CHAPTER 2

Repurposing Agricultural Support
Creating Food Systems Incentives to Address Climate Change

ROB VOS, WILL MARTIN, AND DANIELLE RESNICK

Rob Vos is division director and **Will Martin** is a senior research fellow, Markets, Trade, and Institutions Division, International Food Policy Research Institute (IFPRI), Washington, DC. **Danielle Resnick** is a nonresident fellow, IFPRI, and a fellow with the Brookings Institution, Washington, DC.

KEY MESSAGES

- Agricultural support policies transfer around US$620 billion per year to the farm sector worldwide.
- Support policies based on subsidies and trade barriers are highly distortive to markets and are also regressive, as most support is provided to larger farmers. On balance, the incentives this support creates appear to increase greenhouse gas emissions that contribute to climate change.
- Support provided to the farm sector in the form of subsidies involves budget allocations that can be reallocated. Better outcomes could be achieved if even a small portion of agricultural subsidies were repurposed into investments in R&D dedicated to productivity-enhancing and emissions-reducing technologies. Repurposing would create multiple wins – mitigating global climate change, reducing poverty, increasing food security, and improving nutrition.
- Because current support policies are often politically popular and serve well-organized interests, reform will be difficult, especially since repurposing would need to be internationally coordinated for greatest effect.
- Successful reform will require detailed analysis of winners and losers and thoughtful strategies. Creating constituencies for reform at the national level and in international forums will be essential to build political consensus for concerted global action.

Agricultural support policies provide enormous transfers of resources to farmers — about US$620 billion per year worldwide in 2018–2020 — and enjoy strong political support in both developed and developing countries. Some agricultural support policies, such as input subsidies, have boosted global food production, particularly of staple crops, thereby reducing hunger and poverty. Yet, there are serious concerns about their impacts on achieving sustainable, healthy, and inclusive food systems. Redirecting, or "repurposing," agricultural subsidies toward investments that support both increased production and greater sustainability — such as agricultural research and development (R&D) and rural infrastructure — has the potential for win-win-win gains for people, planet, and prosperity.

CURRENT IMPACTS OF AGRICULTURAL SUPPORT AND OPTIONS FOR REFORM

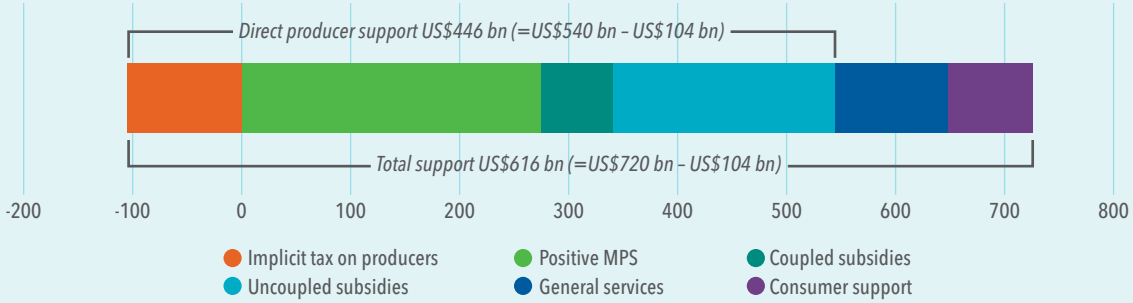
Current agricultural support goes largely to agricultural producers, primarily in forms that affect market prices and distort incentives for producers and consumers (Box 1). Support coupled to output or input use increases output, thus increasing greenhouse gas (GHG) emissions from agricultural production and land conversion for agriculture. Support provided through trade barriers, however, may reduce global emissions by reducing demand for output. The strong focus of many agricultural support policies on promoting staple crops has improved access to basic calories but has done much less to improve dietary diversity. Moreover, impacts of the support are often regressive — benefiting wealthier commercial farmers, while denying poorer farmers access to markets — and, when provided through trade protection, raise the cost of food and harm poor consumers.

Government support to agriculture is often justified by perceived needs to protect farm incomes, ensure food availability, and promote agricultural productivity. Of the $620 billion total, individual producers received about $540 billion in "positive" support[1] per year (2018–2020) through market price support and subsidies. However, its efficiency in delivering benefits to farmers is low, estimated at 35 percent,[2] with the remainder either shared with consumers or dissipated as economic waste. Many interventions create trade

BOX 1 CURRENT AGRICULTURAL SUPPORT

Current agricultural support (provided by 54 countries for which comparable data are available) amounts to US$616 billion per year, net of taxes on agriculture (2018–2020).[a] Of this, positive direct support to farmers amounts to $540 billion per year, but some farm activities (often exports) are also taxed, at $104 billion globally per year. Thus, net direct farm support averaged $446 billion per year in 2018–2020 (Figure A).

