

*The Food, Agriculture, Biodiversity,  
Land Use and Energy Pathways  
(FABLE) Consortium*

**2019 Report of the FABLE  
Consortium: Pathways to  
Sustainable Land-Use and  
Food Systems**



The **F**ood, **A**griculture, **B**iodiversity, **L**and Use, and **E**nergy (FABLE)  
Pathways Consortium

# The FABLE Consortium

- ✓ A **collaborative initiative** operating as part of the Food and Land-Use Coalition (FOLU)
- ✓ **Objective:** to understand how countries can transition towards sustainable land-use and food systems and collectively meet the Sustainable Development Goals and objectives of the Paris Agreement

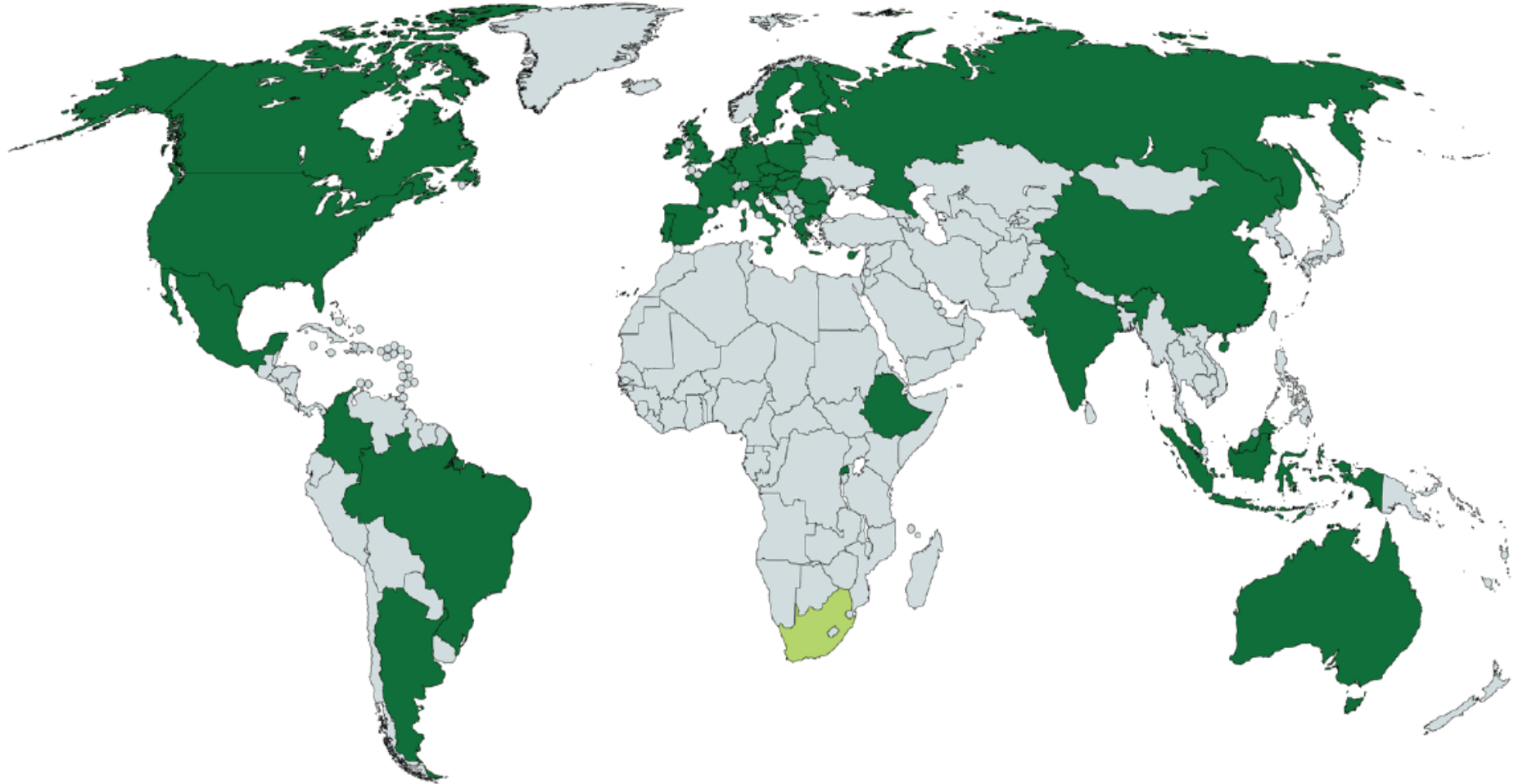
## The Fable Consortium:

- Independent research teams from 18 countries, including the European Union
- Led by IIASA and SDSN
- Working closely with EAT, the Potsdam Institute for Climate Impact Research (PIK), and many other institutions
- Members provide training & technical support to each other and collaborate to fill knowledge gaps in building FABLE pathways



# FABLE Country Teams

Argentina  
Australia  
Brazil  
Canada  
China  
Colombia  
Ethiopia  
European Union  
Finland  
India  
Indonesia  
Malaysia  
Mexico  
Russian Federation  
Rwanda  
Sweden  
United Kingdom  
United States

