Achieving Sustainable Development Goal 2

Which Policies for Trade and Markets?

Edited by
ICTSD

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International Centre for Trade and Sustainable Development

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Abbreviations

BMI	body mass index
CBD	Convention on Biological Diversity
CETA	(Canada–European Union) Comprehensive Economic and Trade Agreement
FAO	Food and Agriculture Organization
FDI	foreign direct investment
FTA	free trade agreement
G20	Group of 20 (major economies)
G77	Group of 77 (developing countries)
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
ICT	information and communications technology
OECD	Organisation for Economic Co-operation and Development
RTA	regional trade agreement
SDG	Sustainable Development Goal
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UNFCCC	United Nations Framework Convention on Climate Change
UPOV	International Union for the Protection of New Varieties of Plants
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

Figures, Tables, and Boxes

Foreword

In recent decades, huge progress has been made throughout the world in lifting vast numbers of people out of poverty, creating jobs, and protecting our fragile planet. At the same time, however, millions of people still do not live dignified lives in which their basic needs are met, and they cannot be sure that their children and future generations will have a safe place to live where they can survive and prosper.

Since the Second World War, governments have collaborated to develop institutions and common legal frameworks that in retrospect can be seen to have provided the basis for the steady growth in prosperity that has since transformed so many people's lives. In the area of trade, as elsewhere, the agreements that have emerged from this process have been far from perfect; indeed, they have often been unfair in important ways. Because they have been built on a legal framework that centres on principles of equal treatment and non-discrimination, they have nonetheless been seen widely to provide an enduring basis for closer economic integration between countries and world regions.

Despite recent achievements, there is no room for complacency. As climate change threatens to intensify the shared challenges we face in the years ahead, countries will need to redouble these efforts to collaborate, rather than mistakenly assume that any one country can succeed alone. Working together across national borders will be critical to ensuring respect for fundamental rights and ensuring that people are free to live meaningful and fulfilling lives.

In September 2015, governments at the United Nations took a major step towards defining a common framework for future action, when they adopted 17 Sustainable Development Goals (SDGs) as part of the new Agenda 2030. Among other things, this included a commitment under SDG 2 to end hunger and all forms of malnutrition by 2030. Better-functioning markets for food and agriculture are integral to this bold new vision: governments agreed, for example, to "correct and prevent trade restrictions and distortions in world agricultural markets" as one of the measures they would take to help achieve this goal.

The short papers in this compilation examine the linkages between SDG 2 and policies affecting trade and markets, and seek to identify opportunities for action in three separate policymaking and negotiating processes: the G20, the World Trade Organization, and the evolving network of preferential trade agreements. As such, they are intended to contribute to discussions on how these three separate policy processes can best support the achievement of Agenda 2030 objectives, and SDG 2 in particular; and also to the reflections among the sustainable development community on the relevance of trade policy for progress towards the global goals.

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Overview

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Overview

In 2015 governments agreed to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture—including a specific commitment to end hunger and all forms of malnutrition by 2030. The goal, the second of the Sustainable Development Goals (SDGs) agreed at the United Nations in New York as part of its Agenda 2030, marked a significant milestone in the steps towards the progressive realisation of the right to food, including by building on and going beyond previous commitments in the Millennium Development Goals, and those established at the 1996 World Food Summit.

Since then, despite steady progress in reducing undernourishment in recent decades, new estimates by the Food and Agriculture Organization (FAO) have indicated that conflict and climate-related emergencies have pushed the number of hungry people upwards again, to 815 million people, while indicators for other forms of malnutrition have worsened. Furthermore, governments have experienced difficulty in finding satisfactory ways forward in a number of areas where closer collaboration is likely to be needed in order to achieve progress on shared objectives, including those set out under the SDGs.

Policies affecting trade and markets are widely seen as being an important component in the package of measures that governments will need to consider in order to accelerate progress towards the SDGs. SDG 17.10 commits countries to "promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization." However, it is worth noting that trade is presented in the SDGs and in the Addis Ababa Action Agenda as a "means of implementation" rather than as an end in itself. While SDG 2b explicitly addresses the need to "correct and prevent trade restrictions and distortions in world agricultural markets," SDG 2c also deals with the functioning of food commodity markets, food reserves, and extreme price volatility. While all of the SDGs could directly or indirectly affect trade and markets in ways that have consequences for SDG 2, a number of the goals and targets also have direct implications for food and nutrition security, and for environmental sustainability in the global food system (see also the analysis in the flagship report (FAO 2015) and Díaz-Bonilla and Hepburn 2016).

Policy design in this area, along with global rules, can affect not only how much food is available, to whom, and in which countries; but also job creation and both rural and urban incomes in ways that have significant repercussions for the ability of governments to achieve food security on a sustainable basis, including by promoting the resilience of vulnerable households and communities in the face of climate change.

At the same time, trade policy has not been immune to the tensions that have hindered efforts to move forward on other global challenges. Despite ministers agreeing in 2015 to end agricultural export subsidies, the World Trade Organization (WTO) ministerial conference in Buenos Aires two years later ended without consensus outcomes or a roadmap for talks on agricultural trade, even though they did agree to continue talks on fish subsidies, and smaller groups of trade ministers issued joint statements on topics such as fossil fuel subsidies. In the absence of further progress at the multilateral level, many governments have continued pushing ahead with talks on bilateral and regional trade agreements, many of which not only modify market access commitments but also create new patterns of regulatory harmonisation within blocs or across countries and groupings.

Under Argentina's presidency in 2018, the G20 group of major economies has highlighted the issue of "a sustainable food future" as one of three high-priority areas for the year. Other initiatives, such as the annual agriculture ministers' meeting convened as part of the Global Forum for Food and Agriculture in Germany, have shone a spotlight on topics such as the need for a "more sustainable, more responsible, and more efficient" global livestock sector, and called for the implementation of Agenda 2030 and the achievement of the SDGs.

In this context, ICTSD has commissioned a series of short papers exploring the conceptual linkages between the various targets established under SDG 2 on the one hand, and policies affecting trade and markets on the other hand. These pieces, which were prepared for an informal policy dialogue in March 2018 in Buenos Aires, are intended as a contribution to the rich ongoing discussion in this area, rather than as a landing zone or end point in this process (ICTSD and FAO 2018). In particular, as the authors themselves point out, each target needs to be seen alongside the other components of SDG 2, including the agreed "means of implementation," as well as alongside the goals and targets set out in the remaining SDGs. While the starting points of these pieces are therefore the specific targets under SDG 2, they also each open out on to a much broader discussion of how policies affecting trade and markets are relevant to sustainably achieving food security and the vision of Agenda 2030.

The compilation includes four papers. In the first of these, Shenggen Fan, Eugenio Díaz-Bonilla, Emily EunYoung Cho, and Christopher Rue begin with SDG 2.1 and SDG 2.2 commitments to make the case for open, transparent, and equitable trade as being essential to ending hunger and malnutrition sustainably. Fan and colleagues examine the relevance of SDG 2 for the global food system in the context of Agenda 2030, review progress to date in overcoming hunger and malnutrition, and discuss what type of trade policy framework can best support food and nutrition security and environmental sustainability. They also put forward recommendations for how the global community can best support progress, focusing in particular on the role of WTO, G20, and governments negotiating free trade agreements (FTAs).

In the second paper, Raul Montemayor looks at SDG 2.3 and discusses the relevance of policies affecting trade and markets for the achievement of commitments to double agricultural productivity and the incomes of small-scale food producers by 2030. Montemayor looks in particular at the extent to which crop and income diversification strategies can help achieve progress on SDG 2.3, alongside other initiatives such as social protection schemes, extension services, and investment in infrastructure. He examines critically the potential benefits and risks associated with trade liberalisation, and looks at the extent to which the global trade agenda has been able to deliver outcomes that benefit small producers, before concluding with some reflections on the political economy of advancing progress on the SDGs.

In the third paper, Céline Charveriat examines how policies affecting trade and markets are relevant for achieving the SDG 2.4 target of ensuring sustainable food production systems and implementing resilient agricultural practices. She assesses the environmental challenges linked to agriculture and food, and discusses different perspectives on pathways towards more sustainable food production, trade, and consumption. Her analysis seeks to establish the contours of a forward-looking action agenda, including priorities for action. Arguing in favour of "no-regret and confidence-building measures," she calls for governments to take measures that help close the knowledge gap on trade, investment, and the global food system; to build confidence through the G20 process; to mainstream

trade within the work programme of the United Nations Framework Convention on Climate Change (UNFCCC); and to create an independent trade and SDG commission under the aegis of WTO.

Finally, Graham Dutfield's paper examines the commitments under SDG 2.5, on maintaining genetic diversity, and considers the extent to which policies affecting trade and markets are relevant to achieving agreed objectives in this area. Dutfield discusses the significance of genetic diversity for plant and animal innovation and the role of small-scale farmers in particular in maintaining it. He looks at the challenges facing governments and other actors in the area of genetic diversity, in the context of the evolving international governance architecture, and identifies three high-priority action areas: improving the economic conditions of small farmers; improving access to and circulation of plant genetic resources, knowledge, and technologies; and extending genetic diversity initiatives to cover livestock.

As the authors of the four papers indicate, there is growing recognition that approaches to overcoming malnutrition need to go beyond the problem of undernourishment and include also micronutrient deficiencies and the issue of obesity and overweight. However, as Charveriat's paper suggests, there may be less consensus at the international level over what is meant by "sustainable agriculture," as well as over which pathways governments can most effectively take to achieve progress in this area.

Among other things, the papers address the significance of SDG 2 for talks on agricultural trade, including negotiations at WTO on topics such as domestic support to farming; tariffs and market access barriers; export bans and restrictions; and export competition. Some of the authors also delve into more detail on issues such as public food stockholding programmes, or the use of safeguards to protect against sudden import surges or price drops. However, the four contributions also touch on how policies beyond agriculture affect the global food system in ways that have implications for the functioning of global markets and the achievement of SDG 2. These include specific issue areas such as fisheries, services, and fossil fuel subsidies, as well as cross-cutting topics such as investment, infrastructure, value addition, and innovation.

What is therefore clear from the analysis is that governments will need to go beyond the relatively limited scope of action set out in the "means of implementation" if they are to succeed in achieving the ambition of the individual targets established under SDG 2, as part of a broader effort to implement their Agenda 2030 commitments. In addition, they may need to revisit the extent to which the SDG indicators agreed by the United Nations General Assembly (2017) are adequate to measure progress towards SDG 2—with indicator SDG 2.b.1, "agricultural export subsidies," arguably an insufficient yardstick for evaluating whether governments have managed to "correct and prevent trade restrictions and distortions in world agricultural markets," as set out under SDG 2b.

The four papers in this compilation also make clear that action is required at different levels, in different fora, and by different actors. While collective and individual action by national governments is clearly key, the contributions show how local, regional, and global initiatives are also required, in areas ranging from climate change adaptation to maintaining and safeguarding genetic diversity. In the area of trade policy, WTO clearly remains a critical forum for further progress, although bilateral and regional trade negotiations are also important. The proposals and recommendations made by the authors examine what is feasible and desirable in these areas, as well as looking at what can usefully be done by the G20. The table below summarises the main recommendations put forward in the four papers.

Summary of main recommendations

	Fan et al. SDG 2.1 & 2.2	Montemayor SDG 2.3	Charveriat SDG 2.4	Dutfield SDG 2.5
WTO	Agree specific actions on domestic support, market access, and export competition, as well as fisheries, environment, fossil fuels, intellectual property, and competition policy	Link new developing country safeguard to applied tariffs Phase out trade-distorting domestic support Revisit farm subsidy rules on public food stockholding	Establish an independent trade and SDGs commission Focus next World Trade Report on SDGs (or SDG 2)	Convene forums with World Intellectual Property Organization (WIPO) and FAO (see details below)
G20	Public expenditure reviews with food and nutrition focus Review financial markets to lift obstacles to financing changes in food systems Consider options to finance investments to help achieve SDGs		Agricultural ministers' track to exchange experiences on pathways for sustainable food production, consumption, and trade FAO and Organisation for Economic Co-operation and Development (OECD) to report to G20 on pathways to sustainable food production and consumption	Ask WIPO, FAO, and WTO to hold joint forum(s) on underused and neglected crop species, and on using geographical indications and certification marks to benefit small-scale, local producers and valorise plant and animal diversity Consider how to address animal genetic resource erosion
FTAs	Evaluate relationship with WTO rules (including General Agreement on Tariffs and Trade (GATT) Article XXIV) Examine whether new FTAs safeguard developing country policy space on food and nutrition security			Allow sui generis regimes for plant variety protection rather than under 1991 Act of the International Convention for the Protection of New Varieties of Plants (UPOV 1991) Provide technical cooperation on geographical indications and trademarks to support genetic diversity
Other		Support crop and income diversification at national level	UNFCCC to include workshop on trade and investment issues under its agriculture track	Parties to the FAO International Treaty on Plant Genetic Resources for Food and Agriculture should adopt an interpretative statement on role of local and indigenous farmers as plant breeders

References

Díaz-Bonilla, E., and J. Hepburn. 2016. *Trade, Food Security, and the 2030 Agenda.* Geneva: International Centre for Trade and Sustainable Development (ICTSD).

FAO. 2015. *The State of Agricultural Commodity Markets 2015–16*. Rome: Food and Agriculture Organization.

ICTSD and FAO. 2018. "Towards More Equitable and Sustainable Markets for Food and Agriculture: Advancing Agenda 2030 in the G-20, WTO and FTAs." Dialogue, Buenos Aires, Argentina, 16 March. https://www.ictsd.org/themes/agriculture/events/towards-more-equitable-and-sustainable-markets-for-food-and-agriculture.

United Nations General Assembly. 2017. "Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development." Resolution A/RES/71/313 adopted by the General Assembly on 6 July 2017. ggim.un.org/documents/A_RES_71_313.pdf.

SDG 2.1 and SDG 2.2: Why Open, Transparent, and Equitable Trade Is Essential to Ending Hunger and Malnutrition Sustainably

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Introduction

During the past years there have been several noteworthy global pledges on eliminating hunger, achieving food security and improved nutrition, and moving to environmentally sustainable patterns of production and consumption of food and agricultural goods. These pledges include the commitment to the Sustainable Development Goals (SDGs) in December 2015, followed by the entry into force of the historic Paris Agreement on climate change in November 2016, and the incremental advances at the World Trade Organization (WTO) during the 9th and 10th ministerial conferences in Bali in 2013 and in Nairobi in 2015, all of which represented important steps towards building a more supportive international system for the attainment of those objectives.

However, as the limited results from the 11th Ministerial Conference in Buenos Aires in December 2017 suggest, much remains to be done for humanity to be able to achieve the SDGs by 2030. This paper will briefly consider the importance of trade in achieving the SDGs and transforming food systems. The paper also highlights some key policies that are critical to achieving these goals.

Trade is Critical to Achieving SDG 2 and Transforming Food Systems

SDG 2 commits all countries to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture." As its first two targets, SDG 2.1 pledges to "end hunger and ensure access by all people ... to safe, nutritious and sufficient food all year round" by 2030, and SDG 2.2 commits countries, also by 2030, "to end all forms of malnutrition." Additionally, the targets under goal 2 promise to reach internationally agreed targets on stunting and wasting in children under five years of age, and include the commitment to "address the nutritional needs of adolescent girls, pregnant and lactating women and older persons."

The goal and targets address the triple burden of malnutrition: hunger, or insufficient intake of calories; deficiencies in proteins, vitamins, minerals, and micronutrients, also known as hidden hunger; and excess consumption of calories (sugar, fats, and others), leading to problems such as obesity, diabetes, and cardiovascular diseases (Pinstrup-Andersen 2007). As will be discussed, many countries are facing multiple burdens of malnutrition, and progress on global nutrition targets is slow or moving backwards (Global Nutrition Report 2017). Adequately functioning food systems will be critical in achieving SDG 2 to eliminate all forms of malnutrition.

SDG 2 has important linkages to many other SDGs, with more than half of the goals relating to global food security and nutrition. For instance, the elimination of poverty (SDG 1) is central to ensuring food security and nutrition, and vice versa, as hunger, poverty, and malnutrition form a vicious circle. Food security and nutrition are both key drivers of other SDGs, while benefiting from their achievement, especially improved health (SDG 3), gender equality (SDG 5), and reduction of inequality (SDG 10). Moreover, food systems play key roles in responsible production and consumption (SDG 12), in maintaining sustainability of fisheries (SDG 14), and in mitigating climate change (SDG 13) while adapting to its effects (Fan 2016).

To achieve the range of goals, the global food system needs to be transformed into one that is nutrition- and health-driven, productive and efficient, environmentally sustainable and climate-smart, inclusive, and based on a diverse, competitive, and dynamic private sector. While there may be trade-offs along these dimensions, there also are complementarities. Therefore, countries, always operating with limited resources, must prioritise and define a proper sequencing of interventions to minimise the trade-offs and maximise the synergies.

A nutrition- and health-driven value chain that delivers healthy, nutritious, and sustainable diets is critical, especially as the world faces population growth, urbanisation, and increasingly intensive agricultural and industrial practices. The food system should be productive and efficient, by producing more food with fewer resources, and reducing food waste and loss, to meet current and future needs. The system must also be environmentally sustainable to minimise negative impacts on our planet, such as land degradation, deforestation, and over-use of species. The adoption of climate-smart approaches[1] —including low-carbon policies, agroforestry approaches, zero-till farming, and climate-ready crop varieties—will be crucial. The global food system also needs to be inclusive, especially of smallholder farmers, women, and youth, as they often lack access to assets and markets and risk exclusion from food value chains. Lastly, the food system should be based on a diverse, competitive, and dynamic private sector, operating within an enabling environment based on adequate macroeconomic and sectoral policies, improved infrastructure, institutional and regulatory frameworks, and access to information and communications technology (ICT).

Trade and trade policies are essential to transforming food systems. Trade can contribute to improved health and nutrition by diversifying the supply of healthy food and lowering food prices (Hawkes 2015). The food system can become more productive and efficient as trade can shift food from regions of low production costs and ample supply to areas of high production costs and insufficient supply to meet demand (Glauber 2017). Increased trade from higher-yielding and less biodiverse countries to lower-yielding and more biodiverse countries can be effective in preventing biodiversity loss (Tilman et al. 2017). Similarly, although actual commercial flows occur due to a variety of reasons, trade from water-abundant to water-scarce regions can aid food security without pressuring local water levels, and can contribute to an environmentally sustainable and climate-smart food system (Oki and Kanae 2006). As trade policies can also help improve access to markets, foster opportunities for value addition, and create rural jobs to contribute to agricultural productivity and incomes for small producers, it will be important for trade to be more inclusive (Díaz-Bonilla and Hepburn 2016a).

