







Harvests on the Brink: Climate, Policy & the Future of Farming in South Asia

ESPAR....

Enabling Stakeholder Participation and Applied Research in Policy Comprehension project aimed to addresses climate-resilient agriculture across vulnerable coastal landscapes of South Asia. This comprehensive initiative, funded by the Asia-Pacific Network for Global Change Research assessed the current policy landscape and identified policy-practice gaps in coastal agro-ecosystems through empirical research. It also developed strategic policy propositions through insights from stakeholder workshops, creating country-specific white papers with operational guidelines. Through systematic reviews of literature, geospatial mapping, and community engagement, this project sought to effectively mainstreams resilient farming practices in coastal Socio-Ecological Production Landscapes, advocating nature-based climate solutions for enhanced regional preparedness.



Executive Summary

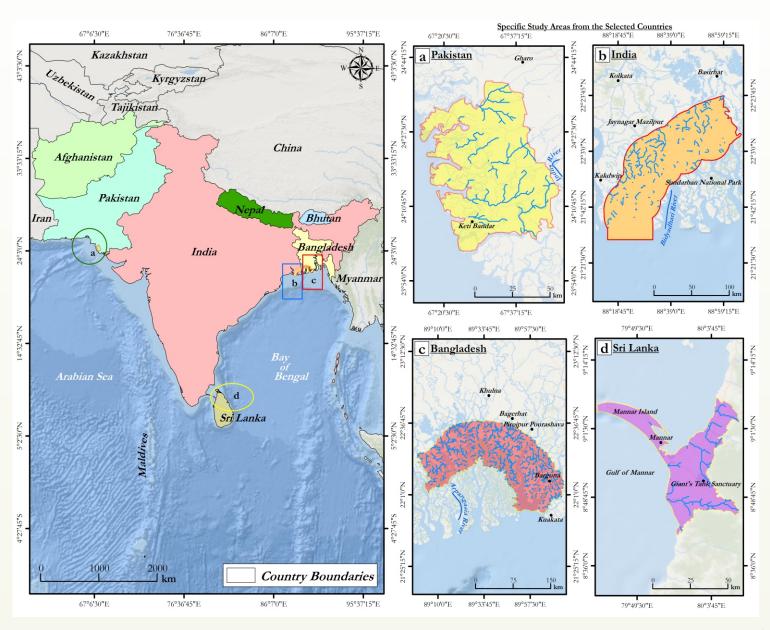
The coastal agricultural landscapes of South Asia face unprecedented challenges from climate change, threatening food security and livelihoods across the region. The ESPAR project addressed this critical issue by examining the prevailing disconnect between agricultural policies and their practical implementation in vulnerable coastal communities.

Climate events like El Nino and extreme weather phenomena cause significant agricultural yield variability in South Asia, with recent studies showing crop yield variability ranging from 12% to 22% across different regions, directly impacting millions of marginal farmers. Without proper adaptation measures, the region could experience economic losses equivalent to 1.8% of GDP by 2050, escalating to 8.8% by 2100, with some recent projections suggesting potential losses exceeding 24% by the end of the century for parts of South Asia. The project recognized that while governments have developed various climate-resilient agricultural policies, significant gaps exist between policy intentions and ground-level implementation.

Through comprehensive field research across selected coastal landscapes in South Asia, the ESPAR project team systematically mapped these policy-practice disconnects. The initiative employed community-centred approaches, conducting extensive consultations with farmers, local leaders, and policymakers to understand real-world challenges. Special attention was given to the opinion of women farmers, who increasingly shouldered agricultural responsibilities as climate pressures forced male labourers to migrate to cities. The findings were synthesized into practical, evidence-based policy recommendations through country-specific white papers that could bridge the gap between government intentions and farmer needs. Other key outcomes included mapping of climate-vulnerable agricultural areas and comprehensive frameworks for integrating nature-based solutions into farming practices. The project emphasized sustainable approaches that work within existing socio-economic structures while building resilience against climate extremes.

ESPAR's collaborative approach involved researchers, government officials, and farming communities working together to co-create solutions. This participatory methodology ensured that policy recommendations were scientifically sound and practically implementable, ultimately contributing to enhanced food security and climate preparedness across the vulnerable coastal regions of South Asia.

Project Intervention Sites



Objectives & Roadmap

Objective 1: To assess the current policy landscape on climate-resilient coastal agriculture in South Asia

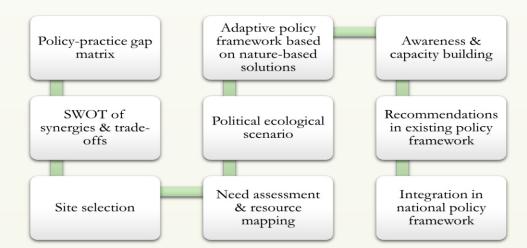
- · Review and synthesis of existing national and regional agricultural policies
- · Mapping of climate-resilience integration across current coastal agriculture policies

Objective 2: To evaluate existing farming practices and identify policy-practice gaps in coastal agro-ecosystems

- Policy–practice gap matrix based on field-level evidence
- Empirical case studies from coastal farming communities

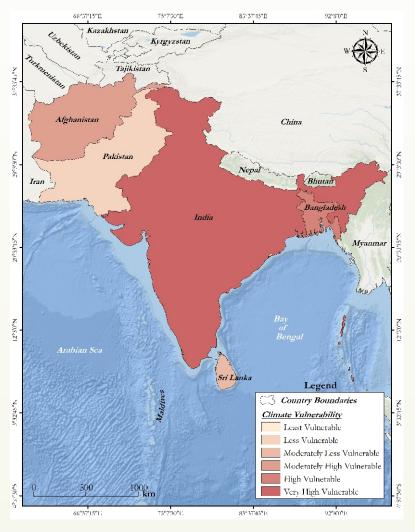
Objective 3: To propose policy frameworks for integrating climate-resilient practices into coastal Socio-Ecological Production Landscapes (SEPLs)

- Draft policy frameworks / White paper for policy uptake
- · Awareness programmes for stakeholders and communities
- Website for knowledge dissemination and practice-sharing

