FABLE 2023 Scenathon

Pathways for food and land-use systems in the Rest of Asia and Pacific region

FABLE CONSORTIUM

About FABLE
The Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium is a collaborative initiative to support the development of globally consistent mid-century national food and land-use pathways that could inform policies towards greater sustainability. The Consortium brings together teams of researchers from 24 countries and international partners from the UN Sustainable Development Solutions Network (SDSN), the International Institute for Applied Systems Analysis (IIASA), the Alliance of Bioversity International and CIAT, and the Potsdam Institute for Climate Impact Research (PIK). https://www.fableconsortium.org/

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Countries in the "Rest of Asia and Pacific" region
Bangladesh, Brunei Darussalam, Cambodia, Fiji Islands, French Polynesia, Japan, Korea DPR, Korea Rep, Laos ,Malaysia, Mongolia, Myanmar, New Zealand, New Caledonia, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Vanuatu, Vietnam, Timor-Leste.

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Our food and land-use systems are critical for staying within our planetary boundaries and the Earth's system resilience. Among the six Transformations required to achieve the Sustainable Development Goals (SDGs), the fourth Transformation—focusing on food, land, and water—is crucial. This Transformation is key to achieving SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land). Moreover, it significantly supports the remaining SDGs, underscoring its crucial role in fostering a sustainable future.

In this document, we present the results of the 2023 'Scenathon', a modelling exercise by the FABLE Consortium exploring three alternative futures for national and regional food and land-use systems. The term 'Scenathon' stands for 'a marathon of scenarios' and refers to FABLE's iterative process for ensuring that national and regional pathways have coherent trade assumptions and align with global sustainability targets (see the 2024 Sustainable Development Report for more information).

Through these long-term pathways, we can identify trade-offs and synergies between different goals and see the impact of various actions, as well as key levers for guiding sustainable development policies through 2030 and 2050. These results, together with our modelling tools and methods, are designed to support decision-making and the development of better policies and targets to drive the transformation of our food and land-use systems.

Countries in the "Rest of Asia and Pacific" region: Bangladesh, Brunei Darussalam, Cambodia, Fiji Islands, French Polynesia, Japan, Korea DPR, Korea Rep, Laos ,Malaysia, Mongolia, Myanmar, New Zealand, New Caledonia, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Vanuatu, Vietnam, Timor-Leste.

Figure 1. Historical share of GHG emissions from Agriculture, Forestry, and Other Land Use (AFOLU) to total AFOLU emissions and removals by source in 2020

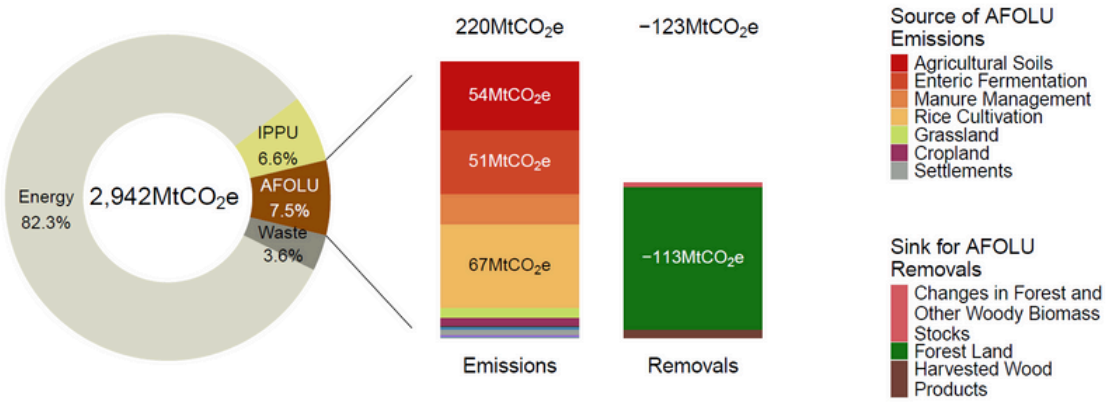
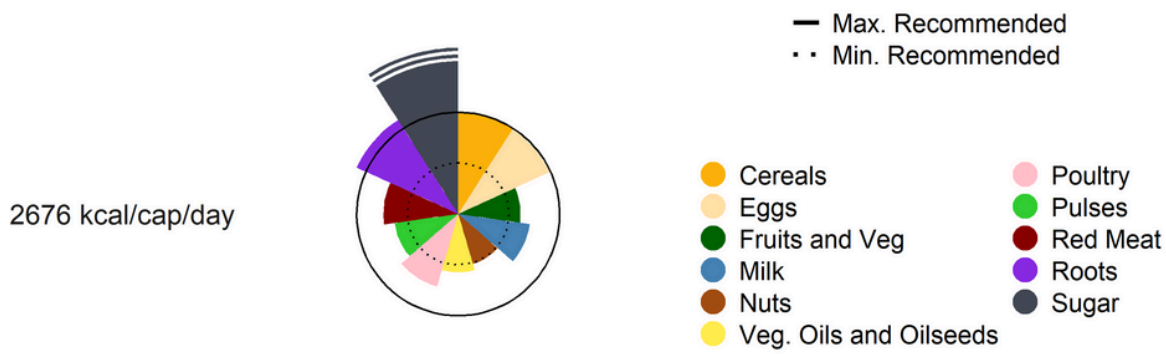


