Food and Agriculture Organization of the United Nations

2018

IN BRIEF

THE STATE OF AGRICULTURAL COMMODITY MARKETS

AGRICULTURAL TRADE, CLIMATE CHANGE AND FOOD SECURITY

CONTENTS

This booklet contains the key messages and a summary of the content from the publication ***The State of Agricultural Commodity Markets 2018***. The numbering of the tables and figures corresponds to that publication.

FOREWORD

There will be no sustainable future without eradicating poverty and hunger. Ensuring food security for all is both a key function of and a challenge for agriculture, which faces ever-increasing difficulties – as populations rise, urbanization increases and incomes grow, the agricultural sector will be under mounting pressure to meet the demand for safe and nutritious food. Agriculture has to generate decent jobs and support the livelihoods of billions of rural people across the globe, especially in developing countries where hunger and poverty are concentrated. Furthermore, the sector has a major role to play in ensuring the sustainability of the world's precious natural resources and biodiversity, particularly in light of a changing climate.

Climate change will have an increasingly adverse impact on many regions of the world, with those in low latitudes being hit the hardest. This means that countries in Africa, Asia and Latin America, many of which already suffer from poverty, food insecurity and various forms of malnutrition, will be disproportionately at risk. Agriculture in these regions will be negatively affected. Regions with temperate climates, on the other hand, could see positive impacts, with warmer weather benefitting their agricultural sectors. Climate change can widen the economic gap between developed and developing countries. Unless we take urgent action to combat climate change, we can expect to see a very different global picture of agriculture in the future. Agricultural trade will also change.

International trade has the potential to stabilize markets and reallocate food from surplus to deficit regions, helping countries adapt to climate change and contribute towards food security. However, we must ensure that the evolution and expansion of agricultural trade is equitable and works for the elimination of hunger, food insecurity and malnutrition globally. For this reason, in recent years, the relationship between agricultural trade and food security has become an increasing part of both trade and development agendas.

Developing countries, in particular, will need support from the global community to facilitate their adaptation and mitigation efforts in relation to climate change and to transform their agriculture and food systems sustainably. As the migration crisis of

recent years has shown, no country stands unaffected. What happens in one part of the globe will undoubtedly affect other parts, and domestic and foreign policies must take account of this.

The year 2015 signalled the arrival of two landmark initiatives that recognized the need for countries to take collective action to promote sustainable development and combat climate change: the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), and the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC). Both initiatives reflect evolving thinking around global issues, and both call for a fair and transparent international trade system. In food and agriculture, trade can play a role and contribute to meeting the targets of both the 2030 Agenda and the Paris Agreement.

The work of the Food and Agriculture Organization of the United Nations (FAO) underpins these international efforts, while also being guided by them. Through its Strategy on Climate Change, FAO delivers transformational solutions for adaptation and mitigation in agriculture at global, national and local levels. The Organization also works towards transparent and efficient global agricultural commodity markets and supports Member Nations in formulating and implementing agricultural and trade policies that are conducive to improved food security and nutrition. In this way, FAO's work supports the discussions in the World Trade Organization (WTO).

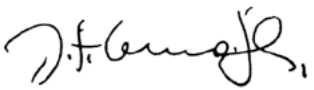
This edition of *The State of Agricultural Commodity Markets* focuses on the complex and underexplored intersection between agricultural trade, climate change and food security. It is clear that we cannot tackle hunger without finding adaptation and mitigation solutions to climate change in agriculture and food systems. It is also clear that the uneven impact of climate change across regions and countries, and the corresponding changes in food availability and access will affect international trade patterns and trade routes.

Under the Paris Agreement, many countries have committed to reducing their greenhouse gas emissions, including in the agricultural sector, one of the main contributors to

climate change. Collective consultations on approaches to tackle agriculture's vulnerability to climate change were initiated in November 2017 at the Twenty-third Conference of the Parties of UNFCCC under the Koronivia Joint Work on Agriculture.

This report supports these discussions by providing an in-depth analysis of the Paris Agreement and the WTO agreements to enhance clarity and provide guidance on policy options that could strengthen the mutually supportive role of these accords in tackling climate change and hunger. Wide-ranging policy actions are necessary to ensure that trade will contribute to the efforts aimed at ensuring food security and promoting adaptation and mitigation to climate change. The uneven impact of climate change across the world and its implications for agricultural trade, especially for developing countries, underlines the need for a balanced approach to policies, which should enhance the adaptive role of trade, while supporting the most vulnerable.

Developing and implementing policies that shift global agricultural production onto a more sustainable path, protect the most vulnerable countries and regions and at the same time facilitate the contribution of trade to the achievement of Sustainable Development Goal 2, will be key if we are to see a world free of hunger and malnutrition by 2030.



José Graziano da Silva
FAO Director-General

THIS REPORT

The 2018 edition of *The State of Agricultural Commodity Markets* aims to deepen the discussion on the broad spectrum of policy instruments available to policy-makers implementing the Paris Agreement. It examines how various forms of domestic support and trade measures relate to climate change adaptation and mitigation; how they might be used in the future; and, how World Trade Organization (WTO) rules shape policy choices.

The report explores policy options that lie on the juncture of: the Paris Agreement, a framework that allows flexibility in setting targets and choosing interventions; and the WTO agreements, which are based on specific rules aimed at minimizing production and trade distortions. As such, it discusses how best to strengthen the mutually supportive role of these multilateral accords.

