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Traditional Strategies to Cope With Socio-environmental Variation

The Case of Farmers' Germplasm Management and Experimentation in Southern Guinea-Bissau

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Layout of the presentation

- Introduction
  - Smallholder farming
  - Partnership for scaling (with whom and how)
  - Case study
- Methodology
- Results and Discussion
  - Ploughing strategies
  - Sowing methods
  - Variety used and their performance
- Conclusion

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Introduction

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Smallholder farmers (84%).

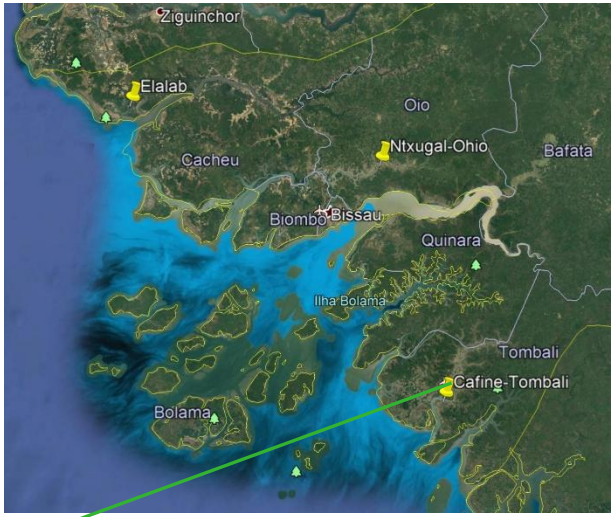
Research in smallholder farmer (low uptake of improved technologies).

Partnership for scaling (how are the farmers viewed in this process?).

Case Study : Mangrove Swamp Rice (MSR) in Guinea-bissau
MSR agroecosystem is a complex traditional socio-technical system, where all activities are manual (labour limited), highly variable and multi-ethinic.

Knowledge gap from both formal and local knowledge system on **farmers agronomic practices.**

Study area-West Africa-Guinea-Bissau
The Tombali region



Mixed-method approach

- Surveys
- Ethnography-Technography
- On-farm farmers-managed trials (baby-mother trials)

Results: Ploughing strategies

Ploughed fields

First step of ploughing - cutting weeds .

Cutting and covering weeds the same day.

Not ploughed fields

Weedy fields broadcasted .

Not ploughed.

Never ploughed (recent field).

Results: Ploughing strategies in the Tombali region (%)

Village	Ploughing strategies		
	Plough*	All Ploughed	Not ploughed
Cafal (n= 19)	100	79	21
Cafine (n=16)	100	38	63
Caiquene (n=8)	100	25	75
Quibil (n=15)	100	80	20
Total (n=58)	100	60	40
Chi-square		13.168	
df		3	
p-value		0.004	

Results: Effect of ploughing strategies in rice performance

Trait	Ploughing strategy (PS)†	
	Not Ploughed	Ploughed
No. of days to Transplant/Thinn	40.4 ^{ns}	37.9
No. hills/m^2	7.4*	5.4
Hill distance (cm)	39.3***	27.8
No. seedlings/hill	10.5***	16.1
Total no. of tillers/hill	30.2 ^{ns}	28.6
No. of productive tillers/hill	24.9***	22.9
Water level at flowering (cm)	11.2***	6.0
Plant height (cm)	148**	140
No. of panicles/hill	22.9 ^{ns}	23.4
Days to harvest (days)	141 ^{ns}	138
Grain weight per hill (g. hill^{-1})	43.2 ^{ns}	41.7
Grain yield (g.m^{-2})	280 **	219
Hundred grain weight (g)	2.3	2.5**

† data presented per m^{-2} based on the measurement of 1 m^{-2} grid were later corrected to addressed the difference between measurements made in fields with ridges formed (50% of effective area) and fields without ridges (effective area of 100%) see the article: https://www.doi.org/10.1007/s13593-025-01070-x

Results: Sowing methods (visual)

Direct sowing

Broadcast

Dibbling

Indirect sowing (transplanting)

Upland nursery

In the swamp nursery

Transplant in plain fields

Transplant on ridges

Results: Sowing methods in the Tombali region (%)

Village	Sowing methods			
	Indirect sowing (Transplant)		Direct sowing	
	Nursery in the upland	Nursery in the swamp	localized seed sowing (dibbling)	Seed broadcast at a low seed rate
Cafal (n=73)	18	84	12	59
Cafine (n=91)	1	97	10	78
Caiquene (n=23)	78	74	4	17
Quibil (n=34)	74	94	50	15
Total (n=221)	26	90	16	56
Chi-square	110.64	10.81	33.10	51.30
df	3	3	3	3
p-value	0.000	0.01	0.000	0.000

