AfricaRice

APPSA 2nd SCIENTIFIC CONFERENCE

2 - 4 April 2025 | Manthabiseng Convention Centre
Maseru, Kingdom of Lesotho

Innovations to support the development of African rice value chain

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CCARDESA
Centre for Coordination of Agricultural Research and Development for Southern Africa

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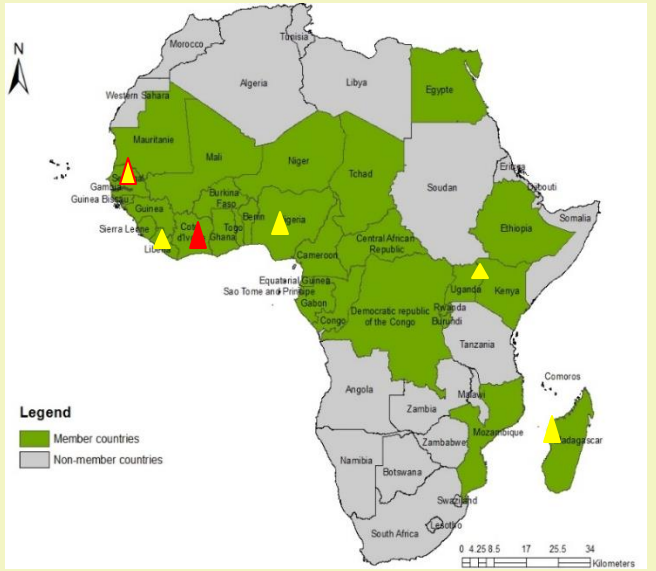
Africa Rice Center (AfricaRice)

- **AfricaRice** is one of 15 international agricultural research centers of CGIAR
- **AfricaRice - an association of 28 African member countries (Counsel of Ministers & National Expert Committee)**
- **AfricaRice has 4 research programs; 6 Task Forces and & 6 Research Stations in Africa**



Research Programs

1. Genetic Diversity and Improvement
2. Sustainable Productivity Enhancement
3. Policy, Innovation Systems and Impact Assessment
4. Rice Sector Development Program

Task Forces

1. **Breeding**
2. **Agronomy**
3. **Postharvest and Value Addition**
4. **Policy**
5. **Gender**
6. **Mechanization**

Research Stations

Cote d'Ivoire

Senegal

Liberia

Nigeria

Uganda

Madagascar

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Overview of the Rice Sector in Africa

- Staple food for 750 million Africans
- Production: 23 Mt white rice
- Consumption: 38 Mt
- Average yield in Africa: 2.3 t/ha

  Irrigated Lowland: 2.2 – 5.8 t/ha,

  Rainfed Lowland : 1.1 – 5.2 t/ha,

  Rainfed Upland: 1.0 – 2.5 t/ha (Tanaka et al., 2017)