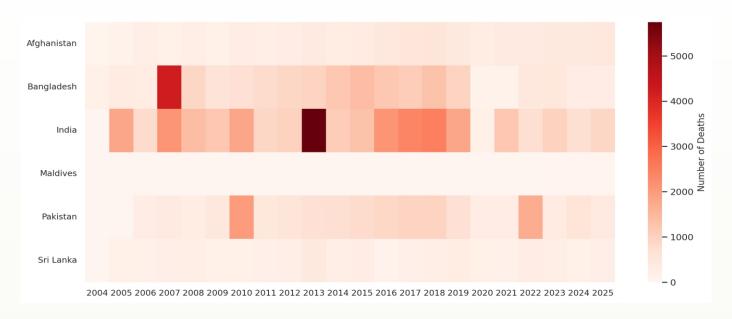


South Asia on the Edge: Mapping Climate Risks & Losses

In South Asia, the imprint of climate change is measured in losses- of lives, livelihoods, and critical assets, and in damages that cut across agriculture, industry, and communities. Addressing these realities requires bridging persistent gaps between policy frameworks and ground-level practices to ensure resilience efforts truly reach vulnerable populations.



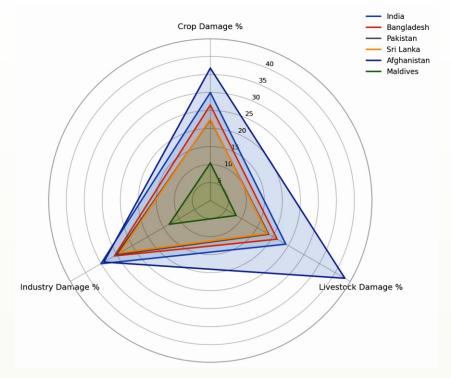
Climate vulnerability in South Asia



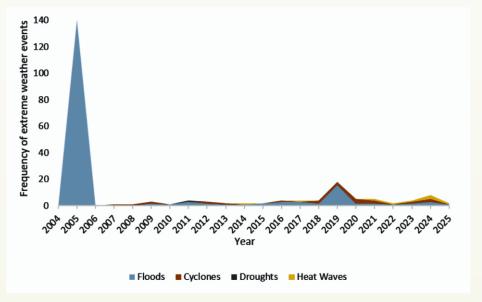
Country-wise deaths due to extreme weather events in South Asia



Country-wise frequency of extreme weather events in South Asia



Country-wise sectoral damage due to extreme weather events in South Asia



Frequency of extreme weather events in South Asia





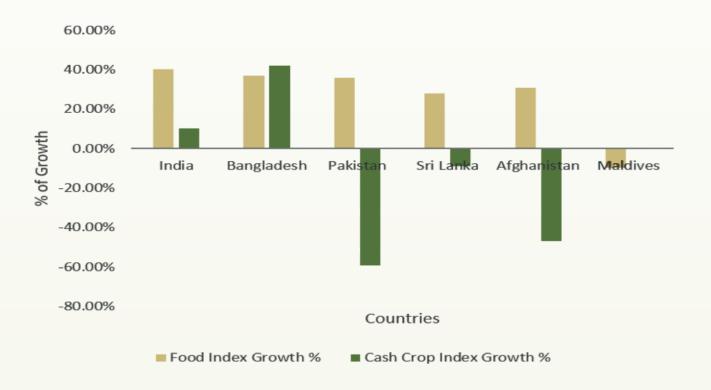




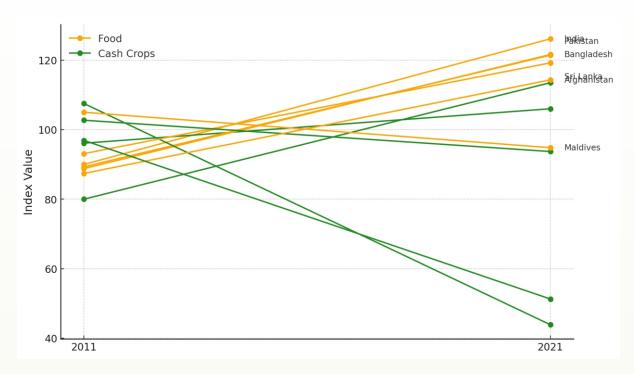
Harvests Through Time: A Decadal View of South Asian Agriculture

Agriculture sustains 1.75 billion South Asians but requires urgent reform. With food production (1.0%) trailing consumption (2.3%) and climate variability reducing yields significantly, the region must balance domestic food security against cash crop exports—a tension that has cost 9.6% of GDP during market volatility.

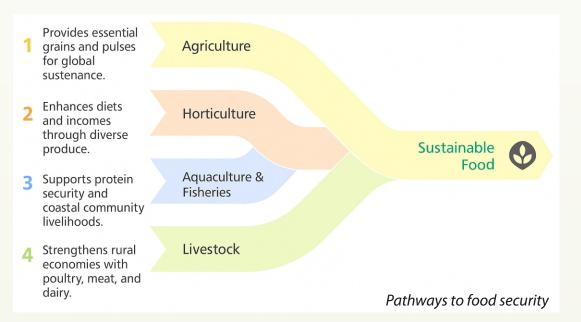
Recognizing these vulnerabilities, South Asian governments have transformed agricultural policies from state intervention to climate-focused market reforms, emphasizing food security through subsidies and climate-resilient technologies. Regional cooperation includes SAARC Food Bank initiatives and drought-resistant crop programs. However, climate impacts vary significantly across the region, with coastal agriculture facing the most severe vulnerabilities due to simultaneous exposure to sea-level rise, salinity intrusion, and intensifying cyclones that compound traditional farming challenges.