HERAT, AFGHANISTAN
Wheat harvest at the Urdo Khan Research Station, which conducts variety testing trials, seed purification and breeder seed production as part of an FAO project to meet the needs of farmers to enhance agricultural productivity and ensure food security.
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EXECUTIVE SUMMARY

CLIMATE CHANGE WILL AFFECT AGRICULTURE AND FOOD SECURITY IN MANY COUNTRIES

Climate change will have significant implications for agriculture and food security. Higher average temperatures, changes in precipitation, rising sea levels, an increase in the frequency and intensity of extreme weather events, as well as the possibility of an increase in damage from pests and disease, are expected to affect crop and livestock production, as well as fisheries and aquaculture.

This impact will be uneven across regions and countries. In low-latitude regions, where most developing and least developed countries are located, agriculture is already being adversely affected by climate change, specifically, by a higher frequency of droughts and floods. For developing countries, climate change could exacerbate the food security challenges they already experience.

Climate change impacts will be location specific, with significant variations across crops and regions. Arid and semi-arid regions will be exposed to even lower precipitation and higher temperatures and, consequently, experience yield losses. Conversely, countries in temperate areas, many of which have developed economies, are expected to benefit from warmer weather during their growing season. As a result, climate change could exacerbate existing inequalities and further widen the gap between developed and developing countries.

AGRICULTURAL TRADE CAN CONTRIBUTE TO CLIMATE CHANGE ADAPTATION AND MITIGATION EFFORTS

Since the beginning of the twenty-first century, agricultural trade patterns have evolved in line with economic growth in emerging economies. In the coming years, agricultural trade could undergo further changes, reflecting the uneven and disproportionate impact of climate change on agricultural sectors across the globe. As climate change alters the comparative advantage and competitiveness of agriculture across regions and countries, some nations could lose while others could gain.

International trade could play a particularly important role in adaptation efforts, contributing towards food security in many countries. In the short term, by moving food from surplus to deficit areas, trade can provide an important mechanism to address production shortfalls due to extreme

weather events. In the long term, international trade could contribute towards adjusting agricultural production in an efficient manner across countries.

Global agricultural market integration should reinforce the adaptive role of trade in terms of increasing availability of and access to food in the countries that will be negatively affected by climate change. Nevertheless, global agricultural market integration would also affect the distribution of gains and losses between producers and consumers. Small-scale family farmers in low-latitude regions could lose, while consumers of food could gain. A reverse result is expected in temperate regions.

Appropriate agricultural and trade policies are important in strengthening the adaptation role of trade and balancing the multiple objectives of the sector. Agriculture needs both to adjust to the effects of climate change and to reduce its greenhouse gas (GHG) emissions. At the same time, to meet growing demand, agriculture in 2050 will need to produce almost 50 percent more food, feed and biofuel than in 2012. Producing more with less, while preserving natural resources and enhancing the livelihoods of small-scale family farmers, will be a key challenge for the future.

Transformative changes in agriculture and food systems appear to be economically and technically feasible. Domestic support measures and trade policies can promote productivity growth and ensure that the international trading system is open, fair and transparent. At the same time, these policies should help both agriculture and trade adapt to and mitigate climate change.

Hunger and malnutrition, poverty, and climate change must be addressed together in order to meet Sustainable Development Goal 2 to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Multilateral agreements and mechanisms allow for global collective action and encourage the alignment of multiple objectives, such as: eradicating hunger; achieving sustainable agriculture; strengthening global partnerships and cooperation in the context of trade; and fighting climate change.

MULTILATERAL AGREEMENTS: THE MUTUALLY SUPPORTIVE ROLE OF THE PARIS AGREEMENT AND WTO COMMITMENTS FOR AGRICULTURE

In 2015, the Paris Agreement on Climate Change set the long-term goal of keeping the rise in global average temperature to well below 2 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change. The Agreement also enables each country to determine its own targets and what it considers to be its fair contribution towards limiting the global average temperature increase. Targets, and the general approach to meeting them, are reflected in the Nationally Determined Contributions (NDCs) – a central component of the Agreement.

There is a clear willingness of countries to respond to climate change by investing in and transforming agriculture sectors. Developing countries in particular highlight the importance of agriculture and food security for adaptation in their NDCs; some countries specify agriculture sectors as important in their mitigation targets. Nevertheless, NDCs remain broad and most do not include specific policies.

Much of the work to translate the Paris Agreement and the NDCs into concrete climate interventions in agriculture is in the making. A wide range of policy instruments is available, from investments in innovative technologies to subsidies that provide incentives to farmers to adopt climate-smart agriculture practices, and regulations to reduce emissions of agricultural activities to carbon taxes. Most of these policy instruments are covered by the WTO agreements, especially the Agreement on Agriculture, which aims to limit the distortionary impact of support measures on production and trade and to establish a fair and non-discriminatory trading system that will enhance market access and improve the livelihoods of farmers around the world. The challenge will be to strengthen the mutually supportive role of the Paris Agreement and the WTO agreements.

POLICIES TO COMBAT CLIMATE CHANGE AND PROMOTE AGRICULTURAL DEVELOPMENT AND TRADE SHOULD BE INTEGRATED

In principle, there is no fundamental conflict between policies under international climate change frameworks and trade rules. Measures to promote adaptation and mitigation in agriculture will be part of broader agricultural and food security policies, and thus will be subject to rules and disciplines of the WTO Agreement on Agriculture (AoA). Significant progress in adaptation and mitigation can be achieved through measures that do not distort trade. These include spending more on innovative technologies and investing in their adoption, as well as extending climate-smart agricultural practices that promote productivity, adapt to climate change and increase carbon sequestration. Expenditure on environmental programmes and ecosystem services that can reduce the negative external effects of emissions generated by agricultural production are additional measures that pose minimal or no distortion to production and trade.