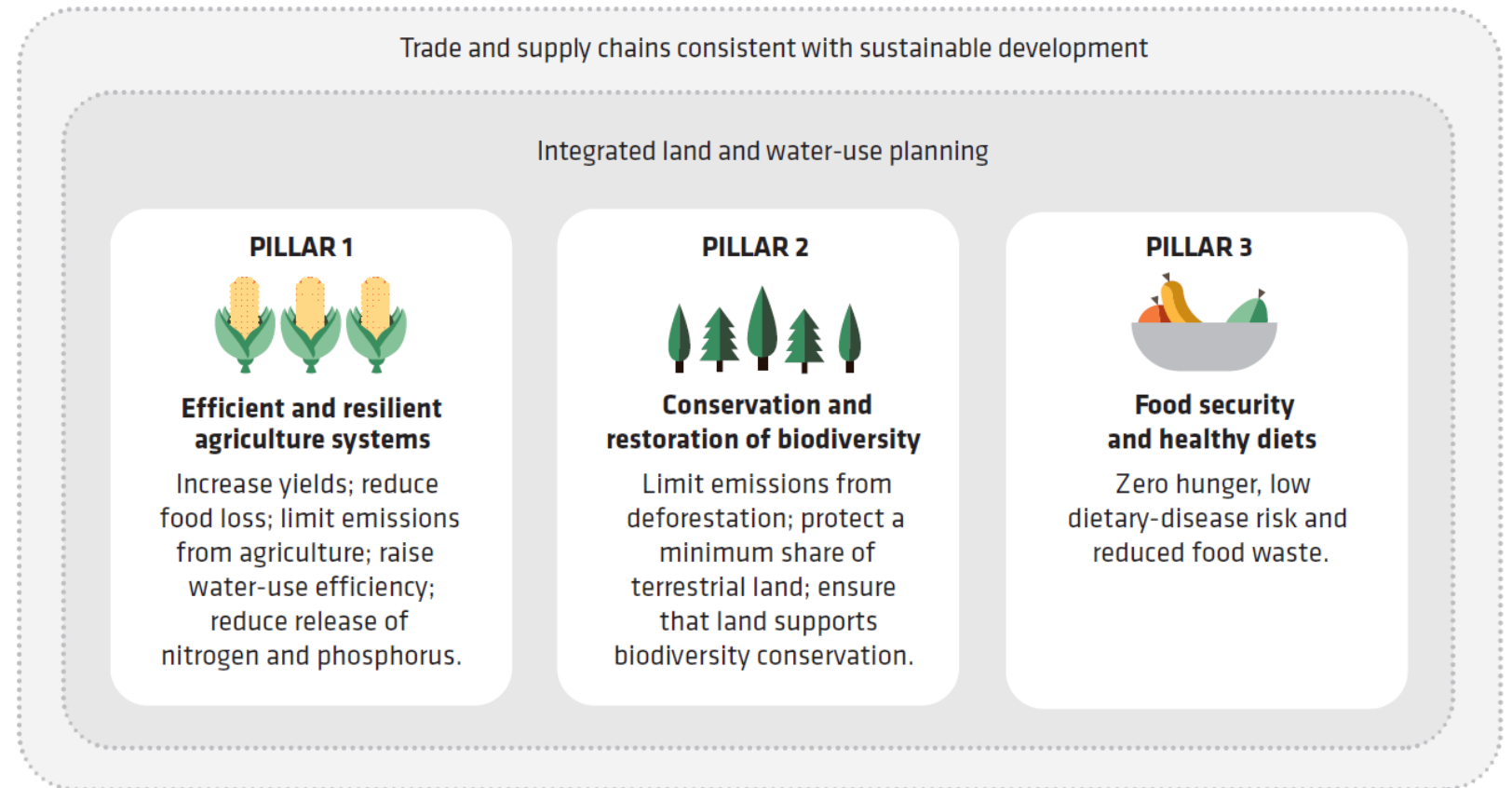


*South Africa had recently joined the Consortium but did not contribute to the FABLE report 2019*

# An integrated framework for action

The FABLE Consortium has identified three pillars for designing integrated strategies to achieve sustainable land-use and food systems.

- Each pillar requires profound changes from business-as-usual practices.
- Each is equally important, and all are interdependent and synergistic.
- They should be tailored to each country, take account of local constraints, and be complemented with local priorities.



Source: Schmid-Traub et al., Nature (2019)

# Targets for sustainable land-use and food systems

Proposed **global targets for sustainable land use and food systems** are **based on:**

- ✓ Focus on mid-century
- ✓ Existing international commitments
- ✓ Latest science
- ✓ Scalable from local to global

