Climate Resilient Agriculture

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SAU

Act fast, get it right and make it work

Food security can't wait, neither can action on climate change

Agriculture alone contributes **10–12 percent of global GHG emissions** (IPCC, 2014a).

Below is breakdown of agriculture emissions globally by sector:

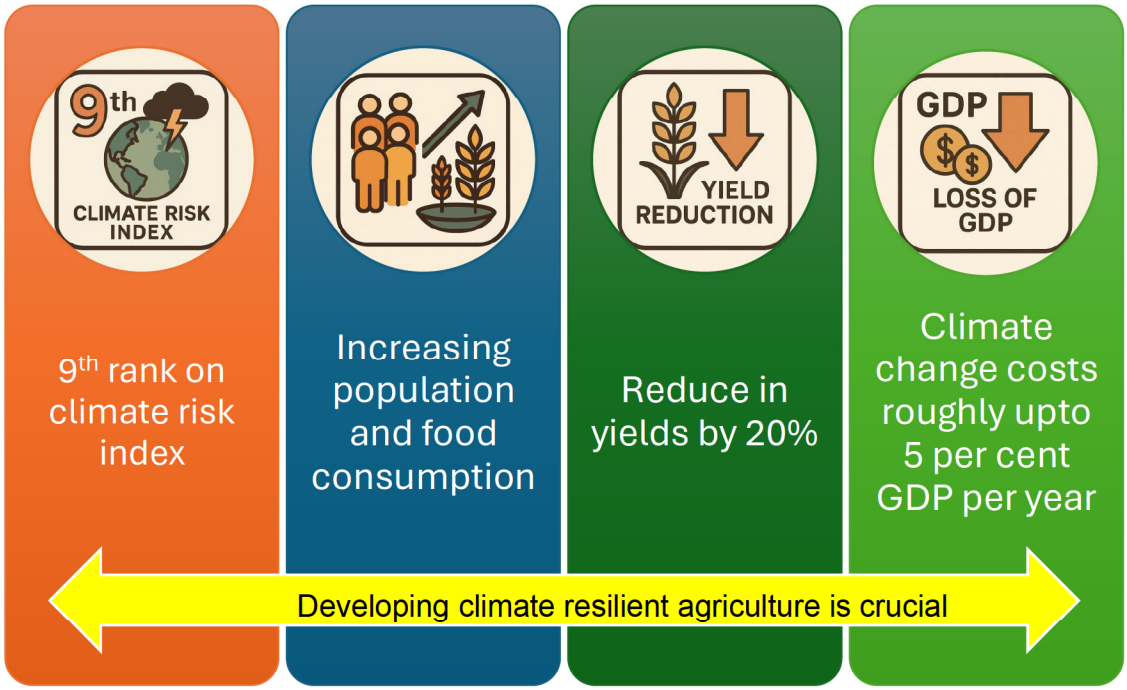
Source: FAOSTAT, 2014.

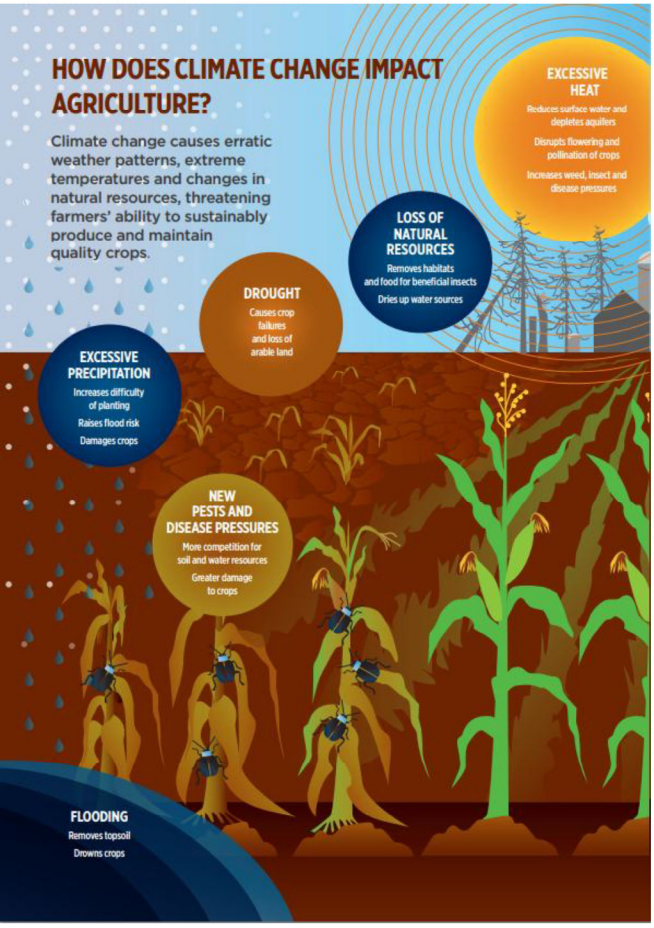
Meaning and definition

Climate resilience refers to the ability of a system to deal with stresses and disturbances, while retaining the same basic structure and ways of functioning, capacity for self-organization and capacity to learn and adapt to change. Resilience is therefore about managing changes and adaptations should contribute to climate resilient development, i.e. adaptation that can stand the test of current and future climate risks (IPCC, 2007).

