

# Info Note

## Shifting food consumption to mitigate climate change is critical to fulfilling the Paris Agreement, but how?

*Assessment of available measures reveals some opportunities, particularly through linking with public health and other policy areas, and limitations*

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**AUGUST 2016**

### Key messages

- Reducing emissions by changing consumption of foods with large greenhouse gas emissions could have a major impact on climate change. Yet past efforts to change diets through public policy have had mixed results, suggesting that recent estimates of technical mitigation potential likely exceed feasible reductions in emissions.
- Shifting consumption away from livestock products is a major opportunity for reducing emissions driven by consumption demand. In some contexts, this could also provide health, food security and other environmental benefits.
- Packages of policy mechanisms and interventions involving health, nutrition, efficiency and sustainability in supply chains will be more effective in achieving dietary change than any one measure.
- Focusing on reducing food loss and waste in high potential areas and involving key value chain actors can increase returns on efforts to mitigate climate change and improve food security.
- Private sector investment in reducing food loss and waste requires an enabling environment, support for development of commercially viable investments, and increased awareness among financial institutions of investment opportunities.

Most attention to climate change mitigation in the agriculture sector has focused on technical and policy options for changing production rather than consumption. Yet significant opportunities for mitigation exist in shifting food consumption patterns. In many cases these options could also improve health, food security and other environmental outcomes. Measures include:

- Consumption taxes and subsidies
- Health promotion initiatives
- Product labelling and certification initiatives

- Reducing food loss and waste through changes in policy, technology, or value chains.

The IMAGE model estimates that agricultural emissions will reach about 8 gigatonnes of carbon dioxide equivalents per year (GtCO<sub>2</sub>e/yr) in 2030. How much mitigation is possible from shifting consumption patterns? Havlík et al. suggest that the technical mitigation potential of shifting dietary patterns to the diet recommended by the World Health Organization ranges between 0.31 and 1.37 GtCO<sub>2</sub>e/yr in 2030. Stehfest et al. estimate the technical mitigation potential of decreasing food loss and waste by 15% (estimates vary from 30 to 50% for lost or wasted food) to be 0.79 to 2.00 GtCO<sub>2</sub>e/yr.

However, it is still unknown how much demand-side mitigation is feasible. Building on the growing literature around the climate change mitigation potential of dietary changes and reducing food loss and waste, CCAFS' partner Unique Forestry and Land Use reviewed evidence for the policy performance of demand-side mitigation options (Kiff et al. 2016). This Info Note summarizes its key findings and describes potential next steps as nations and climate finance institutions consider demand-side mitigation policies and measures.

**Shifting consumption away from livestock products is a major opportunity for reducing greenhouse gas emissions and may also provide health, food security and other environmental benefits.**

While livestock are important nutrition and income sources for many smallholder farmers, livestock production is the largest agricultural source of greenhouse gas emissions globally and is often

associated with land-use change emissions, land degradation, biodiversity loss, high water consumption, and pollution of water and soils. Already, one-third of global cropland is used to produce livestock feed. And livestock production is increasing globally, most rapidly in Africa and Asia. FAO projects that population growth and nutrition transition will lead to increases in meat and milk production by 73% and 58%, respectively, by 2050. Increased consumption of livestock products, combined with less physical activity associated with urbanization, is expected to increase rates of cardiovascular diseases and diabetes, particularly in low and lower middle income countries. Even assuming increased production efficiencies, the resulting increase in greenhouse gas emissions, land-use change emissions and other environmental impacts may defeat national and global efforts to limit climate change to 2°C.

In examining several sustainable diets – from little to no consumption of livestock products and varying the types of meat and dairy products – researchers have found that slowing or reducing meat consumption can achieve climate change mitigation, as well as improve human health and food security in some countries. Most notably in Latin America, where livestock contribute the largest proportion of total agricultural emissions and obesity has

increased dramatically, several countries have developed multi-sectoral policies aiming to reduce mortality from diet-related diseases. Mitigation is a co-benefit of the suggested reduction in meat consumption, but how much mitigation can be accomplished remains unclear. Research quantifying potential greenhouse gas emissions reductions due to decreased livestock consumption has only been published for Europe, where potential reductions are estimated at 7-36%.