Measures such as market price support and some types of input subsidies can distort trade. But some well-targeted climate-smart subsidies may be an effective instrument to provide incentives to farmers to adopt technologies and practices that promote climate change adaptation and mitigation, or to obtain insurance and hedge against the risks of extreme weather events. Such policies can provide a climate-smart stimulus to agriculture and effectively address the trade-offs between food security and climate change objectives.

Effective climate-smart support to farmers can also improve the comparative advantage of agriculture in countries that will be negatively affected

by changing climate, allowing them to become competitive and achieve a better balance in export and import performance. Such measures will be crucial for developing countries that may experience a considerable increase in their net food imports due to climate change. For countries that may be subject to significant climate-induced problems, safety nets will be necessary both at the international level, to alleviate potential pressures in funding food imports, and at the national level through emergency food reserves and social protection programmes that target the poor and the vulnerable.

Trade policies can contribute towards well-functioning international markets to which countries that experience production shortfalls due to weather shocks can resort in order to ensure food security. Global market integration can reinforce this role of trade in adaptation, as long as trade policies are combined with climate-smart domestic measures and investments.

Trade could also be central in climate change mitigation efforts. If trade could provide the necessary signals to farmers to produce low carbon footprint products, emissions could be reduced globally. In practice, this would necessitate the imposition of a carbon tax (or an equivalent mitigation measure) on agricultural products domestically, combined with a corresponding tariff adjustment at the border to discriminate against high carbon footprint imports. Although WTO provisions offer flexibility for waivers or exemptions from complying with the non-discrimination principle, difficulties in the interpretation and application of these provisions could arise due to the lack of an internationally agreed definition and measurement of carbon footprint. Nevertheless, alternative options include carbon labelling of agricultural products that could shape consumer preferences and contribute to reducing emissions from agriculture.

While sufficient space for policy discussions needs to be pursued at the intersection of the WTO and the Paris Agreement, policies should not negatively impact on other countries, especially developing ones, by restricting trade. Developed countries are clearly in a different position when making their choices than low-income developing countries. This is especially true for developing countries where agriculture is characterized by high emissions and will be particularly hit by climate change both in terms of production and of increase in pests and diseases. The different challenges faced by developed and developing countries are recognized in the Paris Agreement and in the WTO agreements through the principle of differentiated responsibilities and capabilities, and the special and differential treatment of developing countries, respectively.

Discussing and implementing policies for climate change adaptation and mitigation will enable the transformative change that is necessary to make agriculture meet the challenges of our time.

PART 1
AGRICULTURAL TRADE: KEY DYNAMICS AND TRENDS

KEY POINTS

➔ The role of emerging economies in global agricultural markets has increased since 2000. Growing income per capita and reduced poverty boosted food consumption and imports, while increases in agricultural productivity led to growing exports.

➔ Developing countries are increasingly participating in international markets. South–South agricultural trade has also expanded significantly. For Least Developed Countries, agricultural imports have grown faster than exports.

THE EVOLUTION OF AGRICULTURAL TRADE: 2000–2016

Between 2000 and 2016, world agricultural trade increased more than threefold in value. On average, trade in agricultural products exhibited an annual growth rate of over 6 percent, rising to USD 1.6 trillion in 2016 from USD 570 billion in 2000 (Figure 1.1). This trend has been driven by economic growth – world gross domestic product (GDP) has also doubled since 2000 – population growth, advances in transport, information and communication technology, and improvements in market access.

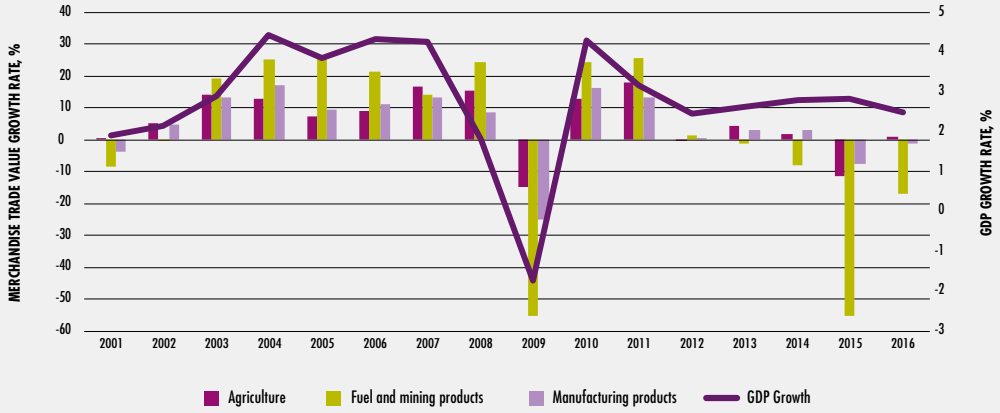
The increasing importance of emerging economies has been a major development in global agricultural markets since 2000. China's share of world imports increased from 2.3 percent in 2000 to 8.2 percent in 2016, placing it third in the ranking of the top twenty importers after the United States of America and the European Union (Member Organization) (Table 1.1).

Between 2000 and 2016, other emerging economies, such as India, Indonesia, and the Russian Federation increased their aggregate share in global imports from 3.4 percent to 5.2 percent. Developed economies such as the European Union (Member Organization) and Japan experienced a decline in their share of total global import value, although they remained high up the ranking of the top twenty importers.

Changes in export patterns clearly underline the increasing importance of emerging economies in global agricultural markets (Table 1.2).