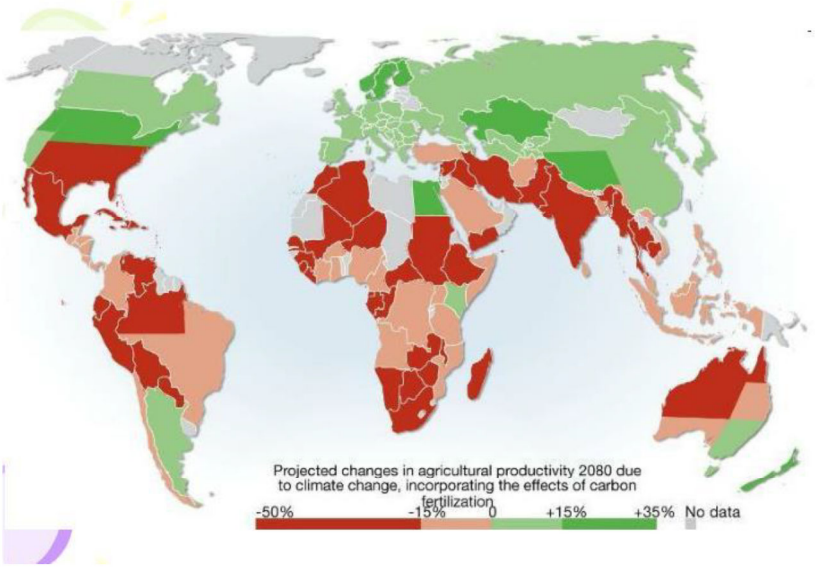
Climate resilient practices means the incorporation of adaptation, mitigation and other practices in agriculture which increases the capacity of the system to respond to various climate related disturbances by resisting damage and recovering quickly (Prabhavati, 2016).

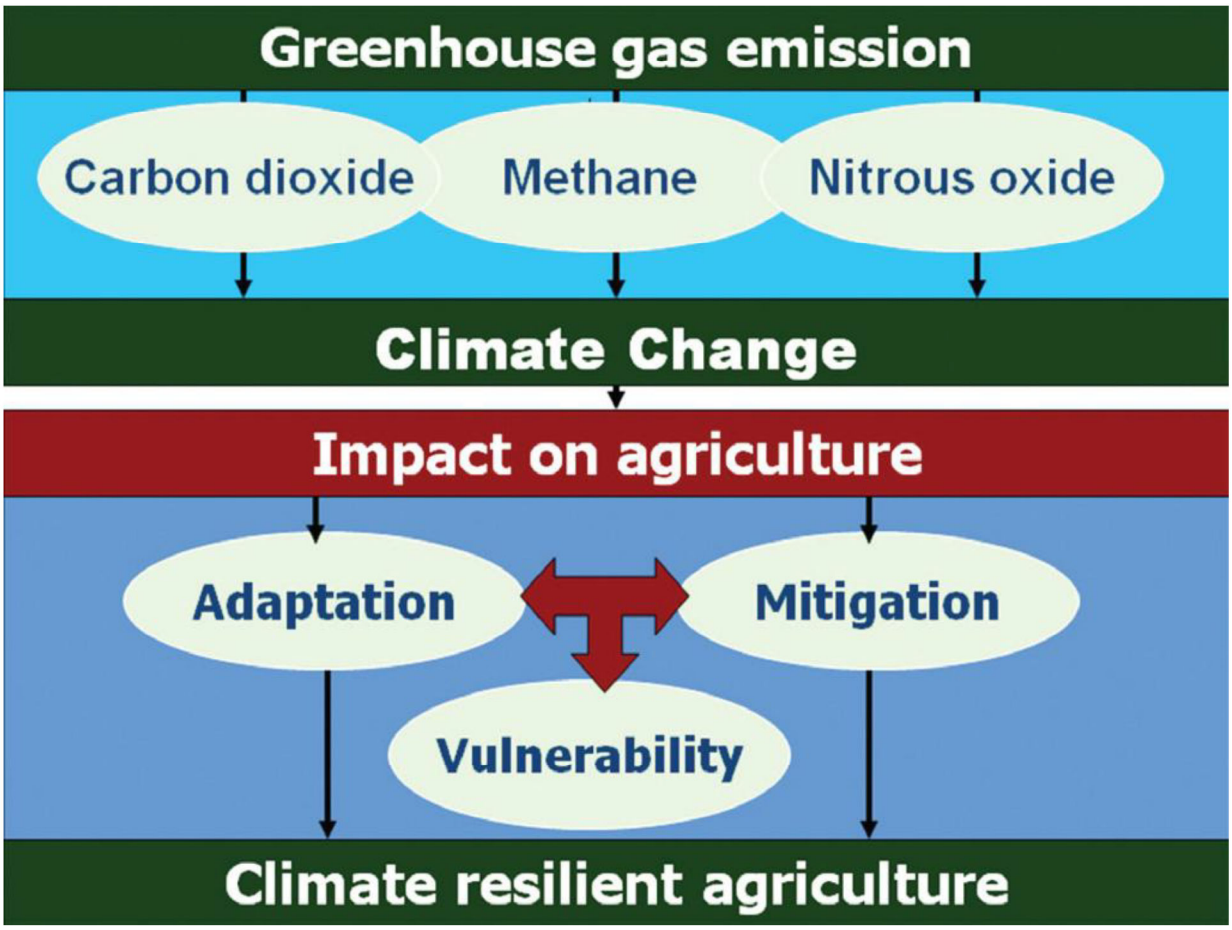
Need for climate resilient practices in Bangladesh





- Cereal productivity to decrease by 20-40% by 2100
- Increase in temperature decreases yield of wheat.
- Excessive temperature rise increase sterility in rice.
- Rice production in rainfed area is vulnerable.




Greenhouse gas emission
Carbon dioxide
Methane
Nitrous oxide
Climate Change
Impact on agriculture
Adaptation
Mitigation
Vulnerability
Climate resilient agriculture

Adaptation and mitigation definition

Adaptation refers to , “adjustments in ecological, social or economic systems in response to actual or expected stimuli and their effects or impacts. This term refers to change in process, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change” (IPCC,2001)

Mitigation is an intervention to reduce the emissions sources or enhance the sinks of greenhouse gases (IPCC 2001).