Figure 2. Daily average kilocalorie intake per capital per food category in 2020



Regional context

RASP

This table summarizes regional targets for food and land use, derived from regional commitments, policies, and strategies. It provides an overview of the region's current ambitions to transform its food and land-use systems. If the region lacked quantitative national targets, we have estimated targets based on qualitative pledges.

SDG	Indicator	**Regional Target** (Sources: UNFSS pathways, NDC commitments)
2 ZERO HUNGER	Self-sufficiency	Promote local food in the diet
	Undernourishment	Reducing undernourishment is an important goal in the region
	Overweight / obesity	Reducing over nourishment
	Diet-relared diseases	Reducing diet-related disease
	Other food-related targets	Reducing food loss and waste
13 CLIMATE ACTION	Total GHG emissions reduction	On average, for the major countries of the region, the target is to reduce GHG emissions by 40% by 2030 compared to BAU
	Agriculture GHG emissions reduction	Reduction of methane emissions
	Reduce or halt deforestation	Slight reduction of deforestation (Myanmar)
15 LIFE ON LAND	Promote afforestation	Increasing forest cover NDCs from Bangladesh, Thailand, Myanmar, New Zealand, and Philippines.
	Expand protected areas or 'Other effective area-based conservation measures'	Slight increase in protected areas (NDCs of Myanmar, Viet Nam, Philippines, Malysia.)
	Reduce or halt use of agrochemicals and other agricultural practices that harm biodiversity	Slight reduction of agrochemical uses (NDCs of Bangladesh and Myanmar and UNFSS pathways of Japan.)
	Expand cropland area under agroecological practices	Increase in agroecological practices and organic farming - UNFSS pathways of Bangladesh, Viet Nam, Philippines, Mongolia, Japan.
8 DECENT WORK AND ECONOMIC GROWTH	Employment in the agricultural sector	Support agricultural workforce and farmers income
	Agricultural exports	Increase exports or structure for exports (Mongolia)
14 LIFE BELOW WATER	Limit water use	Better manage water, mitigate water scarcity
	N and P related targets	Increase organic fertilizer use

Model

Using the open-access FABLE Calculator and the FABLE decentralized modelling infrastructure, we have developed three alternative pathways —Current Trends, National Commitments, and Sustainable Pathway— to explore the impact of various practices and policies on achieving sustainability targets through 2050. We compare our results with targets across food security and nutrition, GHG emissions reduction, forest and biodiversity conservation, and sustainable use of water, nitrogen, and phosphorus.

For each of these pathways, we have established various assumptions regarding the evolution of several model parameters. These parameters include population growth, dietary patterns, food waste, food import and export levels, crop and livestock productivity, agricultural expansion, afforestation, livestock density, protected areas expansion, post-harvest losses, biofuel demand, urban expansion, agricultural practice coverage, and irrigation area expansion. These assumptions detail the extent to which these factors will drive changes in food and land systems from 2020 to 2050.