AREA	GLOBAL TARGET
Food security	<b>Zero hunger</b> <i>Average daily energy intake per capita higher than the minimum requirement in all countries by 2030</i>
	<b>Low dietary disease risk</b> <i>Diet composition to achieve premature diet related mortality below 5%</i>
Greenhouse gas emissions	<b>Greenhouse gas emissions from crops and livestock compatible with keeping the rise in average global temperatures to well below 1.5°C</b> <i>Below 4 GtCO<sub>2</sub>e yr<sup>-1</sup> by 2050</i>
	<b>Greenhouse gas emissions and removals from Land Use, Land-Use Change, and Forestry (LULUCF) compatible with keeping the rise in average global temperatures to below 1.5°C</b> <i>Negative global greenhouse gas emissions from LULUCF by 2050</i>
Biodiversity and ecosystem services	<b>A minimum share of earth's terrestrial land supports biodiversity conservation</b> <i>At least 50% of global terrestrial area by 2050</i>
	<b>A minimum share of earth's terrestrial land is within protected areas</b> <i>At least 17% of global terrestrial area intact by 2030</i>
Forests	<b>Zero net deforestation</b> <i>Forest gain should at least compensate for the forest loss at the global level by 2030</i>
Freshwater	<b>Water use in agriculture within the limits of internally renewable water resources, taking account of other human water uses and environmental water flows</b> <i>Blue water use for irrigation &lt;2453 km<sup>3</sup>yr<sup>-1</sup> (670-4044 km<sup>3</sup>yr<sup>-1</sup>) given future possible range (61-90%) in other competing water uses</i>
Nitrogen	<b>Nitrogen release from agriculture within environmental limits</b> <i>N use &lt;69 Tg N yr<sup>-1</sup> total Industrial and agricultural biological fixation (52-113 Tg N yr<sup>-1</sup>) and N loss from agricultural land &lt;90 Tg N yr<sup>-1</sup> (50-146 Tg N yr<sup>-1</sup>) by 2050</i>
Phosphorous	<b>Phosphorous release from agriculture within environmental limits</b> <i>P use &lt;16 Tg P yr<sup>-1</sup> flow from fertilizers to erodible soils (6.2-17 Tg P yr<sup>-1</sup>) and P loss from ag soils &amp; human excretion &lt;8.69 Tg P yr<sup>-1</sup> flow from freshwater systems into ocean by 2050</i>

# Pathways as a method for problem solving

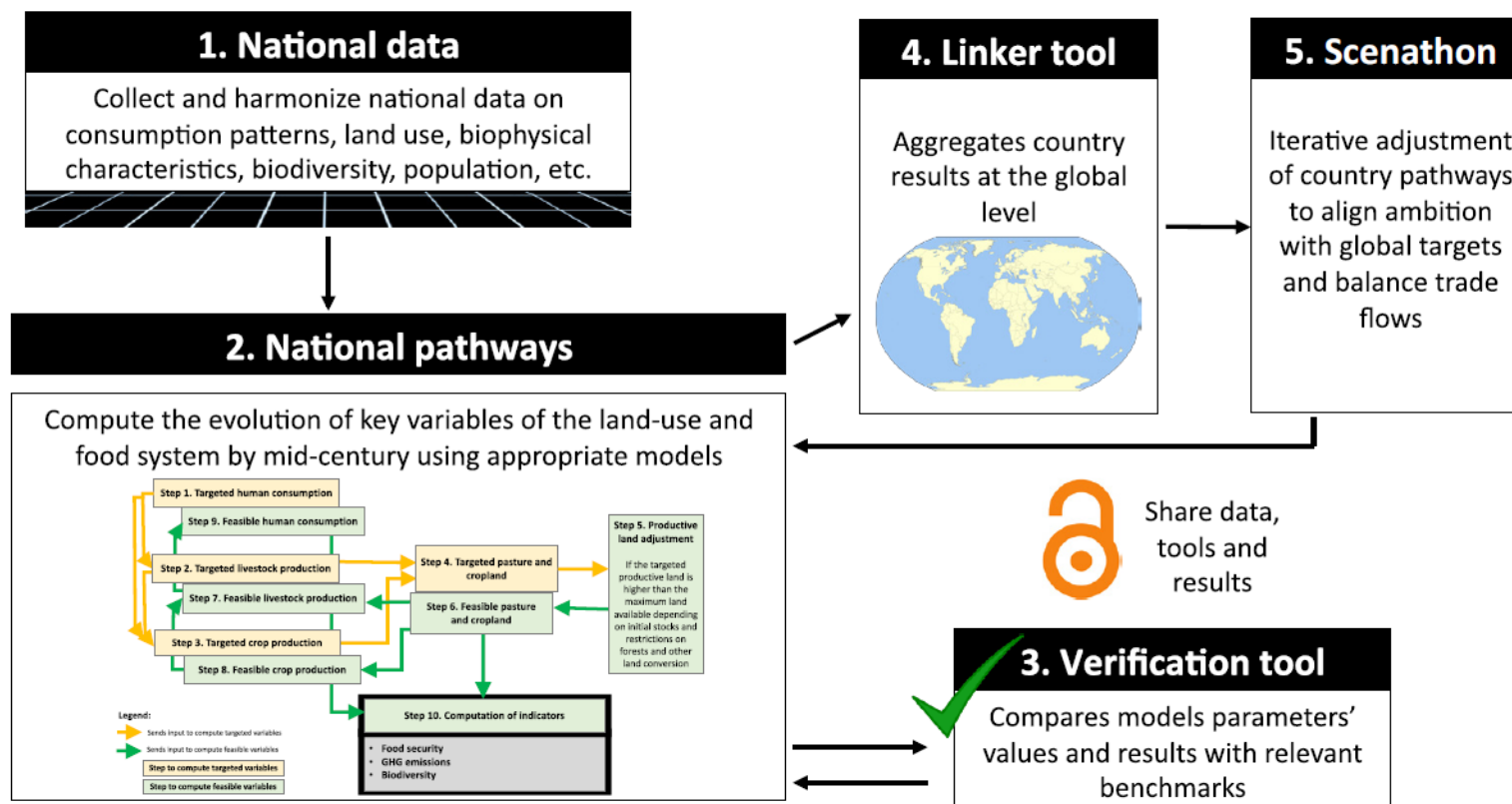
The FABLE Consortium focus on strengthening country teams' capacity to advise their governments on the design and implementation of long-term strategies towards sustainable land-use.

