Trying to beat the water

Understanding the mangrove swamp rice production in Guinea-Bissau

Learning and Unlearning from my inter-transdisciplinary research
Lisbon, 27 June 2025, Viriato Cossa




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Mangrove Swamp Rice (MSR) agroecosystem in Guinea-Bissau

-Poor institutional and infrastructural development (research, roads);

-Almost no use of biocides and modern seeds (farmers' seed system);

-High labor constraints & reliance on rainfall;

-Limited trace of most of introduced/tested technologies in the field of agronomy;

- Many key constraints identified and challenges to link the literature and the farmers' practices (lack of understanding).

Choosing what to focus on-power of knowledge

Call for integration, holistic approaches, transformation or transition (How?)

-On-farm innovations, farmers' knowledge and practices (transdisciplinary)

-Design in action and the role of reflexivity for knowledge justice

Objective

-Characterize MSR farmers' knowledge and practices in Southern Guinea-Bissau

Research questions:

-What are the effects of different farmers' practices on farmers' performance and rice yield and which strategies or innovations can be used to increase their performance in the mangrove swamp rice agroecosystem in Guinea-Bissau

The shift on what to report (the thesis)

Studies no.	Titles
1	To plow or not to plow: endogenous strategies for preparing mangrove swamp rice fields
2	Analysis of endogenous strategies to establish rice crops in mangrove swamp fields
3	Knowing without counting: Why interventions on plant density in Mangrove rice do not persist
4	Varieties, seed systems and experimentation: Lessons learned from the mangrove swamp rice agroecosystem

Methodology – The case area

- The Tombali region, Four villages
- Two ethnic groups-Balantas and Nalus

Methodology

Mixed-Method approach: loop of diagnosis-exploration-implement-assessment

- Technography approach (about 19 months) in Tombali from 2021-2023.

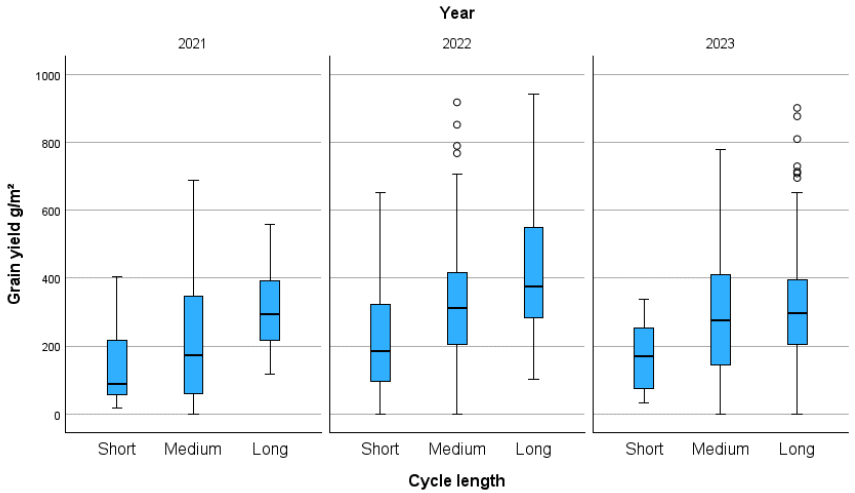
  Participant observations, interviews, focus group discussions and workshops from 2021-2023.

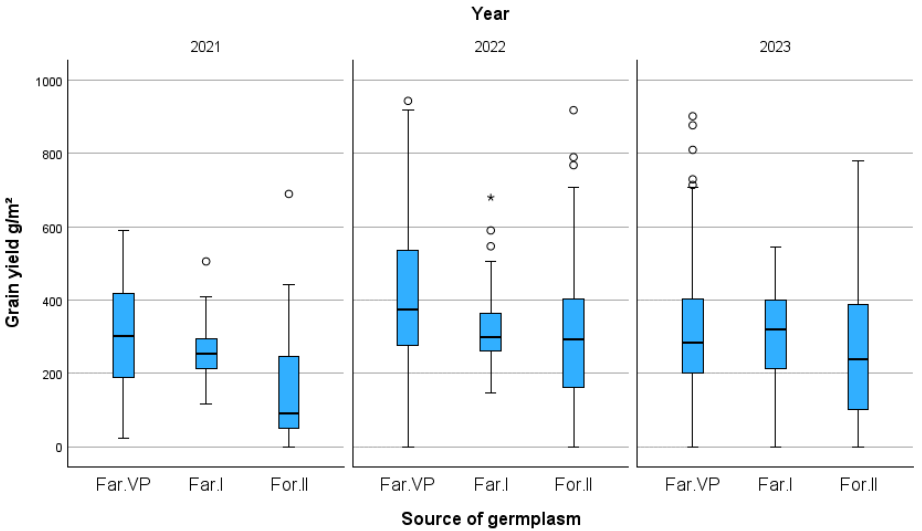
- On-farm farmer-led trials; On-farm farmer-managed randomized variety trials;
- Surveys from 2020- 2022

Varieties, seed systems and experimentation: Lessons learned from the mangrove swamp rice agroecosystem

Results 1. Varieties

- The cycle length and the varieties and related seed system farmers use





Short: 90–105 days; Medium: 105–130 days, Long cycle: more than 130 days.

