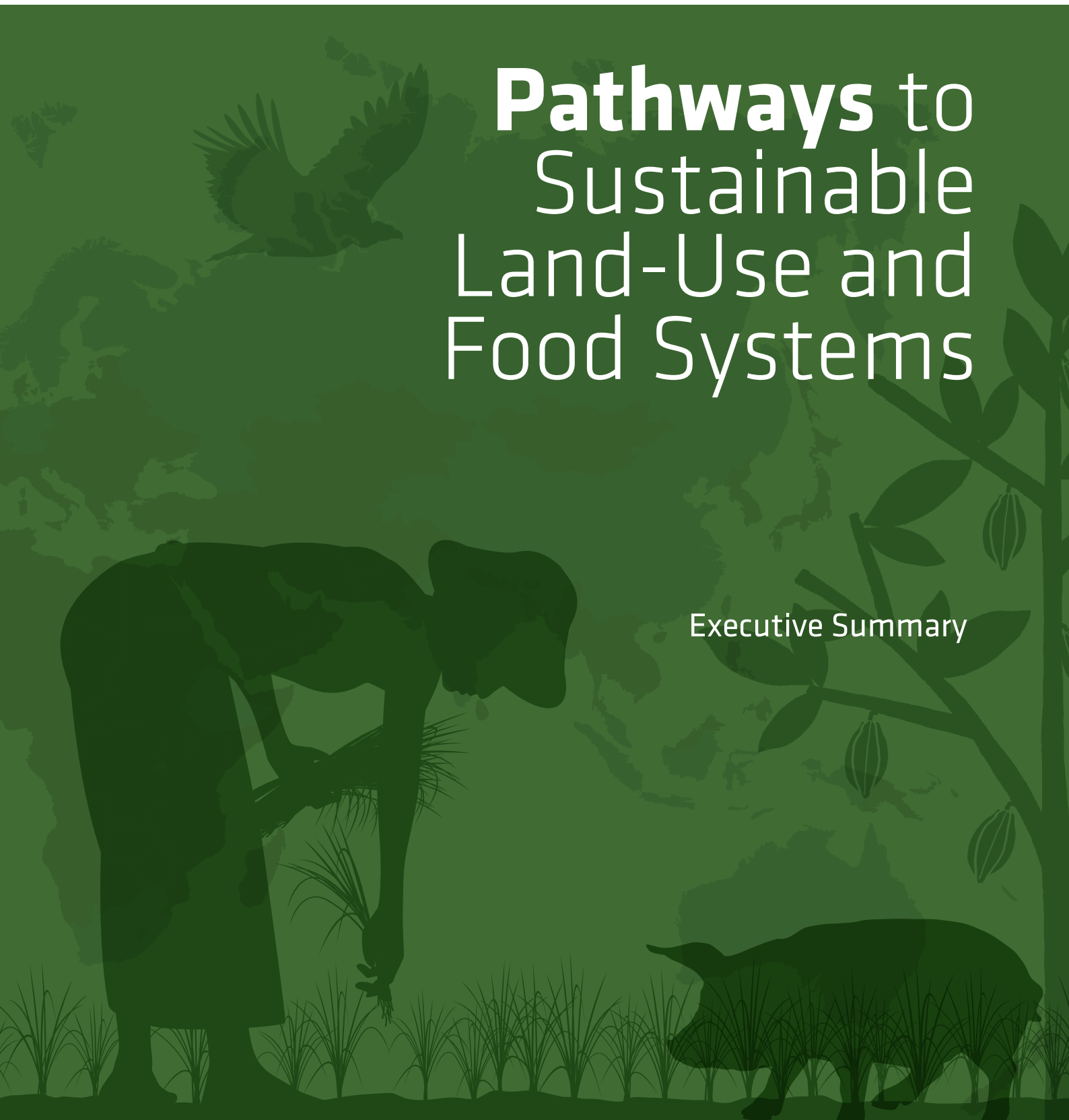


2020 Report of the FABLE Consortium

Pathways to Sustainable Land-Use and Food Systems

Executive Summary



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The full report is available at www.foodandlandusecoalition.org/fable.
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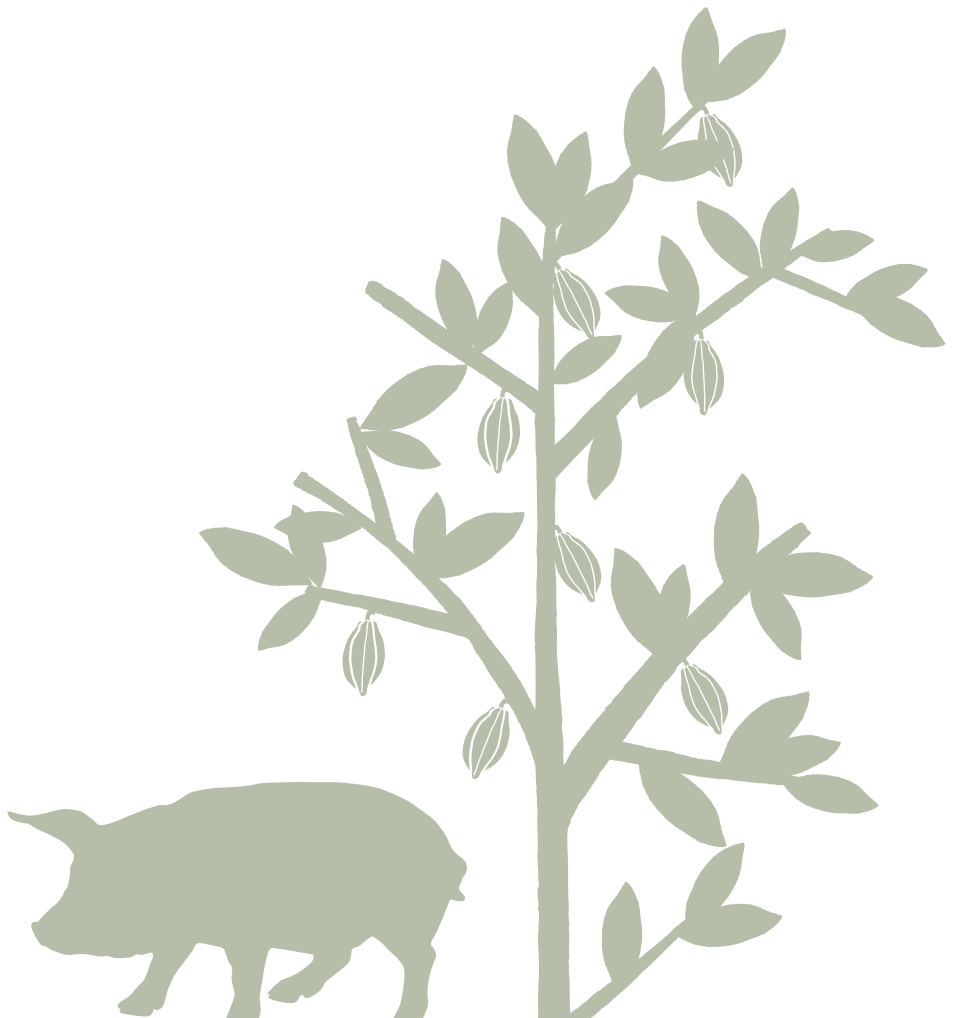


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The Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium is convened as part of the Food and Land Use Coalition (FOLU). It is led by the International Institute for Applied Systems Analysis (IIASA) and the UN Sustainable Development Solutions Network (SDSN), working closely with EAT, the Potsdam Institute for Climate Impact Research (PIK), and many other institutions.

This report was jointly prepared by the members of the FABLE Consortium:

Scientific Director: Aline Mosnier (SDSN)

Project Directors: Michael Obersteiner (IIASA/University of Oxford), Guido Schmidt-Traub (SDSN)

Editor: Jordan Poncet (SDSN)

FABLE Secretariat: Fabrice DeClerck (EAT/Stockholm Resilience Centre), Maria Diaz (SDSN), Clara Douzal (SDSN), Gaëlle Espinosa (SDSN), Marine Formentini (SDSN), Camille François (SDSN), Valeria Javalera-Rincon (IIASA), Sarah Jones (Bioversity International), Micheline Kahn (SDSN), Rudolf Neubauer (IIASA), Fernando Orduña-Cabrera (IIASA), Katya Pérez-Guzmán (IIASA/Consejo Nacional de Ciencia y Tecnología of Mexico), Frank Sperling (IIASA), Marcus Thomson (IIASA), Piero Visconti (IIASA)

