Soil protection for sustainable food security: (New) role of the World Trade Organization?[1]

Falk Matthies & Oliver C. Ruppel

Abstract

Achieving global food security is a critical challenge requiring urgent, coordinated action. This chapter explores how crises such as climate change and geopolitical tensions destabilise agricultural systems and threaten the right to food, highlighting the vital role of soil health in sustaining productivity amidst growing environmental pressures.

The chapter explores the critical relationship between international trade law, particularly under the World Trade Organization (WTO) and its Agreement on Agriculture (AoA), and soil protection. Current trade rules, while focused on market access, subsidies, and export measures, inadequately address the broader dimensions of food security: availability, access, utilisation, and stability. The influence of multinational corporations dominating agricultural markets further highlights the vulnerabilities of global supply chains and underscores the need for trade frameworks that promote sustainable practices.

The chapter calls for comprehensive WTO reform, including eliminating harmful agricultural subsidies, introducing green subsidies for sustainable practices, and establishing green trade agreements. It emphasises recognising and supporting smallholder farmers, whose vital contributions to sustainable food security are often overlooked in global trade negotiations.

The chapter calls for greater international collaboration to integrate soil health and sustainable development into trade policies. While initiatives such as the G7's Global Alliance for Food Security show promise, concrete actions are essential. Protecting soils and aligning trade policies with sustainability can foster resilient food systems that ensure food security and environmental health for future generations.

1 This chapter is partly drawn from the thesis submitted by Matthies in 2024 in partial fulfilment of the requirements for the Master of Laws (LLM) degree at Stellenbosch University. It is further reliant on Ruppel (2021a and 2022b).

Chapter contents

Summary

This chapter discusses the urgent need for global food security, highlighting the interconnected challenges of crises, conflict, climate change, and geopolitical tensions, all of which threaten agricultural trade and undermine efforts to achieve food security. These challenges not only exacerbate food insecurity but also threaten human rights, specifically the internationally recognised right to food, which is binding on states parties and their institutions.

The chapter underscores the vital role of agriculture, which is inherently tied to the health and fertility of soils. Climate change is increasingly threatening soil quality and agricultural productivity, with negative consequences for global food systems. It also highlights the often-overlooked connection between international trade law and soil

protection, particularly in the context of agricultural commodity trade. Changes in trade patterns—whether through increased, decreased, or altered trade flows—have significant impacts on agricultural activities, including soil usage and fertility. Consequently, the legal frameworks governing international agricultural trade must consider soil protection to ensure long-term food security.

International organisations such as the World Trade Organization (WTO) must evolve to promote sustainable development in light of these challenges. The chapter argues for the redesign of the WTO framework, particularly the Agreement on Agriculture (AoA), to better support food security by integrating sustainable agricultural practices and ensuring the right to food is a central concern in trade laws. Currently, the multilateral trade system lacks a comprehensive approach to food security that extends beyond market access, subsidies, and export measures.

The role of multinational corporations, especially those controlling the grain trading and food processing sectors, is also a critical area of concern. These corporations often wield significant market power, which can either support or hinder sustainable food security efforts. Their dominant position in agricultural markets can lead to profit-driven practices that undermine long-term food security and increase vulnerabilities in global supply chains. The chapter calls for the WTO to factor these market dynamics into its food security framework and to develop policies that balance corporate interests with those of vulnerable nations and smallholder farmers.

The WTO's framework must be holistic, incorporating sustainable development and the right to food in trade policies. A key recommendation is the introduction of green trade agreements that incentivise sustainable agricultural practices, protect the environment, and ensure food security as global food demand rises. The chapter also calls for an increasing multilateral coordination between the WTO and other international bodies including the Food and Agriculture Organization (FAO) to address the multiple dimensions of food security—availability, access, utilisation, and stability—through trade rules.

A major aspect of the chapter is the need for rethinking global food systems in relation to soil health. While awareness of the importance of soil protection for sustainable food security is growing, the chapter stresses that translating this awareness into concrete action is critical. International cooperation is essential to ensure soil health is prioritised in global food security efforts. For example, the G7's Global Alliance for Food Security demonstrates high-level discussions on food security, but it is the implementation of actionable policies that determine success.

In the WTO context, several regulatory issues should be addressed, including market access, subsidies, export restrictions, and food aid programmes. The chapter advocates for a review of agricultural subsidies, urging to eliminate harmful subsidies that distort trade and harm the environment. Instead, green subsidies should be promoted to support sustainable agricultural practices that increase food production while

protecting the environment. A revised "Green Box" under the AoA could channel support towards environmentally friendly agricultural practices.

The chapter further stresses the need for a more balanced global food distribution system, particularly for less-developed countries. Smallholder farmers, who play a crucial role in food security, should be better represented in international trade negotiations. The WTO should ensure that their interests are considered in reform processes, as their sustainable farming practices are integral to long-term food security.

The protection of fertile soils, a vital natural asset, also needs to find its way into global trade frameworks. The chapter calls for soil protection policies to be tailored to local contexts, recognising the socio-economic and ecological characteristics of different regions. Only through a more comprehensive, cooperative international effort can the global community address the challenges of sustainable food security and soil conservation.

The chapter concludes by emphasising that the WTO, as a central player in international trade, should reform its policies to support sustainable food security and soil protection. Dr Ngozi Okonjo-Iweala, Director-General of the WTO, has highlighted that trade is essential to solving food system problems. To achieve the necessary transformation in food systems, global trade policies should also align with environmental and sustainability goals. Through trade policy reform, the WTO can help secure global food security while protecting vital soil resources. Ultimately, a holistic approach to food security, incorporating sustainable development, the right to food, and soil protection, is essential for a sustainable future.

1 Introduction

1.1 The connection of international trade, food security, and soil protection

"One in five calories consumed around the world crosses an international border."[2] This statement from Dr Okonjo-Iweala, Director General of the World Trade Organization (WTO), underscores a critical reality: food security is now a global endeavour. Local food production alone is insufficient to meet the nutritional needs of many populations worldwide. Without international trade in agricultural commodities, a significant portion of the global population would face severe food shortages and, potentially, famine.[3] As food demand continues to rise, international trade is expected to play an even greater role, with an estimated 50% of the world population projected to depend on it for staple grains by 2050.[4]

2 See https://www.wto.org/english/news_e/news23_e/dgno_26jul23_e.htm, accessed 30 September 2024.
3 WTO (2023); Fader et al. (2013: 3-4).
4 Ibid.: 1.

The challenges of food insecurity and malnutrition are well-known and affect millions, particularly in parts of Asia, Africa, and the Caribbean.[5] In 2022, around 700 million people—or 9.2% of the global population—faced chronic hunger across 59 countries.[6] Factors such as unequal food distribution, inefficient local and regional agriculture, and limited access to productive land and healthy soils hamper progress toward ending hunger. Sustainable food systems are essential not only for feeding a growing global population but also for providing livelihoods and supporting environmental health.[7]

Agricultural trade is an economic cornerstone for many countries, generating substantial export revenue, but it also has a broader "non-commercial" value.[8] The economic worth of food commodities does not capture their significance for public welfare and nutrition. For instance, cereals constitute 15% of food exports by value, yet they provide 44% of the world's calories.[9] The stability of the food supply is, thus, a matter of national and international concern. The dependence of countries on food imports, especially net-food-importing and other developing nations, underscores these global inequalities.[10] These nations are particularly vulnerable to disruptions in agricultural trade, which can trigger food insecurity and even threaten national security.[11]

The trade of agricultural goods connects production resources—such as land and soils—to the global food system.[12] About 40% of the world's land is used for agriculture, and fertile soils are essential to sustaining this productivity.[13] Protecting these soils is fundamental to ensuring food security, highlighting the need to integrate soil protection and sustainable land management into trade policies.[14]

International trade law, with the WTO at its centre, can play a pivotal role in advancing these goals. Given its oversight of global trade policies, the WTO is positioned to advocate for a holistic approach that aligns agricultural trade, soil conservation, and food security to foster a sustainable global food system.[15]

1.2 Soil protection

Soil management and protection have gained significant momentum in recent years as awareness grows around soil's critical role in sustaining human life.[16] International

5 FAO (2023: 9).
6 See https://www.wto.org/english/news_e/news24_e/agri_24may24_e.htm, accessed 30 September 2024; FAO (2023).
7 Calvo (2024).
8 Murphy & Manduna (2023: 14-15).
9 Ibid.: 5-6.
10 WTO, List of Net Food-Importing Developing Countries (2023) G/AG/5/Rev.12.
11 Murphy & Manduna (2023: 4).
12 Basset (2024: 3).
13 WTO (2020).
14 EU Commission (2021).
15 See also Ruppel & Dobers (2022).
16 Ruppel (2024).

efforts, such as the development of the World Soil Charter, seek to establish guidelines for better soil policies, reflecting the growing recognition of soil's importance.[17] While international conventions acknowledge soil protection, there is still no comprehensive, interdisciplinary global framework.[18] Some of the United Nations' Sustainable Development Goals (SDGs) directly and indirectly address soils.[19] SDG 15, for instance, aims to "[p]rotect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss," with target 15.3 specifically calling for the restoration of degraded land and soil.[20]

Soils are far more than just the ground beneath our feet—they are complex ecosystems that are essential to life on Earth.[21] Healthy, fertile soils are invaluable natural resources, providing numerous ecosystem services that support biodiversity, act as carbon sinks, and enable food production. Maintaining soil health—encompassing chemical, biological, and physical integrity—is crucial for these functions. Healthy soils are also more productive, fostering sustainable agriculture, and enhancing crop yields. Conversely, declines in soil fertility jeopardise agricultural output, thereby, threatening food security on local, regional, and even global scales.[22]

This discussion emphasises soil protection in the context of agriculture, yet soils play a variety of other essential roles that are often overlooked due to the socio-economic focus on maximising agricultural productivity.[23] Securing soil health is fundamental to global sustainability, providing critical services and benefits to the entire international community.[24]

17 Ruppel (2022a: 1-2); cf. FAO Revised World Soil Charter (2015).
18 Ruppel (2022a: 1).
19 EEA (2023); Ruppel (2022a: 2).
20 UN, Transforming our World: The 2030 Agenda for Sustainable Development (2015) 15. & 15.3.
21 Ruppel (2021a: 57); Ruppel (2022a: 1).
22 EU Commission (2021: 4).
23 For detailed soil functions, trade-offs, and synergies cf.: Zhao et al. (2022); EU Commission (2021: 2 & 15).
24 Basset (2024: 2).

