

Enhancing Rice-Based Systems Resilience to Climate Change in Africa

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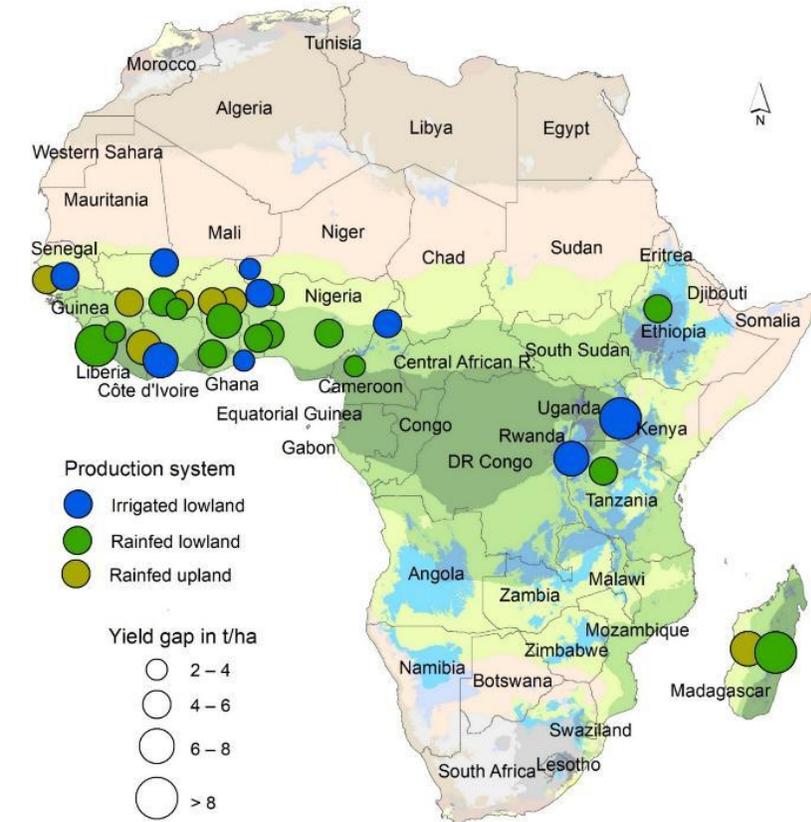


The 10th CARD General Meeting (GM10)
9th March 2026, Antananarivo, Madagascar



Role of rice in food security in Africa

- Rapidly rising demand: consumption growing 6%/year
- Staple food for 750 million people.
- Import dependency: 40% rice imported — US\$9 B/year.
- Low productivity: 2 t/ha vs 4.8 t/ha (world average).
- Climate change : 20–30% projected yield loss.
- GHG emissions increase: +1.2 t CO₂-eq per ton of rice (past 60 years)