Far.VP-farmers' variety portfolio (villages of the study); Far.I- Farmers' variety introductions (Tombali) ; For.II- Formal Institutions variety introduction.

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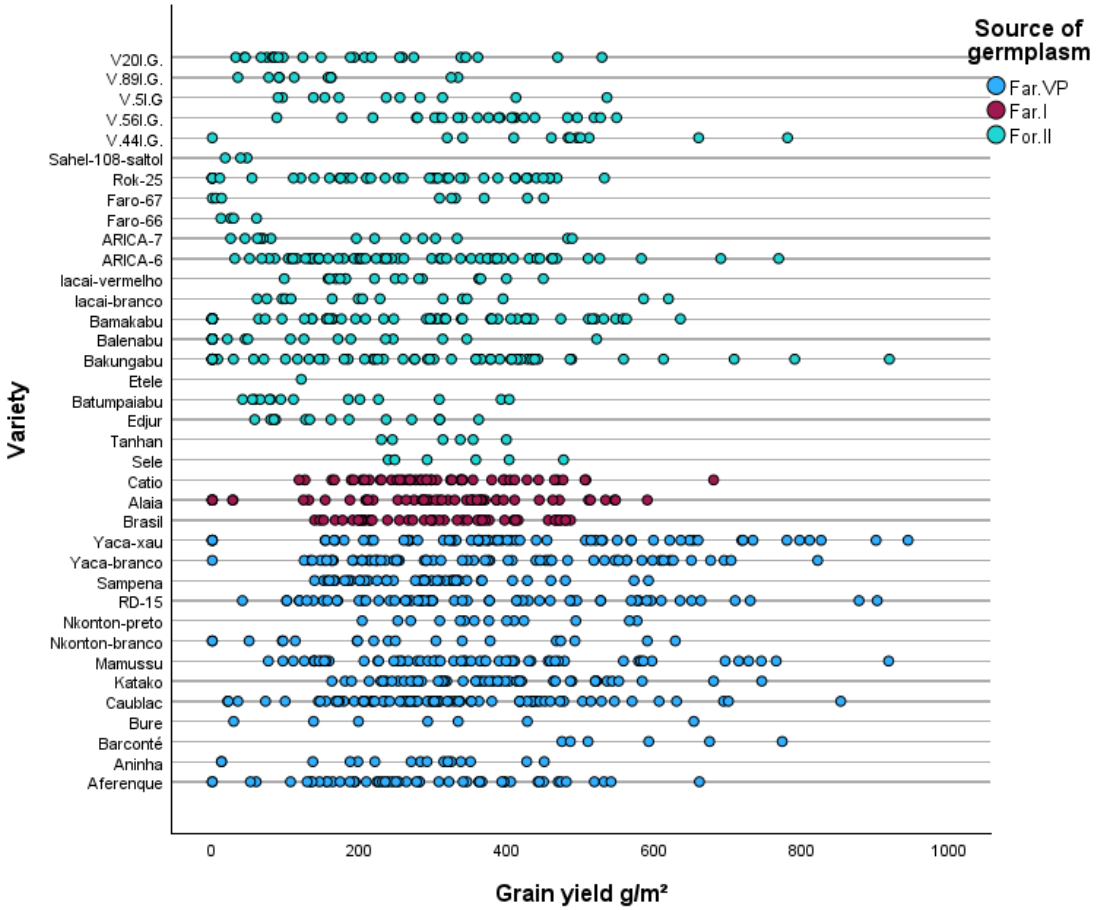
Results 1.Varieties

- Grain yield distribution and top yielding varieties



Formal introduced

Farmer introduced

Farmer varieties

Co-production of knowledge about plowing and sowing

Results 2. Plowing strategies






Manual plowing

Sowing and transplanting without plowing under Sesuvium portulacastrum (L.), blutaparon vermiculare (L.) Mears and Echinochloa colona (L.) E. ssp.