BOX FIGURE A Agricultural producer support by main types of support, 2018–2020 (billions of US$ per year)



Source: OECD, *Agricultural Policy Monitoring and Evaluation 2021* (Paris: 2021).

The "positive" direct support to farmers includes trade measures and market price support, valued at $272 billion per year in total. This support generally does not entail use of government budget resources. Rather, it involves implicit transfers from consumers to producers by creating a price gap between domestic market prices and border prices for specific agricultural commodities. Border measures can take the form of import licenses, tariffs, tariff rate quotas, or export bans that raise domestic prices, benefiting the farm sector. Some emerging and developing countries, including Argentina, India, Indonesia, Kazakhstan, Russia, and Viet Nam, implicitly tax producers of certain agricultural commodities through export taxes or export restrictions, which depresses the domestic price of these products. This "negative" market price support amounted to $104 billion per year, as mentioned above.

Support measures requiring fiscal expenditures amounted to $448 billion per year. These include direct transfers to producers and consumers such as farm output or input subsidies, consumer food subsidies, and spending on public goods in support of agricultural development. Three-quarters of this support ($268 billion) goes directly to farmers: $66 billion in the form of subsidies directly coupled to levels of production and/or to input use and $202 billion in less directly coupled payments to farmers, such as payments to land. Only a limited portion of budgetary support is for R&D and agricultural innovation systems, infrastructure, and other general services for the sector, with only 4 percent of total support allocated specifically to R&D. In 2018–2020, direct support to consumers in the form of food subsidies amounted to 11 percent of total positive support (or $78 billion per year globally).

conflicts between countries and very few help reduce greenhouse gas (GHG) emissions, despite the threat of devastating climate change impacts on agriculture, especially in tropical zones. Only a small share of total support is invested in public goods, including R&D and rural infrastructure, although both the private and social returns of such investments are estimated to be very high (see Chapter 4).

The need for reforms is now well recognized,[3] and the urgency of reducing GHG emissions and adapting to climate change has added impetus to the calls for reform. However, recent studies – discussed below – have shown that simply eliminating all existing support would not greatly reduce emissions, but would depress farm incomes, increase poverty, and raise the cost of healthy diets.[4] Public discourse thus has shifted to how existing support might be repurposed to create

better incentives for producers and consumers. The 2021 United Nations Food Systems Summit (UNFSS) called for such repurposing as part of a just rural transition to sustainable food systems.[5]

GLOBAL SCENARIO ANALYSIS: REMOVING ALL SUPPORT

In a series of recent studies, IFPRI estimated the impact of a complete withdrawal of current agricultural support on GHG emissions, farm output, poverty, food security, and diets using its global model, MIRAGRODEP.[6] A first, perhaps surprising, result is that current measures have only a small influence on the overall (global) volume of agricultural production (Figure 1), although they do have important impacts in individual countries. Second, at the global level, withdrawals of domestic subsidies and border measures have offsetting impacts on production and emissions. Removing subsidies *reduces* both global food output and emissions, but removing border protection, which acts as a tax on demand, slightly *increases* global output and emissions in protecting countries. The combination of removing both subsidies and border support slightly *reduces* global output and GHG emissions from agriculture (Figure 1), lowers farm output, and raises the cost of healthy diets. Thus, simply abolishing all support would not be a game-changer and would involve trade-offs between environmental, economic, and social objectives.

FIGURE 1 Global implications of repurposing domestic support

Source: M. Gautam, D. Laborde, A. Mamun, W. Martin, V. Piñeiro, and R. Vos, *Repurposing Agricultural Policies and Support: Options to Transform Agriculture and Food Systems for Better Health of People, Economies and the Planet*, Technical Report (Washington, DC: World Bank and IFPRI, 2022).

Note: Green bars indicate movement toward societal goals; orange/red bars indicate movement away from societal goals.

The impacts of removing all agricultural subsidies differ substantially between rich and poor countries (Table 1). The drop in farm income per worker would be four times larger in developed countries than in developing countries. Farm employment would decline in developed countries but increase in developing countries, where higher world prices would induce a supply and employment response. However, poverty in developing countries would increase, as higher food prices push more people below the poverty line. GHG emissions would fall by over 6 percent in developed countries, but worldwide they would fall by only 1.5 percent because agricultural production would shift to developing countries.