- Average world yield: 4.6 t/ha

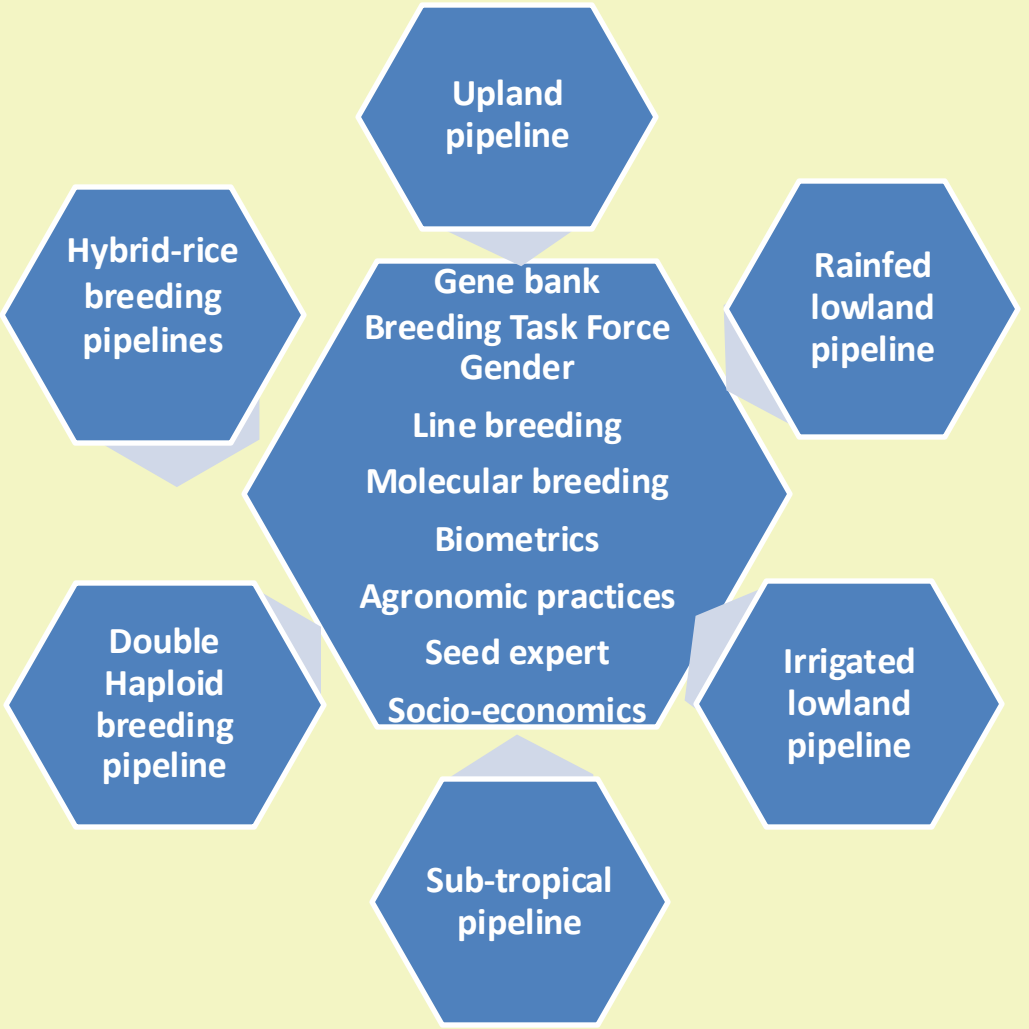
Rice area in Africa (FAOSTAT, 2023)

Total harvested area: 18,446,647 ha

Irrigated (26%); Rainfed (38%); Upland (32%); others (4%) (Diagne et at., 2009)

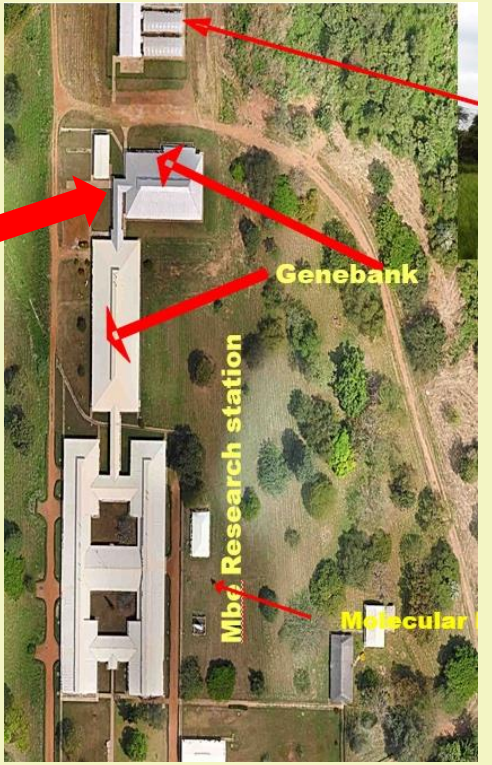
FAOSTAT, 2023

Rice Breeding structural organization at AfricaRice



Rice Biodiversity Center for Africa

The Rice Biodiversity Center for Africa and its genebank holds the largest collection of African rice in the world and the largest rice collection in Africa with almost 21,681 accessions in an ultra-modern infrastructure.