Results: Effect of sowing methods in rice performance

Trait	Sowing methods (SM) †			
	Seed broadcast	Nursery in the swamp	Nursery in the upland	Dibbling
No. days to Transplant/Thinn	41.4^{a}	42.2^{a}	36.0^{ab}	30.1^{b}
No. of hills/m^{-2}	8.3^{a}	4.5^{c}	4.9^{bc}	5.6^{b}
Hill distance (cm)	26.8^{b}	34.8^{a}	35.4^{a}	22.8^{c}
No. seedlings per hill	1.4^{c}	15.0^{b}	19.0^{a}	20.4^{a}
Total no. of tillers tillers/hill	23.3^{c}	35.5 ^{a}	31.9^{b}	23.0 ^{c}
No. of productive tillers/hill	17.6^{b}	28.3^{a}	30.7^{a}	19.5^{b}
Water level at flowering (cm)	7.2^{b}	6.1^{b}	14.7^{a}	4.4^{b}
Plant height (cm)	162 ^{a}	140 ^{b}	134 ^{b}	131 ^{b}
No. panicles per hill	15.4^{b}	28.3^{a}	28.8^{a}	14.8^{b}
Days to harvest (days)	137^{b}	142^{b}	151^{a}	113^{c}
Grain yield (g. hill^{-1})	38.8^{b}	52.8^{a}	39.1^{b}	25.3^{c}
Grain yield (g.m^{-2})	251^{a}	283^{a}	251^{a}	93^{b}
Hundred grain weight (g)	2.3^{c}	2.3^{bc}	2.5^{ab}	2.7^{a}

Means with the same letter in the row do not significantly differ at 5% level by Dwass, Steel, Critchlow-Fligner Method. † data presented per m-2 based on the measurement of 1 m-2 grid were later corrected to addressed the difference between measurements made in fields with ridges formed (50% of effective area) and fields without ridges (effective area of 100%) see the article: https://www.doi.org/10.1007/s10745-026-00660-x

Results: Number of varieties used by farmers (%)

	Number of varieties used by a farmer				
Village	1	2	3	4	5
Cafal (n=72)	25	54	20	0	2
Cafine (n=91)	29	56	13	2	0
Caiquene (n=23)	35	57	4	0	4
Quibil (n=34)	15	62	21	0	0
Mean	26	57	15	1	2

	Village				
Variety	Cafal (n=72)	Cafine (n=91)	Caiquene (n=23)	Quibil (n=34)	Total
Yaca +Yaca sau	83	100	91	79	90
Caublac	61	64	48	94	66
Katako	13	3	4	12	8
N'conton	7	10	9	3	8
Aninha	11	4	4	0	6
Aferenque	0	2	17	0	3
Buré	6	1	0	0	2
Mamussu	3	1	0	6	2
Baricontê	3	1	0	0	1
Alaia	0	0	9	0	1
RD15	3	0	0	0	1
Sampena	0	0	0	6	1
Silá	0	2	0	0	1
Hatnatanha	0	1	0	0	0
Limania	1	0	0	0	1
Malmon	1	0	0	0	1
V.20I.G.	1	0	0	0	1

Results: Rank of varieties in mangrove swamp rice systems

Type of trial	Rice specie	Type	Variety	Grain yield g/m²†	Growth cycle
Mother	*O.Sativa*	Landrace	Yaca sau	289	Long
	O.Sativa	Landrace	Mamussu	239	Long
	O.Sativa	Landrace	Yaca branco	233	Long
	*O.*Sativa	Landrace	Kataco	223	Long
	O.Glaberrima	Landrace	Bakungabu	214	Medium
	O.Sativa	Improved	RD-15	195	Medium
	O.Glaberrima	Landrace	Bamakabu	193	Medium
	O.Sativa	Improved	Faro 67	181	Medium
	O.Sativa	Improved	Rok-25	176	Medium
	O.Sativa	Landrace	Aferenque	176	Long
	O.Sativa	Landrace	Caublac	175	Medium
	O.Sativa	Landrace	Catio	172	Long
	O.Sativa	Landrace	Alaia	171	Long
	O.Sativa	Landrace	Sampena	141	Long
	O.Sativa	Improved	Arica 6	134	Medium
	O.Glaberrima	Improved	V.20	118	Short/medium

Conclusion

- Partnership for scaling of innovation for smallholder farmers should be grounded on/prioritize local knowledge/context.
- Same innovations scaling (varieties and planting density) are pre-conditioned by other constraints (water, labour, services, money etc.) so enabling environment or limiting factors must be well identified and addressed.
- For plant breeders demand-led approach unless rooted/adequate to farmers socio-economic condition will difficultly lead to spread adoption of improved varieties.

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Thank you!