PICMET.2015.7273220
Cariappa, A. A., Acharya, K. K., Adhav, C. A., R, S., Ramasundaram, P., Kumar, A., Singh, S., & Singh, G. P. (2022). COVID-19 induced lockdown effect on wheat supply chain and prices in India – Insights from state interventions led resilience. *Socio-Economic Planning Sciences*, *84*(June), 101366. https://doi.org/10.1016/j.seps.2022.101366
Castella, J.-C., & Bouahom, B. (2014). Farmer cooperatives are the missing link to meet market demands in Laos. *Development in Practice*, *24*(2), 185–198. https://doi.org/10.1080/09614524.2014.885495
Chakraborty, D., & Khan, A. U. (2008). *The WTO Deadlocked: Understanding the Dynamics of International Trade*. SAGE.
Chakraborty, D., & Kumar, A. (2012). ASEAN and China: New dimensions in economic engagement. *China Report*, *48*(3), 327–349. https://doi.org/10.1177/0009445512462300
Chang, B. H., Gohar, R., Derindag, O. F., & Uche, E. (2022). COVID-19, lockdown measures and their impact on food and healthcare prices: empirical evidence using a dynamic ARDL model. *Journal of Economic Studies*, *2019*(December 2019), 1–19. https://doi.org/10.1108/JES-12-2021-0627
Chao, C. C., Yu, E. S. H., & Yu, W. (2006). China's import duty drawback and VAT rebate policies: A general equilibrium analysis. *China Economic Review*, *17*(4), 432–448. https://doi.org/10.1016/j.chieco.2006.02.005
Chatzopoulos, T., & Lippert, C. (2015). Adaptation and Climate Change Impacts: A Structural Ricardian Analysis of Farm Types in Germany. *Journal of Agricultural Economics*, *66*(2), 537–554. https://doi.org/10.1111/1477-9552.12098
Chebil, A., Souissi, A., Frija, A., & Stambouli, T. (2019). Estimation of the economic loss due to irrigation water use inefficiency in Tunisia. *Environmental Science and Pollution Research*, *26*(11), 11261–11268. https://doi.org/10.1007/s11356-019-04566-8
Chen, K. J., Galinato, S. P., Marsh, T. L., Tozer, P. R., & Chouinard, H. H. (2020). Willingness to pay for attributes of biodegradable plastic mulches in the agricultural sector. *HortTechnology*, *30*(3), 437–447. https://doi.org/10.21273/HORTTECH04518-20
Chen, L., Msigwa, G., Yang, M., Osman, A. I., Fawzy, S., Rooney, D. W., & Yap, P. S. (2022). Strategies to achieve a carbon neutral society: a review. In *Environmental Chemistry Letters* (Vol. 20, Issue 4). Springer International Publishing. https://doi.org/10.1007/s10311-022-01435-8
Chen, Q., Xiao, Y., Ma, L., & Su, B. (2018). Agricultural competitiveness in China. *China Agricultural Economic Review*, *10*(1), 176–186. https://doi.org/10.1108/CAER-12-2017-0237
Cheshire, L., & Woods, M. (2013). Globally engaged farmers as transnational actors: Navigating the landscape of agri-food globalization. *Geoforum*, *44*, 232–242. https://doi.org/10.1016/j.geoforum.2012.09.003
Chiarelli, D. D., D'Odorico, P., Müller, M. F., Mueller, N. D., Davis, K. F., Dell'Angelo, J., Penny, G., & Rulli, M. C. (2022). Competition for water induced by transnational land acquisitions for agriculture. *Nature Communications*, *13*(1), 1–9. https://doi.org/10.1038/s41467-022-28077-2
Ching, H. S., Hsiao, C., Wan, S. K., & Wang, T. (2011). Economic benefits of globalization: The impact of entry to the WTO on China's growth. *Pacific Economic Review*, *16*(3), 285–301. https://doi.org/10.1111/j.1468-0106.2011.00548.x
Choe, H., & Thorne, J. H. (2017). Integrating climate change and land use impacts to explore forest

conservation policy. *Forests*, *8*(9), 1–17. https://doi.org/10.3390/f8090321
Choi, J., Gu, J., & Shen, S. (2018). Weak-instrument robust inference for two-sample instrumental variables regression. *Journal of Applied Econometrics*, *33*(1), 109–125. https://doi.org/10.1002/jae.2580
Choi, Y. W., Campbell, D. J., & Eltahir, E. A. B. (2022). Near-term regional climate change in East Africa. *Climate Dynamics*, *April*. https://doi.org/10.1007/s00382-022-06591-9
Ciliberti, S., & Frascarelli, A. (2015). A critical assessment of the implementation of CAP 2014-2020 direct payments in Italy. *Bio-Based and Applied Economics*, *4*(3), 261–277. https://doi.org/10.13128/BAE-16377
Cinquetti, C. A. (2018). Comparative Advantages and Demand in the New Competitive Ricardian Models. *Foreign Trade Review*, *53*(1), 29–48. https://doi.org/10.1177/0015732516681884
Countryman, A. M., & Narayanan, B. G. (2017). Price volatility, tariff structure and the special safeguard mechanism. *Economic Modelling*, *64*(November 2016), 399–408. https://doi.org/10.1016/j.econmod.2017.04.008
Dang, H.-A. H., & Viet Nguyen, C. (2021). Gender inequality during the COVID-19 pandemic: Income, expenditure, savings, and job loss. *World Development*, *140*, 105296. https://doi.org/10.1016/j.worlddev.2020.105296
Dawuni, P., Mabe, F. N., & Tahidu, O. D. (2021). Effects of village savings and loan association on agricultural value productivity in Northern Region of Ghana. *Agricultural Finance Review*, *81*(5), 657–674. https://doi.org/10.1108/AFR-02-2020-0024
Day, M., & Vink, N. (2019). The distortions to incentives in South African agriculture: a case study of the wheat industry*. *Agrekon*, *58*(3), 292–307. https://doi.org/10.1080/03031853.2019.1627226
de Roest, K., Ferrari, P., & Knickel, K. (2018). Specialisation and economies of scale or diversification and economies of scope? Assessing different agricultural development pathways. *Journal of Rural Studies*, *59*, 222–231. https://doi.org/10.1016/j.jrurstud.2017.04.013
Deardorff, A. V. (2011). *Globalisation, Comparative Advantage and the Changing Dynamics of Trade*. OECD.
Debaeke, P., Casadebaig, P., Flenet, F., & Langlade, N. (2017). Sunflower crop and climate change: Vulnerability, adaptation, and mitigation potential from case-studies in Europe. *OCL - Oilseeds and Fats, Crops and Lipids*, *24*(1), 1–15. https://doi.org/10.1051/ocl/2016052
Deppermann, A., Balkovič, J., Bundle, S. C., Di Fulvio, F., Havlik, P., Leclère, D., Lesiv, M., Prishchepov, A. V., & Schepaschenko, D. (2018). Increasing crop production in Russia and Ukraine - Regional and global impacts from intensification and recultivation. *Environmental Research Letters*, *13*(2), 1–12. https://doi.org/10.1088/1748-9326/aaa4a4
Derosa, D. A. (1995). Regional Trading Arrangements among Developing Countries: The ASEAN Example. *Research Report International Food Policy Research Institute*, *103*, 1–129.
Dev Gupta, S. (2014). Comparative Advantage and Competitive Advantage: An Economics Perspective and a Synthesis. *Athens Journal of Business & Economics*, *1*(1), 9–22. https://doi.org/10.30958/ajbe.1-1-1
Dimitrijević, M. S., Čakajac, B. M., & Milojević, I. R. (2023). Competitiveness of the agri-food sector of the Republic of Serbia. *Journal of Agricultural Sciences (Belgrade)*, *68*(3), 347–361.
Ding, X., Qian, Y., & Tong, S. (2016). Globalization, Employment and Agriculture: A Review of the Eleventh Forum of the World Association for Political Economy. *World Review of*

