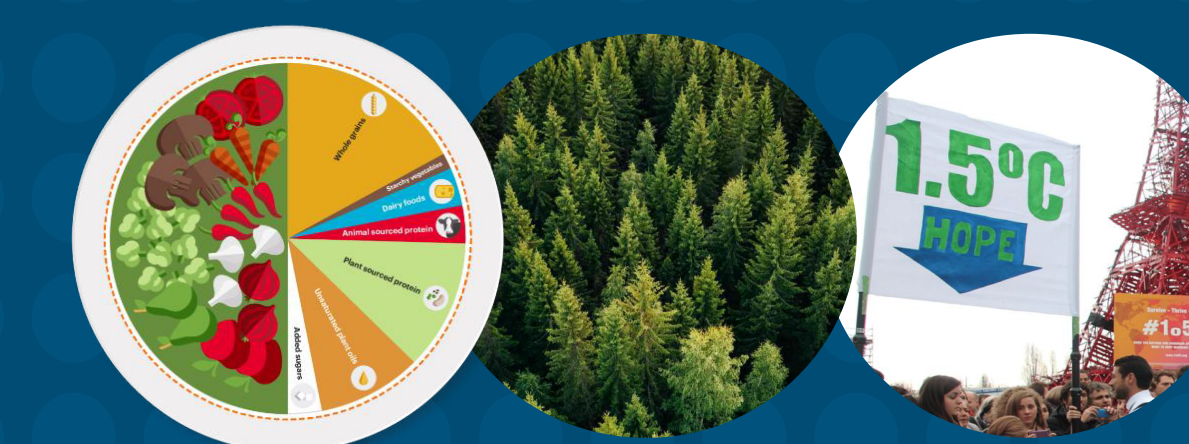
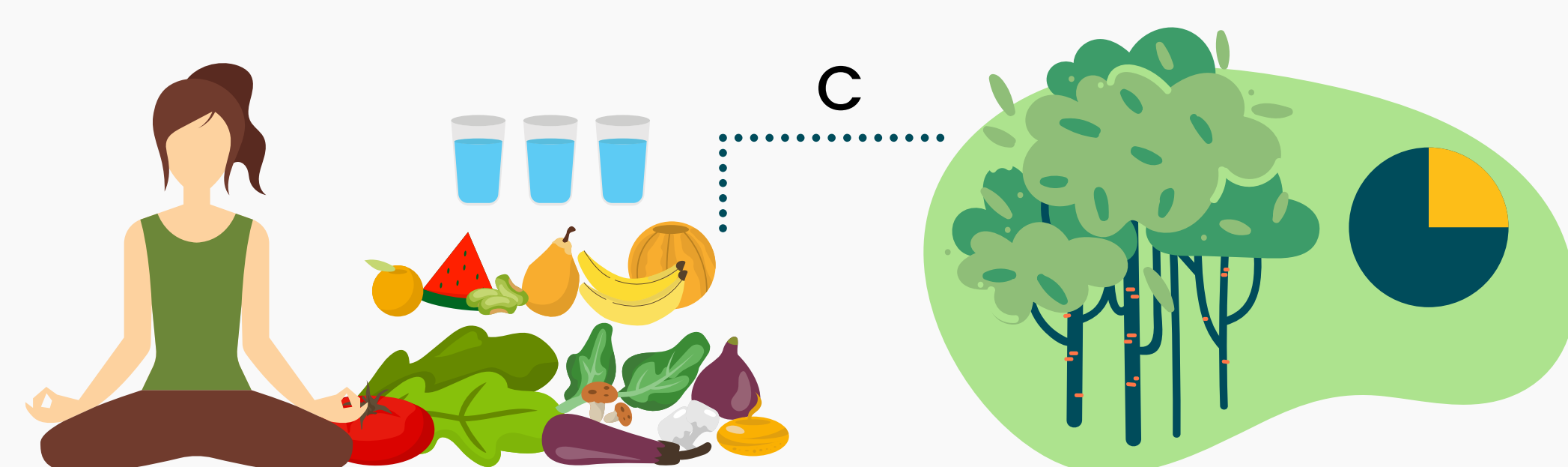




Motivation

- ★ **Shifting to healthy diets** and **afforestation** can reduce greenhouse gas (GHG) emissions and enhance carbon sequestration^[1].
- ★ However, when implemented unilaterally by China, the world's largest agricultural producer and GHG emitter, these measures may support domestic carbon neutrality while triggering **emission leakage** through trade-induced **land-use changes**^[2].