Although traditional exporters such as the European Union (Member Organization) and the United States of America remain at the top of the ranking in terms of the share of total export value, Brazil increased its share from 3.2 percent in 2000 to 5.7 percent in 2016. China became the fourth most important

FIGURE 1.1
WORLD MERCHANDISE TRADE VALUE AND WORLD GDP: ANNUAL GROWTH RATES, 2000–2016



SOURCE: FAO calculations using WTO Statistics and World Development Indicators, (World Bank). Agricultural trade comprises products covered by the Agreement on Agriculture, Annex 1, that is, it includes food and agricultural raw materials and excludes fish and forestry.

exporter, increasing its share of total export value from 3.0 percent in 2000 to 4.2 percent in 2016.

The increased participation of emerging economies in global agricultural trade reflects the pace of structural change along the development path. During the last two decades, rapid economic growth and increases in per capita income in these economies fuelled the demand for agricultural products and, in conjunction with their large populations, led to significant increases in imports.

A key feature of the increased participation of middle- and low-income countries in global agricultural markets has been the rapid growth of South–South trade — that is, trade in agricultural products within the middle- and low-income countries group. The share of imports by middle- and low-income countries sourced from other middle- and low-income countries increased from 41.9 percent in 2000 to 54.4 percent in 2015. During the same period, exports followed a similar trend.

AGRICULTURAL POLICY TRENDS

The expansion of agricultural trade since 2000 was also facilitated by

improvements in market access as a result of the 1995 WTO AoA. Average applied tariff levels declined as countries met their commitments under the Agreement, but also as a result of bilateral and regional trade agreements and unilateral policy changes. Nevertheless, this average hides considerable variation in border protection on individual products across countries. A number of countries have maintained substantially high import barriers for products such as dairy, rice and sugar, which have historically been highly protected.

TABLE 1.1
MAJOR IMPORTERS OF AGRICULTURAL PRODUCTS: SHARE OF TOTAL IMPORT VALUE, 2016 AND 2000

2016			2000		
	Rank	**Share**		**Rank**	**Share**
European Union (Member Organization)	1	39.1	European Union (Member Organization)	1	45.3
United States of America	2	10.1	United States of America	2	10.1
China	3	8.2	Japan	3	8.7
Japan	4	4.2	Canada	4	2.8
Canada	5	2.7	Mexico	5	2.3
Mexico	6	2	China	6	2.3
China, Hong Kong SAR	7	1.9	China, Hong Kong SAR	7	2
India	8	1.9	Republic of Korea	8	2
Republic of Korea	9	1.9	Russian Federation	9	1.7
Russian Federation	10	1.9	Saudi Arabia	10	1.2
Indonesia	11	1.4	Switzerland	11	1.2
Viet Nam	12	1.3	Indonesia	12	1
United Arab Emirates	13	1.2	Brazil	13	0.9
Malaysia	14	1.1	Malaysia	14	0.8
Australia	15	1	Egypt	15	0.8
Turkey	16	1	Turkey	16	0.8
Switzerland	17	0.9	India	17	0.7
Singapore	18	0.9	Thailand	18	0.7
Thailand	19	0.9	Philippines	19	0.6
Saudi Arabia	20	0.9	Algeria	20	0.6
Total		**84.5**	**Total**		**86.5**

SOURCE: FAO calculations using data from World Integrated Trade Solution (accessed February 2018). Agricultural trade comprises products covered by the Agreement on Agriculture, Annex 1.

The implementation of the agreement at the December 2015 Nairobi WTO Ministerial Conference to eliminate export subsidies on agricultural products will contribute to a more level playing field in trade for both emerging economies and developing countries.

TABLE 1.2
MAJOR EXPORTERS OF AGRICULTURAL PRODUCTS: SHARE OF TOTAL EXPORT VALUE, 2016 AND 2000

2016			2000		
	Rank	Share		Rank	Share
European Union (Member Organization)	1	41.1	European Union (Member Organization)	1	46.9
United States of America	2	11	United States of America	2	14
Brazil	3	5.7	Canada	3	3.9
China	4	4.2	Australia	4	3.7
Canada	5	3.4	Brazil	5	3.2
Argentina	6	2.8	China	6	3.0
Australia	7	2.5	Argentina	7	2.7
Indonesia	8	2.4	Mexico	8	1.9
Mexico	9	2.3	New Zealand	9	1.6
India	10	2.2	Thailand	10	1.5
Thailand	11	2.0	Malaysia	11	1.4
Malaysia	12	1.8	India	12	1.2
New Zealand	13	1.6	Indonesia	13	1.1
Viet Nam	14	1.3	Turkey	14	0.9
Turkey	15	1.3	Colombia	15	0.7
Russian Federation	16	1.1	Chile	16	0.7
Chile	17	0.9	Singapore	17	0.7
Singapore	18	0.8	Viet Nam	18	0.6
Switzerland	19	0.7	South Africa	19	0.6
South Africa	20	0.7	Switzerland	20	0.6
Total		**89.8**	**Total**		**90.9**

SOURCE: FAO's calculations using data from World Integrated Trade Solution (accessed February 2018). Agricultural trade comprises products covered by the Agreement on Agriculture, Annex 1.

PART 2
THE LINKAGES BETWEEN AGRICULTURAL TRADE, FOOD SECURITY AND CLIMATE CHANGE

KEY POINTS

➔ **Climate change will affect world regions unevenly. It is already affecting vulnerable countries and will pose a major threat to their food security.**

➔ **Agricultural trade can help in adapting to climate change and in ensuring food security. It can support adaptation efforts by stabilizing markets and reallocating food from surplus to deficit regions.**

Climate change is expected to slow down the decline in the number of undernourished, partly offsetting the positive effect of economic growth on food security. Most modelling studies suggest that the likely impact of climate change on food security, globally, may be relatively small compared to that of other drivers such as population and GDP growth. However, due to its uneven effects, climate change can be a critical factor for food security in some regions.