## Major steps in the FABLE method for developing national pathways

**1. Capacity development and sharing of best practice** for data management and modeling of the three pillars.

**2. Development of mid-century national pathways** that can collectively achieve the jointly agreed global targets and have consistent trade assumptions.

**3. Analysis of national policy options and support to national and international policy processes.**



# Scenathon [σι'να:θον]

*Scenario + Marathon*

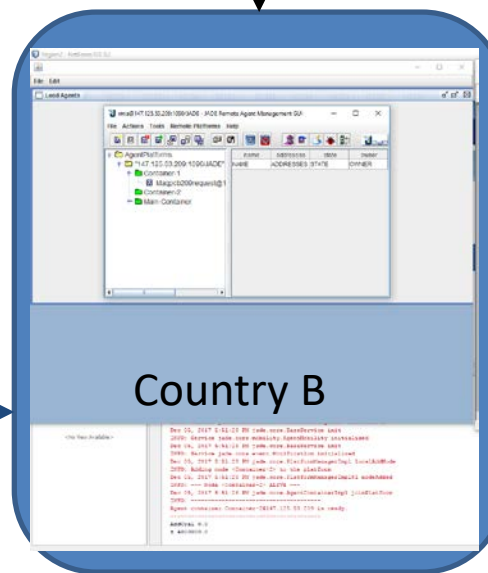
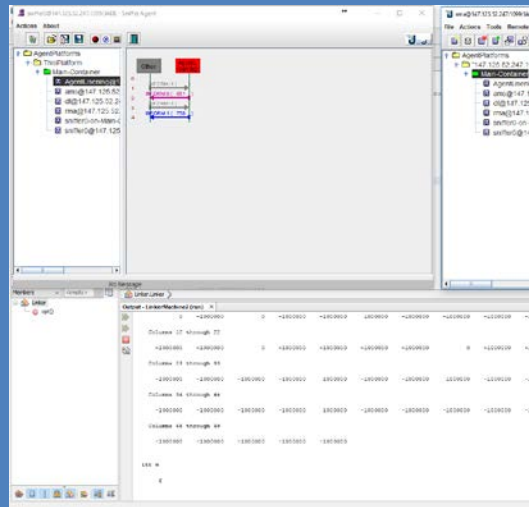
A SCENATHON is a time restricted scenario exercise building solution pathways.