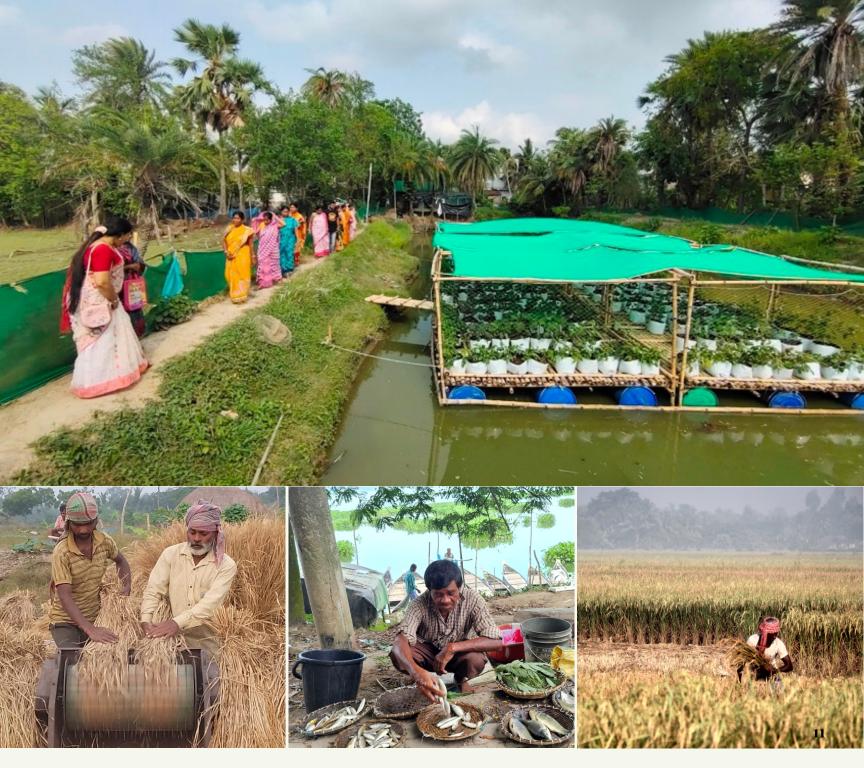
Comparing food and cash crop index growths across the last two decades in South Asia



Comparing food and cash crop indices across the last two decades in South Asia



Harvests Through Time



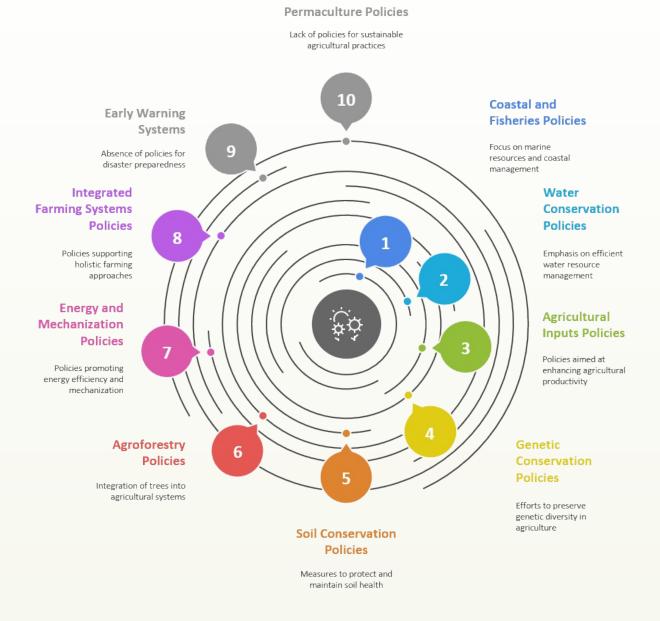
Coastal Agriculture in India: Policy Snapshot

Policy Instrument	Primary Sector(s)	Instrument	Primary Sector
National Agroforestry Policy (2014)	Agroforestry; Ecosystem-based	Marine Fishing Policy (2004)	Marine fisheries; Coastal
	adaptation	National Fisheries Policy (2020)	Fisheries
National Mission for Sustainable Agriculture(2014)	Integrated farming; Water; Inputs; Risk	PM2.5 PMMSY (2020)	Fisheries value chain
Soil Health Management(2014)	Soil conservation; Inputs	National Agriculture Policy (2004)	Agriculture
On Farm Water Management (2014; later under PDMC)	Water conservation; Irrigation efficiency	ATMA Scheme (2005)	Extension services
Rainfed Area Development Programme	Integrated Farming	Coastal Aquaculture Authority Act (2005)	Coastal aquaculture regulation
(2014)	System	Plant Quarantine Order (2003)	Biosecurity; Genetic resources
National Mission for Green India (2014)	Forestry; Ecosystem services	Seed Bill (2004)	Seed governance
Blue Revolution – Neel Kranti Mission (2014)	Fisheries	National Livestock Mission (2021–22)	Livestock; Inputs; Insurance

Major agricultural policies in India

Coastal agriculture worldwide requires policy frameworks that address the intersection of farming systems and marine-influenced climate risks. India's coastal agriculture operates under the National Mission for Sustainable Agriculture (NMSA) and National Innovations in Climate Resilient Agriculture (NICRA), which have developed salt-tolerant crop varieties and water-efficient technologies for climate adaptation. However, these national frameworks show mixed effectiveness in addressing coastal-specific challenges like salinity intrusion and cyclone resilience, highlighting gaps between policy design and localized implementation needs.

