CLIMATE SMART, SUSTAINABLE AND INCLUSIVE AGRICULTURE PRACTICES

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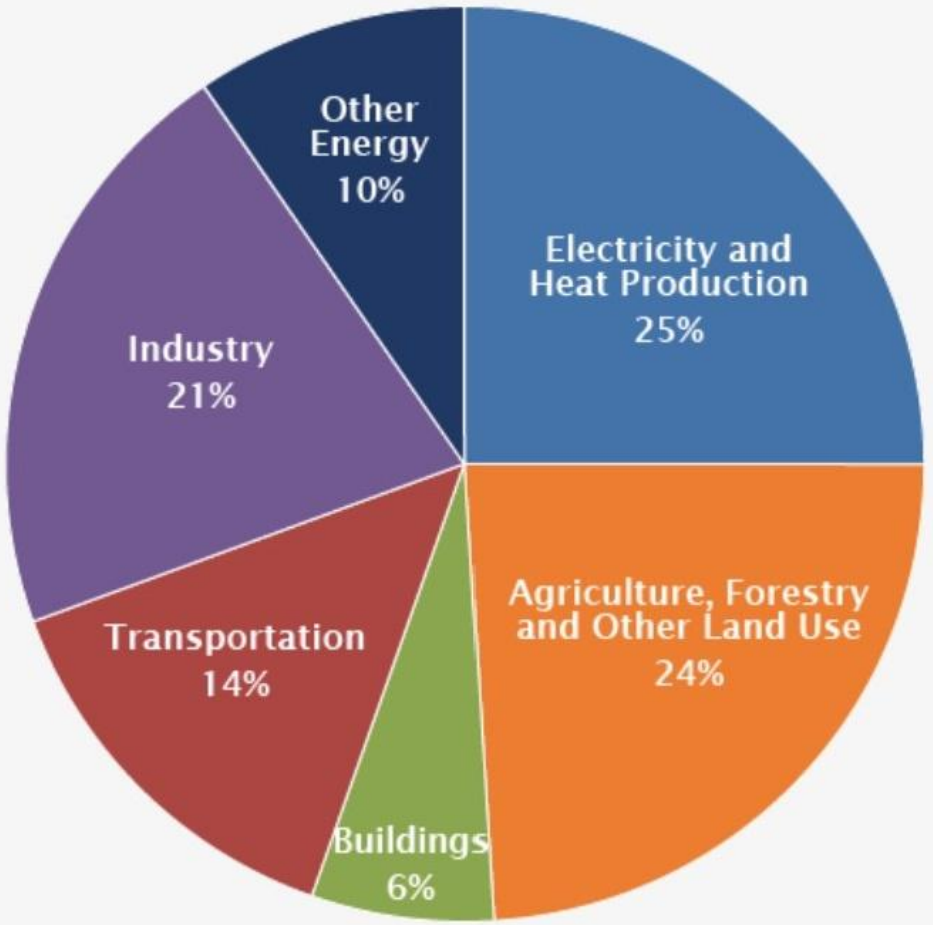
FAO RAP

CONTENT

- GHG emission from the Agriculture Sector
- Challenges in the Adoption of CSA Practices
- Major Structural Changes Needed in Asian Agriculture
- Initiatives in the Region in the Adoption & Promotion of CSA Practices
- Guidelines for Promotion and Adoption of CSA Practices
- Suggested Principles for the Promotion and Adoption of CSA Practices
- Key Messages

Global Greenhouse Gas Emissions by Economic Sector



Global Greenhouse Gas Emissions by Gas

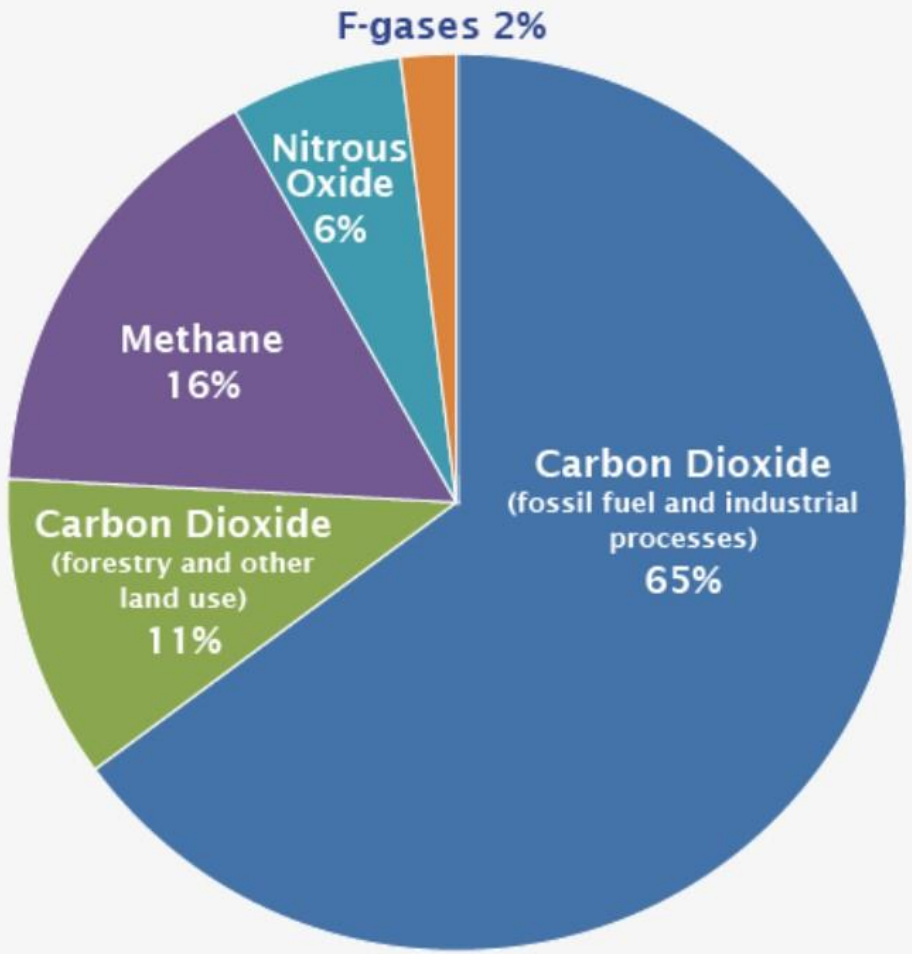
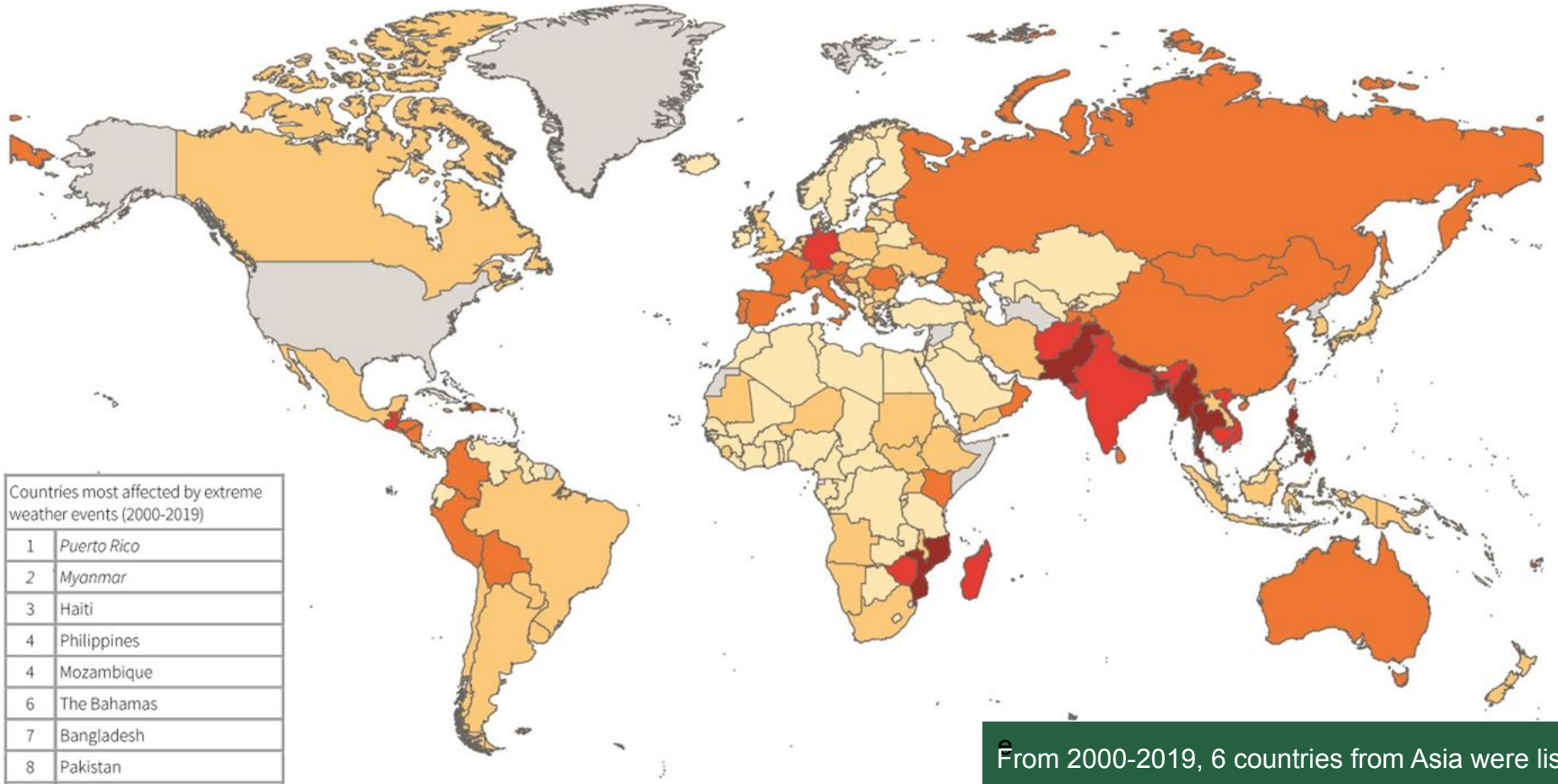