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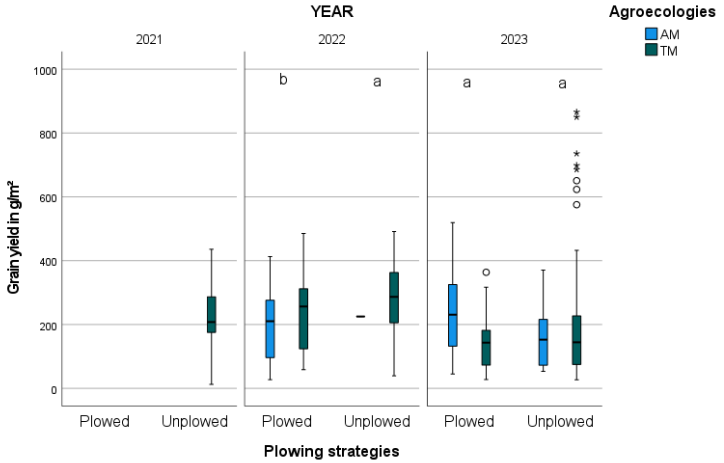
Results 2:Plowing decisions, frequency, yields

Some of the reason not to plow

- Need for better use of labor;
- Physical barriers (roots that are not rot cannot be plowed);
- Good yields;
- Existence of volunteer crop;
- illness, delays in plowing...

Village	Plowing strategies	
	All plots plowed (%)	Some plots not plowed (%)
Cafal (n= 19)	79	21
Cafine (n=16)	38	63
Caiquene (n=8)	25	75
Quibil (n=15)	80	20
Mean (n=58)	**60**	**40**
Chi-square	13.168	
Df	3	
p-value	0.004	



Results 3: Sowing methods

Direct sowing

Volunteer crop

Broadcast 1.4 (3)

Dibbling 20 (52)

Transplanting

Upland nursery

In the swamp nursery

Transplant in plain fields 19 (29)

Transplant on ridges 15.0 (56)

Results 3.

Sowing methods in the Tombali region (%)

The combination of both direct sowing and transplant help spread transplanting labor demand

Labor fall into synchrony with other villages, biophysical-conditions.

Use of "high" seed/seedlings per hill is part of an adaptation strategy to diverse conditions (drought, excess of water, etc)

Village	Crop establishment methods			
	Direct sowing		Nursery sowing and Transplanting	
	Seed broadcast at a low seed rate	Localized seed sowing (dibbling)	Nursery in the upland	Nursery in the swamp
Cafal (n=73)	59	12	18	84
Cafine (n=91)	78	10	1	97
Caiquene (n=23)	17	4	78	74
Quibil (n=34)	15	50	74	94
Mean (n=221)	**56**	**16**	**26**	**90**
χ^2	51.3	33.1	110.6	10.8
Df	3	3	3	3
p-value	<0.001	<0.001	<0.001	0.01

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Discussion

- Farmers’ rational and logic are beyond plot or field and integrate other livelihoods, and across community labor dynamics while scientists' logic focusses at individual field level and its environmental and biophysical attributes

-Management prioritizes land coverage rather than productivity and seed use efficiency due to high risk of crop failure

-Scaling-up of innovations and specific management is limited, site specific and contextual:

complex biotic environment (mangrove trees, beneficial plants, weeds, and rice varieties) * the physical environment (rainfall, landscape) * the social environment (labor availability, coordination of tasks, resources)

Discussion

- Change in the use/importance of practices
    - Previous research reported more on transplanting and limited use of direct sowing methods (Salem, 1999 p.241, Gent, Temudo 1998) although (Temudo,1998) mentioned change among Balantas.
    - Different reports on seed rate (Salem, 1999 p.241) and change in the plant density (Temudo 1998, p.). Long dry spells (heat, drought and water quality change) as observed in 2023.

- Biophysical conditions of the MSR field influence the use of sowing methods.
- High yield variability (from 0 to 4 t/ha) and no significant yield difference among sowing methods (there are exceptions).

Conclusions

- Our observations of farmers' knowledge and practices on MSR agroecosystems revealed:
- the holistic approach farmers use,
- their improvisation skills, and
- the interconnection between MSR production and other livelihood activities that can affect the adoption, diffusion, and scaling up and out of innovations produced by mainstream science

Conclusions: Basket of farmers' innovations

Labor saving farmers' innovations

- Use of unplowed fields (skip plowing)
- Use of volunteer crops and direct sowing
- Use of upland nurseries

Resilience and flexibility

- Early planting* upland nursery *long duration variety
- Early planting*direct sowing*long duration variety
- Late planting* in swamp nursery*medium duration variety
- Early planting*medium duration variety

Improvisation under unexpected events

- Direct sowing after losing a nursery or transplanted plot

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Thank you!

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