Adaptation strategies

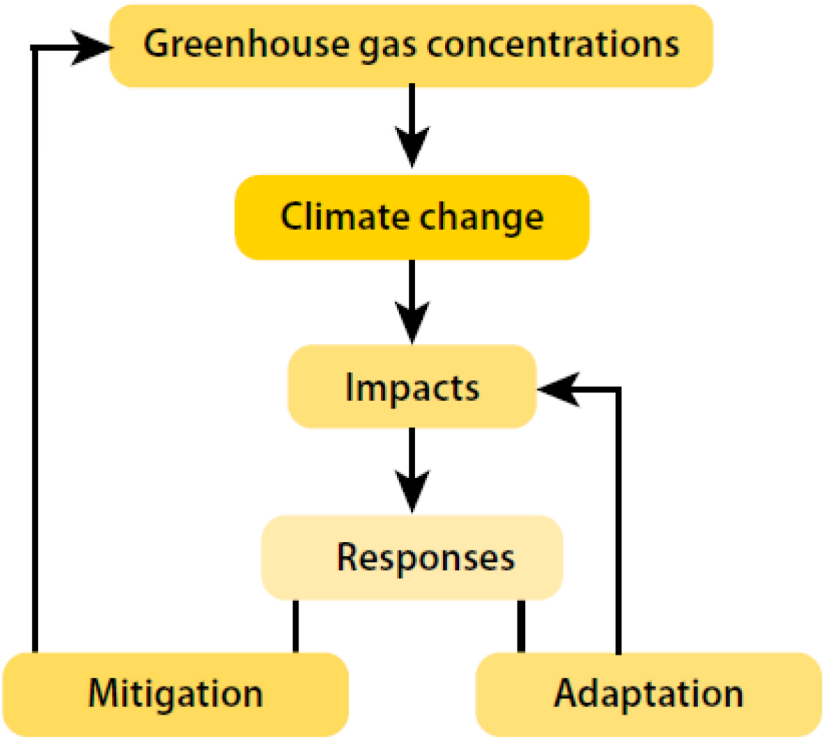
- Developing cultivars tolerant to heat and salinity stress and resistant to flood and drought
- Modifying crop management practices
- Improving water management
- Adopting new farm techniques such as resource conserving technologies
- Crop diversification
- Improving pest management
- Better weather forecasting
- Crop insurance
- Harnessing the indigenous technical knowledge of farmers

(Source: Climate change impact, adaptation and mitigation in agriculture: methodology for assessment and application)

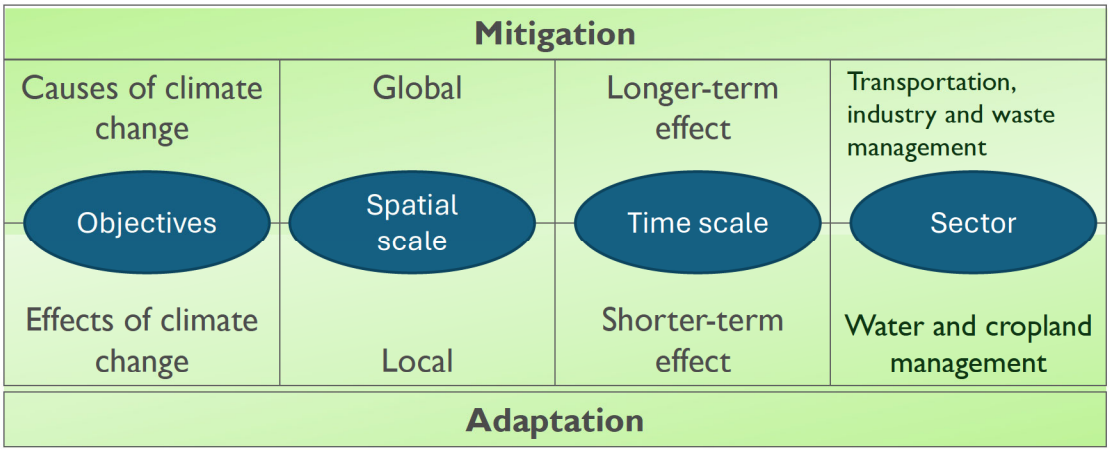
Mitigation Strategies to Climate Change

Measure	Examples
Cropland management	Improved agronomic practices
	Nutrient management
	Water management
	Tillage management
Restoration of degraded lands	Erosion control, organic amendments
Livestock management	Improved feeding practices
	Specific agents and dietary additives
Manure management	Anaerobic digestion
	More efficient use as nutrient source

(Source: Adaptation and mitigation strategies for climate resilient agriculture, Ravindra *et al.*, 2013)


Greenhouse gas concentrations
Climate change
Impacts
Responses
Mitigation
Adaptation

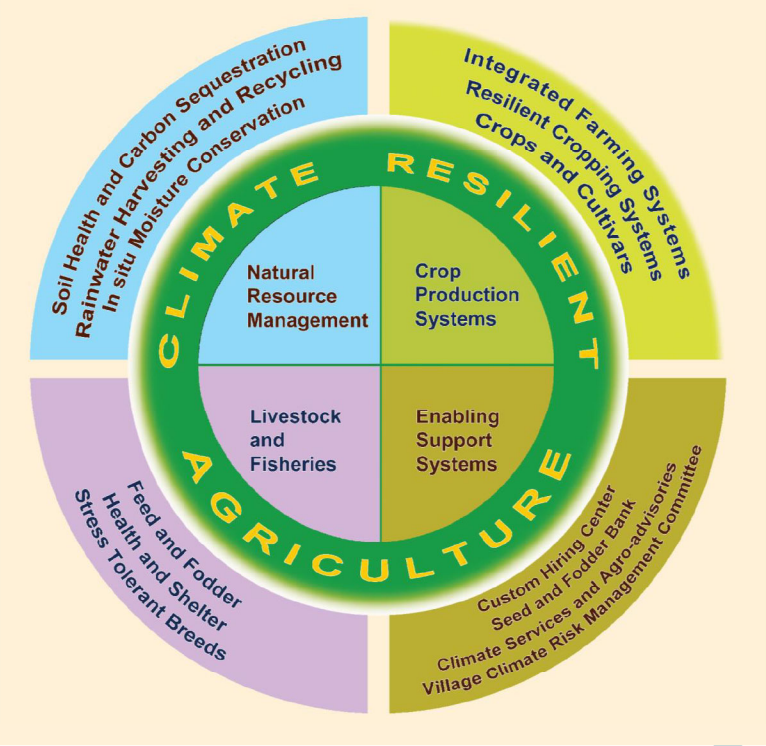
Main differences between adaptation and mitigation



→ Same final common target: Sustainable development

Concept of Climate Resilient Agriculture/ Climate Smart Agriculture (CSA)

- CSA has emerged as a way forward to consolidate and strengthen the climate change adaptation and mitigation regime at the global level.
- CSA integrates the economic, social and environmental dimensions of sustainable development by jointly addressing food security and climate change challenges.
- To be more specific, CSA is an approach to develop the technical, policy and investment conditions to achieve sustainable agricultural development through an integrated approach that is responsive to local conditions.
- CSA brings together practices, policies and institutions that are not necessarily new but are used in the context of climatic changes, which are unfamiliar to farmers.