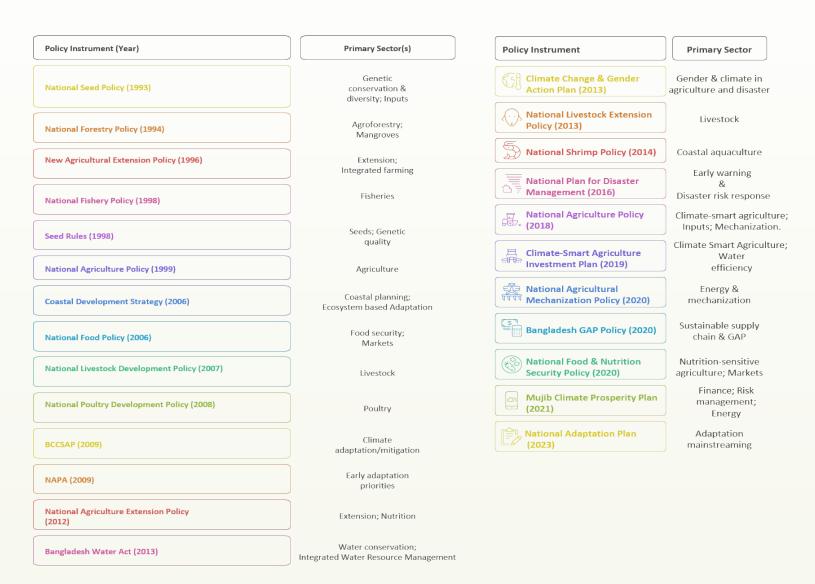




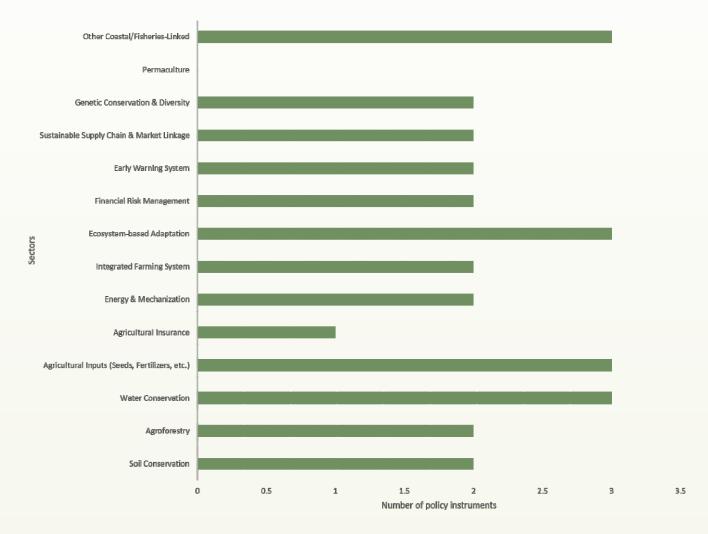
Policy balance sheet: Strengths and gaps in Indian coastal agriculture

Policy Snapshot: India

Coastal Agriculture in Bangladesh: Policy Snapshot



Bangladesh addresses coastal agriculture vulnerabilities through its National Adaptation Programme of Action (NAPA) and Bangladesh Climate Change Strategy and Action Plan (BCCSAP), which prioritize salt-tolerant crop development, mangrove restoration, and community-based coastal afforestation. Despite significant national budget allocation for climate adaptation, implementation challenges persist in coordinating across ministries and effectively reaching vulnerable coastal communities dependent on traditional farming systems.

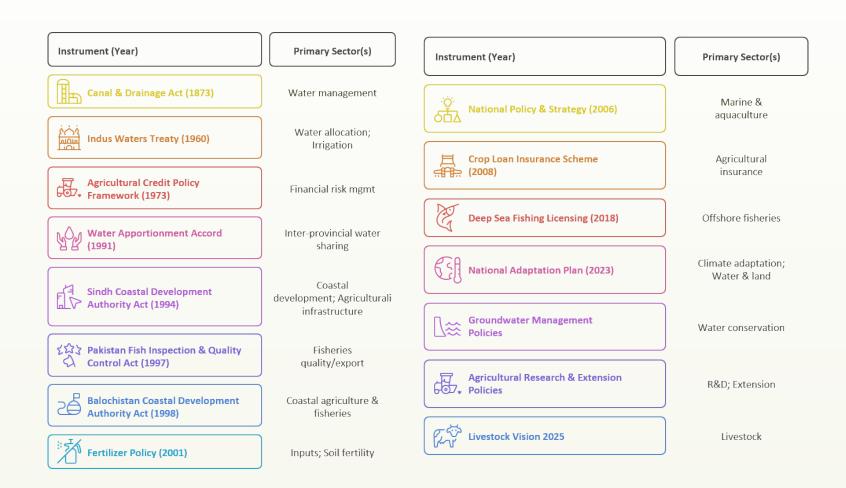




Policy balance sheet: Strengths and gaps in the coastal agriculture of Bangladesh

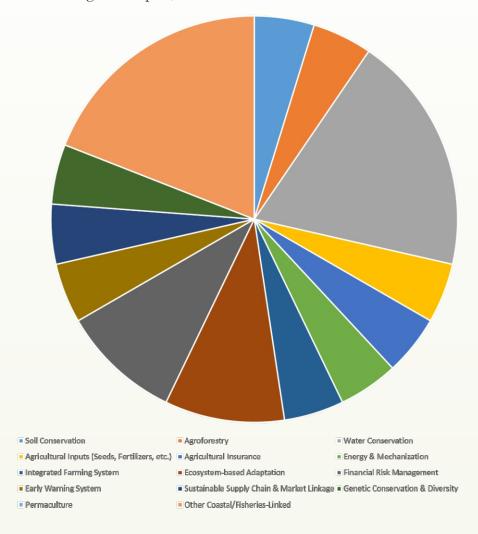
Policy Snapshot: Bangladesh

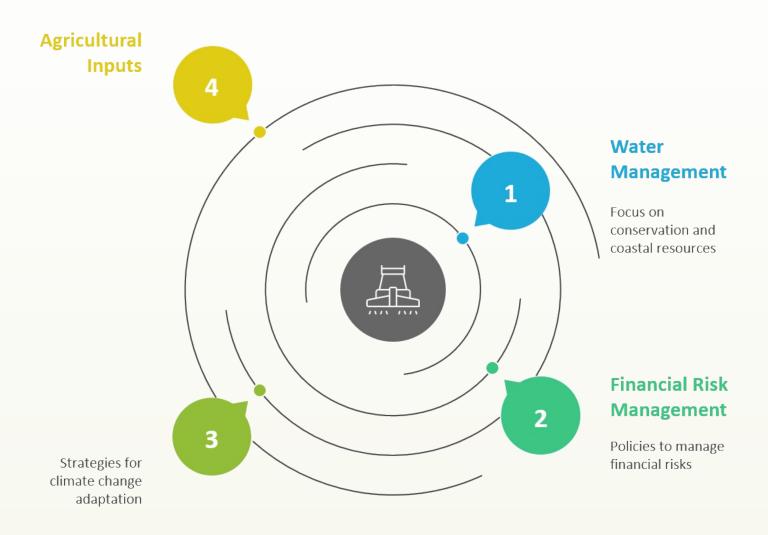
Coastal Agriculture in Pakistan: Policy Snapshot



Major agricultural policies in Pakistan

The coastal agriculture policy framework of Pakistan operates through its National Climate Change Policy (2012) and provincial strategies that prioritize mangrove plantation, salt-tolerant crop varieties, and integrated coastal zone management for vulnerable farming communities. While these frameworks promote ecosystem-based adaptation and community engagement approaches, implementation effectiveness remains constrained by coordination challenges between federal and provincial jurisdictions in addressing the complex, multi-sectoral nature of coastal climate risks.