Hunger and Malnutrition: Past Trends and Current Conditions

Agricultural and food production has increased significantly at the global level over the past decades. The world is producing 25 percent more calories and 27 percent more proteins per capita in the 2010s compared with in the 1960s. Inflation-adjusted food and agricultural price indices decreased by 18–20 percent from the 1960s and 1970s to the 2010s. At the same time, global average income

1 Climate-smart agriculture, and similar concepts such as "eco-efficient agriculture," encompass practices that aim at improving productivity while ensuring adaptation, resilience, and mitigation in relation to climate change, having as final objectives food security and development (see, for instance, FAO 2013). Eco-efficient agriculture has been defined as one that "improves livelihoods by raising productivity and minimizing negative environmental impacts through more economically and ecologically prudent use of resources" (CIAT 2012). These concepts help to assess technologies according to their ability to generate multiple wins.

more than doubled, and the poverty headcount ratio at US$ 1.90 a day (2011 purchasing power parity) declined from 39 percent in the 1980s to 13 percent in the 2010s (World Bank World Development Indicators).

The overall global growth in production and income has led to significant progress in reducing global hunger and malnutrition. Between the early 1990s and 2015, the prevalence of undernourishment worldwide declined from 19 percent to less than 11 percent, equivalent to a reduction of almost 220 million people (Food and Agriculture Organization (FAO) Food Security Indicators). Yet, progress has been uneven across regions. Improvements have been driven largely by Asia, especially China, while reductions in hunger in Africa over the past decade have stalled or worsened (FAO et al. 2017). Furthermore, global progress reversed in 2016, with an increase of 38 million undernourished people, largely due to armed conflicts and climatic events in Africa and the Middle East and weaker economic growth in Latin America and the Caribbean. About 815 million people are undernourished at the world level.

Slow progress in reducing other forms of malnutrition is also a concern. Between the early 1990s and the last available date in the 2010s, prevalence of anaemia in women of reproductive age declined from almost 40 percent to about 33 percent, and stunting of children under five years of age declined from about 39 percent to 23 percent (World Bank World Development Indicators).[2] But still, 2 billion people in the world lack key micronutrients such as iron and vitamin A (Global Nutrition Report 2017). Furthermore, global prevalence of overweight (body mass index (BMI)[3] of 25 kg/m^2 or over) and obesity (BMI of 30 kg/m^2 or over) has been increasing and is currently about 39 percent for women and 37 percent for men, with about 1.9 billion people considered overweight, of which some 600 million are obese. These problems have led to rising rates of high blood glucose or diabetes, hypertension, and other non-communicable diseases (Global Nutrition Report 2015; 2016; 2017).

Therefore, at the current pace, the SDG target of eliminating all forms of malnutrition by 2030 will not be reached. Moreover, the current global system of production, processing, distribution, and consumption does not seem to be generating adequate levels of income and inclusion for large segments of poorer, more vulnerable populations. At the same time, it is putting pressure on natural resources and local environments and generating significant levels of greenhouse emissions, all of which threaten the timely achievement of other related SDGs.

Policies for an Open, Transparent, and Equitable Trade System

To support open, transparent, and equitable trade, policies need to address different issues in market access and export competition. Reducing high import tariffs and phasing out tariff-rate quotas over time will be important in expanding secure and equal access to markets for food and agriculture. Exceptions and carve-outs to protect a small number of so-called "special" and "sensitive" products should be avoided. Singling out some products for special protection can bias production towards those products and negatively impact diet diversity, which is key to healthy nutrition, and increase prices for consumers, affecting economic access. Tariff

2 Different factors can cause anaemia (lack of sufficient red blood cells), but iron deficiency is the most common. Other indicators, such as vitamin A deficiency, are not available with wide coverage and periodicity.

3 The BMI is calculated as bodyweight in kilograms divided by height in metres squared.

escalation, whereby higher tariffs are placed on processed products rather than on primary raw materials, must also be addressed as it directly affects opportunities for value addition.

The use of safeguards when countries experience sudden negative external impacts, such as import surges or drastic price changes, should be more carefully evaluated, considering costs and benefits.[4] Though such safeguards can provide support when shocks create market volatility, the current mechanism lacks transparency and provides permanent protection for producers who are not necessarily poor (Hallaert 2005). A truly temporary and price-based system that is managed by an international organisation to avoid indiscriminate use by countries may be a better approach.

Export bans and restrictions are frequently imposed in some countries to promote food security by reorienting production to local markets, which lower prices and increase the food supply in the short term. Over time, however, producers decrease supply in response to weak markets, and poor farm households that are net producers experience income losses; therefore, that policy becomes self-defeating (Aragie, Pauw, and Pernechele 2016). Further, this can negatively impact net food-importing countries. Thus, export bans and restrictions should be eliminated, or at least subjected to stricter disciplines in their use.

Fair competition in domestic and international spheres is also important. The presence of large players in different segments of those value chains highlights the need to pay attention to competition policies and the relative market power of different actors, in both product and input markets. Developing countries will have to strengthen domestic policy and legislation, such as antitrust laws, to govern monopolistic structures. There is also a parallel international challenge if the horizontal and vertical integration of the food system makes the global system less competitive.

Eliminate inefficient domestic support policies

Domestic support policies can have a wide-ranging impact on food systems, trade, and nutrition. Input subsidy policies should also be evaluated for their efficiency and equity, and whether they are using resources that should be directed to more impactful investments in addressing food security. Input subsidy policies are highly visible means for governments to demonstrate support to their constituents (farmers and producers) and could potentially reduce dependence on world markets. However, the policy crowds out commercial fertiliser demand, and the food production response is often lower than expected. Further, it diverts resources that can be used for other, more needed public investments. Research in China has shown that government investments in rural infrastructure—such as irrigation and roads—and agricultural research and development have a significant impact on agricultural productivity growth and reductions in poverty (Fan, Zhang, and Zhang 2004).

Another issue in domestic support is the operation of public stocks for food security reasons. Some developing countries seek to be able to buy at non-market prices when the food security products are bought from low-income, resource-poor producers. This would not only violate general criteria

4 Currently, all countries can use the margin between bound and applied tariffs, or apply the common safeguard of Article XIX of the General Agreement on Tariffs and Trade (GATT) 1994. The Special Safeguard of the Agreement on Agriculture is available only to countries (mostly developed countries) that have transformed quantity restrictions into tariffs under the agreement. Concerns expressed by some developing countries regarding the negative impact on their producers of domestic subsidies and other export practices mostly from industrialized countries can be managed under the Agreement on Subsidies and Countervailing Measures.

of domestic support policies permitted by WTO, but also impact producers in other countries (Díaz-Bonilla 2013; 2017a; 2017b). While food stocks have been a common response to food crises, they are often ineffective and costly to operate fairly, with too many objectives ranging from emergency aid to producer support. While public physical stocks may still be needed under some circumstances, more direct instruments, such as investments in food production, agricultural research and development, safety nets, and transfers, can better address supply-side issues and aid households (Bouët and Laborde 2017).[5]

Promote environmental sustainability

As agricultural production and land-use changes linked to agriculture have significant implications for greenhouse gas emissions, policies will require changes to be in line with the commitments made in Paris under the United Nations Framework Convention on Climate Change (UNFCCC) by the Conference of the Parties in 2015 (COP21). Governments will need to implement new policies and budgetary commitments to support adaptation and mitigation practices by farmers. Those policies may need complementary measures that operate at the border (for instance to avoid "carbon leakage"), such as the extension of domestic taxes and standards to imported products (Blandford 2013; Tangermann 2016).

Policies on biofuels also need to be considered. Using crops for biofuels reduces food and feed availability and increases prices, contributing to the reduction of consumption and nutritional well-being of net buyers (buyers who buy more food than they sell or produce). While the use of crops as biofuels could also mean higher incomes for some farmers in developed and developing countries, and perhaps, under some conditions, some reduction in greenhouse emissions, there are lingering questions on the potential trade-distorting effects and the distribution among winners and losers (HLPE 2013; IFPRI 2008; Meyer, Schmidhuber, and Barreiro-Hurlé 2013). With inadequate notification to WTO committees under the current system, it is difficult to provide relevant information on the impact of biofuel subsidies on agricultural markets (Blandford 2013; Josling 2013).

Responding to a separate concern in improving environmental sustainability, governments should consider phasing out fossil fuel subsidies as well.[6] Taking into account that food production and its supply chain accounts for approximately 30 percent of global energy consumption, shifting towards more renewable energy will be important (WWAP 2014). At the global level, the G20 could serve as a platform to promote this issue (SDG 12c).[7]

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5 The problem of food price inflation and price spikes is usually better managed by a combination of macroeconomic and investment policies, combined with safety nets for poor people.

6 This is a reminder that non-agricultural trade policies may also have significant implications for achieving food security objectives, such as those related to trade and competition in different key markets, such as farm equipment, fertilisers, and seeds, or for services such as credit or transport and logistics (Díaz-Bonilla and Hepburn 2016a).

7 A promising step outside the G20 process is the initiative taken by a group of countries during the 2017 WTO Ministerial Conference in Buenos Aires, which issued a statement that calls for "enhanced WTO transparency and reporting" to enable "the evaluation of the trade and resource effects of fossil fuel subsidies programmes," seeking "the rationalisation and phase out of inefficient fossil fuel subsidies that encourage wasteful consumption" (Ministerial Statement WT/MIN(17)/54, 11 December 2017).

In addition to agricultural production, sustainable fisheries are important not only as a source of nutrition, but also as the mainstay of many livelihoods (Díaz-Bonilla and Hepburn 2016b). Fisheries production and trade are affected by a series of problems, including illegal, unreported, and unregulated fishing and harmful fisheries subsidies (Díaz-Bonilla and Hepburn 2016b; Rashid Sumaila 2016). The Ministerial Conference in Buenos Aires put in place a work programme to achieve SDG 14.6, which calls for the prohibition by 2020 of "certain forms of fisheries subsidies which contribute to overcapacity and overfishing" and the elimination of "subsidies that contribute to illegal, unreported and unregulated fishing." WTO members must make sure that the work programme is completed on time.

Support vulnerable populations with inclusive policies

To complement the trade policies, governments should promote domestic policies and investments that help transform the food system to tackle hunger and malnutrition, especially for vulnerable populations that often do not reap the benefits of free trade. Poor and vulnerable populations can be supported through well-targeted investments and productive safety nets aimed at enabling households to resist shocks, create assets, and become food self-sufficient.

Public investments and services should focus on strengthening human capital through improvements in health, water and sanitation, nutrition, and education, particularly in rural areas. Investments should also create a more equitable agrarian structure by expanding land ownership and access to water for small and family farmers and landless workers. Improving the function of financial markets, developing rural infrastructure, and providing support for intermediate cities are important. Investments and safety nets that promote climate change adaptation and mitigation to build climate resilience will be needed. There is also a need for women's empowerment programmes and the elimination of institutional, political, and social biases that discriminate against vulnerable groups.

Additionally, investments in agricultural research and development and innovation systems that focus on smallholders in developing countries are needed in order to increase productivity, resilience, and sustainability in production as a way to reduce poverty and improve food security. In this regard, it is necessary to ensure that international agreements on intellectual property rights (including those that are part of regional trade agreements) do not impose constraints on the ability of developing countries to use the technologies needed to eliminate hunger and malnutrition.[8]

Conclusion: Role of the Global Community

Most of the national policies mentioned above can be pursued by countries largely unconstrained by international agreements and legal frameworks. At the same time, there is room in the international framework to improve coordination policies, avoid damaging spillovers, and address systemic issues that require different forms of collective action. It is necessary to achieve a proper balance between the needed policy space to design and implement policies to support food and nutrition security, and an adequate coordination of policies at the global level to ensure the operation of the multilateral

8 See Pardey, Wright, and Nottenburg (2001) and Pardey and Koo (2003) for a review of different opinions about the correct balance of rights and obligations under the international rules for the levels of intellectual property protection, and about the freedom of researchers to operate in developing countries and the rights of farmers.

system as a public good that avoids a damaging cycle of "begging-thy-neighbour" policies (Josling 2014).[9]

Supporting and complementing the work of the United Nations on these topics, especially for governance and coordination, will be important.

The previous sections suggested different adjustments in WTO disciplines related to the three pillars of the Agreement on Agriculture (domestic support, market access, and export competition) and in relation to other areas, including fisheries, environment, fossil fuels, intellectual property rights, and competition policies. In any case, a key requirement is that WTO members abide by their obligations to notify trade and related policies under different WTO agreements, and that there are meaningful legal implications for non-compliance (e.g. see Josling 2013).

Other groups of initiatives may be pursued under the G20 process, as suggested earlier in the case of energy subsidies. The G20 could also encourage public expenditure reviews with a food and nutrition focus to help realign priorities and expenditures.[10] Another possibility is to review the operation of financial markets to remove obstacles that impede the financing of needed changes in food systems. The G20 could establish further work tracks in some of the existing groups to consider options to finance investments that will help achieve the SDGs.

Regional trade agreements should also be evaluated carefully in their potential conflicts with other WTO rules (including the disputed terms of GATT Article XXIV),[11] as well as whether, under the banner of creating "new-generation" or "WTO plus" agreements, developing countries are asked to surrender too much of the policy space they need to address food security and nutrition concerns (which, it has been suggested, may happen in cases of labelling, regulation, and taxing of unhealthy foods, and the use of agricultural technology).

While the task ahead is ambitious, by working together to build an open, fair, and transparent agricultural trading framework, the world can more realistically achieve SDG 2 and beyond.

9 The international system of legal rules for trade and trade-related operations can be seen as a public good that coordinates policies across countries to minimise the overall costs for all of them of the simultaneous use of policies that, while trying to protect employment and production at home, in fact may end up negatively affecting themselves and the world through reduced trade overall and world recessions (as happened in the 1930s). The same logic applies to food and nutrition security: countries trying to ensure food supply for their citizens and protect their citizens from price shocks through trade and trade-related policies may end up exacerbating price volatility and food scarcity for themselves and others, worsening global food security conditions (Josling 2014).

10 See, for example, the case of Honduras in Díaz-Bonilla and Centurión (forthcoming).

11 Article XXIV determines the conditions for custom unions and free trade areas to be compatible with the non-discrimination principle of GATT, and later WTO, legal frameworks. The original GATT Article XXIV was complemented by an "Ad Article XXIV," and later updated by a 1994 understanding when the WTO was created.

References

Aragie, E., K. Pauw, and V. Pernechele. 2016. *Achieving Food Security and Industrial Development in Malawi: Are Export Restrictions the Solution?* MaSSP Working Paper 15. Washington, DC: International Food Policy Research Institute (IFPRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130465.

Blandford, D. 2013. *International Trade Disciplines and Policy Measures to Address Climate Change Mitigation and Adaptation in Agriculture.* E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Bouët, A., and D. Laborde. 2017. "Building Food Security through International Trade Agreements." Washington, DC: International Food Policy Research Institute (IFPRI). http://www.ifpri.org/blog/building-food-security-through-international-trade-agreements.

CIAT. 2012. *Eco-efficiency: From Vision to Reality.* Colombia: International Center for Tropical Agriculture (CIAT). http://www.ciat.cgiar.org/publications/Pages/eco_efficiency_from_vision_to_reality.aspx.

Díaz-Bonilla, E. 2013. "Food Security: What's Trade Got to Do with It? Part I." Food Security Portal. http://www.foodsecurityportal.org/food-security-whats-trade-got-do-it-part-i.

Díaz-Bonilla, E. 2017a. "Food Security Stocks: Economic and Operational Issues". In *Agriculture, Development, and the Global Trading System: 2000–2015,* edited by A. Bouet and D. Laborde Debucquet. Washington, DC: International Food Policy Research Institute (IFPRI).

Díaz-Bonilla, E. 2017b. "Food Security Stocks and the WTO Legal Framework." In *Agriculture, Development, and the Global Trading System: 2000–2015*, edited by A. Bouet and D. Laborde Debucquet. Washington, DC: International Food Policy Research Institute (IFPRI).

Díaz-Bonilla, E., and M. Centurión. Forthcoming. *Una Revisión del Gasto Público para la Seguridad Alimentaria y Nutricional en Honduras.* Washington, DC: International Food Policy Research Institute (IFPRI).

Díaz-Bonilla, E., and J. Hepburn. 2016a. "Overcoming Malnutrition: Why Policies on Trade and Markets Matter." Washington, DC: International Food Policy Research Institute (IFPRI). http://www.ifpri.org/blog/overcoming-malnutrition-why-policies-trade-and-markets-matter.

Díaz-Bonilla, E., and J. Hepburn. 2016b. *Trade, Food Security, and the 2030 Agenda.* Geneva: International Centre for Trade and Sustainable Development (ICTSD). http://www20.iadb.org/intal/catalogo/PE/2016/16475.pdf.

Fan, S. 2016. "A New Global Food System for Achieving the Sustainable Development Goals." Washington, DC: International Food Policy Research Institute (IFPRI). http://www.ifpri.org/blog/new-global-food-system-achieving-sustainable-development-goals.

Fan, S., L. Zhang, and X. Zhang. 2004. "Reforms, Investment, and Poverty in Rural China." *Economic Development and Cultural Change* 52 (2): 395–421.

FAO. 2013. *Climate-Smart Agriculture: Sourcebook*. Rome: Food and Agriculture Organization (FAO). www.fao.org/docrep/018/i3325e/i3325e.pdf.

FAO, IFAD, UNICEF, WFP, and WHO. 2017. *The State of Food Security and Nutrition in the World 2017: Building Resilience for Peace and Food Security.* Rome: Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP), and World Health Organization (WHO).

Glauber, J. 2017. "Trade Barriers Aren't the Way to Fix Nutrition." Washington, DC: International Food Policy Research Institute (IFPRI). http://www.ifpri.org/blog/trade-barriers-arent-way-fix-nutrition.