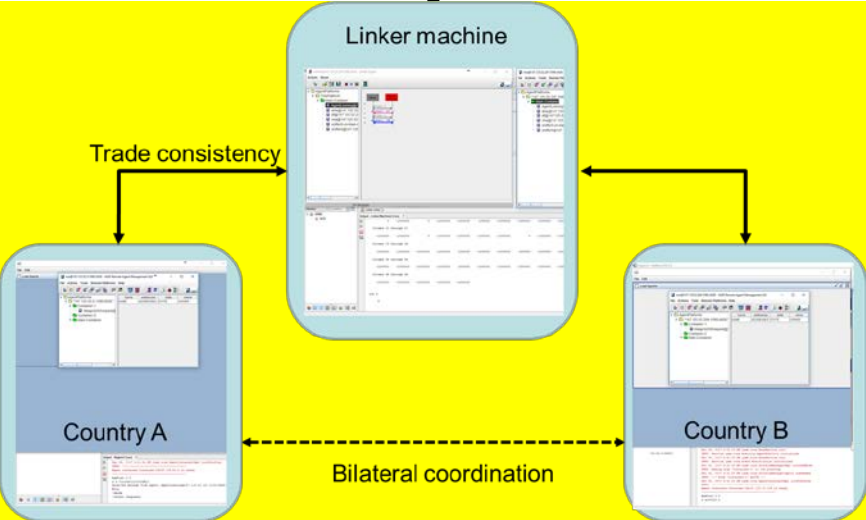


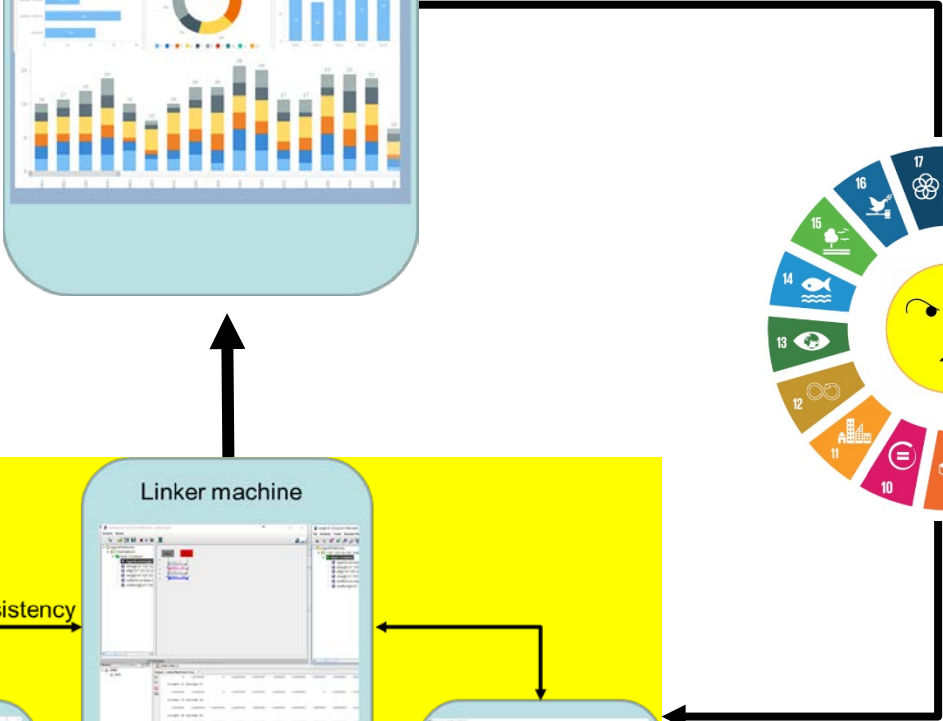
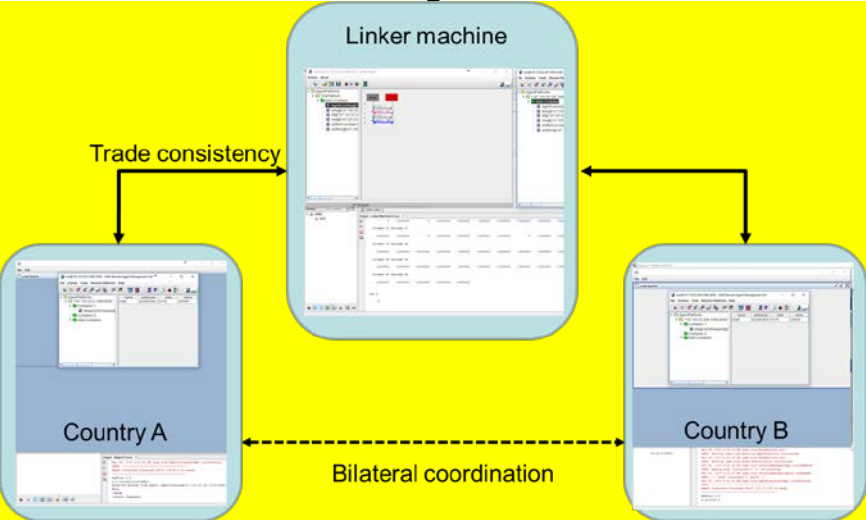
# Linker machine