Policy balance sheet: Strengths and gaps in the coastal agriculture of Pakistan

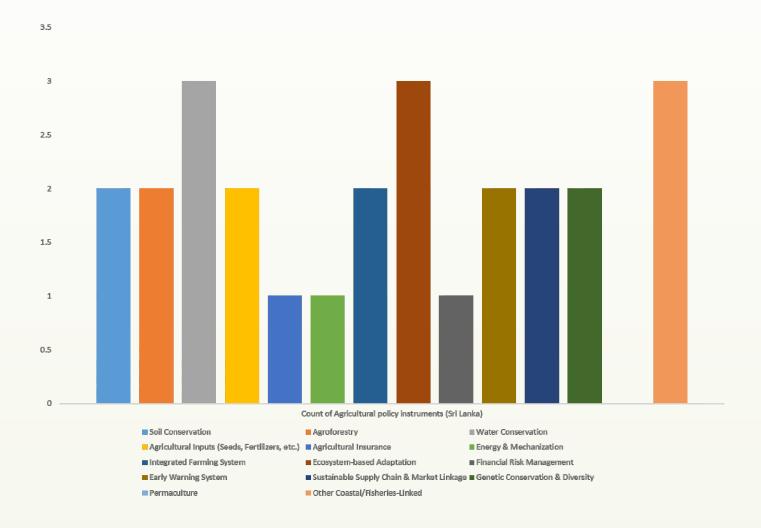
Policy Snapshot: Pakistan

Coastal Agriculture in Sri Lanka: Policy Snapshot

Instrument (Year)	Primary Sector(s)	Instrument (Year)	Primary Sector	
اللي Food Act No. 26 (1980; amended 1991, 2011)	Food safety; Agriculture value chain	NDC Implementation Plan (2021–2030)	Low-carbon & resilience in agri	
National Environment Policy (2003)	Environment; Agriculture linkages	Aquaculture & Culture-Based Fisheries Sector Development Plan (2021–2025)	Coastal aquaculture	
National Agriculture Policy (2007)	Agriculture	National Environmental Action Plan (2022–2030)	Env.—agri integration; finance	
National Climate Change Adaptation Strategy (2011–2016)	Adaptation; Water; Crops	Livestock Development Policy & Strategic Approach (2022)	Livestock	
Cleaner Production for Agriculture (2012)	Inputs; Water; Post- harvest	National Policy on Climate Change (2023)	Climate-smart ag; Water; Biodiversity	
National Action Programme (2015–2024)	Soil conservation; Coastal erosion	Carbon Net Zero 2050 Roadmap (2023)	Low-emission ag; Forestry	
National Biodiversity Strategic Action Plan (2016–2022)	Biodiversity; Agrobiodiversity	Climate-Smart Agriculture Investment Plan (2024)	CSA; Finance; Youth	
National Adaptation Plan (2016–2025)	Adaptation; Early warning; Water	Coastal Zone & Coastal Resource Management Plan – CZ&CRMP (2024)	Coastal ecosystems; Water	
Overarching Agriculture Policy (2019)	Agriculture		Marine fisheries (IUU)	
National Agriculture Policy (2021)	Productivity;			

Disaster readiness

Sri Lanka's coastal agriculture adaptation operates through its National Adaptation Plan (2016-2025) and Coastal Zone Management Plan, focusing on climate-smart aquaculture, salinity barriers, and ecosystem-based adaptation across vulnerable sectors, including agriculture and fisheries. While the plan targets extensive climate resilience for vulnerable populations and creates substantial adaptation investment opportunities, gaps remain in integrating traditional coastal farming practices with modern climate adaptation technologies at community level.



Policy Snapshot: Sri Lanka

Strong Emphasis

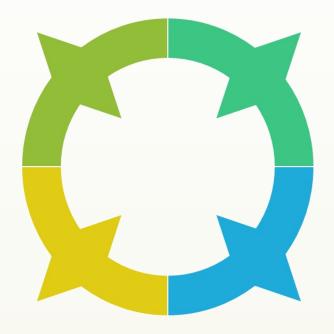
Soil Conservation

Soil conservation receives strong emphasis despite low coverage.

Low Coverage

Agricultural Inputs

Agricultural inputs have basic coverage with minimal emphasis.



Ecosystem-based Adaptation

Strong emphasis on ecosystem-based adaptation reflects climate vulnerabilities.

High Coverage

Water Conservation

Water conservation is emphasized with moderate coverage.

Basic Coverage

Policy balance sheet: Strengths and gaps in the coastal agriculture of Sri Lanka

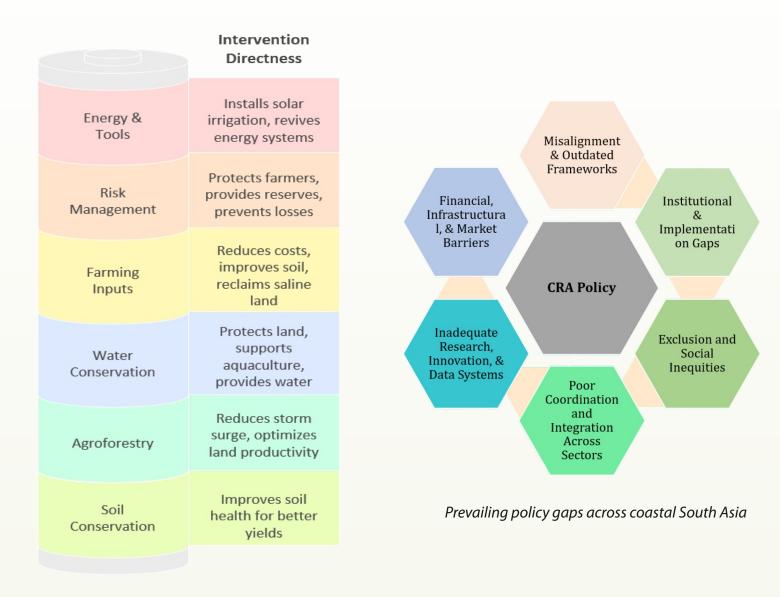
Policy Snapshot: Sri Lanka

Where Policy Falls Short: Exposing the Gaps in Agriculture

The coastal agriculture of South Asia faces a critical paradox- while climate adaptation technologies exist and are increasingly adopted, fundamental systemic challenges persist.