Clearly, agricultural policy reform must be carefully thought through to achieve the drastic reductions in GHG emissions that are needed to avert disastrous climate change impacts. Given the multiple goals that food systems are now called upon to address, how can the substantial resources that support agriculture be repurposed in ways that simultaneously provide strong incentives to reduce GHG emissions, improve food system efficiency and farm productivity, and help combat poverty, hunger, and malnutrition?

TABLE 1 Impacts of abolishing all agricultural subsidies by country group (percent change)

	World	Developed	Developing
Macroeconomic			
National real income	0.05	0.05	0.04
Farm Sector			
Real farm income per worker	-4.51	-11.36	-2.70
World prices	2.93	2.93	2.93
Production volume – crops	-1.31	-2.56	-1.02
Production volume – livestock	-0.49	-1.10	-0.07
Social			
Farm employment	-0.53	0.25	-0.60
2040 poverty at PPP $3.20	0.05	-0.01	0.06
Nutrition/Diets			
Dairy consumption per capita	-0.42	-0.49	-0.37
Veg & fruit consumption per capita	-0.48	-0.54	-0.45
Healthy diet food prices	1.70	2.17	1.44
Climate			
Emissions from production, % of ALU	-0.59	-1.52	-0.38
Emissions from land-use change, % of ALU	-0.89	-4.52	-0.07
Total emissions, % of ALU	-1.48	-6.04	-0.44
Nature			
Agricultural land	-0.06	-0.15	-0.01

Source: M. Gautam, D. Laborde, A. Mamun, W. Martin, V. Piñeiro, and R. Vos, *Repurposing Agricultural Policies and Support: Options to Transform Agriculture and Food Systems for Better Health of People, Economies and the Planet*, Technical Report (Washington, DC: World Bank and IFPRI, 2022).

Note: ALU = agriculture and land use.

GLOBAL SCENARIO ANALYSIS OF REPURPOSING SUPPORT

Existing subsidies can be repurposed in ways that would make significant progress toward achieving both global climate and food security goals. Additional model-based analysis conducted by IFPRI and the World Bank[7] indicates that investing an additional 1 percent of agricultural output value in R&D for technologies that both increase the efficiency of production and reduce emission intensities – such as modified diets for ruminants and alternate wetting and drying for rice – complemented by incentives to farmers for the adoption of those technologies could achieve greater gains with fewer trade-offs than simply eliminating subsidies.

This scenario assumes an internationally concerted strategy in which all countries shift resources from current market-distorting subsidies toward more spending on R&D that reduces emissions and, by raising productivity, creates incentives for farmers to adopt the improved technologies. The scenario results are promising: global welfare and food output increase; food prices fall, making food and healthy diets more affordable for many people; and poverty rates fall worldwide (Figure 1). Global GHG emissions from agriculture and land use change would drop by about 40 percent, both because of the direct reduction in emissions from crop production and because higher productivity reduces the need for agricultural land. Farm incomes would fall with the removal of subsidies, although returns to farm labor would rise if policy reform were combined with rural development policies to facilitate a benign movement of labor out of agriculture.

The reduction in GHG emissions could be increased further through complementary policies not considered in this scenario analysis. These could include measures — such as nutrition education, food standards, and taxation — that influence food demand and dietary choices to reduce excess consumption of unhealthy or emissions-intensive food products (see Chapter 8).

POLITICAL CONSTRAINTS TO POLICY REFORM

Reallocation of agricultural support to R&D focused on productivity-enhancing and emissions-reducing technologies could produce better outcomes for food security and nutrition and for the natural environment, especially if carried out in an internationally coordinated manner. However, even the best reform agenda will inevitably face considerable political hurdles.

Political economy studies typically focus on three factors that shape policy outcomes: interests, institutions, and ideas.[8] Interests matter because different groups have different goals and different abilities to organize to promote those goals. Institutions, such as electoral processes, land tenure systems, and international organizations, matter because they filter whose interests prevail in policy processes and shape the scope of potential decisions. Ideas matter because they influence both the goals of stakeholders and the policies used to achieve them. Four case studies of agricultural support policies presented here provide insight into the interplay among interests, ideas, and institutions in generating support for particular interventions and in achieving reforms in the face of often-formidable obstacles (Boxes 2–5).