2 Trade in agricultural commodities and the relevance for soil

In the wake of globalisation, trade in agricultural commodities, as with other sectors, has increased rapidly. The past few decades have been pivotal in shaping this growth.[25] From 2000 to 2022, the value of global agricultural trade more than quadrupled.[26] More countries have become involved in trading agricultural goods, and the structure of the global agricultural trade network has shifted towards greater decentralisation.[27] According to the Food and Agriculture Organization (FAO), the value of global agricultural exports in 2020 reached USD 1.5 trillion, with high-income countries accounting for around 60% of this total.[28]

To effectively analyse international trade law in the context of sustainable food security and soil protection, it is crucial to analyse the structure of global trade in agricultural commodities. This includes appreciating its complexity and significance. Key factors such as food supply chains, agricultural trade policies, and the impact of globally prevailing risk factors need to be considered to assess their relevance in the context of soil management.[29]

2.1 Global trade in agricultural commodities

Agricultural supply chains involve a diverse array of actors, though the key players remain relatively consistent across various sectors.[30] While the number of individual producers in many agricultural sectors is substantial, most are small-scale farmers, particularly in developing countries.[31] For instance, in 2012, up to 80% of farmland in sub-Saharan Africa and Asia was managed by small-scale farmers, typically working on parcels of land up to ten hectares.[32] In the same year, approximately 500 million smallholder farms were operating in developing countries.[33] According to the FAO, these small-scale farmers account for over 70% of the world's food production.[34] The initial stages of many agricultural supply chains are situated in developing countries, which often act as raw resource exporters. Primary agricultural commodities are grown for export to higher-income or developed countries.[35] Therefore, the global demand

25 Ruppel & Dobers (2022).
26 See https://www.wto.org/english/tratop_e/agric_e/ag_imp_exp_charts_e.htm, accessed 30 September 2024.
27 FAO (2022: 1).
28 Ibid.: 3.
29 Ruppel (2021a: 62); Ruppel (2022a: 2).
30 Rudloff & Wieck (2020: 3).
31 Ibid.: 4.
32 FAO (2013: 1).
33 HLPE (2013: 28).
34 FAO (2020: 3).
35 Rudloff & Wieck (2020: 8).

for food can only be understood through the lens of small-scale farmers in these regions.

Production conditions and agricultural practices vary significantly around the world, leading to varying impacts on the environment, particularly on soil fertility and availability.[36] For example, highly productive black soils, often referred to as the food basket of the world, are primarily found in only a few countries, such as Russia and Kazakhstan, with more than half of the world's black soils located there.[37] In 2010, 66% of sunflower seeds, 30% of wheat, and 26% of potatoes were harvested globally from these soils, which cover approximately 7% of the world's ice-free land surface, with a third of this land used for crops.[38] These differential practices and institutional frameworks mean that trade can have varied effects on countries, including exacerbating soil degradation.[39]

The agricultural commodity supply and value chain typically consists of four stages: inputs (including equipment), production, processing, and distribution (including retail).[40] A single state or geopolitical region can play multiple roles within the agricultural supply chain. For instance, more developed economies, with higher per capita income, consume more agricultural products and often have more diverse diets. However, economic development does not always correlate directly with increased agricultural productivity or activity.[41] The European Union (EU) is both a major consumer of agricultural products, with significant imports, and a dominant producer of agricultural commodities for export.[42] Similarly, China is the world's largest producer and importer of agricultural commodities.[43] Moreover, agricultural supply chains often become more concentrated over time, as certain products from specific regions establish themselves in importing countries or through long-standing trade relationships.[44] These varying positions within the supply chain result in differing powers and interests when it comes to agricultural trade discussions.

36 WTO & UN Environment (2018: 31); Ruppel (2021a: 62); Ruppel (2024).
37 FAO (2022: 5).
38 FAO (2022: 3 & 6); See https://www.fao.org/global-soil-partnership/intergovernmental-technical-panel-soils/gsoc17-implementation/internationalnetworkblacksoils/more-on-black-soils/black-soils-in-the-world/en/, accessed 30 September 2024.
39 Ruppel (2022a: 1).
40 Cucagna & Goldsmith (2018: 297-298).
41 Rask & Rask (2011: 186).
42 Rudloff & Wieck (2020: 2).
43 Jiang (2020); See https://www.fao.org/china/fao-in-china/china-at-a-glance/en/, accessed 30 September 2024.
44 Rudloff & Wieck (2020: 3-4).

2.2 Trade policies concerning agriculture and soil

Agriculture and its commodities are subject to a wide range of regulations and guidelines, reflecting the growing importance of improving quality of life and responding to increasing calls for enhanced safety standards and better quality control.[45] For this discussion, the focus is on international trade law as it pertains to agricultural commodities, without delving into the specific regulations or guidelines related to individual products, food safety standards, or regional agreements on agricultural trade. While these other frameworks certainly play a role in influencing agricultural trade, they are not the primary focus here.

The WTO plays a central role in international trade by providing a platform for governmental negotiations on trade agreements, establishing a binding legal framework for the implementation and monitoring of those agreements, and offering a dispute settlement system to resolve trade frictions. Agricultural trade has been a key issue within the WTO for decades, with the organisation successfully resolving disputes in this sector.[46]

However, the WTO was not initially designed with an environmental focus, and its 1994 founding structure did not specifically address concerns such as soil protection.[47] The core tasks of the WTO are to open national markets, promote free and fair trade, increase global welfare, and ensure stability through a rule-based approach. While the organisation's primary focus is on trade, the WTO does have a mandate to promote sustainable development.[48] This mandate allows the organisation to address issues related to soil protection, but only to the extent that these issues are linked to trade.[49] The WTO's trade-related focus means that its ability to directly tackle environmental concerns such as soil protection is limited to those cases where soil issues intersect with its core mission of facilitating trade and promoting economic welfare.

This has significant implications for the WTO's decision-making processes and its ability to resolve conflicts.[50] While the organisation is not specifically tasked with environmental governance, its role in regulating trade can provide an avenue for addressing soil protection and related issues within the broader context of global trade policy.

45 Ruppel (2021a: 62).

46 The WTO Agreement on Agriculture came into force in 1995; See https://www.wto.org/english/tratop_e/agric_e/negoti_e.htm, accessed 30 September 2024. 89 cases cite the Agreement on Agriculture in the request for consultations: WTO (2024).

47 Ruppel (2021b: 512-513).

48 Preamble of the agreement establishing the WTO: "[…] while allowing for the optimal use of the world's resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment and to enhance the means for doing so in a manner consistent with their respective needs and concerns at different levels of economic development."

49 Ruppel (2021a: 64).

50 Ibid.

The challenge lies in balancing the interests of sustainable development with the WTO's broader objectives of promoting free trade and economic growth.

2.2.1 General Agreement on Tariffs and Trade

The General Agreement on Tariffs and Trade (GATT) 1994 plays a crucial role in regulating global trade and addressing barriers to trade. One of the key principles of GATT is the prohibition of trade restrictions or bans. Article XI(1) states that trade restrictions or bans are generally prohibited; however, there is an exemption outlined in Article XI(2)(a), which allows member countries to impose temporary export bans or restrictions on foodstuffs during critical shortages of essential products.[51] This creates a situation where such restrictions, even when applied for short periods, can disrupt international agricultural trade and leave countries that rely heavily on food imports vulnerable to supply risks.[52]

For non-food agricultural products, the WTO applies stricter regulations regarding export restrictions and bans.[53] This disparity in treatment—where agricultural products are differently regulated than other goods—can put importing countries at a disadvantage, as they can be more susceptible to disruptions in supply caused by export restrictions from other countries.

The GATT also manifests the principle of non-discrimination in international trade law. Under this principle, members' national policies must not discriminate against like products from different trading partners (the "most favoured nation" or MFN principle),[54] nor should they discriminate between imported products and domestically produced products (the "national treatment" principle).[55] However, Article XXIV(5) provides an exception to the non-discrimination principle when it comes to regional trade arrangements (RTAs). These arrangements, which foster trade integration, can promote economic growth and contribute to food security by stabilising trade relationships within a specific region.[56]

For countries implementing national policies related to agriculture, including soil protection policies, these policies must comply with the non-discrimination rules of the GATT. Any national agricultural legislation or practice must be designed in a way that does not favour domestic agricultural products over imports or discriminate between trading partners, ensuring that trade flows remain fair and consistent with WTO commitments. This underscores the importance of aligning policies with international

51 Wolff & Glauber (2023: 7); Ruppel (2022b: 5).
52 Rudloff & Wieck (2020: 6).
53 Ruppel (2022b: 5).
54 Art I of the GATT.
55 Ibid.: Art III.
56 Ruppel (2022b: 5-6).

trade rules to avoid trade conflicts and ensure a balance between national priorities and global trade obligations.

2.2.2 Agreement on Agriculture

Especially the WTO Agreement on Agriculture (AoA)[57] plays a crucial role in shaping global trade in agricultural products by regulating key restrictions and allowances. Its primary aim is to make agricultural trade fairer, more competitive, and less interventionist, addressing the longstanding distortions in agricultural trade.[58] The AoA serves as a *lex specialis*, or specialised set of rules, that takes precedence over the GATT and other WTO agreements.[59] According to Article 21(1) AoA, while the provisions of GATT and other WTO agreements in Annex 1A apply, they are subject to the specific provisions outlined in the AoA.[60] In principle, all WTO rules governing trade in goods apply to agriculture, though the AoA introduces exceptions and specific regulations in cases where they conflict with GATT rules, such as for instance special safeguard measures and agricultural subsidies.[61] Notably, the preamble of the AoA acknowledges non-trade concerns, including food security and the need to protect the environment.

The AoA is built on three key pillars: market access, domestic support, and export subsidies.[62] Market access is facilitated by converting import barriers into tariffs that are subject to reduction commitments. Special provisions allow certain programs to be excluded from obligations under Article 4.2 for primary agricultural products (Annex 5.1) and essential staples in the traditional diet of developing countries (Annex 5.7). Domestic support is categorised based on its impact on trade, with support measures placed into the amber, green, or blue boxes. Amber box measures directly affect trade and are subject to reduction commitments, while green box measures (those with minimal or no trade impact) and blue box measures (amber box measures with conditions to mitigate trade distortions).[63]

A significant achievement of the 10th Ministerial Conference in Nairobi (MC10) in 2015 was the agreement to eliminate all export subsidies.[64] Developed countries were required to phase out subsidies immediately while developing countries had until

57 Entered into force on 1 January 1995.
58 Ruppel (2022b: 6).
59 Van den Bossche & Zdouc (2022: 952).
60 Ruppel (2022b: 6).
61 Van den Bossche & Zdouc (2022: 952).
62 Arts 4, 6 & 9 of the AoA.
63 See https://www.wto.org/english/tratop_e/agric_e/negs_bkgrnd13_boxes_e.htm, accessed 30 September 2024; Dall'Agnola (2024: 164).
64 WTO, Ministerial Decision on Export Competition of 19 December 2015 (2015) WT/MIN(15)/45.