- Capacity to conserve under optimal conditions, up to 100,000 rice accessions.
- The rice genetic resources housed in AfricaRice genebank are key to developing new varieties adapted to African agro-ecologies

Improved varietal development and dissemination

- *Support Varietal Release Efforts in SSA : Between 2022-2024 alone, 65 varieties from rainfed upland, rainfed lowland, Irrigated and High Elevation were released in Senegal (4), Uganda (2), Ghana (8), Mali (11), Tanzania (1), Zambia (5), Nigeria (3), Madagascar (2), Rwanda (3), Ethiopia (1), Côte d'Ivoire (6), Burkina Faso (5).*

Digital tools for improving productivity rice-based systems

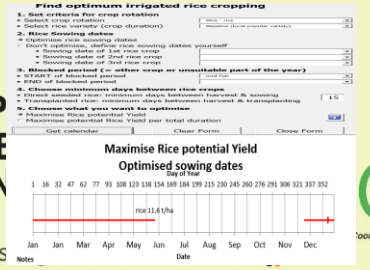
1. RiceAdvice: An Android-based app that provides customized guidelines for optimal fertilizer management for improving rice farmers' production and income. It can be adapted to any irrigated or favorable rainfed lowland in Africa.

Rice GAPfinder

A tool to collect data on the Sustainable Rice Platform Standard and Performance Indicators

2. Rice GAPfinder: A tool to collect data on the Sustainable Rice Platform Standard and Performance Indicators for accelerating data-driven solutions

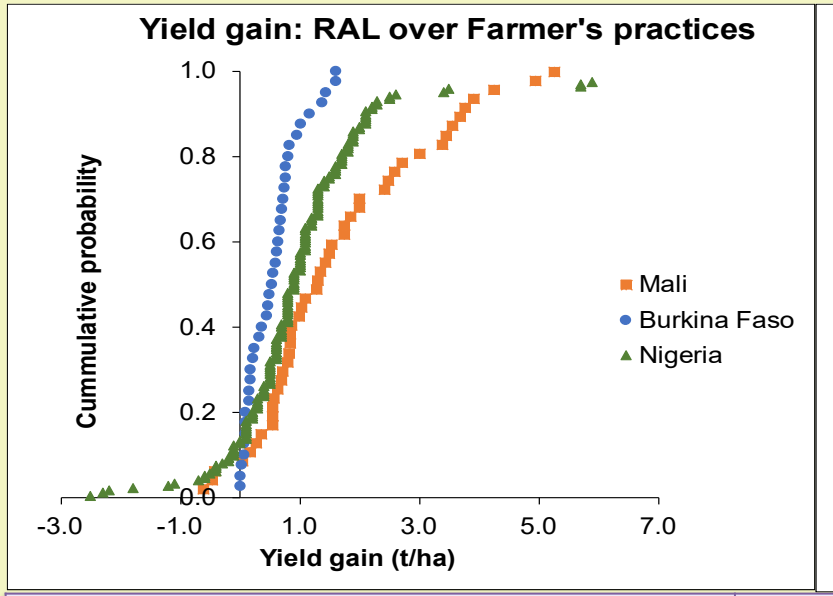
3. Crop Calendar Construction: tool that can optimize rice potential yield and the sowing dates using crop simulation model.