THE POWER OF INTERESTS AND IDEAS. In recent years, agricultural policy in India has pushed domestic food prices below world levels, helping consumers but hurting many farmers (Box 2).[9] This is consistent with a common global pattern: despite large agricultural labor forces, many lower-income countries tax agriculture, while rich countries with few farmers generously subsidize the sector.[10] In wealthier countries, smaller numbers of farmers tend to be more effective in lobbying for their interests than urban consumers, who spend less of their incomes on food than consumers in poorer countries. In addition to pressures from special interest groups, policymakers often design policies based on broad perceptions of what is considered best for agriculture and food security. Indian policymakers have designed policies based on the "idea-driven" goal of national self-sufficiency in staple foods, seeing self-sufficiency as synonymous with food security. In this regard, India's input subsidy schemes (especially for fertilizer and electricity) and its active R&D program have helped maintain the supply of staple foods, and hence self-sufficiency, despite relatively low farm prices. Input subsidies garner strong political support from both farmers and input providers, interest groups who are perhaps less aware of the losses they suffer from the low food prices (see South Asia in the regional section). Where goals are in confict, the interest in the self-sufficiency goal seems to be strong enough to override the goal of relatively low food prices — with India's protection on import-competing commodities generally positive, and that for exportables generally negative.[11]

Another important goal of India's agricultural policy is price stabilization for key staple crops. The country's government has pursued this through a combination of trade measures and public stockholding.[12] Purchases for price stabilization and subsidized food distribution to the poor are influenced by minimum support prices. When the Indian government attempted to reform agricultural marketing arrangements in 2020, it encountered intense resistance from different interest groups, including farmers, commission agents, and state governments, and eventually dropped the reforms.[13]

INSTITUTIONAL COMMITMENTS. The evolution of agricultural policies in China highlights a combination of shifting social interests, institutional factors, and ideas (Box 3). During the 1980s, the government taxed agriculture to provide low-cost food for urban consumers. In the 2000s, government policies shifted dramatically toward support for agriculture. This policy change was, in part, a response to the widening urban–rural income gap associated with rapid economic growth and constraints on outmigration from rural areas. In addition, China's commitments at the World Trade Organization (WTO) had an important institutional influence by limiting the growth of agricultural trade

BOX 2 FARM SUPPORT AND OBSTACLES TO REFORM IN INDIA

Bharat Ramaswami

Professor of Economics, Ashoka University, Haryana, India

India's agricultural policies support farmers through input subsidies (fertilizer, electricity, and hence groundwater) and consumers through low food prices. Key staples, namely rice and wheat, receive substantial price support, and subsidized food distribution schemes rely on public procurement that likewise benefits farmers. Electorally driven credit subsidies (created by forgiving formal sector loans) are also sizable. However, agriculture does not provide a viable livelihood for most Indian farmers, with 86 percent of farms working less than 2 hectares and mostly growing staple foods.[a]

Expansion of India's farm support is a perennial election theme. Its enormous political traction persists despite the fact that price subsidies have perpetuated the bias toward staple crops and hampered structural transformation and growth. At the same time, interventionist agricultural trade policies generally protect consumers and implicitly tax producers.

Subsidies have also contributed to environmental degradation and greenhouse gas (GHG) emissions; most notably, methane emissions from rice cultivation are sustained through rice price supports and electricity subsidies. Depletion of valuable water resources is also aggravated by support policies, both directly (through electricity subsidies that promote groundwater withdrawal) and indirectly (through output subsidies that promote overproduction of water-intensive rice). However, the policy debate on environmental damage stemming from agriculture has focused on air pollution, as crop-residue burning is a major contributor to poor air quality in northern India. Crop-residue burning is a common practice in the paddy-wheat crop rotation sustained by support prices.[b] Reduction of GHG emissions has yet to receive similar attention.

Resolving trade-offs between supporting livelihoods and food security, on the one hand, and environmental sustainability on the other, is a challenge in India. Current agricultural subsidies amount to about 2 percent of GDP, but account for about 20 percent of farm income.[c] Any repurposing of support, including toward R&D and promotion of climate-smart policies, could thus cause hardship for poor farmers.

In the past decade, successive Indian governments have experimented with reforms. Historically, open-ended procurement of rice and wheat has been the primary mechanism to provide price support to farmers. The system is logistically demanding, however, and leaves the government with unwanted stocks. For other crops, policymakers have favored price deficiency payments, which are easier to administer despite being expensive and reproducing some of the market distortions of the procurement system. Policymakers increasingly see direct (uncoupled) transfers as an alternative to these distortionary subsidies. Progress has been made in financial systems to facilitate such payments, but gaps remain in reaching all farmers, in part because of poor land records and insufficient digital connectivity.

