Exploring rice intensification strategies that optimize food security, climate change and health co-benefits

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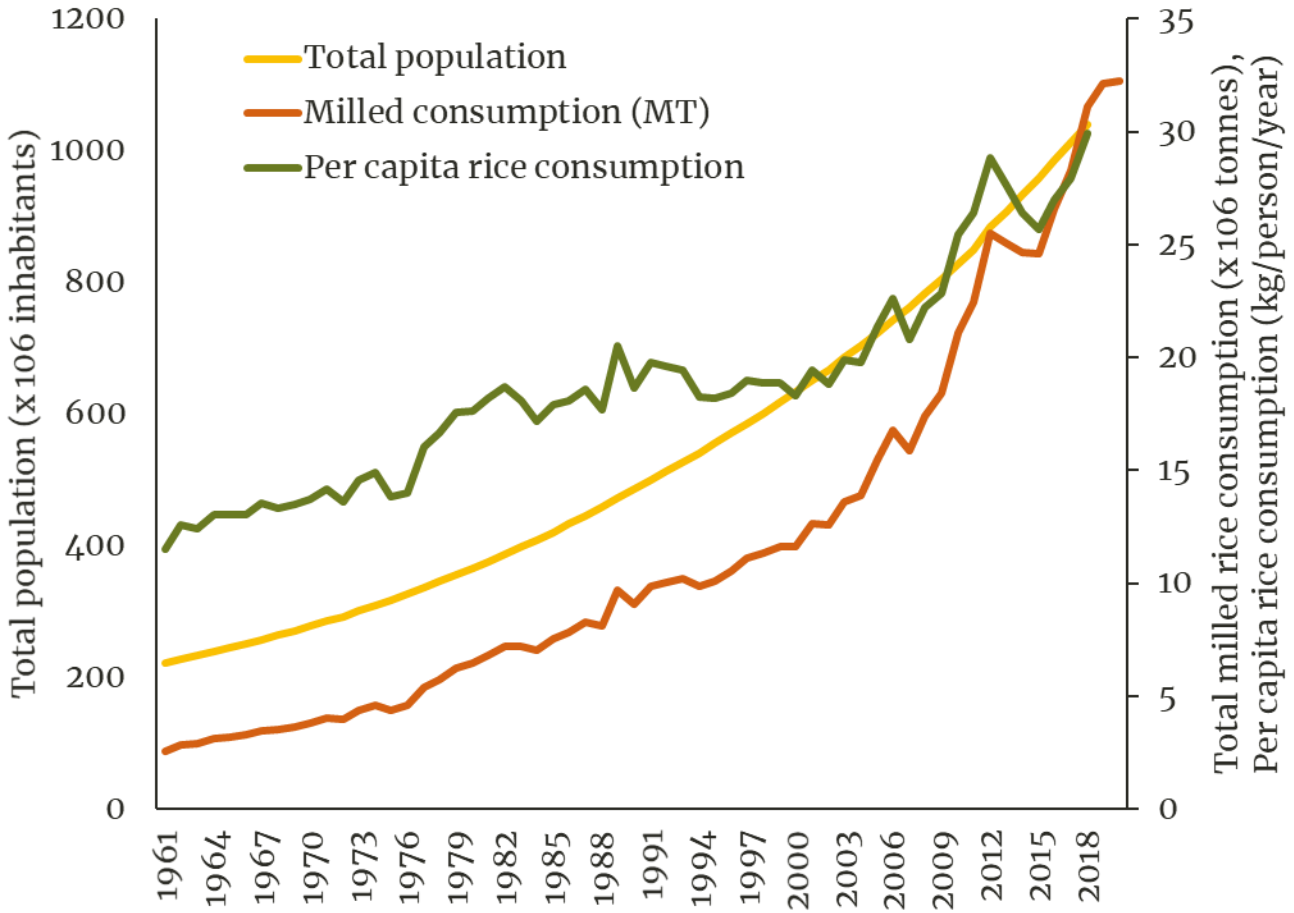
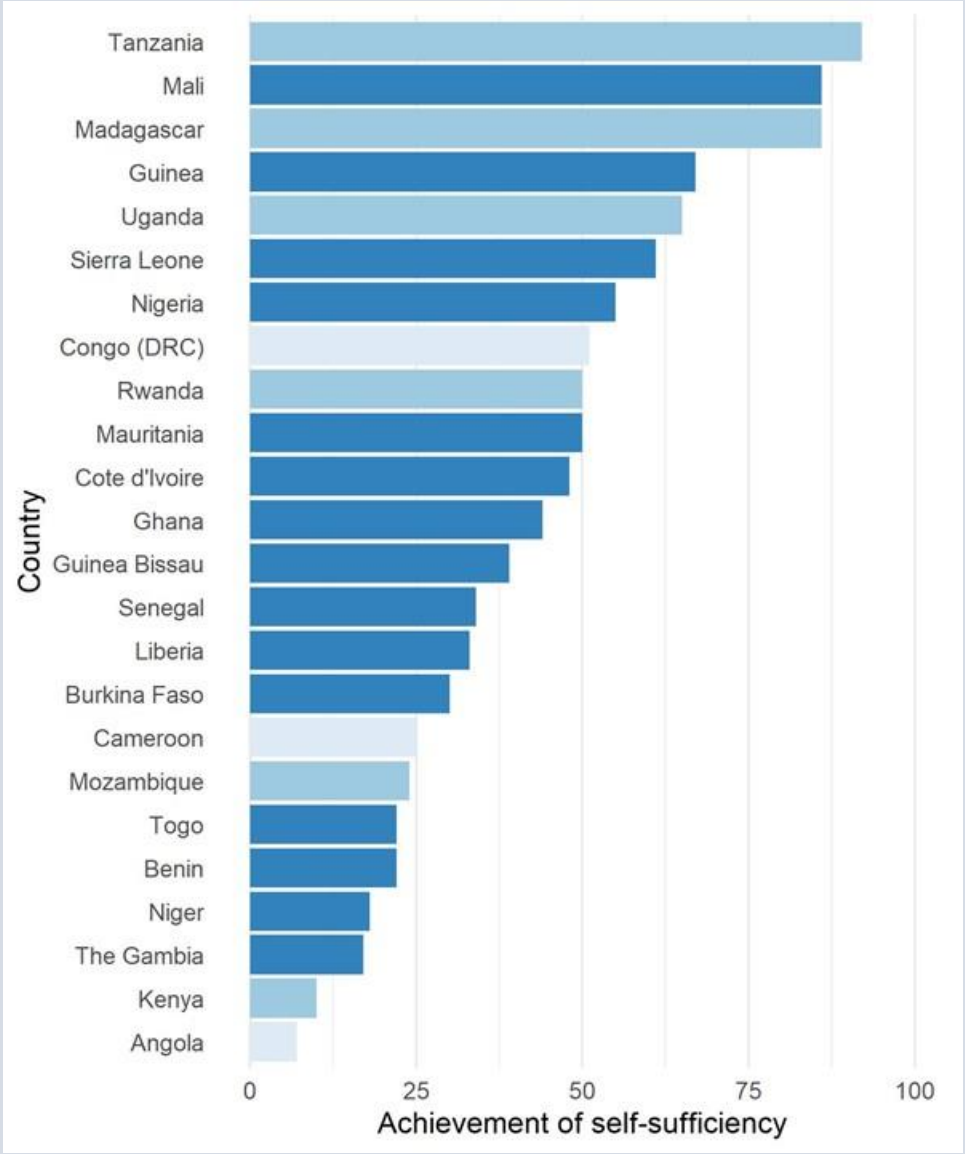
Demand for rice and self-sufficiency in sub-Saharan Africa