Global Nutrition Report. 2015. *Global Nutrition Report 2015: Actions and Accountability—To Advance Nutrition and Sustainable Development*. Washington, DC: International Food Policy Research Institute (IFPRI).

Global Nutrition Report. 2016. *Global Nutrition Report 2016: From Promise to Impact—Ending Malnutrition by 2030.* Washington, DC: International Food Policy Research Institute (IFPRI).

Global Nutrition Report. 2017. *Global Nutrition Report 2017: Nourishing the SDGs*. Bristol: Development Initiatives Poverty Research.

Hallaert, Jean-Jacques. 2005. *Special Agricultural Safeguards: Virtual Benefits and Real Costs—Lessons for the Doha Round.* IMF Working Paper No. 05/131. Washington, DC: International Monetary Fund. https://ssrn.com/abstract=888000

Hawkes, C. 2015. "Nutrition in the Trade and Food Security Nexus". In *The State of Agricultural Commodity Markets 2015–16*, edited by FAO. Rome: Food and Agriculture Organization (FAO). www.fao.org/3/a-i5223e.pdf.

HLPE. 2013. *Biofuels and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security.* Rome: High Level Panel of Experts on Food Security and Nutrition (HLPE).

IFPRI. 2008. *Biofuels and Food Security.* Washington, DC: International Food Policy Research Institute (IFPRI). http://www.ifpri.org/publication/biofuels-and-food-security.

Josling, T. 2013. *Transparency and Monitoring in Agricultural Trade: Policy Options for the Post-Bali Agenda.* E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Josling, T. 2014. "The WTO, Food Security and the Problem of Collective Action Food Price Volatility, Food Security and Trade Policy." Presented at the Food Price Volatility, Food Security and Trade Policy Conference, 18–19 September 2014, World Bank, Washington, DC.

Meyer, Seth, Josef Schmidhuber, and Jesús Barreiro-Hurlé. 2013. *Global Biofuel Trade: How Uncoordinated Biofuel Policy Fuels Resource Use and GHG Emissions.* Issue Paper No. 48. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Oki, T., and S. Kanae. 2006. "Global Hydrological Cycles and World Water Resources." *Science* 313 (5790): 1068–72.

Pardey, P.G. and B. Koo. 2003. *Biotechnology and Genetic Resource Policies*. Washington, DC: International Food Policy Research Institute (IFPRI).

Pardey, P.G., B.D. Wright, and C. Nottenburg. 2001. "Are Intellectual Property Rights Stifling Agricultural Biotechnology In Developing Countries?" In *2000–2001 IFPRI Annual Report*. Washington, DC: International Food Policy Research Institute (IFPRI).

Pinstrup-Andersen, P. 2007. "Agricultural Research and Policy for Better Health and Nutrition in Developing Countries: A Food Systems Approach." *Agricultural Economics* 37 (s1): 187–98.

Rashid Sumaila, U. 2016. *Trade Policy Options for Sustainable Oceans and Fisheries*. E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Tangermann, S. 2016. *Agriculture and Food Security: New Challenges and Options for International Policy*. E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

Tilman, D., M. Clark, D.R. Williams, K. Kimmel, S. Polasky, and C. Packer. 2017. "Future Threats to Biodiversity and Pathways to Their Prevention." *Nature* 546 (7656): 73–81.

WWAP (United Nations World Water Assessment Programme). 2014. The *United Nations World Water Development Report 2014: Water and Energy.* Paris: United Nations Educational, Scientific and Cultural Organization.

SDG 2.3: How Policies Affecting Trade and Markets Can Help Raise Food Producers' Incomes and Productivity

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Sustainable Development Goal 2.3 aims to double, by 2030, "the agricultural productivity and the incomes of small-scale food producers, particularly women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets, and opportunities for value addition and non-farm employment." This short paper seeks to identify key interventions, including possible changes in approaches and strategies, which may be needed to achieve this goal. It will at the same time explore and analyse the role that policies and governance frameworks affecting trade and markets can play in doubling the agricultural productivity and incomes of small-scale food producers.

Enhancing the welfare of agricultural producers, particularly the large numbers of small farmers in the developing world,[1] is an indispensable element of any strategy to achieve the overall goal of ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture, as espoused by SDG 2. Based on the estimates of the International Fund for Agricultural Development in 2011, as many as 70 percent of poor people in the world reside in rural areas, and around 80 percent of these are engaged in farm activities of some kind (IFAD 2011). The World Bank, in turn, has determined that enhancing growth in the agriculture sector is "two to four times more effective in raising incomes among the poorest compared to other sectors" (World Bank 2017).

Even poverty in urban areas is traceable to the exodus of large numbers of rural residents who cannot survive, much less eke out a decent living, on their farms. Crime, pollution, malnutrition, homelessness, and a host of other social problems in cities and rural areas will only get worse unless the large numbers of small farmers in the countryside earn enough income to provide for the basic food, clothing, and shelter needs of their families.

Although the Millennium Development Goal target of halving the 1990 poverty rate was achieved 5 years ahead of schedule in 2010, 1 in every 10 people in the world, or about 767 million people, were still classified as extremely poor in 2013, subsisting on US$ 1.90 or less per day (World Bank 2016). An even larger number of people hover above this poverty threshold and are inherently prone to falling back into extreme poverty in the event of crop losses, price spikes, and family emergencies. A recent study cites World Bank data that indicate 72 percent of the population in low-income countries in 2013 subsisted on less than US$ 3.10 a day; in middle-income countries, this percentage was 29 percent (Roser and Ortiz-Ospina 2018).

Poverty and malnutrition are particularly widespread and severe in many parts of Asia and Africa, where crop farm sizes are typically small, ranging from half a hectare to two hectares per family.[2] Herd sizes of livestock farmers and fish-catch capacities of fishers are generally also small in scale. This small scale of operations, coupled with comparatively low yields, often results in high costs of production. Farmers often do not own the land they till or do not enjoy security of tenure. Very few have access to affordable credit, and many have no or very limited savings and assets to

1 There is currently no universally accepted definition of a "small-scale food producer," although several attempts are under way to resolve this issue. The Office of the Chief Statistician and Statistics Division of the Food and Agriculture Organization, for example, has suggested categorising producers based on "a combination of two criteria, namely the physical size of the farm, as expressed by the amount of operated land and number of livestock heads in production, and the economic size of the farm, as expressed by its revenues," and then setting a threshold, in either absolute or relative terms, below which producers could be categorized as "small-scale" (FAO 2017).

2 Several economists from the Food and Agriculture Organization have estimated that 84 percent of all farms are smaller than two hectares (Lowder, Raney, and Skoet 2014).

fall back on in times of need. In many developing countries, government support is insufficient and intermittent, while farmers are generally unorganised and unable to advocate effectively for their interests. Climate change and market volatility have exacerbated the situation, making these small producers more prone to risks and vulnerable to both natural and human calamities.

Many attempts have been made to improve the productivity and enhance the incomes of these large numbers of small producers. Governments have invested heavily in rural infrastructure, research to develop appropriate farming technologies, and services to provide credit, input, and marketing support to farmers. However, these efforts often pale in comparison to what needs to be done, especially after long years of neglect and underinvestment in agriculture. Initiatives have also not been complemented by adequate and sustained budgetary support, necessary policy reforms, and effective implementation strategies. United Nations data indicate, for example, that government expenditures for agriculture, together with official development assistance for the sector, have in fact declined significantly in relative terms over the years.[3] As a result, agricultural productivity remains low in many areas, the farming population continues to age, and rural youth increasingly eschews farming for work outside the farms. Clearly, traditional approaches alone will not work, and new and more aggressive strategies will have to be adopted if the SDG aim of doubling the productivity and incomes of small producers by 2030 is to be met. This challenge is underscored by the Food and Agriculture Organization (FAO) estimate that doubling productivity will require an average productivity growth rate of 4.6 percent per year over a 15-year period from 2015 to 2030, a pace that is significantly faster than productivity gains in 1961–2012 (Mikecz and Vos 2016).

In many developing countries, government interventions typically focus on improving the yields and incomes of farmers from the primary crops they cultivate or the animals they raise. It is debatable, however, whether these small producers can bank solely on their primary sources of income to extricate themselves from poverty, given the small scale of their operations and the relatively low value of the crops or animals they normally raise. Accordingly, it may be necessary to increase the range of economic opportunities for farmers to generate more income and diversify their income sources. This will have to be complemented by efforts to enhance their financial and technical capacities so they can actually take advantage of these additional opportunities. At the same time, small producers will need safety nets and other confidence-building mechanisms that will convince them to try out new ventures and take the necessary risks.

Crop- and income-diversification strategies to augment the incomes of small producers from primary crops will need to be looked into more closely. This could involve, for example, the establishment of small vegetable gardens, raising a few heads of livestock, and segregating a small area for inland fish culture within the small farm of a rice or corn farmer. Initially, the scale should

3 The United Nations Sustainable Development Knowledge Platform states: "To increase the productive capacity of agriculture, more investment is needed, both public and private, from domestic and foreign sources. However, recent trends in government spending are not favourable. The agriculture orientation index, defined as agriculture's share of government expenditures divided by the sector's share of gross domestic product (GDP), fell globally from 0.37 to 0.25 between 2001 and 2013. The decline in the index was interrupted only temporarily during the food price crisis of 2006 to 2008, when governments increased agricultural spending" (United Nations 2017). The platform adds: "Since the late 1990s, the percentage of aid for supporting agriculture in developing countries has been stable at around 8 per cent, when measured as a share of sector-allocable aid from member countries of the Development Assistance Committee of the Organisation for Economic Co-operation and Development (OECD). This has decreased, from a peak of 20 per cent in the mid-1980s, as a result of donors beginning to focus more on improving governance, building social capital and bolstering fragile States."

be small enough to require only minimal investments and simple technologies, target only local markets, and entail risks that the farmer is willing and able to take. These small ventures can provide important, even if small, incremental income flows to farmers while they wait to harvest their main seasonal crops. They can also allow farmers to avoid relying on just one crop to sustain their families and provide them a hedge against losses on their primary crop in case of calamity. Farmers can also sell their livestock or supplemental crops to address personal emergencies instead of having to mortgage their land or divert funds intended for their farms. At a later stage, farmers can be grouped into production and marketing clusters to synchronise their production calendars and varietal choices with the regular requirements of supermarkets, food processors, and large assemblers.

Diversification strategies for small producers will require the adoption of farming system approaches. While this concept is not new, it is often set aside in favour of support programmes that focus on individual crops or farming environments and often end up encouraging monocrop agriculture instead of developing synergies among various farming activities. Non-farm activities such as food processing, intermediate manufacturing, or the provision of carpentry, food supply, and other services to rural residents could likewise be significant sources of supplemental income. This implies that income diversification and enhancement programmes should involve farm households and communities—and not just individual farmers, farms, or crops—and should incorporate productive opportunities to be taken up by different members of the farm family and the farming community.

A crop and income diversification approach will require a deeper appreciation of farmers' cash flows and liquidity positions in addition to the traditional fixation on yields and incomes.[4] Small farmers typically start a cropping season with very limited cash to purchase farm inputs and hire labour to help prepare their land and plant their crops. Those who have access to credit, whether formal or informal, usually secure funds only for production inputs and generally cannot borrow for subsistence needs. As a result, many small farmers run out of money before they start harvesting and selling their crops. If family emergencies arise, or money is needed for food and other essential needs, small farmers have no option but to borrow from informal creditors, to whom they are forced to mortgage their land or other properties, and usually also their crops. Banks and other formal lending institutions rarely provide loans for subsistence or emergencies, and so farmers end up paying extremely high financing charges to informal lenders, even as they are often forced to pay their debts in the form of their harvests valued at below-market prices. If a farmer's crop is damaged by pests or natural calamities, any unpaid debt is rolled over to the next season under the same onerous terms, placing the farmer in the proverbial debt trap. Crop- and income-diversification strategies can play a large role in helping farmers cope with this vicious cycle of illiquidity and debt by generating incremental amounts of cash on a regular basis while farmers wait for the harvest of their main crop. During emergencies, farmers can sell their pigs or goats instead of being forced to mortgage their properties or borrow at usurious rates.

4 The United Nations has adopted two major indicators to measure SDG 2.3 accomplishments, namely the volume of production per labour unit by classes of farming/pastoral/forestry enterprise size, and the average income of small-scale food producers, by sex and indigenous status. While these performance indicators may suffice at the global level, they will have to be expanded at the operational and field levels to take into account total farm household income, which, as this paper discusses, may come from a variety of agricultural and off-farm activities in addition to primary crops. Cash and disposable incomes of farmers over a cropping season may also be just as critical as absolute incomes levels.

Governments can complement these diversification strategies through other support and social protection programmes. These could include conditional cash transfers or arrangements where farmers can work on local infrastructure projects during their free time and receive payment for their services, such as the Mahatma Gandhi National Rural Employment Guarantee Act food-for-work scheme in India. In other countries, governments provide regular cash transfers to pre-identified families for the education or nutrition of their children. China has been successful in promoting rural enterprises that provide jobs for excess farm labour and augment the incomes of rural households. Health and medical insurance programmes, and emergency relief services following calamities, will likewise help farmers cope with crises when their cash resources are inadequate.

Farmers will need new skills, technologies, and capacities when they venture into new crop- and income-diversification activities—otherwise, they will not be able to take advantage of these opportunities. Farm extension and rural advisory services will have to be intensified in tandem with the development of technologies that are affordable, farming system-based, and simple enough for ordinary farmers to understand and apply. Importantly, these technologies must prove to be profitable to farmers. Governments will in turn have to complement these with infrastructure support, particularly roads, irrigation, and communication facilities, to enable farmers to procure inputs and sell their products and services in a timely manner and at least cost. With mobile telephone services now becoming available even in remote rural areas, user-friendly applications that allow farmers to monitor prices, purchase inputs, or sell their crops electronically could be extremely beneficial and cost-effective.

Many farmers will, however, still baulk at venturing into new activities, even when these offer clear income opportunities and even after they have acquired the acumen to adopt new technologies. Many farmers cannot afford to take risks because they have very little or no savings and resources to fall back on in case of failure. One failed crop will be enough to bankrupt them, and it could take them three to four good crops to recover. Governments will therefore have to build up the confidence of such farmers to venture into new activities, such as through crop insurance programmes that will reimburse farmers for their losses from natural calamities, and loan guarantee schemes that will allow them to renew their credit lines from banks even if they are unable to pay their loans due to crop failures. These safeguards will at the same time make banks and other lending institutions less hesitant to lend to farmers, while giving farmers access to cheaper credit. Linkages with food processors, supermarkets, and other institutional buyers will give added assurance that farmers will be able to sell their products at a profit when they experiment with new crops. Including small farmers and their dependants in social security, health and life insurance, and educational loan schemes will further enable farmers to avoid diverting their funds and attention away from farming activities when personal emergencies arise. Crop diversification activities will complement these risk-mitigation programmes by levelling out cash flows and providing additional funds when needed.

It goes without saying that farmers will continue to need support to improve their productivity and enhance their incomes from their primary crops, which are usually relatively low-value food staples such as rice and corn. This will entail essentially similar interventions to those needed when farmers diversify into other crops and livelihood opportunities. However, the conventional focus of policies and programmes on societal goals such as food security will have to change, and governments should now place a larger emphasis and exert a more conscious effort on improving farmers' welfare in particular. Improved farm incomes will provide a more effective stimulus for farmers to become more

productive and capable of providing sufficient and more reasonably priced food to the population. Since many of the world's malnourished people are farmers, improving the productivity of farmers while at the same time giving them the income and capacity to buy the food they need will be an extremely effective way to achieve food security for a large proportion of the population.

What then would be the role of trade and trade policy in this effort to improve farmers' productivity and incomes, and contribute to the attainment of the larger objective of eliminating poverty and malnutrition? How could trade rules be tweaked so that small producers can benefit from the opening-up of trade, while at the same time ensuring they have an even chance of surviving and prospering when they start competing with producers in other countries?

In theory, trade liberalisation will expand the markets that can be accessed by small producers beyond the local markets they are currently supplying. These new markets can provide better prices and a more stable and dependable outlet for their products. They can give farmers the incentive to expand and diversify their production, improve their efficiency and productivity, and ultimately increase their incomes. Competition from their counterparts in other countries will also push farmers to try out, refine, and adopt new and improved farming technologies that will reduce costs and improve product quality and value.

It is clear from these discussions, however, that domestic policies and support programmes that enhance farmers' productivity and incomes will be the most critical ingredient for enabling small producers to compete in the international marketplace and benefit from freer trade. Farmers will be unable to supply markets, whether domestic or foreign, with acceptable and affordable products if they do not have the capacity, resources, and confidence to do so. Prematurely exposing them to competition from more efficient and better-supported producers from other countries will only exacerbate their situation. There have, of course, been cases where small producers have bucked the trend and have been able to compete and export their products, such as coffee farmers in Viet Nam, fresh vegetable producers in Kenya, and rice farmers in Viet Nam and Thailand. However, the majority of small producers in developing countries are ill-prepared, and it is doubtful whether they will be able to simply export themselves out of poverty.

At the same time, however, shielding farmers from competition will more often than not lull them into complacency and deprive them of opportunities to become better and more profitable farmers. Protection will tend to distract farmers from looking for ways to improve productivity, lower costs, and diversify income sources. In turn, governments will tend to delay needed policy reforms and investments, and divert resources to other concerns, on the pretext that farmers are being protected anyway. For more liberalised trade to help and not harm small producers, it will be important to synchronise efforts to improve the competitiveness of local farmers with initiatives to open up markets to more competition. This will require determined and sustained efforts by governments and farmers on the one hand, and trade rules and governance systems that will ensure fair competition and a level playing field for market players on the other hand.

On the domestic front, marketing infrastructure will have to be upgraded so that farmers' produce can be immediately processed, stored, and delivered to final markets as fast and as efficiently as possible. Electronic trading platforms that will allow producers to monitor prices and market their products to a wider array of buyers in real time will be particularly useful. These will have to be

complemented by marketing infrastructure and efficient logistics for handling agricultural products, which are generally lacking in many developing countries. Governments will also have to adopt domestic trade rules that will enhance competition among input dealers, buyers, and other market players and prevent the manipulation of stocks and prices. Exporters, in turn, will need government assistance in complying with regulations on food safety, sanitary and phytosanitary measures, rules of origin, and other regulations and standards. These interventions at the domestic level will allow local producers to supply local markets efficiently and generate an actual and viable opportunity to channel their surplus to foreign markets.