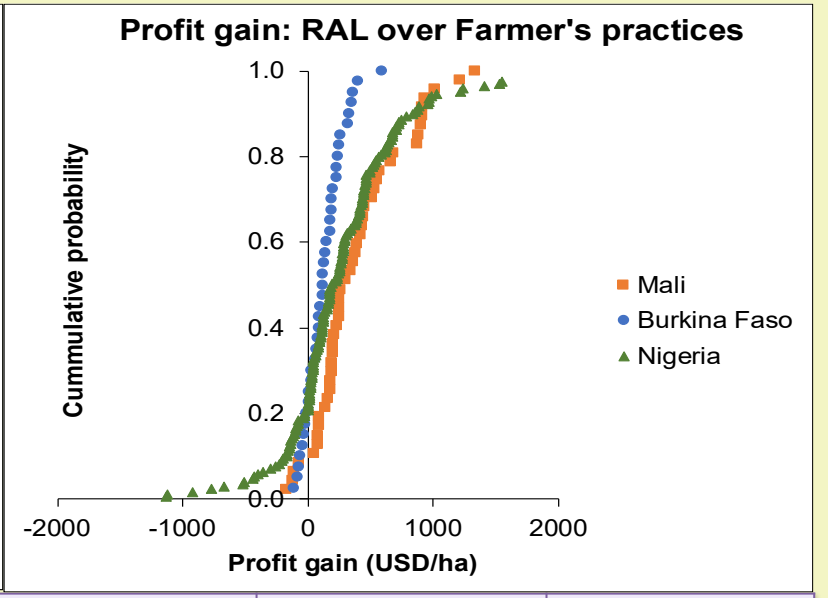


4. WeedManager: an interactive decision support tool, which provides weed management advices with rice farmers based on the response to easy-to-answer multiple-choice questions about the rice farm

RiceAdvice-WeedManager

RiceAdvice Lite (RAL) boosts agronomic gains key performance indicators in irrigated rice



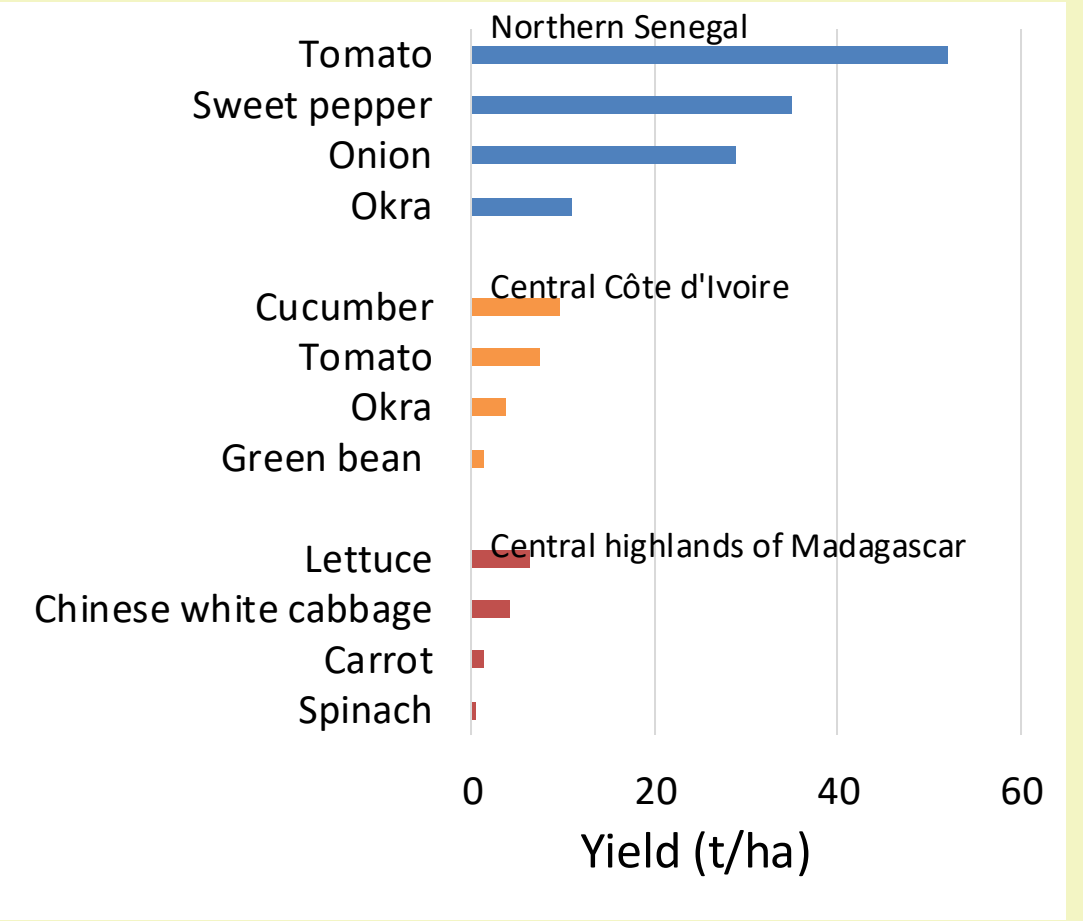


	Burkina Faso	Mali	Nigeria
Mean FP yield	5.9	3.0	3.8
Mean yield gain (t/ha) over FP	0.6 (10%)	1.7 (56%)	0.9 (26%)
Profit gain over FP (USD)	137 (11%)	404 (78%)	393 (27%)

