

Climate technologies for agrifood systems

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Agrifood systems, livelihoods and food security

- Agrifood systems are an important source of income and livelihood and are especially sensitive to climate change
- Building strong and resilient systems will be key as agrifood systems transform, and climate technologies can play an important role in this
- Agrifood systems encompass the entire range of actors and their interlinked value-adding activities from production to storage, processing, distribution and retail



Climate technology

Climate technology is defined as **equipment, practical knowledge, or skills for performing a particular activity** in relation to climate change mitigation or adaptation (hardware, software, orgware)

Climate adaptation technology is defined as 'all technologies that can be applied in the process of adapting to climatic variability and climate change' and 'the application of technology in order to reduce the vulnerability, or to enhance resilience'

Climate mitigation technology is defined as encompassing technologies and practices that can lead to a **reduction in greenhouse gases (GHG) emissions** or **increase the capacity of carbon sinks** to absorb GHGs from the atmosphere

Summary of climate change impacts on agriculture



Increased frequency and intensity of extreme climate events such as heat waves, droughts and floods, leading to loss of agricultural infrastructure and livelihoods



Decrease in fresh water resources, leading to water scarcity in arable areas



Sea-level rise and coastal flooding, leading to salinization of land and water, and risks to fisheries and aquaculture



Water and food hygiene and sanitation problems



Changes in water flows impacting inland fisheries and aquaculture



Temperature increase and water scarcity affecting plant and animal physiology and productivity



Beneficial effects on crop production through carbon dioxide "fertilization"



Detrimental effects of elevated tropospheric ozone on crop yields



Changes in plant, livestock and fish diseases and in pest species



Damage to forestry, livestock, fisheries and aquaculture



Acidification of the oceans, with extinction of fish species

Source: FAO. 2016. *The State of Food and Agriculture 2016. Climate change, agriculture and food security*. Rome.
<https://openknowledge.fao.org/items/5dc75cb7-bb13-4d4c-ab33-0c03b3a5da38>

Identifying appropriate climate technology options

- Tailored technology needs **assessments**
- Strengthening **capacity**
- Targeting **finance** and **investment**
- **Scaling up** effective options
- **Policy cohesion**



