The role of food and land use systems in achieving India's sustainability targets

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Background and Motivation

- To meet SDG goals, India needs to balance food demand with limited environmental impacts
- India's CO2 emissions - 3.5% in 1997 to 6.88% in 2017, 23.4% from AFOLU
- Covid-19 pandemic – spiraling effects on food systems with implications on natural resources (Harris et al., 2020; Kumar et al., 2020).
- Integrated assessment of development and sustainability targets is lacking

Research Objectives and Design

- Integrated assessment – land use, food demand, environment
- Pathways to achieve SDG goals
- Use a partial equilibrium model (MAgPIE) to make projections until 2050
- Key indicators such as GHG emissions, food security, water use, and food self-sufficiency.

Scenarios and Pathways

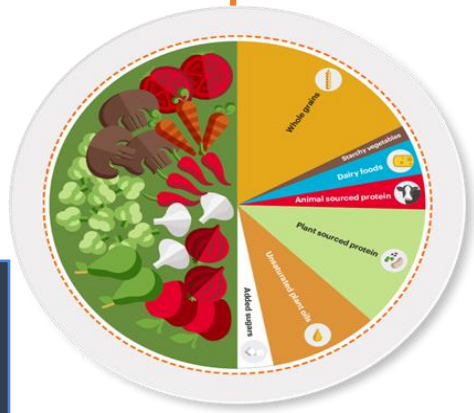
Paris Agreement, Bonn Challenge, CBD

Current Trends
SSP2

- Population
- GDP
- Food Demand
- Food Loss
- Feed Efficiency
- Climate Change (RCP6.0)
- Water- Climate Change

- Bonn Challenge (21 Mha)
- Medium Interest rate/Technological Cost
- Medium Increase in Pasture Yield
- 10 percent trade liberalization for secondary and livestock products in 2030,2050,2100 and 20 percent for crops.
- Bioenergy- Constant Demand