- **Yield gain: 10–56%**
- **Profit gain: by 11–78%**

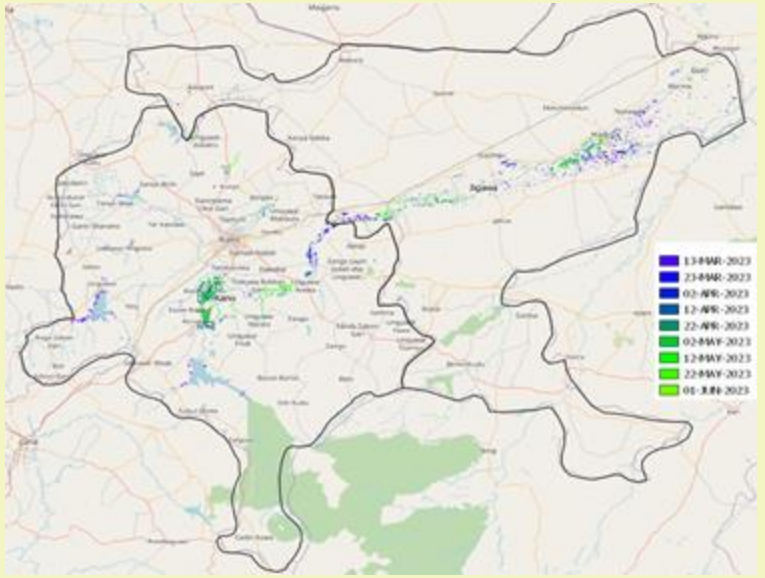
Introduction of off-season crops/vegetables in lowland rice-based systems for income generation

- Promising crops/vegetables identified through participatory evaluation in three countries.
- Large yield variation across countries due to weather conditions & management practices.

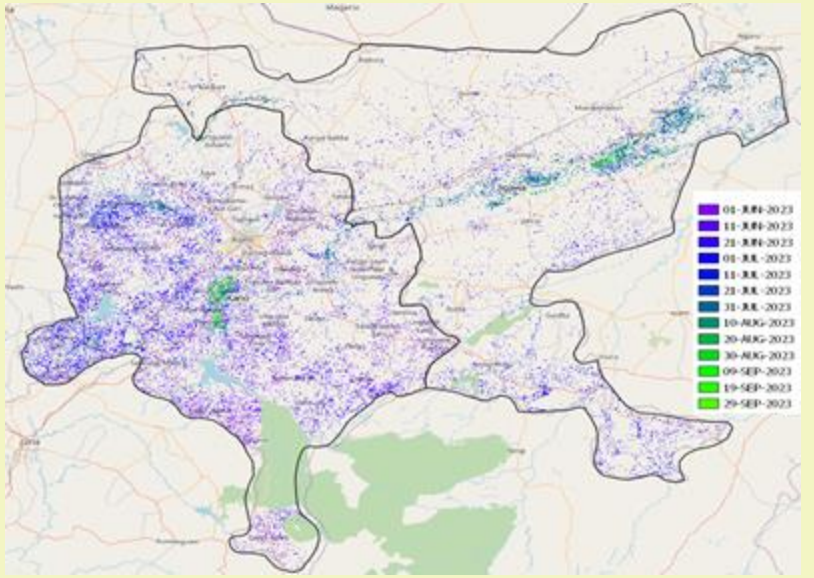


Rice area and yield estimation based on remote sensing and a rice growth simulation model in Nigeria