FABLE Country Teams: **Argentina:** Federico Frank (INTA EEA Anguil, UNLPam), Ximena Sirimarco (INTA-UNMDP), María Paula Barral (UNMDP, INTA EEA Balcarce), Pablo García Martínez (Centro Atómico Bariloche, Consejo Nacional de Investigaciones Científicas y Técnicas), Sebastián Villarino (UNMDP, INTA EEA Balcarce, Consejo Nacional de Investigaciones Científicas y Técnicas), Adrian Monjeau (Consejo Nacional de Investigaciones Científicas y Técnicas, Fundación Bariloche); **Australia:** Raymundo Marcos-Martinez (Commonwealth Scientific and Industrial Research Organisation), Javier Navarro Garcia (Commonwealth Scientific and Industrial Research Organisation), Michalis Hadjikakou (Deakin University), Brett Bryan (Deakin University), Romy Zyngier (ClimateWorks Australia), Eli Court (ClimateWorks Australia); **Brazil:** Wanderson Costa (National Institute for Space Research), Marluce Scarabello (National Institute for Space Research), Aline Cristina Soterroni (National Institute for Space Research, IIASA), Fernando Ramos (National Institute for Space Research); **Canada:** René Reyes (University of British Columbia, Instituto Forestal de Chile), Hisham Zerriffi (University of British Columbia), Avery Maloney (University of British Columbia); **China:** Xinpeng Jin (Center for Agricultural Resources Research, Chinese Academy of Sciences), Zhaohai Bai (Center for Agricultural Resources Research, Chinese Academy of Sciences), Hao Zhao (Center for Agricultural Resources Research, Chinese Academy of Sciences), Xiaoxi Wang (China Academy for Rural Development, Zhejiang University), Jinfeng Chang (College of Environmental And Resource Sciences, Zhejiang University), Fangyuan Hua (Peking University), Lin Ma (Center for Agricultural Resources Research, Chinese Academy of Sciences); **Colombia:** John Chavarro (Pontificia Universidad Javeriana), Andrés Peña (Pontificia Universidad Javeriana), Armando Sarmiento (Pontificia Universidad Javeriana), Juan Benavides (Pontificia Universidad Javeriana), Efraín Domínguez (Pontificia Universidad Javeriana); **Ethiopia:** Kiflu Gedefe Molla (Policy Studies Institute), Firew Bekele Woldeyes (Policy Studies Institute); **Germany:** Jan Steinhauser (Universität Hamburg), Uwe Schneider (Universität Hamburg); **Finland:** Heikki Lehtonen (Natural Resources Institute Finland), Janne Rämö (Natural Resources Institute Finland); **India:** Chandan Kumar Jha (Indian Institute of Management Ahmedabad), Vartika Singh (Indian Institute of Management Ahmedabad, Humboldt-Universität zu Berlin, IFPRI), Satyam Saxena (Indian Institute of Management Ahmedabad), Ranjan Kumar Ghosh (Indian Institute of Management Ahmedabad), Miodrag Stevanović (PIK), Jan Philipp Dietrich (PIK), Isabelle Weindl (PIK), Benjamin Leon Bodirsky (PIK), Hermann Lotze-Campen (PIK, Humboldt-Universität zu Berlin), Alexander Popp (PIK); **Indonesia:** Habiburrachman A H Fuad (Research Center for Climate Change, Universitas Indonesia), Nurul L. Winarni

(Research Center for Climate Change, Universitas Indonesia), Sonny Mumbunan (Research Center for Climate Change, Universitas Indonesia), Jatna Supriatna (Research Center for Climate Change, Universitas Indonesia), Nurlaely Khasanah (Research Center for Climate Change, Universitas Indonesia), Rizaldi Boer (Climate Risk and Opportunity Management in Southeast Asia Pacific, Institut Pertanian Bogor), Gito Immanuel (Climate Risk and Opportunity Management in Southeast Asia Pacific, Institut Pertanian Bogor), Lukytawati Anggraeni (Climate Risk and Opportunity Management in Southeast Asia Pacific, Institut Pertanian Bogor), Annuri Rosita (Climate Risk and Opportunity Management in Southeast Asia Pacific, Institut Pertanian Bogor); **Malaysia:** Wai Sern Low (Jeffrey Sachs Center on Sustainable Development, Sunway University), Andrew Chiah Howe Fan (Jeffrey Sachs Center on Sustainable Development, Sunway University), Jeremy Jiang Shen Lim (Jeffrey Sachs Center on Sustainable Development, Sunway University), Danesh Prakash Chacko (Jeffrey Sachs Center on Sustainable Development, Sunway University), Jit Ern Chen (Jeffrey Sachs Center on Sustainable Development, Sunway University), Chun Sheng Goh (Jeffrey Sachs Center on Sustainable Development, Sunway University); **Mexico:** Charlotte E. Gonzalez-Abraham (Independent Contractor), Gordon McCord (University of California San Diego), Marcela Olguin (Independent Contractor), Sonia Rodríguez Ramírez (INSP), Juan Manuel Torres Rojo (CIDE), Arturo Flores (INP), Camilo Alcantara Concepcion (Universidad de Guanajuato), Irene Pisanty (UNAM), Gerardo Bocco (UNAM); **Norway:** Anne Sophie Daloz (CICERO), Robbie Andrew (CICERO), Bob van Oort (CICERO); **Russian Federation:** Anton Stokov (Russian Presidential Academy of National Economy and Public Administration), Vladimir Potashnikov (Russian Presidential Academy of National Economy and Public Administration), Oleg Lugovoy (Russian Presidential Academy of National Economy and Public Administration); **Rwanda:** Dative Imanirareba (Uganda Martyrs University), Fidèle Niyitanga (University of Rwanda), François Xavier Naramabuye (University of Rwanda); **South Africa:** Odirilwe Selomane (Centre for Complex Systems in Transition, Stellenbosch University), Belinda Reyers (Future Africa, University of Pretoria; Stockholm Resilience Centre); **Sweden:** Shyam Basnet (Stockholm Resilience Centre), Ingo Fetzer (Stockholm Resilience Centre), Torbjörn Jansson (Swedish University of Agricultural Sciences), Line Gordon (Stockholm Resilience Centre), Elin Rööf (Swedish University of Agricultural Sciences), Serina Ahlgren (Research Institute of Sweden), Amanda Wood (Stockholm Resilience Centre), Anna Woodhouse (Research Institute of Sweden); **United Kingdom:** Alison Smith (University of Oxford), Nicholas Leach (University of Oxford), Paula Harrison (UK Centre for Ecology & Hydrology), Saher Hasnain (University of Oxford), Charles Godfray (University of Oxford), Jim Hall (University of Oxford), Michael Obersteiner (University of Oxford); **United States:** Grace Wu (The Nature Conservancy and the National Center for Ecological Analysis and Synthesis), Justin Baker (RTI International and NC State University), Gordon McCord (University of California San Diego), Chris Wade (RTI International).