At the global level, reforms and initiatives will similarly have to be pursued if small producers are to benefit from freer trade. In the area of market access, the current impasse in the World Trade Organization (WTO) over future tariff reform modalities has not prevented aggressive reductions in agricultural tariffs under a host of regional free trade agreements. Many countries have also opted to adopt applied tariff rates that are significantly below their committed bindings. While this trend has had positive effects on trade flows, it can also pose challenges to small producers whose productivity and competitiveness levels are still relatively low. It could also place governments in a precarious situation if imports severely disrupt local markets and vulnerable sectors. Hence, it is important to develop tools that will allow governments to promptly and effectively cope with market disturbances even as they continue to open up their markets. Proposals to adopt a new Special Safeguard Mechanism or improve the current Special Safeguard should be viewed in this light, and not as a veiled attempt by some developing countries to skirt their tariff binding commitments. A safeguard remedy that is inversely linked to applied tariff rates may encourage developing countries to accept more aggressive tariff cuts while obviating the possibility of countries with already high tariffs on certain commodities still availing themselves of the remedy.

In the domestic support pillar, reforms will have to centre on phasing out the high levels of trade-distorting support that many developing countries are still allowed to provide to their producers. At the same time, steps should be taken to ensure other countries comply with their own commitments and limits on subsidies for their producers so they do not end up distorting markets, particularly at the expense of small producers in developing countries. Subsidies allow farmers to fend off imports and at the same time unfairly undercut competitors in the export market. They can deprive small producers in both developed and developing countries of the opportunity to sell their products abroad, even if they are actually more efficient and competitive.

The current system that allows mostly developed countries to continue to provide large trade-distorting subsidies to their producers while most developing countries are subjected to a much lower cap is clearly anomalous. Worse, these countries are even allowed by current trade rules to increase their support by reconfiguring their subsidies and categorising them as non-trade distorting. Recent attempts to cap overall trade-distorting support levels merely propose absolute limits to what heavy subsidisers can do, but they do little to bridge the huge variations in the levels of subsidisation among countries. The clamour of many developing countries to exclude them from any further disciplines on domestic support until the large subsidisers bring down their levels of support to equitable levels is therefore understandable.

Current rules that severely limit the ability of many developing countries to support their small farmers should also be adjusted. For example, the formula for computing the level of subsidy under

a price support programme compares current buying prices with an outdated reference price and assumes that all marketable production is eligible for the price subsidy. As a result, even so-called public stockholding programmes that actually absorb a very small proportion of total output in a country will register a level of subsidisation well in excess of the country's de minimis limits on trade-distorting support. Instead of providing a blanket exemption for such price support schemes from established limits, it may be more reasonable to adopt a more meaningful and accurate formula to capture the actual level of subsidisation arising from such programmes.[5] At the same time, stocks procured under such public stockholding programmes should not be allowed to be exported and end up distorting markets elsewhere.

The WTO Ministerial Decision in Nairobi in 2015 to eliminate export subsidies and impose stricter rules on other export competition instruments finally corrects a historical anomaly where a few large subsidisers managed to retain the option to provide huge subsidies while most developing countries are not allowed to introduce any similar support to their exports. Still, some exemptions have been retained and some countries may still decide to subsidise their exports. Affected countries must be allowed to protect themselves, and rules on anti-dumping and countervailing duties may have to be simplified so as to make these trade remedies more accessible and useful. Additionally, steps should be taken to prevent the reconfiguration of export subsidies into domestic support measures that have the same distortive effect.

Unless global trade rules are reformed not only to remove trade distortions but also, more importantly, to ensure a truly level playing field and prevent unfair trade practices, opening up markets and liberalising trade will generally not benefit small producers in developing countries and may even put them at greater risk. Even when such trade opportunities become accessible, often most of the gains will be captured by processors, traders, and speculators, while small producers will typically end up with a disproportionally small share of the profit. As global trade reform is pursued and governments implement the necessary programmes at the domestic level, conscious efforts will have to be made to ensure farmers will be able to take advantage of the new opportunities proffered by freer trade. In turn, farmers will have to be better organised, and should move up the value chain and graduate into processing, marketing, and related ventures, in order to capture a more significant share of the final value of their product.

This discussion on the continuing need to reform trade and the apparent resistance of many countries to calls for the removal of trade-distorting practices shows that efforts at poverty alleviation, including those that will enhance farmers' productivity and incomes, are not always benign activities where support is unanimous and everybody comes out a winner. In many cases, people (and countries) benefit from the poverty and backwardness of others. Changing the status quo therefore represents real threats to their interests and will meet stiff opposition from them even if they know that they are hurting other people, particularly poor farmers in developing countries, in the process. Political will, enlightened leadership, and global consensus will be important in forcefully pursuing the needed reforms and ensuring the benefits derived from these reforms are shared equitably among stakeholders.

5 The current formula for computing the subsidy under a price support programme for a commodity uses the difference between the 1986–1988 average price of imports of the commodity (called the reference price) and the current procurement price and multiplies this by the total volume of production of the commodity for the year. There have been suggestions to replace the 1986–1988 reference price with a rolling average of import prices for the preceding three (or five) years. Others have proposed that only the volume actually procured be used in the computations (Montemayor 2014).

At the same time, leaders will have to come to a shared realisation that eliminating poverty and improving the welfare of large numbers of small producers, even if it requires sacrifices and concessions in the immediate term, will ultimately redound to the benefit of all. At the domestic level, more purchasing power in the hands of large numbers of small producers will create the demand for industrial products and services that will generate jobs in the cities and spur faster and more equitable economic growth for the whole population. At the global level, removing trade distortions that will provide better opportunities for developing countries to export their products and import their needs will lead to even higher growth in trade for all countries.

On the other hand, focusing on one's self-interest while paying only lip service to initiatives to help small farmers increase their yields and generate more income will be self-defeating in the end. Adopting SDG aims and funding poverty-eradication programmes will be meaningless for as long as countries maintain trade-distorting practices that ruin farmers' livelihoods and deprive them of opportunities to improve their welfare. The rise of conflict, terrorism, and refugee migration in recent years only goes to show that, inevitably, there is a huge price to pay for neglecting the plight of the world's poor and hungry people.

References

FAO. 2017. "Proposed International Definition of Small-Scale Food Producers for Monitoring SDGs 2.3.1 and 2.3.2." Draft. Rome: Office of the Chief Statistician and Statistics Division, Food and Agriculture Organization (FAO). http://www.fao.org/3/a-bt612e.pdf.

IFAD. 2011. *Rural Poverty Report 2011: Facts and Figures*. Rome: International Fund for Agricultural Development (IFAD). https://www.ifad.org/documents/10180/c1bbf5fa-bdc3-4ea6-9366-d163b95b1180.

Lowder, S., T. Raney, and J. Skoet. 2014. "The Global Distribution of Smallholder and Family Farms." Washington, DC: Consultative Group to Assist the Poor. http://www.cgap.org/blog/global-distribution-smallholder-and-family-farms.

Mikecz, O., and R. Vos. 2016. *Can Smallholders Double Their Productivity and Incomes by 2030?* ESA Working Paper No. 16-05. Rome: Agricultural Development Economics Division, Food and Agriculture Organization (FAO).

Montemayor, Raul. 2014. *Public Stockholding for Food Security Purposes: Scenarios and Options for a Permanent Solution*. Issue Paper No. 51. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Roser, M., and E. Ortiz-Ospina. 2018. "Global Extreme Poverty." Our World in Data. https://ourworldindata.org/extreme-poverty.

United Nations. 2017. "Sustainable Development Goal 2." Department of Economic and Social Affairs, Sustainable Development Knowledge Platform. https://sustainabledevelopment.un.org/sdg2.

World Bank. 2016. *Poverty and Shared Prosperity 2016: Taking on Inequality*. Washington, DC: World Bank. http://www.worldbank.org/en/publication/poverty-and-shared-prosperity.

World Bank. 2017. *Agriculture and Food*. Washington, DC: World Bank. http://www.worldbank.org/en/topic/agriculture/overview.

SDG 2.4: Can Policies Affecting Trade and Markets Help End Hunger and Malnutrition within Planetary Boundaries?

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In 2015, as part of the 2030 Agenda, which calls for ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture (Sustainable Development Goal (SDG) 2), SDG 2.4 established the objective of "ensuring sustainable food production systems and implementing resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality."

Currently, the world's food system, which can be defined broadly as "a system that embraces all the elements (environment, people, inputs, processes, infrastructure, institutions, markets and trade) and activities that relate to the production, processing, distribution and marketing, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes" (HLTF 2018), is unsustainable from both a social and an environmental point of view.

While this paper focuses on SDG 2.4, it is important to address the multidimensional challenges faced by the food system and to contribute to the realisation of other SDGs, in particular SDGs 2, 6, 12, 13, 14, and 15. Moreover, alongside agricultural production, it is crucial to consider issues linked with food consumption, such as diets, food packaging, and food waste. Finally, multilateral targets other than the SDGs need to be taken into account, especially the 2050 net zero goals of the Paris Agreement on climate change,[1] but also those contained in multilateral environmental agreements that are relevant for agriculture, such as the United Nations Convention on Biodiversity.

In a context of demographic change and regional disparities in projected population trends, there is an emerging consensus on the need for a major transformation of the world food system. However, there is little consensus on credible pathways towards sustainability, and even less agreement on the roles that trade, markets, and investment can play among other drivers of change.

Notwithstanding this complexity and polarisation, it is urgent to establish a forward-looking regional, plurilateral, and multilateral trade agenda, looking at how best to internalise the current environmental externalities of the food system, through the following tools: subsidies, pricing mechanisms, rules and regulations, and finance.

To kick-start such an ambitious agenda, confidence-building measures might be necessary, including:

- Closing the knowledge gap regarding the links between trade, investment, and sustainable food consumption and production.
- Building confidence through the G20 agricultural ministers process.
- Mainstreaming trade within the agricultural work programme of the United Nations Framework Convention on Climate Change (UNFCCC).
- Creating an independent trade and SDGs commission under the aegis of the World Trade Organization (WTO).

1 The Paris Agreement refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount of carbon sequestered.

An Unsustainable Food System

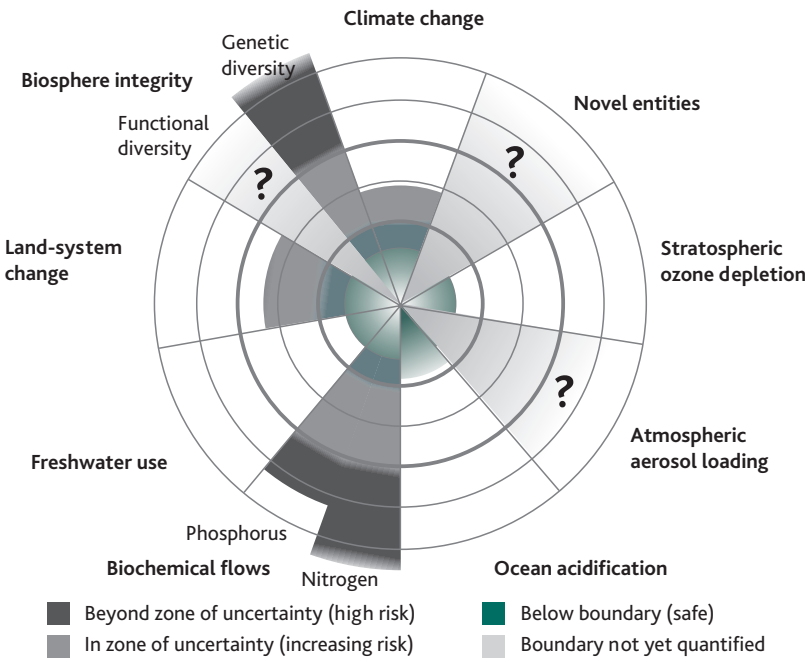
Environmental challenges

Today's world food and agricultural system is taking a huge toll on the world's environment. Under business-as-usual trajectories, some of the nine planetary boundaries, defined as "the environmental limits within which humanity can safely operate," might be crossed well before or by 2050, with a high risk of irreversible damage to the environment and to the ability to produce healthy, nutritious food for all (Table 1 and Figure 1) (Steffen et al. 2015).

Table 1: Key environmental challenges linked to agriculture and food

Issue	State of play
Soil health	10 million hectares abandoned per year because of soil erosion and related loss of productivity (Pimentel and Burgess 2013, 443) 5 billion tonnes of soil eroded by tillage every year (Pierzynski and Brajendra 2017, 3) Decline in soil's capacity to retain nutrients, retain moisture, and maintain a healthy pH, with soil being lost "10 to 40 times faster than it is being replenished" (Lang 2006)
Greenhouse gas emissions	"[Greenhouse gas] emissions from agriculture, forestry and fisheries have nearly doubled over the past fifty years" (FAO 2014) due to crop and soil management, enteric fermentation, and manure management
Land conversion	37 percent of the planet's landmass outside of Antarctica is dedicated to growing food (Besada, McMillan Polonenko, and Agarwal 2017, 413) The majority of current land-use change in the world comes from forests, wetlands, and grasslands being converted into farms and grazing pastures; for instance, world agriculture was responsible for roughly 80 percent of tropical deforestation between 2000 and 2010 (Butler 2012)
Biodiversity loss	About three-quarters of the genetic diversity found in agricultural crops has been lost over the past century, and this genetic erosion continues (Schröder, Begemann, and Harrer 2007, 29); "90% of our food energy and protein comes from only 15 plant and 8 animal species" (CBD Secretariat 2018) Agriculture is a major contributor to habitat loss, pollution, and eutrophication of ecosystems (WWF 2017)
Water use and pollution	Agriculture accounts for 70 percent of the world's freshwater withdrawals (UNESCO 2016, 3) "A 14 percent increase in water withdrawals for irrigation is expected for developing countries by 2030" (FAO 2002) Impacts of excess nutrients and chemical pesticides include pollution and eutrophication of surface waters and impairment of groundwater
Material footprint	Lost or wasted food has high environmental costs—perhaps 30 percent of the world's agricultural land is devoted to producing food that will never be eaten (IFPRI 2016, 6) Food and beverage packaging constitutes more than half of all packaging uses (food 41 percent, beverages 14 percent) (Muncke 2009)

Figure 1: The current state of planetary boundaries



Source: Steffen, W., K. Richardson, J. Rockström, S.E. Cornell, I. Fetzer, E.M. Bennett, et al. 2015. "Planetary Boundaries: Guiding Human Development on a Changing Planet." Science 347 (6223): 1259855. http://science.sciencemag.org/content/347/6223/1259855.

Health and socioeconomic challenges

The current world food system is contributing to suboptimal health and social outcomes, which need to be addressed to realise SDGs, notably SDG 1 and SDG 3:

- Two billion people are affected by under-nutrition and micro-nutrient deficiencies (FAO 2011b), and many of them are farmers. The vast majority of smallholder rural households are operating close to or below the US$ 2/day poverty line. In many countries, farmers' incomes are well below national averages.

- There are major gender gaps in the agricultural sector, marked by women facing more constraints in accessing productive resources, markets, and services (FAO 2011a; IFPRI 2014), and lost opportunities for women to play a greater leadership role in ecological restoration.

- There is a major increase of food-related illnesses, with 1.9 billion adults being overweight in 2016, of whom 650 million were obese (WHO 2017). The global economic impact of obesity amounts to about 2.8 percent of global gross domestic product (GDP) (Dobbs et al. 2014).

- Agriculture practices, notably the use of antibiotics in high-density livestock farming models, are contributing to antimicrobial resistance and the risk of pandemics (EPHA 2017).

What pathways towards global sustainable food production, trade, and consumption?

While there seems to be a general consensus that fundamental changes are required to ensure food production meets the needs of a growing population without crossing planetary boundaries, there is little scientific or political consensus as to which models or pathways would allow the world's food and land-use systems to fit within planetary boundaries, in line with the best available science, the SDGs, and the Paris Agreement. The main difference of opinion lies in assumptions made about the relative importance and feasibility of tackling supply-side and demand-side issues, and the type of agricultural production models that should be encouraged—for instance, sustainable intensification versus agroecology. The different socioeconomic impacts of these models, in terms of employment and equity, and the role of innovation and technology in reaching SDG 2 are also important factors of disagreement.

Many studies regarding sustainable pathways for agriculture take as a central assumption the need for a major increase in agricultural production. In fact, the Food and Agriculture Organization (FAO) reports that the world's food producers will need to produce 60 percent more food by 2050 to feed a projected world population of 9.6 billion people (Alexandratos and Bruinsma 2012, 7). This projection assumes that global food demand will increase in quantity and quality due to urbanisation and increases in average incomes in emerging countries. The same study projects that by 2050, world calorie consumption per capita will increase by 10.7%, with the biggest relative increase coming from Africa and South Asia. Livestock meat, milk, eggs, and vegetable oils represented 22% of calorie consumption in developing countries in 2005–2007; this share is expected to rise to 28% by 2050 (Alexandratos and Bruinsma 2012, 23, 41). "As nations urbanize and their citizens become wealthier, people generally increase their calorie intake and the share of resource-intensive foods—such as meats and dairy—in their diets" (WRI 2016, 1).

However, some studies conclude that a more modest growth in agricultural production might be required, estimating that an increase of approximately 25–70 percent above current production levels may be sufficient to meet 2050 crop demand (Hunter et al. 2017, 386). Others question the need for growth altogether, by pointing to the need to tackle demand-side issues, through healthier and more sustainable diets, moving away from using food crops for the production of energy, and achieving a drastic reduction in food waste (at the production, transportation, transformation, selling, and consumption stages).

Moreover, there is dissent regarding projections for increases in agricultural productivity to 2050. The FAO projections indicate that "average cereal yields at the global level will expand by 11% by 2026 relative to [2014–2016], with annual growth rates projected to slow" (OECD and FAO 2017, 104). Other studies, with a longer time frame, come to a different conclusion. For example, the World Bank (2013) projections suggest that due to climate change, global cereal yields might fall by 20 percent by 2050.

Within this complex picture, a way forward would be to set as a hypothesis for discussing future pathways the need for the total material footprint of nutrition to be in line with planetary boundaries, by ensuring it grows more slowly or even declines by 2050, which effectively means a reduction in the average per capita material footprint of nutrition (Cassidy et al. 2013; Hiç et al. 2016; Lettenmeier et al. 2012).