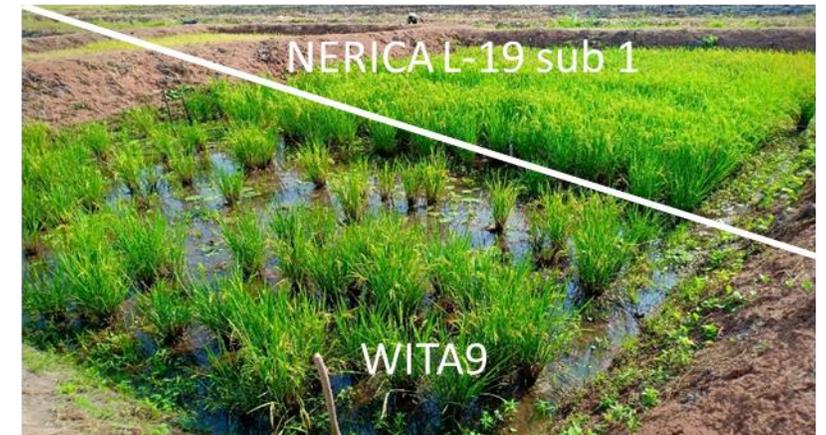


Yield gaps in SSA

Climate Resilient Innovations in Rice-Based Systems

■ Stress tolerant rice varieties

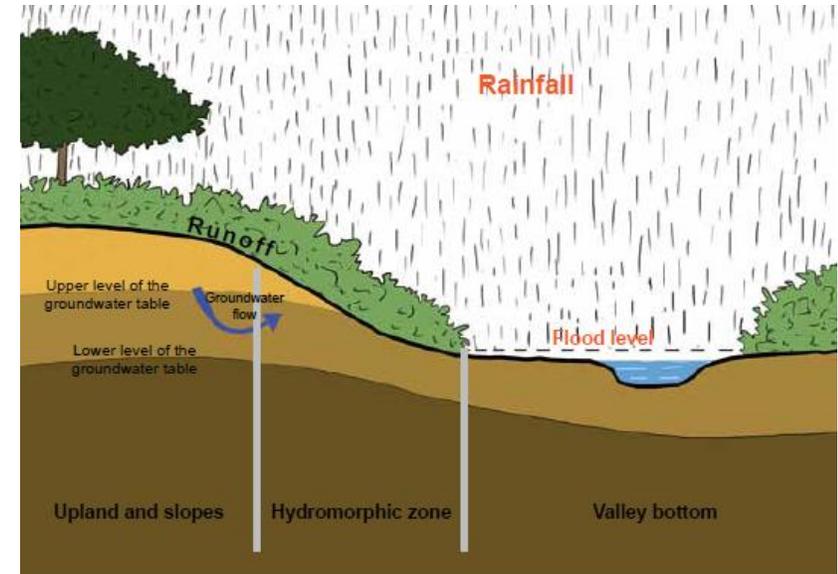
- Drought-tolerant: ARICA 3, KAFACI 1, WITA 9
→ +20% yield under drought
- Cold-tolerant: FOFIFA 194, 195, 196 → +2 t/ha
- Submergence-tolerant: NERICA-L 19-Sub1,
WITA 4-Sub1 → +1.1–4.5 t/ha
- Salinity-tolerant: ARICA 11, ISRIZ lines → +1–3
t/ha



Climate Resilient Innovations in Rice-Based Systems

■ Smart-Valleys

- Inland valleys = low-lying areas between uplands
- High potential: rice, fish, vegetables, fruits, livestock
- Cover \approx 190 Mha, but $<$ 5% cultivated
- Main constraint: poor water control
 - Drought and flooding
 - Limited farmer investment
 - Low adoption of improved varieties, good practices
 - Poor grain yield and quality
- If 10% developed \rightarrow Africa rice self-sufficient



Smart-Valleys

- Participatory & locally-led approach for water control
- Aim to sustainably intensify and diversify agricultural-based systems
- Low-cost: 700 vs > \$5,000/ha (irrigated approach)
- Nature-based solution (trees and water source preserved)
- Easily replicated and adapted by farmers