This report was coordinated by Jordan Poncet under the direction of Aline Mosnier, Guido Schmidt-Traub, and Michael Obersteiner. Lead writers of chapters 1-4 are Guido Schmidt-Traub, Aline Mosnier, Jordan Poncet, Michael Obersteiner, Fabrice DeClerck, Sarah Jones, Katya Pérez-Guzmán, Clara Douzal, and Camille François. All Consortium members reviewed these chapters. FABLE country teams wrote chapter 5 based on a template developed by Jordan Poncet, Camille François, Aline Mosnier, Sarah Jones, Clara Douzal, and Marine Formentini. Editors and reviewers of chapter 5 are Jordan Poncet, Katya Pérez-Guzmán, Clara Douzal, Camille François, Aline Mosnier, Sarah Jones, Piero Visconti, Gaëlle Espinosa, Micheline Kahn, and Maria Diaz. Clara Douzal produced all the figures and Sarah Jones produced all the maps in this report. Aline Mosnier, Valeria Javalera-Rincon, Katya Pérez-Guzmán, Clara Douzal, Rudolf Neubauer, Fernando Orduña-Cabrera, Frank Sperling, and Marcus Thomson organized the 2020 Scenathon.

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Executive Summary

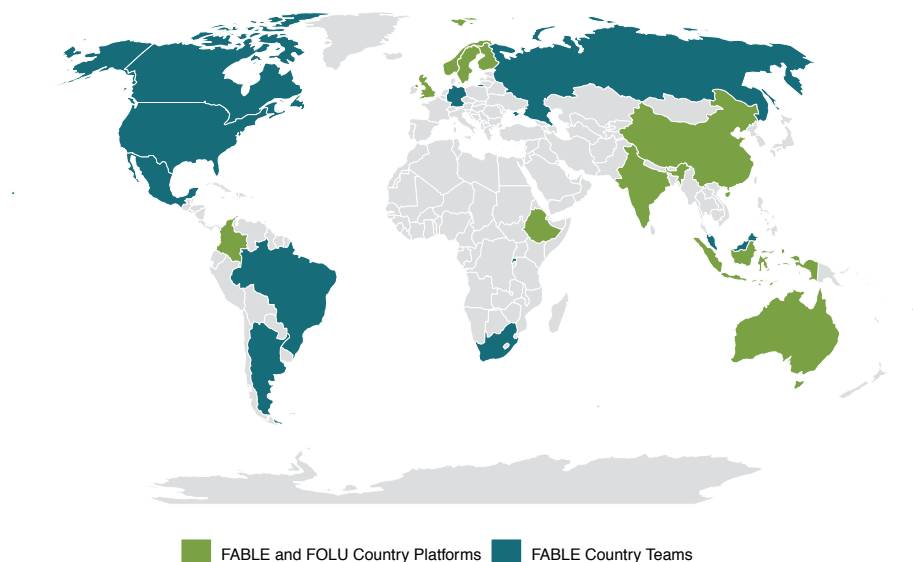
In this second report of the FABLE Consortium, country teams present 20 national pathways towards sustainable land-use and food systems (Figure A). The pathways have been significantly improved since the 2019 report to show how countries can meet mid-century objectives on food security, healthy diets, greenhouse gas emissions, biodiversity, forest conservation, and freshwater use. National FABLE Pathways are consistent with the Sustainable Development Goals (SDGs) and the objectives of the Paris Agreement. They ensure consistent trade flows and can inform long-term climate strategies towards net-zero greenhouse gas emissions under the United Nations Framework Convention on Climate Change (UNFCCC) as well as biodiversity strategies under the Convention on Biological Diversity (CBD).