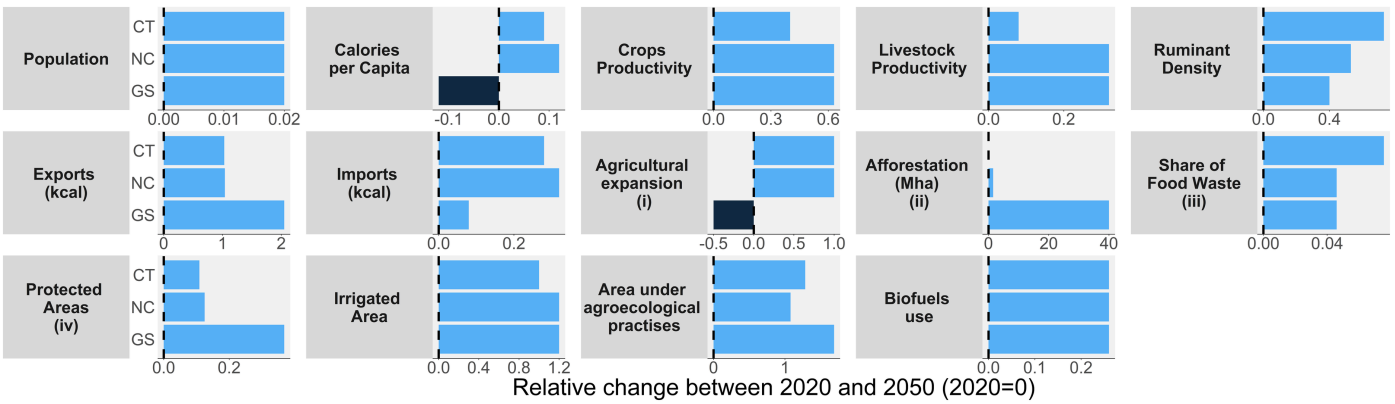
Pathway narratives

Current Trends: Represents a low-ambition trajectory primarily shaped by historical trends and existing policies, offering a glimpse into a future heavily reliant on the current level of implementation and enforcement.

National Commitments: Attempts to predict how food and land systems will evolve if national strategies, pledges, and targets concerning climate, biodiversity, and food systems are met. This is based on a review of policy documents that describe the national climate and biodiversity strategies, the UN food system pathway, the national dietary guidelines, and other relevant policy documents for food and land systems.

Global Sustainability: Identifies additional actions to help closing the gap between the collective outcome of the National Commitments pathway and the global sustainability targets. There may be large overlaps between the 'National commitments' pathway and the Global Sustainability pathway, depending on how ambitious country teams and local stakeholders think the current national commitments are.

Figure 3. Assumptions on the levers for change in each pathway



Notes: (i) Results are expressed in code, taking the value 1 for 'Free expansion scenario', -0.5 for 'No deforestation' and -1 for 'No Agricultural expansion'.
(ii) Results are expressed in a net increase rather than relative change.
(iii) Results are expressed % of consumption that is wasted.
(iv) Results are expressed in % of total land in 2050.

