



# A Healthy, Inclusive and Sustainable Food System for India- evaluating a synergistic food system measures

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## Background

- India's agrifood system grapples with challenges such as persistent malnutrition, environmental degradation, resource strain, and social disparities.
- Transitioning to sustainable food systems necessitates cohesive bundling of sustainable food and land use management measures, inclusive changes and identifying strategic entry points for transformation.

## Objective

*Develop an integrated food system development pathway (FSDP) for India's transformation towards a healthy, nature positive and inclusive food system up to 2050.*

## Methodology & Scenario Description

- Integrated modelling framework
- Model of Agriculture and its Impact on the Environment (MAGPIE)
- Assess **19 transformative food system measures (FSMs)** and **3 external socio-economic transitions** discretely and in packages.
- 22 FSMs combined into 5 distinct packages – **Diets, Livelihoods, Biosphere, Agriculture, CrossSector**
- Lastly, all individual FSM integrated together as FST\_SSP2 (without) and FST\_SDP (with) **CrossSector** transition
- Each FSMs evaluated as scenarios provides a possible future trajectory of food system transition.
- Quantify the effects of these FSMs on 14 indicators representing the health, environment, inclusion, and the economy dimensions.

## Results

- In the absence of any FSMs, current transitions show unsustainable trajectories.
- Coordinated measures yield more benefits than trade-offs.** In the FSDP scenario, combining all FSMs *improves 12 out of 14 indicators.*
- Promoting **diverse, healthy diets with more plant-based foods, less sugar, and no starchy staples reduces YLL**, especially with more horticulture products.