Agricultural policy reform would serve India's national interests and potentially make an important global contribution to climate change mitigation, but it lacks political ownership. In addition, the country's federal structure gives state governments considerable influence over agricultural policies. Ignoring these constitutional constraints on federal authority has proved costly. In 2020, the central government pushed through reforms to liberalize agricultural markets, but was forced to reverse course when it encountered strong opposition from state governments, commission agents, and farmers, culminating in a year of demonstrations involving more than 5,000 protests.[d] These political interests would be less constraining in an economy that offered plentiful jobs in the nonfarm sector; as things stand, reforms may have to be designed through consensus and then carried out incrementally to gain the necessary political support.

protection, leading policymakers to support farm incomes through lump-sum payments to farmers. More recently, China has also increased public investments in R&D and innovations in technologies and practices that raise agricultural productivity, reduce GHG emissions, and enhance carbon sequestration – a combination of approaches that helps both achieve self-sufficiency goals and meet commitments under international agreements on climate change (including the Paris Climate Accord). This exemplifies how

BOX 3 CHINA'S EFFORTS TO REFORM AND "GREEN" AGRICULTURE

Jikun Huang

Professor of Agricultural Economics, China Center for Agricultural Policy, Peking University, Beijing

China's agricultural performance has been impressive, averaging 4.5 percent annual sectoral growth and 7 percent annual growth in farm incomes since the 1980s, while substantially diversifying production. Yet, many challenges remain.[a] The rural–urban income gap has widened, and agricultural expansion has come at the cost of natural resource degradation and high greenhouse gas (GHG) emissions.

Achieving self-sufficiency in staple foods and stability of domestic food prices are policy priorities in China. The Chinese government implicitly taxed agriculture until the early 1990s by keeping urban food prices low. This policy was reversed in the mid-1990s as concerns grew about the expanding rural–urban income gap and urban consumers became less concerned about food prices. The government allowed domestic prices to rise above world market prices and began providing direct payments to farmers – thus shifting from taxation of producers to protection of domestic production. As a result, the nominal rate of protection (NRP) in agriculture increased from –50 percent in 1981 to around +13 percent in recent years, with direct payments adding 5 percentage points (as reflected in the nominal rate of assistance, NRA; see Figure B).

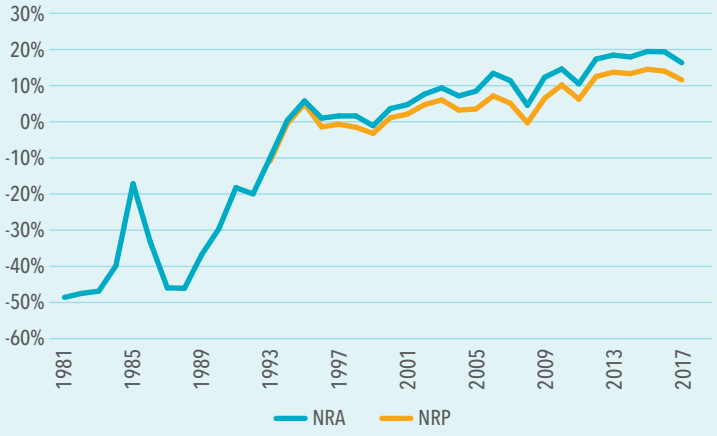
The reversal in China's agricultural policies might have been even greater if it had not been limited by the country's commitment to multilateral trading rules. For instance, protection of domestic rice production would likely have been higher if not for China's commitment to a tariff binding (cap) of 65 percent at the World Trade Organization (WTO). While the country's policymakers remain committed to ensuring grain self-sufficiency, they managed to do so without raising protection for rice, unlike other high-growth economies in the region.

To further support farm incomes, in 2004, the Chinese government introduced a direct payment scheme largely decoupled from agricultural production and increased support through crop procurement schemes. Despite the huge fiscal cost, these reforms had only a modest effect on average farm incomes, and benefits from procurement were unequally shared. As a result, the government phased out public procurement of all commodities, except for rice, wheat, and cotton, and converted all farm subsidies to lump-sum income transfers to farmers in 2015.

