



Climate Change & Food Systems: Assessing Impacts and Opportunities

A Draft Report Prepared by Meridian Institute

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Meridian Institute
Connecting People to Solve Problems

Executive Summary

Food and agriculture are significant contributors to and heavily impacted by climate change, but they also offer opportunities to mitigate greenhouse gas (GHG) emissions. This draft report reviews key literature about how food and agriculture affect climate change and how climate change is affecting food systems. It illustrates how a food systems approach to climate change adaptation and mitigation can drive positive changes and inform decision making to avoid unintended effects from narrowly targeted interventions. And it documents specific interventions throughout the food system that support adaptation and mitigation in the short term while broader transformation is pursued.

Approaching adaptation and mitigation through a food systems approach broadens the range of opportunities and facilitates consideration of systems-level effects and interactions. Food systems include growing, harvesting, processing, packaging, transporting, marketing, consumption, and disposal of food and food-related items. These include pre-production activities like developing and delivering inputs like fertilizer, seeds, feed, farm implements, irrigation systems, information and research and development; production of crops, fish, and livestock; post-production activities like storage, packaging, transportation, manufacturing and retail; consumption activities either in homes or dining establishments; and waste and disposal that occurs throughout the system. Food systems operate within and are influenced by social, economic, political and environmental contexts, and people are involved throughout as producers, information providers, policymakers and regulators, workers in health, forestry, trade, finance and in companies, and as consumers.

Several key messages emerged from the literature review and discussions with leading food and agriculture experts who work on climate change adaptation and mitigation. While it is estimated that agriculture contributes 14% of global GHG emissions, estimates of emissions from agriculture and food system activities (including but not limited to agriculture production) are up to nearly 33% of all global emissions. Climate change impacts food and agriculture in complex ways that vary by geography, and while some temperate regions are seeing short-term positive changes, many areas are suffering from declining yields as rising temperatures and extreme weather, including droughts and floods, impact crops and livestock and fisheries.

While more systems-level research is urgently needed to drive transformation and achieve the Sustainable Development Goals, there are immediate near-term actions that should be taken to mitigate climate change and to support adaptation and increase climate resilience; the report includes numerous specific examples. New decision-support tools that include a systems approach would greatly help decision makers at the country and regional level. Likewise, institutions and governance mechanisms that support systems-level decision making are necessary.

The majority of the world's countries have included mitigation and adaptation interventions related to crops, livestock, forestry, fisheries, and aquaculture in their nationally determined

contributions, and low-income countries put a strong emphasis on these sectors. These interventions are heavily focused on production, but post-production activities contribute more in developed economies, and as more economies develop we can expect proportionately more from post-production activities overall.

Post-production emissions are largely associated with energy use. Processing is energy intensive, including milling and removing water. Packaging can be a significant component of municipal waste. Transportation contributes less than commonly assumed, with the exception of many vegetables where time-sensitive distribution involves airfreight. The cold chain, or refrigeration, contributes substantially to emissions, and its use is growing.

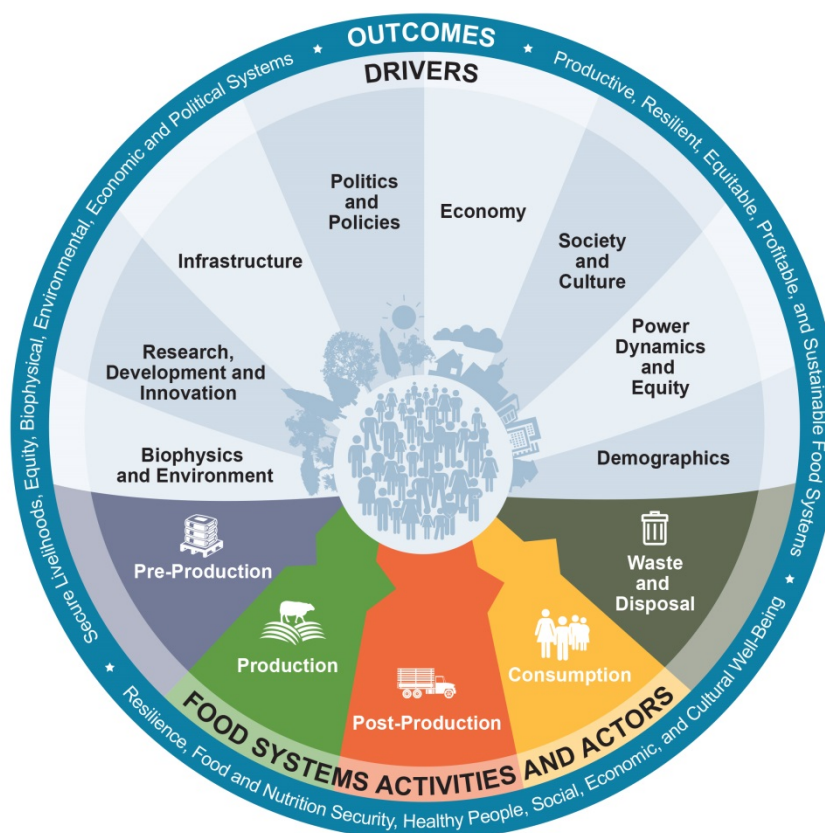
Diets and consumption patterns affect climate change. As countries develop, diets tend to change in ways that negatively affect both the environment and health. Reducing meat consumption could reduce emissions substantially. And the right diet changes could positively impact not just climate change, but also health.

Roughly one third of food gets lost or wasted globally, about 1.3 billion ton per year. The waste and loss occur throughout the food supply chain, and it is mostly through waste of edible food in medium and high-income countries while in lower income countries it is lost at earlier stages such as storage and transport.

To support stakeholders making choices about adaptation and mitigation interventions through a food systems lens, the report cites eight key Climate Change Food Systems Principles. These include (1) interconnectedness; (2) equity; (3) resilience; (4) renewability; (5) responsiveness; (6) transparency; (7) scale; and (8) evaluation.

The report gives three examples to illustrate how specific mitigation or adaptation interventions may have implications, benefits, or unintended consequences in other parts of the food system. The first shows how diets impact the environment and health. Generally diets that are healthier for humans are also better for the environment. For example, diets that are higher in plant-based ingredients and lower in animal products, as well as diets lower in processed foods that have reduced sodium. But in addition to these positive associations there are possible downsides. For example, reducing red meat consumption could reduce dietary GHG emissions, but it could have profound negative impact on livelihoods in low-income countries. The second explores the ways carbon pricing policies affect different stakeholders – farmers, suppliers, traders, and transporters, for example. Finally, soil carbon sequestration illustrates trade-offs. No-till agriculture offers soil organic carbon gains, but it is often used in combination with genetically engineered crops and herbicides for weed control. There are many co-benefits as well.

The report combines an overview of what we know about food, agriculture, and climate change and offers practical steps for immediate action while new research, decision-support tools, governance mechanisms, and other efforts are pursued to support the broader transformation that is urgently needed for sustainable food systems and achieving the Sustainable Development Goals.



Feedback

The draft report, *Climate Change & Food Systems: Assessing Impacts and Opportunities*, was developed with input from a global team of authors and advisors. As the team continues development and revisions to the draft report, additional input and feedback will be incredibly valuable to ensure that the report content is relevant and current, and that the report messages speak to diverse audiences around the world.

We kindly ask that as you review the report; available on-line here <http://bit.ly/2oFucpe> and provide feedback via the on-line form.

About Meridian Institute

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