Figure 1: World Map of the Global Climate Risk Index 2000 – 2019

Source: Germanwatch and Munich Re NatCatSERVICE



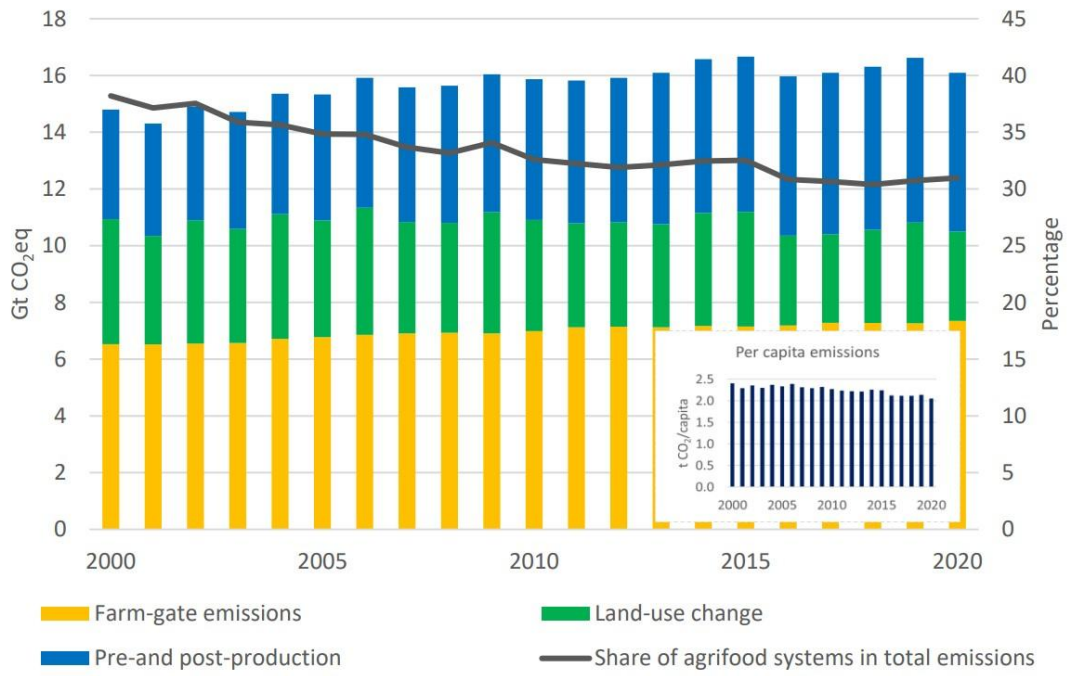
Countries most affected by extreme weather events (2000-2019)	
1	*Puerto Rico*
2	*Myanmar*
3	Haiti
4	Philippines
4	Mozambique
6	The Bahamas
7	Bangladesh
8	Pakistan
9	Thailand
10	Nepal

Italics: Countries where more than 90% of the losses or deaths occurred in one year or event

e

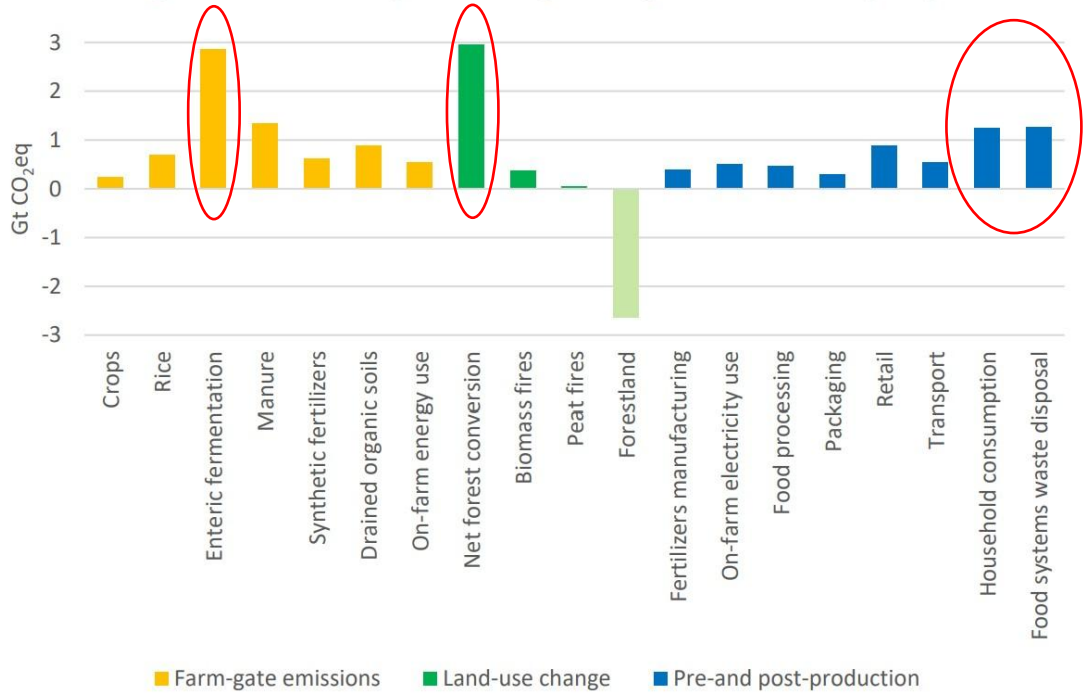
From 2000-2019, 6 countries from Asia were listed in the Global Climate Risk Index – posed challenges to food security (Myanmar, Philippines, Bangladesh, Pakistan, Thailand, Nepal)