Environmental concerns and international commitments to reducing GHG emissions led the Chinese government to enhance its Store Grains (Food) in Land (SGiL) and Store Grains (Food) in Technology (SGiT) programs to raise productivity, enhance food security, and promote sustainable production. The program enlargement, introduced in 2015, included large-scale investments in "high-standard farmland," defined as land with a high degree of resilience to impacts of droughts and floods, water-saving production practices, high yields, and soil improvement. Through the SGiT, public expenditure on agricultural R&D was raised to RMB 26 billion (about US$4.1 billion), overtaking US spending and making China the world's largest public investor in agricultural R&D.[b] The additional R&D is primarily focused on biotechnology and digital technology.

In 2016, the Chinese government also introduced a special project to reduce fertilizer and pesticide use and a subsidy program to promote the use of organic fertilizers. In 2018, Technical Guidelines on Green Agricultural Development were issued, promoting low-carbon and circular-economy technologies to raise productivity, reduce GHG emissions, and enhance carbon sequestration. This strategy is part of China's effort to comply with its commitments under the Paris Accord to reduce GHG emissions by 2030 and achieve carbon neutrality by 2060.

BOX FIGURE B China's support to agriculture, 1981–2017



Source: Data compiled from J.K. Huang and G.L. Yang, "Understanding Recent Challenges and New Food Policy in China," *Global Food Security* 12 (2017): 119–126, and OECD, *Agricultural Policy Monitoring and Evaluation 2021* (Paris: 2021).

Note: Nominal rate of protection (NRP) is calculated as support from border protection divided by the value of agricultural production at world prices. The nominal rate of assistance (NRA) is calculated as support from all sources divided by value of agricultural production at world prices.

institutions (international agreements, in this case) can drive national policy reform.

SHIFTING INTERESTS. European policy reforms between the 1980s and the early 2000s illustrate how even policies that are rooted in long-held ideas, like food self-sufficiency, and heavily supported by powerful interest groups can be fundamentally changed (Box 4). Europe's original Common Agricultural Policy (CAP) maintained high support prices for farmers. But in the

BOX 4 THE POLITICAL ECONOMY OF EU AGRICULTURAL POLICY REFORM

Johan Swinnen

Global Director, CGIAR Systems Transformation Science Group, and Director General, International Food Policy Research Institute, Washington, DC

When the European Union (EU)'s Common Agricultural Policy (CAP) was designed in the 1960s, it featured administratively determined market price support, with an important role for import barriers. Farm organizations had lobbied strongly for this system to protect them against internal and external competition. The policy found support in widely felt concerns about food security – typically identified with food self-sufficiency – given the challenges of accessing food in many parts of Europe during and after World War II.

High support prices ignited a strong supply response and turned the EU into a major commodity exporter by the 1980s. The farm support required export subsidies, provoking the ire of other agricultural exporters, particularly the United States, which responded with its own program of export subsidies. As world agricultural prices fell to unprecedented lows during the mid-1980s, pressures from other countries increased as did budgetary pressures, with rising costs of export subsidies and storage. The unsold stocks accumulated in embarrassing "butter mountains" and "wine lakes."

Agricultural exporters pushed hard for reform of global agricultural trade during the Uruguay Round of global trade negotiations (1986–1993). Given European desire to contribute to the Uruguay Round and the internal problems with the price support system, important CAP reforms were introduced in 1963.[a] Reforms reduced support prices and replaced them with direct payments to farmers.

The prospect of accession of 10 Eastern European countries with large agriculture sectors to the EU in the 2000s caused much concern. Expectations were that, unless the CAP was further reformed, their accession would lead to exploding budgets, a massive inflow of cheaper Eastern agricultural products, and a conflict with WTO agreements. Food safety and animal welfare crises in the 1990s compounded the pressure for reform. In addition, reform was made easier by institutional changes, as decisions no longer required unanimous agreement of EU member states, removing the veto power of those most opposed. This resulted in the 2003 reform that decoupled farm subsidies from production decisions, while maintaining the overall level of farm support and allowing the gradual integration of the Eastern European countries in the CAP.[b]

Environmental goals have been gradually integrated into Europe's agricultural policies. Subsequent incremental reforms over the past 30 years have introduced environmental policies and shifted more of the budget to such measures.[c] However, the global food price spikes in 2008–2011 provided arguments for those lobbying against environmental measures that restricted input use and production – weakening pro-environment reforms.[d]