Towards the “super year” 2021

In 2020, the world has seen unprecedented environmental, social, and economic crises underscoring how unsustainable land-use and food systems are. Business as usual is not an option, as underscored by unprecedented forest fires, coral bleaching, heat waves, and unrelenting biodiversity loss. Deforestation rates in many parts of the Amazon are dramatically increasing. Moreover, the COVID-19 pandemic is taking lives, increasing food insecurity, causing massive economic damage, and has temporarily disrupted logistics in key food supply chains, yet the global food system has shown a surprisingly high resilience.

Figure A

Countries represented in the FABLE Consortium and the Food and Land Use Coalition

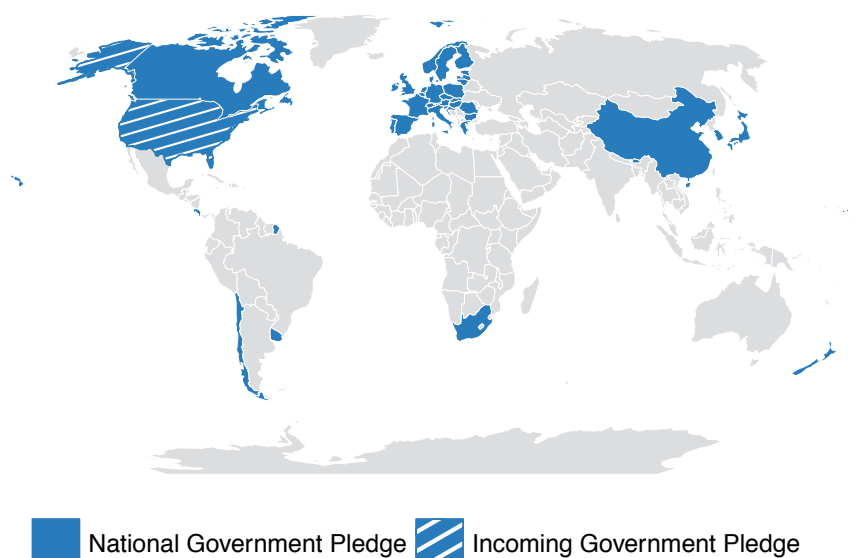


Indonesia has achieved the third consecutive year of falling deforestation rates. China, the European Union, Japan, South Korea, the UK, and other countries have now committed to net-zero greenhouse gas emissions around mid-century (Figure B). Leaders from 77 countries and the EU have signed the Leaders' Pledge to Nature, which commits to reversing biodiversity loss by 2030.

exception might be the EU, which is launching the European Green Deal with a comprehensive Farm to Fork Strategy covering the entire food and land-use system, including international spillovers. The FABLE pathways described in this report are a method for problem solving for the design and implementation of integrated, long-term strategies towards sustainable land-use and food systems.

We are heading towards a “super year” for sustainable land-use and food systems in 2021 with China hosting the CBD COP15 in Kunming, the UN hosting a Food Systems Summit in New York, and the UNFCCC COP26 in Glasgow, UK. These three major meetings provide an opportunity to increase the level of ambition, raise the profile of land-use and food systems, and – critically – accelerate the implementation of integrated strategies. Three breakthroughs are needed for the “super year”:

Countries committed to net-zero emissions around mid-century, as of November 2020