2018 to comply. However, least-developed countries and net-food-importing developing countries were allowed to continue using export subsidies until the end of 2030. Since then, agricultural negotiations at the WTO have seen limited tangible progress. At the 12th Ministerial Conference (MC12) held in Geneva, Switzerland in 2022, members adopted a ministerial declaration to address food insecurity, reaffirming the importance of trade in global food security.[65] One outcome was, for instance, a commitment to refrain from imposing export bans or restrictions on food purchased by the World Food Programme for non-commercial humanitarian purposes.[66] At the 13th Ministerial Conference in 2024 (MC13) held in Abu Dhabi, United Arab Emirates, members remained divided on key issues such as public stockholding and domestic support, with negotiations stalled.[67]

Article 12 of the AoA plays a critical role in regulating the export of agricultural commodities and foodstuffs. If a WTO member imposes export prohibitions or restrictions on food under the exemption of Article XI(2)(a) GATT, it must comply with the requirements of Article 12. This mandates that the exporting country "give due consideration to the effects of such prohibition or restriction on importing Members' food security."[68] Additionally, Article 12(1)(b) obligates the exporting country to notify the WTO Committee on Agriculture in advance about the nature and duration of the restriction, as well as to consult with affected members, especially those with a vested interest as importing countries.[69]

2.2.3 SPS Agreement

The WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) also plays a key role in shaping trade in agricultural commodities, especially concerning food safety and public health. Agricultural commodities traded internationally must adhere to sanitary and phytosanitary standards to ensure food security.[70] While the SPS Agreement recognises the right of WTO members to implement measures essential for the protection of human, animal, and plant health, these measures can become non-tariff barriers to agricultural trade if they lack transparency or fail to align with international standards.

The SPS Agreement explicitly references the standards and recommendations set by the Codex Alimentarius, a collection of international food standards, guidelines,

65 WTO, Ministerial Declaration on the Emergency Response to Food Insecurity (2022) WT/MIN(22)/28.
66 WTO, Ministerial Decision on World Food Program Food Purchases Exemption from Export Prohibitions or Restrictions (2022) WT/MIN(22)/29.
67 Calvo (2024).
68 Art 12(1)(a) of the AoA.
69 Wolff & Glauber (2023: 7).
70 Ruppel (2022b: 3); Mwenda (2024: 4).

and codes of practice developed by the Codex Alimentarius Commission.[71] This body, jointly established by the FAO and the WHO, sets food safety regulations based on scientific research and international expertise. The Codex provides a framework for ensuring the safety of food in international trade, impacting the trade of agricultural commodities by influencing food safety practices in production, processing, and supply chains.

Under the SPS Agreement, WTO members are encouraged to adopt Codex standards as the default benchmark for food safety. If a member wishes to impose stricter food safety measures than those established by Codex, it must justify these measures scientifically. This ensures that countries do not unnecessarily restrict trade through overly stringent or unsupported regulations.

2.3 Global risk factors for agricultural trade and soil

As various sources highlight, agricultural commodities continue to be central to global geopolitics.[72] Wars and extreme weather events are increasingly threatening fragile food supply chains, disrupting grain production and exports. Additionally, demand shocks in key markets can lead to a decline in export earnings and increased price volatility for export crops.[73]

The stability of food supply, distribution, and access is not uniform across all regions, as these systems are vulnerable to a range of factors. The interconnectedness of international trade in agricultural goods has far-reaching implications for soil health and the sustainability of agricultural systems. With varying production conditions and fluctuating food demand, crises, conflicts, and climate change play a central role in shaping global food systems. These challenges exacerbate vulnerabilities in agricultural production, trade, and soil health, further highlighting the need for resilient and sustainable systems that can withstand such pressures.

2.3.1 Crisis

The global COVID-19 pandemic was one of the most disruptive crises in recent history, affecting virtually every aspect of society and the economy. The impact of the pandemic was felt worldwide, from travel and social interaction restrictions to economic downturns, factory closures, and a crash in the financial markets.

71 E.g., Arts 3 & 5(8) read with the definition in Annex A (3)(a) of the SPS Agreement; Ruppel (2021b: 63); See https://www.fao.org/fao-who-codexalimentarius/about-codex/en/, accessed 30 September 2024.

72 Coface (2023); Barclays (2023).

73 Pais et al. (2020).

Unsurprisingly, the COVID-19 pandemic also had a profound effect on agricultural production and the trade of agricultural commodities, particularly as countries implemented national measures to protect public health and safeguard domestic supply.

The trade-restrictive measures adopted by several governments to contain the spread of the virus significantly disrupted food supply chains and hindered access to food.[74] Initially, the WTO forecasted a sharp decline in global trade. However, this downturn was not as severe as anticipated, and global trade in agricultural commodities even outperformed expectations, growing by 3.5% in 2020.[75] This resilience can largely be attributed to the recognition by governments of the essential nature of the food industry, which ensured that agricultural trade remained relatively stable.

Despite this, food systems were still deeply affected. The FAO estimated that over 100 million more people were facing hunger in 2020 compared to 2019, highlighting the disconnection between the growth of the international food trade and the actual nutritional needs of the global population.[76]

Access to international markets plays a crucial role in national food security, and disruptions to these markets can have serious consequences. For many countries, the reliance on international markets to meet domestic food demand becomes especially critical during global economic shocks. The global financial crisis of 2007-2008, for example, led to price surges and food emergencies in 48 countries, causing widespread social instability.[77] These events underscore the vulnerability of countries that depend on global trade to secure their food supply, and how periodic global shocks can exacerbate food insecurity at the national level.

2.3.2 Conflict

Military conflicts, whether between states or within a state, have profound and far-reaching macroeconomic consequences, particularly for agricultural production and trade. In addition to the immense suffering and human rights violations experienced by local populations, such conflicts can severely disrupt agricultural exports. When countries involved in conflict experience damaged or destroyed infrastructure, including farming facilities, storage, and transportation routes, agricultural goods may become unviable for export.[78] This disruption can lead to shortages in global markets, especially if the country is a major exporter of essential products including grains, oilseeds, or fertilisers.

74 Espa (2021: 43).
75 Arita et al. (2022: 2).
76 FAO (2021: 10).
77 FAO (2009); Wolff & Glauber (2023).
78 UN Resolution 2417 (2018) S/RES/2417.

At present, we monitor more than 100 armed conflicts around the world. Some of these conflicts make the headlines, others do not. Some of them started recently, while others have lasted for more than 50 years. The most affected region: more than 45 armed conflicts are currently taking place throughout the Middle East and North Africa in the following territories: Cyprus, Egypt, Iraq, Israel, Libya, Morocco, Palestine, Syria, Turkey, Yemen and Western Sahara. Africa comes second in the number of armed conflicts per region with more than 35 non-international armed conflicts (NIACs) taking place in Burkina Faso, Cameroon, the Central African Republic (CAR), the Democratic Republic of the Congo, Ethiopia, Mali, Mozambique, Nigeria, Senegal, Somalia, South Sudan and Sudan. Asia is the theatre of 19 NIACs involving 19 armed groups. These are happening in Afghanistan, India, Myanmar, Pakistan and the Philippines. Two international armed conflicts – between respectively India and Pakistan, and between India and China – are also taking place in the region. The following military occupations constitute the majority of armed conflicts that are currently taking place in Europe: Russia is currently occupying Crimea and the self-proclaimed 'People's Republics' of Donetsk and Luhansk in Ukraine, Transdniestria (Moldova), as well as South Ossetia and Abkhazia (Georgia), while Armenia is occupying parts of Nagorno Karabakh (Azerbaijan).[79]

Any warfare activities alter soil not only during conflict, but also during peace times through firing facilities, military bases, manufacturing operations, open/burning and open detonation, and dumping of munition. Soil pollution mostly comes from the use of nitro aromatic explosive compounds. Manufacturing and testing of weapons are also responsible for soil pollution. The negative effects from the use of incendiary weapons containing white phosphorus comes from their co-contaminants and residues of combustion. Such weapons may result in soil polluted with trace elements, hydrocarbons, organic solvents, surfactants, synthetic phenols, cyanide, dioxins, and radionuclides. To a lesser extent other trace elements are released including antimony, arsenic, cadmium, chromium, copper, mercury, nickel and zinc. The recovery of these soils can take from years to centuries depending on the extent of soil pollution. The detonation of mines causes adverse effects on soil with metal and plastic fragments and explosives residues. Africa has the highest number of landmines, about 37 million, distributed in 19 countries. Among these countries Angola alone has 15 million landmines. From 1945 until 2006, the total number of nuclear explosions that took place in the world were 2 053. The threat from radionuclide pollution is due to their persistence in soils that can reach thousands of years. Following a nuclear explosion, fine particles with radionuclide contaminants are transported in air currents before deposition on the soil. There is a potential for wide scale pollution over long distances. Major concern is arising from the use in conflicts of depleted uranium (DU) armour piercing weapons and their long-term effect on the environment and human health.

79 Cf. https://geneva-academy.ch/galleries/today-s-armed-conflicts, accessed 5 March 2025.

The risk of soil pollution arises from the fine radioactive dust released during the impact of DU projectiles into armour. Chemical warfare agents (CWA) are compounds that incapacitate an enemy, through death or injury. An example of CWA are nerve agents, which were originally produced as insecticides, but used for military purposes because of the extent of their toxicity. While only few studies have focused on the effects and impact of nerve agents in soil, polluted soil is a threat for human health because it can easily be transferred into the food chain. Battlefields, bombed cities and military training areas are all sites of high levels of pollution by trace elements and organic contaminants. The sources are shells, bullets and bombs, unexploded mines, cartridge cases, damaged vehicles, leaking fuel and burning buildings. Battlefields and training areas where there has been intense use of weapons over extended periods are all sites of high levels of pollution by trace elements, and organic compounds. These areas remain polluted with lead, copper, zinc, nickel antimony, arsenic and bismuth. Strategic objectives in armed conflicts can include the incapacity of an enemy to fight through the destruction of their infrastructure and resources. Fuel manufacture and storage are often targeted with the consequence of leakage of large quantities hydrocarbons into the soil or their combustion with the release of hydrocarbon and other emissions to the atmosphere and subsequent deposition onto the soil.[80]

Before the Russian aggression, Ukraine was the fourth largest corn exporter and fifth largest wheat seller in the world and a major supplier to poor countries in Africa and the Middle East that rely on grain imports. After Russia's invasion, grain prices soared worldwide as the Black Sea ports through which the Ukrainian harvest is normally shipped were closed, driving up inflation rates around the world. People and the environment in Ukraine have since been exposed to unimaginable suffering and Ukrainian soils, especially black earth, the most fertile soils in Ukraine (called Chernozem), have also suffered enormously from the destructive war. Hopefully, the war in Ukraine will come to an end at some point. But even when the deadly explosions of all those rockets, grenades and bombs finally cease, their destructive potential - and this applies accordingly to all areas affected by warlike activities - will remain imprisoned in the ground for a long time to come. Mines and other explosives have destroyed buildings, releasing asbestos into the environment. The Zaporizhzhia nuclear power plant was shelled and refineries were hit, spilling oil and other chemicals into the ground and water supply. Not to mention vast quantities of the munitions themselves, which contain toxic elements. These corrosive chemicals are here to stay. Millions of hectares of agricultural land in Ukraine have been contaminated with chemicals, impacting global food security. Once these chemicals enter the soil and groundwater, it may only be a matter of time before they enter the food chain via plants, animals and drinking water. In conclusion, these depressing developments should make it clear that the value of land urgently deserves its own

80 Cf. https://openknowledge.fao.org/server/api/core/bitstreams/fe5df8d6-6b19-4def-bdc6-62886d824574/content/src/html/chapter-03-6.html, accessed 9 March 2025.