Figure 1: Global agrifood systems emissions by component and indicator



Source: FAO. 2022. Emissions totals. In: *FAO*. Rome. Cited October 2022. https://www.fao.org/faostat/en/#data/GT and FAO. 2022. Emissions shares. In: *FAO*. Rome. Cited October 2022. https://www.fao.org/faostat/en/#data/EM

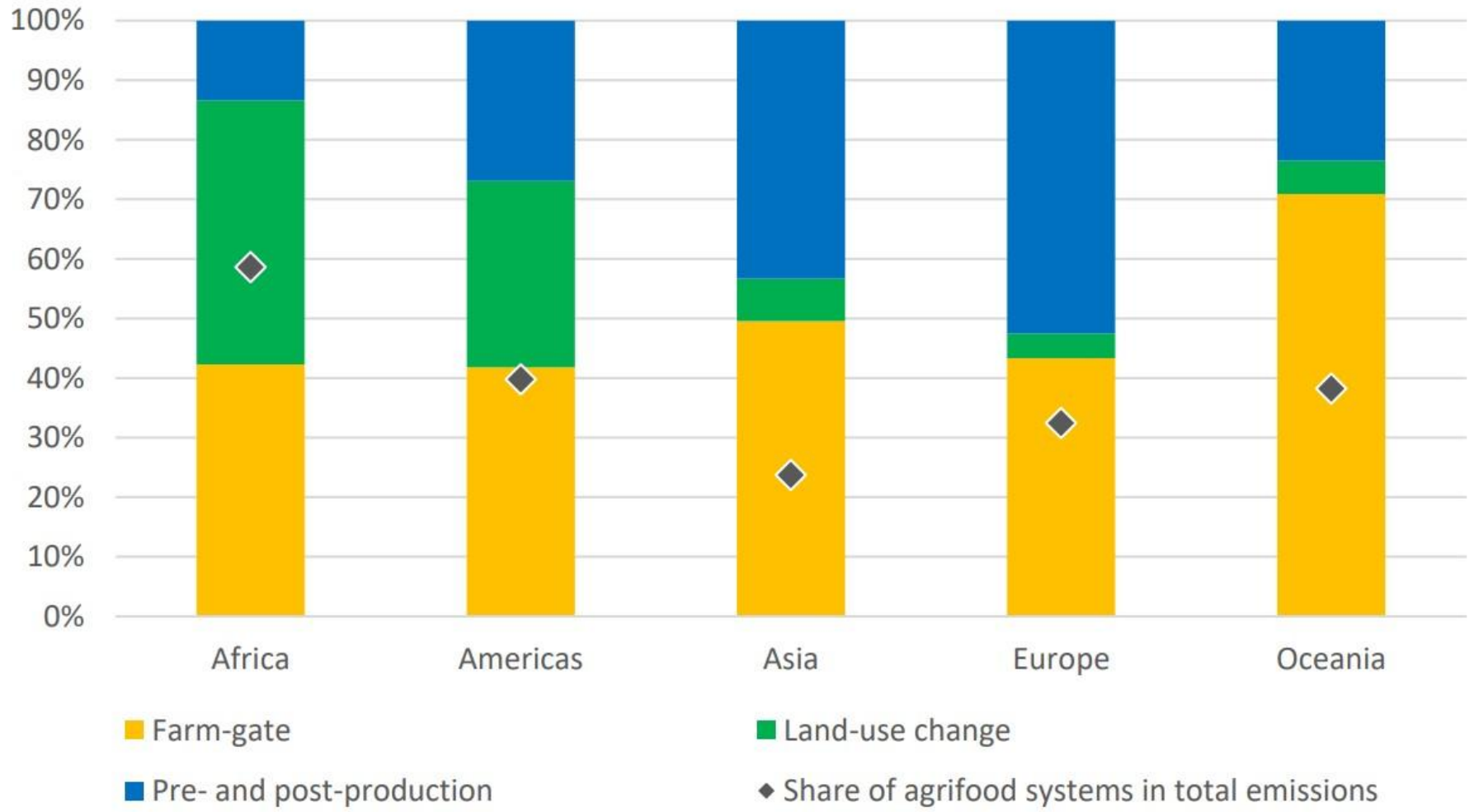
Figure 2: Detailed composition of agrifood systems emissions (2020)



Note: Emissions/removals on forestland (which are not part of agrifood systems emissions) are also shown as included in the FAOSTAT Emissions database.

Source: FAO. 2022. Emissions totals. In: *FAO*. Rome. Cited October 2022. https://www.fao.org/faostat/en/#data/GT

Figure 4: Regional agrifood systems emissions and share in total emissions (2020)



Source: FAO. 2022. Emissions totals. In: *FAO*. Rome. Cited October 2022. https://www.fao.org/faostat/en/#data/GT and FAO. 2022. Emissions shares. In: *FAO*. Rome. Cited October 2022. https://www.fao.org/faostat/en/#data/EM

Challenges in the Adoption of Climate Smart Agriculture Practices

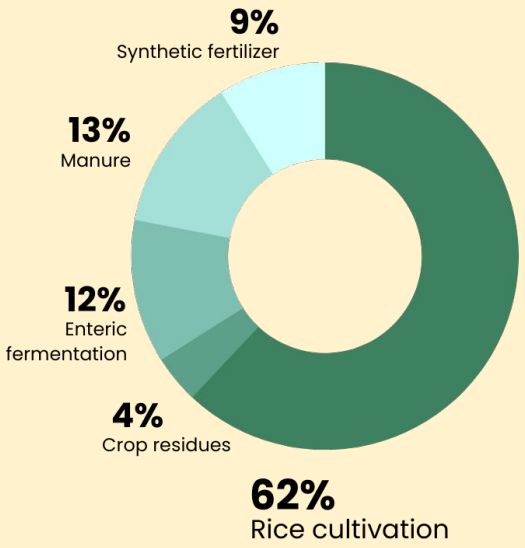
Challenge #1	Despite the availability, there is limited adoption due to **lack of financial incentives to the farmers**
Challenge # 2	**Digital agriculture is not properly introduced** to farmers in terms of the cost efficiency of the new technologies (i.e., decision support tools, mobile apps, and computer GIS mapping)
Challenge # 3	Additional costs without any **immediate financial benefit**
Challenge # 4	Possible carbon credit system **requires a system-level approach**
Challenge # 5	**Enabling policy** at national and local levels on CSA practices at scale and carbon credit system in the agriculture sector

Major structural changes needed in Asian Agriculture

- Technology leap in mechanization and digitalization
- Farm reorganization of separate smallholder farms into out-grower cooperatives of small farms with commercial nucleuses
- Shift from traditional production to circular and bio-economy-based production of evolved and diversified principal and by-products

Rice Farming

has the largest GHG footprint, with 12 percent of global emissions coming from flooded rice fields as methane gas (CH_4) is linked to anaerobic conditions resulting from submerged paddy fields and has a global warming potential 28 times higher than carbon dioxide (CO_2).