CLIMATE RESILIENT AGRICULTURE
Natural Resource Management
Crop Production Systems
Livestock and Fisheries
Enabling Support Systems
Soil Health and Carbon Sequestration
Rainwater Harvesting and Recycling
In situ Moisture Conservation
Integrated Farming Systems
Resilient Cropping Systems
Crops and Cultivars
Feed and Fodder
Health and Shelter
Stress Tolerant Breeds
Custom Hiring Center
Seed and Fodder Bank
Climate Services and Agro-advisories
Village Climate Risk Management Committee

What is climate-smart agriculture?

Sustainably Increases Productivity

Resilience (Adaptation)

Reduces/Removes Greenhouse Gases (Mitigation)

Enhances Achievement of National Food Security

Climate Smart Agriculture - Concept

1

An integrated approach to developing technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change.

2

It integrates the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges.

3

CSA brings together practices, policies and institutions that are not necessarily new but are used in the context of climatic changes, which are unfamiliar to farmers.

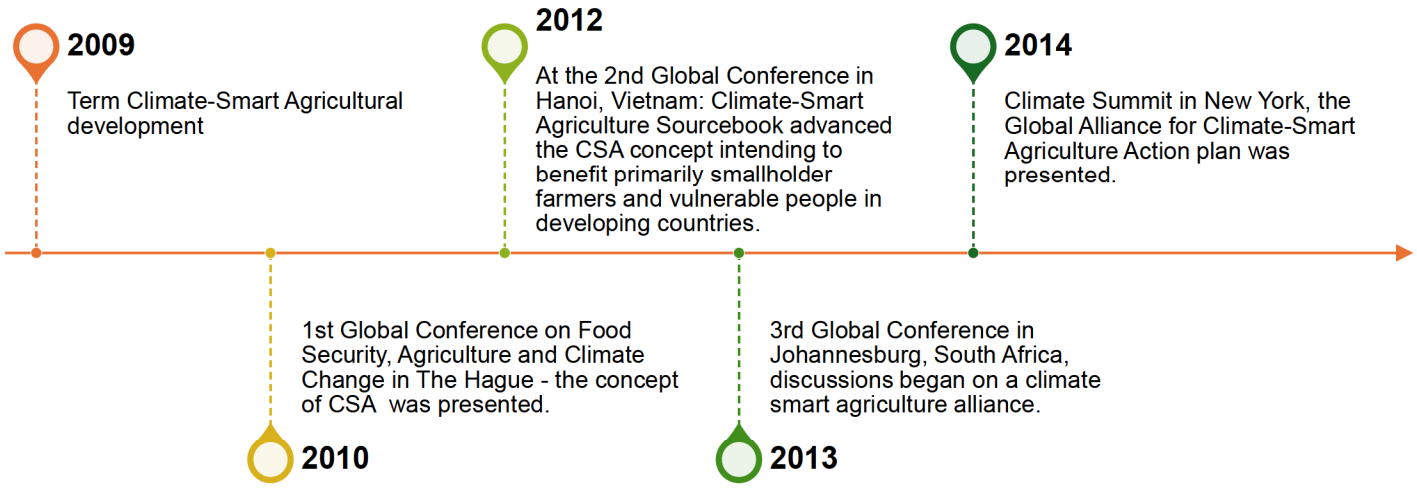
Climate Smart Agriculture

Climate-smart agriculture is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support the development and ensure food security in a changing climate.

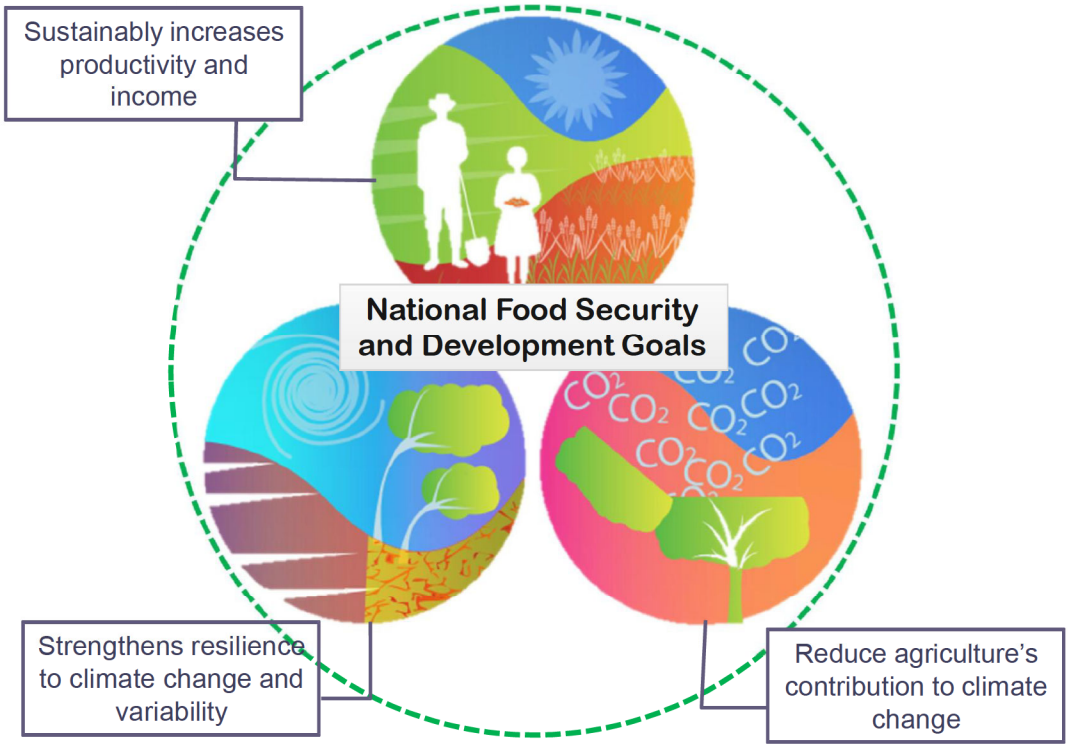
The term climate-smart agricultural development was first used in 2009