Current reforms aim to build a Farm-to-Fork strategy as part of an EU-wide Green Deal that is designed to make Europe the first climate-neutral continent by 2030.[e] The reforms include payments to farmers conditional on reduced use of pesticides and fertilizers, a shift to organic farming practices, and adoption of new technologies that reduce GHG emissions from agriculture. Development and adoption of new, lower-emission technologies will reduce emissions from both production and land use change. A trade-off is that the reduction in fertilizer use and shift to organic farming practices could reduce productivity and thus create pressure to expand agricultural land, be it in the EU or elsewhere, potentially leading to increased global GHG emissions from land use change or a shift to regions with higher emission intensities.[f] As a decade earlier, high food prices in global markets in 2022 trigger the same political economy reactions, reinforcing lobbying pressure from farmers and agribusiness against environmental policies that would reduce productivity and thus the EU's potential to produce food.

face of rising budget costs for farm and export subsidies and pressures from trading partners to reduce export subsidies, the European Commission initiated a major overhaul of the CAP in the 1990s. During the 2000s, new ideas — namely, growing environmental concerns — drove further reforms to European agricultural policies. Incremental changes to reduce agriculture's environmental footprint were introduced from 2003, and more extensive reforms are underway as part of Europe's effort to become the first climate-neutral continent.[14] The reform proposals include payments to farmers conditional on their adoption of more sustainable practices.

COORDINATING TRADE-OFFS ACROSS GOALS. The United States' biofuel program targets three goals — energy self-sufficiency, farm income support, and emission reductions (Box 5). Combining these goals helped build political support over the years for the biofuel program from farmers, investors in biofuel production, and environmental advocates. Much of the support is provided by mandates, which face less budget scrutiny because they have no direct fiscal cost, and which may result in continued production even when it is uneconomic. However, to allay concerns that the use of food grains for biofuel would reduce food availability, the program set targets for expanding biofuel production from nonfood feedstocks. The efficiency of the technology using such inputs for biofuel production is still unproven, explaining in part why the targets have not even remotely been achieved. This failure sends a cautionary note about setting environmental targets without allocating R&D resources to help achieve them.

COLLECTIVE ACTION CHALLENGES. While these four experiences provide lessons for policy reform, they do not address all the types of policy challenges facing national policymakers. For example, collective action problems associated with management of land and water resources require strong institutions, such as water user groups (see Chapter 7). The weakness of such institutions in many parts of sub-Saharan Africa appears to explain the poor coverage and performance of surface irrigation schemes in the region.[15]

Collective action problems also contribute to underinvestment in agricultural R&D globally. Poor countries often underinvest in R&D because constituents cannot see tangible benefits from these investments in the short term.[16] Small countries have less incentive to invest in R&D because they receive only a small share of the benefits from research findings of broad applicability, and hope to benefit from spillovers from other countries' investments and innovations (see Chapter 4).[17] The CGIAR international research system was developed to address these collective action problems. However, an international system also requires strong national agricultural research systems that can adapt improved technologies and practices to local conditions and can promote their adoption. Creating incentives for developing country governments to allocate more resources to national R&D systems remains a challenge. An interesting funding model is the collective agreement among producer organizations in Côte d'Ivoire to provide funding for reinvestment in the Inter-Professional Fund for Agricultural Research and Extension for services to all agricultural sectors.[18]

A GLOBAL REPURPOSING AGENDA

Repurposing agricultural support clearly holds great promise for generating more sustainable, resilient, inclusive, and equitable food systems. Existing government agricultural support budgets offer a potential source of public finance for innovations and incentives to producers and consumers. Currently, only an eighth of total government support to agriculture is invested in R&D, inspection and control systems, and rural infrastructure — all areas where the private sector tends to under-provide — while three-quarters is allocated to individual producing firms, many of which are commercial and large-scale operations, thus reinforcing inequality. Hence, a strategy to mobilize both public and private finance for food systems transformation should include repurposing of the agricultural support that contributes to solving serious environmental, food security, and equity problems.

Current beneficiaries will undoubtedly resist policy reforms, while those who might gain from reforms are likely to be uncertain about the benefits or insufficiently organized to mobilize for change. Consequently, most policy reforms emerge from development of policy instruments that improve the

BOX 5 THE POLITICAL ECONOMY OF BIOFUEL POLICIES IN THE UNITED STATES

Biofuel policies in the United States are an energy and agricultural strategy with important environmental dimensions. Biofuel policies were first introduced in the 1970s, with the goal of replacing expensive petroleum-based fuels and lead-based additives then used to improve engine performance. They were also supported by interest groups – first farmers and then ethanol producers. As concerns about global greenhouse gas (GHG) emissions increased, biofuels were increasingly justified on environmental grounds.[a]

Support for biofuels was initially provided by a subsidy in the form of a tax credit.[b] Production of ethanol tripled between 2000 and 2007, thanks to the combination of a fixed subsidy and a sharp rise in the price of oil. Reforms in 2005 and 2007 introduced a mandate for the use of biofuels, with targets rising from 13 billion gallons in 2010 to 36 billion gallons in 2022. This policy was enormously popular with ethanol distillers and blenders, who otherwise would face substantial uncertainty about profitability and throughput; however, the mandate makes the demand for feedstock unresponsive to price changes, hence likely increasing the volatility of grain prices.