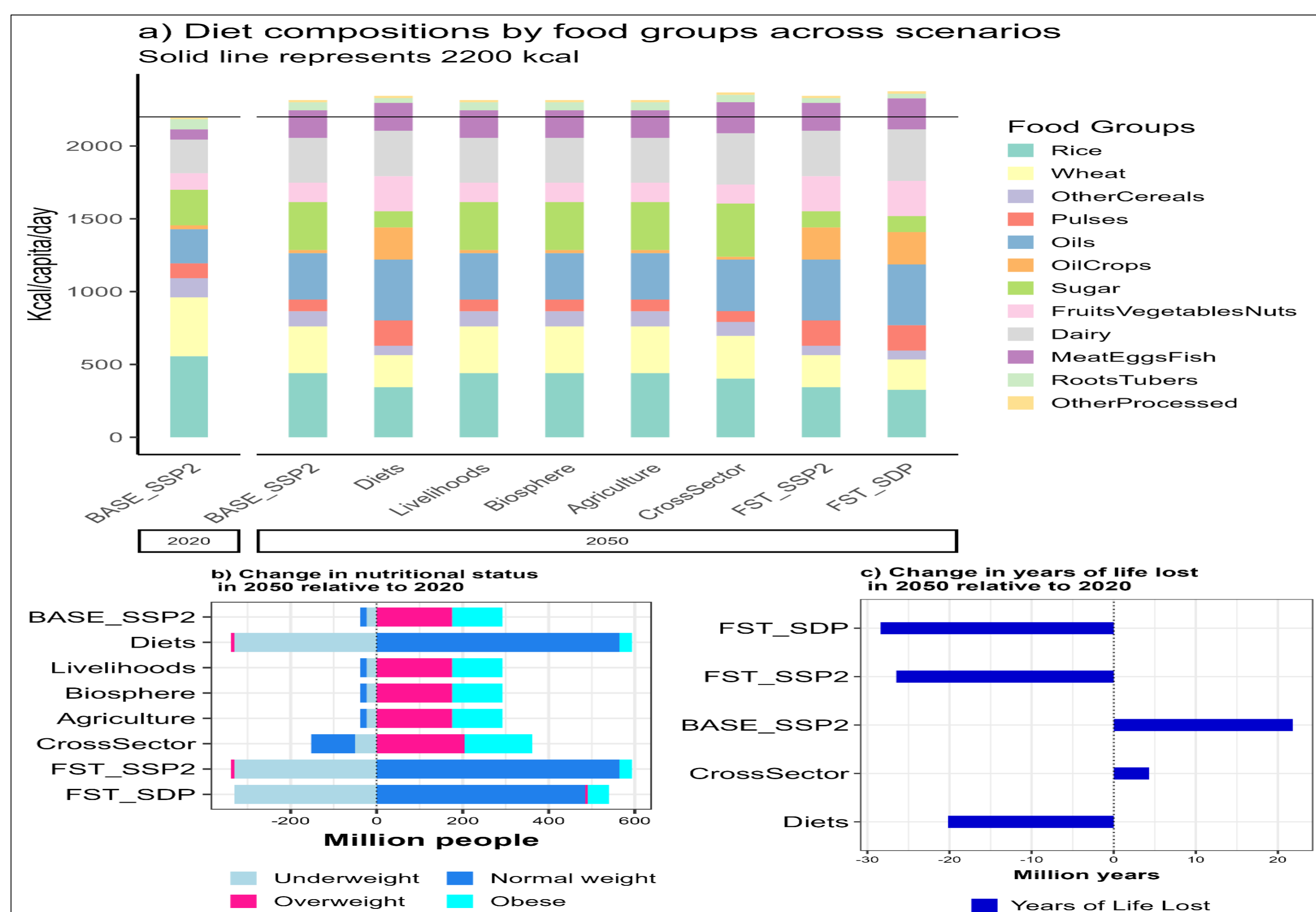


Figure 2: Changes in health and nutrition outcomes for different scenarios by 2050.

	Health			Environment						Inclusion			Economy		
	Underweight Mio people	Obesity Mio people	Premature Mortality Mio years of life lost	Cropland Landscapes Biodiv. Intactness Index	Hotspot Landscapes Biodiv. Intactness Index	Croparea Diversity Shannon Index	Nitrogen Surplus Mt N/yr	Env. Water Flow Violations km3/yr	AFOLU GHG Emissions GtCO2eq/yr	Expenditure on Ag. Products USD/person/yr	Poverty Mio people below 3.20\$/day	Ag. Employment Mio people	Ag. Wages Index rel. to 2010	Economic Supply Billion US\$/yr	Production Costs Billion US\$/yr
BASE_SSP2	307	176	72	67.68	85.73	2.28	32	7	1.5	531	189	96	3.54	31	660
<b>Diets</b>															
Diets	0	88	30	67.62	85.47	2.39	31	27	1.4	581	192	107	3.54	31	713
LowProcessed				69	67.58	85.73	2.27	32	6	544	189	97	3.54	31	662
HighLegumes				70	67.64	85.67	2.21	31	6	548	190	97	3.54	31	674
HighVegFruitsNuts				62	67.33	85.79	2.37	33	14	606	195	113	3.54	32	748
HalfOverweight	307	88	65	67.81	85.71	2.3	31	5	1.5	522	189	94	3.54	31	643
NoUnderweight	0	176	41	67.94	85.26	2.24	32	14	1.5	556	193	99	3.54	31	691
LowFoodWaste				72	67.84	85.69	2.37	30	7	492	187	90	3.54	30	612
<b>Livelihoods</b>															
Livelihoods				68.27	85.62	2.44	27	5	1.3	652	187	77	6.48	31	544
LibTrade				68.06	85.72	2.5	27	5	1.3	500	188	86	3.54	31	579
MinWage				67.77	85.67	2.28	32	6	1.5	684	188	89	6.48	31	636
CapitalSubst				67.71	85.67	2.28	32	7	1.5	549	191	105	3.54	31	677
<b>Biosphere</b>															
Biosphere				68.79	86.67	2.33	32	0	1.2	537	188	96	3.54	31	669
REDD+				67.37	85.89	2.27	32	9	1.3	546	190	96	3.54	31	666
LandConservation				67.78	86.56	2.27	32	8	1.5	543	190	96	3.54	31	662
WaterConservation				67.66	85.73	2.31	31	0	1.5	534	188	96	3.54	31	661
BiodivOffset				68.91	85.9	2.36	32	9	1.5	531	188	96	3.54	31	658
<b>Agriculture</b>															
Agriculture				66.82	84.54	2.36	20	34	1	684	199	132	3.54	31	824
NitrogenEfficiency				67.68	85.65	2.27	20	6	1.4	557	190	103	3.54	31	686
LandscapeHabitats				67.83	85.16	2.29	32	5	1.5	537	190	96	3.54	31	661
RiceMitigation				67.76	85.7	2.3	32	9	1.5	535	191	97	3.54	31	666
LivestockManagement				66.66	85.19	2.16	34	14	1.2	636	196	120	3.54	31	777
ManureManagement				67.67	85.69	2.29	31	5	1.4	544	189	100	3.54	31	677
SoilCarbon				67.54	85.8	2.31	32	5	1.5	535	189	96	3.54	31	662
<b>CrossSector</b>															
FST_SSP2	0	88	23	69.35	86.07	2.54	17	0	1.7	864	196	112	6.48	30	689
CrossSector	281	216	54	67.71	85.66	2.36	29	8	1.6	554	200	84	5.02	36	681
Population	299	178	78	67.76	85.7	2.3	31	6	1.5	538	190	95	3.54	30	647
HumanDevelop	289	214	50	67.64	85.71	2.27	29	8	1.7	565	200	84	5.02	29	691
EnergyTrans				67.65	85.63	2.33	32	9	1.5	528	189	97	3.54	36	666
FST_SDP	0	108	22	69.12	86.17	2.52	17	0	1.8	793	200	89	6.48	36	787

Figure 1: Effect of individual food system measures (FSMs) and packages (Diets, Livelihoods, Biosphere, and Agriculture) on key food system indicators.