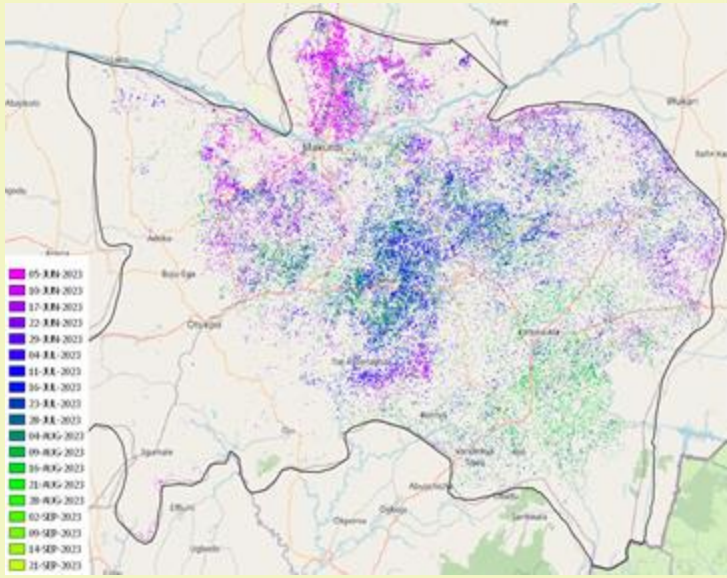
- **Objectives**:
  1. Estimating rice cultivation area and yield
  2. Assessing rice yield gap and yield limiting factors.
- **Approach**: Remote sensing and crop modelling using **RiceYES** which serves as an interface between MAPscape-RICE and ORYZA model



Rice area and Start of season (SoS) Kano & Jigawa states, dry season 2023



Rice area and Start of season (SoS) Kano & Jigawa states, wet season 2023



Rice area and Start of season (SoS) Benue state, wet season 2023

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AfricaRice
Rice science at the service of Africa
La science rizicole au service de l'Afrique

CGIAR

Smart-Valleys for improved water control in inland valleys

- Low-cost and participatory approach for water control in inland valleys.
- Combines farmers and scientifical knowledge and involves design and implementation of irrigation & drainage canals, bunding, leveling, while preserving ecosystem services.
- Developed and adapted through collaborations among AfricaRice, NARS and Universities.
- Requires 700 USD/ha against 5,000 USD/ha for classical approach.
- Adopted by > 50,000 farmers in 10 West and Central African countries.
- Increased rice yield by 2.3 t/ha, farmers' income by $687/ha and diversification with vegetables, legumes and fish in inland valleys.

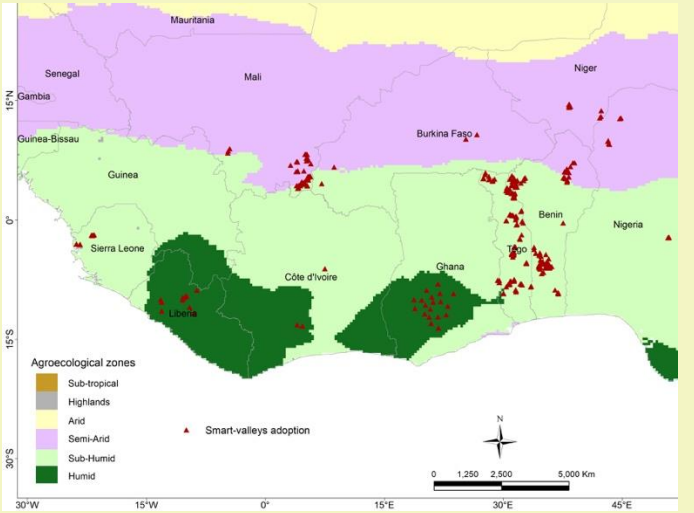

Fig. Smart-Valleys adoption sites
Source: Updated from Dossou-Yovo et al. (2022)
https://www.sciencedirect.com/science/article/pii/S0378429022001198

For further information, contact Elliott Dossou-Yovo, e-mail: e.Dossou-yovo@cgiar.org