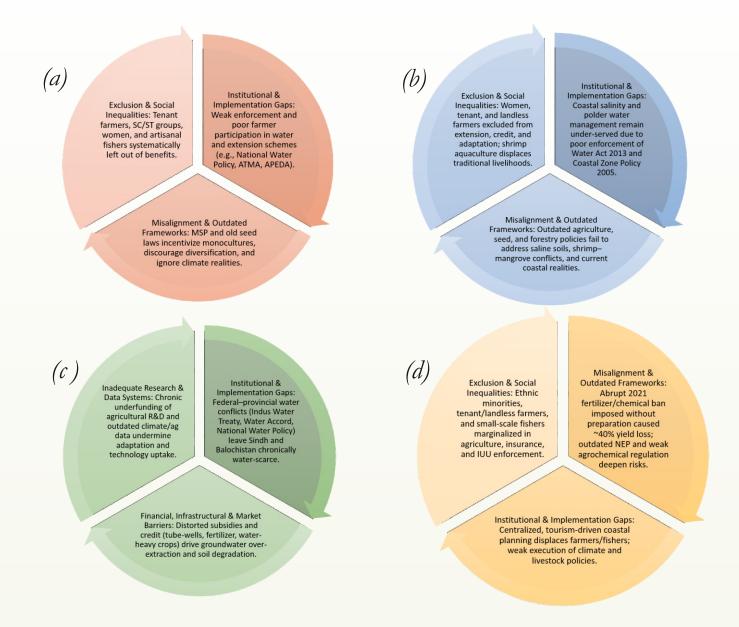
Unsustainable Practices	India	Bangladesh	Pakistan	Sri Lanka
Intensive Monocropping & Less Diversification				
Over-extraction of Groundwater				
Inefficient Water Use in Upstream				
Encroachment on Coastal Wetlands				
Poor Drainage & Embankment Management				
Inefficient Irrigation Practices				
Unplanned Shrimp Aquaculture & Mangrove Destruction				
Inadequate Soil & Water Conservation				
Excessive Use of Agrochemicals				
Crop Residue Burning				
Unsustainable Livestock Rearing System				

Unsustainable practices adversely affecting both agriculture and environment across coastal South Asia



Coastal agriculture adaptations across coastal South Asia ranked by directness of intervention.

Exposing the Gaps in Agriculture 26



Major policy gaps in agriculture in (a) India; (b) Bangladesh; (c) Pakistan; (d) Sri Lanka







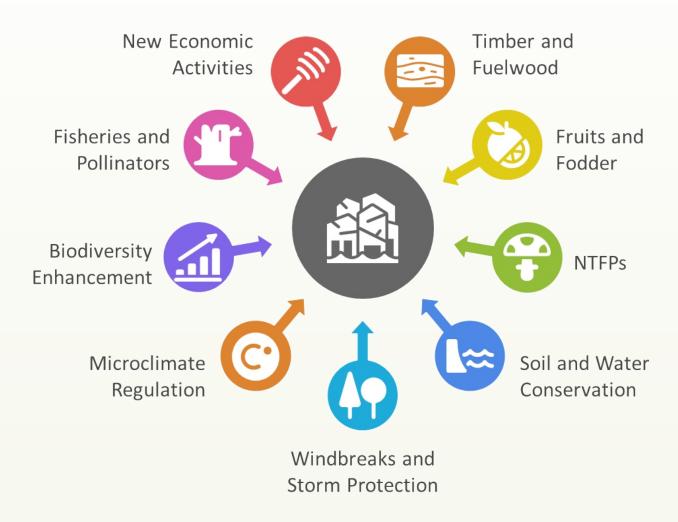


Growing Futures: The TOFI Model in India

Trees Outside Forests (TOF) in coastal India cover a significant portion of the landscape, providing crucial community benefits such as livelihood support, ecosystem services, and climate resilience, and recent initiatives and policy frameworks are increasingly aligning to promote their expansion and integration with adaptation strategies.

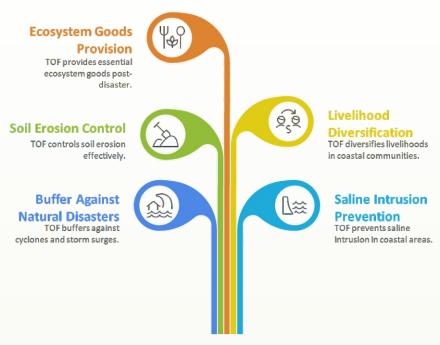


Trees Outside Forests in India offer a multi-dimensional platform for climate resilience, rural development, and ecosystem restoration. Their success depends on incentive structures, policy alignment, participatory stewardship, and innovations in certification and supply chains—delivering substantial livelihood and ecological benefits.



Community benefits from TOFI

The TOFI Model in India



Multifaceted benefits of TOFI

Community Participation

Involves local communities in planting and maintaining trees.

Quality Planting Material

Ensures access to highquality seeds and saplings.

Value-Chain Development

Enhances the economic benefits of agroforestry products.

Technical Support

Offers expertise in selecting and managing tree species.



Strong Extension Services

Provides essential support and guidance to farmers.

Multi-Stakeholder Partnerships

Fosters collaboration among NGOs, Panchayats, and government agencies.

Access to Finance

Provides financial support for agroforestry investments.