Reducing GHG Emissions at a Rice Farm

Water-saving Technologies

- Alternate wetting and drying
- Direct seeded rice system
- Intermittent drainage

Rice Varieties

- Climate-ready varieties
- Short maturity and high yield
- Biotic and abiotic tolerance
- High biomass

Soil and Nutrient Management

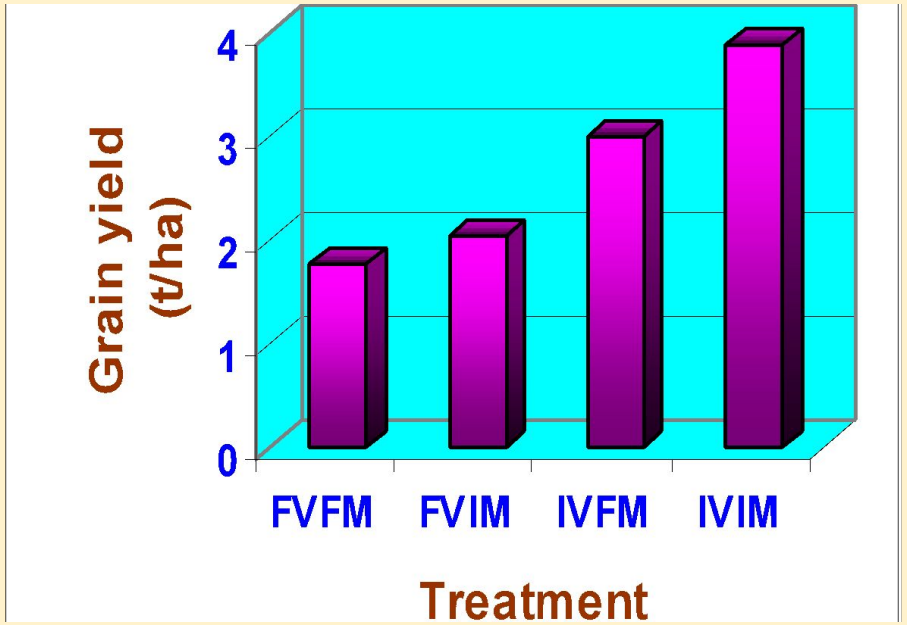
- Chemical vs Organic fertilizer
- Nitrogen-fixing legumes
- Biomass incorporation (fresh vs compost)
- Time and rate of application
- Methane-oxidating bacteria

Cropping and crop-animal system

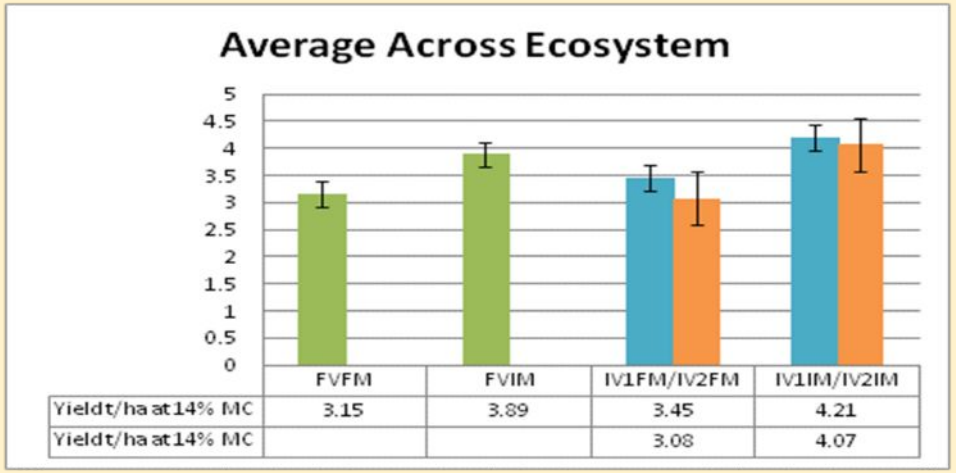
- Diversification vs Intensification
- Conservation vs Conventional tillage
- Lowland agroforestry
- Crop-animal integration
- Crop biomass and animal manure
- management

Bringing Synergy: Combining Climate Smart Varieties with Good Agronomy

Intervention	Yield increase (%)
Improved variety (IV)	21-69%
Improved management (IM)	16-38%
IV + IM	51-130%



Ayeyawardy Delta



			Fresh	Brackish	Saline	Total
Saltol STL	V1	IV1	6	6	6	18
		IV2				0
Sin Thu Kha	V2	IV1				0
		IV2	4		4	8
BR 11 Sub 1	V3	IV1				0
		IV2	2	6	2	10
Paw San Yin	V4	FV – Land Race		2	2	4
Bay Gyar	V5				2	2
Thai Bay Gyar	V6			2		2
Manaw Thukha	V7	FV – Modern Variety	2			2
Sin Thwe Latt	V8		4	2	2	8

When both improved varieties (IV) and improved management (IM) were applied, the advantage was about 20% under fresh water, 43% under brackish, and 37% under saline water conditions over FV+FM. The overall mean across locations indicated an advantage of 1 t per hectare (>31%).

Source: RK Sing & RV Labios, IRRI, 2017

Existing adaptation & mitigation options across the rice production cycle

can reduce as much as 65% - mostly methane

UP TO 10% — *Timing* of residue incorporation in field

UP TO 7% — Planting short-duration rice varieties

Average 33% — Alternate Wetting & Drying, Efficient use of fertilizer

UP TO 15% — *Amount* of residue left after harvest, no straw burning

1 Improve water management:
AWD/ Mid-season drainage/Laser land leveling

2 Residue management:

In-situ: avoid burning, incorporation combined with AWD, decomposer

Off-field: bailer, alternate use (feed, composting, biochar, mushroom production, other products

3 Nutrient management:
- SSNM/RCM
- Sulphur containing fertilizers

4 Variety: Shorter duration

5 Mechanized and precise direct-seeded rice

1M5R

6 One Must five Reductions

Source: Virender Kumar, IRRI, 2023

Shift in Crop Establishment Methods in Asia

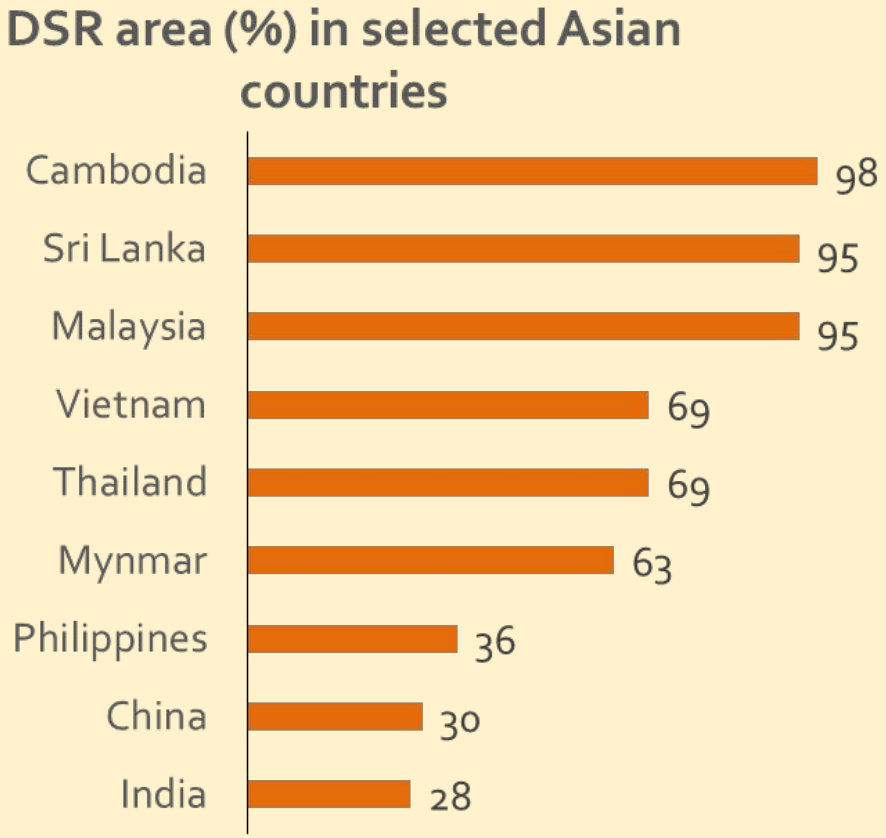
Productivity and profitability has been low