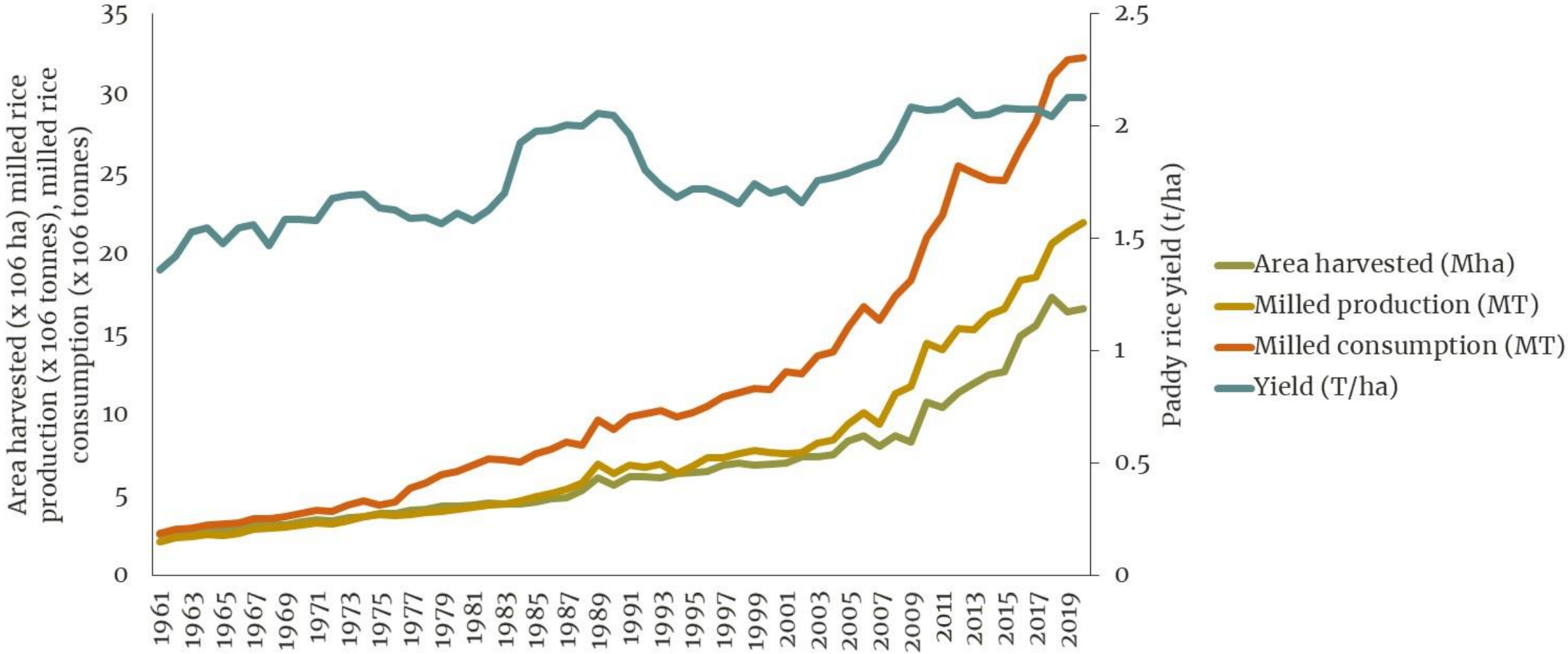




No sub-Saharan African country has met the rice self-sufficiency objective

Source: Africa Rice Center

Trends in rice production



Recent review on impact of rice cultivation on malaria risk

A) **New evidence that irrigated rice does bring more malaria in Africa**
   - Interventions more equitable
   - Infection prevalence not as intense

B) **The relationship between rice and malaria will probably be an emerging problem for Africa**
   - Not surprising: rice fields were remaining hotspots for local malaria vector species in places like China, Portugal, and Turkey

Effect of larviciding, other biological control, and rice cultivation practices on malaria vectors

	Does it work? (% effectiveness)	No. of studies (no. in SSA)	Farmer acceptability
Biological larvicides	-60%	10 (2)	**Not economical**
Synthetic organic chemicals	Around -73%	6 (2)	
Fish	Around -84%	6 (1)	**Additional income and source of protein**
Intermittent irrigation	-35% (late-stage)	7 (2)	**Mixed** • **Well-accepted in Portugal & China – higher yield and lower water consumption** • **Skeptical in India – water distribution issues**

Opportunity for collaboration

Project title: Rice intensification: could climate change interventions help African malaria elimination?

Donor: Wellcome Trust

Period: 27 months (started in 2019)

Main partners: LSHTM, Africa Rice Center, IRRI

Methods

- To determine the effect of different rice cultivation practices on malaria vector density, rice yield, water productivity, and greenhouse gas emissions (GHGs), 7 field trials were conducted in central Côte d'Ivoire and eastern Tanzania.
- Each trial assessed the effect of different growing techniques, including
  - the period of flooding during land preparation,
  - method of crop establishment,
  - timing of fertilizer application, and
  - water management technique (e.g., alternate wetting and drying irrigation – AWD, and mid-season drainage)

Results

- Fields that were flooded for longer periods of time during land preparation, direct-seeded (vs. transplanted) or with fertilizer were associated with more malaria vectors.
- Compared to continuously flooded fields (CF), fields under AWD and mid-season drainage were not effective in reducing malaria vectors in Côte d'Ivoire but did not cause any yield penalties, consistently reduced water use by 23 – 49%, reduced global warming potential by 30 – 57% and increased water productivity by 18 – 53%.
- On the other hand, fields under AWD were successful in reducing malaria vectors by 63.8% (95% CI -74.3, -49.1, $p<0.0001$) in Tanzania.

Conclusions

There are rice-growing techniques that can minimize mosquito and greenhouse gas production particularly methane, whilst reducing water use and sustaining yields.

Some techniques need to be adjusted and repeated across more trials (and more seasons and locations) to demonstrate its efficacy.

Summary &conclusions

Rice sector development will continue, but meanwhile, enhance collaborative research between ag and health sectors

Research priorities

- Integrate mosquito control into rice research
  - Development of less labour-intensive methods of counting mosquitoes
  - Multi-centre/location approach
- Effectiveness of each rice technique (e.g. tilling, fertiliser application etc.) on mosquitos needs to be investigated