*Political Economy*, *7*(4), 541–555. https://doi.org/10.13169/worlrevipoliecon.7.4.0541
Disdier, A.-C., Emlinger, C., & Fouré, J. (2015). *Atlantic versus Pacific Agreement in Agri-food Sectors: Does the Winner Take it All?* www.cepii.fr
Dollar, D., Hallward-Driemeier, M., & Mengistae, T. (2006). Investment climate and international integration. *World Development*, *34*(9), 1498–1516. https://doi.org/10.1016/j.worlddev.2006.05.001
Draper, P., Freytag, A., & Al Doyaili, S. (2013). Why should sub-Saharan Africa Care about the Doha development round? *Economics*, *7*, 1–27. https://doi.org/10.5018/economics-ejournal.ja.2013-19
Dreher, A. (2006). Does globalization affect growth? Evidence from a new index of globalization. *Applied Economics*, *38*(10), 1091–1110. https://doi.org/10.1080/00036840500392078
Dufour, G., & Pavot, D. (2020). WTO Negotiations: The Unfinished Doha Development Agenda and the Emergence of New Topics. *Global Trade and Customs Journal*, *15*(5), 244–251.
Dunning, J. H. (1993). Internationalizing Porter's Diamond. *Management International Review*, *33*, 7–15.
Durevall, D., & van der Weide, R. (2017). Importing High Food Prices by Exporting: Rice Prices in Lao PDR. *Journal of Agricultural Economics*, *68*(1), 164–181. https://doi.org/10.1111/1477-9552.12179
Engelbrecht, D., Biswas, W. K., & Ahmad, W. (2013). An evaluation of integrated spatial technology framework for greenhouse gas mitigation in grain production in Western Australia. *Journal of Cleaner Production*, *57*, 69–78. https://doi.org/10.1016/j.jclepro.2013.06.010
Enwelu, I. A., Enwereuzor, S. O., Asadu, A. N., Nwalleji, H. U., & Ugwuoke, B. C. (2017). Access and Use of Information and Communication Technologies by Extension Workers in Anambra State Agricultural Development Programme, Nigeria. *Journal of Agricultural Extension*, *21*(2), 152–162.
European Spice Association. (2018). *European Spice Association Quality Minima Document: Vol. rev 4* (Issue December).
Fafchamps, M., & Minten, B. (2002). Returns to social network capital among traders. *Oxford Economic Papers*, *54*(2), 173–206. https://doi.org/10.1093/oep/54.2.173
Fan, P., Ouyang, Z., Nguyen, D. D., Nguyen, T. T. H., Park, H., & Chen, J. (2019). Urbanization, economic development, environmental and social changes in transitional economies: Vietnam after Doimoi. *Landscape and Urban Planning*, *187*(September 2017), 145–155. https://doi.org/10.1016/j.landurbplan.2018.10.014
FAO. (2017a). Building Agricultural Market Information Systems: A literature review. In *FAO*. Food and Agriculture Organization of the United Nations. https://www.fao.org/documents/card/en/c/ab733e43-9b57-4947-ac58-29f4e5a63596
FAO. (2017b). Information and Communication Technology (ICT) in Agriculture. In *Computers and Electronics in Agriculture* (Vol. 22, Issues 2–3). Food and Agriculture Organization of the United Nations. https://doi.org/10.1016/S0168-1699(99)00008-3
FAO. (2022). *The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict* (Issue March). chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.fao.org%2F3%2Fcb9013en%2Fcb9013en.pdf&clen=1680551
Farajzadeh, Z., Ghorbanian, E., & Tarazkar, M. H. (2022). The shocks of climate change on economic growth in developing economies: Evidence from Iran. *Journal of Cleaner*

*Production*, *372*(July), 133687. https://doi.org/10.1016/j.jclepro.2022.133687
Farrell, P., Bogard, J., Thow, A. M., Boylan, S., Johnson, E., & Tutuo, J. (2023). Food price and availability in Solomon Islands during COVID-19: A food environment survey. *Nutrition and Health*, *July*, 1–9. https://doi.org/10.1177/02601060231183592
Fatihudin, D. (2019). Globalization, strengthening of indonesian local market character as consequences and reality of open economic system. *Humanities and Social Sciences Reviews*, *7*(3), 11–16. https://doi.org/10.18510/hssr.2019.732
Feenstra, R. C., & Taylor, A. M. (2017). *International Trade* (4th ed.). Macmillan Learning.
Fekete, H., Kuramochi, T., Roelfsema, M., Elzen, M. den, Forsell, N., Höhne, N., Luna, L., Hans, F., Sterl, S., Olivier, J., van Soest, H., Frank, S., & Gusti, M. (2021). A review of successful climate change mitigation policies in major emitting economies and the potential of global replication. *Renewable and Sustainable Energy Reviews*, *137*(March 2020). https://doi.org/10.1016/j.rser.2020.110602
Feng, F., Jia, N., & Lin, F. (2023). Quantifying the impact of Russia–Ukraine crisis on food security and trade pattern: evidence from a structural general equilibrium trade model. *China Agricultural Economic Review*, *15*(2), 241–258. https://doi.org/10.1108/CAER-07-2022-0156
Fetai, B., Koku, P. S., Caushi, A., & Fetai, A. (2016). The relationship between exchange rate and inflation: The case of Western Balkans Countries. *Journal of Business, Economics and Finance*, *5*(4), 360–364. https://doi.org/10.17261/pressacademia.2017.358
Fold, N. (2000). Globalisation, state regulation and industrial upgrading of the oil seed industries in Malaysia and Brazil. *Singapore Journal of Tropical Geography*, *21*(3), 263–278. https://doi.org/10.1111/1467-9493.00081
Fonchamnyo, D. C., & Akame, A. R. (2017). Determinants of export diversification in Sub-Sahara African region: a fractionalized logit estimation model. *Journal of Economics and Finance*, *41*(2), 330–342. https://doi.org/10.1007/s12197-016-9352-z
Food and Agriculture Organization of the United Nations. (2018). Ending Extreme Poverty in Rural Areas. In *The World Bank*. Food and Agriculture Organization of the United Nations. http://www.worldbank.org/en/publication/global-monitoring-report/report-card/twin-goals/ending-extreme-poverty
Food and Agriculture Organization of the United Nations. (2023). *FAOSTAT*. FAOSTAT. https://www.fao.org/faostat/en/#data
Fragoso, R. M. S., & Marques, C. (2007). A competitividade do regadio em Portugal no contexto da Nova Política Agrícola Comum: o caso de uma exploração agrícola no Alentejo. *Revista de Economia e Sociologia Rural*, *45*(1), 49–70. https://doi.org/10.1590/S0103-20032007000100003
François Nègre. (2022). *WTO Agreement on Agriculture*. European Parliament. https://www.europarl.europa.eu/factsheets/en/sheet/111/wto-agreement-on-agriculture
French, S. (2017). Revealed comparative advantage: What is it good for? *Journal of International Economics*, *106*(2017), 83–103. https://doi.org/10.1016/j.jinteco.2017.02.002
Freund, C., & Braga, C. A. P. (2012). The economics of Arab transitions. In C. Merlini (Ed.), *Arab Society in Revolt: The West's Mediterranean Challenge* (pp. 122–143). Brookings Institution Press.
Fukase, E., & Martin, W. (2001). Economic and Fiscal Implications of Cambodia's Accession to the ASEAN Free Trade Area. *Asian Economic Journal*, *15*(2), 139–172. https://doi.org/10.1111/1467-8381.00129

Fuller, S., Yu, T. H., Fellin, L., Lalor, A., & Krajewski, R. (2003). Transportation Developments in South America and Their Effect on International Agricultural Competitiveness. *Transportation Research Record*, *1820*, 62–68. https://doi.org/10.3141/1820-08

Fung, K. C., & Siu, A. (2008). Political economy of service trade liberalization and the Doha round. *Pacific Economic Review*, *13*(1), 124–133. https://doi.org/10.1111/j.1468-0106.2007.00357.x

Ganbold, N., Fahad, S., Li, H., & Gungaa, T. (2021). An evaluation of subsidy policy impacts, transient and persistent technical efficiency: A case of Mongolia. *Environment, Development and Sustainability*, *0123456789*. https://doi.org/10.1007/s10668-021-01821-2

George, T. (2020). A new look at agricultural development and the non-agriculture economy in low-income countries. *Global Food Security*, *26*(April), 100449. https://doi.org/10.1016/j.gfs.2020.100449

GezmİŞ, H. (2016). Argentina ' s Neo -developmental Turn : A New Approach towards Integration with Mercosur. *Uluslararası İlişkiler*, *13*(51), 63–80. https://doi.org/10.33458/uidergisi.463074

Ghosh, B. N. (2009). Globalization and food policy dilemmas in developing countries: Contextualizing the indian scenario. *Journal of Third World Studies*, *26*(2), 107–120.

Ghosh, J. (2010). The Unnatural Coupling: Food and Global Finance. *Journal of Agrarian Change*, *10*(1), 72–86. https://doi.org/10.7312/columbia/9780231157643.003.0004

Gil-Pareja, S., Llorca-Vivero, R., & Martínez-Serrano, J. A. (2016). A Re-Examination of the Effect of GATT/WTO on Trade. *Open Economies Review*, *27*(3), 561–584. https://doi.org/10.1007/s11079-015-9385-5

Gochoco-Bautista, M. S. (2009). The Philippine economy in the face of external shocks. *Asian Economic Papers*, *8*(3), 87–107. https://doi.org/10.1162/asep.2009.8.3.87

Goel, R. K., Yadav, C. S., Vishnoi, S., & Rastogi, R. (2021). Smart agriculture – Urgent need of the day in developing countries. *Sustainable Computing: Informatics and Systems*, *30*(August 2020), 1–10. https://doi.org/10.1016/j.suscom.2021.100512

Goldstein, J., & Gulotty, R. (2022). Trading Away Tariffs: The Operations of the GATT System. *World Trade Review*, *21*(2), 135–158. https://doi.org/10.1017/S1474745621000458

Gopalan, S., Nguyen Trieu Duong, L., & Rajan, R. S. (2020). Trade configurations in Asia: Assessing de facto and de jure regionalism. *World Economy*, *43*(4), 1034–1058. https://doi.org/10.1111/twec.12907

Gopinath, M., Roe, T. L., & Shane, M. D. (1996). Competitiveness of U.S. Food Processing: Benefits from Primary Agriculture. *American Journal of Agricultural Economics*, *78*(4), 1044–1055. https://doi.org/10.2307/1243860

Goss, J., & Burch, D. (2001). From agricultural modernisation to agri-food globalisation: The waning of national development in Thailand. *Third World Quarterly*, *22*(6), 969–986. https://doi.org/10.1080/01436590120099740