### Packages of policy mechanisms and interventions involving health, nutrition, efficiency and sustainability will be more successful in achieving dietary change than any one measure.

Researchers investigated how consumer demand for healthy or sustainable foods is influenced by hard policies such as subsidies and taxation and by soft measures such as health promotion, product labelling, and certification. Table 1 summarizes conclusions about the efficacy of each approach.

Most dietary change measures have been implemented by governments in the developed world to decrease consumption of unhealthy foods. However, developing

*Table 1. Qualitative summary of strengths and limitations of potential demand-side policies and measures that could achieve public health objectives and mitigate greenhouse gas emissions. Source: Kiff et al. 2016.*

Approach	Strengths	Limitations
Subsidies to 'healthy' foods	Consistent evidence that subsidies increase consumption of targeted food types.	Effects on overall consumption (and thus GHG footprint) unclear; Possible 'rebound effects' unclear.
Taxes on 'unhealthy' foods	Modeled evidence potential to change consumption of high GHG footprint products; Some evidence of dietary change among specific subgroups for targeted foods.	Very little empirical evidence on meat taxes or on taxes in developing countries; Effects on overall diets, on low income groups and on the agri-food sector unclear, including possible 'rebound effects'; Political barriers likely to be high.
Public health promotion of 'healthy' foods	More successful when 'at risk' groups targeted; Likely to have public & policy makers' support.	Evidence suggests variable and small long-term changes in consumption.
Public health promotion to reduce disease risks	Some evidence of effective school-based initiatives, including in developing countries; Likely to have public & policy makers' support.	Evidence suggests positive but small health benefits when general population targeted; Specific evidence on dietary change due to interventions insufficient to estimate GHG benefits.
Restrictions on advertising	Likely to have strong public support.	Limited evidence of reductions in exposure to advertising or on actual consumption.
Product labelling		Other factors likely to dominate purchase decisions; Little evidence of carbon labeling impact on purchasing decisions; Limited demand from consumers or retailers.
Sustainability certification	Growth in internationally traded commodities.	No evidence relating to meat.

countries are increasingly focusing on healthy diets. As mentioned previously, several countries in Latin America are conducting health promotion campaigns to reduce diet-related non-communicable diseases, such as obesity.

Table 1 shows that, while subsidies on “healthy” foods generally increase consumption of targeted foods, the effect of subsidies and taxes on diets and health outcomes is often unclear; though effectiveness may increase if such policies are coupled with targeted “soft measures.” Research has found that health promotion measures are more successful when targeting specific groups, such as people at risk of lifestyle-related health conditions and children in schools.

*“There is a general consensus that nutritional education is an important element within a diverse policy package, although its ability to influence behavioural change on its own is thought to be limited.” (Kiff et al. 2016)*

Product labelling, including nutrition facts and certifications, are read by most consumers. However, research shows that price, taste, convenience and habit are more important determinants of consumers’ purchases than nutrition. Similarly, perceptions of food safety or product quality may outweigh the perceived importance of sustainability criteria.

### **Focusing on food loss and waste hot spots and involving key value chain actors can increase returns on efforts to mitigate climate change and improve food security.**

FAO, in a comprehensive study on global food loss and waste, estimates that approximately one third of the food produced for human consumption – equivalent to 1.3 billion tons of food per year – is lost or wasted. This

contributes significantly to food insecurity and emissions: it is estimated that reducing food loss and waste by 50% could provide 20% of the gap between currently available calories and the estimated demand in 2050, and that lost and wasted food resulted in 3,300-5,600 MtCO<sub>2</sub>e in greenhouse gas emissions in 2009.

While multiple technical, technological and infrastructure options have been documented as effective in significantly reducing food loss and waste, adoption rates are often low. A lack of attention to the commercial viability of technical options has often hampered efforts to attract investment and scale-up adoption.

