Facilitating, Enabling, and Triggering Sectoral Transitions: China

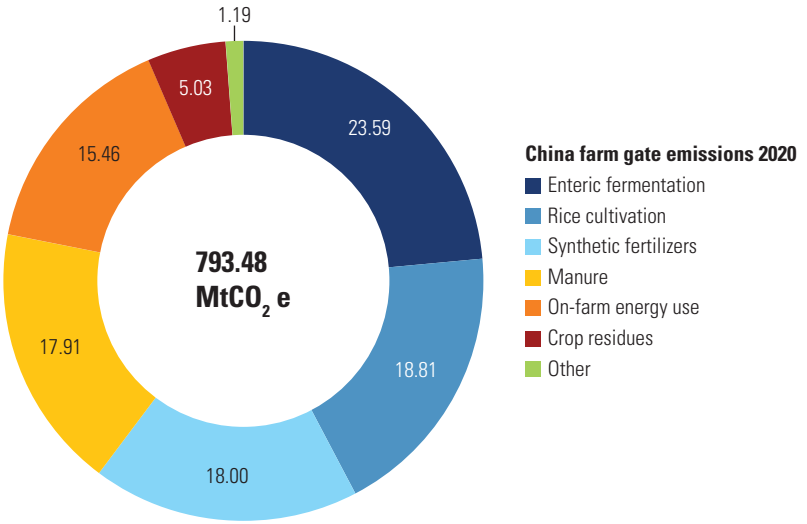
Case Study 20. Climate-Smart Agriculture in Guangdong, China

Contributors: William R. Sutton and Bethany Linton

Context

While China has achieved tremendous success over recent decades in increasing agricultural production and feeding its population, this success has come at the cost of significant environmental degradation (World Bank 2022h). Agriculture in China is a major source of air, land, and water pollution. China's agri-food system also generates more GHG emissions than any other country in the world and accounts for more than 14 percent of its total GHG emissions.[10] The sector releases substantial amounts of CO_2, methane, and nitrous oxide, which trap up to 25 and 300 times the heat of CO_2, respectively. When it comes to agricultural production, the largest sources of GHG emissions are synthetic fertilizers, livestock manure, and enteric fermentation from ruminant livestock, at 18, 18, and 24 percent, respectively (figure 3.18). Poor agriculture practices—such as excessive fertilizer and pesticide use, and mismanaged livestock waste—are also the leading cause of water pollution (World Bank, forthcoming b), affecting sources for drinking, recreation, crops, and fisheries. Improved manure management, dietary changes, more efficient fertilizer use, and reducing waste in the food system could contribute to important emissions reductions from the sector.

FIGURE 3.18 China's Farm Gate Emissions, 2020



Source: World Bank staff calculations, based on 2020 data from FAOSTAT (FAO 2020).

China's 12th Five-Year Plan called for pollution control from crop production through soil management and efficient use of pesticides. The plan also defined improved agricultural targets for each level of local government as part of their performance evaluations.

In Guangdong Province, heavy pesticide and fertilizer use—60 to 70 percent of which ended up as residue on crops or was released into the environment (World Bank 2022b)—and waste from a standing pig population of more than 20 million has led to significant water contamination. Following public demand for improved water quality, the government asked for World Bank assistance in developing policy reform and greener practices on farms.

Policies

As part of this policy reform, the Guangdong Department of Agriculture, alongside the World Bank and GEF, funded the Guangdong Agricultural Pollution Control Project in 2013, which aimed to reduce nutrient pollution in local water supplies from crop and livestock production in the province. This would improve water quality in the province's estuary systems and the coastal ecosystems of the South China Sea, generating global environmental benefits in the form of reduced GHG emissions.

The project strengthened institutional capacity to implement agricultural pollution control activities, including monitoring and evaluation methodologies and verification procedures. It generated policy studies on various technical packages related to the excessive application of chemical fertilizer and pesticide, low fertilizer use efficiency, high rice production costs, and the increase in pig manure and waste pollution in Guangdong and across China. The project activities targeted agricultural officers, farmers, cooperatives, and enterprises, training them in livestock waste management, fertilizer and pesticide application, and how to develop standards and regulations for certification of safe and green agricultural products. Although external financial support for project activities concluded in 2021, the policies for greener agricultural production are ongoing.

Results and Impacts

The interventions supported by the project resulted in multiple benefits, including demonstrating a rural circular economy by replacing chemical fertilizers with treated livestock waste. This reduced both water pollution and GHG emissions. To source this natural fertilizer and reduce pollution, the project subsidized the piloting of several new, greener pig production technologies that either used livestock waste to generate biogas for energy on the farms, using the solids for organic fertilizer, or innovative zero discharge piggery designs that incorporate complete capture and rapid composting of livestock waste for use as organic fertilizer. The project also

promoted more modern, compound, slow-release, and organic fertilizers for farmers to use on their crops instead of overapplying single-nutrient ammonia fertilizer. Together with training on how and when to effectively apply fertilizers for maximized crop bioavailability, and promoting modern fertilizers among suppliers, the policies resulted in improved practices that decreased costs to farmers, increased crop yields, reduced water pollution, and lowered GHG emissions.

Reducing nutrient pollutants in waterways also generated tremendous local financial and environmental benefits. These included provincial economic savings, avoided expenditures in downstream water quality improvement, avoided health care costs, reduced deforestation, and reducing annual average GHG emissions by almost 84,000 $mtCO_2e$. Much of this was by reducing methane and nitrous oxide. Policies addressing pollutant reduction practices and livestock waste management activities developed under the project are being upscaled throughout Guangdong Province and across China. For example, Guangdong Province has recently written upscaling good pollutant reduction practices developed under the project to the whole province into its 14th Five-Year Plan for Agriculture and Rural Development.

Key Takeaways

- Agriculture is not only a source of GHG emissions; it can also serve as a source of practical decarbonization actions, even when it involves many smallholder farmers.
- Improved agricultural policies can provide multiple wins at once, mitigating GHG emissions while also reducing water pollution, increasing crop yields, and reducing costs to farmers.
- Promoting local environmental benefits can generate global public goods. Although the project's main objective was to reduce water pollution in response to local public demand, it also generated important reductions of global climate pollutants.
- Positive results can be achieved without a heavy-handed approach. Rather than banning polluting practices such as chemical fertilizer use or pig production, the project secured the collaboration of farmers and the private sector by working to green existing practices.