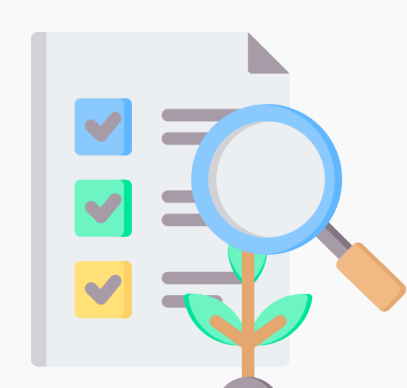


Research Objective

- ★ To assess the synergies and trade-offs under the improvement of one or more components in the food-land-climate nexus.
- ★ To examine how China's unilateral climate actions interact with globally coordinated measures



Approach



- ★ **Model type:** Linking our integrated environmental-economic model^[3] with the Global Timber Model (GTM)



- ★ **Data source:** Global Trade Analysis Project (GTAP) version 10 database and the Environmental Impact Database.

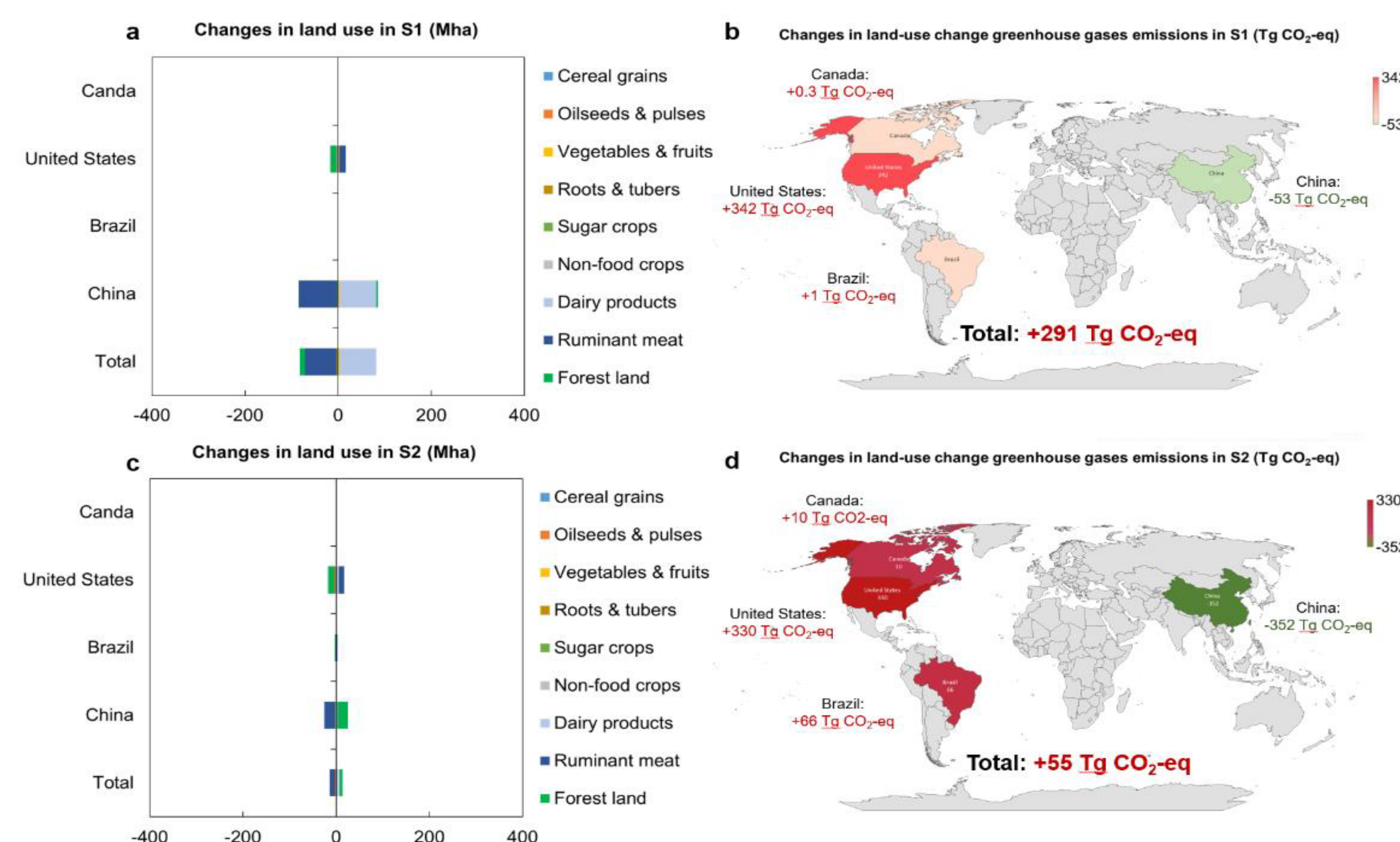


