Task Force 5
2030 Agenda and Development Cooperation

Policy brief

REPURPOSING AGRICULTURAL POLICY SUPPORT FOR CLIMATE CHANGE MITIGATION AND ADAPTATION

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ABSTRACT

Agricultural production is both strongly affected by climate change and a major contributor to climate change, with agriculture and land use change accounting for about one fifth of total global greenhouse gas emissions – more than for transport or industrial uses. Agricultural production benefits from substantial government support, costing at least US$640 billion per year worldwide. Past and current support have an impact on greenhouse gas emissions by influencing the composition and location of output, and production practices. This brief summarises evidence indicating that simple elimination of all existing support measures would do little to reduce global emissions from agriculture, while they could be cut by as much as 40 per cent with "smart repurposing" that would shift resources towards R&D and incentives for the widespread adoption of productivity-enhancing and climate-resilient production practices. Such policy reform, if concerted globally, will also provide win-win solutions for reducing poverty (SDG1), improve food security and reduce the cost of a healthy diet (SDG2), while improving global welfare, reducing global inequalities and improving biodiversity (SDGs 8, 10 and 15).

The brief recommends that the G20: (i) support the international AgIncentives Consortium to serve as an enhanced platform to monitor the environmental, as well as the economic and social impacts of agricultural support measures; (ii) prepare a guidance note for the international coordination of smart repurposing of agricultural support measures to align these with common objectives of sustainability and efficiency of food systems, poverty reduction, food security and affordability of healthy diets for all; and (iii) organise joint sessions of Agriculture, Finance and Development Track Ministers to engage in policy dialogue leading to concerted action for the repurposing of agricultural support measures.

CHALLENGE

Agricultural production is both strongly affected by climate change and a major contributor to it. Agriculture and land use change account for one fifth of global greenhouse gas (GHG) emissions (FAO 2021). When also including other parts of supply chains (transport, storage, processing, distribution, etc.), the agrifood system contributes one third of global GHG emissions (Tubiello et al., 2021). At the same time, the agrifood system is a direct victim of climate change, with production, yields and nutritional value of food already being affected by greater climate variability and more frequent and intense extreme weather shocks. At the core of this conundrum are the incentives facing the agrifood system.

CURRENT AGRICULTURAL SUPPORT

Current agricultural support provided by 54 countries for which comparable data is available amounts to about US$640 billion per year. This support is mainly provided to agricultural producers. Nearly all this support is provided by G20 countries and most of it in forms that distort markets through production-linked support to farmers, often entailing incentives to production processes and products that generate substantial GHG emissions.

During 2017–2019, an estimated US$446 billion (equivalent to 12.5 per cent of gross farm receipts) was provided annually in the form of direct subsidies to farmers from governments (Figure 1). Near US$200 billion per annum took the form of market price support through trade restrictions, mostly in the form of tariffs that push up domestic prices. In addition, farmers receive direct subsidies that are either "coupled" to output levels and input use, while others are (at least notionally) "decoupled" from specific production and provided as direct payments to farmers. The 54 countries for which such data are collected by the OECD spent on average US$185 billion per year on coupled subsidies and US$68 billion per year on subsidies decoupled from production during 2017–2019. They further spent US$106 billion per year on General Services Support policies designed to create enabling conditions for agriculture, such as agricultural innovation systems, sanitary and phytosanitary standards, and rural infrastructure.

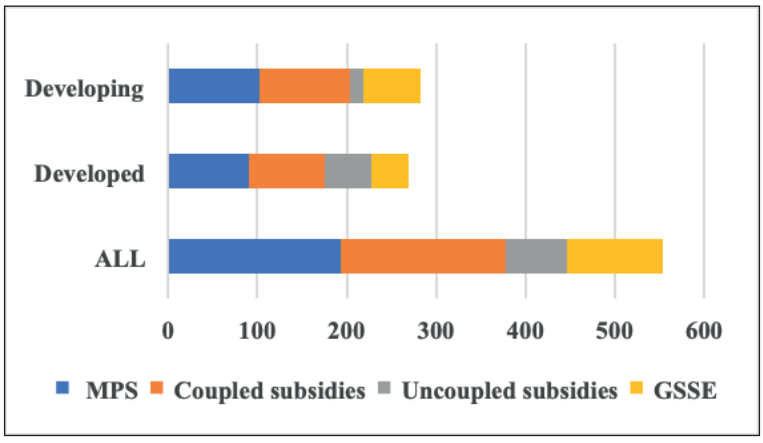


Figure 1: Agricultural producer support by main types of support, 2017–2019

(Billions of US$ per year)

Source: Laborde et al. (2021)

The support provided by countries has a long history and mostly has been grounded in perceived needs to promote agricultural productivity, protect farm incomes and/or ensure adequate and accessible food availability. No doubt in many instances these objectives have been served by the support measures. At the same time, however, they have provided incentives for modern farming systems that are a major cause of global GHG emissions and excessive pressures on land, water and other natural resource systems.