Goss, Jasper, & Burch, D. (2001). From agricultural modernisation to agri-food globalisation: The waning of national development in Thailand. *Third World Quarterly*, *22*(6), 969–986. https://doi.org/10.1080/01436590120099740

Greene, W. H. (2003). *Econometric Analysis* (Rod Banister (ed.); 5th ed.). Prentice Hall. https://spu.fem.uniag.sk/cvicenia/ksov/obtulovic/Manaž. štatistika a ekonometria/EconometricsGREENE.pdf

Groom, B., & Tak, M. (2015). Welfare analysis of changing food prices: a nonparametric examination of rice policies in India. *Food Security*, *7*(1), 121–141.

https://doi.org/10.1007/s12571-014-0413-x
Gupta, D., Fischer, H., Shrestha, S., Shoaib Ali, S., Chhatre, A., Devkota, K., Fleischman, F., Khatri, D. B., & Rana, P. (2021). Dark and bright spots in the shadow of the pandemic: Rural livelihoods, social vulnerability, and local governance in India and Nepal. *World Development*, *141*, 105370. https://doi.org/10.1016/j.worlddev.2020.105370
Gupta, S., & Kumar, N. (2020). Time varying dynamics of globalization effect in India. *Portuguese Economic Journal*. https://doi.org/10.1007/s10258-020-00190-4
Gutiérrez-Romero, R. (2022). Conflicts increased in Africa shortly after COVID-19 lockdowns, but welfare assistance reduced fatalities. *Economic Modelling*, *116*(March), 1–19. https://doi.org/10.1016/j.econmod.2022.105991
Haddad, A. M., & Shahwan, Y. (2012). Optimization agricultural production under financial risk of water constraint in the Jordan Valley. *Applied Economics*, *44*(11), 1375–1385. https://doi.org/10.1080/00036846.2010.539550
Hammad, H. M., Nauman, H. M. F., Abbas, F., Jawad, R., Farhad, W., Shahid, M., Bakhat, H. F., Farooque, A. A., Mubeen, M., Fahad, S., & Cerda, A. (2023). Impacts of COVID-19 pandemic on environment, society, and food security. *Environmental Science and Pollution Research*, *0123456789*, 1–12. https://doi.org/10.1007/s11356-023-25714-1
Hansen, J., Sato, M., Ruedy, R., Lo, K., Lea, D. W., & Medina-Elizade, M. (2006). Global temperature change. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(39), 14288–14293. https://doi.org/10.1073/pnas.0606291103
Hearn, B., & Piesse, J. (2020). A reassessment of stock market integration in SADC: The case of Namibia. *Development Southern Africa*, *37*(3), 501–518. https://doi.org/10.1080/0376835X.2020.1717928
Heckscher, E., & Ohlin, B. (1920). *Factor Proportions Model* (Vol. 1). Bertil Ohlin.
Hejazi, J., & Emamgholipour, S. (2022). The Effects of the Re-imposition of US Sanctions on Food Security in Iran. *International Journal of Health Policy and Management*, *11*(5), 651–657. https://doi.org/10.34172/ijhpm.2020.207
Hepburn, J., & Bellmann, C. (2009). Doha round negotiations on the green box and beyond. In *Agricultural Subsidies in the WTO Green Box: Ensuring Coherence with Sustainable Development Goals* (pp. 36–69). https://doi.org/10.1017/CBO9780511674587.004
Hertel, T. W., Martin, W., & Leister, A. M. (2010). Potential implications of a special safeguard mechanism in the world trade organization: The case of wheat. *World Bank Economic Review*, *24*(2), 330–359. https://doi.org/10.1093/wber/lhq010
Hidayat, A., Robiani, B., Marwa, T., & Suhel, S. (2023). Competitiveness, Market Structure, and Energy Policies: A Case Study of the World's Largest Crude Palm Oil Exporter. *International Journal of Energy Economics and Policy*, *13*(3), 111–121. https://doi.org/10.32479/ijeep.14199
Hill, A. D., Johnson, S. G., Greco, L. M., O'Boyle, E. H., & Walter, S. L. (2021). Endogeneity: A Review and Agenda for the Methodology-Practice Divide Affecting Micro and Macro Research. In *Journal of Management* (Vol. 47, Issue 1). https://doi.org/10.1177/0149206320960533
Hoang, H. (2020). The underground economy in transition countries from the perspective of globalization: The case of Vietnam. *Revista Amazonia Investiga*, *9*(29), 234–242. https://doi.org/10.34069/ai/2020.29.05.26
Hodges, J., Foggin, M., Long, R., & Zhaxi, G. (2014). Globalisation and the sustainability of farmers, livestock-keepers, pastoralists and fragile habitats. *Biodiversity*, *15*(2–3), 109–118.

https://doi.org/10.1080/14888386.2014.931247
Huo, D. (2014). Impact of country-level factors on export competitiveness of agriculture industry from emerging markets. *Competitiveness Review*, *24*(5), 393–413. https://doi.org/10.1108/CR-01-2012-0002
Hussein, H., & Knol, M. (2023). The Ukraine War, Food Trade and the Network of Global Crises. *International Spectator*, *0*(0), 1–22. https://doi.org/10.1080/03932729.2023.2211894
Hwa, E.-C. (1989). The Contribution of Agriculture to Economic Growth: Some Empirical Evidence. *The Balance between Industry and Agriculture in Economic Development*, *16*(11), 106–126. https://doi.org/10.1007/978-1-349-19746-0_5
IFS. (2021). *IFS Guideline Product Fraud Mitigation*. International Featured Standards.
ILO. (2021). *Child labour statistics*. https://ilostat.ilo.org/topics/child-labour/#
Islam, M. A., Khan, M. A., Popp, J., Sroka, W., & Oláh, J. (2020). Financial development and foreign direct investment-the moderating role of quality institutions. *Sustainability (Switzerland)*, *12*(9), 1–22. https://doi.org/10.3390/SU12093556
Jambor, A., & Babu, S. (2016). Competitiveness of global: Agriculture policy lessons for food security. In *Competitiveness of Global Agriculture: Policy Lessons for Food Security*. Springer. https://doi.org/10.1007/978-3-319-44876-3
Jamhari, J., Wirakusuma, G., Nugroho, A. D., & Lakner, Z. (2021). Regional market integration, Covid-19, and agricultural trade performance in Southeast Asia. *Bulgarian Journal of Agricultural Science*, *27*(6), 1051–1064.
Jaroensathapornkul, J., & Tongpan, S. (2020). Impacts of Government Spending on Thailandûs Agricultural Sector. *Agricultural Economics*, *395*, 385–395.
Jenicek, V., & Grofova, Š. (2014). Least developed countries – characteristics. *Agricultural Economics (Czech Republic)*, *60*(2), 65–73. https://doi.org/10.4324/9780203553565
Jha, P. K., Araya, A., Stewart, Z. P., Faye, A., Traore, H., Middendorf, B. J., & Prasad, P. V. V. (2021). Projecting potential impact of COVID-19 on major cereal crops in Senegal and Burkina Faso using crop simulation models. *Agricultural Systems*, *190*, 103107. https://doi.org/10.1016/j.agsy.2021.103107
Johnston, B. F., & Mellor, J. W. (1961). The Role of Agriculture in Economic Development. *American Economic Review*, *51*(4), 566–593.
Jones, S. (1995). Food market reform: the changing role of the state. *Food Policy*, *20*(6), 551–560.
Jorgenson, A. K. (2007). Foreign direct investment and pesticide use intensity in less-developed countries: A quantitative investigation. *Society and Natural Resources*, *20*(1), 73–83. https://doi.org/10.1080/08941920600982866
Jorgenson, A. K., & Carolina, N. (2008). Foreign Investment Dependence and Agriculture Production: Pesticide and Fertilizer Use in Less-Developed Countries, 1990-2000. *Social Forces*, *87*(1), 529–560.
Josling, T. (1999). Implementation of the WTO Agreement on Agriculture and developments for the next round of negotiations. *European Review of Agriculture Economics*, *26*(3), 371–388. https://doi.org/10.1093/erae/26.3.371
Jung, J. H., & Park, J. (2014). Outcome measures of agricultural R&D and contributory factors. *Asian Journal of Technology Innovation*, *22*(1), 152–167. https://doi.org/10.1080/19761597.2014.905228
Jurkėnaitė, N., Baležentis, T., & Štreimikienė, D. (2022). The sustainability prism of structural changes in the European Union agricultural system: The nexus between production, employment and energy emissions. *Business Strategy and the Environment*, *31*(1), 145–158.