price tag, even though it is actually priceless. The detrimental impacts of armed conflict situation on soils around the world need to be reconsidered, also in legal terms.[81]

Ukraine is richly endowed with fertile soil, abundant water resources, and diverse mineral and energy resources. The war on Ukraine, led to the imposition of martial law on 24 February 2022. Not only has the war inflicted severe human costs, substantial economic losses, and considerable environmental harm on Ukraine, it has also exacerbated several longstanding challenges that have hindered Ukraine's economic development and improvements in living standards, including low investment, a declining trade-to-GDP ratio, and weak productivity growth. Despite massive supply-side and other constraints imposed by the war, the economy has shown considerable resilience, even if output remains well below its pre-war level. Moreover, the authorities have taken important steps to build on Ukraine's largely open trade regime, driven by a strong commitment to integrate with the European Union. The ongoing war, led to a 33% collapse in the value of exports between 2021 and 2022, prompting concerns about global food security due to Ukraine's traditional role as a major exporter of agricultural products, especially cereals and sunflower oil. Such concerns have been partly assuaged by the continuation of some Ukrainian agricultural exports via the Black Sea and alternative river and land routes, albeit under precarious conditions. The global trading system also played a key role in avoiding a global food crisis in 2022, as it enabled countries dependent on food imports from Ukraine to find alternative suppliers and products to meet their demand for food. The latest estimates in the World Bank's Third Rapid Damage and Needs Assessment (RDNA3) put the war-related damage and losses incurred by Ukraine's agricultural sector at USD 80.1 billion. RDNA3 recommends that future investments focus on improving access to liquidity, fostering disaster- and climate-resilience, capturing synergies between food and energy production, and strengthening public entities with responsibilities in the agricultural sector, among other priorities. Ukraine's agricultural sector receives protection mainly through tariffs. The simple average applied MFN tariff rate on agricultural products (WTO definition), at 9.7%, has remained broadly unchanged since Ukraine's last Review in 2016 (9.6%). MFN tariffs applied on agricultural products range from 0% to 50% (with a rate of 54.5% corresponding to an ad valorem equivalent for certain wines). The product categories receiving the highest levels of tariff protection, on average, are sugars and sugar confectionery, animal fats and oils, and vegetables. About 14% of agricultural tariff lines exceed 15%, while another 15% of lines enter Ukraine duty-free. During martial law, Ukraine exempts from customs duty imports of products by the "industrial agricultural sector", including polymer sleeves and bags for storing agricultural products; plastic tubes, pipes, and hoses; textile bulk containers; and trailers and semi-trailers with self-loading or self-

81 Cf. Ruppel (2024).

unloading for the transportation of agricultural products. During the period under review, Ukraine implemented export bans on several agricultural products. Buckwheat was subject to a temporary export ban between 9 April 2020 and 1 July 2020. The stated purpose of this measure was "to prevent [a] critical shortage of foodstuff". In addition, the Ministry of Agrarian Policy and Food has negotiated memoranda of understanding with participants in the cereals market specifying maximum export volumes. The purpose of these instruments was to avoid the introduction of export restrictions, safeguard food security, and provide stability and predictability to market participants.[82]

The effects of these conflict related disruptions have been particularly severe in regions highly dependent on food imports.[83] Northern Africa, for instance, relies heavily on grain imports, with Ukraine and Russia being major suppliers.[84] The region, already facing a severe drought and financial constraints, saw food prices spike further due to the conflict, pushing food security to even more precarious levels.[85] Similarly, the Horn of Africa, already grappling with food insecurity and ongoing armed conflicts, experienced even worse consequences.[86] These regions, with limited domestic agricultural capacity, are particularly vulnerable to external shocks, resulting in dire consequences for their populations.[87]

The political sensitivity surrounding the impact of conflict on global food security is evident, with leaders such as (former) US President Joe Biden publicly accusing Russian President Vladimir Putin of exacerbating the global food crisis by blocking Ukrainian grain exports.[88] This highlights the reciprocal relationship between food security and conflict, where disruptions in food supply can fuel political instability and exacerbate the humanitarian crisis.

In response to these disruptions, many countries have turned to export restrictions to protect their domestic food security. For example, the EU delayed new decommissioning obligations for agricultural land to boost domestic food production and secure its supply.[89] However, such measures often lead to a delayed increase in food quantities, as agricultural cycles require time to ramp up production.[90]

82 See with further references, Report of the WTO Secretariat prepared for the second Trade Policy Review of Ukraine, WT/TRP/S/467, dated 18 December 2024, at https://www.wto.org/english/tratop_e/tpr_e/s467_e.pdf, accessed 9 March 2025; Rudloff & Götz (2022); Rudloff (2023); Dall'Agnola (2024); Welsh (2023); Albrecht et al. (2022); Wolff & Glauber (2023).
83 Rudloff (2023: 52).
84 Welsh (2023).
85 Albrecht et al. (2022: 3).
86 Ibid.: 4.
87 Welsh (2023).
88 Wolff & Glauber (2023: 4); See https://www.politico.com/news/2023/02/21/biden-putin-russia-ukraine-00083786, accessed 30 September 2024.
89 Rudloff (2023: 54-55); Landwirtschaftskammer Niedersachsen (2022).
90 Rudloff (2023: 50-51).

In line with the WTO's goal of facilitating trade, several international measures have been implemented to ease the flow of agricultural commodities, such as the facilitation of Ukrainian agricultural exports into the EU.[91] While the WTO does provide exceptions for export restrictions in the case of emergencies, these measures still contradict the broader goals of free trade, creating long-term challenges for the global food system with ripple effects which can be felt worldwide, deepening the challenges of hunger and food insecurity in vulnerable regions.

2.3.3 Climate change

Agricultural sectors are also particularly vulnerable to the impacts of climate change due to their direct dependence on weather patterns and environmental conditions.[92] Agriculture has always been susceptible to uncertainties such as varying weather conditions, which influence crop yields and the overall productivity of farming.[93] As the climate changes, the range of pests and diseases also shifts, further complicating agricultural production and food security.[94] This creates an increasing need for adaptive strategies, with international trade playing a crucial role in mitigating these effects.[95]

International trade can help countries adapt to climate change by providing access to food supplies from areas with surplus production due to favourable weather conditions, balancing out deficiencies in other regions affected by extreme weather events.[96] For example, countries experiencing droughts or floods may rely on food imports from regions where conditions are more favourable, helping to stabilise domestic food supplies.[97] However, these benefits are not without challenges, as climate change also intensifies extreme weather events such as droughts, floods, and wildfires, all of which can have long-term detrimental effects on agricultural systems.[98]

Soil health is particularly at risk from the effects of climate change.[99] Unpredictable rainfall patterns, for instance, can lead to soil erosion and pollution, which significantly reduces the fertility of agricultural land. This phenomenon is especially concerning in developing countries, where agriculture is a major contributor to the economy and livelihoods.[100] The loss of fertile soils not only hampers local agricultural production

91 Ibid.: 54.
92 See https://www.fao.org/koronivia/topics/food-security-socio-economic-dimensions/en/, accessed 30 September 2024.
93 Wolff & Glauber (2023: 4); FAO (2020: 3).
94 WTO, Communication from The United States: The World Trade Organization's Role in enhancing Food Security (2023) JOB/CTG/25; WTO & UN Environment (2018: 33).
95 Hufstader (2024).
96 WTO & UN Environment (2018: 33).
97 Ruppel (2022a: 3).
98 Hufstader (2024).
99 Oxfam (2022: 4-5); Hufstader (2024).
100 Ruppel (2022a: 3).

but also exacerbates food insecurity, particularly in regions already vulnerable to famine.[101] According to UN humanitarian appeals, the number of people experiencing acute hunger in the world's top climate hotspots has doubled from 2016 to 2021, underscoring the urgent need for sustainable agricultural practices and enhanced food security.[102]

To address these challenges, there is a growing need for more environmentally efficient agricultural production and distribution systems. By integrating agricultural trade internationally, production can shift to regions where environmental conditions are more favourable, allowing for greater efficiency in both food production and soil conservation.[103] Healthy, fertile soils are critical for sustaining agricultural production, and protecting these soils is essential to ensure long-term food security. Climate change may even present an opportunity for certain regions with healthy soils to serve as global suppliers, helping to mitigate the effects of climate-related agricultural disruptions elsewhere.

In this context, international trade can play a key role in enhancing soil protection and food security.[104] By allowing for the relocation of agricultural production based on both environmental and market needs, countries can adapt to the changing climate, while ensuring that soil resources are preserved and utilised as efficiently and sustainably as possible. Ultimately, fostering global collaboration and sustainable agricultural practices will be essential in addressing the dual challenges of climate change and food security.

3 Food security and the right to food

The FAO has been key in shaping the definition of food security since the mid-1970s.[105] The concept gained significant prominence during the World Food Summit in 1996 in Rome, where global attention was brought to the issue. Over time, this definition has been further refined through FAO and other international meetings on food security. According to the FAO's widely accepted definition, food security consists of four dimensions:[106]

Food availability: This refers to always having enough food, which can come from domestic production, imports, food stocks, or, when necessary, food aid.

Food accessibility: Not only must food be available, but it must also be accessible to people, both physically and financially. This means that food should be affordable,

101 Rudloff & Wieck (2020: 5); Hufstader (2024).
102 Oxfam (2022: 3).
103 Ruppel (2022b: 2).
104 Ibid.: 3.
105 Peng & Berry (2019: 1-2).
106 FAO (2006); See https://www.worldbank.org/en/topic/agriculture/brief/food-security-update/what-is-food-security, accessed 30 September 2024; Peng & Berry (2019).

and socio-cultural factors (such as the cultural acceptance of the food) should also be considered.[107]

Food utilisation: This dimension ensures that individuals can utilise food properly, which requires access to adequate facilities such as clean water for food preparation and the necessary healthcare for the body to digest and make use of the food consumed.[108]

Stability: The food security system must be reliable and consistent over time. Any disruption, such as crises, conflicts, or the impact of climate change, can undermine food security. Stability refers to the ability to withstand such shocks and maintain a reliable food supply, even in the face of external stressors.

Food insecurity can be categorised into chronic food insecurity, where people are persistently unable to meet their basic food needs, and transitory food insecurity, where temporary setbacks cause a short-term decline in food security.[109]

SDG 2 aims to address hunger and food security directly and indirectly by calling for the improvement of soil quality for sustainable food production.[110] Soil health is critical, particularly in poor rural areas, for maintaining long-term agricultural productivity and food security.[111]

International climate agreements, including the Paris Agreement (2015), also recognise the strong link between food security and the protection of ecosystems, including soils. Although the Paris Agreement does not explicitly mention soils, it acknowledges the importance of safeguarding food security and the vulnerability of food systems to climate change.[112] It highlights the need for climate mitigation and adaptation measures that also protect agricultural systems, which depend heavily on soil health.[113]

Similarly, the Koronivia Joint Work on Agriculture (KJWA) under the UN Framework Convention on Climate Change (UNFCCC) recognise agriculture's potential to address climate change.[114] The KJWA covers topics such as soil carbon, soil health, and sustainable soil management. It emphasises that the protection and improvement of soils are essential for both mitigating climate change and ensuring food security, as soils serve as one of the largest carbon sinks and are foundational to agricultural production.

