

State of Science, Technology and Innovation Skills for Sustainability of India's Food and Land-use Systems



Study Team

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ENERGY



AGRICULTURE



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The Energy and Resources Institute



TERI is a dynamic organization with a global vision and local focus. TERI is the **largest developing-country independent research** institute working to move human society towards a sustainable future.



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TERI has a **staff strength** of over 800, drawn from multi-disciplinary and specialized fields, offices and regional centres, equipped with state-of-the-art facilities and a diverse range of activities.



TERI's work on **agriculture, climate resilience, land-use, forests and biodiversity** spans from policy research, technology development and working with communities. Our work focuses on bringing sustainability in agricultural practices by developing plant and microbe derived products that reduce the use of chemical fertilisers while substantially improving crop yields.

About the Food and Land Use Coalition

Launched in 2017, FOLU brings together stakeholders to accelerate the transformation of food and land-use systems to deliver the SDGs, Paris Agreement & Aichi Biodiversity Targets.

FOLU mission is to:



A self-governed coalition of **diverse institutions**

With an expansive and **influential network**

Reaching across **global and national** levels

Delivering a robust **evidence base** for action

Protect and restore the planet's **natural resources and ecosystems**

Build a more **resilient, prosperous rural economy** for farmers and their families

Shift our food and land use systems so they **absorb more greenhouse gases than they emit**

Find a **healthier, less wasteful way to feed 9+ billion people** by the 2030s

Coalition partners:



Supported by:



FOLU India Country Platform

Coalition partners



WRI INDIA



FABLE India Country Lead

Background

- India is home to about 17% of the world's population but has only 2.4% of the world's land area – practices on sustainability in India have a bearing of **global goals on sustainable development and climate change**.
- The Green Revolution emerged as a technological solution to meet the challenge of **food security** and feeding India's population in the 1960s.
- Several **challenges**, including declining farm profitability, depletion of natural resources, resurgence of new pests and diseases, global warming and climate change, all of which pose potential threats to sustainable agricultural production.
- Meeting the objectives of food and nutrition security, conservation of the natural resource base, sustainable and resilient rural livelihoods, and climate change mitigation and adaptation, demands significant **capabilities in terms of science, technology and innovation** as well as **holistic and integrated approaches to skill development**.

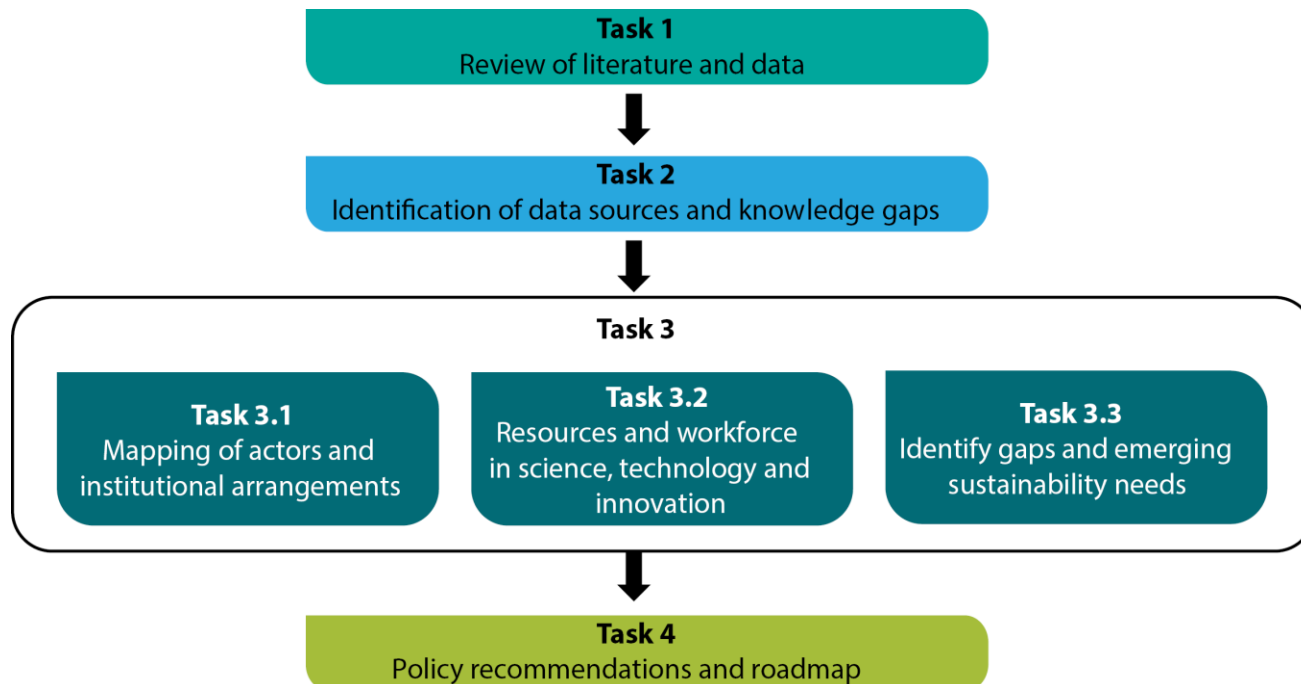


Objectives

- To assess capabilities in science technology and innovation (STI) in terms of education, research and extension in the context of sustainable food and land use systems.
- To identify areas of strengthening in skilling approaches in the context of sustainable food and land use systems.