- High seed rate (180-350 kg/ha) of own saved seed

- Low adoption of quality seeds of inbred/hybrids
- No/low mechanized seeding

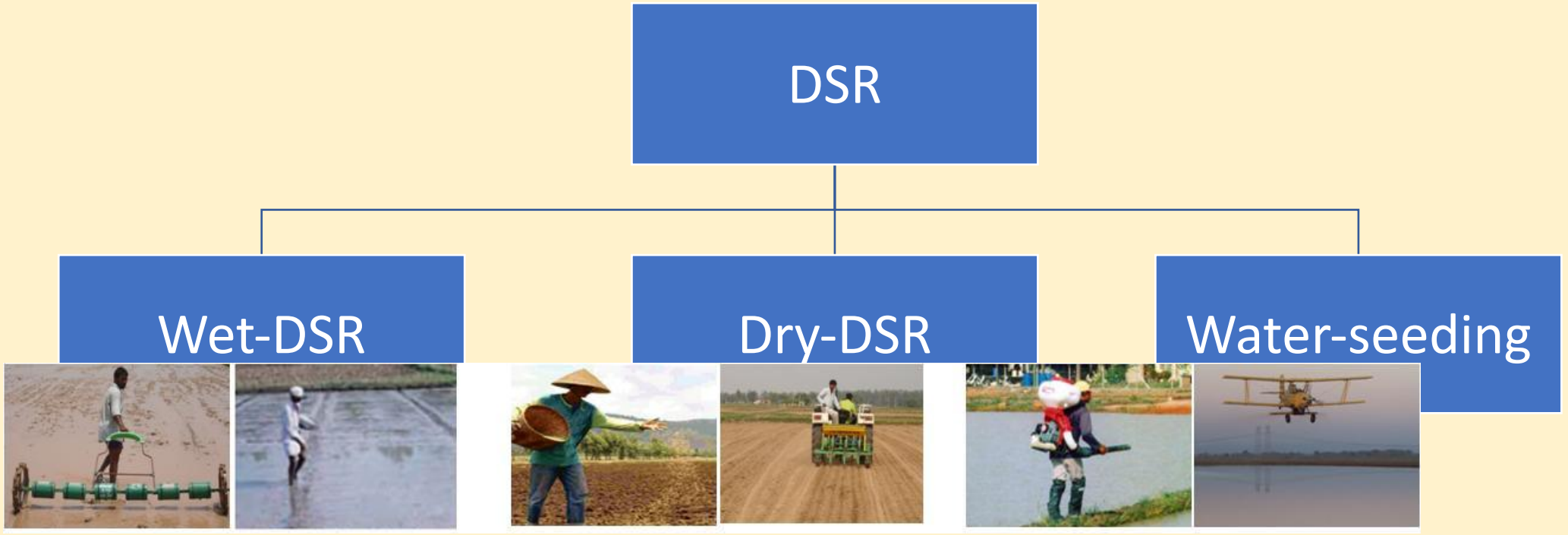
- Weed and Pest management
  - ✓ High weed infestation, high yield losses
  - ✓ High herbicide and pesticide use

- Lodging associated with high seed rate and broadcast method



Source: Virender Kumar, IRRI, 2023

Types of DSR



Pre-germinated seeds + puddled soil

Dry seed + non-puddled soil

Pre-germinated seeds in standing water + puddled or on-puddled soil

Source: Virender Kumar, IRRI, 2023

Why mechanized DSR (mDSR)

Labor scarcity

Productivity and profitability has been low

- High seed rate (180-350 kg/ha) of own saved seed

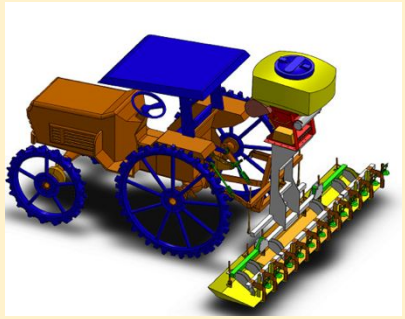
- Low adoption of quality seeds of inbred/hybrids
- No/low mechanized seeding

- Weed and Pest management
  - ✓ High weed infestation, high yield losses
  - ✓ High herbicide and pesticide use

- Lodging associated with high seed rate and broadcast method

mDSR + improved variety + improved agronomy

- Reduce seed rate through mDSR
- Use of high-quality seed of improved variety
- Reduce pest pressure through optimum crop density and integrated weed management
- Reduce lodging through optimum crop density and balanced nutrient management
- Higher yield and profitability



Source: Nguyen Van Hung, IRRI, 2023

mDSR Technology Development

Dry – mDSR in India

Wet – mDSR - (line/ row) seeding

Drone broadcast- seeding

Dry – mDSR in Cambodia

Wet – mDSR - Hill seeding

Wet – mDSR – combined fer. deep placement

Drone line seeding (Liu, et al., 2022, under development)

Cambodia: Large imported machines have limited reach; three local manufacturers designed small seeders; through projects, they improved various parts.

Vietnam: Wet mDSR was introduced and tested from 2021 – companies and farmers have started apply with the technical support from projects.

Source: Nguyen Van Hung, IRRI, 2023

The way forward to mDSR

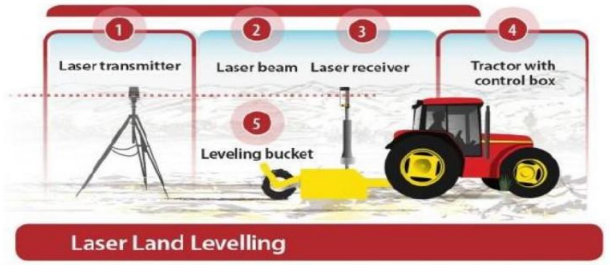
- ✔ Site-specific mapping for scale-appropriate precision DSR, considering all value chain processes/ factors (crop calendar, soil, water, climate, seed, fertilizer, pest, mechanization, service providers, market, etc.),
- ✔ To support the adoption of precision DSR:
  - Precision DSR technologies (scale-appropriate dry, wet, scale, operational factors, etc.) and supported interventions, e.g., precision land leveling
  - Contract farming and business model developments, e.g., inclusion of precision DSR associated with best management practices in the contract farming
  - Behavioral change interventions, e.g., farmer perceptions, stakeholder linkages

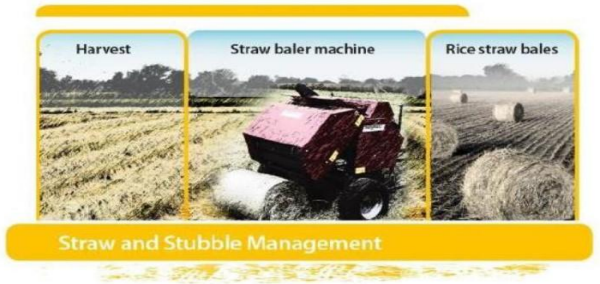
Source: Nguyen Van Hung, IRRI, 2023

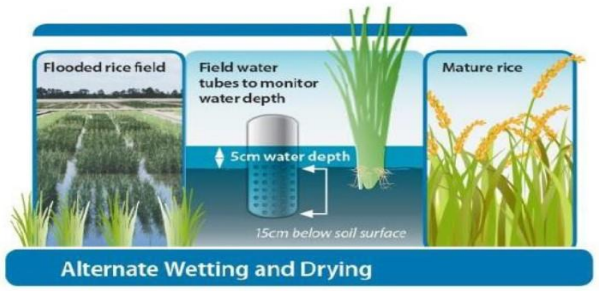
1) Low-Emission Farming: Example - Thai-Rice NAMA Project (2018 – 2023)