Current Trend+EAT Lancet Diets



3 GOOD HEALTH AND WELL-BEING

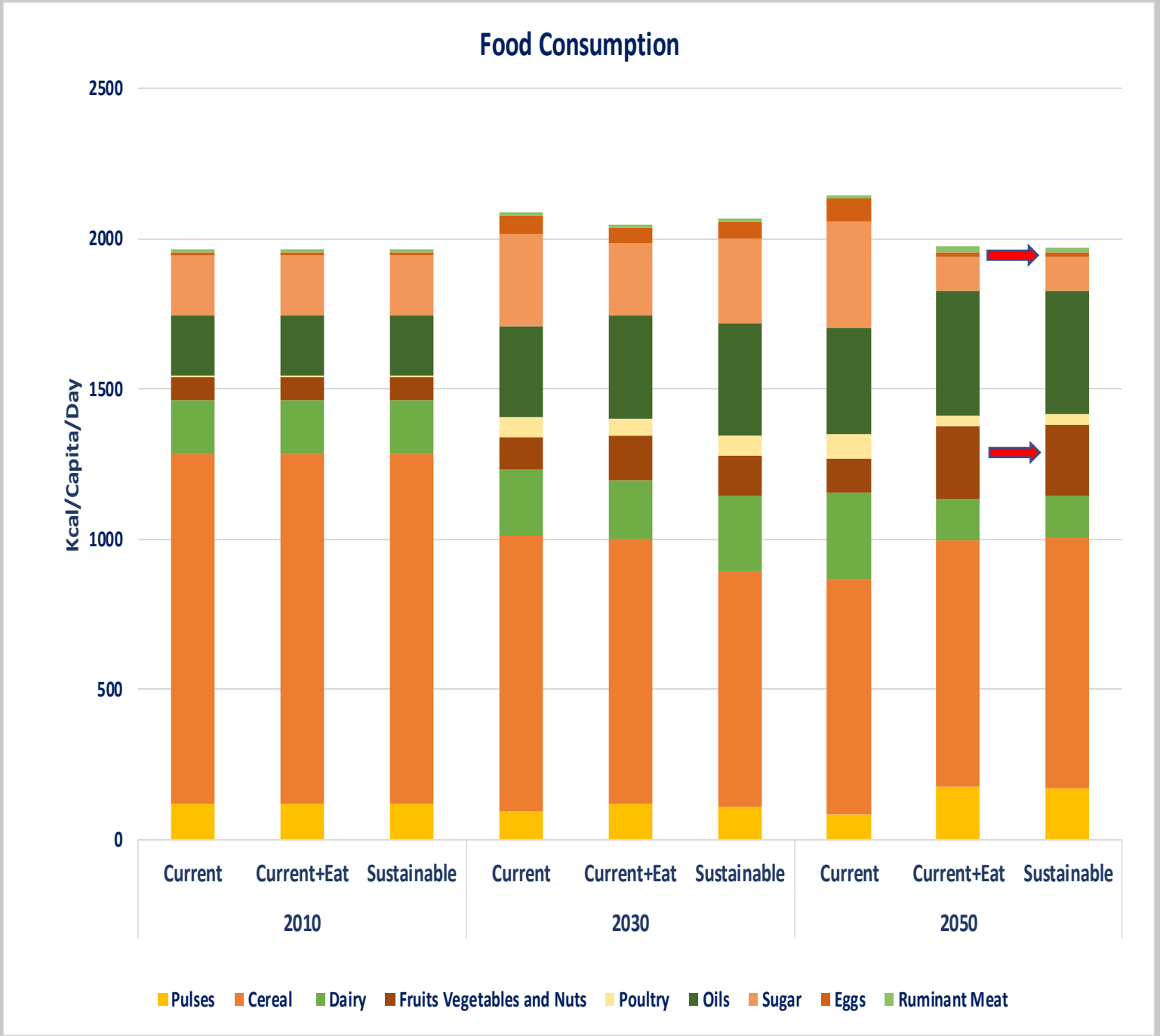
Sustainable Pathways
SSP1

- Population
- GDP
- Food Demand
- Food Loss
- Feed Efficiency
- Climate Change (RCP2.6)
- Water- Climate Change, EFP

- Bonn Challenge (26 Mha)
- Low Interest rate- Technological Cost
- High Increase in Pasture Yield
- livestock/secondary: 10% in 2030, 5% in 2050,2100 crops: 20% in 2030, 10% in 2050,2100
- Bioenergy- National Biofuel Policy 2018