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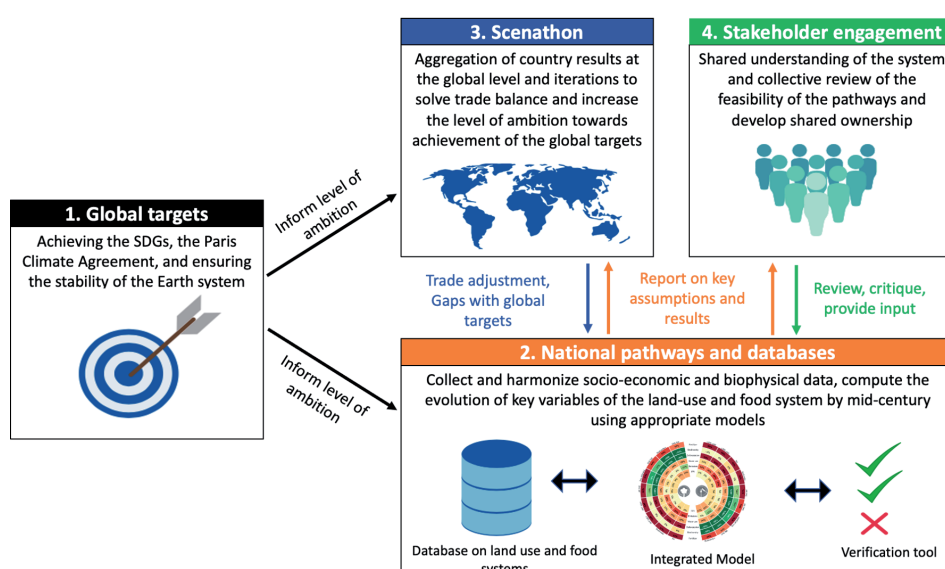
1. **Governments must adopt a bold post-2020 Biodiversity Framework** that sets out ambitious goals for the protection and restoration of nature.
2. **All must accelerate the design and implementation of integrated strategies, particularly through more ambitious climate strategies that integrate land-use and food systems.** In particular, this will require the inclusion of biodiversity and maps for long-term land-use design in climate strategies, drawing on recent experiences in China and many other countries.
3. **Developed countries must mobilize additional finance**, for example through greater climate finance with a particular focus on nature-based solutions and biodiversity co-benefits.

The FABLE Approach

FABLE pathways for sustainable land-use and food systems are a method for problem solving. Pathways work backwards from the mid-century targets and shed light on the major transformations that are needed to achieve them. They help in three critical ways: (1) they provide a framework for engaging stakeholders (governments, businesses, civil societies and the scientific community), to review, pose questions, and suggest improvements for how to achieve the targets, which can build a societal consensus for the transformations; (2) without a long-term perspective countries risk locking themselves into unsustainable infrastructure and land-use systems, which would make achieving the mid-century targets far more costly if not impossible; (3) they help identify mid-term technology benchmarks needed to achieve the targets, such as increases in agricultural productivity or efficiency gains in livestock, which can then guide business action and innovation challenges. Long-term pathways are critical for success, and FABLE's mission is to develop the tools to prepare them.

Figure C

Step-by-step FABLE methodology



FABLE pathways are developed by each FABLE country team in four steps (Figure C). First, country teams adopt global targets (Table A) covering the entire land-use system that are consistent with the SDGs and the Paris Agreement. Second, teams develop national pathways using locally appropriate modeling tools. To this end, the FABLE Consortium has developed a simplified FABLE Calculator to

complement more complex models. Third, in an iterative process (“Scenathon”) country teams adjust their assumptions and pathways to ensure balanced trade flows and to aim towards achieving the global FABLE targets. Throughout the process, country teams engage stakeholders to review assumptions, seek technical advice, and build a shared vision of how to transform land-use and food systems.

Table A Global FABLE targets	
AREA	GLOBAL TARGET
Land and Biodiversity	A minimum share of earth's terrestrial land supports biodiversity conservation. <i>No net loss by 2030 and an increase of at least 20% by 2050 in the area of land where natural processes predominate.</i>
	A minimum share of Earth's terrestrial land is within protected areas. <i>At least 30% of global terrestrial area by 2030</i>
	Zero net deforestation. <i>Forest gain should at least compensate for the forest loss at the global level by 2030</i>
Greenhouse gas emissions from AFOLU	Greenhouse gas emissions from crops and livestock <i>compatible with keeping the rise in average global temperatures to below 1.5°C, which we interpret as below 4 GtCO₂e yr⁻¹ by 2050 (3.9 Gt for non-CO₂ emissions and 0.1 Gt for CO₂ emissions)</i>
	Greenhouse gas emissions and removals from Land-Use, Land-Use-Change, and Forestry (LULUCF) <i>compatible with keeping the rise in average global temperatures to below 1.5°C. Negative global greenhouse gas emissions from LULUCF by 2050</i>
Food security	Zero hunger. <i>Average daily energy intake per capita higher than the minimum requirement in all countries by 2030</i>
	Low dietary disease risk. <i>Diet composition to achieve premature diet related mortality below 5%</i>
Freshwater	Water use in agriculture <i>within the limits of internally renewable water resources, taking account of other human water uses and environmental water flows. Blue water use for irrigation <2,453 km³yr⁻¹ (global estimates in the range of 670-4,044 km³yr⁻¹) given future possible range (61-90%) in other competing water uses</i>
Nitrogen	Nitrogen release from agriculture within environmental limits. <i>N use <69 Tg N yr⁻¹ total Industrial and agricultural biological fixation (global estimates in the range of 52-113 Tg N yr⁻¹) and N loss from agricultural land <90 Tg N yr⁻¹ (global estimates in the range of 50-146 Tg N yr⁻¹) by 2050</i>
Phosphorous	Phosphorus release from agriculture within environmental limits. <i>P use <16 Tg P yr⁻¹ flow from fertilizers to erodible soils (global estimates in the range of 6.2-17 Tg P yr⁻¹) and P loss from agricultural soils and human excretion <8.69 Tg P yr⁻¹ flow from freshwater systems into ocean by 2050</i>