Kiff et al. identified the need for a bottom-up identification of loss and waste reduction priorities and commercially viable interventions in product value chains with high GHG footprints. The analysis revealed strengths and limitations for technology, value chain, and policy approaches to reducing food loss and waste (Table 2).

### **Private sector investment in reducing food loss and waste requires an enabling environment, commercially viable investments, and increased awareness among financial institutions.**

Public- private partnerships (PPPs) can create an enabling environment for piloting and upscaling innovative approaches to reduce food loss and waste by helping to:

- Catalyse locally relevant and equitable investments in improving value-chain processes.
- Overcome investment risks and barriers (e.g. technology, policy, capital).
- Attract public finance to reduce private sector risk.

*Table 2. Qualitative summary of strengths and limitations of approaches to reduce food loss and waste. Source: Kiff et al. 2016.*

Approach	Strengths	Limitations
Technology	Numerous potential applications; Likely to have strong private sector involvement.	Empirical evidence of effective reductions in loss & waste; Initial investment costs can be high for smallholders; Commercialization of technical options often limited.
Value chain	Numerous potential applications and measures; Likely synergies with profit-making incentives of value chain actors.	Quantitative data on effective reductions in loss & waste limited; May require complex collaboration among value chain actors as well as government, civil society, finance sector.
Policy	Numerous potential measures; Can play key roles in mobilizing other <u>agri-</u> food chain actors; Likely potential to mobilize private sector investment.	May require complex collaboration among <u>agri-</u> food sector stakeholders, including various government ministries, civil society, private sector, finance sector.

- Support producer or marketing cooperatives that ensure dissemination of knowledge and access to resources in a socially inclusive manner.

Public policy contributions to achieve these ends would include:

- Create an enabling environment and provision of public goods, such as electricity, roads and marketing infrastructure.
- Integrate reduction of food loss and waste, including postharvest losses, into agricultural research and extension.
- Develop guidelines, regulations and policies relating to: food waste treatment and use (e.g. livestock feed), packaging, food hygiene/safety and product labelling, research, technology and infrastructure development and evaluation of progress in addressing food loss and waste.
- Directly support producers in food insecure communities.

## Conclusions and way forward

The IPCC's Fifth Assessment Report estimated that the technical mitigation potential of demand-side measures is even greater than the mitigation potential of supply-side measures. While Kiff et al. caution that the feasible potential to reduce agricultural greenhouse gas emissions through demand-side measures is likely to be much smaller, there are still significant opportunities to decrease emissions.

Policy efforts to address demand-side drivers of agricultural greenhouse gas emissions should link with other policy domains, such as

- Food security – where improvements in post-harvest processes can also reduce food loss and waste;
- Public health – where improvements in dietary patterns could reduce non-communicable disease risks while reducing demand for food types with high carbon footprints; and
- Agri-environment policies to prevent pollution of the production environment.

Efforts to reduce greenhouse gas emissions through demand-side measures can also be aligned with policies aiming to improve agri-food sector competitiveness by reducing post-harvest food loss and waste and improving product quality and safety. An important example is the multiple benefits of linking demand-side mitigation with animal health policies, in which reduced livestock mortality, increased productivity and improved product safety and quality can increase profitability for livestock keepers while also reducing emissions per unit of livestock product

marketed. Demand-side measures may also be more effective when linked with supply-side measures aiming to improve productivity, sustainability and product quality at production level.

The agri-food sector not only provides food and drink for consumers, but also significantly contributes to economic growth and employment. It is important to note that influencing consumption and demand may imply structural changes in employment and economic opportunities, and some demand-side measures (e.g. subsidies and taxes) may be politically contentious. Platforms can improve collaboration at all levels of government, industry bodies and consumers to address the multiple concerns around food production, supply and consumption. This is an important strategy that empowers stakeholders while engaging the private sector in developing strategies and measures that support economic growth and promote commercially viable investments. A potential model for such collaboration in developing countries is presented in the text box below.