In agrifood value chains

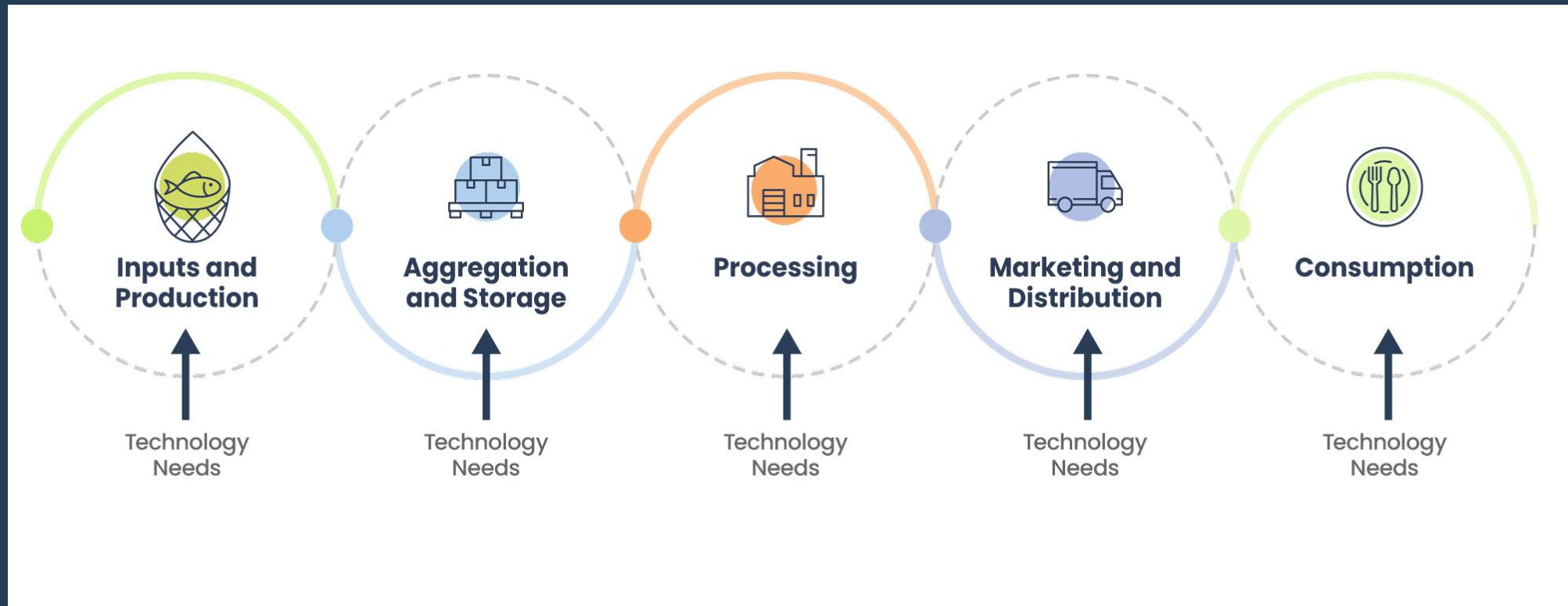


Table 1. Adaptation categories and options relevant to the agrifood sector^(*)

Adaptation category	Adaptation option
Agricultural diversification	Agricultural diversification: on-farm biodiversity (i.e. intercropping)
	Agricultural diversification: landscape
	Mixed systems: crops, trees, silvopastoral, fisheries, aquaculture, agroforestry
	Agroecological approaches at multiple scales
Agronomic management (farm level)	Organic management
	No till, reduced tillage or conservation agriculture
	Integrated pest and weed management
Livestock management	Seasonal feed supplementation
	Improved animal health and parasites control
	Thermal stress control
Shift in production timing/location/species/density	Substitution/change plant or animal type
	Adjustment of planting dates/counter-season crop production
	Shifting location of crop production, grazing; relocation of aquatic
Genetic improvement	Conventional breeding (cultivar or species improvement, assisted evolution in fisheries)
	Biotech and bioengineering
Collective resource management	Community forest management
	Community seed/feed/fodder banks
	Collective water storage and management schemes
	Farmer-to-farmer training, farmer field schools
	Social support networks
Climate services	Improving weather forecasting and early-warning systems
Infrastructure	Food storage infrastructure
	Improved food transport and distribution
	Improved efficiency and sustainability of food-processing, retail and agrifood industries
	Investment in protection infrastructure



Consumer-side behaviour change	Dietary changes
	Reduce food waste (retailer and consumer)
Food system transformations	Food sovereignty, agroecology, right-to-food approaches
	Integrated approaches at multiple scales
	Shortening supply chains, direct sales, circular economies
Policy and planning	Community-based adaptation (including disaster risk management)
	Local governance and conflict resolution schemes
	Regional and local food systems strengthening
	National and international adaptation planning, coordination, policy and governance
	Improving access to community services and social protection
Livelihood diversification	Diversification of livelihoods (economic diversification, either on-farm or employment in local community)

^(*) The terminology as presented in the table follows the IPCC source documentation. Technical terms across institutions may vary; therefore, kindly consider these as IPCC reference terminology.

Source: Adapted from IPCC. 2022a. Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Pörtner, H.-O., Roberts, D.C., Tignor, M., Poloczanska, E.S., Mintenbeck, K., Alegría, A., Craig, M. et al., eds. Cambridge, UK and New York, USA, Cambridge University Press. <https://doi.org/10.1017/9781009325844>