This year, FABLE has made several improvements to the design of national pathways. First, all countries now present at least one Current Trends Pathway and one Sustainable Pathway to assess how far and how quickly improved policies can make land-use and food systems sustainable. Second, we have broadened the scope of the analysis to include freshwater, future climate-change impacts on crops, a richer discussion of biodiversity targets, and a more detailed trade analysis. Third, we have incorporated feedback on last year's pathways. As a result, we now have greater confidence in the robustness of the FABLE pathways.

Key findings and policy implications

Current Trends Pathways lead most countries towards unsustainable land-use and food systems, but through decisive action governments and other stakeholders can meet the related SDGs and objectives of the Paris Agreement. The Sustainable Pathways concurrently meet the objectives related to food security, greenhouse gas emissions, water use, and biodiversity (Table B).

Table B Achievement of FABLE targets under the Current Trends and Sustainable Pathways		
GLOBAL FABLE TARGET	CURRENT TRENDS	SUSTAINABLE
Land and Biodiversity		
Land where natural processes predominate. No net loss by 2030 (globally) ...	<i>Achieved</i>	<i>Achieved</i>
Land where natural processes predominate. ...and an increase of at least 20% by 2050 in the area of land where natural processes predominate (globally)	<i>Not achieved</i>	<i>Not achieved</i>
Zero net deforestation globally by 2030	<i>Not achieved</i>	<i>Achieved</i>
GHG emissions from AFOLU		
Global GHG from Agriculture less than 4 GtCO ₂ e yr ⁻¹ by 2050	<i>Not achieved</i>	<i>Almost achieved (4.1 GtCO₂e yr⁻¹)</i>
Global GHG from LULUCF less than 0 GtCO ₂ e yr ⁻¹ by 2050	<i>Not achieved</i>	<i>Achieved</i>
Food Security		
Average calorie consumption per capita greater than the average minimum daily energy requirement in all countries by 2030	<i>Achieved</i>	<i>Achieved</i>
Freshwater Use		
Global consumptive blue water use less than 2,453 km ³ yr ⁻¹ by 2050 (global estimates in the range of 670-4,044 km ³ yr ⁻¹)	<i>Achieved</i> <i>(but not achieved for the lower boundary of the literature estimates)</i>	<i>Achieved</i> <i>(but not achieved for the lower boundary of the literature estimates)</i>

Each country faces specific challenges and solutions vary. For example, FABLE country teams adopt varying assumptions on changing diets and reducing food loss and waste. These differences often reflect deep cultural and historic preferences, agroclimatic conditions, and other factors that governments and scientists should take into account when designing strategies towards sustainable land-use and food systems. This demonstrates the importance of country-driven analyses of land-use and food systems as presented in this report.

Countries need a systems approach that covers three pillars of sustainable land-use and food systems (Figure D). These pillars cover efficient and resilient agriculture systems that ensure farmers' livelihoods, conservation and restoration of biodiversity, and food security and healthy diets – that should be embedded in integrated land-use design policies and sustainable supply chains. They contribute to many SDGs, are critical for meeting the objectives of the post-2020

Biodiversity Framework and can contribute about a third of the emission reductions to achieve the objectives of the Paris Agreement.