### *How to promote collaboration to address food production, supply and consumption? The case of WRAP*

The Waste and Resources Action Programme (WRAP, <http://www.wrap.org.uk/>) brings together multiple stakeholders to promote change in behaviour, such as reduction in food waste based in the United Kingdom. A non-governmental organization, its members include agri-food businesses, institutional food providers (e.g. school and hospital caterers), local governments and community groups.

WRAP employs multiple strategies to influence consumers' behaviour. For example, it conducts and translates research and evidence on the extent and causes of and barriers to decreasing food waste. It produces ground-breaking reports that have successfully raised awareness among companies, government, the media and the general public. WRAP also brokers voluntary agreements involving government, companies and community groups: for example, companies committed to improving resource efficiency and reducing waste in the United Kingdom grocery sector in the Courtauld Commitment 2025. Additionally, WRAP provides information, tools and practical advice to support practice changes by business and consumers, runs consumer campaigns in collaboration with local governments, companies and community groups, and provides grants and loans to enable stakeholders to take action.

## Further Reading

- [FAO] Food and Agriculture Organization of the United Nations. 2011a. *World Livestock 2011*. Rome, Italy: Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/docrep/014/i2373e/i2373e.pdf>
- Garnett T, Mathewson S, Angelides P, Borthwick F. 2015. *Policies and actions to shift eating patterns: What works?* Oxford and London, UK: Food Climate Research Network (FCRN) and Chatham House, The Royal Institute of International Affairs. Available at: [http://www.fcrn.org.uk/sites/default/files/fcrn\\_chatham\\_house\\_0.pdf](http://www.fcrn.org.uk/sites/default/files/fcrn_chatham_house_0.pdf)
- Havlík P, Valin H, Herrero M et al. 2014. Climate change mitigation through livestock system transitions. *Proceedings of the National Academy of Sciences*, 111, 3709-3714. Available at: <http://dx.doi.org/10.1073/pnas.1308044111>
- Herrero M, Havlík P, Valin H, Notenbaert A, Ru no MC, Thornton PK, Blümmel M, Weiss F, Grace D, Obersteiner M. 2013. Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems. *Proceedings of the National Academy of Sciences*, 110(52): 20888-20893. Available at: <http://www.pnas.org/content/110/52/20888.long>
- Kiff L, Wilkes A, Tennigkeit T. 2016. *The technical mitigation potential of demand-side measures in the agri-food sector: a preliminary assessment of available measures*. CCAFS Report No. 15. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: [www.ccafs.cgiar.org](http://www.ccafs.cgiar.org)
- Smith P, Haberl H, Popp A, et al. 2013. How much land-based greenhouse gas mitigation can be achieved without compromising food security and environmental goals? *Global Change Biology*, 19: 2285-2302. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/gcb.12160/abstract>
- Stehfest E, Berg M V D, Woltjer G, Msangi S, Westhoek H. 2013. Options to reduce the environmental effects of livestock production -

Comparison of two economic models. *Agricultural Systems* 114:38-53. Available at: <http://dx.doi.org/10.1016/j.agsy.2012.07.002>

- Wollenberg E, Richards MB, Smith P, et al. 2016. Reducing emissions from agriculture to meet the 2°C target. *Global Change Biology*. Available at: <http://dx.doi.org/10.1111/gcb.13340>

*This brief is based on the CCAFS report by Laura Kiff, Andreas Wilkes and Timm Tennigkeit. [The technical mitigation potential of demand-side measures in the agri-food sector: a preliminary assessment of available measures](#). It is intended to further research and action to support low emissions development.*

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*The views expressed in this brief are those of the authors and are not necessarily endorsed by UNIQUE Forestry and Land Use, CCAFS or its supporters.*

**Citation:** Wilkes A, Kiff L, Wollenberg E, White, J. 2016. *Shifting food consumption to mitigate climate change is critical to fulfilling the Paris Agreement, but how?* CCAFS Info Note. Copenhagen: CGIAR Research Program on Climate Change, Agriculture and Food Security.

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