1	Sub-Mission on Agroforestry (SMAF) Provides financial and technical support to farmers for tree planting
2	Wood-Based Industries Guidelines Regulates the establishment and functioning of wood-based industries
3	Trees Outside Forests in India (TOFI) Program Supports landscape restoration and farmer incentives

Schemes & guidelines relating to TOFI

1	National Agroforestry Policy Enactment India's foundational policy to promote agroforestry
2	Sub-Mission on Agroforestry Creation Establishment of SMAF under the National Mission
3	National Forest Policy Encouragement Promotion of tree planting on private and community lands
4	Model Rules for Felling of Trees Issuance MoEFCC issues rules to simplify tree felling
5	State-Level Reforms Guidance Model rules guide states to standardize procedures
6	Regulatory Barriers Reduction Simplification of regulations for farmers
7	Ease of Business Support Facilitation of business for farmers

National laws and policies relating to TOFI

The TOFI Model in India



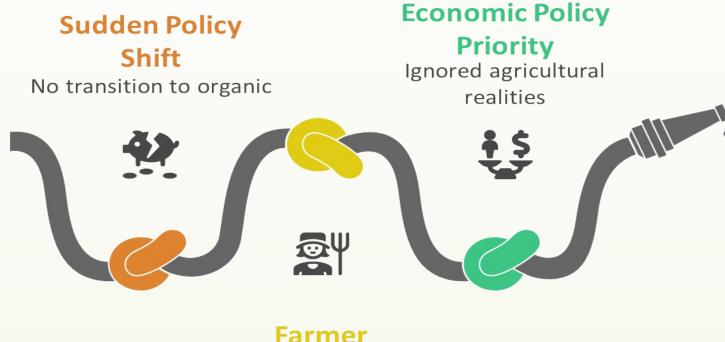




From Promise to Peril: Sri Lanka's Organic Farming Story

Sri Lanka's abrupt "all-organic" farming policy, implemented in 2021, led to a dramatic food security crisis and widespread economic disruption. The country's attempt provides a cautionary tale on how not to enact large-scale agricultural transformation.

Sri Lanka's experience highlights the dangers of abrupt, poorly planned policy shifts in agriculture. The crisis underscores the importance of gradual transition, systems planning, and maintaining food security above all.



Farmer unpreparedness

Lacked training, organic supplies



Export Losses

Tea production drops sharply

Price Hikes

Domestic food prices increase



Economic

\$425 million in losses

Import Increase

Large rice quantities imported





Food Insecurity

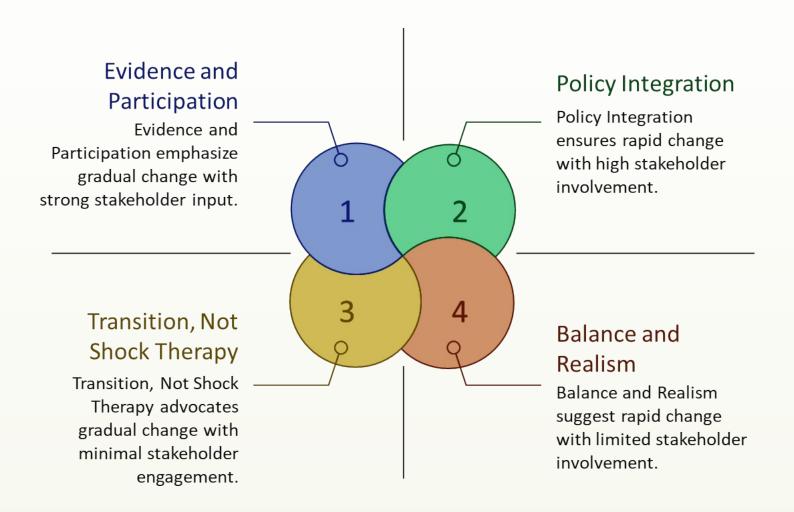
Acute food and energy shortages

Harvest Collapse

Drastic paddy yield reduction

Food security crisis

35 Sri Lanka's Organic Farming Story



Lessons learnt for successful agroecological transition

Sri Lanka's Organic Farming Story







Policy Misalignment & Outdated Frameworks

- Establish formal coordination among the Ministry of Agriculture, Ministry of Water Resources, Department of Fisheries, Ministry of Environment, and disaster management authorities
- Mobilize and deploy fully staffed coastal Agricultural Science Centres for climate extension
- •Introduce incentives for locally tailored, carbon-neutral farming techniques
- Enact just-transition policies supporting organic certification and precision farming

Institutional & Implementation Weaknesses

- •Train and deploy sufficient climate-resilient agriculture officers in every coastal district
- Launch maintenance and repair training for climate-smart irrigation machinery
- Recruit business development experts in coastal centres to support farmer cooperatives
- •Enhance digital advisory platforms with coastal weather and market data

Financial, Infrastructure & Market Barriers

- •Increase public investment in coastal canal and micro-irrigation modernization
- •Expand targeted crop and livestock insurance under national schemes
- Create coastal agritech incubators in state universities
- •Upgrade coastal wholesale markets and integrate with the national trading portal

Inadequate Research, Innovation & Data Systems

- •Fund salt- and flood-tolerant crop research through agricultural university grants
- •Open soil health laboratories in all coastal districts
- •Establish participatory coastal innovation hubs linking researchers and farmers
- •Integrate real-time coastal weather data into the national advisory network

Exclusion & Social Inequities

- •Launch targeted support programs for coastal tribal and fishing communities
- •Provide gender-responsive extension services for women farmers
- •Fund youth entrepreneurship in coastal agribusiness
- •Create inclusive coastal resource governance councils

- •Create a National Coastal Agriculture Mission with all relevant ministries
- •Mandate cross-sector planning between agriculture, fisheries, tourism, and pollution control
- •Form state-level coastal coordination committees including farming and fishing representatives
- •Link rural employment schemes with climate-smart coastal agriculture projects



Policy Misalignment & Outdated Frameworks

- •Create permanent coordination between the Water Development Board, Department of Agricultural Extension, and Ministry of Environment
- •Scale the Blue Gold polder program to all coastal polders
- Incentivize integrated shrimp-rice-mangrove systems via subsidies and technical aid
- Legislate empowered Water Management Associations for community-led flood control