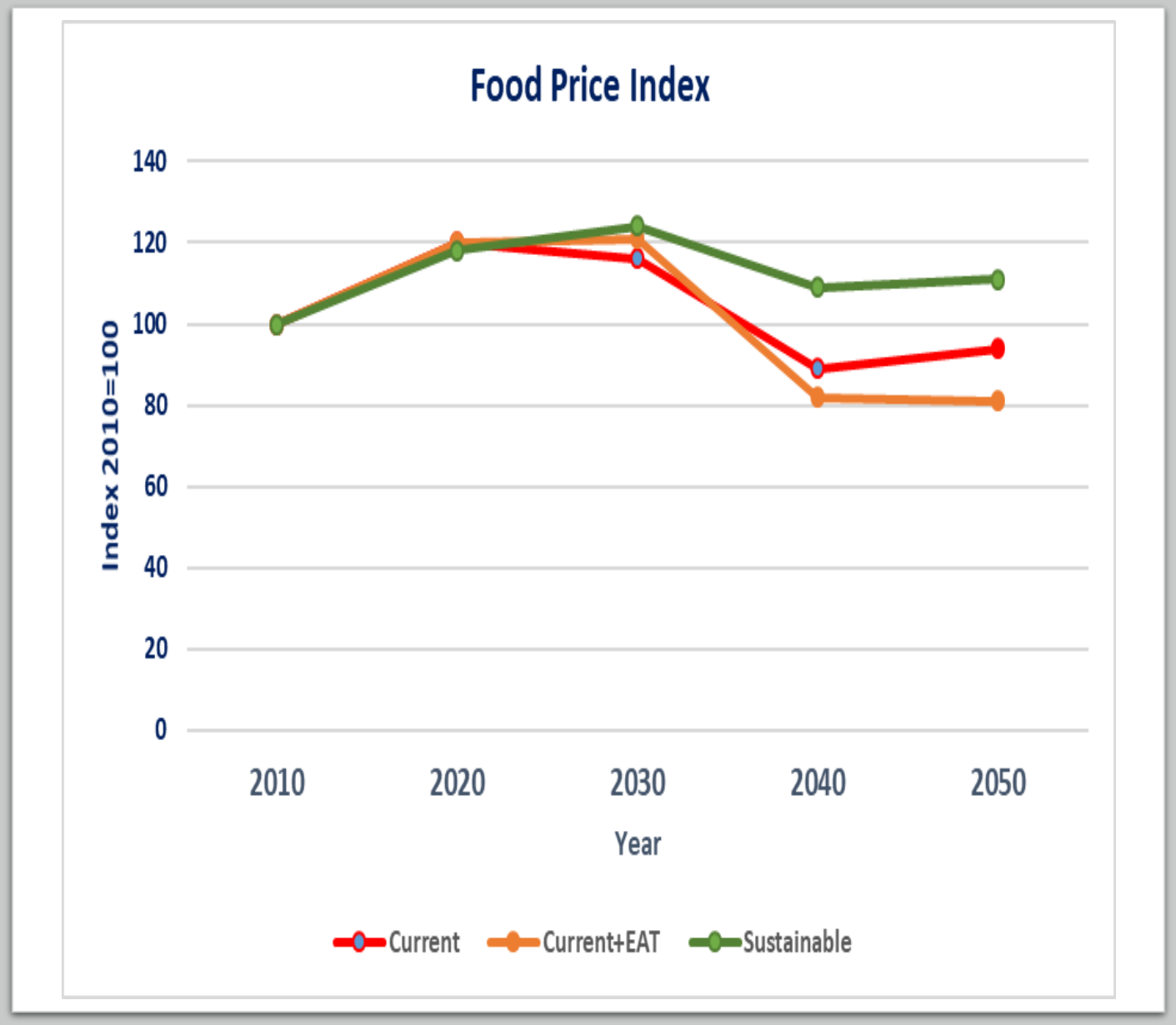
Food Consumption

- Food security goal can be accomplished by 2050
- Cereals, sugar, oils, and animal products – 79% of current diets
- Consumption of pulses, fruits, vegetables and nuts, oils and other crops increases in scenarios with EAT-Lancet recommendations
- Reductions are observed in the consumption of dairy, eggs, and sugars in 2050