Because of concerns that transferring large shares of grain output to production of biofuels would raise food prices,[c] the mandate required only a 25 percent increase in conventional biofuels and targeted a twentyfold increase in advanced biofuels, mainly from vegetation unsuitable for human consumption. However, at the time, there was no established technology to achieve this increase, nor have substantial advances been made yet, with the result that advanced biofuel output has increased only sixfold.[d]

Another drawback to promoting ethanol for environmental purposes is that while bioethanol use may decrease fossil-fuel emissions, its production increases emissions through the land use change required to grow bioenergy crops.[e] Considering only the land use change entailed within the United States, recent estimates suggest that US ethanol has a higher GHG intensity than oil-based gasoline.[f]

Several lessons can be drawn from this experience. One is that environmental goals, and particularly mitigation of climate change, may provide important pressure for change. A second is that it may be helpful to build coalitions, including among interests with different but potentially compatible goals – such as energy self-sufficiency and farm income support – to achieve rapid, widely supported reform. However, no single instrument such as biofuel policy can hope to achieve multiple goals, so additional policy instruments are needed.[g] Finally, simply mandating a goal, such as a major expansion of output using new technologies, is unlikely to be successful unless it is backed by investments in targeted R&D.

balance between gains and losses – such as the EU's provision of financial support to farmers who engage in forest conservation and organic practices – or identifying windows of opportunity for change.[19] Windows of opportunity for national reforms may come from international agreements, including the WTO and Paris Climate Accord. Such agreements could also provide an opportunity for developing an internationally concerted repurposing agenda.

The case for such an agenda is easily made. Climate change is an existential threat to food systems globally and the repurposing scenarios analyzed in this chapter clearly show that international cooperation for repurposing achieves superior outcomes on all environmental, economic, and social dimensions for all countries compared with current non-cooperative agricultural support policies. Nonetheless, getting to a common approach will not be easy. This is so because some key tools for emissions reduction – such as carbon taxes and transferable emissions quotas – work less well in agriculture than in sectors dominated by energy-use emissions. For instance, it is difficult to monitor and tax emissions from livestock or rice production. Thus, a carbon tax would create little incentive to change production techniques. Regulatory approaches, such as mandating reduced use of chemical fertilizer or targeting levels of organic farm production, may be ineffective in lowering emissions if they reduce yields (as the evidence suggests) and thus increase the agricultural land footprint, and hence, emissions from land use change.

A detailed analysis of societal gains in the short and long run and of likely winners and losers could help to build support for repurposing. Reallocation of resources to R&D focused on raising productivity and reducing emissions is expected to produce major societal gains, including benefits for those farmers who benefit from current support. However, the gains from innovation in sustainable production methods may be perceived as uncertain, and adoption may come at a cost to producers in the short run. Compensatory payments to losers and to offset adoption costs for producers could help win political support. Importantly, appropriate regulations, such as mandates on the use of renewable energy or limits on the conversion of land for farming, may be essential to overcome the resistance of some agricultural producers to more environmentally sustainable reforms.

Shifting resistance that is tied to ideas, such as the notion that self-sufficiency should be prioritized, may require policy analysis to overcome misperceptions about the impacts of particular policies and reframing of reform benefits in new ways to secure political support. It may require identifying policy options that minimize the cost of a goal that cannot be changed — for instance, replacing a goal of zero imports or exports of any staple with a broader goal of net food self-sufficiency.

Lastly, there are interactive and mutually reinforcing dynamics between the domestic and global policy arenas. Creating constituencies for reform at the domestic level is essential to achieving global action. To spur domestic action and overcome resistance, an even-handed global diffusion of technologies and financial resources is needed to let all countries reap the benefits of agricultural policy reform. Given that climate change and environmental sustainability transcend borders and that national policies have strong international spillover effects, international coordination is essential. However, reaching a common understanding of the benefits of acting together (and the cost of failure) will not be easy. Intense dialogue, informed by continuous and credible assessments of the gains to be obtained and trade-offs to be reckoned with, will be essential to smart repurposing of agricultural support.