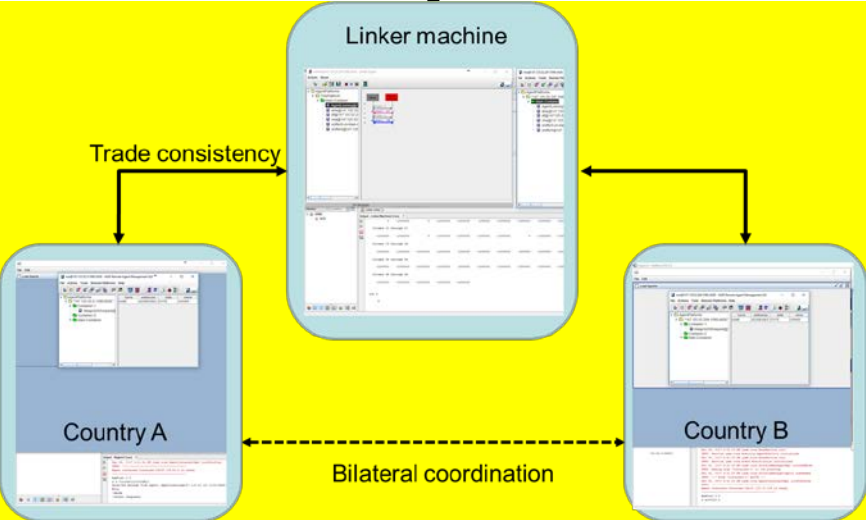
Trade consistency



Bilateral coordination







# **Key Findings of the FABLE 2019 Report**

# Most global targets can be reached by 2050

Performance metrics of the computed pathways across the three FABLE pillars

Trade consistent with sustainable development

Integrated land use planning

## PILLAR 1



### Efficient and resilient agriculture systems

**Average productivity growth** in kcal/ha agricultural land:  
+ 56% between 2010 and 2050 globally

**Global GHG emissions from crops and livestock:**  
6 Gt CO<sub>2</sub>e in 2050

**Global GHG emissions from land use change:**  
-1.6 Gt CO<sub>2</sub>e in 2050

## PILLAR 2



### Conservation and restoration of biodiversity

**Global deforestation:**  
1.6 Mha/year in 2050

**Net global forest cover change:**  
+1.6 Mha/year in 2050

**Cumulated global afforested land:**  
191 Mha in 2050

**Share of total land which could support biodiversity:**  
57% of global land in 2050

Range across FABLE countries  
16% - 82%

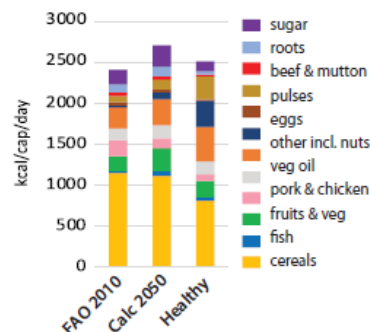
## PILLAR 3



### Food security and healthy diets

**Food security:**  
Average energy intake > minimum requirement from 2030 onwards in all FABLE countries

### Average diet in FABLE countries:



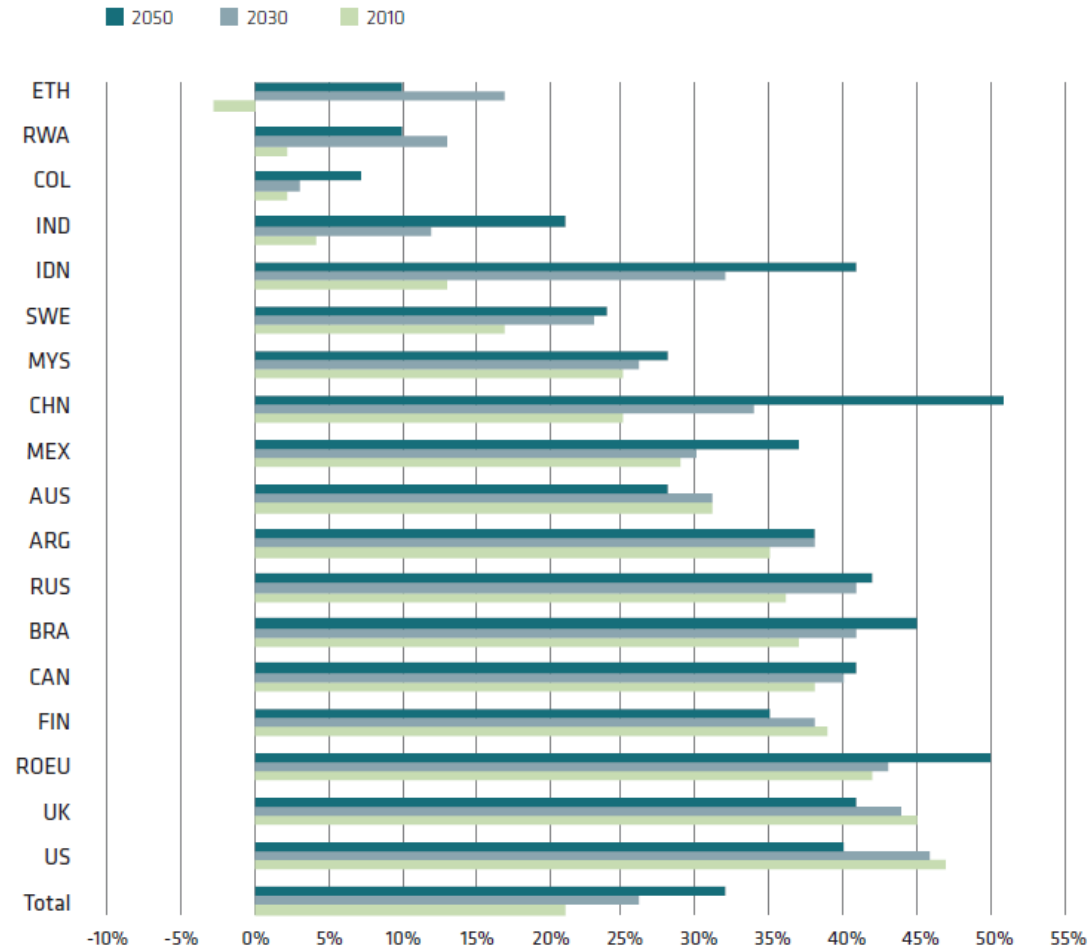
## 4 out of 5 targets can be reached:

- ✓ Average dietary energy intake can be above the minimum by 2030 in FABLE countries
- ✓ Zero net global deforestation can be achieved from 2030 onwards
- ✓ Negative net GHG emissions from land use change by 2050
- ✓ 50 %+ of global land can be spared to conserve and restore biodiversity
- ❖ Insufficient progress towards reducing GHG emissions from agriculture