Through these frameworks, international trade and soil protection become more closely interconnected. Agricultural trade can serve as a means of addressing food

107 Peng & Berry (2019).
108 Rudloff (2023: 52); Peng & Berry (2019).
109 FAO (2008); Peng & Berry (2019); Webb et al. (2006: 1404-1408).
110 UN, Transforming our World: The 2030 Agenda for Sustainable Development (2015) 2.1 & 2.4; EEA Soil and United Nations Sustainable Development Goals (2023).
111 Ruppel (2022a: 3).
112 Ibid.: 4.
113 The Preamble, Arts 2(1)(b) & 4(1) of the Paris Agreement of 2015; EU Commission (2021); Ruppel (2021a: 58).
114 See https://www.fao.org/koronivia/en/, accessed 30 September 2024.

security challenges, especially in areas impacted by soil degradation or climate-induced events. Furthermore, international trade law has the potential to promote sustainable soil management practices, encouraging the protection of fertile soils and supporting agricultural production in the face of climate change. Thus, the integration of soil protection in global trade policies could play a pivotal role in enhancing food security while addressing the adverse effects of climate change.

The human right to food, which has been enshrined in international legal frameworks such as the Universal Declaration of Human Rights (UDHR) and the International Covenant on Economic, Social, and Cultural Rights (ICESCR), is closely linked to agricultural production and soil protection.[115] This right is not only about the freedom from hunger, but also ensures that individuals have regular, reliable, and unobstructed access to sufficient and culturally appropriate food, which is essential for a dignified and healthy life. The right to adequate food, as outlined in ICESCR Article 11, is underpinned by four dimensions: availability, accessibility, utilisation, and stability.[116]

Agricultural trade, including both domestic production and international trade, plays a significant role in realising this right globally. However, for food security to be sustainable, the soil—the very foundation of agricultural production—must be preserved and managed sustainably. Without fertile soil, local food production becomes impossible, especially for rural communities in developing countries where self-sufficiency through farming is the primary means of securing food. Ensuring access to and protecting fertile soils can be considered an obligation to safeguard the right to food.

The WTO and the international trade regime have a critical role to play in addressing food security from a trade perspective.[117] The inclusion of soil protection in agricultural trade policies, coupled with multilateral and bilateral trade agreements, can contribute to maintaining global food security. Sustainable agricultural practices should be promoted within these frameworks, recognising the interconnectedness of soil, food production, and the human right to food. Strengthening the legal framework around the right to food, including soil sustainability, would ensure reliable enforcement and contribute to broader global food security objectives, particularly under the UN's SDGs, such as SDG 2.4, which targets sustainable food production systems.[118]

In sum, ensuring the protection of fertile soils, as part of a sustainable agricultural policy, is central to realising the human right to food. Trade regulations, along with soil protection measures, can help maintain and enhance global food security, aligning with both human rights and environmental sustainability goals.[119]

115 Rudloff & Wieck (2020: 4); Kattau (2015: 324-325); Ziegler (2001); UN CESCR General Comment No. 12: The Right to Adequate Food (Art 11 of the Covenant) (1999).
116 Ziegler (2001: 16); See https://www.worldbank.org/en/topic/agriculture/brief/food-security-update/what-is-food-security, accessed 30 September 2024.
117 Rudloff & Wieck (2020: 4).
118 Ruppel (2021a: 58); De Schutter (2014).
119 Ruppel (2022b: 5).

Agriculture and international trade in agricultural commodities are central to ensuring global food security, particularly in developing countries where local agricultural production, often small-scale and livestock-based, plays a vital role in meeting food needs. Many households in these regions rely heavily on agriculture not only for food availability but also as a key source of income through local markets.[120] However, this is increasingly threatened by "land grabbing", which reduces people's access to land for food production, thus, endangering their self-sufficiency and food security.[121]

The global trade system is a double-edged sword for food security. While international trade enables countries to supplement domestic production through imports, particularly during times of low domestic output or when building stockpiles for crises, it also introduces vulnerabilities. For countries dependent on food imports, the risk of food insecurity increases if supply chains are disrupted due to political, economic, or military conflicts.[122] The greater the concentration of food supply sources, especially if those sources are in regions prone to instability, the higher the potential risk of sudden food shortages.

This dependency on imports has been highlighted by recent global events. Armed conflicts, such as the ongoing wars, have displaced people from their land and livelihoods, disrupted markets, and increased food prices, which compounds existing food security challenges.[123] Similarly, the economic fallout from the COVID-19 pandemic and the Russian invasion of Ukraine has exacerbated food insecurity worldwide by disrupting food production and supply chains. These events have resulted in soaring food prices, making it difficult for many households—especially in developing countries—to afford nutritious food, thus, deepening malnutrition.[124]

The rising food prices resulting from such crises disproportionately affect vulnerable populations, particularly in least-developed countries (LDCs) and net food-importing developing countries, where the cost of a healthy diet becomes prohibitively high. According to international organisations, these countries are among the "hunger hotspots," with 24 countries identified globally, of which sixteen are located on the African continent.[125]

In sum, while international trade can help address food shortages, it also exposes countries to external shocks. For many developing nations, especially those reliant on food imports, political instability, natural disasters, and global economic fluctuations can swiftly disrupt food access and availability, threatening food security. Therefore, a more resilient, diversified approach to agriculture and trade is needed, alongside efforts to safeguard the rights of small-scale farmers and protect local food systems.

120 Mwenda (2024: 2-3).
121 For the phenomena of land grabbing and its legal implications cf.: Baker-Smith & Attila (2016); Cochrane (2016); Ruppel (2022b: 4).
122 Rudloff (2023: 52).
123 WFP & FAO (2022).
124 Welsh (2023).
125 WFP & FAO (2022).

4 Role of the WTO in sustainable food security

4.1 Less trade: Self-sufficient agriculture?

While self-sufficiency in agriculture may seem to be a potential solution to food insecurity, especially given the vulnerability of countries relying on international trade, it is not necessarily a practical or sustainable answer in the current global context. Advocating for total self-sufficiency could lead to inefficiencies, environmental degradation, and missed opportunities for global cooperation. If every country focused solely on ensuring its agricultural interests without considering the global trade system, it could easily create chaos, undermining the achievements of international trade, cooperation, and progress in addressing global challenges such as climate change.[126]

A trade-based, integrated global economy allows regions suffering from food insecurity to import food from areas where crises, conflicts, or climate impacts are less severe.[127] The FAO therefore emphasises that agricultural trade and market integration are essential for increasing food availability and accessibility.[128] Liberalised trade policies can stimulate trade flows, improve market efficiency, and provide consumers with a greater variety of affordable agricultural products, including livestock.[129]

However, this does not mean that strengthening local food systems is irrelevant. The development of a country's agricultural system remains a sovereign right, and every nation should prioritise food security for its population.[130] At the same time, international obligations, including humanitarian needs, must be respected in a globalised world.[131] While international trade brings undeniable benefits, such as promoting specialisation, competition, and innovation, it also carries risks—especially for countries that rely heavily on imports.[132]

Therefore, the current global system requires reform, not retreat. The WTO's role in regulating trade law is essential to ensuring that food security is prioritised and that soil protection is considered in global trade agreements. A major gap in international trade rules is the handling of food sharing during times of scarcity.[133] Strengthening the legal framework under the WTO to address food security and soil protection through trade regulations is necessary to mitigate the risks of reliance on agricultural imports and ensure sustainable solutions to global food insecurity.

In summary, while self-sufficient agriculture may not be a viable or realistic solution, changes are urgently needed in how we approach global agricultural trade.

126 Wolff & Glauber (2023: 9).
127 WTO & UN Environment (2018: 33).
128 FAO (2020: 4).
129 Mwenda (2024: 4).
130 FAO (2020: 5).
131 Ruppel (2022b: 5).
132 WTO & UN Environment (2018: 34).
133 Wolff & Glauber (2023: 9).

Balancing international cooperation with local food system development and strengthening trade regulations to safeguard food security is critical in addressing the pressing challenges of today's interconnected world.

4.2 Adjusting existing WTO regulations

The connection between food systems and international trade policy, as highlighted by WTO Director-General Dr Okonjo-Iweala, is crucial in addressing global food security and sustainable agricultural practices.[134] The WTO plays a significant role in shaping food systems and indirectly influencing soil protection through its trade regulations, especially in times of crisis, conflict, and climate change. As trade and agriculture are inherently linked, the WTO's regulations also have the potential to improve food security and soil health on a global scale.[135]

One of the most important elements of this relationship is the alignment between the WTO and the FAO, particularly regarding sustainable development and food security. Through agreements such as the SPS Agreement, which references the Codex Alimentarius Commission's standards and guidelines, the WTO and FAO work together to enhance sustainable agricultural practices.[136] This cooperation was further strengthened with an additional agreement in 2023. The FAO's annual report, the State of Food Security and Nutrition in the World, provides valuable insights into global food security, contributing to the WTO's policy work on agricultural issues.[137]

However, despite this collaboration, there are calls for significant reforms within the WTO's legal framework to promote a more sustainable and holistic approach to food security.[138] The current rules, particularly under the AoA, are seen as inadequate in achieving the economic, social, and environmental goals necessary for a sustainable agricultural system.[139] A more comprehensive approach that integrates the UN's SDGs, such as SDG 2 (food security), SDG 12 (sustainable production), SDG 13 (climate action) and SDG 15 (ecosystem sustainability), is essential for addressing food insecurity in a way that also protects the environment, including soil health and biodiversity.[140]

134 WTO (2023).
135 WTO, Communication from Argentina, Brazil, Chile, Paraguay and Uruguay: Principles and Values of the Region Regarding the Production of Food Within the Framework of Sustainable Development (2021) G/AG/GEN/187.
136 Preamble, Arts 3, 12 & Annex A of the SPS Agreement; WTO (2023).
137 WTO (2023).
138 Saner (2024).
139 WTO, Submission by Brazil: Joint Statement – The Contribution of International Agricultural Trade to Sustainable Food Systems (2021) G/AG/GEN/186.
140 WTO, Communication from Brazil (2022) WT/MIN(22)/W/5; Dall'Agnola (2024: 186).

One pressing issue is the regulation of food export bans, which can severely impact food security, particularly in LDCs and net-food-importing developing countries.[141] Export restrictions can create significant disruptions in global food access, as seen during the COVID-19 pandemic and the early months of the Ukraine war when countries heavily reliant on food imports faced severe price volatility and shortages.[142] WTO members did take steps at the MC12 in 2022 to limit export restrictions for World Food Program (WFP) purchases, which are vital for humanitarian efforts.[143] This decision, however, included exceptions that allowed members to restrict exports to ensure their national food security, thus, weakening the overall impact of the reform.[144]

While the exemption for WFP purchases is a step forward, export bans and trade barriers remain a critical challenge.[145] These measures often lead to higher food prices, longer delivery times, and supply chain disruptions, which can exacerbate food insecurity.[146] A potential compromise could involve exempting LDCs from export restrictions to protect their domestic food supply, especially during global price surges.[147] However, this would not address the fundamental issue that many poor populations in these countries are unable to afford food, even when it is available.