IMPACT ON GLOBAL GHG EMISSIONS OF TODAY'S AGRICULTURAL SUPPORT MEASURES

Few of the existing agricultural support measures have been explicitly designed to meet environmental objectives, such as the reduction of GHG emissions from agriculture. In fact, some countries allocate much of their support to emission-intensive agricultural products like rice, beef and dairy, thereby unintentionally contributing to higher GHG emissions.

A logical and perhaps naïve question to ask thus would be whether the world would be environmentally better off by doing away with all agricultural support? The short answer is, unlikely so. Despite the significant influence of such support over time, recent global model-based analysis points to two important insights.

First, perhaps surprisingly, current support measures have only a small influence on the overall (global) volume of agricultural production. This does not mean that support measures have no effect on production; they do in individual countries. When incentives are changed (e.g., by taking current support away), however, this will also influence production patterns across products and between production. Also, removal of subsidies would increase agricultural prices, reducing demand and eventually also production. Therefore, on balance, the net effect on global production is limited.

Second, by implication, the current support has, on balance, a very limited net impact on global GHG emissions from agricultural production and land-use change (Laborde et al., 2020, 2021; Gautam et al., 2021). This limited impact is explained in part by the fact that, on average, high-emission products (such as livestock and rice) are not subsidised more relative to less emission-intensive types of agricultural production, and in part by the impact of agricultural trade protection on consumer prices for some high-emission products: without the protection, those prices would fall, increasing demand, production and land use for those products, which in turn would induce more GHG emissions.

On balance though, the removal of current coupled subsidies and border measures would reduce emissions, but only slightly. This gain for the environment, would come, however, at the cost of lower yields and farm incomes, which in turn could affect global food security. This shows that a naïve reform of abolishing all support will not simultaneously meet multiple goals of sustainable food system transformation and generate important trade-offs between environmental, economic and social objectives.

Consequently, agricultural policy reform needs to be carefully thought through in order to strike a proper balance across all dimensions of sustainable development countries. That is,

can the substantial resources that support agriculture be repurposed in a way that provides, on the one hand, strong incentives to reduce GHG emissions and adapt to climate change; and, on the other hand, improves food system efficiency, protect farm incomes, and helps combat poverty reduction, hunger, and malnutrition?

PROPOSAL

POTENTIAL FOR GHG EMISSION REDUCTION BY REPURPOSING SUPPORT MEASURES

Many possible scenarios could be considered for repurposing current support to serve both global climate and food security goals. Further model-based analyses (Gautam et al., 2021, forthcoming) point out, however, that shifting support towards investments in and incentives for technology improvements that would both increase efficiency in production and resource use and reduce emission-intensities of agricultural production would make significant progress towards achieving both global objectives.

Incentives for investing in emission-reducing agricultural productivity growth could be provided by shifting resources that are currently made available as distorting subsidies towards more spending on appropriate R&D and compensating farmers for any financial loss from subsidy removal along with the upfront costs of adopting more sustainable technologies and production practices. Many studies indicate that the economic returns from R&D focused on increasing agricultural productivity are extraordinarily high (see e.g., Alston et al., 2009), and agricultural productivity growth appears to have a much bigger impact on poverty reduction than productivity growth in other sectors (Ivanic and Martin, 2018), such that this has the potential of creating significant simultaneous impacts in terms of climate change mitigation and adaptation, poverty reduction and improvements in global food security.