Climate change can also affect nutrition. The effects that climate change might have on the four dimensions of food security – availability, access, utilization and stability – are summarized in Table 2.1.

In the long term, by altering the comparative advantage of agriculture across regions, climate change could result in a significant shift in production patterns and a reconfiguration of international trade. This may deepen or reverse the net trade positions of regions and countries.

While some regions may to some extent benefit from climate change, such as in the northern latitudes, GDP could decline significantly in Africa and South Asia.

The impact of changing climate on GDP can largely be understood as the joint effect of two major contributing factors. The first factor relates to the direction and magnitude of climate change effects on crops as defined by climate-induced crop yield shocks. The second revolves around how important the arable sector is to the economy, reflected by the share of crops in the value of output of all economic sectors.

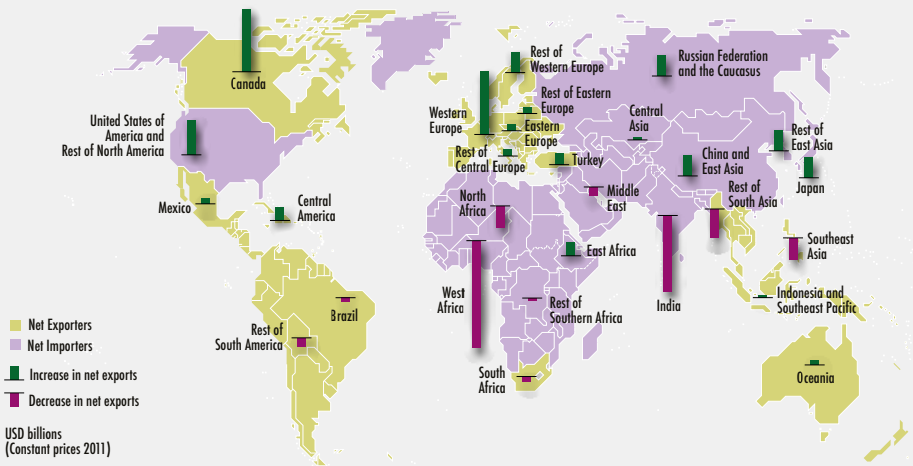
At the global level, the decrease in agricultural production due to climate change is expected to result in a relatively small increase in world food market prices. Nevertheless, across regions food price changes will differ depending on the uneven impact of climate change on agricultural production and the extent to which countries and regions adjust to changing climate in terms of GDP, wages and trade.

TABLE 2.1
CLIMATE CHANGE AND FOOD SECURITY

Dimension of food security	Climate change effects on food security	Time horizon
Availability	▸ Global mean crop yields of rice, maize and wheat projected to decrease 3–10 percent per degree of warming ▸ Impacts on livestock through reduced feed quantity/quality, pest and disease prevalence, physical stress; meat, egg and milk yield and quality decrease ▸ 5–10 percent decrease in potential fish catch in tropical marine ecosystems	Slow onset, long term
Access	▸ Increasing food prices ▸ Relocation of production with impacts on prices, trade flows and food access	Slow onset, long term
Utilization	▸ Reduced food safety due to higher rates of microbial growth at increased temperatures ▸ Reduced nutritional quality of crops due to decreases in leaf and grain nitrogen, protein and macro- and micronutrient concentrations associated with increased carbon dioxide concentrations and more variable and warmer climate	Slow onset, long term
Stability	▸ Damage to crops and livelihoods from extreme events (heatwaves, droughts, floods, storms, etc.) ▸ Short-term disruptions of trade through effects on transport systems	Extreme events, short term

SOURCE: Based on FAO (2016); Campbell *et al.* (2016); and Schmidhuber and Tubiello (2007).

FIGURE 2.3
CHANGES IN AGRICULTURAL NET TRADE IN 2050: CLIMATE CHANGE SCENARIO RELATIVE TO THE BASELINE (IN BILLION USD, 2011 CONSTANT PRICES)



NOTE: The final boundary between the Republic of the Sudan and the Republic of South Sudan has not yet been determined. Final status of the Abyei area has not yet been determined.
SOURCE: Based on data provided by Wageningen Economic Research. 2018. Climate Change and Global Market Integration: Implications for global economic activities, agricultural commodities and food security. SOCO 2018 Background Paper, FAO, Rome.

PART 3
AGRICULTURAL TRADE AND CLIMATE CHANGE: EXPLORING THE POLICY SPACE

KEY POINTS

➔ In principle, there is no fundamental conflict between climate change policies and multilateral trade rules. Various provisions of the WTO can accommodate the implementation of climate-related policies of the Paris Agreement.

➔ There is scope for countries to pursue environmental protection objectives under WTO rules. However, the interpretation and application of these rules with regard to the treatment of identical food products that differ solely in their carbon footprint remains untested. An internationally agreed definition of carbon footprint could facilitate the implementation of policies for climate change adaptation and mitigation.

➔ Discussions should be pursued at the juncture of the Paris Agreement and the WTO agreements to strengthen their mutually supportive approach. This can contribute to reducing agricultural emissions globally.

The uneven impact of climate change on agricultural production across regions will heighten the role of trade in adaptation and in contributing to food security. To a large extent, this potential will depend on a well-functioning trading system and consequently on domestic policies and border measures. The Paris Agreement has succeeded in reaching a political consensus around tackling the challenges of climate change collectively. However, its effectiveness in promoting adaptation and mitigation in agriculture will depend on specific actions that are yet to be discussed. This discussion will have to take place on the basis, *inter alia*, of the Paris Agreement and the WTO agreements – in particular the AoA, which covers agricultural policy instruments – and seek to identify how to strengthen the mutually supportive approach of both accords. Table 3.1 provides a more detailed description of WTO disciplines on domestic support.