Smart-Valleys



Pilots and adoption

- > 200 sites, 11 countries; ± 50,000 farmers



Productivity gains

- Rice yield increase: 2.0 → 4.3 t/ha
- Vegetables, legumes, trees, fish



Economic benefits

- Farmers' income: USD 500 → 1,200 /ha



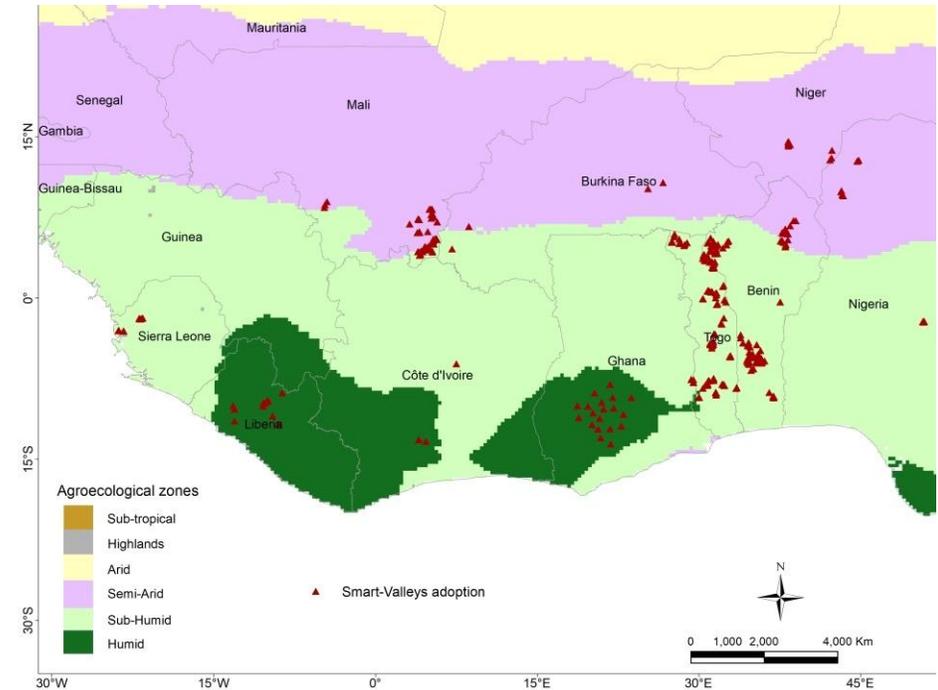
Food security

- Household food consumption score: 60 → 67



Ecosystem services

- Carbon sequestration
- Biodiversity



Biochar

- Soil degradation and low soil organic matter, major challenges for rice sustainability.
- Biochar: Stable, carbon-rich material produced by pyrolyzing biomass under limited oxygen.
- Benefits
 - ✓ Improves soil moisture (5 – 10%)
 - ✓ Enhances nutrient holding capacity
 - ✓ Increases yield (10 – 20%)
 - ✓ Increases income (30 – 60%)
 - ✓ Reduces methane (10 – 30%)