While research with a strong focus on emission reductions as well as productivity increases is relatively new, there are already promising new technologies and practices that could reduce methane emissions from rice and from cattle by up to 50 per cent (see, for example, Mernit 2018 on dietary supplements for cattle; and Chidthaisong 2013 on alternate wetting and drying in rice). Hurdles to adoption of some of these new technologies can be formidable (see e.g., Liu, 2018), but many types of improved farm management practices could provide substantial environmental benefits at low cost (Valin et al., 2021). Because there has been relatively little emphasis in research programmes on reducing GHG emissions, it seems likely that the portfolio of lower-emission innovations could be expanded quite rapidly if given greater priority. Innovations that reduce emissions from the largest single source of GHG emissions – enteric fermentation by ruminants – would seem particularly likely to result in both emission reduction and increases in productivity since these emissions involve an obvious waste of a potentially valuable hydrocarbon.

An *internationally concerted* effort to effectively shift existing budgetary resources now used for agricultural subsidies towards incentives for the adoption by farmers of such emission-intensity-reducing technologies could yield a reduction of almost 20 per cent in global emissions. In the referred scenario analysis (Laborde et al., 2021) it is assumed that the new support structure would lower emission-intensities on average by 30 per cent and would apply to agricultural production that currently accounts for roughly two-thirds of global GHG emissions from agriculture.

Further analysis by Gautam et al. (2021) reconfirms this finding in an illustrative scenario that assumes *all* countries concertedly repurpose current coupled subsidies for payments to farmers conditioned to adoption of higher productivity and lower emission-intensity technologies and supplemented by additional government support for R&D in such technologies and infrastructural improvements. This would not only help reduce GHG emissions from both agricultural production and land-use change by about 40 per cent, it would also increase yields globally, improve farm incomes in developing countries, reduce poverty and hunger, and more poor people would be able to afford the cost of a nutrition-adequate diet, as well as improving global welfare, reducing global inequalities and improving biodiversity (see Table 1 and also Annex Figure A.1). In this way the proposed agricultural and food policy reform, if concerted globally, will provide win-win solutions for making simultaneous progress towards SDGs 1, 2, 8, 10, 13 and 15.

Table 1. Global model-based scenario of concerted effort of repurposing existing coupled agricultural subsidies into conditional payments to farmers adopting productivity and emission-reducing technologies and investments in R&D and basic infrastructure (2020–2040)

		Direction of impact
Macro	Global GDP	+/0
Farm	Real farm income per worker	-/0
	Agricultural prices (world)	-
	Yields – crops	+
	Yields – livestock	+
Social	Farm employment	-
	Poverty (at $3.20 ppd poverty line)	-/0
	Food insecurity (PoU)	-/0
Diets	Sugar consumption per capita	++
	Dairy consumption per capita	++
	Fruits & vegetable consumption per capita	++
	Affordability healthy diets	+
Climate	GHG emissions from production	-
	GHG emissions from land-use change	-
	GHG emissions – total	-

Source: Gautam et al. (2021, forthcoming)

Legend: ++ = strong increase in indicator; + = moderate increase; +/0 = small-to-very small increase; -/0 = small-to-very small decrease; - = moderate decrease; -- = strong decrease. Colours indicate change towards desired outcomes: **dark green** = moderate-to-strong positive impact; **light green** = weak but positive; **red** = moderate-to-strong negative impact; **pink** = weak but negative.

Note: Simulation results with IFPRI's MIRAGRODEP global dynamic general equilibrium model, assuming globally concerted policy reform. Simulation results show average impact over period 2020–2040.

These findings show that a smart repurposing of current agricultural support has the potential of contributing to agriculture's environmental sustainability while also contributing (moderately) to poverty reduction, food security and better nutrition. Key to these outcomes is ensuring that reorientation of support leads to significant efficiency improvements (in terms of both higher yields and lower emission intensities). It is also clear that by reorienting agricultural incentives in this way, not all food system challenges may be addressed in full.

The above assessment is illustrative of the potential for internationally concerted policy reform with better improved outcomes for sustainable development. Findings from additional repurposing scenarios are summarised in the Annex to this policy brief. They are meant to foment policy discussion in search of solutions that balance global and national societal interests and also can be made politically feasible.

POLICY CHALLENGES AND THE ROLE OF THE G20

Agricultural support policies are the prerogative of national governments. Such positive effects on global development would require considerable policy coordination between all countries, since present support is distributed unevenly as poorer nations have less fiscal space to provide agricultural support and, perhaps even more importantly, because national agricultural research systems have generally weaker resource capacity to develop high-productivity and sustainable farm technologies and practices relevant to the local context, and farmers of those countries face bigger obstacles in adapting those practices. To be effective at the global level, an even-handed diffusion of both technologies and financial resources would be needed to let all countries reap the benefits of such agricultural policy reform.

