A bottom-up approach to sustainable transformation: accounting for regional preferences in global environmental goals

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Introduction

- Food security goals are presently at odds with environmental security, more so due to effects of climate change (Alexandratos & Bruinsma, 2012).
- India - most populated country in the world faces double burden of malnutrition and obesity, also water and environmental degradation
- Changing food consumption can have positive impacts on both health and environment (Tilman & Clark, 2014)
- Balanced intake of most food groups, with particular focus on the reduction of animal-sourced foods, is considered
  - both human and environment friendly (Beal et al., 2023; Springmann, 2023)
  - maintains planetary boundaries.
- However, regional preferences in dietary habits needs to be accounted for when considering planetary boundaries.

Can India meet future nutritious food demands while limiting externalities such as overextraction of groundwater, depletion of forests and other natural resources and methane emissions?

Methodology

- Modelling scenario framework
- Partial equilibrium Model of Agriculture and its Impact on the Environment (MAgPIE)
- Cost minimizing optimization approach to meet food demand under socio-economic transitions (GDP, Income and demographic structure are drivers of food demand in the future)

Scenario name	Food demand structure
Business-as-Usual (BAU)	Endogenous diets following historical shares of food groups
EAT_Lancet	All regions including India transition to EAT Lancet dietary recommendations by 2030
NIN_India	India transitions to dietary recommendations by the National Institute of Nutrition (NIN) whereas all remaining regions transition to EAT Lancet

Food demand is a constraint in the model, goal is to meet through three factors –

i. land conversion to increase domestic production,

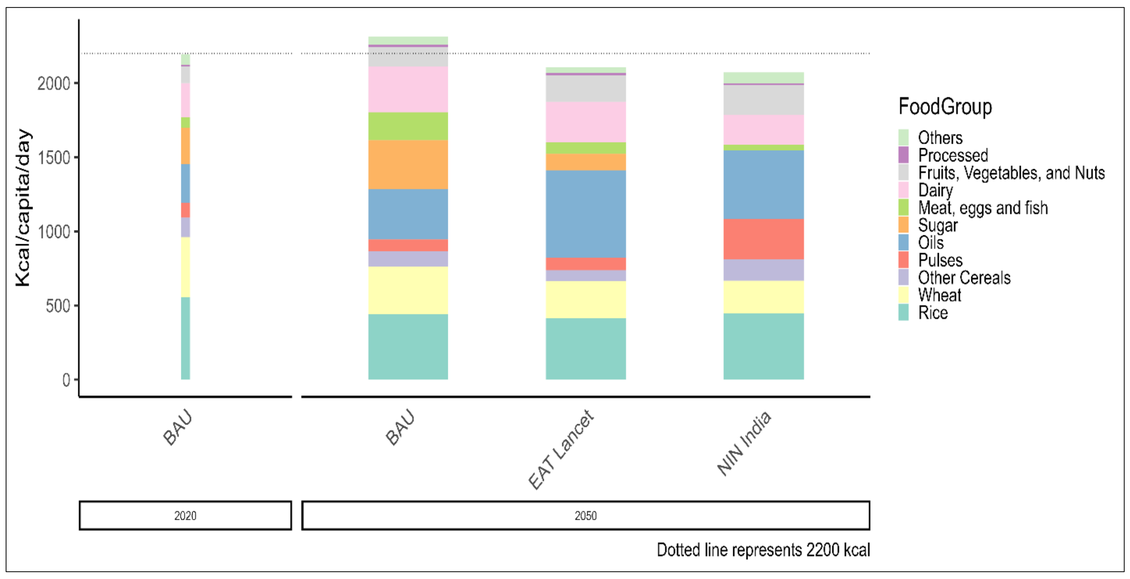
ii. inter-regional trade, and

iii. technological intensification

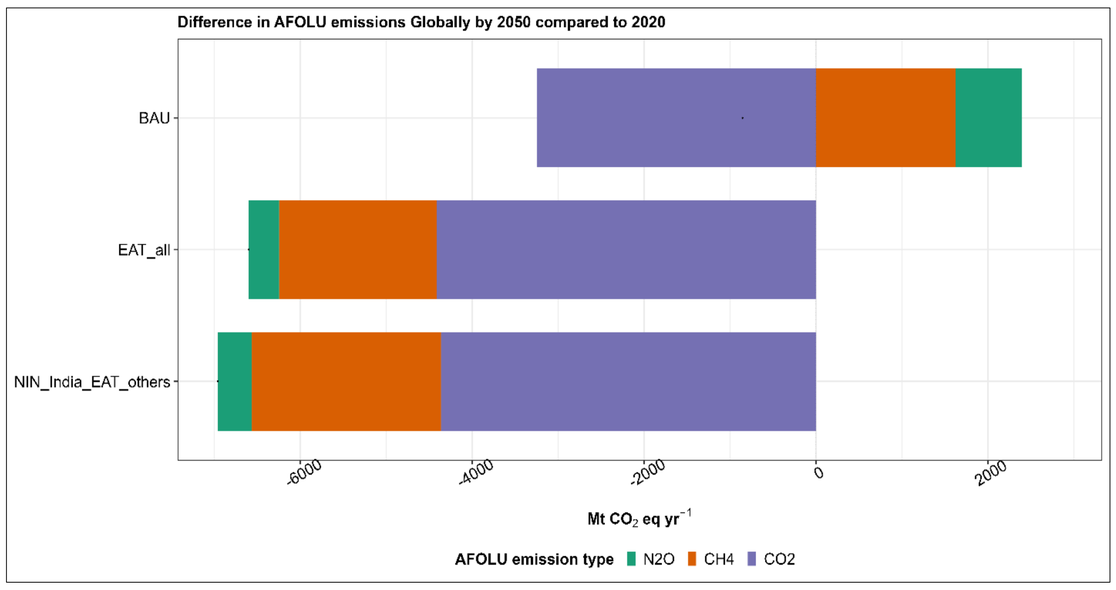
We analyze results w.r.t consumption of food groups, AFOLU emissions, water resources and food prices and export trends across trade scenarios

Results

- ❑ Diversity in food intake across varying demand scenarios, reduced consumption of sugars for India
- ❑ reduced consumption of livestock products including dairy in the other scenarios as compared to BAU (-59% in EAT Lancet and -80% in NIN)



- ❑ Overall reduction in global emissions of GHG gases
- ❑ Transition to regional dietary preferences yields global benefits



- ❑ Effects on water withdrawals and trade exports from India are in the opposite direction suggesting trade-offs
- ❑ However, food prices are lower in both the scenarios by upto 10%, suggesting benefits of transition to healthy diets

Takeaways

- ❖ When NIN diets are implemented in India, the pressures on cropland expansion are reduced leading to lower CH4 emissions from land use change, than when EAT Lancet diets are implemented
- ❖ However, a shift to healthy diets in India may result in an increase in water footprints
- ❖ regional dietary recommendations that account for historical dietary patterns are more suitable and yield higher benefits for all indicators

References

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