In conclusion, while the WTO plays a vital role in shaping international trade and food security policies, its regulations need to evolve to address the interconnected challenges of food access, environmental sustainability, and equitable access to food. A more integrated, reform-oriented approach that balances the needs of vulnerable nations with global trade dynamics, and that ensures the protection of both food security and soil health, is crucial for achieving a more resilient and sustainable food system worldwide.

4.2.1 Asymmetry of the AoA

Export restrictions are often used as quick policy tools to safeguard national food security, particularly during crises, conflicts, or catastrophic climate events. These

141 Wolff & Glauber (2023: 5); Dall'Agnola (2024: 183-184).
142 Calvo (2024).
143 WTO, Ministerial Decision on World Food Program Food Purchases Exemption from Export Prohibitions or Restrictions (2022) WT/MIN(22)/29; See https://www.wfp.org/procurement, accessed 30 September 2024.
144 WTO, Ministerial Decision on World Food Program Food Purchases Exemption from Export Prohibitions or Restrictions (2022) WT/MIN(22)/29; Wolff & Glauber (2023: 5 & 9).
145 WTO, Summary Report of the Special Meeting of the Committee on Agriculture Held on 18 June 2020 (2020) G/AG/R/94; WTO, Summary Report of the Meeting of the Committee on Agriculture Held on 15-16 March 2022 (2022) G/AG/R/10; Dall'Agnola (2024: 178).
146 WTO, Summary Report of the Meeting of the Committee on Agriculture Held on 30 November - 1 December 2020 (2021) G/AG/R/97; See https://www.wfp.org/procurement, accessed 30 September 2024.
147 Calvo (2024).

measures, which include export bans, licensing, duties, and quantitative restrictions, allow countries to control the flow of foodstuffs in and out of their borders, ensuring adequate domestic supply and protecting their agricultural industries. The Russian invasion of Ukraine, for example, led to a significant number of export restrictions, which between February 2022 and October 2023 were estimated to cost USD 130 billion.[148] These measures, although essential for immediate food security, can have significant ripple effects on global agricultural production and distribution, highlighting the tension between national and global food security needs.

The AoA has also come under scrutiny for creating loopholes that disproportionately benefit developed countries,[149] enabling countries to maintain higher tariffs on "sensitive" agricultural products while reducing tariffs on less important ones, creating what is known as "tariff peaks."[150] This obviously not only undermines the principle of free trade but has also been criticised for limiting market access for developing countries.[151] Additionally, the AoA's "green box" and "blue box" exemptions—designed to support environmental and rural development policies—have been seen as tools for developed nations to subsidise their agriculture in ways that may not align with fair trade or food security.[152]

To address these issues, several reforms are being proposed for the AoA. One major goal is to achieve greater market access for agricultural producers in developing countries, particularly through product-specific tariff reductions in developed nations.[153] This could enhance the comparative advantage of agriculture in developing countries, especially those vulnerable to the impacts of climate change. Climate-smart agricultural support could help these countries adopt more sustainable practices, improve their competitiveness, and contribute to global food security, including soil protection.

Moreover, the AoA's green and blue box measures could be redefined to focus more specifically on sustainability goals, particularly soil conservation and climate resilience.[154] This would involve clarifying what constitutes sustainable agricultural subsidies and introducing caps on the expenditures of such programs to ensure they promote real environmental benefits rather than protecting entrenched interests.

Despite ongoing negotiations to update the AoA, progress has been slow, and the urgency of reforming these regulations is growing.[155] The AoA plays a central role in

148 WTO (2023: 27).
149 Dall'Agnola (2024: 163).
150 See https://www.wto.org/english/thewto_e/glossary_e/glossary_e.htm, accessed 30 September 2024.
151 Dall'Agnola (2024: 163).
152 De Schutter (2014: 6).
153 Dall'Agnola (2024: 187).
154 Ibid.: 189.
155 Wolff & Glauber (2023: 2).

shaping global agricultural trade and, by extension, influencing food security and sustainable agricultural practices worldwide.

4.2.2 Public stockholding: Harmful or beneficial to food security?

It remains uncertain whether public stockholding programs alone can effectively ensure food security and how they should be managed within the framework of international trade law. Some experts argue that while public stockholding can boost food prices, it is less effective at stabilising them.[156] Others see global stockpiles as a potential safety valve in times of market pressure.[157]

Public stockholding programs can either include price support or be designed without it, and this distinction is crucial for their legal evaluation under the AoA.[158] Programs that do not involve price support and are aimed purely at food security are generally seen as non-trade-distorting, and, therefore, can qualify for the green box under the AoA, allowing countries to implement them without financial limitations. In contrast, programs that involve price support, such as government procurement and distribution of food at fixed prices, fall under the amber box and are subject to strict financial limits. These procurement programs are only permitted within a *de minimis* limit, with the allowable volume determined by various factors.[159]

For many developing countries, public stockholding schemes, particularly those that include price support, are a vital policy tool for enhancing national food security. These programs can help stabilise food availability and accessibility, particularly in countries with large populations. For example, China is estimated to hold half of the world's grain stocks but does not release them to alleviate market pressures.[160]

As trade liberalisation has progressed, many countries have increasingly relied on international agricultural trade, which has become an essential element of global food security and market efficiency.[161] Trading food grains to balance surpluses and deficits is seen as economically optimal and consistent with the WTO's trade principles.[162] However, due to outdated calculation mechanisms and the lack of necessary updates to the AoA, policy space for developing WTO members to address food security is shrinking, even as global food insecurity, particularly in developing countries,

156 Ibid.: 6.
157 Rudloff (2023: 50).
158 Dall'Agnola (2024: 175); Sharma & Shajahan (2024: 322).
159 Ibid.: 321-328.
160 Cramon-Taubadel (2022).
161 Sharma & Shajahan (2024: 330).
162 WTO, Communication from The United States: The World Trade Organization's Role in enhancing Food Security (2023) JOB/CTG/25.

continues to rise.[163] The WFP advocates for strengthening public food reserves to tackle recurring food crises.[164]

Alternatively, others suggest restricting the use of domestic support for public stockholding in countries that rely heavily on food imports or are not major food exporters.[165] Additionally, it has been proposed that countries with public stockholding programs commit to releasing stocks on the global market under specific conditions.[166] Another area for exploration is the role of private stockholding by exporters, which could provide regional food security during shortages without interfering with global price stabilisation, a strategy that has historically been ineffective in the long term.[167]

4.2.3 Supply chain regulation

Regulating supply chain management is a key strategy for addressing the negative impacts of international trade, and soil protection could be a crucial issue to tackle within this framework.[168] By implementing legal provisions that prioritise sustainable outcomes, countries can better manage the environmental implications of agricultural trade while aligning with the requirements of WTO law.

Countries or geopolitical regions that play significant roles at multiple stages of agricultural supply chains can leverage their position to address critical challenges, such as food security and soil protection. A comprehensive approach that combines agricultural export measures with rules governing the imports of agricultural commodities may yield more favourable outcomes for food security and sustainable soil management.[169]

One promising approach is to make market access contingent on adherence to transparent sustainability standards, such as internationally recognised good agricultural practices.[170] This could foster sustainable development, particularly in developing countries, by incentivising compliance with environmentally responsible farming methods.

However, while national or supranational governments have the authority to regulate supply chains and agricultural production, these regulations must align with WTO law to ensure their legitimacy in the context of global trade.[171] Supply chain regulation, while necessary for promoting sustainability, must be carefully crafted to comply with

163 Sharma & Shajahan (2024: 322 & 325-327).
164 See https://www.wfp.org/food-systems, accessed 30 September 2024.
165 WTO, Communication from Brazil (2022) WT/MIN(22)/W/5.
166 Wolff & Glauber (2023: 10).
167 Ibid.: 3.
168 Ruppel (2021a: 62-63).
169 Rudloff & Wieck (2020: 2-3).
170 Dall'Agnola (2024: 188).
171 Ruppel (2022b: 2).

WTO requirements, balancing the goals of environmental protection, food security, and free trade.

4.2.4 Standards

"[I]f a country applies international standards, it is less likely to be challenged legally in the WTO than if it sets its own standards."[172] Recognising the food safety standards of different countries through agreements can help harmonise trade barriers, streamline customs procedures, and provide easier access to global markets, thus, enhancing trade.[173] These agreements could also include mutual recognition of criteria related to sustainable soil management and preservation.

Adherence to international standards and regulations is essential for accessing global markets and ensuring food safety.[174] However, such standards can present challenges for smallholder farmers, especially when stringent requirements prevent them from participating in international trade, potentially exacerbating food insecurity. While the WTO may not be the ideal platform for developing specific standards in areas such as soil management and sustainable agricultural practices, it still has an important role to play in fostering progress, strengthening international acceptance, and promoting compliance with such standards.

Specialised research organisations, as well as cooperation bodies in soil management, agricultural practices, and food systems, are better suited to develop and improve these standards. For instance, the FAO's International Code of Conduct for the Sustainable Use and Management of Fertilisers can play a significant role in promoting sustainable food production and soil protection within agricultural activities.[175]

4.2.5 Subsidies

Subsidies play a key role in shaping agricultural practices and influencing trade dynamics. In recent years, a shift away from market fundamentalism has increased the potential scope of subsidies as a policy tool, especially in agriculture.[176] With agricultural support in major economies reaching around USD 850 billion annually in 2020-2022, subsidies are a central mechanism for governments to achieve public

172 See https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm4_e.htm, accessed 30 September 2024.
173 Rudloff & Wieck (2020: 7).
174 Mwenda (2024: 7).
175 FAO (2019).
176 Trachtman et al. (2023: 42).

objectives.[177] However, while subsidies can foster certain desired behaviours, they often distort international trade, a widely accepted concern.

The WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement) prohibits export subsidies under Article 3, although agricultural export subsidies can still be provided under certain conditions in the AoA, as per Article 9. Following the MC10 Ministerial Conference, WTO members have largely eliminated or are in the process of eliminating agricultural export subsidies, which is a positive step toward reducing trade distortion and promoting food security.[178] However, distinguishing between export and domestic subsidies is complex, as subsidies can take various forms and be presented in different ways.[179] This calls for increased transparency and stricter enforcement of MC10 decisions, particularly since notification obligations are often violated.[180]

Export subsidies from developed countries, driven by coupled payments, can harm developing nations. In regions such as the US and the EU, subsidies encourage overproduction, leading to artificially low export prices that squeeze out producers in developing countries, both in the global and domestic markets.[181] An example of this is the overproduction of cotton in the US, incentivised by subsidies, which depresses global prices and undermines African cotton farmers. While this might theoretically result in lower prices in importing countries, it can exacerbate poverty and food insecurity, as the agricultural sector often forms the backbone of developing economies.[182] Such practices can harm the economic development of poorer countries, particularly through the distortion of global agricultural markets.[183]

The disparity in subsidy-related spending between high-income and low-income countries further widens the gap in food security. While high-income countries spent USD 507.6 billion on food security measures, low-income countries spent only USD 4.3 billion.[184] This imbalance makes it harder for developing countries to compete and maintain food security. Furthermore, a global analysis suggests that increasing coupled subsidies can decrease the technical efficiency of agriculture, despite higher output levels.[185]

Beyond economic trade concerns, agricultural subsidies have significant environmental consequences. Many subsidies encourage unsustainable practices, such as the overuse of agrochemicals, fuels, and fertilisers, as well as the expansion of agricultural

177 OECD (2023: 122).
178 WTO, Ministerial Decision on Export Competition of 19 December 2015 (2015) WT/MIN(15)/45.
179 Dall'Agnola (2024: 166).
180 Ibid.: 175; WTO, Summary Report of the Meeting of the Committee on Agriculture Held on 22-23 September 2020 (2020) G/AG/R/96.
181 Damania et al. (2023: 6); Rudloff & Wieck (2020: 5).
182 Dall'Agnola (2024: 190).
183 Rudloff & Wieck (2020: 5).
184 FAO (2023).
185 Damania et al. (2023); Pisulewski & Marzec (2022: 561).

land into biodiverse areas.[186] Particularly harmful are unrestricted variable input subsidies and coupled subsidies, which incentivise monoculture farming and excessive use of resources.[187] The difficulty in targeting these subsidies properly results in widespread inefficiency, damaging the environment and soils in the process. The WTO's current trade-distortion approach does not adequately address the environmental impacts, particularly in terms of soil protection.

Experts have called for a more nuanced approach to subsidies, including a proportionality approach that integrates sustainability concerns into trade law.[188] This would allow subsidies harmful to sustainable development to be prohibited if they distort trade or are not justified by sustainable benefits. One proposed framework for integrating sustainability into the WTO is a sustainability-trade distortion matrix, which would assess subsidies not just by their trade impact but by their environmental and social effects as well.[189]

While current subsidies often harm the environment, they could also be used as a tool to support sustainable agriculture and thus also promote soil protection. "Green" subsidies targeting sustainability allow farmers to adopt more sustainable practices, offsetting the higher costs of using sustainable inputs and protecting soils.[190] For instance, subsidies could support soil conservation efforts, carbon sequestration through agricultural land, and resilience to natural disasters. These efforts could contribute to mitigating climate change and soil degradation, which would benefit global food security in the long run.[191]

El Salvador's direct grants for reforestation and fruit tree diversification projects serve as a positive example of how subsidies can support soil recovery and preservation.[192] However, only a small proportion of subsidies are currently linked to sustainability requirements, and many agricultural subsidies remain tied to practices that harm the environment.[193]

4.2.6 Transparency and notification

The WTO's role in monitoring compliance with its laws, particularly regarding trade-restrictive measures that affect soil and food security, depends heavily on transparency

186 WTO (2023: 43); Trachtman et al. (2023: 52); Dall'Agnola (2024: 189).
187 Calvo (2022); Damania et al. (2023: 7); Trachtman et al. (2023: 52).
188 Trachtman et al. (2023: 44).
189 Ibid.: 45.
190 Rudloff & Wieck (2020: 5-6).
191 WTO (2023: 44).
192 Ibid.: 30.
193 Dall'Agnola (2024: 188).

and notification obligations.[194] However, there are significant challenges in ensuring that member countries comply with the mandatory notifications under both the SCM Agreement and the AoA. These compliance rates are alarmingly low across many WTO members, with some countries even reporting zero compliance.[195] This lack of transparency in notifying trade-restrictive measures undermines the WTO's ability to effectively monitor and assess the scope and development of policies that impact agricultural trade, soil health, and food security globally.

In times of crisis, conflict, or climate change, many WTO members enact emergency measures, including subsidies, tariffs, or other trade restrictions, often in response to immediate national concerns such as food shortages, economic instability, or environmental degradation. While some of these measures may align with international law or global interests, many do not. As a result, there is a growing concern about the lack of consistency and transparency in how these policies are implemented and reported.

Although members recognise the importance of transparency, there remains significant controversy surrounding the notification obligations under the WTO framework.[196] Some countries argue that these obligations place undue pressure on them, particularly in contexts of national crisis or urgent food security concerns. The WTO's role in overseeing these notifications is often seen as a challenge to sovereignty, with countries wary of external scrutiny of their domestic policies, particularly in sensitive areas such as agricultural subsidies, trade restrictions, or measures related to food security.

The WTO Secretariat is often tasked with managing the information flow on these measures, which could play a vital role in tracking the effectiveness of trade and agricultural policies in achieving global food security and sustainable soil management goals. Strong information management by the Secretariat can enhance the transparency of trade measures, providing valuable insights into how various policies are affecting global agricultural markets and food security.[197] However, the potential benefits of such a role are often countered by concerns over sovereignty and the fear that WTO's interventions may lead to increased external control over domestic policy choices. There are also practical concerns about resource limitations—many countries, especially those with fewer resources, are concerned that the costs of fulfilling notification obligations may be prohibitively high, especially when their focus is on addressing immediate crises.

194 WTO, Summary Report of the Meeting of the Committee on Agriculture Held on 28 July 2020 (2020) G/AG/R/95; Dall'Agnola (2024: 179).
195 WTO, Compliance with Notification Obligations (2021) G/AG/GEN/86/Rev.43.
196 Dall'Agnola (2024: 179).
197 Ibid.: 180.

5 Conclusion

Achieving global food security is one of the most critical goals facing humanity and must be the central issue for the international community. However, various crises—ranging from conflict and climate change to geopolitical tensions—threaten the stability of agricultural trade and jeopardise the global goal of food security. These crises exacerbate food insecurity, undermining human rights and the right to food.

Agriculture, inherently tied to the fertility of soils, is increasingly threatened by climate change, which severely impacts soil quality and agricultural production. International trade law is more deeply interconnected with soil protection than might be initially expected, due to the relevance of trade in agricultural commodities. Changes in trade patterns—whether through more, less, or different trade flows—have significant mutual effects on agricultural activities and, consequently, the usage and fertility of soils. The legal conditions for international agricultural trade, thus, also have direct implications for soil protection and food security.

The current multilateral trading system lacks a comprehensive legal framework that adequately addresses food security beyond market access, subsidies, and export measures.[198]

One critical area to address is the role of multinational corporations, especially those dominating the grain trading and food processing sectors. These companies often wield oligopoly powers, influencing agricultural markets in ways that can either support or obstruct sustainable food security efforts. Their market dominance can drive unsustainable profit-maximising practices and create vulnerabilities in global supply chains, exacerbating food insecurity. The risks associated with such concentrated power in the food sector should not be underestimated, and the WTO must factor this into its framework for food security.

This will require enhanced flexibilities within international trade law to address these profound issues. As suggested, WTO members should align their efforts even closer with those of other international organisations, such as the FAO, to address each dimension of food security—availability, access, utilisation, and stability—through trade rules.[199]

An urgent rethinking of global food systems, particularly for soil health, is needed. While there is growing awareness of the importance of soil protection and sustainable food security, the degree to which this awareness translates into action remains to be seen. International cooperation and compromise will be key to making progress in this area.[200] For example, the G7's Global Alliance for Food Security and their statements

198 Ibid.: 184.

199 WTO, Communication from The United States: The World Trade Organization's Role in enhancing Food Security (2023) JOB/CTG/25.

200 Dall'Agnola (2024: 192-193).

on the issue reflect high-level discussions on how to address these challenges, but concrete action must follow.[201]

For the WTO, this means tackling several regulatory issues, including market access, subsidy disciplines, export restrictions, and food aid programs. The WTO must continue the work to eliminate harmful agricultural subsidies that distort trade and exacerbate environmental degradation, while also promoting green subsidy policies that encourage sustainable agricultural practices.[202]

Moreover, global food distribution must be more balanced, particularly for less developed countries, ensuring that all members—especially smallholder farmers—are able to participate in the agricultural market and benefit from it.[203] Especially in Africa, these farmers play a critical role in food security, yet their influence in negotiations often goes underrepresented. The WTO must ensure that smallholder interests are adequately represented in the reform process, as their sustainable practices are often key to ensuring long-term food security.

The goal is to recognise fertile soils as a precious natural asset that must be protected, given their essential role in food production. This protection must be considered in light of local realities, including the socio-economic and ecological characteristics of specific regions.[204]

As the Director-General of the WTO has stated, "[w]e cannot solve the food systems problems we face without trade. We cannot achieve the food systems transformation we need without reforming trade policy."[205] The time has come for reform in global trade policy to ensure that international trade supports sustainable food security, soil protection, and the overall health of the planet's agricultural systems.

References

Albrecht, A., G. Kurtz, B. Rudloff, A. Schmitz, C. Wagner, I. Werenfels & C. Zilla, 2022, "Krieg und Hunger – Versorgungsrisiken, Lösungsansätze, Konfliktkonstellationen". *SWP 360 Grad.*

Arita, S., J. Grant, S. Sydow & J. Beckman, 2022, "Has global agricultural trade been resilient under coronavirus (COVID-19)? Findings from an econometric assessment of 2020". *Food Policy* 10.

Baker-Smith, K. & S. Attila, 2016, *Eco Ruralis Report: What is land grabbing? - A critical review of existing definitions.*

201 BMZ (2022); G7, Berlin Ministerial Conference on 24 June 2022: Uniting for Global Food Security (2022) 2.
202 Calvo (2024).
203 Dall'Agnola (2024: 194).
204 WTO, Summary Report of the Meeting of the Committee on Agriculture Held on 21-22 November 2022 (2023) G/AG/R/104.
205 WTO (2023).

Barclays, 2023, *War and extreme weather threaten fragile food supply chains,* at https://www.ib.barclays/our-insights/global-food-systems-under-mounting-pressure.html, accessed 30 September 2024.

Basset, C., 2024, "Soil security: The cornerstone of national security in an era of global disruptions". *Soil Security* 16.

BMZ, 2022, *The Global Alliance for Food Security*, at https://www.bmz.de/en/issues/food-security/global-alliance-for-food-security, accessed 30 September 2024.

Calvo, F., 2024, "World Trade Organization Agriculture Negotiations at MC13". *IISD Policy Analysis,* at https://www.iisd.org/articles/policy-analysis/wto-food-security-agriculture-negotiations-mc13, accessed 30 September 2024.

Cochrane, L., 2016, "Land Grabbing". In: Thompson, P.B. & D.M. Kaplan (eds), *Encyclopedia of Food and Agricultural Ethics.* New York: Springer Verlag.

Coface, 2023, "Agricultural commodities under pressure". *Economic publications*, at https://www.coface.com/news-economy-and-insights/agricultural-commodities-under-pressure, accessed 30 September 2024.

Cramon-Taubadel, S., 2022, "Russia's invasion of Ukraine – implications for grain markets and food security". *Agrardebatten,* at https://agrardebatten.de/agrarzukunft/russias-invasion-of-ukraine-implications-for-grain-markets-and-food-security/, accessed 30 September 2024.