Overcoming national resistance to agricultural policy reform arguably could be the biggest challenge. As mentioned, national farm and agricultural policies have a long history in most countries and have established entitlements and vested interests. Clearly, policy reform needs to be politically sensitive. With an eye on protecting the global common good, internationally concerted efforts by the G20 could help create broader consensus between and within countries how to conduct the much-needed reforms.

International coordination is a must, if only because environmental sustainability is a global priority that transcends borders. While agriculture and food policies are the responsibility of national governments, which need to align these with national priorities, the implications of these policies have strong international spillover effects, including through their impact on competitiveness in international markets and on the environment. Based on existing commitments, the G20 is well placed to provide leadership and guidance. G20 Summits and ministerial meetings have repeatedly made urgent calls to take the necessary action to combat the impacts of climate change on the world's ability to produce enough affordable and healthy food accessible to all.

DETAILED PROPOSALS

The following three proposals would promote and support international coordination of the smart repurposing of agricultural subsidies under the leadership of the G20:

- *Monitoring and evidence for informed policy decisions*: The G20 supports the strengthening and enhancement of the AgIncentives Consortium[1] established by several international organisations (FAO, IADB, IFPRI, OECD and The World Bank) to monitor agricultural support policies. Support to the Consortium would aim to expand coverage of the monitoring of support policies to all countries, and further detail the nature of the support such that it will also facilitate continuous monitoring of environmental, economic and social impacts of agricultural support measures, as relevant to the sustainable development goal of ending hunger and all forms of malnutrition (SDG2).
- *Evaluating policy solutions for sustainable, resilient and green food systems:* The G20 asks the AgIncentives Consortium to provide comprehensive scenario analyses to assess alternative options for effective and smart repurposing of existing agricultural support measures aligned with objectives of sustainability and efficiency of food systems, poverty reduction, food security and affordability of healthy diets, in consideration of national conditions and capabilities. These scenario analyses should help underpin a G20 guidance note for international coordination of the repurposing of agricultural support measures.
- *Building the momentum for repurposing public policies and support*: In joint sessions of Ministers for Agriculture, Finance and the Development Track, the G20 fosters dialogue among members on the repurposing of agricultural support measures leading to a concerted agenda for enacting such policy reforms in pursuance of common goals while recognising differences in country-specific conditions and capacities.

ANNEX

ADDITIONAL RESULTS OF REPURPOSING SCENARIOS

Gautam et al. (2021, forthcoming) present a range of additional repurposing scenarios to better understand possible trade-offs across multiple objectives, including environmental sustainability, food security, poverty reduction, yield growth and protecting farm incomes.