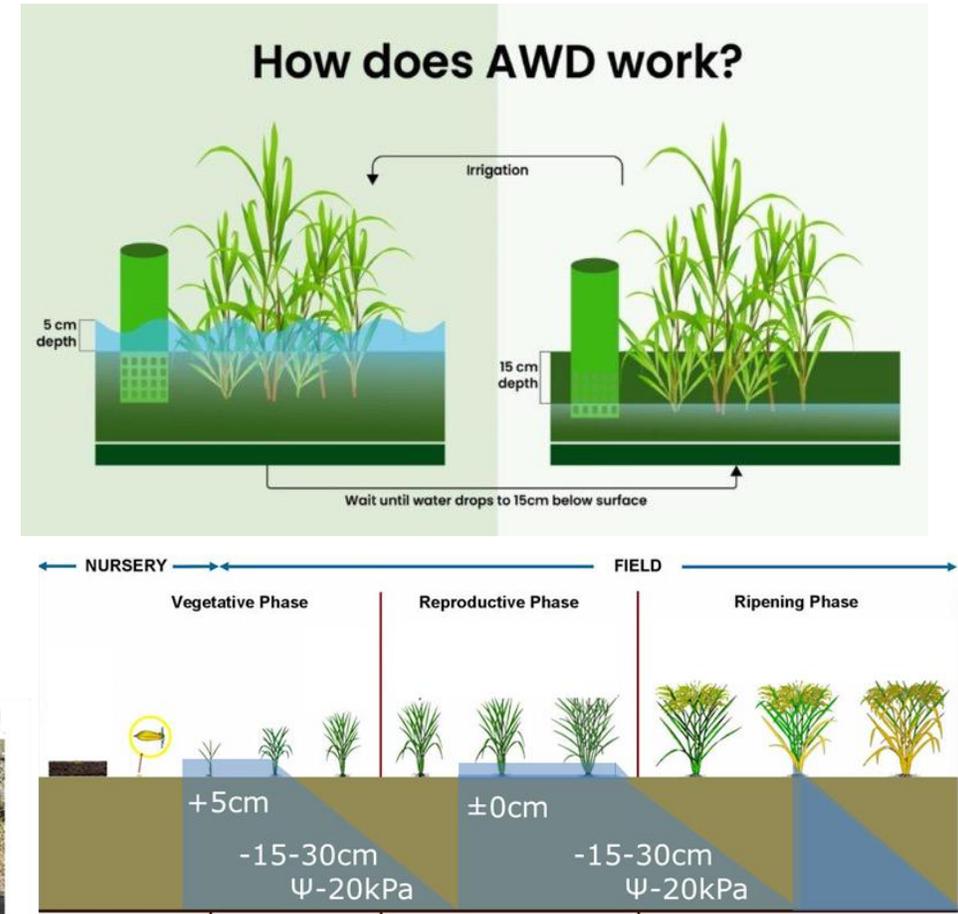
Direct seeded rice

- Labor scarcity and high labor costs, major challenges to rice cultivation.
- Direct seeding: sown directly in field.
- Benefits
 - ✓ Reduces labor (20 – 30%)
 - ✓ Reduces water use (20 – 40%)
 - ✓ Supports timely planting windows
 - ✓ Increases income (5 – 20%)
 - ✓ Reduces methane emissions (30 – 60%)
- Mechanical seeder: further reduced labour used



Alternate wetting and drying

- Water scarcity: major challenge for irrigated rice.
- AWD is based on water level in tube.
- Benefits of AWD
 - ✓ Saves irrigation water (30–60%)
 - ✓ Strengthens resilience to drought spells
 - ✓ Maintains rice yield and grain quality
 - ✓ Increases income (5 - 20%)
 - ✓ Reduces methane emission (30 – 50%)
- Suitable for irrigated systems with timely access to water.



Integrated rice-fish

- Addresses low farm income, limited dietary diversity, and dependence on agrochemicals in rice systems.
- Combined production of rice and fish in same field
- Benefits
 - ✓ Reduces pressure: fish consume insects and weeds.
 - ✓ Achieves same yield without fertilizer compared to recommended fertilization
 - ✓ Increases farmers income
 - ✓ Diversification of income and nutrition.
 - ✓ Increases soil carbon (0.3–1.0 t C/ha/year).



Multiple harvest (ratoon) rice

- Addresses land scarcity and rising production costs.
- Several harvests of rice from single seeding.
- Benefits
 - ✓ Increased total yield and production (30 – 60%)
 - ✓ Reduces water use (15 – 30%)
 - ✓ Reduces labour (20 – 40%)
 - ✓ Increases income (20 – 60%)
 - ✓ Reduces methane emissions (25 – 50%)