# Target 1: Food security

Figure 8

*Difference between the computed average daily energy intake per capita and the Minimum Daily Energy Requirement (MDER) for each FABLE country, sorted by 2010 surplus (from lowest to highest)*

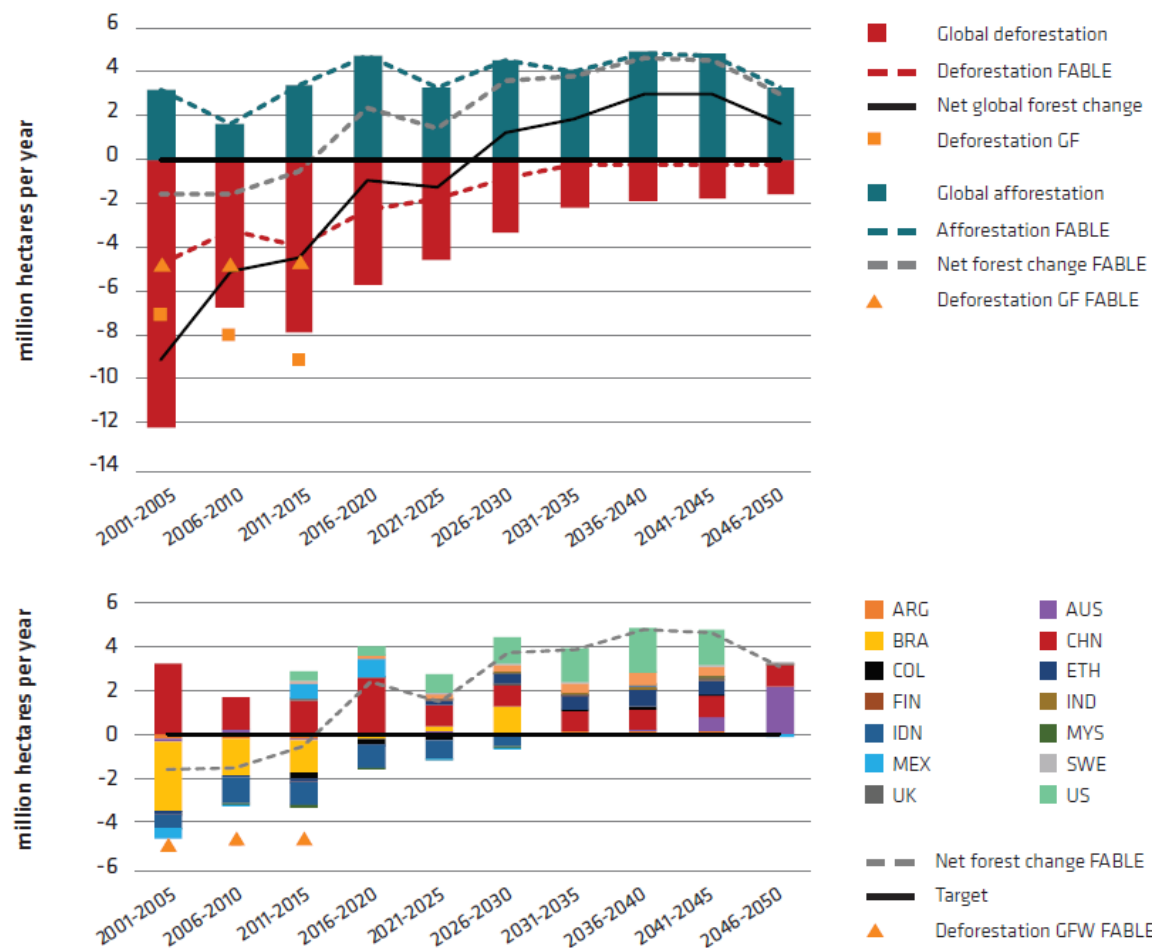


By 2030 and 2050, all countries achieve an average daily energy intake per capita that exceeds their respective Minimum Daily Energy Requirement (MDER).

*Note: Energy intake also includes the 2010 consumption level of animal fat and alcohol reported by FAO, as these are not computed in the calculator in 2050. These two items represent 6 percent of average calorie intake in FABLE countries. A surplus indicates that the computed energy intake is higher than the MDER at the national level, while a negative number indicates a deficit compared to the MDER.*

# Target 2: Zero net deforestation

Figure 9 Computed forest cover change globally (top) and in FABLE countries (bottom)



Our results show that zero net deforestation could be achieved already by 2016-2020 for FABLE countries as a group, and by 2026-2030 globally.