Box 1: The material footprint of nutrition: the example of Europe

Taking into account the whole life cycle of the products (from the extraction of raw materials to the processing industry, distribution, consumption, recycling, and disposal), the concept of material footprint aims at measuring and optimising the resource consumption of both products and their ingredients and the production processes along the whole value chain. The material footprint of average diets in 13 European countries ranges between 4.3 and 7.0 tonnes per person in a year. In order to decrease resource consumption to a level in line with the planetary boundaries, the entire material footprint of household consumption (including mobility, nutrition, and housing) should achieve a level of 6–8 tonnes per capita per year by 2050. As the nutrition-related material footprint of households and countries may already reach an average level of 6–8 tonnes, it is estimated that the material footprint of nutrition has to be reduced significantly by 2050.

Source: Lettenmeier, M., C. Göbel, C. Liedtke, H. Rohn, and P. Teitscheid. 2012. "Material Footprint of a Sustainable Nutrition System in 2050: Need for Dynamic Innovations in Production, Consumption and Politics." Proceedings in Food System Dynamics and Innovation in Food Networks 2012: 584–98.

Moving forward, the distributional effects of a transition towards a sustainable food system also need to be taken into account. From a global fair share's perspective—requiring a fair distribution of finite resources, including carbon, among potential users—efforts should be distributed fairly among countries. Based on the "common but differentiated responsibilities and capacities" principle of the UNFCCC, many developing country governments argue for the need for developed countries to take the lead in decarbonising agriculture. According to this line of thinking, developing nations should not be asked to take on commitments, or should be given financial support to do so, in light of the necessary increase in average calorie intake per capita required in many developing countries and the immense challenges faced by developing countries in transforming their agricultural sectors. This differentiated approach would be in line with the need for many rich countries to reduce average calorie or meat consumption per capita for health reasons (WRI 2016). The same kind of reasoning could be applied within each country—for instance, that efforts should be distributed fairly among individuals and sectors, to avoid an unjust transition that would create a disproportionate burden for the poorest and the most vulnerable people.

What Role for Trade and Investment?

Alongside public domestic policies, trade, markets, and investment trends and rules are bound to play an important role in facilitating or hindering the transition towards sustainable agricultural practices:

- Trade liberalisation, through a reduction in tariffs and non-trade barriers, can put downward pressure on farm gate prices, making it difficult for producers to bear the cost of higher environmental standards—unless their competitors are under the same constraint.
- Subsidies can hinder or increase the capacity of the sector to adapt to environmental and climate change; for instance, subsidising crop insurance (instead of providing other forms of financial support, conditional on changing practices) could insulate producers from increased climate risk and create a disincentive to the adoption of climate-smart practices.
- Liberalisation of foreign direct investment (FDI) in the food and land sector affects private-sector behaviour, notably competitive strategies among major players in agro-business and global value chains, or the role of private investors in financing sustainable production projects at scale and possibly divesting from unsustainable production.
- Intellectual property rules impact on the ability to diffuse technological and other innovations within agriculture.

An increasingly globalised food system …

Transitioning to a sustainable pathway will take place within an increasingly globalised agriculture and food system. Agriculture represented 10 percent of total merchandise exports in 2016 (WTO 2017b, 10). The value of world exports of agricultural products has increased by 70 percent since 2006, or an average of 5 percent per year between 2006 and 2016 (WTO 2017b). In part, this sharp increase is due to the increase in the price of major food commodities. It is also important to note that not all countries and sectors have been moving in the same direction.

Agricultural trade is effectively a lifeline to many countries because of a high degree of dependence on imports as a proportion of the country's total food consumption. This is due to trade and agricultural policies and natural constraints. Sixty-six countries are already incapable of meeting their domestic food needs (Clapp 2015b, 5), and this number is expected to increase in the face of climate change. An estimated 16 percent of the world's population relies on international trade to meet their food needs, and this proportion is predicted to rise to 51 percent by 2050 if current trends prevail (Clapp 2015b, 6). The *OECD–FAO Agricultural Outlook 2017–2026* observes that continued growth in international agriculture and fish trade is projected, albeit at a slower pace—at about half the previous decade's rate (OECD and FAO 2017).

When taking into account the trade dependence of the entire food system, from farm to fork, one needs to look at upstream and downstream trade. The food system relies on trade for a significant proportion of its inputs (e.g. farm equipment, seeds, financial services, transport, logistics). For example, "international trade in pesticides products grew from around $4.5 billion in 1980 to over $23 billion in 2009" (Niemi and Huan-Niemi 2012, 6).

Global agricultural trade has changed considerably in structure, with an increased importance of high-value products such as horticultural products and dairy and meat products (World Bank 2008). Developments in global agri-food markets have also resulted in changes in the way global agricultural value chains are organised, with increasing levels of vertical coordination, consolidation of the supply base, and increased dominance of large multinational food companies (McCullough, Pingali, and Stamoulis 2008). Investment, including FDI, in food production, processing, and retail is expanding rapidly, including in middle- and low-income countries (Maertens and Swinnen 2014).

> Around 70 per cent of the value added in agro-industrial exports in 2011 originated from industries supplying inputs to agricultural firms to produce their exports. [Within this 70 percent] intermediate products from primary industries, mainly consisting of agricultural inputs, represented 23 per cent of the overall value added in the sector's exports. Inputs from other manufacturing industries such as fertilizers, pesticides, tools and agricultural machinery, represented 10 per cent of this total, [with] the share of services ... reaching 38 per cent of the total value added in 2011 (WTO 2017b, 43).

Over the past 10 years, several agricultural commodities have also experienced significant price volatility. Alongside other factors, the magnitude and the frequency of price spikes have led some to believe that we have been moving from a demand-constrained to a supply-constrained agricultural trading system (ICTSD 2014b, 2).

With still high levels of trade and investment protection ...

Notwithstanding these globalisation trends, agriculture remains a highly protected sector, in terms of both trade and investment, which explains why it is a key topic at WTO and in regional trade negotiations:

- A growing number of countries resort to subsidies to support domestic agricultural production. In the case of cotton, a crop whose production has major environmental costs, overall support measures for the sector, including direct support to production, crop insurance subsidies, and minimum support price mechanisms, reached record levels in 2014–2015 (ICTSD 2016, 44). Subsidies are also common for products associated with high greenhouse gas emissions, such as livestock products, livestock feed, and rice.

- Because of concerns regarding food security, several countries, for instance China, India, Indonesia, and the Russian Federation, resorted to export prohibitions and restrictions to minimise domestic food price increases during the 2008 and 2011 price spikes on international markets (ICTSD 2014a).

- The percentages of tariff peaks (applied tariffs above 15 percent) in agricultural products are 30 percent, 41 percent, and 48 percent for developed, developing and least developed countries, respectively. In the case of a high-carbon food item such as meat, the percentage of tariff peaks is even higher, reaching 46 percent, 54 percent, and 66 percent, respectively (UNCTAD 2014, 3 and 4).

- Non-tariff barriers are common in agriculture, including quotas, licensing, packaging, and labelling requirements; sanitary and phytosanitary rules; food, plant and animal inspections; rules of origin; and import bans.
- According to the *FDI Regulatory Restrictiveness Index* in 2017, FDI restrictions tend to arise mostly in primary sectors such as mining, fishing, and agriculture. For agriculture, this includes restrictions regarding leasing and ownership of land by foreign entities (OECD 2017).

And whose further liberalisation is questioned on the grounds of environmental protection and sustainability

In both developed and developing countries with large agricultural sectors, there is considerable political support, often under pressure from domestic lobbies, for maintaining high levels of protection in some or all agricultural sectors, mostly on the grounds of concern for food security, environmental protection, and farmers' livelihoods. This is partly due to the difficulty of modelling and predicting the environmental impacts of trade and investment liberalisation, leading many stakeholders to take a precautionary approach, preventing further liberalisation.

The application of economic or land-use models in the context of trade only provides a partial picture of the environmental impacts of trade and investment liberalisation within the agricultural sector. This quantitative approach therefore needs to be complemented by qualitative data. In practice, a combination of these approaches is often used in case studies and in sustainable impact assessments under free trade agreements (Kuik et al. 2018).

There is also a longstanding school of thought on non-trade concerns in agriculture. In 1994, the Uruguay Round Agreement on Agriculture, through Article 20, invited WTO members to "take into account … non-trade concerns." Non-trade concerns are defined by the agreement's preamble as food security and environmental protection, and they were reaffirmed as part of the Doha mandate for WTO negotiations. Some members have an even broader perspective and include structural adjustment, rural development, and poverty alleviation. "This reflects a concern that free market expansion and globalization may undermine the provision of valued non-market amenities and cultural traditions associated with agriculture" (Barthélemy and Nieddu 2007, 520).

These concerns are not without grounds. Several studies point to negative environmental impacts of trade liberalisation in specific sectors and countries (Azhar, Khalil, and Ahmed 2007; Feridum, Ayadi, and Balouga 2006; McCarney and Adamowicz 2005; UNEP 1999). This is especially the case for specific agricultural products, such as globally traded meat, feed, and ingredient crops such as soy and palm oil (Clapp 2015a, 15). The rise in production geared to global markets can mean shifting to large-scale monoculture farming operations, whose environmental effects can range through biodiversity loss, land conversion, and water depletion. These concerns are less prevalent in the case of crops grown by small farmers as part of biodiverse farming systems. Others point to the lack of attention paid by trade proponents to the environmental impacts of the transportation, processing, packaging, and cold storage of food, the loss of genetic diversity linked with specialisation and intellectual property rules, or the diffusion of an industrial model of production through large-scale land acquisitions (Clapp 2015a).

Table 2: Sustainable production and consumption: key pro- and anti-trade arguments

	Potential benefits	Potential downsides
Greater efficiency	Support for sustainable production systems through specialisation and competition, leading to allocative and price efficiency, reducing pressure on the environment, and lowering prices of sustainable food for consumers	Rebound effect: producers take advantage of increased efficiency to produce yet more goods, with potential negative environmental impacts; e.g. following technological improvements that reduce the environmental footprint per unit of production, farmers might increase production by clearing forests, exhausting finite resources, or consuming more environmentally harmful inputs Diffusion of unsustainable mass consumption models leading to an increase in consumer demand; e.g. trade liberalisation can lead to a reduction in the price of products with a high environmental footprint, which might lead to a change in consumer demand and diets, increasing their net environmental footprint. For instance, world chocolate confectionary consumption has increased in volume by 10 percent since 2012; chocolate is among the most water-intensive commodities in the world, with the production of 1 kg of chocolate requiring 24 000 litres of water (Hoekstra 2008; Statista 2018) Global value chains, delinking producers and consumers, and food price and farm gate costs, can lead to an increase in the market power of intermediaries
Diffusion of technology	Diffusion of cleaner technologies through imports of innovation embodied in intermediate and capital goods; transfer of knowledge	Intellectual property rights increase the costs of accessing new technologies, promote rent-seeking rather than innovation, and discourage replication or adaptation of new technologies
Resilience to shocks	Deeper agricultural markets allow smoothing of domestic production shocks linked with natural disasters or other sources	Net food-importing countries, which depend on world markets, are vulnerable to price spikes on world markets and uncoordinated response measures
Access to investment	Foreign direct investment into more sustainable production systems, fuelled by global supply chains, higher standards of multinational companies, and demands of more affluent consumers	Exploitation of natural resources due to lack of domestic regulations, insufficient traceability, and lack of sharing of benefits

However, yet others conclude that domestic agricultural, environmental, and economic policies, rather than trade per se, are by far the primary cause of environmental degradation (Choudhary, Singh Chauhan, and Kumar Kushwah 2015; Kinda 2013; Nordström and Vaughan 1999). This school of thought is in line with a cornerstone principle of WTO, which does allow for environmental regulation as long as it does not discriminate between domestic producers and importers.

Moreover, there is evidence linking trade to improvement of environmental outcomes, for instance in the case of organic agriculture—noting that the surface of agricultural land under organic agriculture is used as a proxy indicator for the proportion of agricultural area under productive and sustainable agriculture by the United Nations Conference on Trade and Development in its monitoring of SDG 2.4 (UNCTAD 2016, 15). Arising from a change in consumer demand, the rise in organic agriculture has also been facilitated by cross-border trade and investment. Organics is one of the fastest-growing food markets worldwide, valued at about US$ 82 billion in 2015 (FiBL 2017, 15).

> In 2013, there were 170 countries with certified organic agriculture, with almost 2 million producers farming just over 43 million hectares of organic agricultural land. Organic agricultural land today accounts for about 1 per cent of total agricultural land... About one

> quarter of the world's organic agricultural land and more than 80 per cent of the producers are in developing countries... The growth in land certified for organic agriculture has been significant over the past decade and a half, rising from just under 15 million hectares in 2000 to more than 43 million hectares in 2013 (UNCTAD 2016, 15).

Summarised in Table 2 are the key arguments in favour of or against greater trade and investment liberalisation vis-à-vis sustainable production and consumption.

A Forward-Looking Agenda

Within this complex picture, marked by continuing controversy around trade and globalisation, what could be a forward-looking agenda for WTO, the G20, other multilateral fora, and regional trade agreements (RTAs) to improve the chances of reaching SDG 2.4?

Given the specificity of each country's challenges in meeting SDG 2.4 (in terms of natural environmental constraints, the structure and competitiveness of the agricultural sector, poverty, health, and food security concerns), domestic agricultural sustainability strategies, including net zero greenhouse gas emissions by 2050, should be crafted at the domestic level. In most countries, internalising externalities (Pretty et al. 2013) will imply a reorientation of domestic agricultural, food, and sometimes energy and climate policies, as well as a renewed effort in research and development and capacity-building of farmers and other key actors within the food chain. The role of trade and investment policies should be to create an enabling environment in which such domestic strategies can best be implemented.

So that concerns about loss of competitiveness do not thwart domestic sustainability efforts, and in light of the high level of interdependence between countries, coordinated approaches that take into account cross-border effects should therefore be considered. For instance, better notification procedures, alongside effective global disciplines to ensure sustainability, should be used to address the expansion of mandated production of biofuels (Díaz-Bonilla and Hepburn 2016).

Potential priorities for action

Subsidies

The concept of trade-distorting subsidies needs to be complemented by the notion of subsidies that are environmentally harmful or distort climate change measures. The 2017 WTO decision on fisheries, which calls for comprehensive and effective disciplines that prohibit certain forms of fisheries subsidies that contribute to overcapacity and overfishing, could be used as a precedent (WTO 2017a). Such subsidies should be phased out within a specific time frame, even if they have no trade-distorting impact. Currently, measures deemed as green by WTO could be supporting unsustainable agricultural practices. Moreover, some amber and green box subsidies, which insulate farmers from the effects of climatic variability in the form of reduced insurance premiums or relief from natural disasters, can serve as a disincentive to adaptation or even a perverse incentive, for example to farm marginal land.

Trade negotiations should also aim at the elimination of subsidies that have a direct or indirect impact on sustainable agriculture (Table 3), such as:

- subsidies for unsustainable energy, including fossil-fuel subsidies, or other subsidies to non-sustainable energy production (including biofuels)
- subsidies for direct inputs such as pesticides and fertilisers and indirect forms of subsidy (e.g. free, or severely underpriced, water use).

Subsidies with minimal trade-distorting effects are already allowed by WTO. However, there might be cases when payments under agri-environmental or climate adaptation schemes may be considered as indirectly contributing to increased output by maintaining producers and farms in production, when they might otherwise cease to exist (for instance, high-nature-value farming). As such, they could be challenged under the Agreement on Subsidies and Countervailing Measures. This is why a peace clause for subsidy measures to encourage sustainable production and consumption could be explored. For these measures to be eligible, a country would need to have a long-term sustainability plan in place and show how measures would be effective in reaching the objectives of that plan, in line with the SDGs, the Paris Agreement, and other multilateral environmental agreements. This would require enhanced scrutiny of the environmental integrity of the measures within the UNFCCC or the Agricultural Committee of WTO. Another approach would be a negotiated clarification of Annex 2 of the Agreement on Agriculture to ensure coverage of policies necessary to implement the Paris Agreement or to ensure sustainable agricultural production as part of SDG 2.4.

Table 3: Towards a new classification for subsidies

Type of impact	Trade-distorting	Non-trade-distorting
Negative effect on SDG 2.4	Prohibited	To be eliminated over a certain number of years
Positive impact on SDG 2.4	To be allowed under certain conditions	Allowed

Global pricing schemes and taxes

The effort to achieve a global carbon price (including in international transport) within the UNFCCC, International Maritime Organization, and International Civil Aviation Organization should be considered within WTO and RTAs, with a view to exploring trade-related aspects and measures that could support the linkage between carbon markets and reduce carbon leakage. Such measures could have a significant impact on agricultural markets, especially if carbon markets are extended to cover all primary sectors.

Rules and regulations

Article XX of the General Agreement on Tariffs and Trade (GATT) includes the protection of plant, animal, and human health and the conservation of exhaustible natural resources as an exemption that can justify diverging from its rules. However, the article is not operationalised and therefore is rarely invoked. Taking as a precedent the 2001 Doha Declaration on the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and public health, which states that "we agree that the

TRIPS Agreement does not and should not prevent members from taking measures to protect public health,"[2] Article XX could be complemented by a formal WTO ministerial declaration clarifying that "This agreement does not and should not prevent the realisation of SDGs, the Paris Agreement and Multilateral Environmental Agreements," which would facilitate recourse to such a clause and provide guidance to the WTO Dispute Settlement Body. To prevent misuse of the clause, specific guidelines could be provided to ensure such measures are specific, effective, and proportionate. Using existing precedents as a basis to build on,[3] similar clauses could be introduced within other regional trade agreements.

There are also opportunities for exploring further application of production and trade restrictions for food or food-related products whose mass production and consumption are clearly incompatible with sustainable agricultural production, on the model of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or the timber and conflict minerals import bans. For instance, one could explore banning the trade in pesticides that are domestically prohibited due to their negative health and environmental impacts. Regulating trade in finite resources that are critical inputs for agricultural production, such as phosphorus, might also be worth envisaging. Another potential track would be a trade ban on environmentally harmful food packaging or products used in the food industry, such as plastic bags or single-use plastics, which are now domestically prohibited in a growing number of countries.