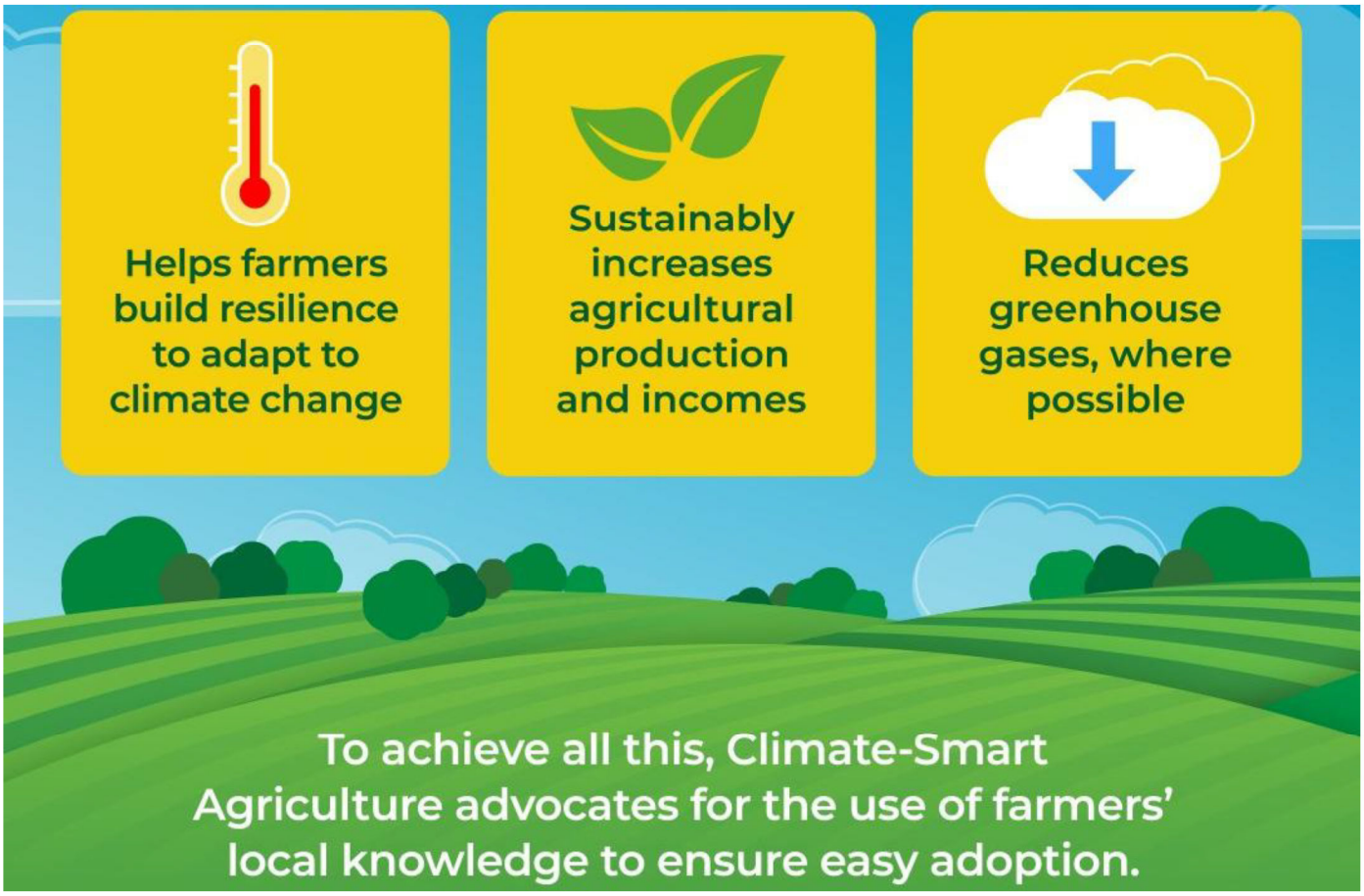
A year later (2010), at the First Global Conference on Agriculture, Food Security and Climate Change at Hague, the concept of climate-smart agriculture was presented

History of CSA

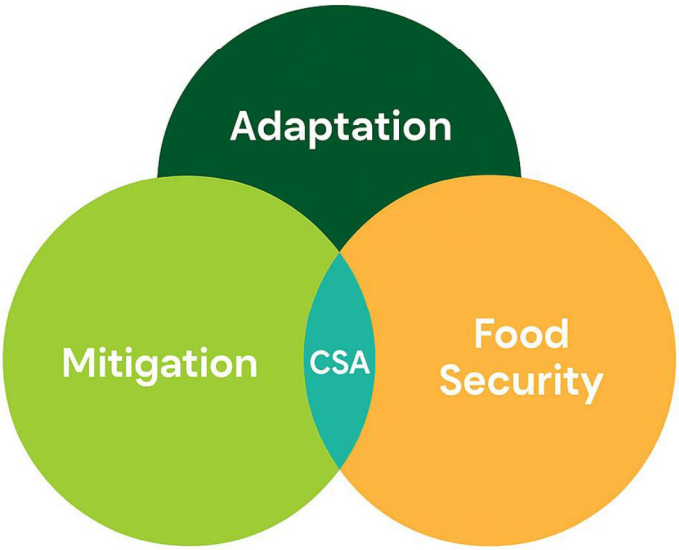


What CSA does?