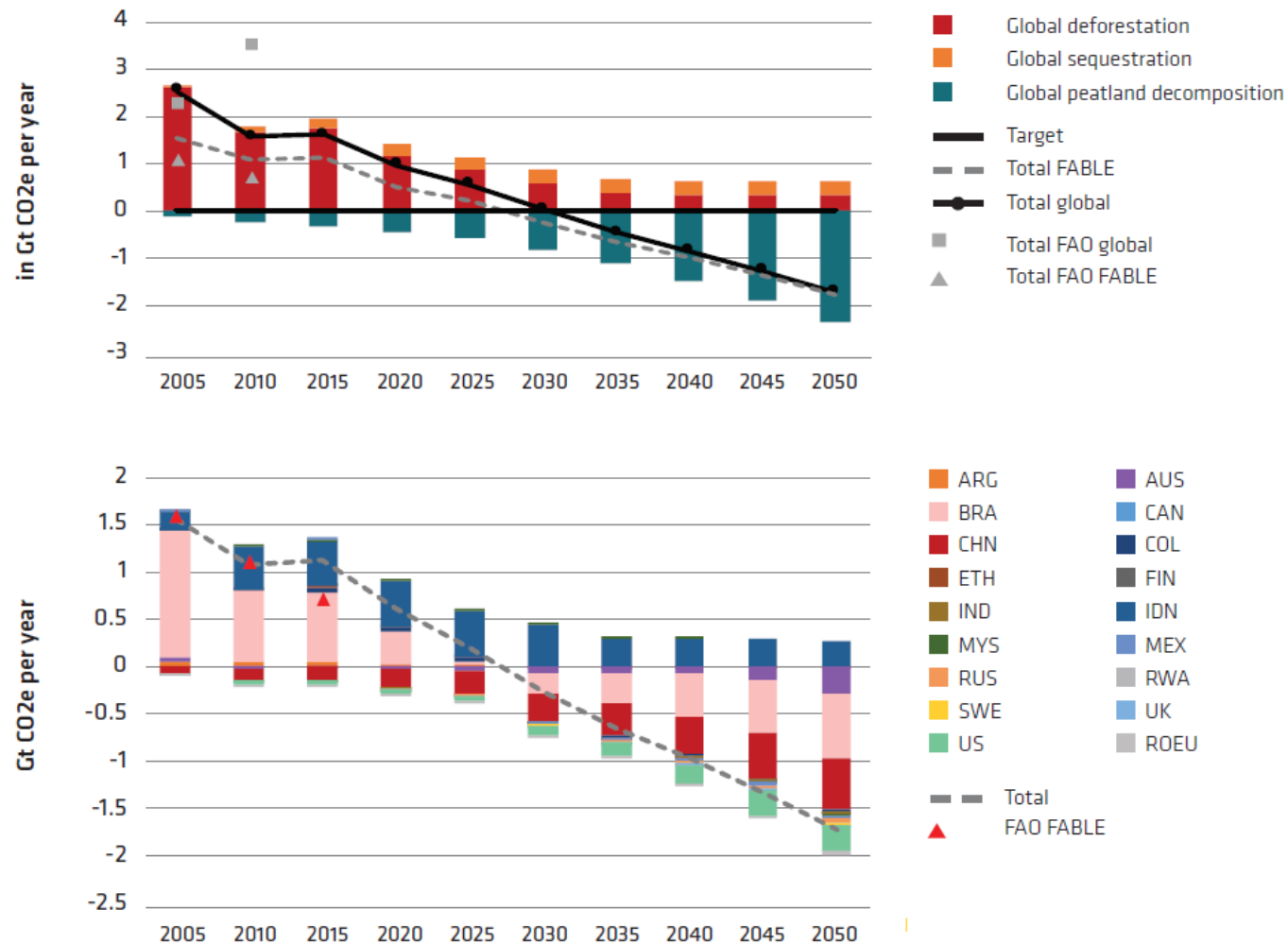
Note: Our computation includes only deforestation caused by the expansion of cropland, pasture and urban areas. For comparison with our estimates for the historical period we use deforestation from commodity expansion, urban expansion and shifting cultivation from Global Forest Watch (GFW) database (GFW, 2019). Dashed lines represent computed results for FABLE countries only, as well as the triangles for GFW historical deforestation.



# Target 4: Zero net GHG emissions from land use change

Figure 11

Computed emissions from land-use change globally (top) and in FABLE countries (bottom)



Results from the FABLE countries and RoW pathways generate net negative emissions from land-use change in the range of 1.7 Gt CO<sub>2</sub>e per year by 2050.

Emissions from land-use change start to turn negative around 2030, largely as a result of:

- **slowing deforestation,**
- **an increase in afforestation,** and
- **an increase in abandoned cropland and pasture** where natural vegetation regrowth can lead to carbon sequestration.

## **Next steps**

# Next steps

The **FABLE Consortium** will pursue five steps to strengthen its work and **support governments and other stakeholders** in making **food and land-use systems sustainable**:

- 1. Build capacity in countries to improve national pathways** using advanced, spatially-explicit data and models, including GLOBIOM, MAgPIE, or other tools.
- 2. Engage stakeholders at national and sub-national levels** around the design of long-term pathways and supporting policies towards sustainable land-use and food systems.
- 3. Support country teams** in applying their models to test policies and improve their design **by simulating the impact of policy options across the three pillars of sustainable land-use and food systems.**
4. Improve the scope and methodology of the FABLE Scenathon.
5. As part of the Food and Land-Use Coalition, work with partners around the world to **launch a Food and Land-Use Action Tracker** that helps countries benchmark their policies against those pursued elsewhere and to learn from experiences in other countries.

# Get in touch

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We welcome comments and suggestions for improving the work presented in this first report and invite research teams and other partners to join this consortium.

**Thank you!**