The main challenge likely to be faced by mitigation policies on agriculture relates to the non-discrimination principle, which prohibits discrimination, for example, of otherwise "like" products differing solely in their carbon footprint as a result of different processes and

TABLE 3.1
TOTAL DOMESTIC SUPPORT

Measures that are not subject to reduction commitments. These may be used without monetary limits on support, provided the relevant implementation criteria are met. Exemption of support measures from reduction commitments may fall under the following three basic policy categories or "boxes":			Measures that are subject to scheduled reduction commitments and bound limits. Measures that do not meet the exemption criteria of Green Box, Development Box, or Blue Box, are often referred to as Amber Box measures.	
Green Box (AoA Annex 2)	**Development Box (Article 6.2 AoA)**	**Blue Box (Article 6.5 AoA)**	**Amber Box (Article 6 AoA)**	
				De minimis
Green Box measures include domestic policies that are considered to have **no** or **minimal impact on trade and production**, such as government services on research and development, extension, and investment in infrastructure. Also included are direct payments to producers of basic agricultural products, such as income support that is decoupled from production, assistance to promote structural adjustment in agriculture, and direct payments under environmental and regional assistance programmes.	Development Box measures provide developing countries with additional flexibility in providing domestic support. The category covers measures taken by developing countries, whether direct or indirect, that are an integral part of their development programmes and encourage agricultural and rural development. These include investment subsidies that are generally available to agriculture, agricultural input subsidies generally available to low-income or resource-poor producers, and domestic support to producers to encourage diversification from growing illicit narcotic crops.	Blue Box measures are similar to Amber Box measures but require farmers to limit production, thus limiting production distortions. At present, there are no limits on Blue Box subsidies.	The Amber Box includes measures to support prices or input subsidies directly related to production. This support is subject to limits: 32 WTO members that had non-exempt domestic support during the base period undertook reduction commitments. Members without such commitments must limit their Amber Box support within the *de minimis* levels. The reduction commitments are expressed in terms of the "Total Aggregate Measurement of Support" (Total AMS), which effectively bounds trade-distorting support.	*De minimis* levels are minimal amounts of domestic support that are allowed even though they distort trade – up to 5 percent of the value of production for developed countries, 10 percent for most developing countries. The *de minimis* provision applies both to support associated with a specific product and non-product-specific support.

production methods (PPMs). In simple terms, based on this rule it may be asked whether a country where the domestic price of meat increases as a result of adopting policies to reduce emissions in its livestock sector – due to additional costs incurred by local producers in order to comply with the new policies – would be able to level the playing field by increasing the tariff rates on meat imports produced through methods generating higher emissions.

Clearly, a meaningful analysis under WTO rules would need to take account of the nature of the specific measures envisaged and the relevant obligations at issue.

PART 4
ADAPTING TO CLIMATE CHANGE AND MITIGATING ITS IMPACT: DOMESTIC POLICIES AND SUPPORT MEASURES

KEY POINTS

➔ Many government measures can promote adaptation, mitigation and food security and have no or minimal distortionary impact on trade. These include research and development, extension, training, technical assistance and investments that can all promote the adoption of climate-smart agriculture practices.

➔ Appropriate incentives may nevertheless be necessary to further facilitate adaptation and mitigation in agriculture. Some types of subsidies can promote large-scale adoption of climate-smart agriculture practices, but discussions may have to focus on their potential impact on production and trade.

➔ Agricultural insurance will be increasingly necessary to protect against climate risk, but its cost is likely to rise.

➔ Emergency humanitarian food reserves at the regional level can promote adaptation to climate change and contribute to food security.

Agricultural policies promote efficiency and correct market failures, such as constraints faced by farmers in adopting new technologies due to lack of information. Countries provide various types of support to farmers, ranging from direct payments that contribute towards maintaining farm incomes without affecting output; to subsidies for inputs such as electricity, water and fertilizer that can increase production. This wide range of policies and regulations creates a set of incentives and disincentives for achieving progress across the three main objectives of climate-smart agriculture (CSA): sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing GHG emissions, where possible.

R&D, training and extension, and advisory services are highly relevant for pursuing climate change adaptation and mitigation objectives. Technological change, extension and training will play a vital role in promoting CSA approaches and ensuring sustainability in agriculture in the face of climate change. Climate-smart technologies adopted today will make a huge difference in the future.

Agricultural insurance: Agricultural insurance can aid farmers in managing increasing climate risks and in investing in their farms. But such insurance can be unaffordable, particularly for small-scale family farmers. The use of subsidies to

promote innovative crop insurance programmes may therefore be justified in the context of likely increases in the frequency and intensity of extreme weather events.

Regional food reserves: Regional efforts can also promote emergency food reserves, such as the ECOWAS Regional Food Security Reserve. Regional schemes can improve efficiency and reduce costs over national reserves by pooling resources across countries. Such reserves would function best when linked to early warning systems that identify climate and price risks and their impacts on food security and livelihoods.

Carbon taxes: Many analysts propose carbon taxes to address the societal externalities caused by GHG emissions through global warming. There are two major challenges in using taxes: first, there are difficulties in determining the appropriate level of the tax; and second, there are problems in applying the tax to emissions from agriculture. However, irrespective of how a carbon tax on agriculture was structured, its immediate effect would be to raise prices of agricultural products in line with the emissions that correspond to their production (Table 4.2).

Cap-and-trade: While taxes are imposed directly on fossil-fuel energy in some countries (e.g. on transportation fuels or natural gas used for heating), a more comprehensive approach to pricing emissions is through cap-and-trade schemes. Cap-and-trade schemes penalize producers of higher emitting products and services by forcing them to pay for emissions permits, while providing incentives for the adoption of lower-emission technologies.