Helps farmers build resilience to adapt to climate change
Sustainably increases agricultural production and incomes
Reduces greenhouse gases, where possible
To achieve all this, Climate-Smart Agriculture advocates for the use of farmers' local knowledge to ensure easy adoption.

Three pillars of CSA



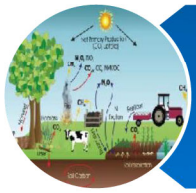
CSA Outputs

- Increase productivity
- Increase net return
- Improve input use efficiency
- Reduction in emissions
- Increase resilience
- Increase gender and social Inclusions

Objectives of Climate Smart Agriculture

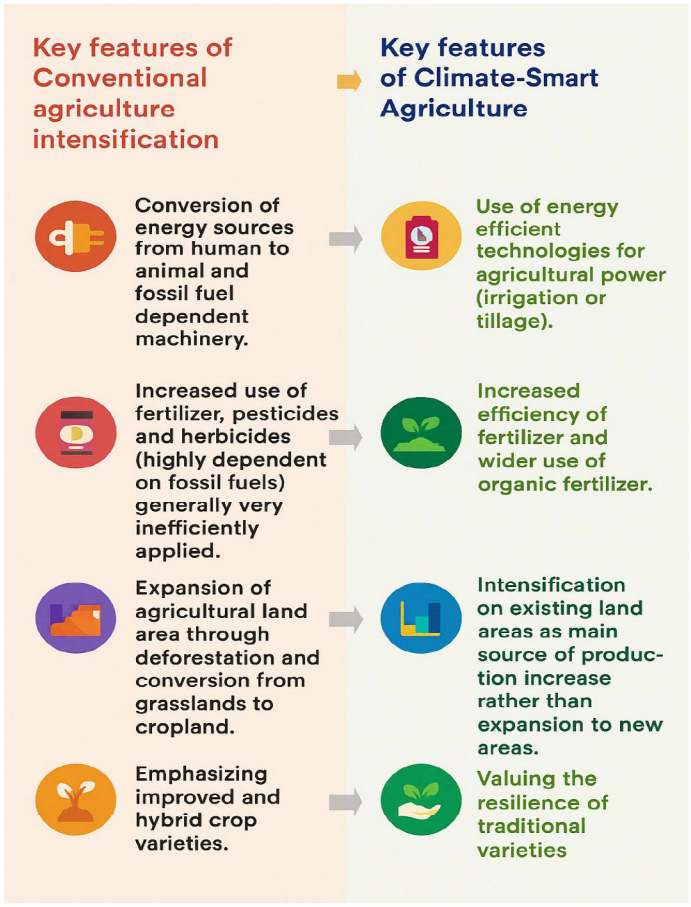
Increase agricultural productivity to support increased incomes and food security

Increase adaptive capacity at multiple levels (from farm to nation)



Decrease greenhouse gas emissions

How does CSA differ from Conventional Agriculture?



Types of climate-smart options

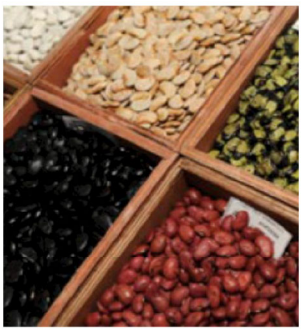
Weather-smart

- Weather forecasts
- Aqro-advisories Weather insurance
- Climate analogues Avoided mdladaptation

Water-smart

- Aquifer recharge Rainwater harvesting
- Community management of water
- Laser leveling
- On-farm water management Solar pumps

Seed/breed-smart



- Adapted varieties
- Adapted breeds
- Seed banks

Carbon/nutrient-smart

- Aqroforestry
- Minimum tillape Land use systems
- Livestock management
- Integrated nutrient management Biofuels

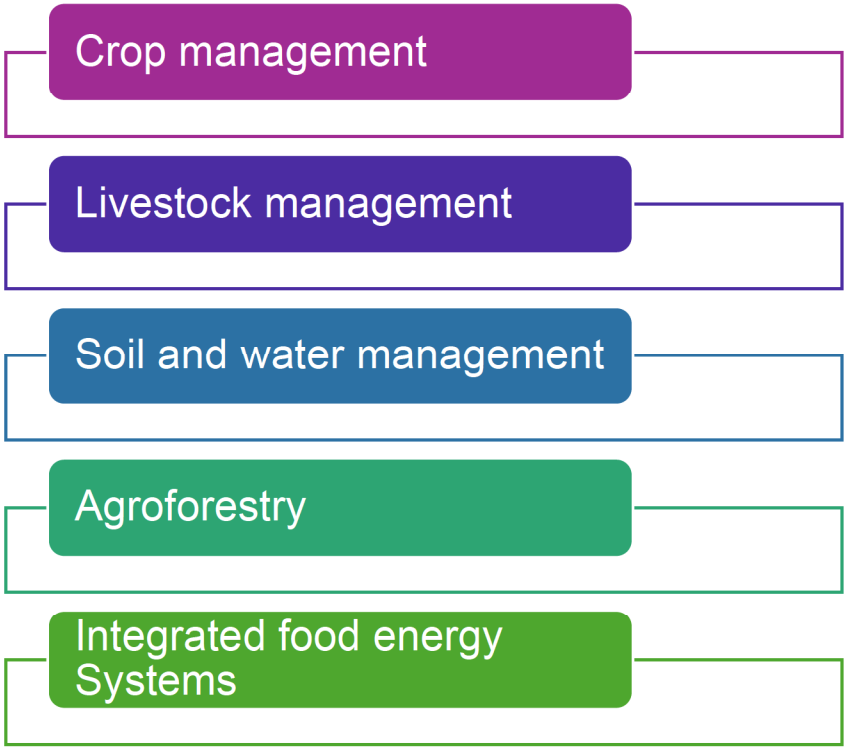
Institutional/ market-smart

- Cross-sector linkages Local institutions
- Gender strategies
- Contingency planning
- Financial services
- Market information
- Farm risk management

CSA practices and technologies adopted include -

- Improved crop varieties for higher yield
- Varieties suitable to cope with drought and excess water or high temperature
- Laser land leveling
- Zero tillage
- Residue retention
- Site specific nutrient management
- Legume integration
- Cropping system diversification
- Use of solar pump
- Use of crop sensor to assess crop health

Climate-smart practices



Crop management

- Intercropping with legumes.
- Crop rotations.
- New crop varieties. (e.g. drought resistant)
- Improved storage and processing techniques.
- Greater crop diversity.