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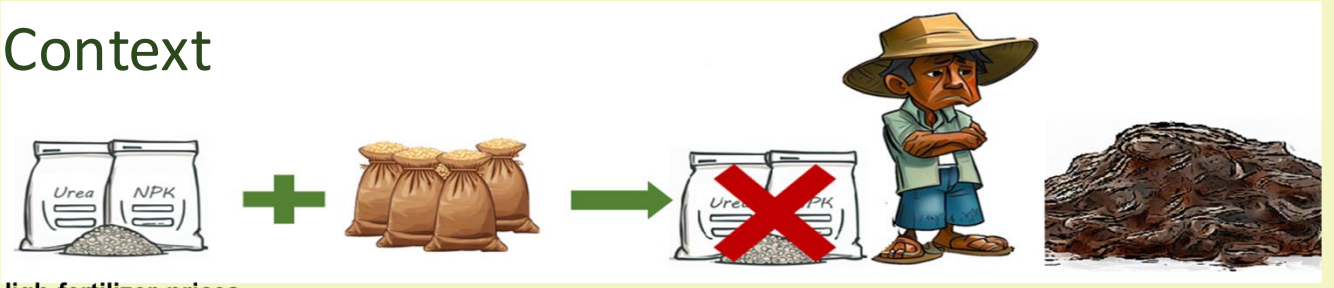
Rice yield and quality improvement

through integrated nutrient management & agronomy fortification for productivity and nutritional quality enhancement

Context

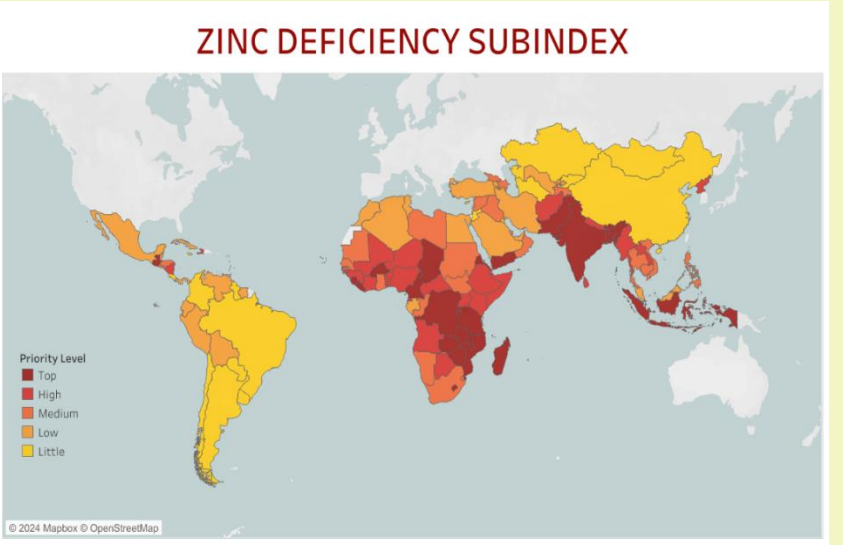


High fertilizer prices (1.5 USD per kg of Urea, 1.31 USD per kg of NPK fertilizer)

Low farmgate paddy prices (0.23 USD per kg)

Disincentive for farmers to apply mineral fertilizers

Farmers rely solely on locally available organic inputs



Integrated nutrient management options

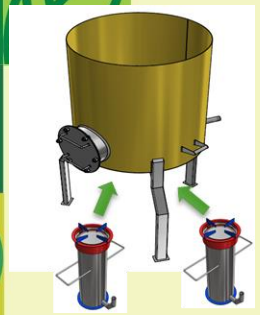
(to improve productivity and quality)

- Locally available organic manures; N fixing green manures; composting of biomass (straw); Mushroom production – additional income
- Partial substitution of inorganic fertilizers – N, P, K and Zn (soil and foliar application); Agronomic fortification & Use of biofortified varieties
- Rice parboiling for further improve nutritional quality

Parboiled rice

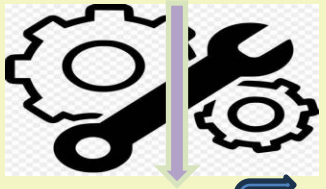
- Micronutrients deficiencies “Hidden hunger” caused by deficiencies in essential minerals like Zinc (Zn) and vitamins
- Zn deficiency:
  - Affects over one billion people worldwide due to inadequate diets.
  - Prevalent in SSA and remains a major health concern.
  - leads to impaired immune function, growth and development issues, skin and wound healing problems, etc.