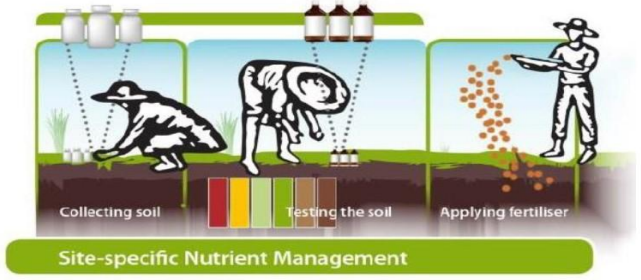
- **Expected impact** of the project is a **reduction in methane and nitrous oxide emissions** through farmers switching from conventional to low-emission rice production (target: **100,000 HHs**)
- **Target area CAPSAS**: Chainat, Angthong, Pathumthani, Singburi, Ayutthaya, Suphanburi
- **Via development of the Government of Thailand's 'Good Agricultural Practices (GAP)++' Standard** , an enhanced standard with strengthened environmental and social aspects, to enable farmers to distinguish their rice from conventional production and thus sell to higher-value markets.
- **Promoting** the adoption of **low-emission, irrigated rice production**
- Availing **mitigation services** on the market
- And other interventions

Thai Rice NAMA Technologies









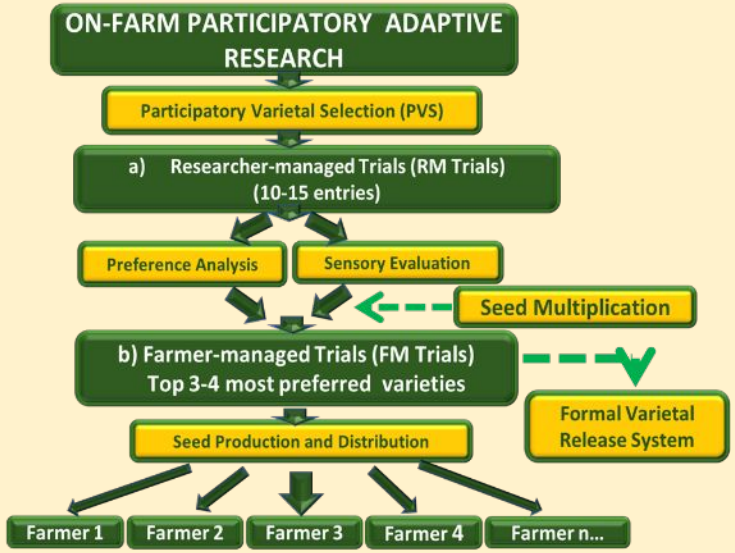
Source: Thomas Jäkel, 2023

https://www.searca.org/pubs/monographs?pid=456
https://cgspace.cgiar.org/handle/10568/106136

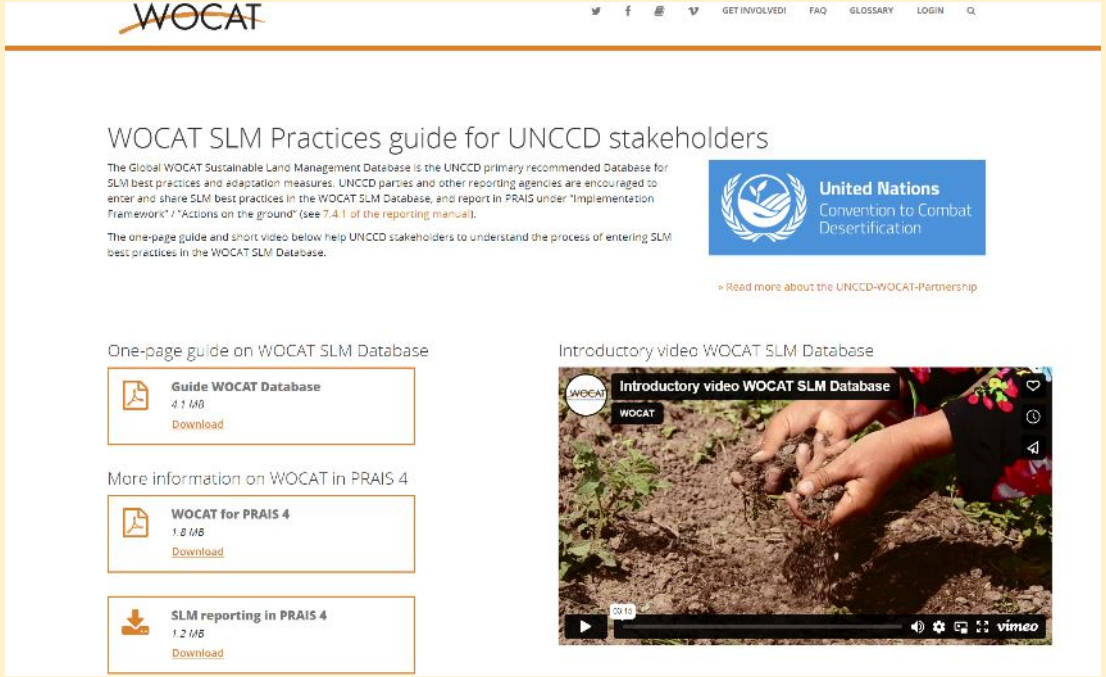
The compendium provides overview of:

- Climate-Resilient Agriculture Ts & As in the Philippines
- Challenges in the context of climate change
- Summary of Philippine policies, strategies, programs, and plans related to CRA
- Natural and socioeconomic conditions of different agroecological systems in the Philippines
- CRA Ts & As (description & methodology) applicable in various ecosystems:
  - irrigated lowland
  - rainfed lowland
  - upland
  - hilly land
  - highland
  - coastal
  - and information technology management

Source: http://irri.org/resources/publications/books/guide-to-participatory-varietal-selection-for-submergence-tolerant-rice



On-farm participatory adaptive research framework (Labios, 2011)



https://qcat.wocat.net/en/wocat/

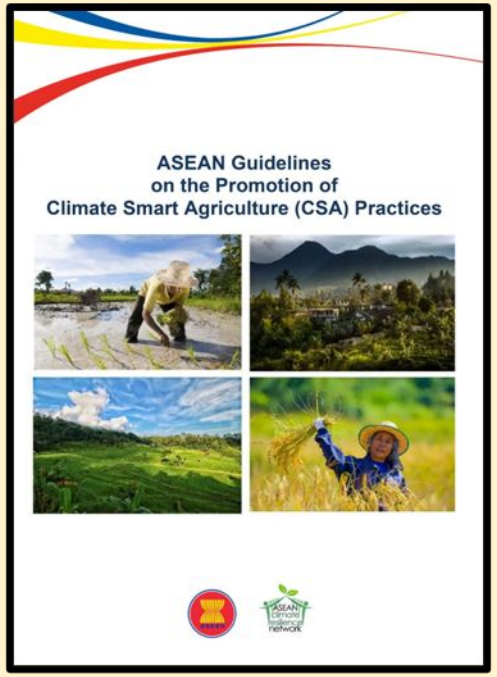
ASEAN Guidelines

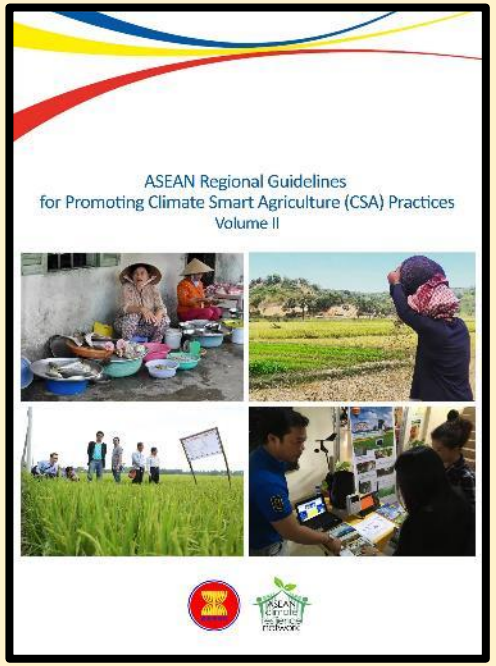
ASEAN Guidelines have been a critical tool in bringing forward the ASEAN agriculture-forestry-food security (FAF) agenda down to ASEAN member-states.