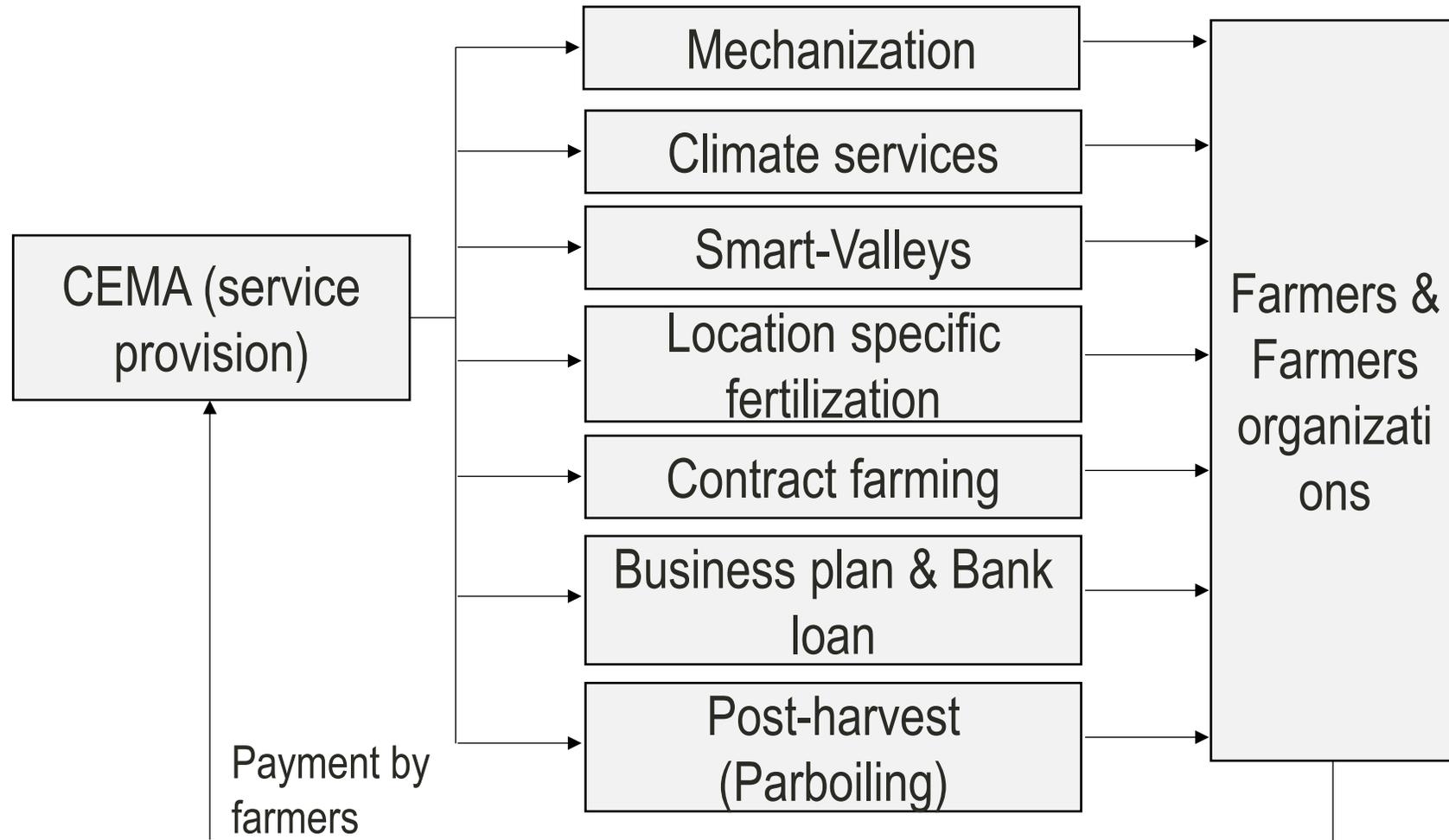
Conservation agriculture

- Addresses soil degradation, erosion, and declining soil fertility in rice cropping systems.
- Conservation agriculture: reduced/no tillage + cover crop + crop rotation.
- Benefits
 - ✓ Improves soil moisture (10 – 30%)
 - ✓ Reduces erosion and runoff
 - ✓ Increases rice yield (+ 4 – 30%)
 - ✓ Increases soil carbon budget (+1 – 3 t/ha/year)



Moving from pilot to large scale adoption: examples of successful business models