Research approach

- Approach: exploratory; descriptive
- Research questions: STI capabilities (science-policy-practice interface); skilling approaches
- Framework: agri-food value chains
- Issues: Doubling Farmers Income Report; NAPCC



Key findings

- **R&D spending** has not kept pace with the growth in India's agriculture gross domestic product over time. Overemphasis in research on the productivity of food crops.
- The **effective** number of scientists engaged in **actual research** is a small percentage of the total number of scientists **in the system**.
- A disproportionate share of research activities go to **food crops**, that too, in irrigated areas.
- **Science-policy-practice interface** can be strengthened. Need for a stronger connect between farmers and researchers.
- The vast network of training institutions in rural areas can be used to meet the challenges of institution building for **Farmer Producer Organizations (FPOs)**.



Key findings

- Skilling approaches can have a **greater involvement** of Ministry of Environment, Forest and Climate Change, Ministry of Jal Shakti and Ministry of Rural Development. Need to strengthen policy **coherence** between identified issues and existing rural development and agriculture schemes.
- Inclusion of **crop diversification** related skilling programmes as a strategy to address root causes of the crop residue burning which is causing groundwater depletion in Punjab, Haryana, and Uttar Pradesh and other externalities such as air pollution.
- Focus on building skills along the entire agri-food **value chain**, rather than the prevailing bias towards upstream production systems.
- Need to move towards a **systems approach** for agro-ecological regions. Roadmap based on:
 - Policy, planning and coordination
 - Capacity building
 - Demand side measures
 - Information systems



Roadmap - Policy, planning and coordination



Short term	Medium term	Long term
<ul style="list-style-type: none">• Skill-building, research and extension agenda by agro-ecosystem specific needs• Strengthen coherence between existing rural development and agriculture schemes• Bridge the gaps in the Agricultural Skill Council of India and National Council for Green Jobs• Establish consortia on R&D in new technologies	<ul style="list-style-type: none">• A suitable institutional framework and a viable mechanism for operationalizing and fostering local skills ecosystems• Skill Councils' capacity-building initiatives should be based on natural resource planning linked to the institutional, social and financial context• Mechanisms for effective public-private partnership for new technology development and innovation• Monitor, report and evaluate rigorously the indicators under the National Indicator Framework on SDGs	<ul style="list-style-type: none">• Operational feasibility for the framework for research and capacity-building initiatives and develop efficient monitoring mechanism• Promote public-private partnerships and increase investment in research, education and skill development along the value-chain• A dedicated civil service based on Indian agricultural and natural resource management• A more flexible funding mechanism focused on skill-sets needed in a particular agro-ecosystem or industry.

Roadmap – Capacity building



Short term	Medium term	Long term
<ul style="list-style-type: none">• Introduce into skilling packs the skills required to meet the key priorities under the NMSA• Include packages on skilling in carbon finance from climate change mitigation activities• Include crop diversification skilling programmes• Build skills related to soil health in extension systems	<ul style="list-style-type: none">• Restructure and streamline the course curriculum in higher education and research towards interdisciplinary approaches• Include agriculture crop insurance alongside packages for small enterprise finance and microfinance in the training packages• A holistic approach to ecosystem-based land-use planning in skill development packs• Create consortia on quality seed production, sustainable and regenerative farming practices, storage, processing and marketing	<ul style="list-style-type: none">• Change criteria for development of education and research infrastructure to focus on agro-ecoregion rather than disciplines• Enhance capacity and skills for managing infrastructure for the agri-retailing sector through public and private investment• Skills in food safety and labelling, including sustainability labelling.

Roadmap – Demand side measures



Short term	Medium term	Long term
<ul style="list-style-type: none">• Strengthen and streamline the Agriculture Skill Council of India's SMART portal• A regular and reliable measure of the skills and employment gap in the food sector	<ul style="list-style-type: none">• Create research-extension-farmer-market linkages at the district level – shift focus from mere production to market demands and to 'producing more from less'• Develop an annual survey on workforce and skills requirements for the food sector in conjunction with industry• Generate demand for skilled and quality human resources in the sector through incentives such as conditional loans and subsidies	<ul style="list-style-type: none">• Enhance the utility of skills gap survey data by developing a standard for data collection and reporting and ensuring its effective adoption• Include farmers' knowledge in research and extension programmes through participatory approaches• Establish mechanisms for generating demand for quality personnel and infrastructure development at the local level

Roadmap – Information systems



Short term	Medium term	Long term
<ul style="list-style-type: none">• Monitor and implement the Agri Infrastructure Fund for farm-gate infrastructure for farmers• An online database of all agri-input dealers along with their skill sets. Upscale DAESI programme. Expand the coverage of registered agri-warehousing with appropriate monitoring and information systems.	<ul style="list-style-type: none">• A real-time management and information systems for agri-logistics• Online facility for global information on recent production and marketing trends, emerging challenges and opportunities along the value chain	<ul style="list-style-type: none">• Evolve and adapt information systems to meet agro-ecological needs• Holistic extension approaches including rural infrastructure, such as roads, cold-storage, food-processing units, warehousing facilities and organized marketing

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