Figure 4. Computed daily average intake per capita over 2000-2050

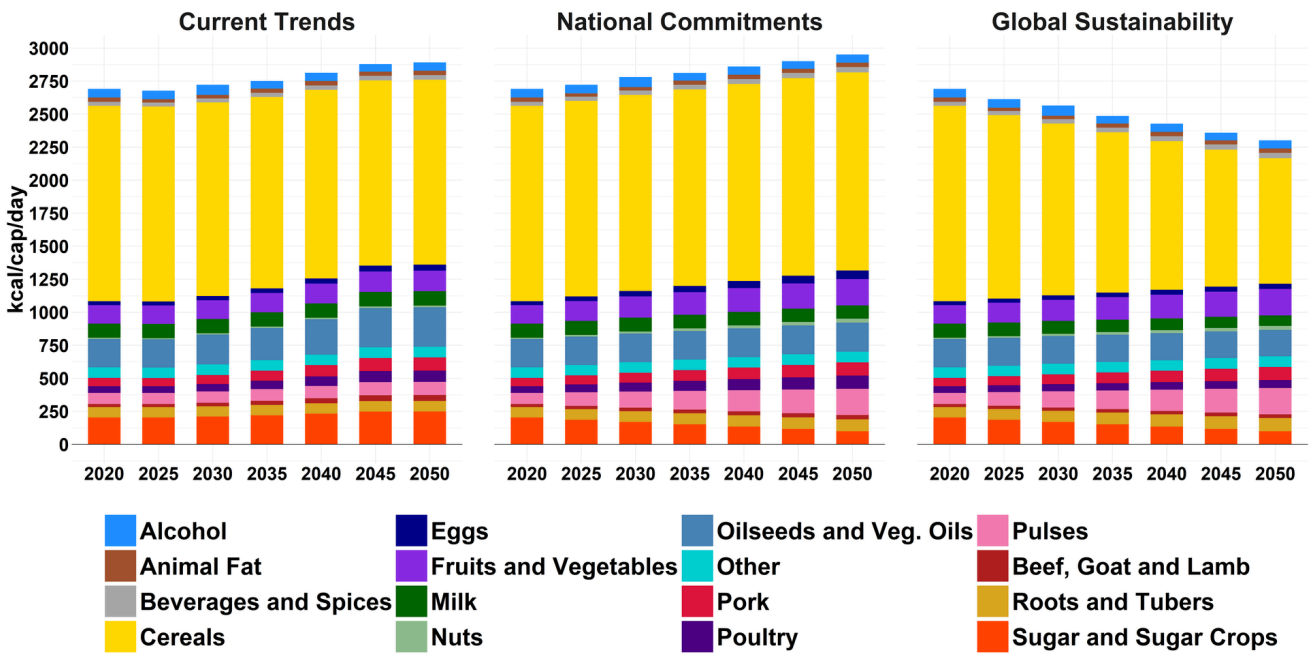


Figure 5. Comparison of the computed daily average kilocalorie intake per capital per food category across the three pathways and the prevalence of undernourishment in 2050