■ CEMA model: Mechanization & Climate-Smart Rice Services in Mali



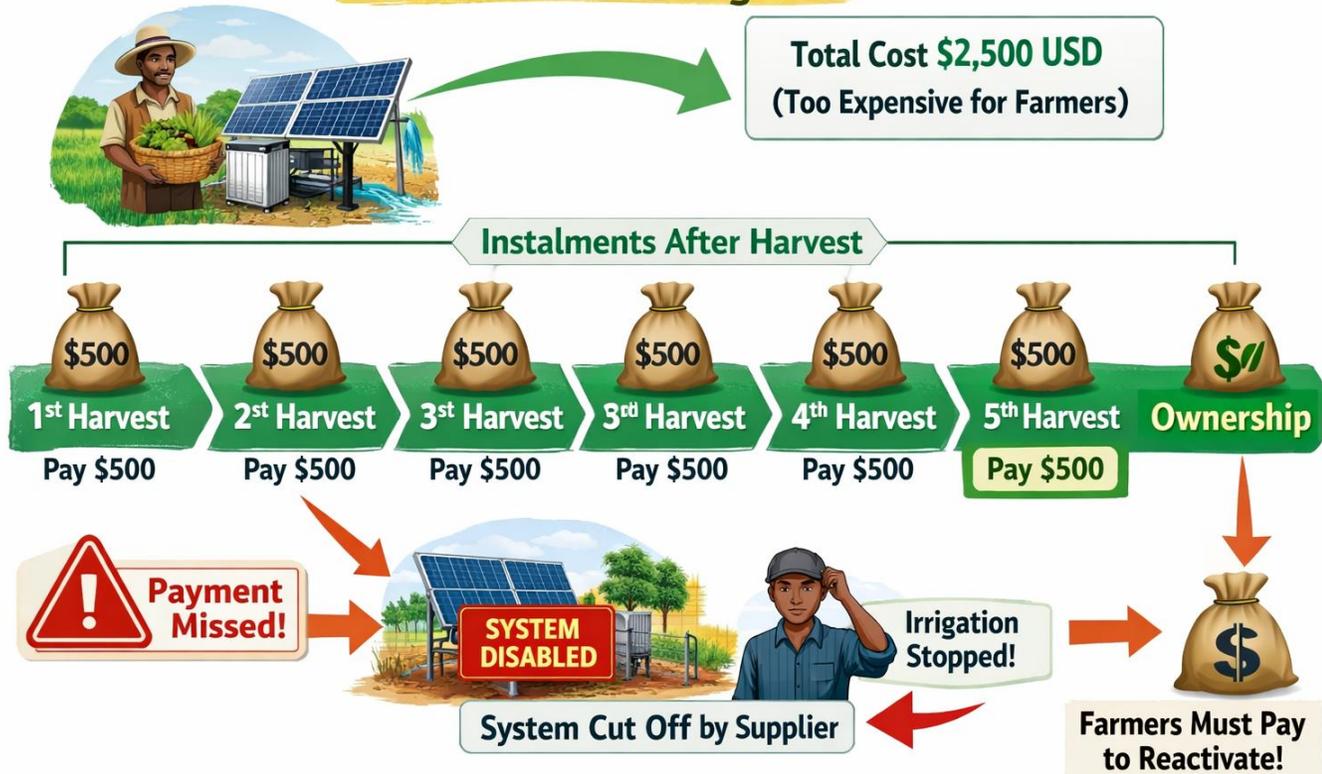
- Impact:
 - ✓ 312,040 farmers (40% women)
 - ✓ +1.6 t/ha yield
 - ✓ +\$800/ha income

Moving from pilot to large scale adoption: examples of successful business models

- Pay-As-You Go business model: scaling solar powered systems in Mali

Pay As You Go Business Model

for Solar Powered Irrigation



Impact:

- ✓ 6255 farmers (1626 women)
- ✓ Saved fuel costs
- ✓ Increased drought tolerance; diversification (vegetables, fish)
- ✓ Income: + \$ 5,262/ha/year

Conclusions

- Proven impacts: innovations increase yield, income, climate resilience and reduce GHG emissions.
- Business models: Validated with private sector for scaling beyond pilots.
- Enabling environment needed
 - ✓ Knowledge
 - ✓ Extension systems
 - ✓ Partnerships
 - ✓ Finance
 - ✓ Infrastructure (small-scale e.g. Smart-Valleys for water control)
 - ✓ Policy

Thank you!
Merci!