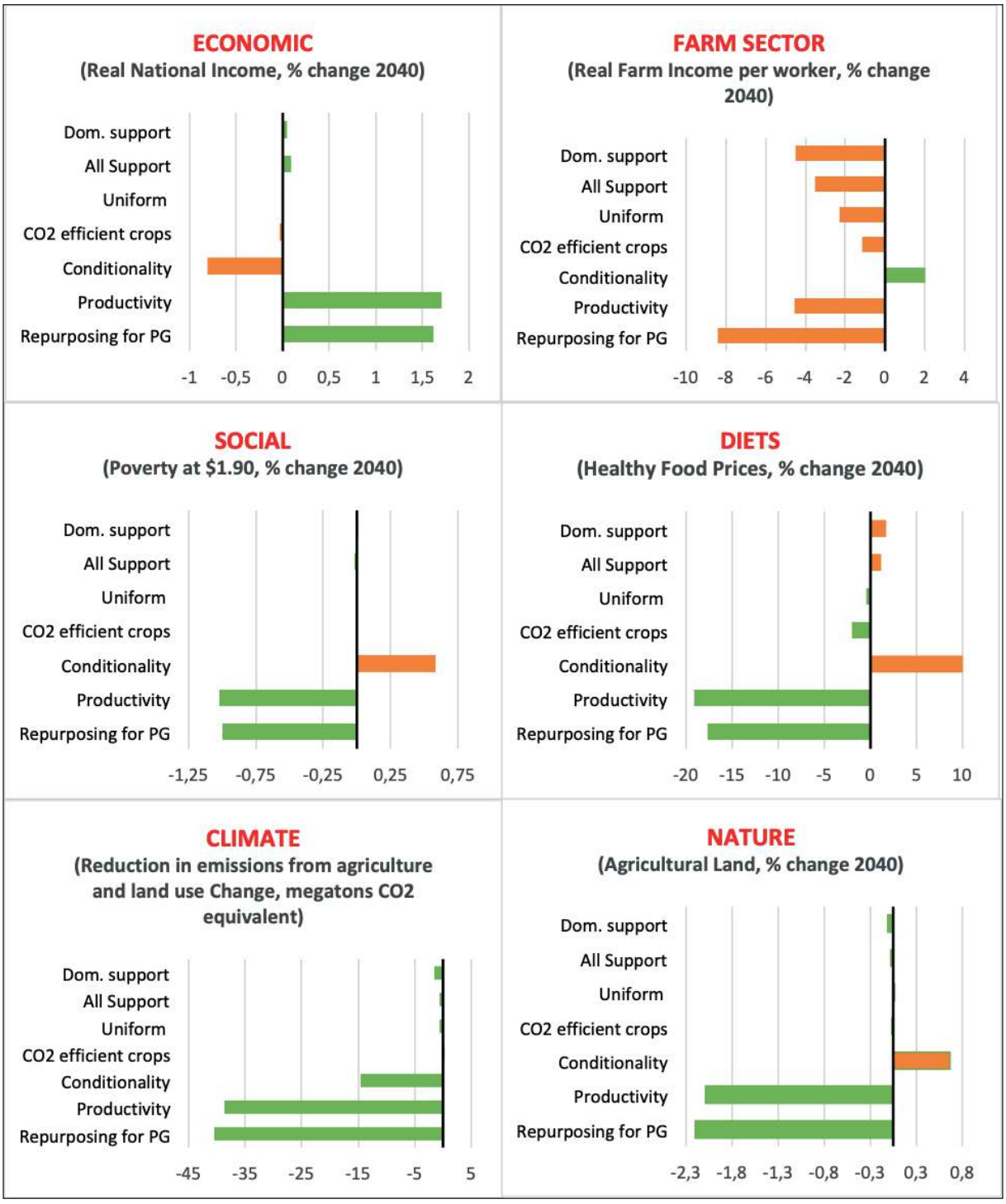
Annex Figure A.1 below compares key results for seven scenarios. The first two consist of two versions of the elimination of support scenarios discussed above in the policy brief: (a) elimination of all domestic support ("Dom. Support"); and (b) elimination of "All Support" (domestic subsidies and market price support through border measures). Figure A.1 confirms the findings discussed in the text, that abolishing existing support would do little to move closer to environmental, social and economic goals.

Findings of two further scenarios are shown in Figure A.1 which (c) distribute support uniformly across agricultural products ("Uniform") or (d) prioritise support to products with low emission intensity ("CO2 efficient crops"). In experiment (c), changing from the current disparate pattern of subsidies to a uniform output subsidy with the same budget cost also has generally modest impacts. Surprisingly, real national income falls, albeit very slightly, a second-best welfare result associated with the continuing distortions in border measures. Global farm income per worker falls, while production shifts towards livestock, suggesting that livestock are, on average, less subsidised than crops – a not surprising result considering that much of the support to crops is provided through input support that is crop specific. This in turn reduces prices of dairy products and raises their consumption levels. Emissions from agricultural production rise by 0.5 per cent, but this increase is more than offset by a decline of 1.1 per cent in land-use emissions.

Simulation (d) involves withdrawing support from the most emission-intensive agricultural commodities – livestock production and rice – and reallocating the available funding to all other agricultural commodities, which are mostly crops with much lower emission intensities. This scenario would reduce average real farm income only slightly and would reduce world prices by around 2 per cent as production of the highly traded grains and other non-livestock commodities expands. The cost of a healthy diet dominated by non-livestock products falls by almost 2 per cent. Perhaps surprisingly, global GHG emissions would increase slightly in this scenario, as the decline in emissions caused by lower agricultural production would be outweighed by increased emissions from land-use change.

The three final scenarios presented in Figure A.1 refer to repurposing of support for the adoption of more sustainable production practices. Scenario (e) ("Conditionality") involves a scenario based on agricultural policy reform that would transform coupled subsidies to direct payments to farmers conditioned on their adoption of "organic" farming practices that reduce use of chemical fertilisers and pesticides, along proposals by the European Union. Based on available evidence, this experiment involves a "productivity penalty" owing to reduced use of modern inputs. As a result, crop production would fall by more than 6 per cent and livestock production by nearly 5 per cent. The decline in output raises world food

prices by a substantial 12.7 per cent which helps raise real farm income per worker. Agricultural land use would increase as resources are drawn into the sector to offset the decline in productivity. On balance it would leave the amounts of emissions from agriculture and land-use change virtually unchanged.