Fig. 1. Changes in land use [Mha] (panels a, c) and greenhouse gases emissions [Tg CO₂-eq] (panels b, d) in China and its main food and feed trading partners (MTP) in scenarios S1 and S2 with respect to the baseline (S0).

Compared with S3 (-65 million people)
S4: additional 145 million people

Compared with S3 (-\$204 billion)
S4: additional \$74 billion

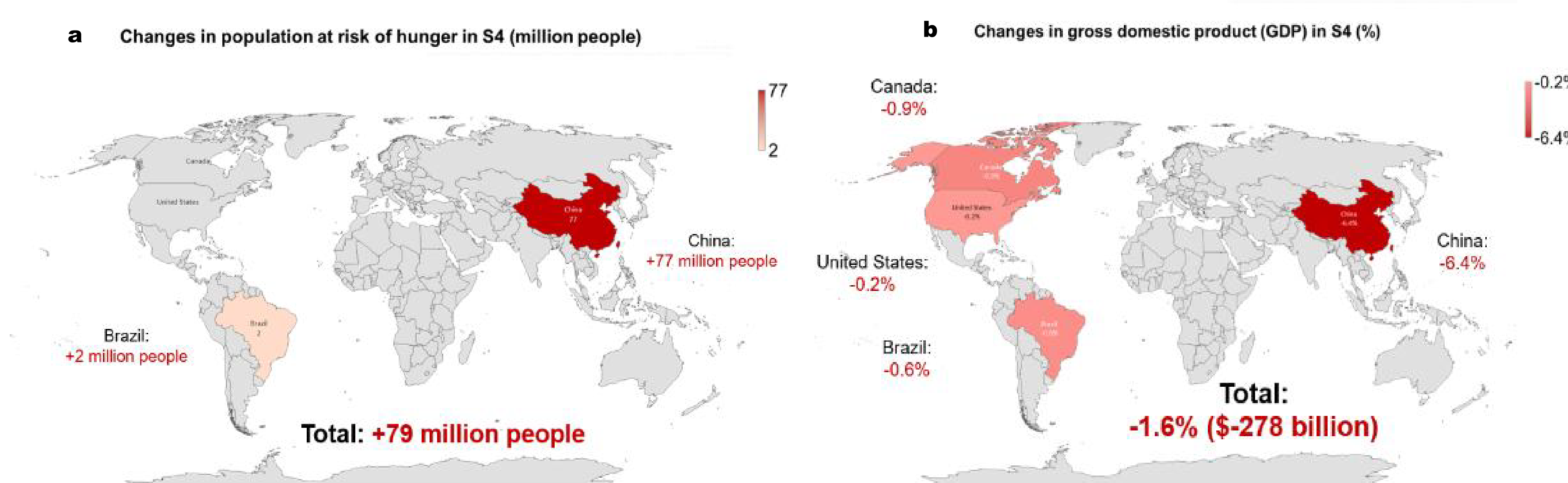


Fig. 2. Changes in (a) population at risk of hunger (million people) and (b) gross domestic product (GDP, % and \$ billion) in China and its main food and feed trading partners (MTP) in scenario S4 with respect to the baseline (S0).