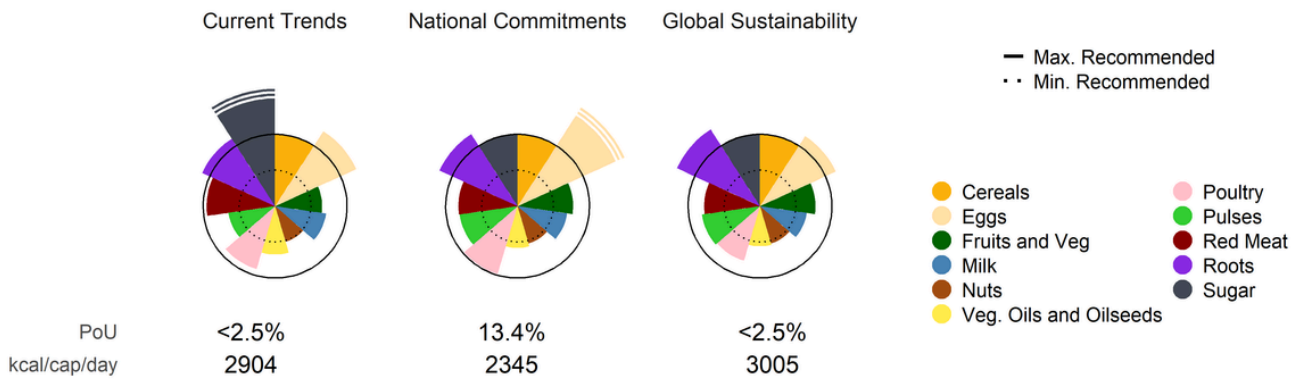


Figure 6. Evolution of land cover 2000-2050

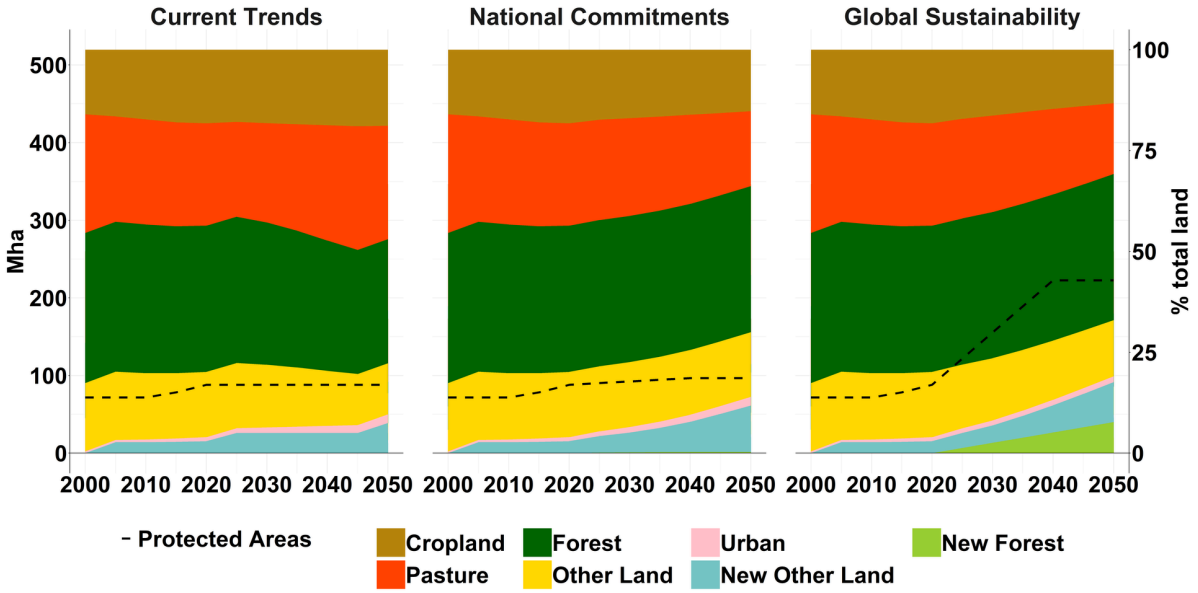


Figure 7. Evolution of the cropland composition 2000-2050

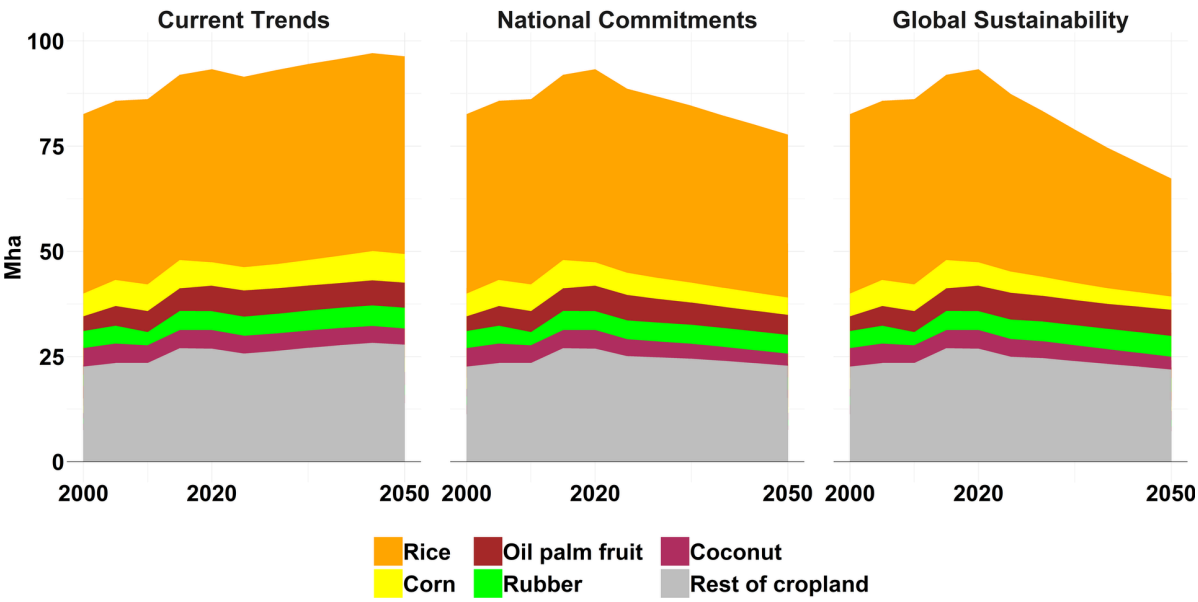


Figure 8. Projected AFOLU emissions and removals between 2020 and 2050 by main sources and sinks across pathways