https://doi.org/10.1002/bse.2879
Kamran, A., Syed, N. A., Rizvi, S. M. A., Ameen, B., & Ali, S. N. (2021). Impact of China-Pakistan Economic Corridor (CPEC) on Agricultural Sector of Pakistan. *The Fourteenth International Conference on Management Science and Engineering Management*, *1191 AISC*(July 2020), 538–549. https://doi.org/10.1007/978-3-030-49889-4_42
Kargbo, J. M. (2006). Exchange rate volatility and agricultural trade under policy reforms in South Africa. *Development Southern Africa*, *23*(1), 147–170. https://doi.org/10.1080/03768350600556315
Kazuyuki, I. (2018). Globalization of agribusinesses and structural change in the palm oil industry: With special reference to Malaysia as a leading country in palm oil development. *Japanese Journal of Southeast Asian Studies*, *55*(2), 180–216. https://doi.org/10.20495/tak.55.2
Keulertz, M., & Woertz, E. (2015). Financial challenges of the nexus: pathways for investment in water, energy and agriculture in the Arab world. *International Journal of Water Resources Development*, *31*(3), 312–325. https://doi.org/10.1080/07900627.2015.1019043
Kireyev, A. (2021). Diversification in the Middle East: From Crude Trends to Refined Policies. *Extractive Industries and Society*, *8*(2), 100701. https://doi.org/10.1016/j.exis.2020.03.013
Kobori, S. (2010). Post-doha challenges for the wto. *Asia-Pacific Review*, *10*(1), 72–81. https://doi.org/10.1080/13439000301602
KOF Swiss Economic Institute. (2021). *KOF Globalisation Index*. https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Koizumi, T. (2019). Impact of agricultural investments on world wheat market under climate change: Effects of agricultural knowledge and innovation system, and development and maintenance of infrastructure. *Japan Agricultural Research Quarterly*, *53*(2), 109–125. https://doi.org/10.6090/jarq.53.109
Korinek, J., & Melatos, M. (2009). Trade Impacts of Selected Regional Trade Agreements in Agriculture. In *OECD Trade Policy Papers No. 87* (Issue No. 87). https://doi.org/http://dx.doi.org/10.1787/225010121752
Korwatanasakul, U. (2022). Revisiting Asian economic integration: challenges and prospects. *Journal of the Asia Pacific Economy*, *27*(2), 199–222. https://doi.org/10.1080/13547860.2020.1840493
Krugman, P. R., & Obstfeld, M. (2003). International Economics Theory and Policy. In *International Economics sixth edition* (6th ed.). Pearson Education, Inc. https://doi.org/10.4324/9780203462041
Kusumahadi, T. A., & Permana, F. C. (2021). Impact of COVID-19 on Global Stock Market Volatility. *Journal of Economic Integration*, *36*(1), 20–45. https://doi.org/10.11130/jei.2021.36.1.20
Kwon, H. Y. (2011). Globalization, cultural openness, and public preferences for East Asian economic integration in South Korea. *International Journal of Public Opinion Research*, *23*(1), 2–23. https://doi.org/10.1093/ijpor/edq027
Laiprakobsup, T. (2014a). Democracy, trade openness, and agricultural trade policy in southeast asian countries. *Japanese Journal of Political Science*, *15*(3), 465–484. https://doi.org/10.1017/S146810991400019X
Laiprakobsup, T. (2014b). Political Liberalization and Agricultural Trade Policy in Indonesia and the Philippines. *Asian Journal of Political Science*, *22*(1), 1–19. https://doi.org/10.1080/02185377.2013.879066
Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the

looming land scarcity. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(9), 3465–3472. https://doi.org/10.1073/pnas.1100480108

Lang, T., & McKee, M. (2022). The reinvasion of Ukraine threatens global food supplies. *The BMJ*, *376*(March), 10–11. https://doi.org/10.1136/bmj.o676

Le, D. N. (2021). Globalisation, Logistics and Food Supply: Evidence from Vietnam. *Malaysian Journal of Economic Studies*, *58*(2), 267–291. https://doi.org/10.22452/MJES.vol58no2.5

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7

Li, G., Sun, J., & Dai, A. (2016). Village differences in rural household energy consumption within the Loess hilly region of China. *Energy, Sustainability and Society*, *6*(1), 1–10. https://doi.org/10.1186/s13705-016-0099-3

Li, J., Ding, H., Hu, Y., & Wan, G. (2021). Dealing with dynamic endogeneity in international business research. *Journal of International Business Studies*, *52*(3), 339–362. https://doi.org/10.1057/s41267-020-00398-8

Li, L., Liu, J., Cheng, B., Chhatre, A., Dong, J., & Liang, W. (2017). Effects of economic globalization and trade on forest transitions: Evidence from 76 developing countries. *Forestry Chronicle*, *93*(2), 171–179. https://doi.org/10.5558/tfc2017-023

Lin, F., Li, X., Jia, N., Feng, F., Huang, H., Huang, J., Fan, S., Ciais, P., & Song, X. P. (2023). The impact of Russia-Ukraine conflict on global food security. *Global Food Security*, *36*(July 2022), 100661. https://doi.org/10.1016/j.gfs.2022.100661

Lissovolik, Y. (2017). EURASIAN ECONOMIC UNION AND ASEAN: COMPLEMENTARITY APPRAISAL. *International Trends / Mezhdunarodnye Protsessy*, *15*(3(50)). https://doi.org/10.17994/IT.2017.15.3.50.4

Long, Y. (2021). Export competitiveness of agricultural products and agricultural sustainability in China. *Regional Sustainability*, *2*(3), 203–210. https://doi.org/10.1016/j.regsus.2021.09.001

Losch, B. (2004). Debating the multifunctionality of agriculture: From trade negotiations to development policies by the South. *Journal of Agrarian Change*, *4*(3), 336–360. https://doi.org/10.1111/j.1471-0366.2004.00082.x

Lu, Yang, An, J., & Shi, S. (2021). Research on Smart Agriculture IoT System Based Heterogeneous Networking Technology. *2021 IEEE 4th International Conference on Information Systems and Computer Aided Education, ICISCAE 2021*, 485–488. https://doi.org/10.1109/ICISCAE52414.2021.9590756

Lu, Yujia, & Chen, Y. (2021). Is China's agricultural enterprise growing steadily? Evidence from listed agricultural companies. *Chinese Journal of Population Resources and Environment*, *19*(2), 203–212. https://doi.org/10.1016/j.cjpre.2021.12.022

Luminita, C., Constantin, C., & Valeriu, I.-F. (2014). Editorial. *Procedia Economics and Finance*, *8*(January), 1–9. https://doi.org/10.1016/s2212-5671(14)00055-0

Lynch, J., & Garnett, T. (2021). Policy to Reduce Greenhouse Gas Emissions: Is Agricultural Methane a Special Case? *EuroChoices*, *20*(2), 11–17. https://doi.org/10.1111/1746-692X.12317

Ma, H., & Sun, Z. (2021). Comprehensive urbanization level and its dynamic factors of five Central Asian countries. *Dili Xuebao/Acta Geographica Sinica*, *76*(2), 367–382. https://doi.org/10.11821/dlxb202102009

Ma, T., Li, B., Fang, C., Zhao, B., Luo, Y., & Chen, J. (2006). Analysis of physical flows in primary commodity trade: A case study in China. *Resources, Conservation and Recycling*,

*47*(1), 73–81. https://doi.org/10.1016/j.resconrec.2005.10.004

Machmuddah, Z., Utomo, S. D., Suhartono, E., Ali, S., & Ghulam, W. A. (2020). Stock Market Reaction to COVID-19: Evidence in Customer Goods Sector with the Implication for Open Innovation. *J. Open Innov. Technol. Mark. Complex*, *6*(4), 99. https://doi.org/10.3390/joitmc604009

Maier, B., & Pitaraki, A. (2016). The Many Identities of the European Union: Exploring the Rival Trade and Investment Ambitions of Organization and Members. *Manchester Journal of International Economic Law*, *13*(3), 357–387.

Maitah, K., Smutka, L., Sahatqija, J., Maitah, M., & Anh, N. P. (2020). Rice as a determinant of Vietnamese economic sustainability. *Sustainability (Switzerland)*, *12*(12), 1–12. https://doi.org/10.3390/su12125123

Mamba, E., Gniniguè, M., & Ali, E. (2020). Effect of foreign direct investment on structural transformation in West African Economic and Monetary Union (WAEMU) countries. *Cogent Economics and Finance*, *8*(1), 1–21. https://doi.org/10.1080/23322039.2020.1783910

Manyong, V., Bokanga, M., Akonkwa Nyamuhirwa, D. M., Bamba, Z., Adeoti, R., Mwepu, G., Cole, S. M., & Dontsop Nguezet, P. M. (2022). COVID-19 outbreak and rural household food security in the Western Democratic Republic of the Congo. *World Development Perspectives*, *28*(March), 100469. https://doi.org/10.1016/j.wdp.2022.100469

Mardones, C. (2022). Economic effects of isolating Russia from international trade due to its 'special military operation' in Ukraine. *European Planning Studies*, *0*(0), 1–16. https://doi.org/10.1080/09654313.2022.2079074

Marenya, P. P., Usman, M. A., & Rahut, D. B. (2021). Community-embedded experiential learning and adoption of conservation farming practices in Eastern and Southern Africa. *Environmental Development*, *40*(December 2020), 100672. https://doi.org/10.1016/j.envdev.2021.100672

Mariano, R. S. (2007). Simultaneous Equation Model Estimators: Statistical Properties and Practical Implications. *A Companion to Theoretical Econometrics*, 122–143. https://doi.org/10.1002/9780470996249.ch7

Maskus, K. E. (2006). Intellectual property rights in agriculture and the interests of Asian-Pacific economies. *World Economy*, *29*(6), 715–742. https://doi.org/10.1111/j.1467-9701.2006.00817.x

Maslennikov, M. I. (2011). International economic trade partners and competitions of the Russian on world agricultural market. *Economy of Region*, *4*, 149–158.