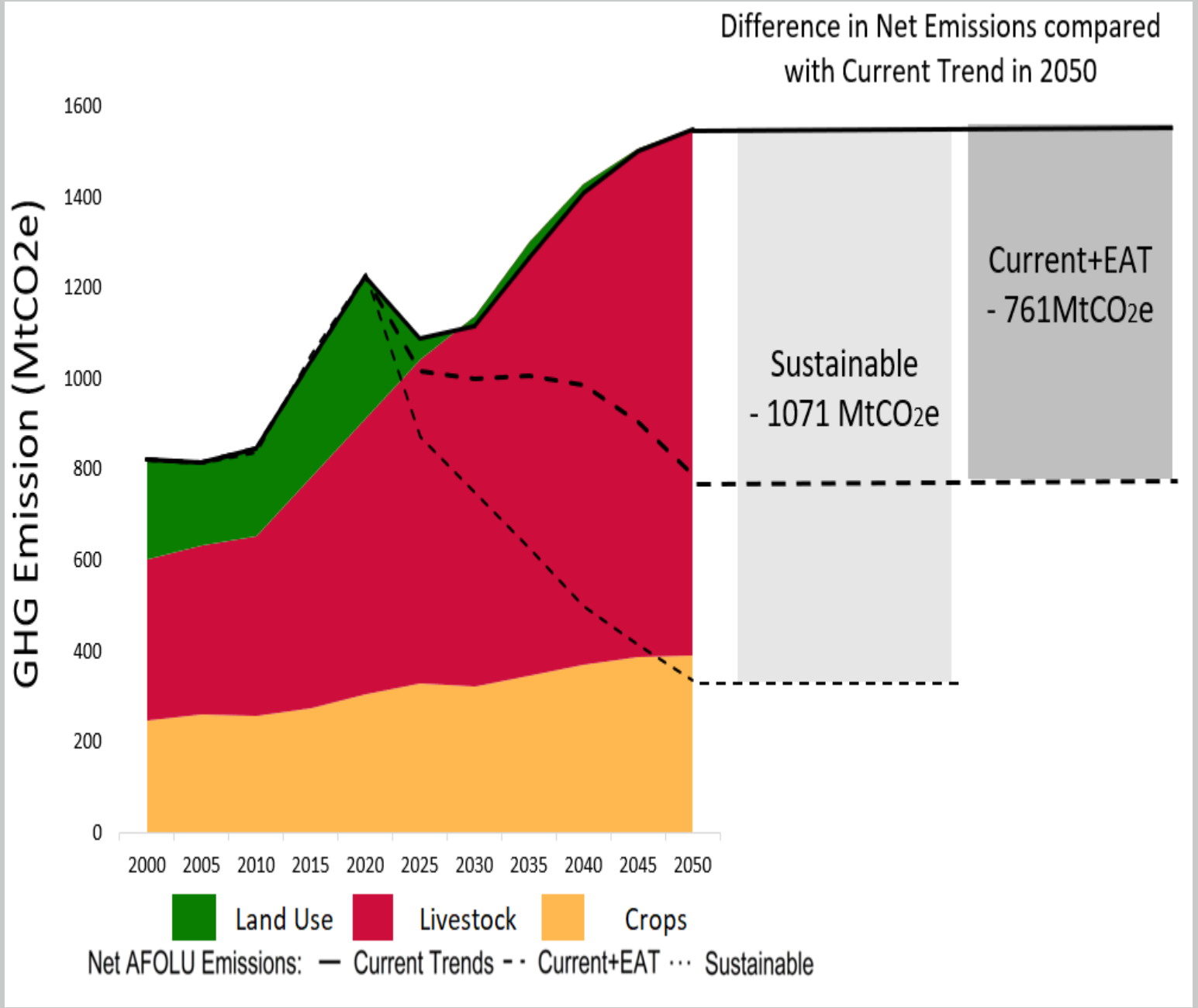
Food Price Index

- Food price index is the highest under the Sustainable pathway in 2050
- More restrictions on resources (EFP, carbon taxes etc.)
- Negative impacts of switching to the Sustainable pathway are limited



GHG Emissions

- Higher emissions in Current trend, mainly due to higher demand for livestock products
- EAT Lancet recommendation - reduction of demand for livestock products, specifically dairy and for cereals by 2050
- 80% reduction in GHG emissions possible in Sustainable Pathway



Land-use, Water and Self-sufficiency

- Overall cropland area increases by 11% in 2030 across the scenarios
- Increase in forest area is larger under the Sustainable Pathway due to the implementation of India's afforestation target
- 38% reduction in annual blue water use 2050 under both Current Trends and Current + EAT pathways, 63% reduction in the Sustainable pathway
- Inclusion of environmental flow protection (EFP) policies and climate change impact results in reduced agricultural water withdrawals by almost half by 2050
- India's self-sufficiency for major food groups remains negative (net importer) in all scenarios

Conclusions

- Increased yields in Sustainable pathways helps meet food demand
- Synergies with agricultural cropland and GHG emissions to meet food demand
- Greater reliance on imports
- Higher food prices
- Possible to address the complex challenges within the environmental and agricultural sector, without extensive effects on international trade and self-sufficiency

Thank you

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