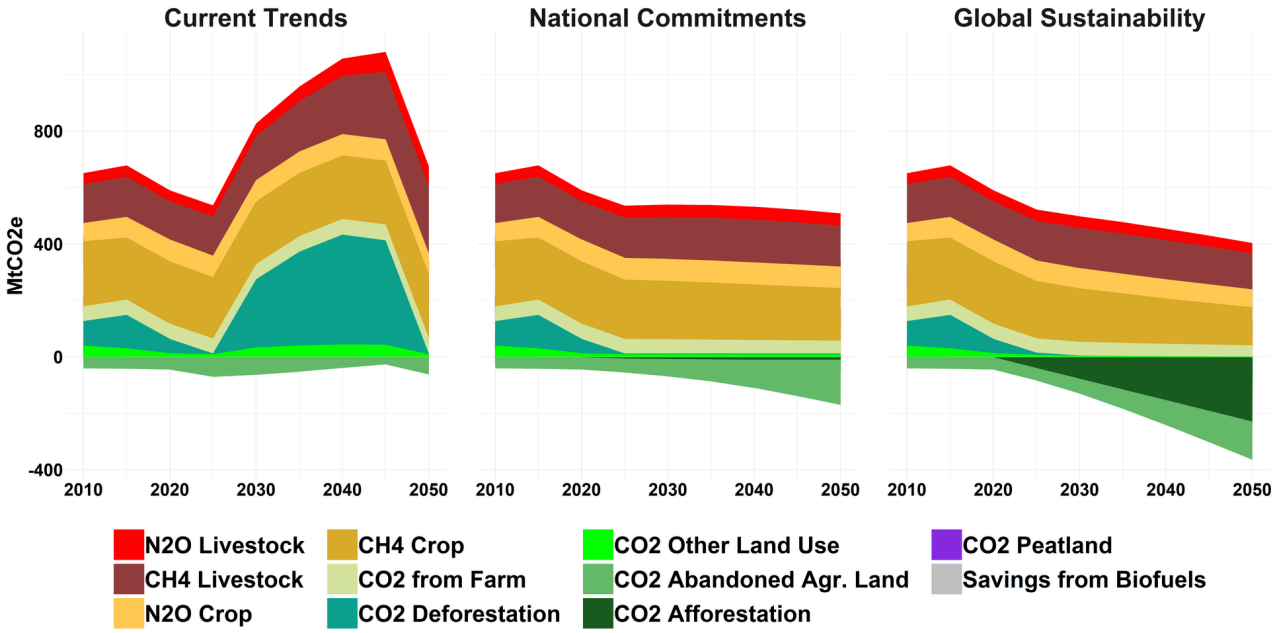


Figure 9. Share of cropland under agroecological practices

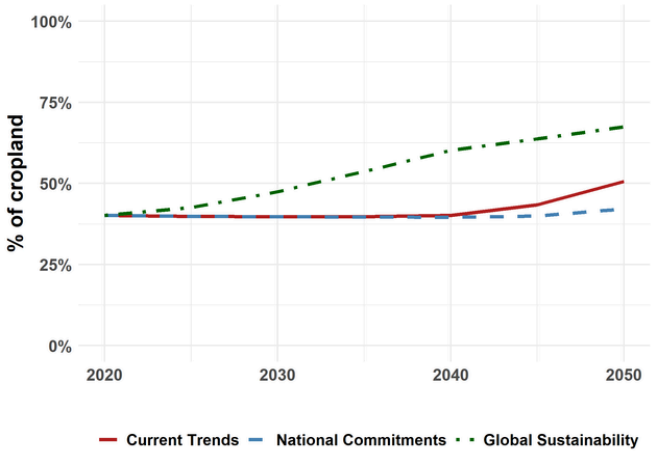
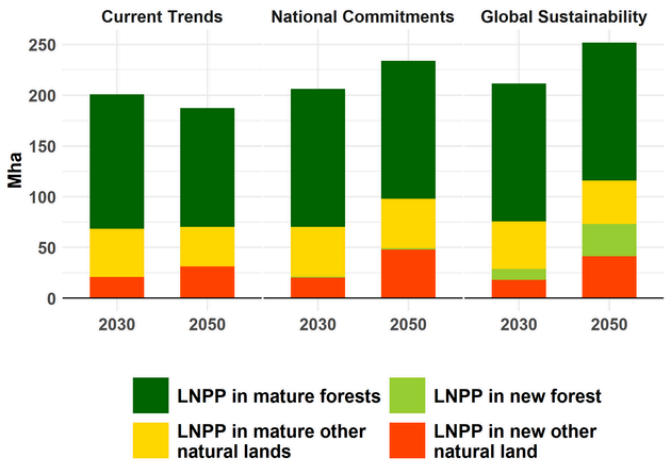


Figure 10. Total area of land where natural processes predominate (LNPP)



Agroecological practices included: Cover crops, cultivar mixtures, diversified farming systems, embedded natural, organic farming, no/minimal tillage.