TABLE 4.2
EFFECTS OF A USD 20 TAX PER TONNE OF CARBON DIOXIDE EQUIVALENT ON SELECTED AGRICULTURAL PRICES FOR SELECTED COUNTRIES (PERCENT INCREASE)

Country	Wheat	Rice	Beef	Sheep meat	Chicken
Australia	3.0	3.4	11.0	13.4	0.2
Brazil	2.2	2.5	16.5	16.7	0.2
China	2.6	4.0	12.5	5.9	0.6
Ethiopia	1.2	7.1	71.5	25.2	2.8
European Union	2.4	13.1	8.2	10.1	0.2
India	3.6	3.5	54.4	22.4	0.5
Indonesia	2.4	5.6	22.6	22.3	2.9
New Zealand	2.4	–	8.9	8.1	0.2
United States of America	2.4	5.6	6.0	–	0.2

SOURCE: Blandford, D. and Hassapoyannes, K. 2018. The role of agriculture in global GHG mitigation. OECD Food, Agriculture and Fisheries Papers No. 110. OECD Publishing.

PART 5
ADAPTING TO CLIMATE CHANGE AND MITIGATING ITS IMPACT: THE ROLE OF TRADE POLICIES

KEY POINTS

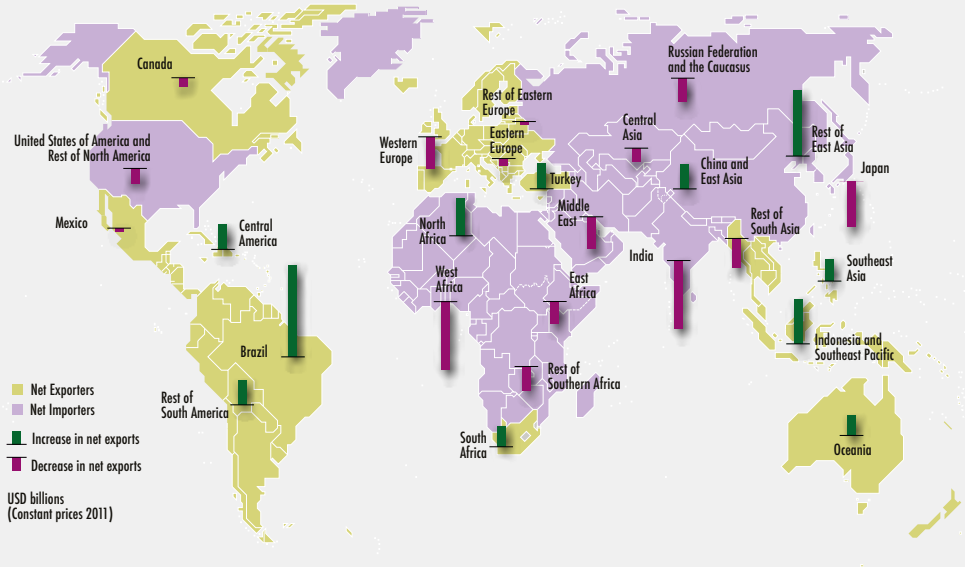
➔ Trade can contribute towards improving food security. In the short term, trade can provide a mechanism for addressing production shortfalls due to extreme weather events. In the long term, it can contribute towards adjusting agricultural production in an efficient manner across countries.

➔ Trade could support mitigation efforts and contribute to reducing global agricultural GHG emissions. Consensus on how to define and calculate carbon footprint and measures to facilitate trade in low-carbon footprint products would be helpful.

Trade is key for economic growth and an essential component of any food security strategy. Generally, every country has a comparative advantage in some goods and services, and all countries could potentially gain when engaging in trade. With climate change expected to alter the comparative advantage of agriculture across regions and countries, trade and trade policies will play an important role in shaping adaptation to climate change and to extreme weather events and in ensuring food security in times of weather-induced production shortfalls (see Figure 5.2).

Market integration, lower import tariffs and the elimination of export subsidies would increase trade globally, enhancing its adaptive role by facilitating the movement of agricultural products from surplus to deficit regions. Although opening markets will have positive impacts on food security, producers in regions that are expected to be negatively affected by climate change will face intense competition. Trade policies should strike a balance between rural development objectives, sustainable agricultural production targets and food security needs.

FIGURE 5.2
IMPACT OF OPEN MARKETS ON NET TRADE POSITIONS UNDER CLIMATE CHANGE IN 2050



SOURCE: Wageningen Economic Research. 2018. Climate Change and Global Market Integration: Implications for global economic activities, agricultural commodities and food security. SOCO 2018 Background Paper, FAO, Rome.

However, the use of trade measures, such as export subsidies, import tariffs and export restrictions, which limit the openness of domestic agricultural markets and alter the linkages between domestic and international prices, is restricted by the AoA.

Trade could also support mitigation efforts and contribute to reducing global agricultural GHG emissions. This is challenging, and discussions on trade policies that can be supportive of mitigation measures will be essential.

PART 6
NON-TARIFF MEASURES (NTMs): REGULATIONS AND STANDARDS

KEY POINTS

➔ Carbon labelling could help to shape consumer preferences, contributing to the transition to a low-emissions economy. This would require an internationally-recognized approach in setting the related standards.

➔ Climate change could result in a considerable increase in the uncertainty surrounding sanitary and phytosanitary (SPS) threats. This would hinder trade especially for developing countries, unless appropriate risk assessment, surveillance, monitoring, diagnostics and border infrastructure are in place.