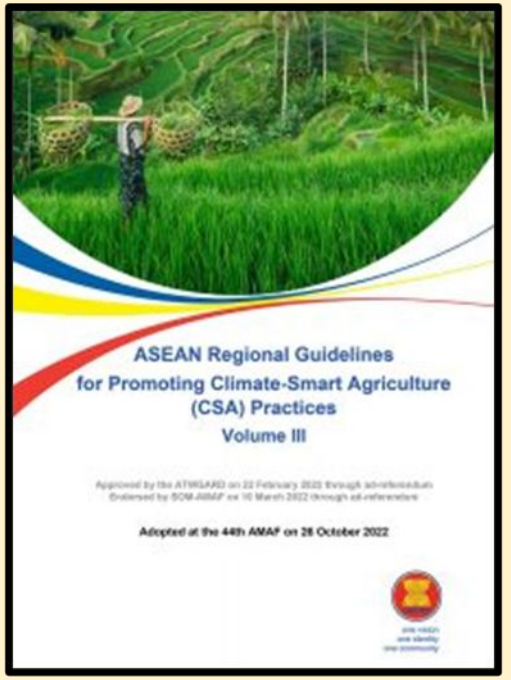
First two volumes of ASEAN CSA Guidelines present various successful CSA approaches that were deemed relevant and scalable across the region.

Vol III aims to (a) provide guidance on how ASEAN Member States (AMS) can promote the adoption and upscaling of CSA practices
(b) provide assessment guidelines in prioritizing the CSA practices
(c) suggest principles for the promotion and adoption of CSA among AMS

ASEAN CSA Guidelines Vol. I, Vol. II, and Vol III.



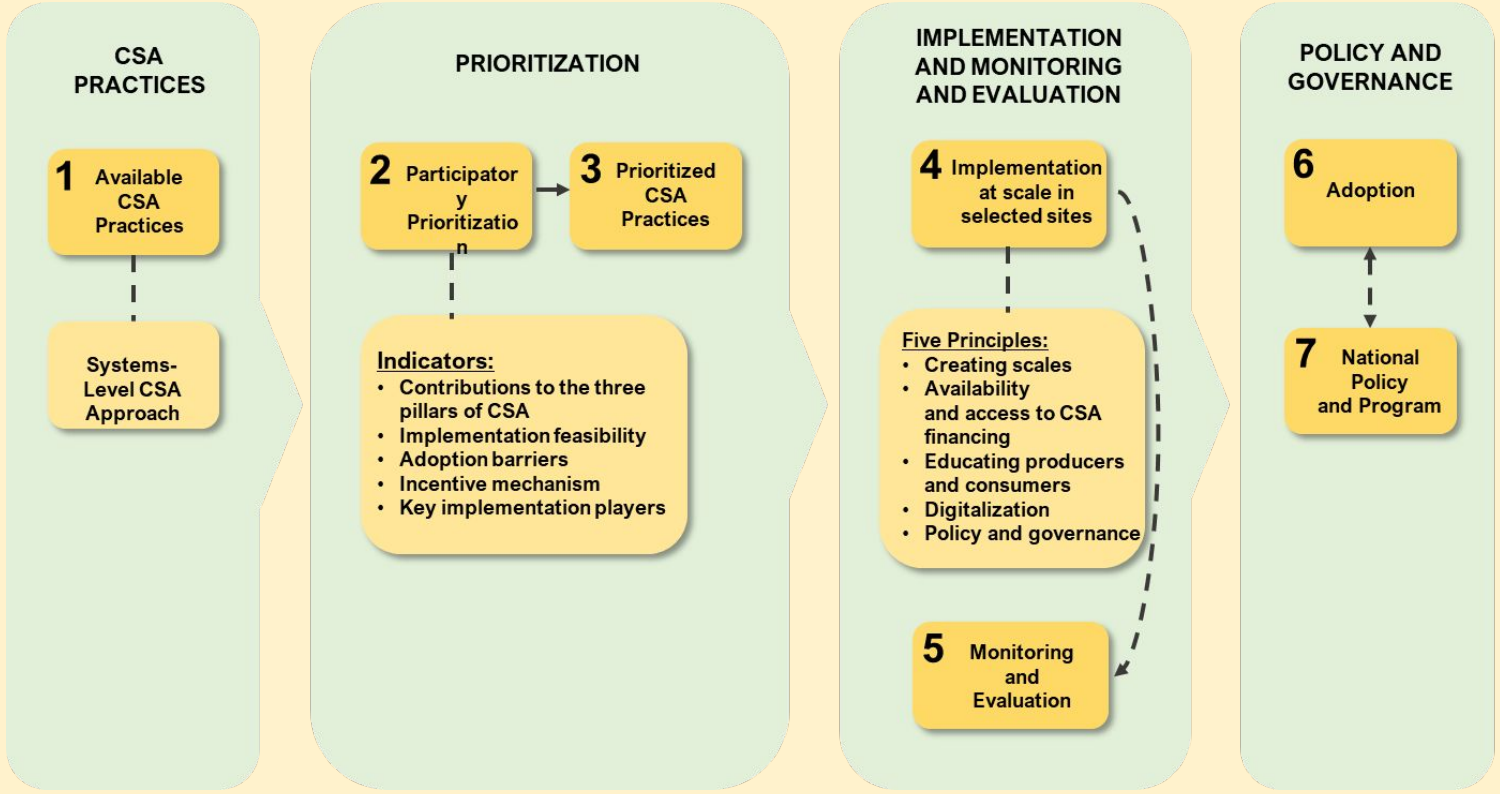




Source: Labios et al., 2019

ASEAN CSA Guidelines

Volume III: Overview of the Content



Stepwise process of prioritization and implementation principles for CSA promotion and adoption.

Source: Labios et al., 2019

PARTICIPATORY APPROACH IN PRIORITIZATION OF CSA PRACTICES

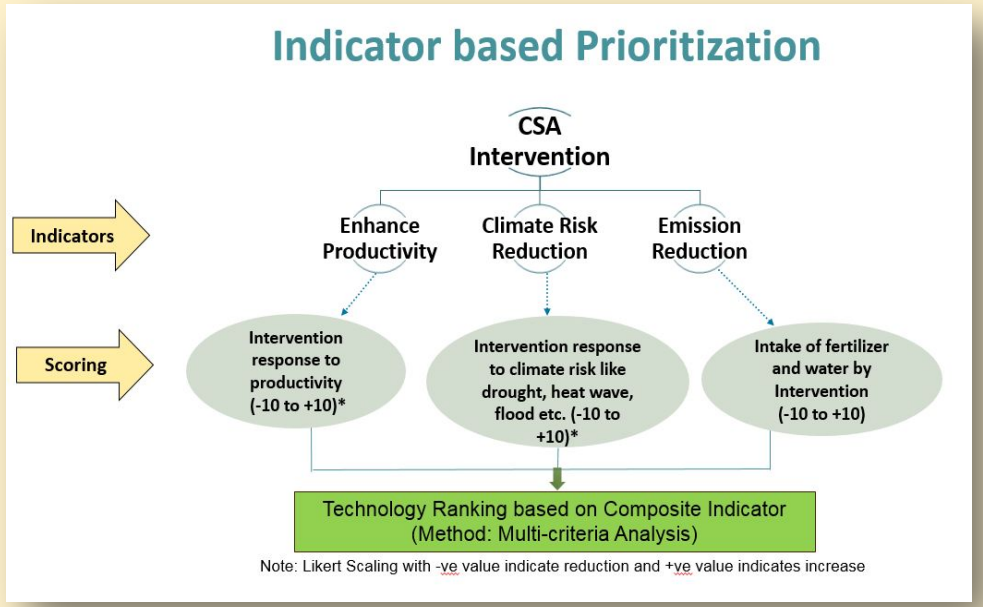
Which CSA approach should I implement?