Maslova, V. V., Zaruk, N. ., & Avdeev, M. . (2020). Problems and Directions of the Improvement of Price Relations in the Russian Agricultural Sector of Economy. In A. V. Bogoviz (Ed.), *Complex Systems: Innovation and Sustainability in the Digital Age* (Vol. 1, pp. 549–555). Springer Nature Switzerland. https://doi.org/10.3389/fclim.2022.931514

Mason, R., & Swanson, T. (2003). A Kuznets curve analysis of ozone-depleting substances and the impact of the Montreal Protocol. *Oxford Economic Papers*, *55*(1), 1–24. https://doi.org/10.1093/oep/55.1.1

McBurney, M., Tuaza, L. A., Ayol, C., & Johnson, C. A. (2021). Land and livelihood in the age of COVID-19: Implications for indigenous food producers in Ecuador. *Journal of Agrarian Change*, joac.12417. https://doi.org/10.1111/joac.12417

McCann, J., Sinno, L., Ramadhan, E., Assefa, N., Berhane, H. Y., Madzorera, I., & Fawzi, W. (2023). COVID-19 Disruptions of Food Systems and Nutrition Services in Ethiopia: Evidence of the Impacts and Policy Responses. *Annals of Global Health*, *89*(1), 1–16.

https://doi.org/10.5334/aogh.3980
McIntire, J. M. (2014). Transforming African Agriculture. In *Global Journal of Emerging Market Economies* (Vol. 6, Issue 2). https://doi.org/10.1177/0974910114525697
Meher, R. (2009). Globalization, displacement and the livelihood issues of tribal and agriculture dependent poor people: The case of mineral-based industries in India. *Journal of Developing Societies*, *25*(4), 457–480. https://doi.org/10.1177/0169796X0902500403
Melo, O., & Foster, W. (2021). Agricultural and forestry land and labor use under long-term climate change in Chile. *Atmosphere*, *12*(3), 1–17. https://doi.org/10.3390/atmos12030305
Méndez, V. E., Bacon, C. M., Olson, M., Petchers, S., Herrador, D., Carranza, C., Trujillo, L., Guadarrama-Zugasti, C., Cordón, A., & Mendoza, A. (2010). Effects of fair trade and organic certifications on small-scale coffee farmer households in Central America and Mexico. *Renewable Agriculture and Food Systems*, *25*(3), 236–251. https://doi.org/10.1017/S1742170510000268
Mihalache-O'keef, A., & Li, Q. (2011). Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries. *International Studies Quarterly*, *55*(1), 71–93. https://doi.org/10.1111/j.1468-2478.2010.00636.x
Milovanovic, J., Shealy, T., & Godwin, A. (2022). Senior engineering students in the USA carry misconceptions about climate change: Implications for engineering education. *Journal of Cleaner Production*, *345*(December 2021), 131129. https://doi.org/10.1016/j.jclepro.2022.131129
Mohammed, T. (2015). A CGE Analysis of the Economic Impact of Trade Liberalisation on the Algerian Economy. *European Journal of Sustainable Development*, *5*(3), 397–408. https://doi.org/10.14207/ejsd.2016.v5n3p397
Mollett, J. A. (1988). The impact of agricultural price policy in developing countries. *Intereconomics*, *23*, 19–24.
Mosoma, K. (2004). Agricultural competitiveness and supply chain integration: South Africa, Argentina and Australia. *Agrekon*, *43*(1), 132–144. https://doi.org/10.1080/03031853.2004.9523641
Mottaleb, K. A., Kruseman, G., & Snapp, S. (2022). Potential impacts of Ukraine-Russia armed conflict on global wheat food security: A quantitative exploration. *Global Food Security*, *35*(November), 100659. https://doi.org/10.1016/j.gfs.2022.100659
Munir, K., & Bukhari, M. (2020). Impact of globalization on income inequality in Asian emerging economies. *International Journal of Sociology and Social Policy*, *40*(1–2), 44–57. https://doi.org/10.1108/IJSSP-08-2019-0167
Murray, W. E. (2000). Neoliberal globalisation, "exotic" agro-exports, and local change in the Pacific Islands: A study of the Fijian kava sector. *Singapore Journal of Tropical Geography*, *21*(3), 355–373. https://doi.org/10.1111/1467-9493.00086
Mykhailov, A. M., Mykhailova, L., Kharchenko, T., Mohylna, L., & Shestakova, A. (2021). Investment instruments for managing innovative transformations of the agricultural sector to ensure sustainable development in the context of globalization. *Estudios de Economia Aplicada*, *39*(7). https://doi.org/10.25115/eea.v39i7.5068
Nabi, T., & Kaur, T. P. (2019). Export Specialization of India with Top Five Agricultural Economies: An Application of RCA and RSCA. *International Journal of Innovative Technology and Exploring Engineering*, *8*(12), 4705–4708. https://doi.org/10.35940/ijitee.L3586.1081219
Nakhumwa, T. O., Hassan, R. M., Kirsten, J. F., & Ng'ong'ola, D. H. (1999). Policy incentives

and the comparative economic advantage in malawian agriculture. *Agrekon*, *38*(3), 356–373. https://doi.org/10.1080/03031853.1999.9523559

Narayanan, S., & Saha, S. (2021). Urban food markets and the COVID-19 lockdown in India. *Global Food Security*, *29*, 100515. https://doi.org/10.1016/j.gfs.2021.100515

Nasir, M. A., Nugroho, A. D., & Lakner, Z. (2022). Impact of the Russian–Ukrainian Conflict on Global Food Crops. *Foods*, *11*(19), 1–16. https://doi.org/10.3390/foods11192979

Nassary, E. K., Msomba, B. H., Masele, W. E., Ndaki, P. M., & Kahangwa, C. A. (2022). Exploring urban green packages as part of Nature-based Solutions for climate change adaptation measures in rapidly growing cities of the Global South. *Journal of Environmental Management*, *310*(October 2021), 114786. https://doi.org/10.1016/j.jenvman.2022.114786

Nedra, B. A., Sharma, S., & Dakhli, A. (2015). Perception and motivation to purchase organic products in Mediterranean countries: An empirical study in Tunisian context. *Journal of Research in Marketing and Entrepreneurship*, *17*(1), 67–90. https://doi.org/10.1108/JRME-07-2014-0015

Nedumaran, G., & Manida, M. (2019). Impact of FDI in agriculture sector in India: Opportunities and challenges. *International Journal of Recent Technology and Engineering*, *8*, 380–383. https://doi.org/10.35940/ijrte.C1081.1083S19

Neglo, K. A. W., Gebrekidan, T., & Lyu, K. (2021). The role of agriculture and non-farm economy in addressing food insecurity in Ethiopia: A review. *Sustainability (Switzerland)*, *13*(7), 1–22. https://doi.org/10.3390/su13073874

Neilson, J., Dwiartama, A., Fold, N., & Permadi, D. (2020). Resource-based industrial policy in an era of global production networks: Strategic coupling in the Indonesian cocoa sector. *World Development*, *135*, 105045. https://doi.org/10.1016/j.worlddev.2020.105045

Nelson, E. J., Helmus, M. R., Cavender-Bares, J., Polasky, S., Lasky, J. R., Zanne, A. E., Pearse, W. D., Kraft, N. J. B., Miteva, D. A., & Fagan, W. F. (2016). Commercial plant production and consumption still follow the latitudinal gradient in species diversity despite economic globalization. *PLoS ONE*, *11*(10), 1–23. https://doi.org/10.1371/journal.pone.0163002

Nematchoua, M. K., Asadi, S., & Reiter, S. (2020). Influence of energy mix on the life cycle of an eco-neighborhood, a case study of 150 countries. *Renewable Energy*, *162*, 81–97. https://doi.org/10.1016/j.renene.2020.07.141

Neville, W. (1992). Agribusiness in Singapore: a capital-intensive service. *Journal of Rural Studies*, *8*(3), 241–255. https://doi.org/10.1016/0743-0167(92)90002-N

Nguyen, D. P., Ho, V. T., & Vo, X. V. (2018). Challenges for Vietnam in the Globalization Era. *Asian Journal of Law and Economics*, *9*(1), 1–3. https://doi.org/10.1515/ajle-2018-0002

Nicholas, K., Fanzo, J., & MacManus, K. (2018). Palm Oil in Myanmar: A Spatiotemporal Analysis of the Effects of Industrial Farming on Biodiversity Loss. *Global Health: Science and Practice*, *6*(1), 210–222. https://doi.org/10.9745/GHSP-D-17-00132

Nie, W., Kumar, S., Arsenault, K., Peters-Lidard, C., Mladenova, I., Bergaoui, K., Hazra, A., Zaitchik, B., Mahanama, S., McDonnell, R., Mocko, D., & Navari, M. (2021). Towards Effective Drought Monitoring in the Middle East and North Africa (MENA) Region: Implications from Assimilating Leaf Area Index and Soil Moisture into the Noah-MP Land Surface Model for Morocco. *Hydrology and Earth System Sciences Discussions*, *May*, 1–36.