Trade- and investment-related measures could be implemented in order to encourage sustainability, such as environmental performance requirements within investments; environmental standards and regulations; and ecodesign and labelling policies.

In terms of innovation and technology transfer, the price of technology, and access to it, are major hurdles in the way of more sustainable forms of production. There is also a lack of research and development suitable for different ecosystems and farming systems, including those in many developing countries; hence there is the need for an international research and development treaty, incentives for public open-access research, and the introduction of greater flexibilities in terms of intellectual property.

Finance

In line with the 2015 Addis Ababa Action Agenda on means of implementation of the SDGs, donor governments might envisage the creation of a sustainability adjustment fund to support poorer countries facing particularly high adjustment costs because of the nature of their farming systems and export orientation.

2 A similar clause on trade and food security was discussed by the African group and G77 at the WTO in 2012–2013.

3 Article 24.4 of the Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union and its Member States says: "The Parties acknowledge their right to use Article 28.3 in relation to environmental measures, including those taken pursuant to multilateral environmental agreements to which they are party" (European Commission 2017). Article 28.3 includes, among other general exceptions, environmental measures necessary to protect human, animal, or plant life or health or measures for the conservation of living and non-living exhaustible natural resources.

Potential fora and processes

G20

The G20 has a longstanding agenda on both trade and food security, which needs to be complemented by equal attention to the sustainability of the agricultural and food system. At the 2017 Hamburg Summit, the G20 pledged to enhance food security, through a commitment to increase agricultural productivity and resilience in a sustainable manner, while aiming to protect, manage, and use water and water-related ecosystems efficiently. The G20 agricultural ministers' declaration also made commitments to greater water efficiency in agriculture. Finally, the G20 elaborated an action plan for taking forward the implementation of the 2030 Agenda for Sustainable Development. The G20's agenda on fossil fuel subsidies could be expanded to look at all forms of environmentally harmful subsidies in the context of the SDGs.

World Trade Organization

Following the adoption of the 2030 Agenda and the Paris Agreement, WTO could reconsider the nature of its rules (for instance, on process and production methods). Another issue pertains to agricultural negotiations. For instance, the classification of subsidies should take into account the impact of subsidies on the environment and climate (see above).

The negotiations on environmental goods and services could be much more specific in terms of their links to SDGs and the Paris Agreement, giving priority to goods and services most likely to support sustainable production practices in line with SDG 2.4. Focusing on a particularly harmful sector, following the precedent of the fisheries agreement, could provide a new impetus to negotiations. This could be developed further by taking a value chain or circular economy approach, which would allow for identification of trade-related measures throughout the supply chain, from inputs to the consumption and disposal of final products (ICTSD and World Economic Forum 2016).

Regional trade agreements and plurilateral agreements

RTAs, building on the model of CETA, should include in their operating text a clarification on the primacy of SDGs, the Paris Agreement, and multilateral environmental agreements over their trade and investment provisions. This could include specific clauses in the case of products and sectors whose further expansion, without a change in production practices, would lead to net negative environmental outcomes, using the example of provisions around timber and conflict minerals.

RTAs could also explore measures to incentivise sustainability, with deeper commitments around environmental goods and services, such as the European Union–Chile agreement on organic products. The approach to harmonisation of standards needs to be based on potential pathways for achieving sustainable food production, trade, and consumption, rather than simply liberalising trade. Countries negotiating trade agreements should commit to improving the quality of sustainability impact assessments and, more specifically, to ensuring their conclusions influence the content and outcome of the negotiations.

At the plurilateral level, the government procurement agreement could be amended to include provisions regarding green procurement in agriculture and food.

Conclusion

Given the polarised nature of the debate and the dependence of many countries on agricultural and food trade, achieving consensus on how best to create enabling conditions for sustainable consumption and production of food through trade and investment will be a long and complex endeavour. Therefore, no-regret and confidence-building measures might be necessary in the first instance to pave the way to future change. Here are four potential ways forward:

1 Close the knowledge gap regarding the links between trade, investment, and sustainable food consumption and production by tasking FAO and the Organisation for Economic Co-operation and Development (OECD) to compile a report for the G20 on pathways to sustainable food production and consumption, encouraging WTO to publish its next World Trade Report on SDGs (or, more specifically, on SDG 2), or enhancing efforts under way to establish metrics for sustainable production within the United Nations 2030 Agenda process.

2 Build confidence through the G20. The G20 agricultural ministers' track should be tasked with exchanging domestic experiences on pathways to the sustainable production and consumption of food, including trade interdependencies. Another approach could be to start informal discussions on specific issues whose resolution would have a major impact in terms of sustainability, such as the future of the livestock sector.

3 Discuss trade within UNFCCC agricultural negotiations by including a workshop on trade and investment issues within the newly agreed work programme for the agricultural track of the UNFCCC negotiations, which should conclude in 2019.

4 Establish an independent trade and SDGs commission. The WTO Director-General should establish an independent, interdisciplinary scientific commission, using the precedents of the 2004 Sutherland Report (Sutherland et al. 2004) and the 2007 Warwick Commission (University of Warwick 2007). The commission would be tasked with producing a report, to be published in 2019, on trade, investment, and SDGs. It could also focus on sustainable food consumption and production or on trade and climate change, in light of the two upcoming reports from the Intergovernmental Panel on Climate Change:

   - Special report on the impacts of global warming of 1.5 °C above pre-industrial levels in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, with consideration for ethics and equity.
   - Special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.

References

Alexandratos, N., and J. Bruinsma. 2012. *World Agriculture towards 2030/2050: The 2012 Revision.* ESA Working Paper No. 12-03. Rome: Food and Agriculture Organization (FAO).

Azhar, U., S. Khalil, and M.H. Ahmed. 2007. "Environmental Effects of Trade Liberalisation: A Case Study of Pakistan." *Pakistan Development Review* 46 (4): 645–55.

Barthélemy, D., and M. Nieddu. 2007. "Non-Trade Concerns in Agricultural and Environmental Economics: How J. R. Commons and Karl Polanyi Can Help Us." *Journal of Economic Issues* 41 (2): 519–27.

Besada, H., L. McMillan Polonenko, and M. Agarwal, eds. 2017. *Did the Millennium Development Goals Work? Meeting Future Challenges with Past Lessons.* Bristol: Policy Press.

Butler, R. 2012. "Agriculture Causes 80% of Tropical Deforestation." https://news.mongabay.com/2012/09/agriculture-causes-80-of-tropical-deforestation/.

Cassidy, E.S., P.C. West, J.S. Gerber, and J.A. Foley. 2013. "Redefining Agricultural Yields: From Tonnes to People Nourished per Hectare." *Environmental Research Letters* 8 (3).

CBD Secretariat. 2018. "Agricultural Biodiversity: What's the Problem?" Montreal: Convention on Biological Diversity (CBD) Secretariat. https://www.cbd.int/agro/whatstheproblem.shtml.

Choudhary, M.P., G. Singh Chauhan, and Y. Kumar Kushwah. 2015. "Environmental Degradation: Causes, Impacts and Mitigation." Presented at National Seminar on Recent Advancements in Protection of Environment and its Management Issues (NSRAPEM-2015), Maharishi Arvind College of Engineering and Technology, Kota, India.

Clapp, J. 2015a. "Food Security and International Trade: Unpacking Disputed Narratives." In *The State of Agricultural Commodity Markets 2015–16*, edited by FAO. Rome: Food and Agriculture Organization (FAO).

Clapp, J. 2015b. "Food Self-Sufficiency and International Trade: A False Dichotomy?" In *The State of Agricultural Commodity Markets 2015–16*, edited by FAO. Rome: Food and Agriculture Organization (FAO). http://www.fao.org/publications/card/en/c/86276bc4-6b6e-444d-9fb4-7d132c972bce/.

Díaz-Bonilla, E., and J. Hepburn. 2016. *Trade, Food Security and the 2030 Agenda*. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Dobbs, R., C. Sawers, F. Thompson, J. Manyika, J. Woetzel, P. Child, et al. 2014. *How the World Could Better Fight Obesity.* New York: McKinsey Global Institute.

EPHA. 2017. *Antimicrobial Resistance (AMR)*. EPHA Position Paper on the 2017 EU Action Plan on AMR. Brussels: European Public Health Alliance (EPHA). https://epha.org/wp-content/uploads/2017/05/AMR-Position-Paper-2017.pdf.

European Commission. 2017. "EU–Canada: Comprehensive Economic and Trade Agreement (CETA)." Brussels: European Commission. http://ec.europa.eu/trade/policy/in-focus/ceta/index_en.htm.

FAO. 2002. *World Agriculture 2030: Main Findings.* Rome: Food and Agriculture Organization (FAO). http://www.fao.org/english/newsroom/news/2002/7833-en.html.

FAO. 2011a. *The State of Food and Agriculture 2010–2011: Women in Agriculture—Closing the Gap for Development.* Rome: Food and Agriculture Organization (FAO).

FAO. 2011b. *The State of Food Insecurity in the World 2011*. Rome: Food and Agriculture Organization (FAO).

FAO. 2014. *Agriculture's Greenhouse Gas Emissions on the Rise*. Rome: Food and Agriculture Organization (FAO). http://www.fao.org/news/story/en/item/216137/icode/.

Feridum, M., F.S. Ayadi, and J. Balouga. 2006. "Impact of Trade Liberalization on the Environment in Developing Countries: The Case of Nigeria." *Journal of Developing Societies* 22 (1): 39–56.

FiBL. 2017. *World of Organic Agriculture 2017*. Frick, Switzerland: Research Institute of Organic Agriculture (FiBL).

Hiç, C., P. Pradhan, D. Rybski, and J.P. Kropp. 2016. "Food Surplus and Its Climate Burdens." *Environmental Science and Technology* 50 (8): 4269–77.

HLTF. 2018. *The Zero Hunger Challenge: Advisory Note for Action—All Food Systems Are Sustainable*. Rome: United Nations High Level Task Force on Global Food and Nutrition Security (HLTF). http://www.un.org/en/issues/food/taskforce/wg3.shtml.

Hoekstra, A.Y. 2008. *The Water Footprint of Food*. Twente, the Netherlands: Twente Water Centre, University of Twente. http://waterfootprint.org/media/downloads/Hoekstra-2008-WaterfootprintFood.pdf.

Hunter, M.C., R.G. Smith, M.E. Schipanski, L.W. Atwood, and D.A. Mortensen. 2017. "Agriculture in 2050: Recalibrating Targets for Sustainable Intensification." *BioScience* 67 (4): 386–91.

ICTSD. 2014a. *Agricultural Export Restrictions, Food Security and the WTO*. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

ICTSD. 2014b. *Post-Bali Negotiations on Agriculture: The Challenge of Updating Global Rules on Trade*. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

ICTSD. 2016. *Evaluating Nairobi: What Does the Outcome Mean for Trade in Food and Farm Goods?* Geneva: International Centre for Trade and Sustainable Development (ICTSD).

ICSTD and World Economic Forum. 2016. *Strengthening the Global Trade and Investment System in the 21st Century*. E15Initiative. Geneva: International Centre for Trade and Sustainable Development (ICTSD) and World Economic Forum.

IFPRI. 2014. *Gender in Agriculture: Closing the Knowledge Gap*. IFPRI Issue Brief No. 84. Washington, DC: International Food Policy Research Institute (IFPRI).

IFPRI. 2016. *Global Food Policy Report*. Washington, DC: International Food Policy Research Institute (IFPRI).

Kinda, S.R. 2013. "Essays on Environmental Degradation and Economic Development." Thesis. Clermont-Ferrand: University of Auvergne.

Kuik, O., M. Kettunen, J. van Vliet, A. Colsa, and A. Illes. 2018. *Trade Liberalisation and Biodiversity: Scoping Study on Methodologies and Indicators to Assess the Impact of Trade Liberalisation on Biodiversity.* Brussels: European Commission, Institute for Environmental Studies, and Institute for European Environmental Policy.

Lang, S.S. 2006. "'Slow, Insidious' Soil Erosion Threatens Human Health and Welfare as Well as the Environment." *Cornell Chronicle*, 20 March. http://news.cornell.edu/stories/2006/03/slow-insidious-soil-erosion-threatens-human-health-and-welfare.

Lettenmeier, M., C. Göbel, C. Liedtke, H. Rohn, and P. Teitscheid. 2012. "Material Footprint of a Sustainable Nutrition System in 2050: Need for Dynamic Innovations in Production, Consumption and Politics." *Proceedings in Food System Dynamics and Innovation in Food Networks 2012*: 584–98.

Maertens, M., and J. Swinnen. 2014. *Agricultural Trade and Development: A Value Chain Perspective*. WTO Working Paper ERSD-2015-04. Geneva: World Trade Organization (WTO).

McCarney, G.R., and W.L. Adamowicz. 2005. "The Effects of Trade Liberalization on the Environment: An Empirical Study." Presented at the Annual Meeting of the Canadian Agricultural Economics Society, 6–8 July, San Francisco, CA.

McCullough, E., P. Pingali, and K. Stamoulis. 2008. *The Transformation of Agri-Food Systems: Globalization, Supply Chains and Smallholder Farmers*. London: Earthscan.

Muncke, J. 2009. "Exposure to Endocrine Disrupting Compounds via the Food Chain: Is Packaging a Relevant Source?" *Science of the Total Environment* 407 (16): 4549–59.

Niemi, J., and E. Huan-Niemi. 2012. "Global Trade in Agricultural Inputs." Presented at the IFAMA 22nd Annual Forum and Symposium, 10–14 June, Shanghai.

Nordström, H., and S. Vaughan. 1999. *Trade and Environment*. Special Studies 4. Geneva: World Trade Organization (WTO).

OECD. 2017. *FDI Regulatory Restrictiveness Index.* Paris: Organisation for Economic Co-operation and Development (OECD). http://www.oecd.org/investment/fdiindex.htm.

OECD and FAO. 2017. *OECD–FAO Agricultural Outlook 2017–2026*. Paris: Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture Organization (FAO). http://www.agri-outlook.org/.

Pierzynski, G., and Brajendra, eds. 2017. "Threats to Soils: Global Trends and Perspectives." Global Land Outlook Working Paper. Bonn: United Nations Convention to Combat Desertification. https://global-land-outlook.squarespace.com/working-papers-1/#working-papers.

Pimentel, D., and M. Burgess. 2013. "Soil Erosion Threatens Food Production." *Agriculture* 3 (3): 443–63.

Pretty, J., C. Brett, D. Gee, R. Hine, C. Mason, J. Morison, et al. 2013. "Policy Challenges and Priorities for Internalising the Externalities of Modern Agriculture." *Journal of Environmental Planning and Management* 44 (2): 263–83.

Schröder, S., F. Begemann, and S. Harrer. 2007. "Agrobiodiversity Monitoring: Documentation at European Level." *Journal of Consumer Protection and Food Safety* 2 (Supplement 1).

Statista. 2018. "Retail Consumption of Chocolate Confectionery Worldwide from 2012/13 to 2018/19 (in 1,000 Metric Tons)." Statista. https://www.statista.com/statistics/238849/global-chocolate-consumption/.

Steffen, W., K. Richardson, J. Rockström, S.E. Cornell, I. Fetzer, E.M. Bennett, et al. 2015. "Planetary Boundaries: Guiding Human Development on a Changing Planet." *Science* 347 (6223): 1259855.

Sutherland, P., J. Bhagwati, K. Botchwey, N. FitzGerald, K. Hamada, J.H. Jackson, et al. 2004. *The Future of the WTO: Addressing Institutional Challenges in the New Millennium.* Geneva: World Trade Organization. http://archive.ipu.org/splz-e/wto-symp05/future_WTO.pdf.

UNCTAD. 2014. *Agriculture: Trade and Competition Policy Papers Presented at the 61st Session of the Trade and Development Board, 15–26 September, Geneva.* Geneva: United Nations Conference on Trade and Development (UNCTAD). http://unctad.org/meetings/en/Contribution/tdb61_c03_UNCTAD.pdf.

UNCTAD. 2016. *Development and Globalization: Facts and Figures*, 2016. Geneva: United Nations Conference on Trade and Development (UNCTAD).

UNEP. 1999. *Trade Liberalisation and the Environment: Lessons Learned from Bangladesh, Chile, India, Philippines, Romania and Uganda: A Synthesis Report.* New York: United Nations Environment Programme (UNEP).

UNESCO. 2016. *Water and Jobs: United Nations World Water Development Report 2016*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).

University of Warwick. 2007. *The Multilateral Trade Regime: Which Way Forward? The Report of the First Warwick Commission.* Coventry, UK: University of Warwick.

WHO. 2017. *Obesity and Overweight.* Geneva: World Health Organization (WHO). http://www.who.int/mediacentre/factsheets/fs311/en/.

World Bank. 2008. *World Development Report 2008: Agriculture for Development*. Washington, DC: World Bank.

World Bank. 2013. *Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience*. Washington, DC: World Bank.

WRI. 2016. *Shifting Diets for a Sustainable Food Future*. Working Paper. Washington, DC: World Resources Institute (WRI).

WTO. 2017a. "Ministerial Ends with Decisions on Fish Subsidies, e-Commerce Duties; Ongoing

Work Continues". Geneva: World Trade Organization (WTO), 13 December. https://www.wto.org/english/news_e/news17_e/mc11_13dec17_e.htm.

WTO. 2017b. *World Trade Statistical Review 2017*. Geneva: World Trade Organization (WTO).

WWF. 2017. "Farming: Pollution." Gland, Switzerland: World Wide Fund for Nature. http://wwf.panda.org/what_we_do/footprint/agriculture/impacts/pollution/.

SDG 2.5: How Policies Affecting Trade and Markets Can Help Maintain Genetic Diversity

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Introduction and Context

Sustainable Development Goal 2.5 concerns genetic diversity of cultivated and domesticated plants and animals and their wild relatives. Seed and plant banks have a central role in achieving effective maintenance of genetic diversity. The word "including" in the target keeps the door open for other approaches that should also be supported if they too play a contributory role. In situ genetic resource management must be considered to be one of these approaches. The rest of SDG 2.5 concerns access to these resources and benefit-sharing from their use and the use of associated traditional knowledge. Such access and benefit-sharing requirements are already agreed through the relevant international instruments.