Source: Labios et al., 2019

PARTICIPATORY APPROACH IN PRIORITIZATION OF CSA PRACTICES

Which CSA practice should I implement?

Example: Assessment of Contributions to CSA Pillars



*in the absence of biotic/abiotic stress

Source: Labios et al., 2019

PARTICIPATORY APPROACH IN PRIORITIZATION OF CSA PRACTICES

Which CSA approach should I implement?

Example: Scoring Table for Contributions to CSA Pillars

Scale: A 10-point likert scale (10% increase/decrease at each interval)

-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10

CSA Practices	Productivity		Resilience		Emission	
	Does the intervention help to increase productivity?	Does the intervention help to increase income?	Does the intervention help in reducing losses during climatic risk?	Which risk does it help to address?	How much extra fertilizer do you use?	How much extra water do you use?
Stress-Tolerant Rice Varieties						
Site-Specific Nutrient Management						
Controlled Irrigation (Alternate Wetting and Drying Technique)						
Ecological Engineering for Biological Pest Control						
PalayCheck System						

Source: Labios et al., 2019

PARTICIPATORY APPROACH IN PRIORITIZATION OF CSA PRACTICES

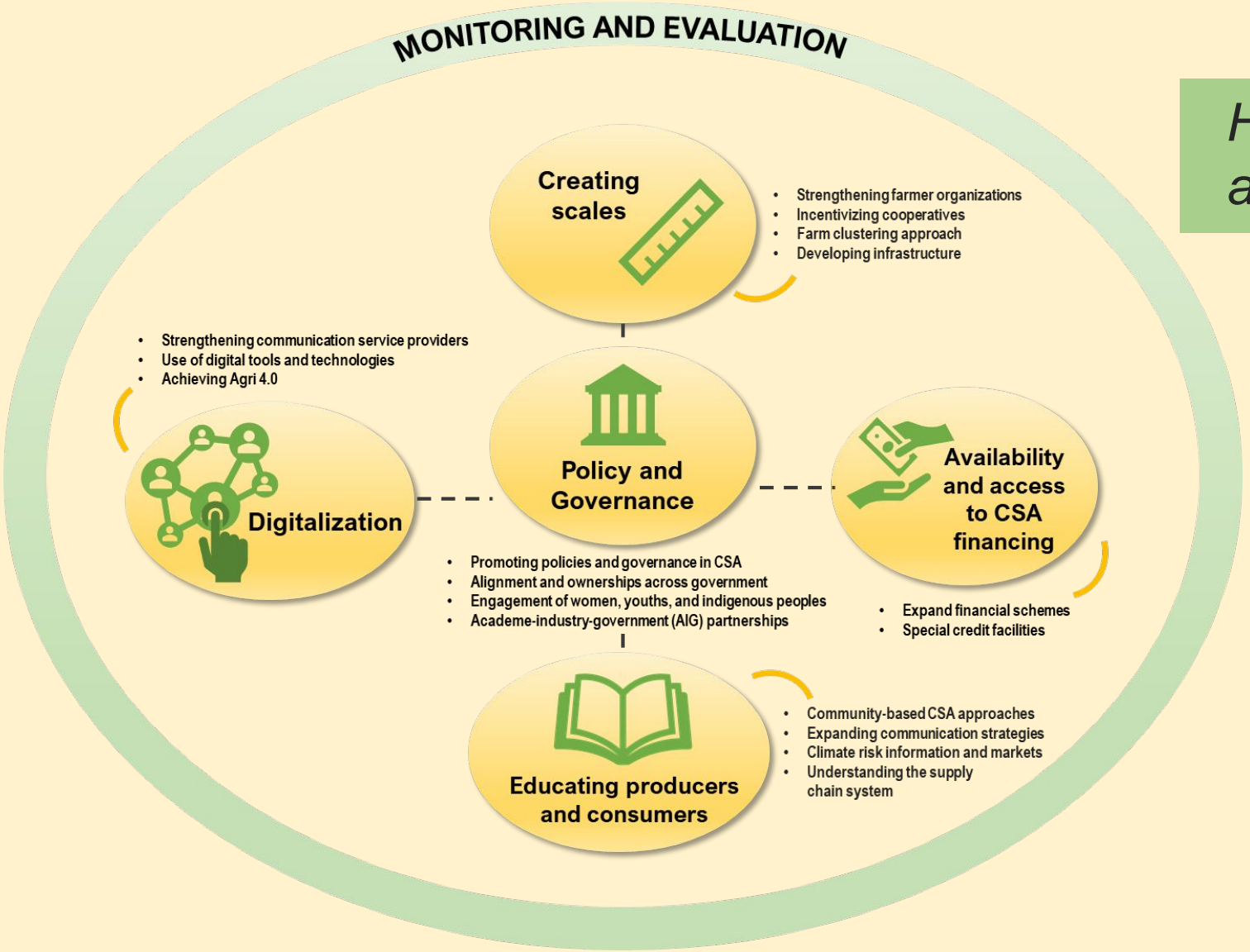
Which CSA approach should I implement?

EXAMPLE: Assessment scoring of CSA practices for irrigated lowland ecosystems, Philippines (*Contributions to CSA Pillars*)

CSA Practices	Assessment			
	Productivity	Resilience	Emission	Average Score
Stress-Tolerant Rice Varieties	0.65	1.15	0.71	0.84
Site-Specific Nutrient Management	1.13	0.69	1.14	0.99 (2)
Controlled Irrigation (Alternate Wetting and Drying Technique)	0.60	1.28	1.42	1.10 (1)
Ecological Engineering for Biological Pest Control	0.44	0.50	0.06	0.33
PalayCheck System	1.69	0.25	0.82	0.92 (3)
Floating Garden	0.58	0.40	0.20	0.39
Sorjan System	1.21	0.40	0.20	0.60
Rice-Fish System	0.94	0.31	0.20	0.48
Rice-Duck System	1.24	0.67	0.39	0.77
Laser-controlled land leveling	1.26	0.60	0.29	0.72
Grain Drying, Storage, Grain Cooling for Postharvest	1.01	0.83	0.08	0.64
Rice Straw Management	0.94	0.56	0.50	0.67

Source: Labios et al., 2019

SUGGESTED PRINCIPLES FOR THE PROMOTION AND ADOPTION OF CSA PRACTICES



How can we better promote and adopt CSA practices?

1. Creating Scales
2. Availability and Access to CSA Financing
3. Educating Producers and Consumers
4. Digitalization
5. Policy and Governance

Source: Labios et al., 2019

KEY MESSAGES

- Addressing challenges posed by climate change in food systems will require multi-sector approaches, cooperation, collaboration, and partnerships among stakeholders.
- The development and adoption of ASEAN guidelines are critical steps towards promoting CSA and Digital Technologies in Food and Agricultural Systems.
- However, it is the responsibility of the Member States (MS) to translate the guidelines and recommendations into robust policies and programs
- We need supporting policies and frameworks, inclusive financing, and better access to relevant advanced technology
- At the Regional level, it is still important to harmonize different MS policies and programs for inclusive and sustainable economic growth in the region.

Thank you!