Nigh, R. (1997). Organic agriculture and globalization: A maya associative corporation in Chiapas, Mexico. *Human Organization*, *56*(4), 427–436. https://doi.org/10.17730/humo.56.4.w761q3q1h4h8m247

Nowak, A., & Kaminska, A. (2016). Agricultural competitiveness: The case of the European

Union countries. *Agricultural Economics (Czech Republic)*, *62*(11), 507–516. https://doi.org/10.17221/133/2015-AGRICECON
Nowak, A., Kobiałka, A., & Krukowski, A. (2021). Significance of agriculture for bioeconomy in the member states of the European Union. *Sustainability (Switzerland)*, *13*(16), 1–17. https://doi.org/10.3390/su13168709
Nowak, A., & Różańska-Boczula, M. (2022). The Competitiveness of Agriculture in EU Member States According to the Competitiveness Pyramid Model. *Agriculture (Switzerland)*, *12*(1), 1–12. https://doi.org/10.3390/agriculture12010028
Nugroho, A. D. (2021a). Agricultural market information in developing countries: A literature review. *Agricultural Economics (Czech Republic)*, *67*(11), 468–477. https://doi.org/10.17221/129/2021-AGRICECON
Nugroho, A. D. (2021b). Does covid-19 have effects on the indonesian horticultural subsector? *Bulgarian Journal of Agricultural Science*, *27*(5), 865–874.
Nugroho, A. D., Bhagat, P. R., Magda, R., & Lakner, Z. (2021). The impacts of economic globalization on agricultural value added in developing countries. *Plos One*, *16*(11), e0260043. https://doi.org/10.1371/journal.pone.0260043
Nurhayati, I., Endri, E., Aminda, R. S., & Muniroh, L. (2021). Impact of COVID-19 on Performance Evaluation Large Market Capitalization Stocks and Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 56. https://doi.org/10.3390/joitmc7010056
OECD. (2020). *Land cover change in countries and regions*. https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_CHANGE
Opara, L. U., & Mazaud, F. (2001). Food traceability from field to plate. *Outlook on Agriculture*, *30*(4), 239–247. https://doi.org/10.5367/000000001101293724
Osabohien, R., Adeleye, N., & Tyrone, D. A. (2020). Agro-financing and food production in Nigeria. *Heliyon*, *6*(5), e04001. https://doi.org/10.1016/j.heliyon.2020.e04001
Osman, R., Ferrari, E., & McDonald, S. (2019). Is improving Nile water quality 'fruitful'? *Ecological Economics*, *161*(January), 20–31. https://doi.org/10.1016/j.ecolecon.2019.03.003
Otsuka, K. (2019). Technology Transfer and Agricultural Development: A Comparative Study of Asia and Africa. In K. Ot & K. Sugihara (Eds.), *Paths to the Emerging State in Asia and Africa* (pp. 35–54). Springer Nature. https://doi.org/10.1007/978-981-13-3131-2_13
Paarlberg, R. L. (2002). *Governance and Food Security in an Age of Globalization*. International Food Policy Research Institute.
Papageorgiou, A. (2012). Sustainable development as a solution to agricultural competitiveness: The case of Greece in the era of European integration. *Journal of Central European Agriculture*, *13*(3), 458–474. https://doi.org/10.5513/JCEA01/13.3.1072
Park, C.-Y., & Lee, J.-W. (2011). Financial Integration in Emerging Asia: Challenges and Prospects. *Asian Economic Policy Review*, *6*(2), 176–198. https://doi.org/10.1111/j.1748-3131.2011.01193.x
Pasara, M. T. (2020). An overview of the obstacles to the African economic integration process in view of the African continental free trade area. *Africa Review*, *12*(1), 1–17. https://doi.org/10.1080/09744053.2019.1685336
Pasara, M. T., & Diko, N. (2020). The Effects of AfCFTA on Food Security Sustainability: An Analysis of the Cereals Trade in the SADC Region. *Sustainability*, *12*(4), 1419. https://doi.org/10.3390/su12041419
Paschalidou, A., Tsatiris, M., & Kitikidou, K. (2016). Energy crops for biofuel production or for

food? - SWOT analysis (case study: Greece). *Renewable Energy*, *93*, 636–647. https://doi.org/10.1016/j.renene.2016.03.040

Paul, A., Shukla, N., & Trianni, A. (2023). Modelling supply chain sustainability challenges in the food processing sector amid the COVID-19 outbreak. *Socio-Economic Planning Sciences*, *87*(PA), 101535. https://doi.org/10.1016/j.seps.2023.101535

Paus, E. (2012). Confronting the Middle Income Trap: Insights from Small Latecomers. *Studies in Comparative International Development*, *47*(2), 115–138. https://doi.org/10.1007/s12116-012-9110-y

Pereira, P., Bašić, F., Bogunovic, I., & Barcelo, D. (2022). Russian-Ukrainian war impacts the total environment. *Science of The Total Environment*, *837*(April), 155865. https://doi.org/10.1016/j.scitotenv.2022.155865

Pfeiffer, A., & Hepburn, C. (2016). Facing the Challenge of Climate Change. *Global Journal of Emerging Market Economies*, *8*(2), 201–215. https://doi.org/10.1177/0974910116634473

Pham, M. P., Nguyen, K. Q., Vu, G. D., Nguyen, N. T. T., Tong, H. T., Trinh, L. H., & Le, P. V. (2022). Drought risk index for agricultural land based on a multi-criteria evaluation. *Modeling Earth Systems and Environment*, *8*(4), 5535–5546. https://doi.org/10.1007/s40808-022-01376-9

Pholphirul, P., & Bhatiasevi, V. (2016). IT investment and constraints in developing countries: Evidence from Thai manufacturers. *Information Development*, *32*(2), 186–202. https://doi.org/10.1177/0266666914535616

Pinder, S. O. (2009). The Dominican Republic and Central America Free Trade Agreement with the USA: Some concerns. *Development in Practice*, *19*(2), 227–232. https://doi.org/10.1080/09614520802689485

Pinilla, V., & Rayes, A. (2019). How Argentina became a super-exporter of agricultural and food products during the First Globalisation (1880–1929). *Cliometrica*, *13*(3), 443–469. https://doi.org/10.1007/s11698-018-0178-0

Pirkle, C. M., Poliquin, H., Sia, D., Kouakou, K. J., & Sagna, T. (2015). Re-envisioning global agricultural trade: time for a paradigm shift to ensure food security and population health in low-income countries. *Global Health Promotion*, *22*(1), 60–63. https://doi.org/10.1177/1757975914531029

Pirnea, I. C., Lanfranchi, M., & Giannetto, C. (2013). Agricultural Market Crisis and Globalization – A Tool for Small Farms. *Revista Română de Statistică*, *61*(10 November), 35–45.

Polimeni, J. M., Iorgulescu, R. I., & Mihnea, A. (2018). Understanding consumer motivations for buying sustainable agricultural products at Romanian farmers markets. *Journal of Cleaner Production*, *184*, 586–597. https://doi.org/10.1016/j.jclepro.2018.02.241

Porter, M. E. (1990). The Competitive Advantage of Nations. *Harvard Business Review*, *March-Apri*, 73–91. https://doi.org/10.1177/014920639101700113

Pozo, S., Sanchez-Fung, J. R., & Santos-Paulino, A. U. (2011). A note on modelling economic growth determinants in the Dominican Republic. *Macroeconomics and Finance in Emerging Market Economies*, *4*(1), 35–41. https://doi.org/10.1080/17520843.2011.548594

Prasada, I. Y., Nugroho, A. D., & Lakner, Z. (2022). Impact of the FLEGT license on Indonesian plywood competitiveness in the European Union. *Forest Policy and Economics*, *144*(June), 102848. https://doi.org/10.1016/j.forpol.2022.102848

Qasim, M., Pervaiz, Z., & Chaudhary, A. R. (2020). Do Poverty and Income Inequality Mediate the Association Between Agricultural Land Inequality and Human Development? *Social Indicators Research*, *151*(1), 115–134. https://doi.org/10.1007/s11205-020-02375-y

Qiang, W., Niu, S., Wang, X., Zhang, C., Liu, A., & Cheng, S. (2020). Evolution of the global agricultural trade network and policy implications for China. *Sustainability (Switzerland)*, *12*(1), 1–16. https://doi.org/10.3390/SU12010192

Qin, Z. L. (2005). Effects of market liberalization on income from sugarcane farming in Guangxi, China. *Sugar Tech*, *7*(1), 25–31. https://doi.org/10.1007/BF02942414

Rada, N. E., & Buccola, S. T. (2012). Agricultural policy and productivity: Evidence from Brazilian censuses. *Agricultural Economics (United Kingdom)*, *43*(4), 355–367. https://doi.org/10.1111/j.1574-0862.2012.00588.x

Rahman, M., & Jahan, H. (2015). Second-generation Cooperation Agenda. *South Asia Economic Journal*, *16*(1), 1–26. https://doi.org/10.1177/1391561415575125

Reardon, T., & Barrett, C. B. (2000). Agroindustrialization, globalization, and international development an overview of issues, patterns, and determinants. *Agricultural Economics*, *23*(3), 195–205. https://doi.org/10.1016/S0169-5150(00)00092-X

Reeves, G. W. (1987). World Agricultural Rrade nad the New GATT Round. *Journal of Agricultural Economics*, *38*(3), 393–405. https://doi.org/10.4324/9780429268168

Reimer, J. J., & Li, M. (2010). Trade costs and the gains from trade in crop agriculture. *American Journal of Agricultural Economics*, *92*(4), 1024–1039. https://doi.org/10.1093/ajae/aaq046

Ren, H., Liu, B., Zhang, Z., Li, F., Pan, K., Zhou, Z., & Xu, X. (2022). A water-energy-food-carbon nexus optimization model for sustainable agricultural development in the Yellow River Basin under uncertainty. *Applied Energy*, *326*(September), 120008. https://doi.org/10.1016/j.apenergy.2022.120008

Renard, M. C. (1999). The interstices of globalization: The example of fair coffee. *Sociologia Ruralis*, *39*(4), 484–500. https://doi.org/10.1111/1467-9523.00120

Ricardo, D. (n.d.). On the Principles of Political Economy, and Taxation. In *On the Principles of Political Economy, and Taxation* (1st ed.). Batoche books. https://doi.org/10.1017/cbo9781107589421

Ringler, C. (2005). Globalization – What's in it for the Poor in Terms of Water and Food Security? *The 2005 World Water and Environmental Resources Congress*, 1–10.