Figure 11. Nitrogen application

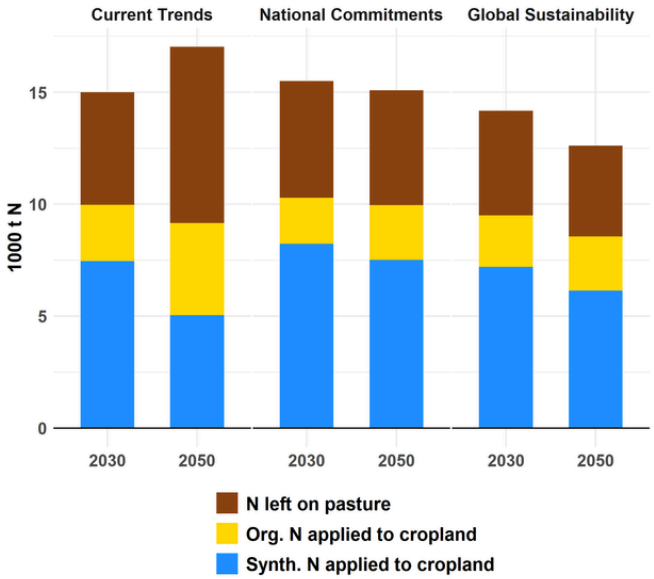
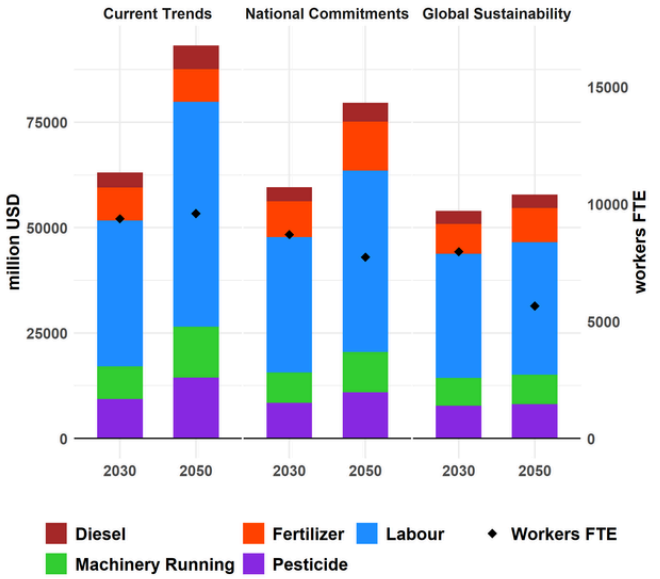


Figure 12. On farm production costs



FTE: Full-time equivalent

For more detailed results and visual data, visit www.scenathon.org

Scenarios and assumptions

		A) CURRENT TRENDS	B) NATIONAL COMMITMENTS	C) GLOBAL SUSTAINABILITY	Justification
1. Macroeconomics	**1.1)** GDP per capita	SSP1	SSP1	SSP2	Based on current trends (2000-2020 World Bank data for East Asia and Pacific)
	1.2) Population	UN_low	UN_low	UN_low	Based on current trends (2000-2020 World Bank data for East Asia and Pacific)
	1.3) Inflation	Average inflation	Average inflation	Average inflation	Based on current trends (2000-2020 average yearly CPI change)
	1.4) Inequalities	Increase	Increase less	Stabilize	Current trends: (NDP (2022). 'Reducing Inequality in the Decade of Action to Achieve the SDGs and Accelerate Post-Pandemic Recovery') National Commitments: Mentioned as an issue to tackle for most governments (UNDP (2022)). 'Reducing Inequality in the Decade of Action to Achieve the SDGs and Accelerate Post-Pandemic Recovery')
2. Land	**2.1)** Constraints on agricultural expansion/deforestation	Free expansion of agricultural land	Free expansion of agricultural land	No deforestation after 2030	Current trends: No official pledge (UNFS, NDC) National Commitments: No official pledge to stop deforestation in most countries of the region (UNFS, NDC) Global Sustainability: Objective fixed in COP26