- An **inclusive livelihood package** involving liberal trade, a high minimum wage, and increased labor engagement measures *may not necessarily boost employment, as production processes often adapt to higher costs and prioritize resource efficiency.*

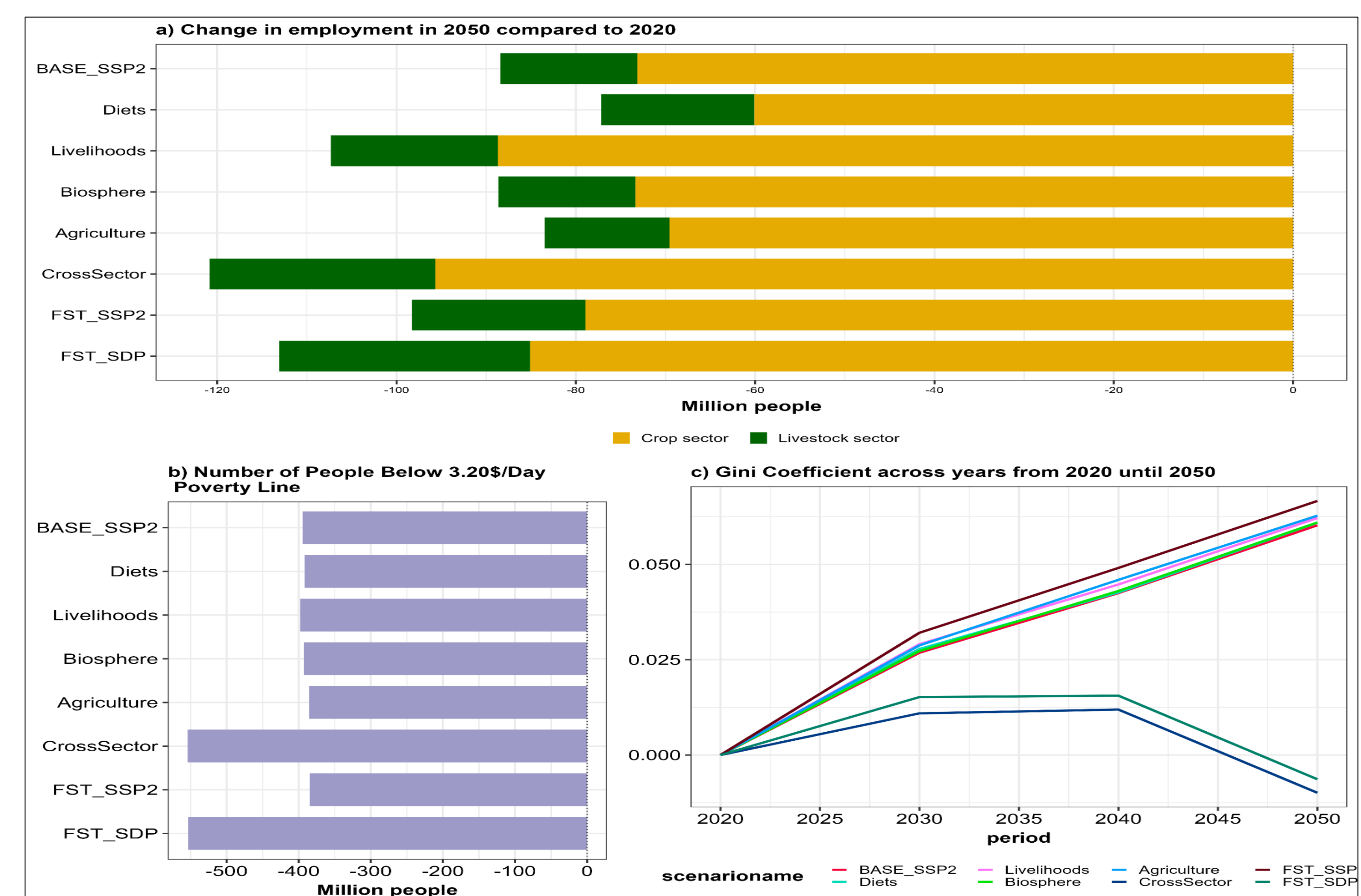


Figure 3: Changes in inclusion outcomes for different scenarios by 2050

## Conclusions

- Improved health and nutrition indicators due to dietary changes may induce trade-offs with water use.
- Issues like declining agriculture employment may need policy support from outside food system.
- India's food system transformation must be anchored in sustainable structural changes outside the food system.

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