Upscaling the GEM parboiler for large-scale use

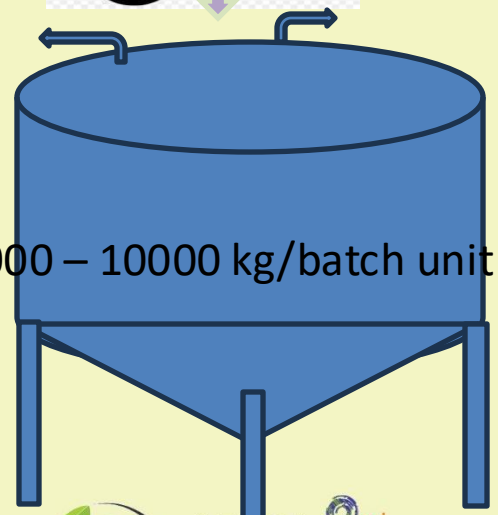


400 kg/batch unit

- GEM parboiling has been used for Fe, Zn & Mg Fortification during Steaming
- Combination of GEM parboiling and right variety has been used to produce Ultra-low glycemic rice.
- GEM parboiled rice recorded higher nutrient content than traditional parboiled.
- GEM parboiling uses rice husk, a by-product of rice milling as energy source instead of firewood commonly used in the region.
- GEM parboiling with rice husk is smokeless with no blackening of parboiling equipment making it healthier and time saving for users.
- GEM operates at atmospheric pressure and mainly by small-scale users

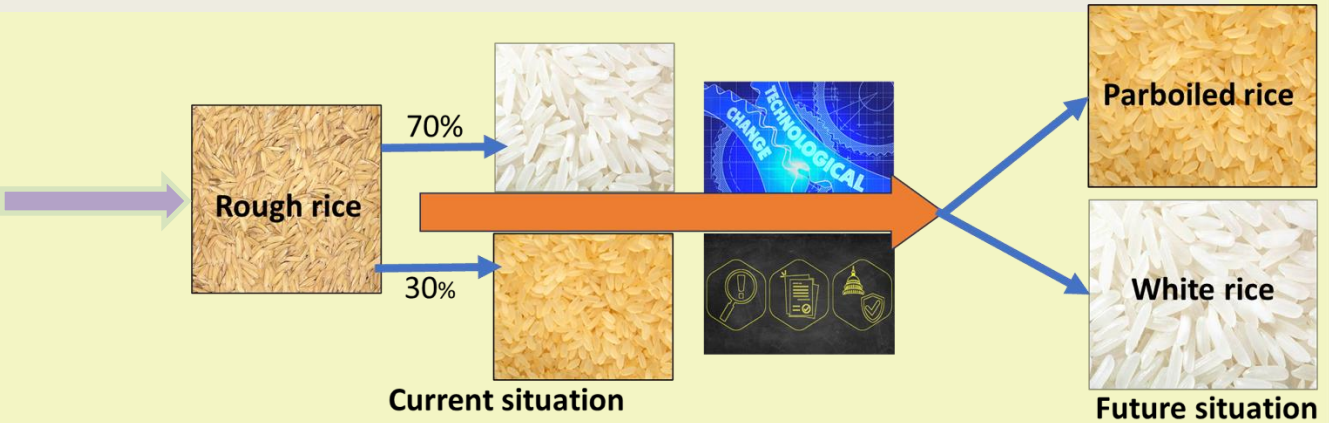


Engineering



5000 – 10000 kg/batch unit

- Auto-feeding GEM parboiler
- Combined parboiling and drying in one system.
- Completely pressurized



Projected trend in type of rice that consumers will be demanding

Other on-going research…

- Climate change adaptation and mitigation
- Irrigation management
- Salinity management
- Long-term trials for yield stability and soil health
- Scale-appropriate mechanization etc.

Potential of expanding to Southern Africa…

- South Africa,
- Zimbabwe and
- Eswatini showed interest to join AfricaRice as member states


Thank you