Cucagna, M.E. & P.D. Goldsmith, 2018, "Value adding in the agri-food value chain". *International Food and Agribusiness Management Review* 3, 293.

Dall'Agnola, G., 2024, "Promoting Food Security through the Multilateral Trading System: Assessing the WTO's Efforts, Identifying its Gaps, and Exploring the Way Forward". *GroJIL* 10, 157.

Damania, R., E. Balseca, C. de Fontaubert, J. Gill, K. Kim, J. Rentschler, J. Russ & E. Zaveri, 2023, *Detox Development Repurposing Environmentally Harmful Subsidies Overview.*

De Schutter, O., 2014, *Report of the Special Rapporteur on the Right to Food: The transformative potential of the Right to Food.*

EEA, 2023, *Soil and United Nations Sustainable Development Goals,* at https://www.eea.europa.eu/signals-archived/signals-2019-content-list/infographics/soil-and-united-nations-sustainable/view, accessed 30 September 2024.

Espa, I., 2021, "Export Restrictions on Food Commodities during the COVID-19 Crisis: Implications for Food Security and the Role of the WTO". In: Bahri, A., W. Zhou & D. Boklan (eds), *Rethinking, Repackaging, and Rescuing World Trade Law in the Post-Pandemic Era.* US: Bloomsbury Publishing.

EU Commission, 2011, *SOIL: the hidden part of the climate cycle.*

EU Commission, 2021, *EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate.*

Fader, M., D. Gerten, M. Krause, W. Lucht & W. Cramer, 2013, "Spatial decoupling of agricultural production and consumption: quantifying dependences of countries on food imports due to domestic land and water constraints". *Environ. Res. Lett.* 8.

Food and Agriculture Organization of the United Nations, 2006, "Food Security" *Policy Brief.*

Food and Agriculture Organization of the United Nations, 2008, "An Introduction to the Basic Concepts of Food Security". *Food Security Information for Action: Practical Guides.*

Food and Agriculture Organization of the United Nations, 2009, "The food price crisis of 2007/2008: Evidence and implications". *Food Outlook Global Market Analysis.*

Food and Agriculture Organization of the United Nations, 2013, "Smallholders and Family Farmers" *Factsheet.*

Food and Agriculture Organization of the United Nations, 2015, *Revised World Soil Charter.*

Food and Agriculture Organization of the United Nations, 2019, *The international Code of Conduct for the sustainable use and management of fertilizers.*

Food and Agriculture Organization of the United Nations, 2020, *Submission on topics 2(e) and 2(f) Koronivia joint work on agriculture.*

Food and Agriculture Organization of the United Nations, 2021, *The State of Food Security and Nutrition in the World: Transforming food systems for food security, improved nutrition and affordable healthy diets for all.*

Food and Agriculture Organization of the United Nations, 2022, *Global Map of Black Soils.*

Food and Agriculture Organization of the United Nations, 2022, *The State of Agricultural Commodity Markets: The geography of food and agricultural trade: Policy approaches for sustainable development.*

Food and Agriculture Organization of the United Nations, 2023, *Joint Statement on the Global Food and Nutrition Security Crisis*.

Food and Agriculture Organization of the United Nations, 2023, *The State of Food Security and Nutrition in the World.*

Hufstader, C., 2024, "How will climate change affect agriculture?". *Oxfam Stories*, at https://www.oxfamamerica.org/explore/stories/how-will-climate-change-affect-agriculture/, accessed 30 September 2024.

Jiang, H., 2020, "China: Evolving Demand in the World's Largest Agricultural Import Market". *USDA International Agricultural Trade Report.*

Kattau, S., 2015, *WTO-Agrarrecht, EU-Agrarrecht und das Menschenrecht auf Nahrung.* PhD thesis, Bremen.

Landwirtschaftskammer Niedersachsen, 2022, *GAP 2023: Ausnahmen zur Stilllegung und zum Fruchtwechsel*, at https://www.lwk-niedersachsen.de/lwk/news/39584_GAP_2023_Ausnahmen_zur_Stilllegung_, accessed 30 September 2024.

Murphy, S. & C. Manduna, 2023, *Food Security and the Agreement on Agriculture: Old Wine in New Bottles?*, at https://drive.google.com/file/d/1UBfbrS1Q6I4UFd283106wHqOObAJ0XOH/view, accessed 10 March 2025.

Mwenda, J., 2024, "Effects of Trade Policies and Regulations on Global Livestock Markets and Food Security in Kenya". *Journal of Livestock Policy* 3, 1.

Organization for Economic Co-operation and Development, 2023, *Agricultural Policy Monitoring and Evaluation.*

Oxfam, 2022, "Oxfam Media Briefing: Hunger in a Heating World: How the climate crisis is fuelling hunger in an already hungry world".

Pais, G., K. Jayaram & A. van Wamelen, 2020, "Safeguarding Africa's food systems through and beyond the crisis". *McKinsey & Company*, at https://www.mckinsey.com/featured-insights/middle-east-and-africa/safeguarding-africas-food-systems-through-and-beyond-the-crisis, accessed 30 September 2024.

Peng, W. & E.M. Berry, 2019, "The Concept of Food Security". *Encyclopedia of Food Security and Sustainability* 2.

Pisulewski, P. & J. Marzec, 2022, "The Impact of Subsidies on Persistent and Transient Technical Inefficiency: Evidence from Polish Dairy Farms". *Journal of Agricultural and Applied Economics* 54.

Politico, 2023, *Biden: 'Putin tried to starve the world'*, at https://www.politico.com/news/2023/02/21/biden-putin-russia-ukraine-00083786, accessed 30 September 2024.

Rask, K.J. & N. Rask, 2011, "Economic development and food production–consumption balance: A growing global challenge". *Food Policy* 2, 186.

Rudloff, B. & C. Wieck, 2020, "Sustainable Supply Chains in the Agricultural Sector: Adding Value Instead of Just Exporting Raw Materials". *SWP Comment* 43.

Rudloff, B. & L. Götz, 2022, "War in Ukraine and food security: Developing a judicious "food first" strategy for autumn". *SWP Point of View.*

Rudloff, B., 2023, "Politischer Umgang mit Nahrungsrisiken: Herausforderungen, Optionen und Verbesserungsansätze". *Wirtschaftsdienst* 103.

Ruppel, O.C., 2021a, "Soil Protection and the Right to Food for a Better Common Future". *Environmental Policy and Law*, 51.

Ruppel, O.C., 2021b, "Soil protection and the right to food: Sustainability implications for global climate governance and world agricultural trade?". In: Ruppel, O.C. & H. Ginzky (eds), *African Soil Protection Law.* Baden-Baden: Nomos.

Ruppel, O.C., 2022a, "Overview of international soil law". *Soil Security* 6, at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4011494, accessed 9 March 2025.

Ruppel, O.C., 2022b, "Soil protection and legal aspects of international trade in agriculture in times of climate change: The WTO dimension". *Soil Security* 6, at https://www.sciencedirect.com/science/article/pii/S2667006222000053?via%3Dihub, accessed 9 March 2025.

Ruppel, O.C., 2024, "Überblick über das internationale Bodenschutzrecht." In: Schnedl, G., O.C. Ruppel, M. Hofer (eds). *Bodenschutz im Zeichen der Klimakrise: Rechtliche Rahmenbedingungen, politische Herausforderungen und Konfliktpotentiale*. Wien: Verlag Österreich, 31.

Ruppel, O.C. & C. Dobers, 2022, "From Stockholm+50 to Bretton Woods+80: Greening Trade Law for Global Climate Governance?". *Journal of Environmental Policy and Law (EPL)* 52 (2), 145-160.

Saner, R., 2024, *WTO, Climate Change, and Sustainable Development.* IISD, at https://sdg.iisd.org/commentary/guest-articles/wto-climate-change-and-sustainable-development/, accessed 30 September 2024.

Sharma, S.K. & A.A. Shajahan, 2024, "WTO and a permanent solution for food security: striving for a hunger-free world". *Food Security* 16, 321.

United Nations World Food Programme & Food and Agriculture Organization, 2022, *Hunger Hotspots. FAO-WFP early warnings on acute food insecurity: October 2022 to January 2023 Outlook,* at https://openknowledge.fao.org/server/api/core/bitstreams/65e8ea3a-dad1-4b9e-9eec-bde51e2f18a3/content, accessed 30 September 2024.

Van den Bossche, P. & W. Zdouc, 2022, *The Law and Policy of the World Trade Organization.* UK: Cambridge University Press.

Webb, P., J. Coates, E.A. Frongillo, B.L. Rogers, A. Swindale & P. Bilinsky, 2006, "Measuring Household Food Insecurity: Why It's So Important and Yet So Difficult to Do". *The Journal of Nutrition* 136, 1404-1408.

Welsh, C., 2023, "Russia, Ukraine, and Global Food Security: A One-Year Assessment". *Center for Strategic and International Studies*, at https://www.csis.org/analysis/russia-ukraine-and-global-food-security-one-year-assessment, accessed 30 September 2024.

Wolff, A.V. & J.W. Glauber, 2023, "Food insecurity: What can the world trading system do about it?". *PIIE Policy Brief* 15.

World Trade Organization & United Nations, 2018, *Making trade work for the environment, prosperity and resilience.*

World Trade Organization, 2020, *DDG Wolff: Reliance on international trade for food security likely to grow,* at https://www.wto.org/english/news_e/news20_e/ddgaw_30apr20_e.htm, accessed 30 September 2024.

World Trade Organization, 2023, *DG Okonjo-Iweala underlines role of trade in transforming food systems at UN summit*, at https://www.wto.org/english/news_e/news23_e/dgno_26jul23_e.htm, accessed 30 September 2024.

World Trade Organization, 2023, *Food security: The key to unlocking agriculture negotiations at the WTO?,* at https://www.wto.org/english/blogs_e/ddg_jean_marie_paugam_e/blog_jp_28mar23_e.htm, accessed 30 September 2024.

World Trade Organization, 2023, *Heads of WTO, FAO sign agreement to boost cooperation on trade, food and climate change*, at https://www.wto.org/english/news_e/news23_e/igo_01dec23_e.htm, accessed 30 September 2024.

World Trade Organization, 2023, *Report on G20 trade measures.*

World Trade Organization, 2023, *Trade Policy Tools for Climate Action.*

World Trade Organization, 2024, *Dispute Settlement: Disputes by agreement,* at https://www.wto.org/english/tratop_e/dispu_e/dispu_agreements_index_e.htm?id=A1#, accessed 30 September 2024.

World Trade Organization, 2024, *WTO members review farm policies, discuss food security, transfer of technology,* at https://www.wto.org/english/news_e/news24_e/agri_24may24_e.htm, accessed 30 September 2024.

Zhao, R. J.L. Gabriel, J.A.R. Martín, Z. Feng & K. Wu, 2022, "Understanding trade-offs and synergies among soil functions to support decision-making for sustainable cultivated land use". *Front. Environ. Sci.* 10.

Ziegler, J., 2001, *Preliminary report of the Special Rapporteur of the Commission on Human Rights on the right to food.*