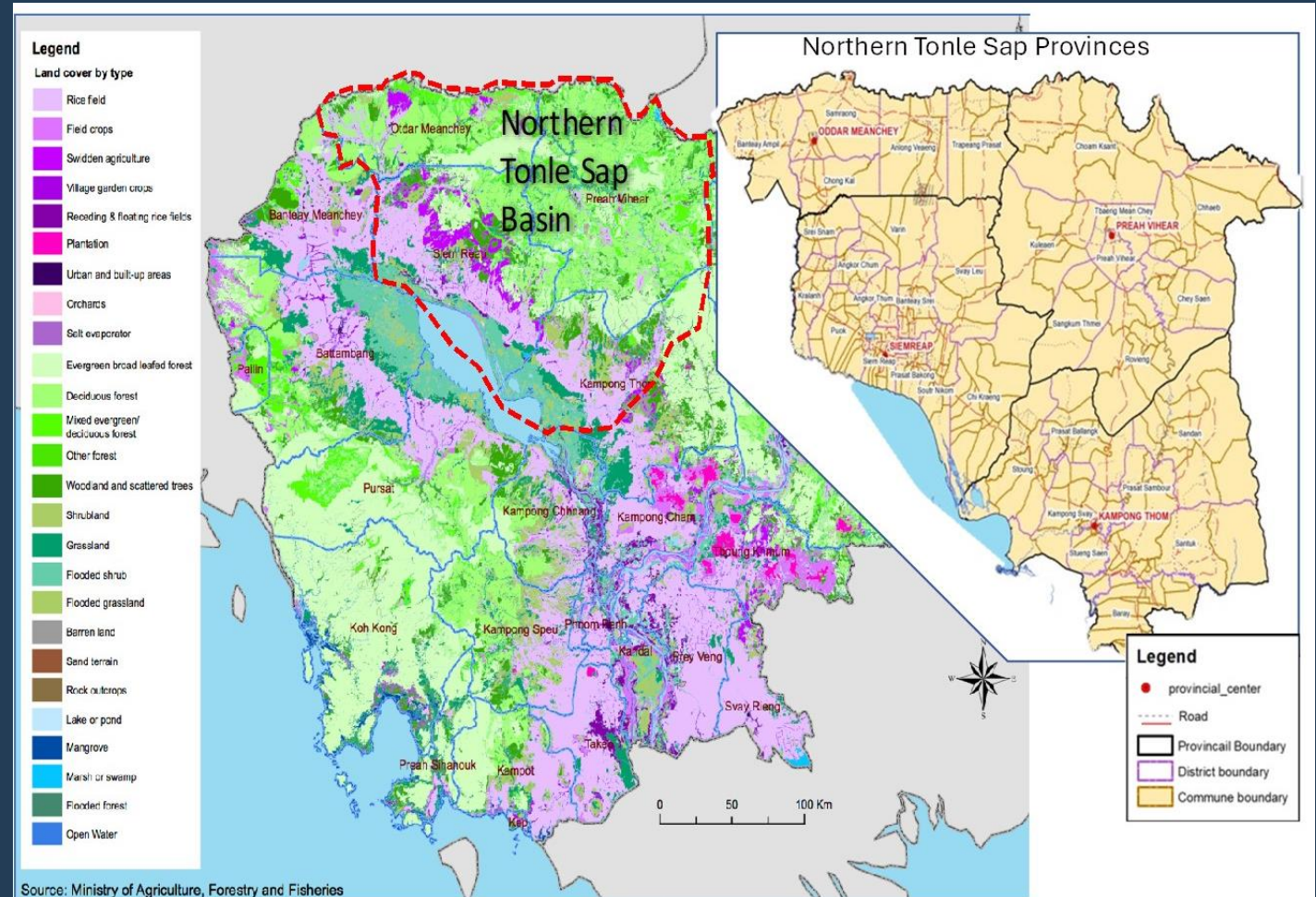


Country Implementation

Cambodia and Climate Adaptation
Technology Interventions in Agrifood systems

Cambodia and the identification of the climate technology packages

- Public-Social-Private Partnerships for Ecologically-Sound Agriculture and Resilient Livelihood (**PEARL**)
- Enhancing climate change resilience of smallholder farmers and local communities by increasing their access to growing premium market segments while using their improved market access to incentivize their transition to climate-resilient practices, mainly through effective public-social-private partnerships.
- The NTSB region encompasses Oddar Meanchey, Kampong Thom, Preah Vihear, and Siem Reap provinces
- 2.5 million hectares, 15% of the total population
- Four value chains: cashew nut, organic rice, mango and vegetables



Cashew nut and climate adaptation needs

- While cashew is considered a relatively climate-resilient crop, e.g. drought tolerance, it is still affected by climate change risks

The main climate related impacts:

Droughts
Increased temperatures
Changes in precipitation patterns
Pest and diseases
Extreme heat and weather events

Current issues in the cashew value chain:

Inadequate storage conditions (high humidity)
Pest infestation
Lack of processing capacity
Lack of quality control measures

Adaptation needs:

Climate-resilient production practices
Strengthening post-harvest handling and infrastructure
Enhancing market access and value addition
Building capacity and knowledge
Fostering partnerships and enabling policies