Annex Figure A.1: Global Implications of Repurposing Domestic Support

(% change relative to baseline projections for 2040)

Source: Gautam et al. (2021; forthcoming)

Note: **green** bars indicate movement towards societal goals;

orange/red bars indicate movement away from societal goals

The final two scenarios focus on incentives for and additional investments in R&D to induce productivity growth and promote emission-reducing technologies. Scenario (f) ("Productivity") assumes such repurposing could achieve a 30 per cent increase in agricultural productivity. The final scenario (g) ("Repurposing for PG") refers to the case discussed further in the brief in which productivity increases, but in which existing coupled subsidies are also removed, with resources equivalent to 1 per cent of the NRA repurposed from subsidies to finance R&D and the remainder used as direct and decoupled payments to farmers (at least till the benefits of R&D start to pay off). Results from these two scenarios are similar and as discussed in the text: with positive impacts on overall welfare and improvements in yields, food prices would decline making food more affordable with commensurate benefits in the form of less poverty and improved food security and access to healthy diets. Global greenhouse gas emissions would drop by around 40 per cent. As a potentially sensitive trade-off, farm incomes would fall with lower agricultural prices.

NOTES

[1] http://www.ag-incentives.org/.

REFERENCES

Alston, J.; P. Pardey; J. James; and M. Andersen (2009), "The Economics of Agricultural R&D", in *Annual Review of Resource Economics*, Vol. 1, pp. 537-566

Chidthaisong, A. (2018), "Evaluating the Effects of Alternate Wetting and Drying (AWD) on Methane and Nitrous Oxide Emissions from a Paddy Field in Thailand", in *Soil Science and Plant Nutrition*, Vol. 64 No. 1, pp. 31-38

FAO (2021). "Emissions from Agriculture and Forest Land: Global, Regional and Country Trends 1990–2019", in *FAOSTAT Analytical Briefs*, No. 25, Rome, http://www.fao.org/3/cb5293en/cb5293en.pdf

Gautam, M.; D. Laborde; A. Mamun; W. Martin; V. Piñeiro; and R. Vos (2021), *Repurposing Agricultural Policies and Support: Options to Promote Sustainable Agricultural Development. Technical Report*, Washington D.C., World Bank and IFPRI (forthcoming)

Ivanic, M.; and W. Martin (2018), "Sectoral Productivity Growth and Poverty Reduction: National and Global Impacts", in *World Development*, No. 109, 429-439

Laborde, D.; A. Mamun; W. Martin; V. Piñeiro; and R. Vos (2020), "Modeling the Impacts of Agricultural Support Policies on Emissions from Agriculture", in *IFPRI Discussion Papers*, No. 1954, International Food Policy Research Institute, https://tinyurl.com/y4cvmv5v (Also available as World Bank Working Paper: http://hdl.handle.net/10986/34453)

Laborde, D.; A. Mamun; W. Martin; V. Piñeiro; and R. Vos (2021), "Agricultural Subsidies and Global Greenhouse Gas Emissions", in *Nature Communications* 12 (10 May), https://doi.org/10.1038/s41467-021-22703-1

Liu, E. (2013), "'Time to Change What to Sow': Risk Preferences and Technology Adoption Decisions of Cotton Farmers in China", in *Review of Economics and Statistics*, Vol. 95, No. 4, pp. 1386-1403

Mernit, J. (2018), "How Eating Seaweed Can Help Cows to Belch Less Methane", in *Yale Environment*, No. 360 (July 2), https://tinyurl.com/y2892zdh

Tubiello, F., et al. (2021), "Greenhouse Gas Emissions from Food Systems: Building the Evidence Base", in *Environmental Research Letters*, Vol. 16, No. 6, p. 065007, https://iopscience.iop.org/article/10.1088/1748-9326/ac018e

Valin, H., et al. (2013), "Agricultural Productivity and Greenhouse Gas Emissions: Trade-Offs or Synergies", in *Environmental Research Letters*, Vol. 8, No. 3, p. 035019, https://iopscience.iop.org/article/10.1088/1748-9326/8/3/035019/meta

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