➔ Additional costs associated with labelling and standards could place a burden particularly on family farmers and small-scale food processors in developing countries.

The application of environmental standards to food products and the use of environmental labelling are becoming popular in many countries. Product standards and labelling have supported the creation of a market for 'organic', 'fair trade' and sustainably-sourced wood and paper products.

Similarly, shaping consumer preferences towards agricultural and food products that are produced by low-emitting methods could provide the necessary incentives for agriculture to further contribute towards mitigation efforts.

When considering this, it would be important to examine whether the environmental provision would permit countries to impose technical regulations associated with the environmental characteristics of products, such as their carbon footprint (see Box 6.1). However, since carbon footprint is not in essence a physical part of products (but rather a consequence of the method of production, processing and transport) the implications of the Technical Barriers to Trade Agreement requirement for the equal treatment for imports of 'like' products remain untested.

Climate change will also alter pest and disease distributions and agricultural trade flows in ways that cannot be easily predicted. As such, it is vital that SPS issues regarding climate change receive adequate attention in the broader policy debate surrounding climate change.

BOX 6.1

ESTIMATING THE CARBON FOOTPRINT OF AGRICULTURAL PRODUCTS

The carbon footprint of agricultural products generally refers to the cumulative carbon equivalent of the emissions generated by all stages of their production throughout the supply chain (the amount of carbon dioxide equivalent or CO_2e per kilogram of product). The analysis of impacts associated with all the stages of a product's life is known as the Life Cycle Assessment (LCA). A complete LCA of a product would consider the emissions generated in the production and supply of inputs used by farmers (primarily CO_2), direct and indirect emissions generated in agricultural production processes (CH_4, N_2O and CO_2, including net emissions associated with land use and land-use change), and subsequent emissions associated with transportation, processing, storage, and delivery of products to consumers. It would also count emissions associated with waste along the supply chain and at the point of final consumption (primarily CO_2).

Guidelines for estimating emissions associated with agriculture through LCAs are provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for Agriculture, Forestry and Other Land Use (AFOLU). These guidelines cover GHG emissions and removals through cropland (arable and tillable land, rice fields, and agroforestry systems), as well as through livestock production and manure management. Emissions associated with upstream and downstream activities relating to agriculture, as well as on-farm energy use, are not included in AFOLU estimates, but indirect emissions relating to energy use in AFOLU are counted in the energy sector.

The IPCC methodology is used by Parties to the Paris Agreement in preparing the national inventory reports of anthropogenic emissions by sources and removals by sinks of GHGs. The methodology is classified into three Tiers that involve increasing levels of complexity, both in terms of data requirements and methods. Tier Three yields the most accurate GHG estimates and should be used for key sectors. Work is currently underway on refining the 2006 guidelines to take into account new scientific and technical knowledge, relating particularly to emissions factors for some categories of activities and gases.

LCAs are also key to carbon labelling. The International Organization for Standardization (ISO), for example, requires that the carbon footprint communicated on environmental labels be quantified by a life cycle assessment based on ISO standards. Carbon labelling should therefore represent the complete carbon story of the product, including both storage and transportation. This is unlike, for example, Food Miles labelling – which provides information on the distance food has travelled from producer to consumer to reflect the energy used for its transportation – which could be said to provide an oversimplified picture.

LCAs of emissions intensity in food and agriculture remain extremely challenging due to methodological issues and data requirements. For certain objectives a partial analysis – e.g. evaluating the carbon footprint of a product at a particular point in the supply chain – can also be useful.

FAO generates estimates of carbon footprint equivalent (FAOSTAT Emissions Intensities) for a range of commodities, based on their efficiency of production, by country and over time. These estimates facilitate national and regional agri-environmental trends analysis. Data are available for a set of agricultural commodities (such as cereals, rice, meat, milk, eggs) and expressed in kg of CO_2e per kg of agricultural commodity. The computation is limited to emissions generated within the farm gate. Additional emissions from upstream and downstream production and consumption processes and trade are excluded, hence the analytical data are not comparable to a full LCA although they provide an excellent basis for LCA work.

SOURCES: Blandford, D. 2018. Border and related measures in the context of adaptation and mitigation to climate change. SOCO 2018 Background Paper, Rome, FAO; IPCC. 2006. Guidelines for National Greenhouse Gas Inventories. Volume 4. Agriculture, Forestry and Other Land Use (http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html); FAO. 2017. Emissions intensities. In FAOSTAT. [online] http://www.fao.org/faostat/en/#data/EI/visualize

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THE STATE OF THE WORLD

2018

THE STATE OF AGRICULTURAL COMMODITY MARKETS

AGRICULTURAL TRADE, CLIMATE CHANGE AND FOOD SECURITY

Global agricultural trade has increased significantly in value terms since 2000. Its pattern has also changed – emerging economies and developing countries play a bigger role in international markets, and South–South agricultural trade has expanded significantly. Climate change is expected to affect agriculture, food security and nutrition unevenly across countries and regions. Changes in comparative advantage in agriculture around the world will also affect international trade.

This edition of *The State of Agricultural Commodity Markets* focuses on the complex and underexplored intersection between agricultural trade, climate change and food security. The report makes an important contribution to the policy debates on climate change adaptation and mitigation under the Paris Agreement and the multilateral agricultural trade rules. The report discusses policies – both domestic support and trade measures – that can promote food security, adaptation and mitigation, and improve the livelihoods of family farmers around the world. Given both the slow- and rapid-onset impacts of climate change, policies that can significantly promote climate change adaptation and mitigation would benefit from deeper discussions in international fora on how to strengthen the mutually supportive role of trade rules and climate interventions.

2018 The State of Agricultural Commodity Markets (full text)