Cashew: Value Chain Components

Identify the climate technologies to address climate adaptation needs

Equipment and products

Examples:
Use of water reservoirs, drip
irrigation systems

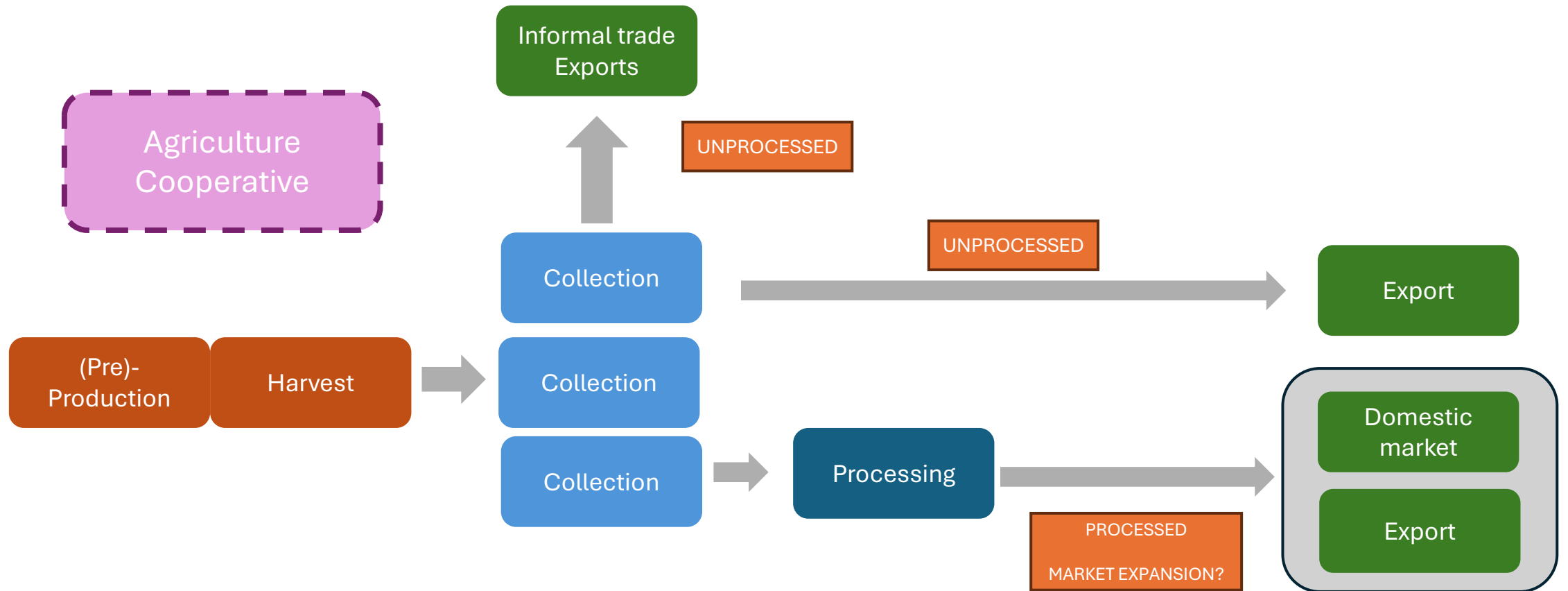
Techniques and practices

Examples:
Smart irrigation practices,
IWM, water harvesting

Skills and knowledge

Examples:
Demonstration farms
Community-based water
management
Strengthen extension
capacity

Cashew value chain: the baseline and possible climate technology interventions



Technology interventions (Asset lists)

(Pre)-Production and Post-harvest handling

ACs primary production:		
Stage	Climate technology intervention	Climate justification
Input management	Soil testing kits Bio-fertilizer production unit	Direct
Land preparation	Mini tractor with implements Laser levelling system Basic field tools set	Direct
Orchard management	Power sprayer with PPE Pruning equipment set IPM traps and monitoring tools Weather monitoring station	Direct
Harvesting	Collection nets system Nut picking tools set	Indirect
Drying	Solar dryer with humidity control	Indirect
Storage	Cold storage Humidity and temperature control system	Direct
Quality Assurance	Aflatoxin testing kit	Indirect

Technology interventions (Asset lists)

Farmers		
Stage	Climate technology intervention	Climate justification
Irrigation	Solar irrigation system Drip irrigation network Soil moisture sensors Water harvesting structure	Direct

Technology interventions (Asset lists)

Processing

Farmers		
Stage	Climate technology intervention	Climate justification
Primary processing	Nut cutting machine Steam boiler unit Kernel extraction tools	Direct
Quality enhancement	Kernel grading system Moisture testing equipment Packaging unit	Indirect

Cashew Nut Processing



Concluding remarks

- ✓ **Climate technologies in agrifood systems are an essential means of accelerating progress** on adaptation and resilience;
- ✓ **Effective implementation of climate technologies must be embedded within agrifood system transformation** including improving production, nutrition, natural resource management and livelihoods. There is often complementarity but trade-offs also exist.
- ✓ **Important to consider the entire agrifood value chain** (processing, distribution and consumption) in climate technology needs assessments. Until now, much of the focus has been on production.

Concluding remarks

- ✓ **Capacity strengthening is needed to realize the benefits of climate technologies** already available for deployment, these must be linked to the identified technology need, building suitable skills, especially for smallholders and vulnerable segments, including equipping women with digital literacy and relevant skills.
- ✓ **Scaling up and effective implementation** of climate technologies requires not only a major increase in available financing, but also **financing tailored to support investments, that build on TNAs and capacity needs assessments**.
- ✓ **Better integration across sectors**, building on experiences and results from existing processes and work, **flowing into NDCs**. Focusing on **context specific** barriers and **aligning the results with financing** investment criteria.