Scenarios and assumptions

	2.2) Afforestation, and forest plantations targets	No afforestation	1,550 Mha forest	40,000 Mha forest	National Commitments based on the commitments to the Bonn Challenge
	2.3) Urban and settlements area	Large increase	Large increase	Increase less	Based on current trends (2000-2020 World Bank data for East Asia and Pacific)
	2.4) Protected areas	No change	Small increase	Large increase	National Commitments: Based on NDCs
3. Productivity and management	**3.1)** Crop productivity for the key crops	Compared with 2020 levels, in 2050: rice yield is stable sugarcane yield increases by 8% oil palm fruit yield increases by 25% cassava yield decreases by 9%	Compared with 2020 levels, in 2050: rice yield increases by 24% sugarcane yield increases by 34% oil palm fruit yield increases by 39% cassava yield increases by 18%	Compared with 2020 levels, in 2050: rice yield increases by 24% sugarcane yield increases by 34% oil palm fruit yield increases by 39% cassava yield increases by 18%	Current Trend: The key crops are rice, sugarcane, and oil palm fruit. In 2020, crop productivity was at: 4.3 t/ha for rice 50 t/ha for sugarcane 19 t/ha for oil palm fruit 19 t/ha for cassava National Commitments: Increasing productivity is mentioned as a goal in several UNFS pathway
	3.2) Cropland under agroecological practices	51%	42%	68%	Current Trends: In 2010, around 40% of the cropland was under agroecological practices. National Commitments: Will extend agroecological practices in some UNFS pathways of the countries of the region.

Scenarios and assumptions

	3.3) Livestock productivity for the key livestock products	The key livestock products are milk, chicken, and pork. In 2050, compared with 2020 levels: milk's productivity decreased by 9% chickens' productivity increased by 9% pork's productivity increased by 12%	The key livestock products are milk, chicken, and pork. In 2050, compared with 2020 levels: milk's productivity decreased by 23% chickens' productivity increased by 22% pork's productivity increased by 52%	The key livestock products are milk, chicken, and pork. In 2050, compared with 2020 levels: milk's productivity decreased by 23% chickens' productivity increased by 22% pork's productivity increased by 52%	National Commitments: Increasing livestock productivity is mentioned as a goal in several NDCs.
	3.4) Pasture stocking rate	Density increases +1.8% per year	Density increases +1.4% per year	Density increases +1.1% per year	
	3.5) Forest management	NA	NA	NA	
4. Trade	**4.1)** Share of consumption which is imported for key imported products (%)	By 2050, the share of total consumption which is imported remains stable	By 2050, the share of total consumption which is imported remains stable	By 2050, the share of total consumption which is imported remains stable	
	4.2) Evolution of exports for key exported products (1000 tons)	By 2050, the volume of exports is multiplied by 2 for cassava, rubber, rice, mutton goat meat, beans, tea, plan oil, coffee	By 2050, the volume of exports is multiplied by 2 for cassava, rubber, rice, mutton goat meat, beans, tea, plan oil, coffee	By 2050, the volume of exports is multiplied by 3 for cassava, rubber, rice, mutton goat meat, beans, tea, plan oil, coffee	

Scenarios and assumptions

5. Food	**5.1)** Average dietary composition	By 2050, the average daily calorie consumption per capita is 2900 kcal and the main food groups are: Cererals (1400 kcal) Oil (300 kcal) Sugar (250 kcal) Pork (100 kcal) Fruits and vegetables (155 kcal) Poultry (85 kcal)	By 2050, the average daily calorie consumption per capita is 3000 kcal and the main food groups are: Cererals (1500 kcal) Oil (220 kcal) Sugar (100 kcal) Pork (100 kcal) Fruits and vegetables (200 kcal) Poultry (100 kcal)	By 2050, the average daily calorie consumption per capita is 2350 kcal and the main food groups are: Cererals (950 kcal) Oil (200 kcal) Sugar (100 kcal) Pork (100 kcal) Fruits and vegetables (200 kcal) Poultry (60 kcal)	Current Trend: In 2020, the average daily calorie consumption per capita is 2675 kcal and the main food groups are: Cereals (1475 kcal) Oil (214 kcal) Pork (63 kcal) Sugar (205 kcal) Fruits and vegetables (140 kcal) Poultry (51 kcal) National Commitments and Global Sustainability: Will to promote a healthier diet mentioned in most UNFS pathways
	5.2) Share of food consumption which is wasted at household level	No change	30% less compared with the 2020 level	30% less compared with the 2020 level	Current Trend: No clear cut-off of food loss and waste in the current trend. National Commitments: There is a will to reduce food loss and waste in most UNFS pathways of the countries of the region.
6. Biofuels	**6.1)** Targets on biofuel and/or other bioenergy use	Biofuel production will follow the OECD-AGLINK scenario	Biofuel production will follow the OECD-AGLINK scenario	Biofuel production will follow the OECD-AGLINK scenario	
	6.2) Targets on other non-food use	No change	No change	No change	
7. Water	**7.1)** Irrigated crop area	No change	No change	No change	