Increasing productivity per hectare of land is absolutely essential as the global human population continues to rise and the proportion of people who produce food, whether they are farmers, pastoralists, fishers, or hunters and gatherers, keeps on diminishing. However, increased food productivity per hectare of land alone does not improve food security. Nutritional quality across the full range of foods consumed by humans, rather than just the major staple foods such as rice, wheat, maize, soybean, and potatoes, is also essential. Quantity and quality are both vital, and increasing both without allowing the achievement of one to be at the expense of the other requires massive innovative effort. Neither small-scale farmers in agriculturally biodiverse areas, nor those applying modern scientific knowledge and techniques, can do all of this alone.

All efforts to improve the quantity and nutritional standards of food are dependent on genetic diversity, the primary source of the variability that farmer-breeders, pastoralists, and plant and animal scientists alike work with to develop plants and animals that enhance food security and support productive livelihoods that ultimately benefit all humans. All of these groups contribute to agricultural innovation, albeit not necessarily in a coordinated fashion.

Local farmers' varieties (Halewood and Lapeña 2016; Louwaars and De Boef 2012) and wild relatives of crops (Castañeda-Álvarez et al. 2016; Montenegro 2016) continue to be extremely important for integrating new traits or new variants of known traits (e.g. disease resistance), and their continued use and existence is essential for both breeders and local and indigenous communities. Being themselves conservers (through their use of agricultural biodiversity) and crop improvers (through their selection practices and on-farm experimentation), many "traditional" cultivators provide an essential service to breeders and to the majority of people who do not cultivate food. Global food security requires access to genetic resources to be open. The International Treaty on Plant Genetic Resources for Food and Agriculture (FAO International Treaty) acknowledges this, establishing a multilateral system of facilitated access to plant genetic resources while respecting national sovereignty and requiring benefit-sharing.

The conservation and protection of genetic diversity, both in situ and in seed banks and plant collections, is a global public good that benefits all of us. SDG 2.5 is a timely recognition of the essential need to support such diversity in order to achieve adequate and sustainable supplies of nutritious food for the global human populace. It also underlines that access to genetic diversity must not be unduly restricted but should remain available to all, especially to those whose livelihoods depend on it, but also for scientific research purposes. The linking of access to fair and equitable benefit-sharing from the use of genetic resources and traditional knowledge

emphasises that the access rights of provider communities require particular attention. In addition, in line with the Nagoya Protocol to the Convention on Biological Diversity (CBD) and the aforementioned FAO International Treaty, provider communities should receive their due from the benefits accrued by scientific and commercial users.

This paper seeks to clarify the scale of the challenges facing the international community with a view to identifying ways that governments and international organisations, cooperating or working separately, can advance SDG 2.5 through trade and market-related actions and policies. Trade can potentially help by encouraging increased productivity and incomes for small producers, facilitating access to and circulation of plant genetic resources and relevant technologies, increasing employment in rural areas, and providing new opportunities for value addition. None of this automatically arises from trade but rather requires the right actions to be adopted. International forums for negotiation on trade and related matters, multilateral institutions, and agreements relevant to trade, as well as the shifting and evolving architecture of preferential trade agreements, create "policy spaces" to engage in meaningful dialogue on this and other SDGs. International cooperation is essential, but governments also have broad freedoms to operate independently, and it is important to identify where opportunities lie and how they can act upon them.

Plant and Animal Innovation and the Vital Importance of Genetic Diversity

Food security depends on access to a sufficient quantity of nutritious food. With a huge and growing global population, an ever-increasing proportion of which has no involvement in the production or supply of food, innovation that enhances food security has never been more important. Crop improvement in terms of greater productivity and nutritional quality is an essential area for innovation. From early times, farmers have set aside some of their harvested seeds for replanting. They selected these seeds on the basis that the plants producing them possessed desirable traits such as high yields, disease resistance, or drought or frost tolerance. Over the generations, this practice resulted in ever-increasing quantities of locally adapted varieties, known as "landraces" or "farmers' varieties." Wild plants and animals became domesticated, taking advantage of the opportunities provided by human habitation to spread on to the disturbed terrain and scavenge for food. While human selection ultimately had a massive effect, "domestication" was a normal evolutionary response to the formation of new ecological niches resulting from human settlement and activity that selectively advantaged individuals with certain traits. In time, humans would have preferred plant species that were edible, with individuals tending to put their energies more into vegetative growth and seed production than in developing extensive and inedible root systems, and selected accordingly.

Plant innovation is inherently cumulative. Thus, all "improved" crops contain "old" genetically encoded traits that are introduced and recombined in new ways. Even today, the inputs for crop improvement work largely include earlier varieties that themselves were previously developed by the same and other improvement techniques. These form a large proportion of the stock of breeding material already in wide circulation among breeders. However, inputs also include varieties acquired from genetic material newly or only recently circulated as breeding material, hence the vital importance of seed banks and plant collections. In addition, varieties hitherto

found within and around the fields of local and indigenous cultivators may also be used. In certain cases, such human populations inhabit areas within the centres of origin and diversity of major crops such as rice, wheat, maize, and potatoes, as were initially identified by the great early twentieth-century Russian geneticist Nikolai Vavilov. The centres remain essential repositories of crop genetic diversity in the in situ conditions that allow them to continue to evolve and co-evolve with human societies. This makes them strategically important in terms of food security, conservation, and commercial activity in plant breeding and commercial biotechnology. And despite genetic erosion, which can be severe in many places, and the existence of large ex situ collections, including those held by the agricultural research bodies overseen by the Consultative Group on International Agricultural Research, the centres continue to be "natural" seed banks.

The hyper-abundance of food products in the developed world and the overall alleviation of undernutrition are largely attributable to modern agriculture, including the varieties in common use bred by public- and private-sector breeders. Thus, bringing scientific expertise into the enterprise of crop improvement must surely in itself be a good thing. However, malnutrition (undernourishment, obesity/overnutrition, and "hidden hunger" or micronutrient deficiencies), which is due both to underconsumption and to overconsumption, and the low-quality diets of many people, with all the attendant health problems from diabetes epidemics to nutritional deficiency diseases, continue to afflict millions of people around the world. By focusing on ending hunger and malnutrition, the SDGs reflect the growing awareness that an exclusive focus on undernutrition is inadequate and that a broader, more comprehensive approach is needed. (See also the discussion in Díaz-Bonilla and Hepburn 2016.)

Generating revenues from plant breeding is a challenge. For varieties that breed true, meaning they have consistent traits that persist generation by generation, farmers and even amateur gardeners can save, clean, and replant or sell seeds. Asexually reproducing species can be mass copied through techniques such as cutting and grafting. In response, biological technologies such as those for producing hybrids, along with intellectual property and contract law—as applied through use of licences that purchasing seed dealers and farmers must agree to—may be deployed so that breeders can derive revenue from plant varieties that they have developed. Supporters of plant intellectual property claim these rights improve the supply of high-yielding varieties for farmers. It seems reasonable to accept the likelihood that plant variety protection laws, whether based on the required standards of the International Convention on the Protection of New Varieties of Plants (UPOV Convention) or not, incentivise overall investment in commercial crop breeding, and in doing so can compensate for reduced government spending on public-sector crop research. They also create a market for foreign and domestic breeding material through the possibility to license. The evidence is somewhat ambiguous but suggests that such increased investments are targeted primarily at a limited set of commercial crop types. Moreover, patents may interfere deleteriously with the balance that plant variety protection seeks to strike between the interests of commercial breeders and the interests, rights, and freedoms of farmers.[1] From the perspective of a small-scale and resource-poor farmer, the exclusionary legal and regulatory norms that underpin seed development and circulation, including intellectual property rights, raise specific concerns, which are considered below.

1 For a consideration of the less than conclusive empirical evidence, see Dutfield (2008), where the commentary takes account of studies by Jaffé and van Wijk (1995), Louwaars et al. (2005), and UPOV (2005).

Crucial as it is to promote plant innovation in favour of food security, it is really important not to disregard the capabilities, needs, and interests of small-scale farmers. In the past these were generally overlooked by policymakers involved in promoting innovation, rural development, trade, and food security. Top-down models of rural development, as typified by the Green Revolution, increased food productivity overall to the benefit of many farmers and consumers. However, in some places there were heavy social and environmental costs, and food security could on occasions actually be diminished. For example, in the 1960s Balinese farmers who were forced to plant Green Revolution modern high-yielding varieties and purchase industrial chemical inputs suffered diminished productivity and crop disease and pest outbreaks. However, when they returned to their own varieties and their original management systems and practices of irrigation, fallowing, and organic disease and pest management based on a network of water temples that had been in place for centuries, high productivity and sustainability recovered (Lansing 2007).

Thus, there are very good reasons why small-scale farmer innovation should be allowed to persist, and indeed be supported. Intellectual property laws and seed regulations, including compulsory seed lists such as the European Agricultural and Vegetable Common Catalogues, may have the effect of reducing local farmer autonomy and their freedom to innovate. The intellectual property laws on patents and plant variety protection as provided under the UPOV Convention may have such disruptive effects if they are drawn up in ways that narrow or eliminate the rights of farmers to replant and exchange saved seed. Patent laws tend to be written this way, and UPOV-compliant plant variety protection laws may also suppress seed-saving, though they do not necessarily have to. The latest 1991 version of the UPOV Convention, which most UPOV members are now parties to, retains flexibilities in this regard. Seed regulations may also reduce farmer autonomy if they require that the only cultivated varieties sown by farmers must be those on an official seed list and that farmers' varieties be mainly or entirely excluded from it for failing to meet strict, inflexible criteria (see Halewood 2016). Unfortunately, in many parts of the world, workable local agricultural systems have been disrupted or even replaced for various reasons (see the earlier example of Bali). One should not be romantic about traditional agriculture, if for no other reason than that many of these systems have been degraded through no fault of the local people themselves and no longer function as they did. Population increases, the spread of market economies, all-too-prevalent assumptions that supposedly advanced scientific approaches such as rapid intensification through high-input monocultural agriculture are superior to local ones such as intercropping and agroforestry, and the imposition of inappropriate laws and regulations by governments are all factors in this. Nonetheless, small-scale agricultural systems based on plant genetic diversity are intact in many areas of the world.

In reality, "tradition" and "modernity" do not operate in separate worlds, and thus the dichotomy between them upon which governmental policies and international agreements over the years have implicitly or otherwise been based is to a large extent false—notwithstanding the Bali example, which might suggest otherwise. Their frequent total separation in rural development policy is arguably a missed opportunity to seek ways to pursue mutually beneficial hybrid solutions such as participatory plant breeding that may do more to further food security and genetic diversity than the common tendency since the Second World War overwhelmingly to favour modernisation. The situation may be moving in the right direction. For example, some good results have been achieved by reviving the use of traditional crop species and introducing modern post-harvesting technologies that ironically

can enhance the viability of "old" varieties and species for the benefit of farmers and consumers (e.g. Cruz 2004). "Traditional" farmers sometimes use modern varieties in their own on-farm crop variety selection activities. Thus, contrary to what is frequently assumed, not all farmers' varieties are ancient; neither are they all "traditional": sometimes there is cross-breeding with modern varieties (see the examples below). Thus, the interaction of traditional knowledge with agricultural techniques applied to local or exotic crops is fertile ground for innovation in many parts of the world.

Nowadays, there is more appreciation that agricultural innovation needs to be construed much more broadly to include small-scale farmers:

> More recently, the scope of what is considered agricultural innovation has broadened. It has become more widely understood as a process that is inherently social in nature. Individuals and communities in specific localities share and adapt local knowledge, selectively integrate "scientific" knowledge, and develop new and better ways of managing resources, responding to opportunities and overcoming local challenges (QUNO 2015).

The Quaker United Nations Office (QUNO), the source of the quote above, follows with the important point that "A broader understanding of innovation in agriculture inspires a reconsideration of the type of policy measures that are needed to nurture and support it." Such reconsideration raises a broad set of policy questions that fall beyond the scope of this article. However, it must surely involve a reassessment of the legal systems ostensibly aimed at promoting plant innovation, and a consideration of possible reforms in terms of intellectual property rights.

Compared with plants, little attention is paid to the connection between intellectual property and the breeding of animals and pastoralism more generally. This may be symptomatic of the strong international focus on plant genetic resources. Given the role of pastoralism in rural livelihoods, the relevance of animal products for food security, and the reduction of livestock biodiversity around the world, this is an imbalance that the global community might wish to address. However, it is also the case that breed society membership and the use of pedigrees affords animal breeders with at least some of the benefits that intellectual property rights provide for plant breeders. For example, currently 42 cattle breed societies dealing in pedigree animals, 34 sheep breed societies, 5 pig breed societies, and 1 goat breed society are recognised by the UK government. Not all have active breeding programmes though, and some may be more concerned with preservation than with improvement. There is an operational market in livestock semen, ova, and embryos, and purebred individuals for mating purposes. This trade has never been dependent on intellectual property rights. Nonetheless, genetic erosion has become a serious concern with domesticated animals as with crops, one requiring attention as SDG 2.5 indicates.

The Fundamental Challenges

Maintain genetic diversity

Despite their poverty, small-scale farmers who are guardians of genetic diversity have a wealth of knowledge and expertise to offer. In a sense they are the "invisible innovators" whose guardianship over the genetic resource base that helps guarantee food security in the future has often been

overlooked. Effectively, they are maintaining and supplying a valuable chemical and informational storehouse for which they are not being adequately rewarded. Notwithstanding the well-intended provisions of a number of international instruments over the years, we continue to provide weak incentives for small-scale farmers to continue providing arguably indispensable public goods that benefit all of us. Of course, small-scale farmers do not just maintain genetic diversity in situ: they use this diversity to be major providers of food security in many developing countries, and indeed in the world:

> More than 90 percent of the 570 million farms worldwide are managed by an individual or a family, relying predominately on family labour. These farms produce more than 80 percent of the world's food, in terms of value. Globally, 84 percent of family farms are smaller than 2 hectares and manage only 12 percent of all agricultural land. While small farms tend to have higher yields than larger farms, labour productivity is less and most small family farmers are poor and food-insecure (FAO, IFAD, and WFP 2015).

Small-scale farmers continue to be major suppliers of a broad range of foods for all, including poor people, food that may deliver a broader array of vital micronutrients than modern varieties bred for purposes other than nutritional quality (see Morris and Sands 2006). This leads to the very important concern that productivity not be seen as purely about crude measures per hectare of bulk harvest volumes without consideration of nutritional quality. The study of the Global Panel on Agriculture and Food Systems for Nutrition on food systems and diets expresses this in stark terms:

> Today's food systems are too focused on food quantity and not enough on quality. They are not helping consumers to make healthy and affordable food choices consistent with optimal nutrition outcomes. In fact, the trend is in the opposite direction. The multiple forms of malnutrition will not diminish unless policy makers and private sector business leaders work together to reshape food systems in ways that will advance the goal of healthier diets for all (Global Panel 2016).

Indeed, while official statistics demonstrate that food production globally has soared and that this has benefited millions of people (Díaz-Bonilla and Hepburn 2016), food security remains a huge problem, with millions still going hungry or living with diseases caused by poor nutrition. Meanwhile, agricultural biodiversity is encountering huge stresses.

Rural development, plant, and agricultural scientists and other professionals have much to contribute. To maximise the positive effects of their expertise, a close engagement with small-scale farmers is probably essential. There is a danger otherwise of enacting policy measures that may inadvertently be damaging to food security and to plant genetic diversity. Again, the Bali example is illustrative.

In summary, the sustainability of the vital roles played by small-scale farms in food production, good nutrition, and the conservation by use of genetic diversity are under threat. Small-scale farmers continue to encounter neglect from policymakers responsible for fostering innovation, rural development, and trade and food security, and attracting investment in agriculture and the scientific

research community. Despite their massive contributions to global food security and genetic resource management, they tend to suffer from extreme poverty (FAO, IFAD, and WFP 2015). Accordingly, paragraph 2.5 should not be read in isolation. SDG 2.3 targets increasing the productivity and incomes of small-scale farmers.

SDG clauses 2.5.1 and 2.5.2 state the following as indicators:

- Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities.
- Proportion of local breeds classified as being at risk, not at risk, or at unknown level of risk of extinction.

These are both, of course, vitally important technical measures for the success of SDG 2.5. Small-scale farmers bearing sophisticated agro-ecological knowledge, innovations, and practices have much to contribute to the success of these endeavours by identifying and classifying resources, varieties, and breeds. Equitable partnerships of farmer and pastoral communities with the formal plant science sector, including the seed banks, need to be established. Small-scale farmers and their communities are likely to have their own priorities as to which resources most need conserving. They may also have their own taxonomies. Much can be gained from the formal scientific sector working with local farming communities. In this context it is worth noting a provision of the Convention on Biological Diversity, which has not attracted the attention it deserves. Article 18.4 requires parties to

> encourage and develop methods of cooperation for the development and use of technologies, *including indigenous and traditional technologies,* in pursuance of the objectives of this Convention. For this purpose, the Contracting Parties shall also promote cooperation in the training of personnel and exchange of experts [emphasis added].

Commons approaches enabling the relatively unrestricted exchange of plant genetic resources are highly desirable. In Peru, for example, an association of six rural communities called the Potato Park (*Parque de la Papa*) negotiated the repatriation of potato varieties held in the collection of the International Potato Center in Lima and has become a strong advocate of the sharing of plant genetic resource and appropriate technologies without the use of intellectual property rights. The Park is also seeking to share its own varieties with farming communities in other parts of the world.

SDG 2a, which advocates increased investment, including in "agricultural research and extension services, technology development and plant and livestock gene banks," has special importance. Ideally, a substantial portion of such investment should be targeted towards the needs of small-scale farmers in the dual roles of producers and guardians of plant genetic diversity. At present, such targeting tends to be lacking. The Global Panel on Agriculture and Food Systems for Nutrition in the same report sums up the current imbalance:

> The Consortium of International Agricultural Research Centers (CGIAR), which commands the most significant capacity to conduct agricultural research and development in low- and

medium-income countries, still allocates about half of its resources to rice and maize. In the private sector, about 45% of research investment is directed towards just one crop: maize (Global Panel 2016).

Agricultural intensification coupled with the widespread use of scientifically bred seeds has been essential in increasing agricultural production and contributing to food security. However, intensification needs to do better in terms of sustainability and in balancing the need to enhance food security with the protection of the genetic resource base. In particular, the following problems affecting the viability of small-scale farming and the maintenance of genetic diversity require attention.