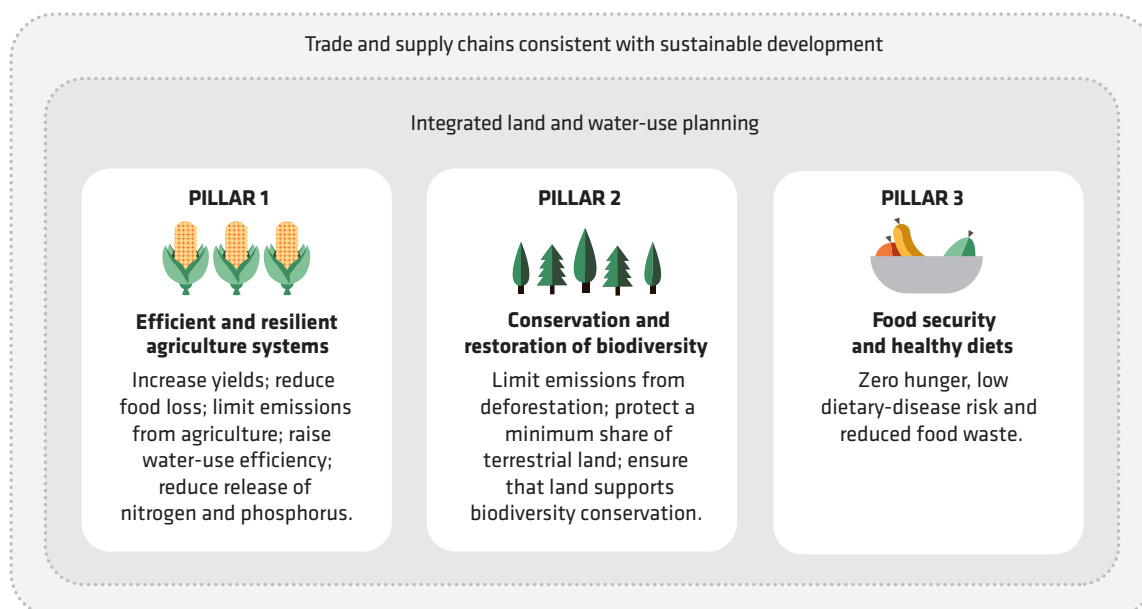
Countries have at least four critical levers for making land-use and food systems sustainable:

(1) Dietary shifts – often towards less meat consumption and less overconsumption of food; (2) sustainable and productive agriculture; (3) improved land-use design, particularly for protecting and restoring nature; (4) rapid reductions in food loss and waste. Together, these levers can lower the demand for pasture and cropland at the global level and thereby support greater conservation and restoration of ecosystems with resultant impacts on increased carbon sequestration, biodiversity conservation and restoration. The report and the country pathways illustrate each of these levers with specific examples.

FABLE pathways provide a tool for countries to integrate biodiversity conservation and

Figure D

Three pillars for integrated land-use and food systems (Schmidt-Traub et al., 2019)



restoration as well as food systems into their climate strategies, particularly in the run-up to the climate and biodiversity COPs. This integration does not require any new negotiations under the Conventions and can instead be advanced through operational strategies at the country level. Such strategies need to be supported by maps of desired land-use, including for food production, biodiversity conservation and restoration, ecosystem services management, and disaster risk reduction. If it is not possible to update an NDC or a long-term climate strategy ahead of the COPs, countries can announce their commitment towards this integration and spatially explicit policies. They can then complete the technical and policy work in preparation for the 2023 stock-take under the UNFCCC. The same strategies and maps could then also serve as national strategies under the Convention on Biological Diversity.

Measures to green international supply chains will make critical contributions towards sustainable land-use and food systems, but they need to be embedded into a broader transformation strategy, as outlined in FABLE Pathways. Perhaps the largest levers for most importers of food and feed to reduce their international environmental footprint is domestic demand reduction through dietary shifts, reductions in food loss and waste, and sustainable intensification of domestic agriculture. Together, these supply- and demand-side levers will reduce the need for imports. Large importers, such as the EU and China, also have an incentive to promote sustainable policies in exporting countries. This provides an added motivation for the hosts of next year's UNFCCC and CBD COPs to pursue ambitious outcomes, including greater financial support for the transformation of land-use and food systems in exporting countries.

Next steps for the FABLE Consortium

In a short period of time, our global consortium of FABLE country teams has developed major analytical capacities on land-use and food systems, pioneered new tools, and strengthened the analytical capacity in 20 countries. We plan to focus upcoming work on the following priorities:

1. As part of the Food and Land Use Coalition, we will work with interested governments to support integrated strategies, including climate and biodiversity strategies under the Conventions, that address short-term pressures on land-use and food systems and are consistent with meeting long-term goals.
2. Through the new Food, Environment, Land, and Development (FELD) Action Tracker, we will advance a deeper understanding of how countries can design, implement, and monitor better policies to transform their land-use and food systems.
3. Partnering with the Food Systems Economics Commission and the Nature Map Initiative, we want to improve modeling tools to develop pathways and model policy options for land-use and food systems. This will include better integration of economic, biophysical and geospatial analyses.
4. The FABLE Consortium members want to train the next generation of analysts and policymakers in developing long-term pathways towards sustainable land-use and food systems, so that FABLE tools can be applied by any research group or government that would like to do so.
5. And finally, we will strengthen and expand the FABLE Consortium, including by welcoming new country teams.