Institutional & Implementation Weaknesses

- •Expand Water Management Group training to every coastal cooperative
- Establish gender-inclusive farmer field schools teaching saline-adapted practices
- •Develop community irrigation committees with government support
- •Build coastal innovation hubs linked to national research councils

Financial, Infrastructure & Market Barriers

- •Allocate revolving funds for polder maintenance
- •Offer microfinance products for salinity-tolerant crop diversification
- •Build cold-storage and processing centres in coastal upazilas
- •Subsidize solar pumps and drainage equipment for small farmers

Inadequate Research, Innovation & Data Systems

- •Increase funding for coastal agriculture research at the Agricultural Research Council
- Launch participatory trials for salt- and flood-tolerant varieties in every upazila
- Establish community seed banks for local landraces
- •Connect farmer innovation platforms with international research networks

Exclusion & Social Inequities

- •Provide conditional cash transfers for ultra-poor coastal households
- Require 50% female representation on water management committees
- Recognize traditional land rights of fishing communities
- •Fund legal aid for equitable water access in polders

- •Form a Delta Council integrating agriculture, water, environment, and disaster management
- •Create district-level Coastal Development Boards with local leaders
- •Require multi-sector reviews for all polder projects
- •Integrate agriculture, fisheries, and tourism planning for coastal zones

PAKISTAN C

Policy Misalignment & Outdated Frameworks

- Harmonize national and provincial water policies under the National Water Policy 2018
- •Integrate the Indus Basin Irrigation System with coastal salinity management
- •Incentivize salt-tolerant varieties and no-till coastal machinery
- •Establish inter-provincial bodies for shared coastal water governance

Institutional & Implementation Weaknesses

- Build coastal adaptation units within Sindh and Balochistan irrigation departments
- •Create an Indus Delta restoration office under the Ministry of Water Resources
- •Train all coastal extension officers in salt-tolerant and water-efficient methods
- •Convene annual coastal agriculture-environment coordination forums

Financial, Infrastructure & Market Barriers

- •Increase funding for Indus Basin canal lining and drainage
- •Launch dedicated credit lines for coastal farmers through the agricultural development bank
- •Partner with private firms to expand hatcheries and reduce mangrove pressure
- •Improve coastal roads and market infrastructure for farm produce

Inadequate Research, Innovation & Data Systems

- •Double the research budget for coastal agriculture at the Agricultural Research Council
- •Establish climate adaptation chairs at coastal universities
- •Implement participatory research in Indus Delta communities
- •Expand coastal weather station networks linked to national meteorological services

Exclusion & Social Inequities

- •Fund women's cooperatives in coastal Sindhi and Balochi communities
- Provide vocational training in climate-smart technologies for youth
- •Create community resource trusts for mangrove and fishery management
- •Ensure equitable representation of marginalized groups in coastal planning

- •Form an Indus Delta Council with federal and provincial ministers
- •Implement a unified digital platform for coastal resource and project management
- •Require inter-ministerial approval for all coastal development plans
- •Align disaster risk reduction strategy with coastal agriculture policies

SRI LANKA

Policy Misalignment & Outdated Frameworks

- Extend the Climate Smart Irrigated Agriculture Project to all coastal districts
- Phase in organic certification gradually to avoid abrupt policy shocks
- Align national organic standards with climate-adaptation criteria

Institutional & Implementation Weaknesses

- •Expand extension officer network in coastal dry-zone districts
- •Develop training in integrated pest and nutrient management for organic systems
- Support farmer organizations in coastal marketing cooperatives
- •Prioritize coastal crop variety trials at the Department of Agriculture

Financial, Infrastructure & Market Barriers

- •Increase budget allocation for coastal farm infrastructure by 25%
- Create targeted low-interest loans for organic input suppliers
- Establish cooperative processing centres for coastal cash crops
- •Build climate-resilient storage facilities in coastal towns

Inadequate Research, Innovation & Data Systems

- •Fund research in salt-tolerant and organic varieties at agricultural universities
- •Launch participatory trials linking farmers and researchers in all coastal districts
- Document and integrate indigenous mangrove farming knowledge
- •Build a national digital portal for coastal agriculture best practices

Exclusion & Social Inequities

- •Provide subsidized organic certification for smallholder coastal farms
- Create livelihood programs for war-affected farmers in the Northern and Eastern provinces
- •Train women's farmer groups in value-addition and market access
- •Form inclusive cooperatives with equal voting rights for smallholders

- •Convene a Coastal Agriculture Coordination Committee under the national planning council
- •Mandate cross-departmental reviews between irrigation, agriculture, and environment ministries
- •Implement watershed-to-sea management plans linking rivers and coastal zones
- •Host annual multi-sector stakeholder forums for coastal climate adaptation

Acknowledgment

We extend our sincere gratitude to the Asia Pacific Network for Global Change Research, all our collaborators from South Asia such as the Ministry of Environment, Sri Lanka, Wayamba University of Sri Lanka, and the Gazipur Agricultural University (former BSMRAU), and our knowledge partner, IIT Madras, for their enduring support throughout this project. We also express our heartfelt gratitude to the Indian Council of Agricultural Research (ICAR) and the Sundarban Development Board, West Bengal, for their consistent support and encouragement in our work. Moreover, we are most grateful to the various academics, policy experts, and local farmers across South Asia who helped us enrich our knowledge base and carry out this project successfully. Finally, we extend our sincere gratitude to the entire team of the South Asian Forum for Environment (SAFE) and the Progyan Foundation for Research and Innovation (PFRI) without whose unwavering commitment and support, this endeavor would not have been possible.

For further reading please refer to:

https://www.apnespar.com/policy.php

About the Organizations

The Asia-Pacific Network for Global ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH Change Research

An intergovernmental platform that supports collaborative research, strengthens capacity, and connects science with policy to address global change across its 22 member countries in the Asia-Pacific region.

SAFE South Asian Forum for Environment

A registered non-profit civil society organization working at the science-society interface towards sustainable environment development and poverty alleviation in the Indian eco-region since the year 2004. (Major stakeholder in UN Environment and in consultative status with ECOSOC & UNFCCC).



Progyan Foundation for Research and Innovation

An independent policy-science non-profit organization, advancing climate policy, biodiversity conservation, sustainable livelihoods, and circular green economy solutions.