Livestock management

- Improved feeding strategies (e.g. cut ’n carry)
- Rotational grazing
- Fodder crops
- Grassland restoration and conservation
- Manure treatment
- Improved livestock Health
- Animal husbandry improvements

Soil and water management

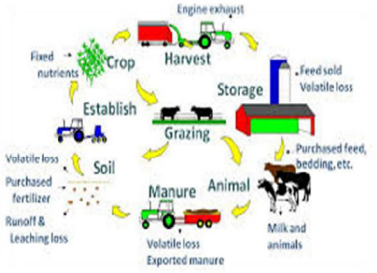
- Conservation agriculture (e.g. minimum tillage)
- Contour planting
- Terraces and bunds
- Planting pits
- Water storage (e.g. water pans)
- Alternate wetting and drying (SRI rice)
- Dams, pits, ridges
- Improved irrigation (e.g. drip)

Agroforestry

- Boundary trees and Hedgerows
- Nitrogen-fixing trees on farms
- Multipurpose trees
- Woodlots
- Fruit orchards

Integrated food energy Systems

- Biogas
- Production of energy Plants
- Improved stoves



Dimension - Climate Smart Agriculture

WATER SMART

WEATHER SMART

NUTRIENT SMART

CARBON SMART

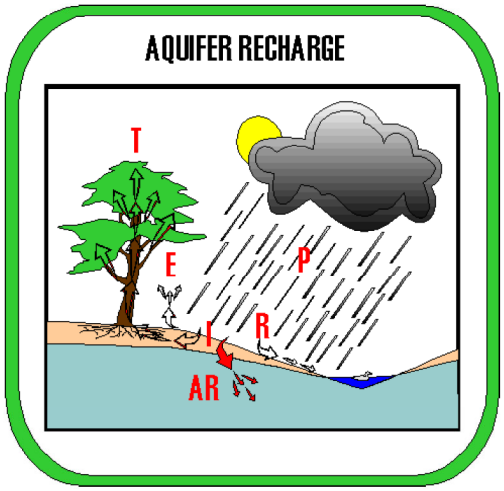
ENERGY SMART

KNOWLEDGE SMART

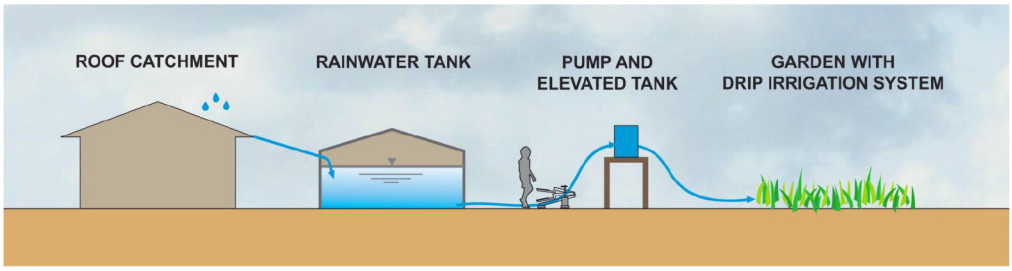
Water smart

- Direct seeded rice
- Raised bed
- Maize bed
- SRI technology
- Drip Irrigation

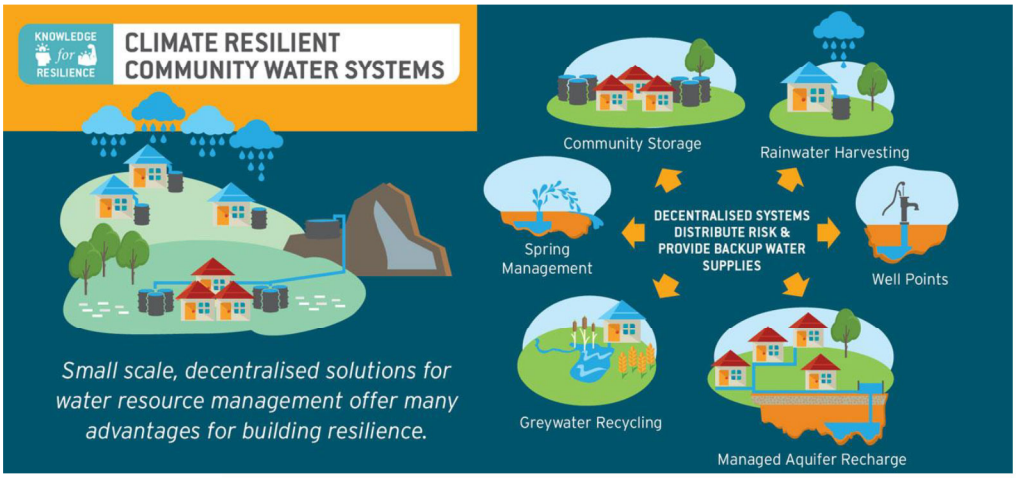
Water smart



Community management of water



On farm water management



Drip irrigation

Direct seeded rice

SRI technology

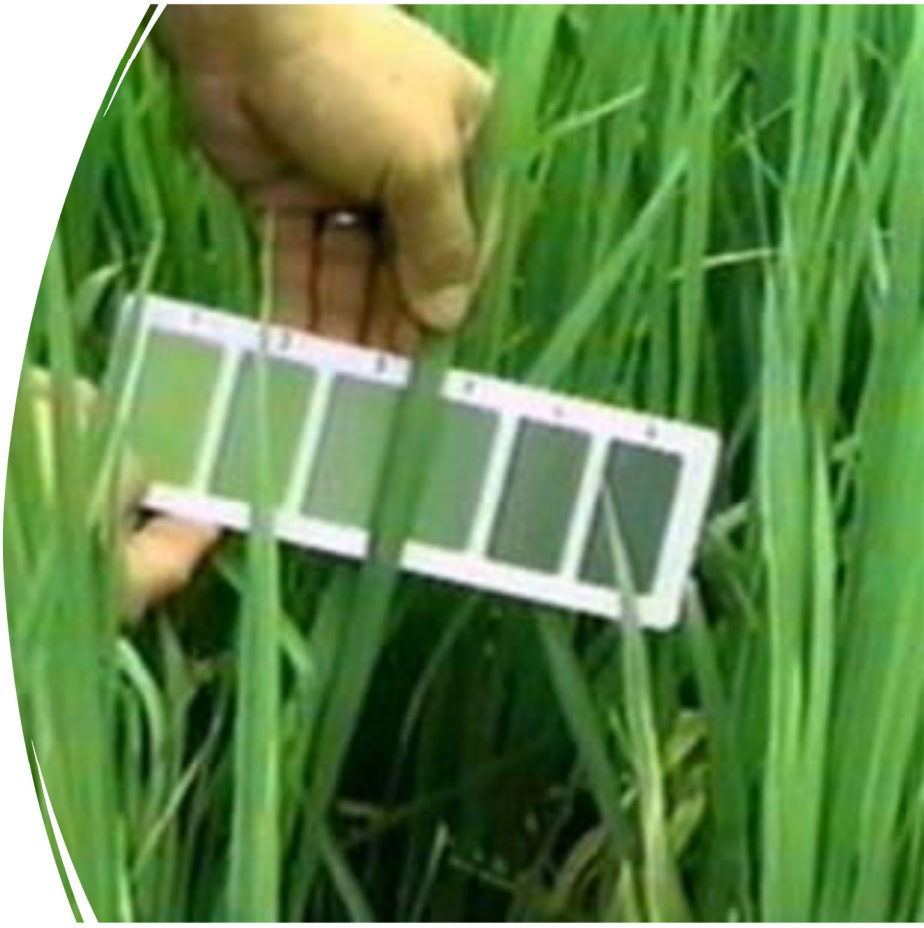
Raised beds

Weather smart

- ✓Weather forecast
- ✓ Index based insurance
- ✓ Seeds

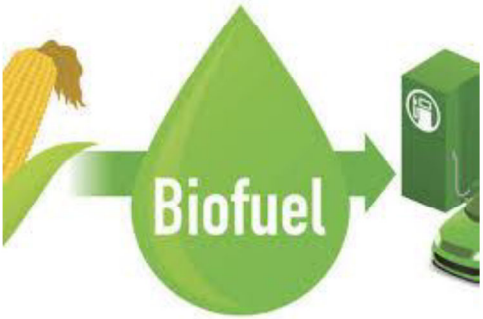
Nutrient smart

- Nutrient expert decision support tool for agriculture.



Energy smart

Fuel efficient engines



No burning

Carbon smart & Energy smart

- Residue management
- No tillage or zero tillage

Carbon smart

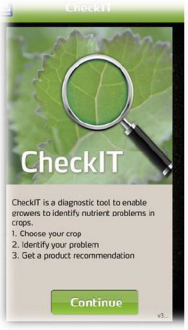
Conservation tillage

Agroforestry (above) , land use system (below)

Livestock management

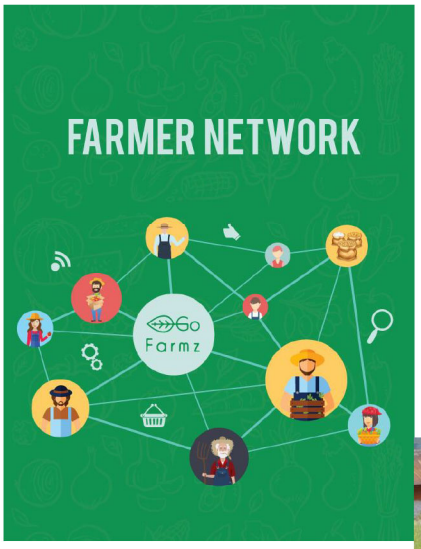
Knowledge smart

- ICTs
- Gender empowerment
- Capacity



Knowledge smart

F2f learning



Market information

CSB

Kitchen garden

Off farm risk management