Rodenburg, J., Meinke, H., & Johnson, D. E. (2011). Challenges for weed management in African rice systems in a changing climate. *Journal of Agricultural Science*, *149*(4), 427–435. https://doi.org/10.1017/S0021859611000207

Rostam, K., Jali, M., & Toriman, M. (2010). Impacts of globalization on economic change and metropolitan growth in Malaysia: Some regional implications. *The Social Sciences*, *5*(4), 293–301. https://doi.org/10.3923/sscience.2010.293.301

Sabajo, C. R., Le Maire, G., June, T., Meijide, A., Roupsard, O., & Knohl, A. (2017). Expansion of oil palm and other cash crops causes an increase of the land surface temperature in the Jambi province in Indonesia. *Biogeosciences*, *14*(20), 4619–4635. https://doi.org/10.5194/bg-14-4619-2017

Sadiqa, B. A., Zaman, K., Rehman, F. U., Nassani, A. A., Haffar, M., & Abro, M. M. Q. (2022). Evaluating race-to-the-top/bottom hypothesis in high-income countries: controlling emissions cap trading, inbound FDI, renewable energy demand, and trade openness. *Environmental Science and Pollution Research*, *29*(33), 50552–50565. https://doi.org/10.1007/s11356-022-19385-7

Salam, S., & Bauer, S. (2022). Rural non-farm economy and livelihood diversification strategies: evidence from Bangladesh. *GeoJournal*, *87*(2), 477–489. https://doi.org/10.1007/s10708-020-10269-2

Salvatore, D. (2013). *International economics* (11th ed.). Wiley.
Samargandi, N., Kutan, A. M., Sohag, K., & Alqahtani, F. (2020). Equity market and money supply spillovers and economic growth in BRICS economies: A global vector autoregressive approach. *North American Journal of Economics and Finance*, *51*(September 2019), 101060. https://doi.org/10.1016/j.najef.2019.101060
Samimi, P., & Jenatabadi, H. S. (2014). Globalization and economic growth: Empirical evidence on the role of complementarities. *PLoS ONE*, *9*(4), 1–7. https://doi.org/10.1371/journal.pone.0087824
Sanchez-Ancochea, D. (2006). Development trajectories and new comparative advantages: Costa Rica and the Dominican Republic under Globalization. *World Development*, *34*(6), 996–1015. https://doi.org/10.1016/j.worlddev.2005.11.012
Sánchez-Ancochea, D. (2012). A fast herd and a slow tortoise? The challenge of upgrading in the Dominican Republic. *Studies in Comparative International Development*, *47*, 208–230. https://doi.org/10.1007/s12116-012-9108-5
Saran, S., Kumar, S., & Gangwar, L. S. (2013). India's exports performance in poultry products and the potential exports destinations. *Agricultural Economics (Czech Republic)*, *59*(3), 134–142. https://doi.org/10.17221/106/2012-agricecon
Sarker, R., & Ratnasena, S. (2014). Revealed Comparative Advantage and Half-a-Century Competitiveness of Canadian Agriculture: A Case Study of Wheat, Beef, and Pork Sectors. *Canadian Journal of Agricultural Economics*, *62*(4), 519–544. https://doi.org/10.1111/cjag.12057
Sasson, A. (2012). Food security for Africa: An urgent global challenge. *Agriculture and Food Security*, *1*(1), 1–16. https://doi.org/10.1186/2048-7010-1-2
Schipanski, M. E., & Bennett, E. M. (2012). The Influence of Agricultural Trade and Livestock Production on the Global Phosphorus Cycle. *Ecosystems*, *15*(2), 256–268. https://doi.org/10.1007/s10021-011-9507-x
Scholte, J. A. (2005). *Globalization: A Critical Introduction* (2nd editio). Palgrave Macmillan.
Schwarz, J., Mathijs, E., & Maertens, M. (2015). Changing patterns of global agri-food trade and the economic efficiency of virtual water flows. *Sustainability (Switzerland)*, *7*(5), 5542–5563. https://doi.org/10.3390/su7055542
Schwarz, J., Mathijs, E., & Maertens, M. (2019). A dynamic view on agricultural trade patterns and virtual water flows in Peru. *Science of the Total Environment*, *683*, 719–728. https://doi.org/10.1016/j.scitotenv.2019.05.118
Seo, Y., Someya, Y., & Dowaki, K. (2019). Environmental impacts and consumer preference for sustainably cultivated Japanese mustard spinach, komatsuna. *Journal of Environmental Management*, *231*(May 2018), 364–369. https://doi.org/10.1016/j.jenvman.2018.10.077
Serrano, R., & Pinilla, V. (2014). New directions of trade for the agri-food industry: A disaggregated approach for different income countries, 1963-2000. *Latin American Economic Review*, *23*(1). https://doi.org/10.1007/s40503-014-0010-6
Sherlock, J., & Reuvid, J. (2008). The Handbook of International Trade A Guide to the Principles and Practice of Export. In *Handbook of International Trade* (2nd ed., Vol. 2). GMB Publishing Ltd. https://doi.org/10.1002/9780470757697
Silva, E. D., Appanah, S., & Kariyawasam, D. (1995). 95/01613 Sustainable forestry management in developing countries. Experiences from Asia. *Fuel and Energy Abstracts*, *36*(2), 110. https://doi.org/10.1016/0140-6701(95)93278-x
Simionescu, M. (2021). The nexus between economic developmentand pollution in the European

Union new member states. The role of renewable energy consumption. *Renewable Energy*, *179*, 1767–1780. https://doi.org/10.1016/j.renene.2021.07.142

Smit, A. J. (2010). The competitive advantage of nations: is Porter's Diamond Framework a new theory that explains the international competitiveness of countries? *Southern African Business*, *14*(1), 105–130. https://www.ajol.info/index.php/sabr/article/view/76358

Smith, A. (1776). The wealth of nations. In *The Wealth of Nations* (1st ed.). J. M Dent & Sons Ltd. https://doi.org/10.4324/9781912281190

Sparling, D., & Thomspon, S. (2011). *Addressing Issues and Perspective on Policy Options Competitiveness of the Canadian Agri-Food Sector*. 1–20. http://www.capi-icpa.ca/pdfs/2011/CAPI_Viability5_Competitiveness.pdf

Srbinovska, M., Gavrovski, C., Dimcev, V., Krkoleva, A., & Borozan, V. (2015). Environmental parameters monitoring in precision agriculture using wireless sensor networks. *Journal of Cleaner Production*, *88*, 297–307. https://doi.org/10.1016/j.jclepro.2014.04.036

Steinberg, M. K., Taylor, M. J., & Moran-Taylor, M. (2014). Coffee and mayan cultural commodification in guatemala. *Geographical Review*, *104*(3), 361–373. https://doi.org/10.1111/j.1931-0846.2014.12031.x

Stuart-Fox, M. (1998). Laos in 1997: Into ASEAN. *Asian Survey*, *38*(1), 75–79. https://doi.org/10.2307/2645470

Subejo, Untari, D. W., Wati, R. I., & Mewasdinta, G. (2019). Modernization of agriculture and use of information and communication technologies by farmers in coastal Yogyakarta. *Indonesian Journal of Geography*, *51*(3), 332–345. https://doi.org/10.22146/ijg.41706

Sud, N. (2014). Governing India's land. *World Development*, *60*, 43–56. https://doi.org/10.1016/j.worlddev.2014.03.015

Suranovic, S. (2012). *Policy and Theory of International Economics*.

Suroso, A. I., Fahmi, I., Tandra, H., & Haryono, A. (2023). Assessing the Effect of Internet Indicators on Agri-Food Export Competitiveness. *Economies*, *11*(10), 1–17. https://doi.org/10.3390/economies11100246

Svatoš, M. (2007). Specific aspects of globalization. *Agricultural Economics*, *53*(2), 65–68. https://doi.org/10.17221/1423-agricecon

Svoboda, J., Lososová, J., & Zdeněk, R. (2016). Subsidies on investments in the EU member states. *Agris On-Line Papers in Economics and Informatics*, *8*(4), 153–162. https://doi.org/10.7160/aol.2016.080414

Tahbaz, M. (2016). Environmental Challenges in Today's Iran. *Iranian Studies*, *49*(6), 943–961. https://doi.org/10.1080/00210862.2016.1241624

Tcvetkov, P. (2022). Engagement of resource-based economies in the fight against rising carbon emissions. *Clean Energy and Electrical Systems*, *8*, 874–883. https://doi.org/10.1016/j.egyr.2022.05.259

Thoburn, J. (2004). Globalization and poverty in Vietnam: Introduction and overview. *Journal of the Asia Pacific Economy*, *9*(2), 127–144. https://doi.org/10.1080/1354786042000207290

Thottathil, S. E. (2014). *India's Organic Farming Revolution: What it Means for Our Global Food System*. University of Iowa Press.