Intensification, plant breeding, and genetic uniformity

Intensification of agriculture tends to be associated with the cultivation over large areas of only a few genetically uniform varieties and the major crop species such as rice, wheat, maize, and soybean. Intellectual property rights generally do not incentivise investment in domestic staple food crops with small-value markets, even those crucial for food security, hence the issue of neglected or orphan crops. Therefore, incentives may not be socially optimal for food security or for genetic diversity. Reforming intellectual property laws should be considered, but maintaining public-sector breeding efforts are very important too. Developing countries with an established domestic private sector may experience a growth in research investment thanks to plant variety protection. However, public-sector breeding is still likely to be of vital importance. There is much to be gained in terms of food security and rural development in working with communities to improve crops that are locally very important but that are neglected by the private sector. In this context it is worth mentioning concerns raised as to whether scientific breeders encounter an inherent trade-off in the sense that the objectives of higher yields and convenience for farmers can lead to breeders selecting and breeding crops with lower nutritional quality. This situation was referred to in an authoritative article as "the breeder's dilemma" (Morris and Sands 2006). Breeders' efforts to improve crops in terms of terms of nutritional quality enhancements, which are likely to depend more on wider access to genetic resources, should be strongly encouraged. Seeds laws need to be flexible so as to accommodate crop species' genetic diversity and to permit the use and circulation of varieties that are genetically more heterogeneous than modern varieties typically are. It is noteworthy that the European Union has shifted direction somewhat in this regard and is now more flexible than it was in permitting the commercial cultivation of local varieties.[2]

2 See Commission Directive 2008/62/EC of 20 June 2008 providing for certain derogations for acceptance of agricultural landraces and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion and for marketing of seed and seed potatoes of those landraces and varieties; and Commission Directive 2009/145/EC of 26 November 2009 providing for certain derogations, for acceptance of vegetable landraces and varieties which have been traditionally grown in particular localities and regions and are threatened by genetic erosion and of vegetable varieties with no intrinsic value for commercial crop production but developed for growing under particular conditions and for marketing of seed of those landraces and varieties.

The problem of neglected and underutilised species, and the lack of attention to small-scale farmers' needs

In order to enhance nutritional quality, and to cater to the specific needs of resource-poor farmers in marginal areas, agricultural research needs to focus much more on the so-called "neglected and underutilised species," and not just the major ones. It also needs to be far more sensitive to the specific needs of, and constraints experienced by, small-scale farmers. A Food and Agriculture Organization (FAO) report identifies the scale of the problem while suggesting that awareness is improving:

> the combination of industrialization of agriculture and formal training for plant breeders created a gap between breeders and farmers, a gap that was exported to developing countries in the post-war era. As the profession of plant breeding lost the habit of interacting closely with producers, concern for how to address farmers' needs and constraints fell by the wayside... Today there is widespread recognition that the conventional package of new varieties and external inputs, while successful in the more favourable production areas, has often failed to benefit small-scale farmers in marginal areas (Ceccarelli, Guimarães, and Weltizien 2009, vii).

Arguably, patents and plant variety protection could do more to help reverse the understandable tendency of the private sector to focus on large-scale industrial agriculture and a narrow range of widespread crop species, which is where most of the profits will be generated. Moreover, to conclude that plant variety protection and patents are essential to providing the necessary incentives for innovation would be to assume that plant innovation only takes place off-farm by scientific breeders and biotechnologists, and that the private sector alone is responsible. That would be to deny the existence of innovation from two other important sources: the public sector and farmers. The role of farmers (or better, "farmer-breeders") in both plant innovation and maintenance and enhancement of agricultural biodiversity continues to be highly significant. For example, Pelegrina and Salazar (2011) highlight the successful development by small-scale farmers of varieties "selected from modern cultivars, landraces and local varieties":

> Farmers in North Cotabato, the Philippines, developed 120 farmer rice varieties in 6 years, in contrast to the national release of only 55 inbred lines in 10 years from public research institutions. In the Mekong Delta of Vietnam, there are more than 100 farmer varieties covering more than 100,000 hectares of rice area... Furthermore, these new varieties carry adapted traits that fit the farming conditions of different macro and micro ecosystems.

There are plausible arguments that intellectual property rights relevant to plants and genetic resources as provided under such agreements as UPOV and the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement), as with seed regulations, tend to fall short in terms of encouraging genetic diversity in agriculture. However, exploiting allowable exceptions and flexibilities in intellectual property laws may offer some advantages over the present situation. Well-designed and culturally appropriate commons approaches may be worth exploring too (Girard and Frison 2018).

Ensure access to and fair and equitable sharing of benefits arising from the utilisation of genetic resources and associated traditional knowledge

In 2010 the Nagoya Protocol to the Convention on Biological Diversity was adopted. The Protocol, whose full name is the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising from Their Utilization, seeks to further the third objective of the CBD: the fair and equitable sharing of benefits arising from the use of genetic resources, including associated traditional knowledge. The Protocol acknowledges that agricultural biodiversity has certain features and raises problems that require distinctive solutions to other kinds of biodiversity that differ due to their human use. Because of the interdependence of all countries on the same global pool of genetic resources for food and agriculture, among other reasons, the Protocol accepts the primacy in this regard of the FAO International Treaty on Genetic Resources for Food and Agriculture, which puts in place a multilateral system of facilitated access to genetic resources for food and agriculture that also contains benefit-sharing provisions.

Likewise, the FAO International Treaty promotes benefit-sharing, an obligation that is triggered when accessions from the multilateral system for facilitated access to plant genetic resources, which the Treaty puts in place, are used commercially. However, it must be firmly stated here that access to the system is itself a benefit; indeed, this is the main benefit that the Treaty brings. Pooling resources is the best way to promote innovation as long as access is sufficiently equitable to reach small-scale farmers. Article 9 promotes the concept of "farmers' rights" as a means to extend due recognition of

> the enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centres of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world.

Implementation of farmers' rights is the responsibility of national government, which must adopt, at least, the following measures:

(a) Protection of traditional knowledge relevant to plant genetic resources for food and agriculture.

(b) The right to equitably participate in sharing benefits arising from the use of plant genetic resources for food and agriculture.

(c) The right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture.

Measures (a) and (b) are alluded to in SDG 2.5; (c) is not, but it should likewise be put into effect.

Conclusions and Recommendations

Ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture all require interventions of many kinds and at many levels from the local to the global. Not all of these are susceptible to trade or market solutions. The same may be said for the narrower SDG 2.5. As public goods, public seed banks and plant collections need sustained long-term financial support. Much of this will come from governments, international organisations, and

private foundations, as has been the case for many decades. This is not to suggest that such funding is necessarily adequate, especially for national and local seed banks, which may be in desperate need of support. Members of the G20 might wish to support a thorough needs assessment with a view to directing financial support appropriately.

Here we identify high-priority areas for international and government action and make recommendations as to how they could best be supported.

Priority 1: improving the economic conditions of small-scale farmers, especially those in the global centres of origin/diversity

We identified the crucial role of small-scale farmers, especially in the centres of origin and diversity, in maintaining genetic diversity and that of such farmers around the world in contributing so much to food security and enhancing nutritional quality. Steps must be taken to improve their economic conditions. Increasing opportunities to capture the benefit of their contributions to global food security and maintenance of genetic diversity, harnessing their abilities to innovate both locally and in collaboration with outside organisations, including breeders, and securing new opportunities for value addition are all trade related. Trade- and market-related efforts must be just and ensure that local people are given incentives to continue with practices favouring genetic diversity that tend otherwise not to be financially rewarding. Producers, including women, indigenous peoples, family farmers, pastoralists, and fishers, need to enjoy material improvements to their lives, whether this is through income generation directly attributable to their on-farm efforts, including their maintenance of genetic diversity, to a fair share of the benefits arising from the use of the latter by others. Generating income themselves is what requires most support. Increased opportunities to trade in agricultural products on the basis of local value addition enable the possibility to fully internalise benefits from commercialisation, and so can provide incentives to continue to contribute to the maintenance of genetic diversity.

Branding schemes can play a useful role in this context (Swiderska et al. 2016). In contrast, access and benefit-sharing alone will result in no more than a tiny percentage of revenues going back. Geographical indications, preferably if the registration requirements are made clear and inexpensive, may serve as valuable means to monetise goodwill in local agricultural products. Trademarks, including collective and certification marks, may be equally useful in this regard. Norms regarding geographical indications and trademarks are provided by the TRIPS Agreement.

How can this priority best be pursued internationally?

- Given the severe lack of research investment in underutilised and neglected crop species, there is a need to investigate whether intellectual property rights, along with open source and commons approaches that are based on far more limited rights to exclude than patents, can be better designed to shift incentives to invest more in researching these genetic resources. Accordingly, WTO, FAO, and the World Intellectual Property Organization (WIPO) should be requested by G20 members to consider holding a joint international forum and regional forums on how to create incentives to carry out research on underutilised and neglected crop species, preferably in collaboration with small-scale farmer communities, whose participation would need to be funded.

- Preferential trade agreements with intellectual property chapters should contain commitments for technical cooperation in the area of geographical indications and trademarks for local products that add value to genetic diversity. WIPO, WTO, and FAO should be requested by G20 members to consider holding an international forum and regional forums on how to overcome the technical challenges of using geographical indications and certification marks that specifically benefit small-scale farmers and local producers and that valorise plant and animal genetic diversity so as to further incentivise their continued use and maintenance. Again, the participation of the latter should be funded.

Priority 2: facilitating and maximising access to and circulation of plant genetic resources, exchanges of relevant knowledge, innovations, and practices, and relevant technologies

The FAO International Treaty has done much to facilitate access to and circulation of plant genetic resources around the world and among public- and private-sector breeders. However, small-scale farmers have so far had little involvement in the implementation of the treaty. The fact that they are likely to be breeders as well as farmers, but are treated only as farmers, arguably diminishes their status and means they are not given full credit for what they do. Equitable partnerships between farmer and pastoral communities with the formal plant science sector need to be established. In Peru the Potato Park has benefited from the repatriation of potato varieties held in the collection of the International Potato Center and is open to the sharing of ideas and techniques with plant scientists. However, this is a rare example. Small-scale farmers and their communities are likely to have their own priorities as to which resources are most in need of conservation.

How can this priority best be pursued internationally?

- Preferential trade agreements with intellectual property chapters should not contain provisions requiring that countries implement the 1991 Act of the UPOV Convention and allow the patentability of plants. The issue is not that UPOV 1991 or plant patents are inherently harmful, but that the introduction of intellectual property protection to cover innovations in the agricultural field needs to be done with immense care, taking into account local conditions and specificities.

- Insofar as plant intellectual property is provided for in these agreements, parties should be free to adopt sui generis regimes for plant varieties, including ones that provide exceptions and limitations to rights, and that do not place restrictions on what small-scale farmers can plant and on how they may dispose of their harvested produce. It should be noted that the benefits of this greater flexibility would be enhanced by seed laws that are sufficiently flexible to allow farmer varieties to be cultivated and circulated.

- Parties to the FAO International Treaty should consider adopting an interpretative statement that "the local and indigenous communities and farmers of all regions of the world, particularly those in the centres of origin and crop diversity", who contribute to "the conservation and

development of plant genetic resources which constitute the basis of food and agriculture production throughout the world" are in fact breeders as well as farmers. The statement should also underline the implications of this: that their participation in the implementation of the treaty, including their opportunities to benefit from the multilateral system of facilitated access, should be enhanced accordingly. In a similar vein, the concept of farmers' rights should more explicitly accommodate the specific interests of small-scale farmers who also contribute to maintenance of genetic diversity not just through conservation and use but also through breeding.

Priority 3: extending current international efforts on plant genetic diversity to maintain the diversity of other forms of life, especially livestock

FAO has provided a vital forum to debate the erosion of animal livestock genetic resources. However, whereas there is a treaty dealing with plant genetic resources, there are still no binding international norms addressing the erosion of livestock animal genetic diversity. The Conference of the Parties to the Convention on Biological Diversity deals with biological diversity more generally and does not seem to be a suitable forum given the specific nature of animal genetic resources. Members of the G20 separately and together should seriously consider initiating formal discussions on how to address the problem of animal genetic resource erosion through international cooperation, whether in the form of a new treaty or otherwise. This process requires the engagement of FAO, which is already doing work in this area, scientists, representatives of animal breeders and breeder organisations, keepers of rare breeds, and local and indigenous livestock keepers, especially in developing countries. In promoting the involvement of the latter, consideration of the emerging concept of "livestock keepers' rights," analogous to farmers' rights, should be introduced as an operational concept (Köhler-Rollefson et al. 2010).

References

Castañeda-Álvarez, N.P., C.K. Khoury, H.A. Achicanoy, V. Bernau, H. Dempewolf, R.J. Eastwood, et al. 2016. "Global Conservation Priorities for Crop Wild Relatives." *Nature Plants* 2: 1–6.

Ceccarelli, S., E. P. Guimarães, and E. Weltizien, eds. 2009. *Plant Breeding and Farmer Participation*. Rome: Food and Agriculture Organization (FAO).

Cruz, J.-F. 2004. "Fonio: A Small Grain with Potential." *LEISA Magazine* 20 (1): 16–17.

Díaz-Bonilla, E., and J. Hepburn, 2016. *Trade, Food Security, and the 2030 Agenda*. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

Dutfield, G. 2008. "Turning Plant Varieties into Intellectual Property: The UPOV Convention." In *The Future Control of Food: A Guide to International Negotiations and Rules on Intellectual Property, Biodiversity and Food Security*, edited by G. Tansey and T. Rajotte. London: Earthscan.

FAO, IFAD, and WFP. 2015. *The State of Food Insecurity in the World 2015: Meeting the 2015 International Hunger Targets—Taking Stock of Uneven Progress*. Rome: Food and Agriculture

Organization (FAO), International Fund for Agricultural Development (IFAD), and World Food Programme (WFP).

Girard, F., and C. Frison, eds. 2018. *The Commons, Plant Breeding and Agricultural Research: Challenges for Food Security and Agrobiodiversity.* Abingdon: Earthscan.

Global Panel. 2016. *Food Systems and Diets: Facing the Challenges of the 21st Century*. London: Global Panel on Agriculture and Food Systems for Nutrition.

Halewood, M., ed. 2016. *Farmers' Crop Varieties and Farmers' Rights: Challenges in Taxonomy and Law*. London: Routledge.

Halewood, M., and I. Lapeña. 2016. "Farmers' Varieties and Farmers' Rights: Challenges at the Crossroads of Agriculture, Taxonomy and Law." In *Farmers' Crop Varieties and Farmers' Rights: Challenges in Taxonomy and Law,* edited by M. Halewood. London: Routledge.

Jaffé, W., and J. van Wijk. 1995. "The Impact of Plant Breeders' Rights in Developing Countries: Debate and Experience in Argentina, Chile, Colombia, Mexico and Uruguay." Amsterdam: Inter-American Institute for Cooperation on Agriculture, University of Amsterdam. repiica.iica.int/docs/B1442i/B1442i.pdf.

Köhler-Rollefson, I., E. Mathias, H. Singh, P. Vivekanandan, and J. Wanyama. 2010. "Livestock Keepers' Rights: The State of Discussion." *Animal Genetic Resources* 47: 119–23.

Lansing, J.S. 2007. *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*. Princeton, NJ: Princeton University Press.

Louwaars, N.P., and W.S. De Boef. 2012. "Integrated Seed Sector Development in Africa: A Conceptual Framework for Creating Coherence between Practices, Programs, and Policies." *Journal of Crop Improvement* 26 (1): 39–59.

Louwaars, N.P., R. Tripp, D. Eaton, V. Henson-Apollonio, R. Hu, M. Mendoza, et al. 2005. *Impacts of Strengthened Intellectual Property Rights Regimes on the Plant Breeding Industry in Developing Countries: A Synthesis of Five Case Studies.* Report for the World Bank. Wageningen: Wageningen University and Research.

Montenegro, M. 2016. "Banking on Wild Relatives to Feed the World." *Gastronomica* 16 (1): 1–8.

Morris, C.E., and D.C. Sands. 2006. "The Breeder's Dilemma: Yield or Nutrition?" *Nature Biotechnology* 24 (9): 1078–80.

Pelegrina, W.R., and R. Salazar. 2011. "Farmers' Communities: A Reflection on the Treaty from Small Farmers' Perspectives." In *Plant Genetic Resources and Food Security: Stakeholder Perspectives on the International Treaty on Plant Genetic Resources for Food and Agriculture,* edited by C. Frison, F. López, and J.T. Esquinas-Alcázar. Abingdon: Earthscan.

QUNO. 2015. *Small-Scale Farmer Innovation Systems: A Review of the Current Literature*. Geneva: Quaker United Nations Office (QUNO).

Swiderska, K., A. Mead, G. Dutfield, and A. Argumedo. 2016. "Designing a Labelling System for Biocultural Heritage-based Products." *Policy Matters* 21: 140–48.

UPOV. 2005. *UPOV Report on the Impact of Plant Variety Protection*. Geneva: International Union for the Protection of New Varieties of Plants (UPOV).

ANNEX 1: Text of SDG 2

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Targets

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

Means of Implementation Targets

2.A Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

2.B Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.

2.C Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

Source: https://sustainabledevelopment.un.org/sdgs

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Achieving Sustainable Development Goal 2

Which Policies for Trade and Markets?

In September 2015, governments at the United Nations took a major step towards defining a common framework for future action, when they adopted 17 Sustainable Development Goals (SDGs) as part of the new Agenda 2030. Among other things, this included a commitment under SDG 2 to end hunger and all forms of malnutrition by 2030. Better-functioning markets for food and agriculture are integral to this bold new vision: governments agreed, for example, to "correct and prevent trade restrictions and distortions in world agricultural markets" as one of the measures they would take to help achieve this goal.

The short papers in this compilation examine the linkages between SDG 2 and policies affecting trade and markets, and seek to identify opportunities for action in three separate policymaking and negotiating processes: the G20; the World Trade Organization, and the evolving network of preferential trade agreements. As such, the papers are intended to contribute to discussions on how these three separate policy processes can best support the achievement of Agenda 2030 objectives, and SDG 2 in particular; and also to the reflections among the sustainable development community on the relevance of trade policy for progress towards the global goals.

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