Farming System and Practices

Crop Production System

Livestock Production Efficiency and Resilience

Fisheries and Aquacultures

Integrated System:

- Conservation Agriculture
- Agroforestry
- Urban and peri-urban agriculture
- Diversified and Integrated Food - Energy Systems

Crop production

- Changing
  - →cropping patterns
  - →planting dates
  - →management techniques
- Diversifying crop systems
- Genetic resources and resilience
- Adequate use of ground water

Crop production

- Managing organic matter
- Retaining soil moisture
- Avoiding soil erosion
- Increasing nutrient use efficiency
- Controlling salinization
- Pest and disease control

Livestock production efficiency and resilience

Feed management	Reducing animal thermal stress	Diversity of genetic resources
Efficient management of manure		Control of animal diseases
Increasing livestock water productivity		Improved grassland management

Efficient and resilient Fisheries

- Strategic location of aquaculture infrastructure
- Selection of suitable stock (saline resistant species in zones facing sea level rise)
- Switching to herbivorous or omnivorous species
- Planting mangroves in aquaculture areas

Integrated systems

Conservation Agriculture

1. Minimal mechanical soil disturbance
2. Maintenance of a mulch of carbon
3. Rotations or sequences and associations of crops

Integrated systems

Agroforestry

- Home gardens with multipurpose trees and shrubs
- Intercropping of trees and crops (timber/cereal; annual crops/first years of forest or orchards plantations)
- Silvopasture
- Shelterbelts, windbreaks, fodder banks, live fences, etc

Climate Smart Village model

- to enhance climate literacy of farmers and local stakeholders
- Develop a climate resilient agricultural system by linking existing government village development schemes and investments
- Promotion of combination of CSA practices and technologies

Components of Climate Smart Village