Tongzon, J. (2012). The challenge of globalization for the logistics industry: Evidence from Indonesia. *Transportation Journal*, *51*(1), 5–32. https://doi.org/10.5325/transportationj.51.1.0005

Torres, R. (2001). *Towards a Socially Sustainable World Economy: An Analysis of the Social Pillars of Globalization*. International Labour Office.

Trenberth, K. E. (2011). Changes in precipitation with climate change. *Climate Research*, *47*(1–2), 123–138. https://doi.org/10.3354/cr00953

Tsai, C. L., Hung, M. C., & Harriott, K. (2010). Human Capital Composition and Economic Growth. *Social Indicators Research*, *99*(1), 41–59. https://doi.org/10.1007/s11205-009-9565-z

Umulisa, Y. (2020). Estimation of the East African Community's trade benefits from promoting intra-regional trade. *African Development Review*, *32*(1), 55–66. https://doi.org/10.1111/1467-8268.12414

Urrego-Mesa, A. (2021). Food Security, trade specialization, and violence in Colombia (1916-2016). *Investigaciones de Historia Económica*, *17*(4), 1–15. https://doi.org/10.33231/j.ihe.2021.08.001

van Berkum, S. (2015). *Agricultural potential and food security in Central Asia in the light of climate change | FAO*. http://www.fao.org/family-farming/detail/en/c/357512/

Van Campenhout, B. (2017). There is an app for that? The impact of community knowledge workers in Uganda. *Information Communication and Society*, *20*(4), 530–550. https://doi.org/10.1080/1369118X.2016.1200644

van den Heuvel, F. P., de Langen, P. W., van Donselaar, K. H., & Fransoo, J. C. (2011). Identification of Employment Concentration and Specialization Areas : Theory and Application. *Beta Working Paper*, *354*(August), 26p. https://doi.org/10.1002/agr

van Tilburg, A. J., & Hudson, P. F. (2022). Extreme weather events and farmer adaptation in Zeeland, the Netherlands: A European climate change case study from the Rhine delta. *Science of the Total Environment*, *844*(May), 157212. https://doi.org/10.1016/j.scitotenv.2022.157212

VanGrasstek, C. (2013). The conduct of the Doha Round. In *The History and Future of the World Trade Organization* (pp. 413–461). World Trade Organization. https://doi.org/10.30875/baa13c96-en

Varacca, A., & Sckokai, P. (2020). The determinants of the EU import demand for soybean and maize: What role for GMOS? *Journal of Agricultural and Food Industrial Organization*, *18*(2), 1–16. https://doi.org/10.1515/jafio-2019-0013

Varshney, A. (1989). Ideas, interest and institutions in policy change: Transformation of India's agricultural strategy in the mid-1960s. *Policy Sciences*, *22*(3–4), 289–323. https://doi.org/10.1007/BF00136322

Vavřina, J., & Martinovičová, D. (2014). Economic performance of SME agricultural producers in the context of risk management: Focus on Visegrad 4 member countries. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *62*(4), 777–782. https://doi.org/10.11118/actaun201462040777

von Braun, J. (2002). Is globalization taking a pause? Implications for international agriculture and food security policy. *Quarterly Journal of International Agriculture*, *41*(3), 187–190.

Wahidin, D., & Purnhagen, K. (2018). Improving the level of food safety and market access in developing countries. *Heliyon*, *4*(7), e00683. https://doi.org/10.1016/j.heliyon.2018.e00683

Wallingford, J., Martinez, E. M., & Masters, W. A. (2023). COVID-19 mobility restrictions and stay-at-home behaviour in 2020 were associated with higher retail food prices worldwide. *Global Food Security*, *37*(May), 100702. https://doi.org/10.1016/j.gfs.2023.100702

WANG, Q., LIU, C., ZHAO, Y., KITSOS, A., CANNELLA, M., WANG, S., & HAN, L. (2020). Impacts of the COVID-19 pandemic on the dairy industry: Lessons from China and the United States and policy implications. *Journal of Integrative Agriculture*, *19*(12), 2903–2915.

https://doi.org/10.1016/S2095-3119(20)63443-8
Warsame, A. A., Sheik-Ali, I. A., Barre, G. M., & Ahmed, A. (2022). Examining the effects of climate change and political instability on maize production in Somalia. *Environmental Science and Pollution Research, 2019*. https://doi.org/10.1007/s11356-022-22227-1
Watanabe, M. D. B., & Cavalett, F. C. O. (2022). Climate change mitigation of drop-in biofuels for deep-sea shipping under a prospective life-cycle assessment. *Journal of Cleaner Production*, *364*(132662), 1–11.
Wegren, S. K. (2014). Human capital and Russia's agricultural future. *Post-Communist Economies*, *26*(4), 537–554. https://doi.org/10.1080/14631377.2014.964467
Wicaksono, T., Nugroho, A. D., Lakner, Z., Dunay, A., & Illés, C. B. (2021). Word of mouth, digital media, and open innovation at the agricultural smes. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 1–22. https://doi.org/10.3390/joitmc7010091
Winkel, T., Bommel, P., Chevarría-Lazo, M., Cortes, G., Del Castillo, C., Gasselin, P., Léger, F., Nina-Laura, J. P., Rambal, S., Tichit, M., Tourrand, J. F., Vacher, J. J., Vassas-Toral, A., Vieira-Pak, M., & Joffre, R. (2016). Panarchy of an indigenous agroecosystem in the globalized market: The quinoa production in the Bolivian Altiplano. *Global Environmental Change*, *39*, 195–204. https://doi.org/10.1016/j.gloenvcha.2016.05.007
Winters, L. A., McCulloch, N., & McKay, A. (2004). Trade liberalization and poverty: The evidence so far. *Journal of Economic Literature*, *42*(1), 72–115. https://doi.org/10.1257/002205104773558056
World Bank. (2021). *World Bank Open Data*. World Bank Open Data. https://data.worldbank.org/
World Farmer Organization. (2020). Covid-19 Pandemic Outbreak: Overview of the Impact on the Agricultural Sector. In *WFO COVID-19 Agri-Information Hub*. (Issue May). www.wfo-oma.org/covid-19-agri-information-hub
WTO. (2021). *WTO Statistics*.
WTO. (2022). *Chronological list of disputes cases*. Chronological List of Disputes Cases. https://www.wto.org/english/tratop_e/dispu_e/dispu_status_e.htm
Wu, F. (2020). Stock market integration in East and Southeast Asia: The role of global factors. *International Review of Financial Analysis*, *67*, 101416. https://doi.org/10.1016/j.irfa.2019.101416
Xu, Y., Wang, Z., Dong, W., & Chou, J. (2023). Predicting the Potential Impact of Emergency on Global Grain Security: A Case of the Russia–Ukraine Conflict. *Foods*, *12*(13), 2557. https://doi.org/10.3390/foods12132557
Yang, H., Huang, X., Hu, J., Thompson, J. R., & Flower, R. J. (2022). Achievements, challenges and global implications of China's carbon neutral pledge. *Frontiers of Environmental Science and Engineering*, *16*(8), 1–4. https://doi.org/10.1007/s11783-022-1532-9
Yatsiv, I., Fediv, I., Yatsiv, S., Fediv, R., & Miller, A. (2023). Famine and Russia's war against Ukraine. *International Journal of Environmental Studies*, *80*(2), 252–258. https://doi.org/10.1080/00207233.2023.2170589
Yetkin Özbük, R. M., Coşkun, A., & Filimonau, V. (2022). The impact of COVID-19 on food management in households of an emerging economy. *Socio-Economic Planning Sciences*, *82*(February 2021), 1–10. https://doi.org/10.1016/j.seps.2021.101094
Zekri, S., & Aaisha Al-Maamari. (2019). An Overview of the Water Sector in MENA Region. In S. Zekri (Ed.), *Water Policies in MENA Countries* (pp. 1–18). Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-29274-4_5
Zhang, M., Luo, Y., Huang, D., Miao, H., Wu, L., & Zhu, J. (2022). Maize storage losses and its

main determinants in China. *China Agricultural Economic Review*, *14*(1), 17–31. https://doi.org/10.1108/CAER-08-2020-0186

Zhang, Y., & Shen, Y. (2019). Wastewater irrigation: past, present, and future. *Wiley Interdisciplinary Reviews: Water*, *6*(3), 1–6. https://doi.org/10.1002/wat2.1234

Zhao, Z., Fang, X., Ye, Y., Zhang, C., & Zhang, D. (2020). Reconstruction of cropland area in the European part of Tsarist Russia from 1696 to 1914 based on historical documents. *Journal of Geographical Sciences*, *30*(8), 1307–1324. https://doi.org/10.1007/s11442-020-1783-y

Zhou, L., Fang, P., & Wang, C. (2017). Dancing with Three Hands: The Identical Roots of China's Agricultural Miracle and Crisis. *Social Change*, *47*(4), 473–492. https://doi.org/10.1177/0049085717730161

Zobeidi, T., Yazdanpanah, M., Komendantova, N., Sieber, S., & Löhr, K. (2021). Factors affecting smallholder farmers' technical and non-technical adaptation responses to drought in Iran. *Journal of Environmental Management*, *298*(March). https://doi.org/10.1016/j.jenvman.2021.113552