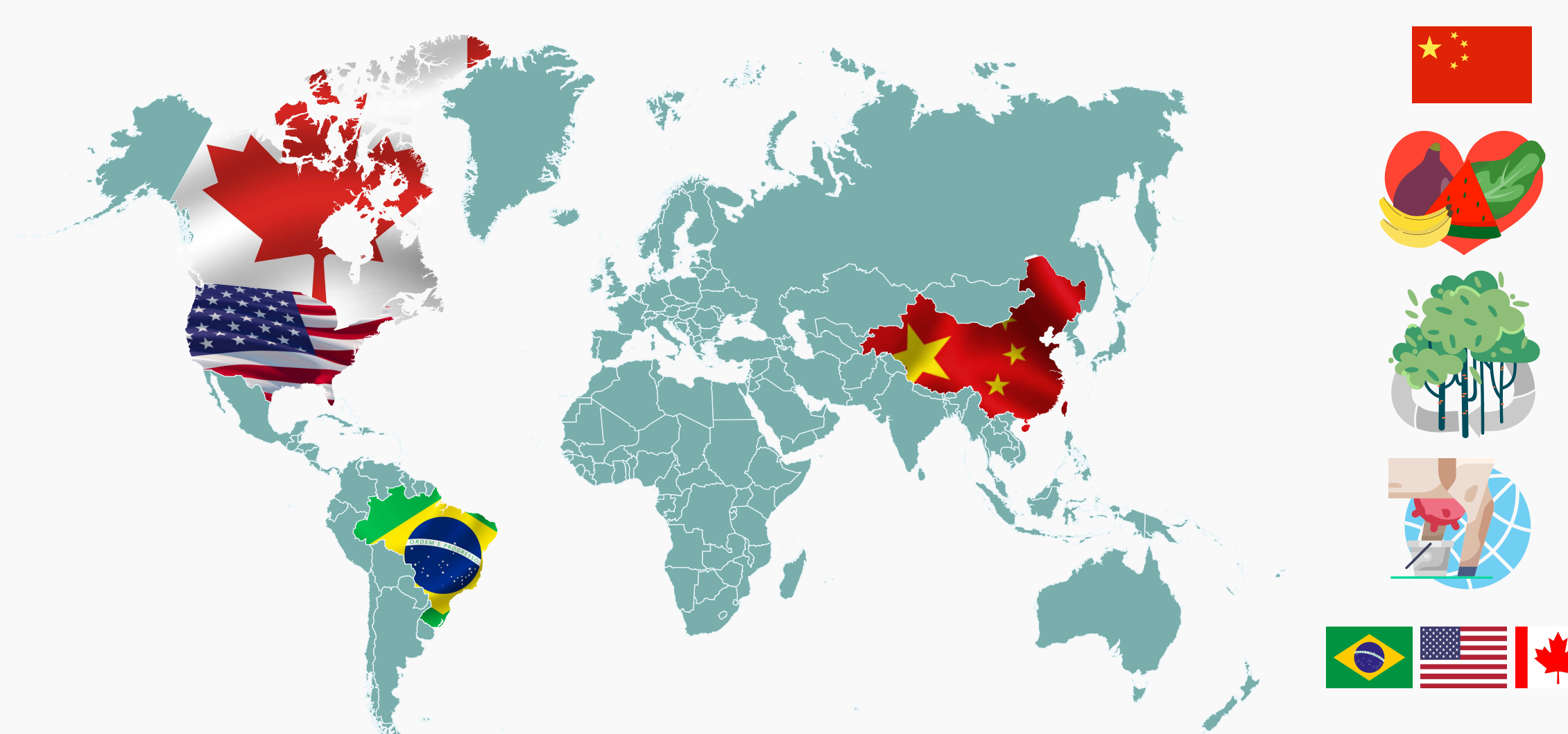
- **S1** - Food scenario: A dietary shift in China
- **S2** - Land scenario: An afforestation policy in China
- **S3** - Climate scenario: A global uniform carbon tax with carbon tax revenue recycling
- **S4** - Combined scenarios: S1+S2+S3

Highlights

- ★ China's dietary shift (with less meat and more dairy) leads to an additional 14 Mha of agricultural land use abroad and causes 364 Tg CO₂-eq of emission leakage, more than tripling the domestic mitigation.
- ★ China's afforestation policy expands food production overseas, resulting in 16 Mha of additional agricultural land use and 424 Tg CO₂-eq of emission leakage, largely offsetting the domestic reduction.
- ★ Without coordinated global actions, **China's unilateral measures** amplify pressures on carbon tax (36%), food price (65%), **the population at risk of hunger (145 million people)**, and **economic losses (\$74 billion)** under the 2°C target.

Implications

- ★ Our analysis caution against relying on policies that target a single goal, thus highlighting the need to carefully combine mitigation strategies to minimise unintended consequences.



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